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"BRAZIL"

PAST, PRESENT AND FUTURE.

J. C. OAKENFULL.

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FOREWORD

The gulf between 1913 and 1918 has been spanned by such a bridge of sighs as no man could cross twice in a lifetime.

Where I had reason to expect help, or at least sympathy, I found only too often indifference or even positive ill-will.

Not a single Provincial or Municipal Authority or Foreign Corporation having definite interest in Brazilian development has lent me the slightest material or moral assistance. For this reason I have been unable to effect many desired improvements, or even to maintain the outward appearance of former books that I have had the honour to publish. The visible result of an extensive advertising campaign is, to say the least, a most damning proof of the paralysing effects of the World's Greatest Crime.

It has been most difficult to issue the work at all, and it is at least three months behind time. Many thousands of miles have been covered by land and sea in search of material since 1914, when the first notes were laid aside, and I hope that a step further has been taken in comparison with "Brazil 1913." The labour entailed has been very heavy, and, since the first inception of the series in 1909, has fallen on my shoulders alone.

Before I began this work I had, as most unfledged youngsters, a number of cherished illusions, but they have almost all gone, alas, and I have, in exchange, a plentiful crop of grey hairs and—an empty pocket.

Had it not been for the great kindness and practical sympathy of Dr. Domicio da Gama, late Foreign Minister, and the Under-Secretary, Dr. Regis de Oliveira, there is little doubt this work would not have seen the light.

I owe, also, a debt of gratitude to Minister Enéas Martins, and to the Directors of the Mining School, Information Bureau and Department of Geology, Drs. Costa Sena, Affonso Costa and Gonzaga de Campos, as well as Dr. Napoleão Reys, Chief of the Archives and Library, Foreign Office, and last, but not least, to the unnamed humble servitors who have rendered many a fruitless journey to this or that Ministry less disagreeable.

J. C. OAKENFULL.

November, 1919.

ECONOMIC MAP OF THE UNITED STATES OF BRAZIL

SPECIALLY DRAWN FOR "BRAZIL IN 1918"

(SHOWING PRINCIPAL RAILWAYS)

FROM RIO JANEIRO TO —

	Miles	Days		Miles	Days
New York	4,748	17-18	Antwerp	5,244	19-20
Cadiz	4,789	12-13	Odessa	6,347	?
Genoa	5,040	15-15	Libau	5,900	?
Trieste	5,858	23-25	Montevideo	1,016	3-4
Lisbon	4,214	11-14	Buenos Aires	1,136	4½-5½
Bordeaux	4,894	16-18	Punta Arenas	2,702	?
Southampton	5,038	16-17	Valparaiso	4,211	?
Bremen	5,501	19-21	Bahia	—	2-3
Amsterdam	—	19-20	Pernambuco	—	3-4
Liverpool	—	19-21	Para	—	13-18
Hamburg	5,519	20-21	Manaos	—	23

BRAZIL :
Past, Present and Future.
(1918.)

CHAPTER I

GEOGRAPHY AND TOPOGRAPHY

Limits

REFERRING to the plan on opposite page, we find that South America was united to the great African Continent, and the formation of the expanse of water known to-day as the South Atlantic Ocean only began during the Cretaceous period. Dr. Ihering has a great weight of scientific opinion to back up the theory expounded in the above diagram. It is presumed that the terraces, or so-called parallel ranges of mountains along the Brazilian coast, as well as the cataracts of the Paraná, São Francisco, Tocantins, etc., etc., and the Amazon valley were formed by the movements of the subsiding port of Arch-helenis, Brazil being one of the oldest parts of the world. In the Devonian period the sea of course covered a great part of the country. Wallace considers that there were originally three islands—(1) The central plateau of Brazil; (2) Guiana, and (3) Venezuela—the intervening spaces now forming the Amazon, Orinoco

and River Plate basins. North and South America were of course quite separated, and were united and parted again before the comparatively recent union caused by the uplifting of the Andean chain, the youngest and most mighty mountain range in the world.

Africa was isolated from Europe in the latter part of the Cretaceous period, and definitely from Brazil in the Oligocene age, the first junction of North and South America presumably taking place in the Pliocene age. When we come to deal with the fauna of Brazil it will be interesting to study the conclusions of the most eminent living authorities with regard to the result of these gigantic movements of the earth's crust.

Almost the whole of Brazil is in the Southern Hemisphere. It attains its greatest dimensions between the Equator and the Tropic of Capricorn. The only South American countries which are not in contact with it are Chili and Ecuador.

The channel which once separated the North-Western and Eastern Continents was only a very narrow one, bridged over at different periods in the world's history.

Connection is presumed to have been made during early Devonian stages, but there was also another junction (Archi-helenis) further south. (See "Devonian Fossils" (Clarke), *Bulletin No. 1 of Geological Survey*, Rio.)

Brazil may be compared in form to a triangle, along the north-east and south-west side of which run the main mountain ranges, the railway lines, etc., punctuated by the principal centres of population.

The Atlantic Ocean forms a natural boundary all

along this base, and the distance from Cape Orange, on the north, to Chuy, south-west, is over 5,000 kilometres.

From north to south there are 37 degrees of latitude, and between Pernambuco, on the eighth parallel south of the Equator, and the eastern Cordillera of the Andes, there are as many degrees of longitude, or 4,350 kilometres.

From Cape Orange to Cape Razo mangrove swamps extend all along the coast, and from north of Recife, as far as the Abrolhos, off Espirito Santo, coral reefs fringe it here and there; but from the mouth of the São Francisco to Santo Antonio sand dunes and banks predominate, the coast-line south of the Doce river being high and rocky, with the exception of narrow belts of alluvial. Trinidad island, far out in the Atlantic, is, like Fernando do Noronha, of eruptive origin. The former has a maximum elevation of 660 metres.

In area Brazil is more than 19 times the size of France, and is the fourth largest country in the world, if Alaska is excluded from the United States.

There are few natural bays of the first class, those of São Salvador (Bahia) and Rio easily outclassing the others. To make up for this, however, the river system is unrivalled. Americans are proud of calling the Mississippi the father of waters, but its volume cannot be compared to that of the Amazon.

The latter rises in the Peruvian Andes, in Lake Lauricocha, and receives all the rivers which spring from the eastern slope of this range, between 3 north and 19 south. It breaks through the Cordillera 78 west of Greenwich, and all occidental Europe could be easily placed within its basin. Its maxi-

mum elevation above normal level exceeds 20 metres at highest floods, and in exceptionally dry seasons lowers its level 5. Marajo Island, in the delta, is 276 kilometres long by 174 wide, exceeding in area Belgium or Holland.

The wind blows up stream almost incessantly from April to December, thus facilitating navigation. From January to March (midsummer) winds blow from every quarter of the compass. From Obidos (600 kilometres up stream), where the tide reaches, to the mouth, its *width* is not less than 74 kilometres. This gigantic stream freshens the waters of the ocean for a distance of at least 180 miles out. It is so deep that its very slight incline is sufficient to give it an impulse powerful enough to retard considerably the speed of vessels bound up stream.

In the estuary, depths of 150 fathoms are common, whilst the average is 25, and the minimum 15 fathoms. Over 1,100 tributaries flow into this majestic river, 1,200 kinds of birds are exclusive to its valley, and Bates found some 8,000 new varieties of animal life on or near the river. The soil of its basin is so rich that for every bushel of maize, beans and rice planted, 800 are often harvested. Its lower part, from Manáos to the sea, appears to have been formerly a bay, 1,000 miles deep and 400 wide.

The area subject to inundation at the present day is probably not much less. Like the Paraguay, it is navigable throughout the greater part of its course. The latter river rises in the State of Matto Grosso, not far from the source of the Tapajoz; but, unlike the Amazon, its course is almost due south to its junction with the Paraná, 2,150 kilo-

metres from its head waters. Here the republics of Paraguay and Argentina meet.

The principal streams belonging to the Amazonian and Paraná basins start from what may be termed a common centre, almost in the middle of Brazil. There is only 6 kilometres between the sources of the Aguapehy and Alegre rivers, belonging to both systems, and in a specially wet season it is possible to travel by water all the way from Cuyabá, in Matto Grosso, to Pará, in the Amazon delta.

Tabatinga, the frontier town, is 4,000 kilometres from the mouth of the estuary. So far up stream the Amazon is 2,775 metres wide and 20 deep, and at Obidos 75 deep. The first great tributary is the Japurá, on the north side, and, almost opposite, the Juruá, 1,200 miles long, both 16 degrees west of the mouth. Below, on the left bank, the Rio Negro, 1,500 miles in length, falls into the main stream close to Manãos, this affluent varying in width from 2 to 15 miles. Its waters are not truly black, but of a dark brown colour, showing golden tints by reflected light, when placed in a glass, the hue being due to alkalis in solution, which have been derived from the primary rocks in its course. A great tributary of the Rio Negro, the Branco, is, on the contrary, of a milky colour, having absorbed this tint from the beds of white tabatinga, or clay, through which it has flowed.

The Purús had joined the parent stream somewhat higher up, on the other bank, and has a length of 2,190 miles. Further to the east and on the same right bank we find the Madeira, fed by over 90 tributaries, the basin of this river alone covering 637,000 square miles. At Obidos, a little westward of the Tapajoz, but on the other side of

the Amazon, according to Martius, over half a million cubic feet of water flow past per second in the dry season. The Tapajoz is 1,158 miles long, the Xingú, somewhat below, 1,260, and there are more than 30,000 miles of navigable waters in the basin of the mighty river. The Tocantins, 1,620 miles long, is not, as generally considered, a tributary of the Amazon, but an independent river, and receives the Araguaya 5 degrees south of the line.

Coming southwards, we find the Parnahyba between Maranhão and Piauhy, and then there are no more considerable rivers until the mouth of the São Francisco is reached. This stream rises in southern Minas Geraes, and wends its way right through the central part of that State and Bahia, running almost parallel with the coast for more than three-fourths of its course, and then taking a sudden turn eastward, and a series of tremendous leaps at Paulo Affonso falls before reaching the sea at Sergipe. The area of its basin is 668,500 square kilometres. It is navigable for an extension of 1,584 kilometres from Pirapora cascades almost to the falls of Paulo Affonso in Alagoas. The total length of this river is 2,900 kilometres, according to Liais, and its principal feeder is the Rio das Velhas, having its origin in the centre of Minas and flowing through a great part of the diamondiferous region of the latter State.

The Rio das Velhas was at one time navigable for more than 650 kilometres, and two other tributaries, the Paracatú, 420 kilometres, and the Rio Grande, 260 kilometres. There are several important streams falling into the sea in Bahia, the principal being the Itapicurú, 990 miles long, Paraguassú, Rio de Contas, Pardo, etc. The Jequitin-

honha has a length of 650 miles, and its basin covers an area of 105,500, the Rio Doce, in Espirito Santo, being over 600 miles long.

The Paraná (Mother of Waters) is in its first course called the Paranáhyba, and rises in 18·30 south and 3·20 west, flowing 580 miles before it is joined by the Rio Grande. This river rises in Minas Geraes, not far from the São Francisco, in 22·20 south and 1·25 west, and has a total length of 950 miles. From the junction of these rivers in 20·30 south, 8 north, the Paraná flows on uninterrupted until, in 23·30 south and 1·20 west, the Tieté, 672 miles long, enters it on the left bank; 270 kilometres further south comes the Paranápanema, rising in 24·30 and 5·20 west; it is 780 kilometres long. A little below the Ivahy joins the Paraná, still on the same bank, and then comes the Ilha Grande, where the river has a width of 4 or 5 kilometres, gradually narrowing between two granitic masses. At Guayrá, below the island, are the seven falls (7 quedas), the stream being reduced to 55 metres in width, and falls over 19 metres by these seven cascades, producing a volume of sound which is audible at a distance of 35 kilometres. Below the stream widens to 110 metres in 7 or 8 miles of course, and at Iguassú, 25·41 south, 125 miles further on, it is 380 metres wide. The total fall of these cataracts is reckoned to be 300 feet, and there are 13 million cubic feet of water per minute, with a H.P. of 24 millions. The Iguassú Falls are no doubt the most majestic in the world, the total width being 13,133 feet, the H.P. 3 millions, and a column of mist rising above them is visible 4 leagues away. The Santa Maria Fall is more than 200 feet high. The river, near whose

mouth are these wonders, is 710 kilometres long, rising 25·30 south and 5·50 west. Twenty kilometres from the Paraná, at the Funil Falls, the stream narrows from 240 metres to 30 in width. (See *Gazetteer.*)

On the right bank of the Paraná is the Paraguay, 2,150 kilometres long, and on the left the Uruguay. Below this junction the River Plate gathers all the rivers into its stream. The Uruguay rises in Santa Catharina State, 27·50 south, 6·40 west, and has an area of 388,000 square kilometres in its own valley. The total length of the Paraná is 2,600 miles, and its average width 2·3 miles.

There are many great waterfalls in Brazil, including those of the Oyapock (Brazilian Guiana), 100 metres high; the Paraguassú (Bahia), 100,000 H.P.; and the Salto Grande of the Jequitinhonha, 44 metres high. Southwards we find the Onça, 220,000, and Patos-Marimbondo Falls of the Rio Grande, 700,000 H.P. The Rio Branco, Ivahy river, Paraná, 80 metres high; Dourado and Agua Vermelha (Parnahyba river), 400,000 and 300,000 H.P. On the Paraná is the Itapura, 54,000, and Avanhandava, 60,000, both dwarfed by Urubupungá, 450,000 H.P.

In Rio Grande do Sul, Passo Fundo of the Uruguay has over 30,000 H.P., and Soledade on the Jacuhy about the same volume of water.

Santa Catharina and other States have many falls, but none of any great magnitude.

There is an absolute continuity between the Campos at the head waters of the Paraná, and those of the upper Amazon, which river has a basin of 3,356,400 square miles.

This does not include any part of the river extra-

Brazilian. The territory to the north-east of the Amazon valley (Brazilian Guiana) is of a hilly nature and consequently dry.

We have then, a vast network of streams watering almost the whole of Brazil. The volume of some of the principal rivers gives a somewhat clear idea of the enormous extent of territory through which they wend their way, and the sketch map at the beginning of the book will demonstrate their relative position and course.

The distance from Pará to Villa Bella (Matto Grosso) by water would be about the following: Mouth of the Madeirá, 270 leagues; on to the Mamoné, 1,015; thence to Guaporé and Villa Bella; 1,264 leagues in all. From the latter place overland to Bahia is 542 leagues, or to Rio Janeiro 520; and from Cuyabá (capital of State) to Rio would be 426 leagues, at 20 to the degree of lititude, in direct line; but the distance by sea is 3,242 nautical miles, and from Rio to Manaos 3,204.

By looking at the map one may see that there are very few spots indeed in Brazil that are not well provided with water. The natural source of most of the rivers seems to be the central plateau, and the majority flow either south or north. from the States of Matto Grosso and Goyaz. As we have already remarked, a narrow mountain chain forms the watershed, in many cases, of two rivers whose course is widely divergent. Thus, we may call Brazil a country of many mountains. This is due naturally to the erosive influences of the rivers throughout the ages dividing and multiplying the mountain ranges. We shall observe a curious instance of this if we turn our attention to the Serra da Sincora, in the State of Bahia.

The Paraguassú has, with its affluents, separated that range into several isolated masses, which confront each other across profound valleys.

More than half of Brazil consists of an elevated plateau cut into by a vast number of rivers. The mean altitude is from 2,000 to 3,000 feet, with isolated ranges up to 7,000 feet, and one peak (Itatiaiá) reaching considerably over 8,000 feet. According to Dr. Alvaro de Silveira (*Jornal do Commercio*, Rio, June 1, 1913) its total altitude does not exceed 2,830 metres. This writer gives pride of place to the Morro da Bandeira in the Serra do Caparão near Manhuassú, close to the Minas and Espirito Santo boundary, reckoning the height of this latter mountain as 2,851 metres, or 9,350 feet. We find the highest summits along the eastern side of the country, near the sea, and in the centre forming three long chains separated by the basins of the São Francisco and Paraguay rivers. Thus the elevation of the land is by no means commensurate with the length and volume of the rivers, and it may perhaps be safely asserted that the accidence of the topography is responsible for the immense extent of the Brazilian fluvial systems.

There are then, four distinct ranges of mountains:—

(1) The Andes, or rather their foothills, which form the extreme western limits of the Republic.

(2) The Guiana and Venezuela Serras, separating the valleys of the Amazon and Orinocco.

(3) The central series, rising here and there into elevated peaks. This covers the greater part of Matto Grosso, Goyaz, central and western Minas and São Paulo, Pernambuco, Piauhy and

Maranhão, and forms the watershed of the Paraguay, Paraná and Uruguay rivers on the one side, and of the lower tributaries of the Amazon on the right bank, and of the Tocantins and the branches on the left hand of the Sao Francisco on the other.

(4) The coastal ranges, extending from the São Francisco river on the north, to the southern part of the State of Rio Grande. Here we find the sources of all the minor streams that discharge their waters into the Atlantic, as far south as the River Plate basin. These ranges are practically unbroken. There are no extensions of plain or wide valleys intervening. Here and there they approach quite close to the sea, in the vicinity of Rio Janeiro and Santos notably, and lower down they recede, leaving a wide alluvial strip in the State of Rio Grande, and in the north, in Bahia (at Cannavieiras), a boggy district, but in general the line is more or less parallel to the coast, and, like it, shows no very great tendency to become broken or undulating.

The coastal range is, however, divided into three distinct parts. The first, called the Serra do Mar, is very near the sea, and lies principally in the States of Espirito Santo, Rio de Janeiro, São Paulo, Paraná, and Santa Catharina. In the State of Rio it is partly bounded on the west by the Parahyba river, which forms a natural limit in this direction.

The third section of the system, the backbone of Brazil, as it is called (Espinhaço), trends N.W. This latter forms part of the eastern edge of the São Francisco basin.

The Roraima Range in Amazonas attains over 8,000 feet and Ibipaba in Ceará 3,300 feet. The

most important mountains in the Mantiqueira besides Itatiaiá are situated near the pass by which the central railway makes its way westward at Barbacena. This little city has an altitude of about 4,000 feet, and may be termed the gate of the mineral district.

In the Espinhaço Range we find Itacolumi (near Ouro Preto), 5,700 feet; Caraça, 6,300 feet; Piedade, 5,800 feet; and Itambé, 6,000 feet. Pedra Branca (Caldas) is 5,560 feet, and Itabira do Campo 5,000 feet. Some other peaks in this region are nearly as high.

In Goyaz we find the Pyrenees attaining nearly the height of 4,500 feet, and the Serra da Canastra reaching 4,200 feet. Amaro in Pernambuco is 4,000 feet, and the Pico das Almas (Bahia) 4,100 feet. In Espirito Santo the Serra de Itapemirim attains 6,800 feet, and that of Itabapoana 4,600 feet.

The second range (Mantiqueira) lies in the States of S. Paulo and Minas Geraes. At Itatiaiá, or near it, it becomes allied to the Serra do Mar, thus this mountain may be said to belong to two systems, as it may be stated to be in two distinct states. Like the Tinguá, it is of a different nature to the others in its vicinity, being composed mainly of later eruptive rocks, such as syenites and phonolites. The crest of this Mantiqueira Range lies at an average of 6,500 feet above the sea, thus forming the most dominating and imposing mountain chain on the opposite side of the valley, through which the Rio-S. Paulo branch of the Central Railway runs, we find the Serra Bocaina, with Morro do Chapeu (1,790 metres). Further south on the right is the Campos de Jordão (1,600 metres). In N.W. S. Paulo, on the Caldas branch of the Mogyana Rail-

way, the line crosses a pass at an elevation of 1,270 metres. In Central Minas the railway attains (Curralinho-Diamantina branch) 1,400 metres above sea-level.

The highest summit in Matto Grosso does not however reach 3,000 feet. The Paraná Plateau (Campos Geraes) extends into Santa Catharina and Rio Grande do Sul, and thrusts out spurs into Minas and São Paulo, and its maximum height is about 5,000 feet, with a mean level of about 2,000 feet.

The broken series of serras west of the S. Francisco river in Minas and Bahia average 2,000 feet, with maximum elevations of nearly 4,000 feet, but forming what is called in the latter state, a chapada, or tableland, from which, in the north, great detached masses rise, frequently of columnar form. Further west the descents are abrupt, causing a series of cascades and cataracts on the rivers flowing into the Amazon. North of Rio City, a short spur, separated from the main range of the Serra do Mar by the Piabanha river, bears the name of Serra dos Orgãos (Organ Mountains). Here, within 40 miles of the capital of the Republic, we find a mean altitude of 6,500 feet, with one or two summits attaining almost 7,300 feet. The massif of the latter peak is noteworthy for being isolated on the east from the main range of the Organs, by tremendous precipices.

This (Pedra Assú) is said by Dr. Orville Derby to be a granitic boss projecting from the surrounding gneiss.

At Theresopolis, 2½ hours from Rio, we are much nearer the finger-like peaks (Dedo de Deus, &c.), which give their name to this range, owing to their presumed resemblance to organ pipes. The

southern half of the Organ Mountains is known as the Serra da Estrella, and reaches in the Cortiço (near Petropolis, two hours from Rio) about 4,500 feet, or some 2,000 feet above the valley in which lies Petropolis (the summer residence of the well-to-do). Behind Rio Janeiro itself we find the Corcovado (hunchback), 2,200 feet, the Tijuca, 3,300 feet, and more to the north, an isolated mountain of somewhat different formation to the surrounding peaks. It is called Tinguá, and gives its name to some curious mineral found in nodules, and known as Tinguáite. Its origin has been presumed to be volcanic, although no crater can be said to exist now. Altitude about 5,000 feet.

This mountain is of truly volcanic origin, and, naturally, its rock formation is quite different to that of its neighbours. In São Paulo the serras decrease in altitude as the Paraná basin is approached, but on the main line, south, in Santa Catharina 1,300 metres are attained by the railway, and the Serra do Mirador, &c., reach higher levels.

In Rio Grande do Sul the highest points do not exceed 1,000-1,200 metres, so there is a gradual drop all the way from the sources of the Iguassú and Uruguay.

Lakes

Brazil is rather poorly off for fresh-water lakes, the largest so called "Lagôas" being really lagoons formed by the junction of various sand-banks and bars. The largest of these is Lagôa dos Patos, in Rio Grande do Sul, 230 sq. kilometres in extention. Adjoining it, and connected by a canal, is Lagôa Mirim, 180 sq. kilometres. Raja Gabaglia, in a work on Brazilian frontiers, page

232, says: "These two lagoons are nothing but one vast tank, in which are decanted the alluvials of all the rivers of this basin. They are in process of alteration, and it seems certain that they will become filled with detritus at no very distant period. (See *Gazetteer*.) Eastward in the same state is Mangueira, with 118 sq. kilometres. This is separated from Mirim and from the ocean by a narrow belt of sand. In Maranhão we find Motta, 73 kilometres, and in Rio Janeiro, Araruama, 60 kilometres, but all the above are of the same character as the chain of lagoons in South-west France, between the mouth of the Gironde and the Côte d'Argent.

The only true lake of any size in Brazil is Mandioné, in Matto Grosso. In Central Minaś Geraes, from Lagôa Santa to below Séte Lagôas, there is a chain of small lakes which at one time are presumed to have formed part of a great inland sea. All these are in the limestone formation of the Rio das Velhas valley. The Amazon itself was supposed to have been formed by an immense gulf, the lower part of which presented the aspect of a veritable sea. The inclination of the valley is even now so slight, that the fall is only 35 metres from Tabatinga to the ocean, or one inch per mile, the trend being northwards (4·15 S. to 1·27 S.).

Inter-state Limits

Practically every state has frontier questions with its neighbours, the principal settlements effected during the past few years, being the long outstanding one between Paraná and Santa Catharina, causing some difficulty to the Federal Government,

which was obliged to intervene with a military expedition to the "Contestado," as the disputed zone was termed. This was finally settled in 1916.

Minas Geraes has litigation with Espirito Santo, Rio, São Paulo, Goyaz and Bahia. Bahia, in addition, with Sergipe, Pernambuco, Espirito Santo, Piauhy and Goyaz. Pernambuco, with Ceará, Alagôas and Parahyba. Rio Grande do Norte, with Ceará and Parahyba. Piauhy with Maranhão and Ceará. Goyaz with Pará and Matto Grosso. Amazonas with Pará and the Acre Territory, this is really a question with the Federal Government.

This latter (Federal District) disputes boundaries with Rio State, Paraná with São Paulo, and Santa Catharina with Rio Grande do Sul.

Proposals have been made to cede the Bahia port of Caravellas to Minas Geraes, in exchange for some concessions in the north of this state.

Most of the above internal difficulties are due to the autonomy of the states and to the existence of export duties imposed by most of them. (See Bibliography.)

Limits (International Settlements)

Argentina.—Definite Treaty, February 5, 1895. The frontier runs along the river Uruguay, from the mouth of the Quarahim, to that of the Pepery-Guassú, up this latter to its head waters, from thence by the Serra de Santo Antonio to the source of the river of the same name, descending the course of this stream to its mouth in the Iguassú, and on by this to its confluence with the Paraná.

British Guiana.—Treaty of June 6, 1904. Rectified by mutual accord in 1908. Arbitration of the

King of Italy. A line running from the source of the Cotingo on Mount Roraima, east by the highest summits to the springs of the Ireng, or Mahú, on Mount Yankontipú, down this stream to its mouth on the right bank of the Tacutú, ascending this to the source, and passing by the *thalweg*, along the Uassuary and Acarahy serras to the source of the Corentyne. By the mediation of Vittorio Emanuel, Britain obtained 19,630 sq. kilometres, and Brazil 13,570.

Dutch Guiana.—May 5, 1906. Consists of a line which runs from the soure of the Corentyne river and follows the *thalweg* of Tumucumaque to the head waters of the river Maroni.

French Guiana.—December 1, 1900. Serra of Tumucumaque from the source of the Maroni to that of the Oyapock, and by this to its mouth in the Atlantic, west of Cape Orange.

Paraguay.—Treaty of January 9, 1872. River Paraná from the mouth of River Iguassú to Sete Quedas. Thence by highest points of Serras Maracajú and Caaguacú to the head waters of the Estrella stream in the Serra Amambahy, following this to its mouth in the Apa, and on by this last to its confluence with the Paraguay, and up this river to the Lagôa Bahia Negra.

Uruguay.—Treaty of October 30, 1909. Arroio Chuy, mouth to Arroio S. Miguel, on to Lagôa Mirim, centre of this between Taquary Islands to before Fanfa point on Brazilian side, and Muniz point on Uruguay side, thence to mouth of river Jaguarão, by watershed to mouth of Jaguarão Chico, right bank of this to Arroio de Mina, and up to its springs. On, in a straight line by Serra do Aceguá to Rio Negro, at mouth of S. Luiz, follow-

ing latter to head waters, the boundary proceeding by peaks of Cemiterio, and Cochilhas Serrilhada, Santa Anna and Haedo to Arroio da Invernada, on by this to its mouth in the Quarihim and by this to the River Uruguay.

Bolivia.—Treaty of November 17, 1903. River Paraguay from mouth of Lagôa Bahia Negra, right bank, 9 kilometres from Fort Coimbra, and thence by a geodesic line to a point 4 kilometres N.E. from the lower end of Lake Bahia Negra. The line continues to 19·2 (N.E.) and on eastwards to the riachão (stream) Conceiçao, following this to Lake Cáceres, cutting lakes Mandioré and Guahyba to River Pando, formerly Pedro 2'o Canal, and along this to Lake Uberaba, and thence to extreme south of corixa Grande, and in a right line south to north by the corixas S. Mathias and Peinado to mount Bôa Vista, and from it in a straight line east to west to Mount Quatro Irmãos, continuing on to the main source of Rio Verde, and by the *thalweg* of this to that of the Guaporé, and Mamoré to the mouth of its tributary the Beni, these two rivers forming the Madeira, the frontier following this river to the mouth of the Abunã, and up along this to the parallel 10·20 S., and by this parallel to the River Rabirra westwards, up to its headwaters, and by *thalweg* to the springs of the igarapé (canoe stream), Bahia, descending the same to the bar on the Aquiry or Acre, and so on to the mouth of a tributary of the latter (Javerija).

Peru.—Treaty, September 8, 1909. From the mouth of the Javerija to its springs and in a right line to the source of the Shambuyaco, and down this to the River Purús. Follow the latter to the mouth of the Santa Rosa, and up this to its source, thence

by the parallel 10, and on south to north to the source of the river Breu, down the latter to the Juruá, and from there in a right line to the vicinity of the Amonea, and on by the watersheds of the Japurá and Ucayali to the Javary, and by this to the Amazon, at Tabatinga, in Brazilian territory, thence following a line from south-west to north-east to the junction of the Apapóris and Japurá rivers.

Note.—The stretch between Tabatinga and the mouth of the Apapóris is in litigation between Peru and Ecuador, the King of Spain being arbiter.

Colombia.—April 24, 1907. Signed in Bogotá. By the Apapóris to its tributary Tarahyra, and on by a right line south to north to the source of the Capury, descending this to its mouth in the Uaupés, near the Jauarité Falls, up this to the mouth of the Kerary of Cairary, and from thence to the Cachoeira Grande on the Issana, continuing by the Serra Araraquára to the junction of the igarapé Peguá, with the Cuiary or Iquiary, following the highest part of the serra to the source of the Memáchi, and thence to cerro Capárro, passing on between the headwaters of the river Tômo, and the igarapé Japery, and by the *thalweg* to the springs of the Macacuny or Macapury to its mouth in the Rio Negro close to the Brazilian village of Cucuhy.

Venezuela.—Treaty of 1907. A conventional line from the mouth of the Macapury on the Rio Negro to the great island in the River Pedro 2'o, and on to the Huá fall on the Maturacá and thence to cerro Cupi, and by the *thalweg* to the serras of Imery, Tapirapecó and Urucuseiro, and northwards by the serras Parima and Marchiáli, and on east by the serras Imenearis, Paracaima and Humirida to the source of the River Cotingo on Mount Roraima.

CHAPTER II

CLIMATE AND DISEASES

It is impossible to speak of the climate of Brazil as a distinct concrete thing. The country is so immense, and its topography, as we have seen, so varied, that it has at least three different zones. Generally speaking, we find that the latitude in Brazil has hardly anything to do with its climate. Of course, it is naturally warmer (on the coast) in the winter at Pará than it is at Rio Grande, but the maximum summer heat is quite as great in all probability in the latter state. The average temperature of Pará is 26° centigrade, or 78° Fahrenheit. In spite of this rather high percentage (owing to the absence of winter, as far as loss of solar heat is concerned), the death-rate is only 20 per thousand per annum. To show how figures prove misleading at first sight, we may note that Rio de Janeiro (within the tropic of Capricorn) has a maximum temperature of about 37° centigrade (98° Fahrenheit), whilst Buenos Aires (11 degrees further south) has a maximum of 105° Fahrenheit (shade). How can one account for such apparent anomalies? To understand the reason for this, one must consider the question of winds, and therein lies the secret of the relative healthiness of places lying well within the tropics, and in some instances almost on the line itself. We shall now proceed to deal systematically

with the three different zones under which we propose to divide Brazil. It may be safely concluded, in fact boldly asserted, that the climate of Brazil, generally speaking, is quite suited to European colonists, whether from the north or south, and any government warning its subject to the contrary acts in blind ignorance, or stupid antipathy, with some reason for its calumny which may not be very difficult to ascertain. To those who are inclined to listen to warnings as to the unsuitability of the climate, I would say—Reflect, and see if the detractors have any other reason besides that of the welfare of the inquirer.

The average temperature of the first, or tropical zone, is 25° centigrade (77° Fahrenheit), but it must be divided by its relative humidity into three parts. (1) The upper Amazon; (2) the interior of the States of Maranhão, Pará, Matto Grosso, Piauhy, Parahyba, and Pernambuco; and (3) the coast line itself.

In the first region, the season of rains is from February to June. From the middle of October till January there is a modicum of wet weather, and from July to October, and January to February, the weather is dry. The temperature rises and falls rapidly in some parts of the Amazon valley. Now and then the thermometer has marked only 51° Fahrenheit. Although the day may be too hot, as soon as the evening approaches, the influence of the breeze is felt. Agassiz noted that a peculiarity of this climate was the almost continual action of a wind blowing from east to west. Maury said: "The rains falling abundantly during some months are invigorating." It is very rare that the wind becomes violent. There is between the Amazon region and India, for example, the same difference

which divides Rome and Boston, U.S.A. The two cities are in the same latitude, but their climates are unlike. The average number of wet days at Pará is 196 annually, and the rainfall is 2·2256 millimetres, a very great amount, but more or less equably distributed.

The prevailing summer winds in this state are those from the north-east. Coastal zones, as a rule, and the valleys of the great rivers are covered with dense forests, and the more arid high lands of the north-east of the Republic possess a typical stunted vegetation termed *caatinga*. It must not be presumed that the minimum of 64° Fahrenheit, and maximum of 98° Fahrenheit, is general all over Amazonia. In the more elevated regions of the two states, frosts have even been observed, and the climate of a great part of northern and southern Pará and Amazonas may be termed healthy, owing to the Campos Geraes of the first, and the high pasture lands of the last.

In a contest in Paris, 1898, between 1,200 children, the first prize for healthy appearance and physical development was given to a boy who had been born in Manáos, of Amazonian parents. Longevity is common. An authenticated case is chronicled of a man who lived to 145 years. Malarial fevers, found in some zones in the valley, are identical with the Italian forms, and in the Campagna of Rome are far more dangerous and difficult to cure.

The dangerous parts of the Amazon valley are limited to a very small section indeed of the country. There are 204,000 square miles of territory where, to quote Bates (naturalist on the Amazon), the cilmate is glorious. According to Hartt, part of the plateau has the best climate in the world, and

one finds in the Campos Geraes, at least 600,000 square miles of lands well suited to stock raising, and even the cultivation of such cereals as oats and barley, as well as wheat.

Wallace says: "The temperature is marvellous, and the nights are noteworthy for the balsamic perfumes wafted through the air."

Herbert Smith wrote: "I have travelled through Amazonas during four years, without the least touch of fever. There are no sunstrokes ever known in this country."

Orton says: "Pará is an invalid's paradise."

Bates says, further, "that Englishmen who have lived 30 years in Pará, conserve the same aspect, and the same freshness of colour as they had when they left their native land."

Reginald Enock, *The Andes and the Amazon* (Fisher Unwin, London, 1911), writes: "The Amazon region is one of the best tropical zones in the world, and its climate is favourable to the development of European races."

A British scientist writes me: "During a residence in Manãos, I gained more than two stones in weight."

The Medical Officer of a British cruiser, which penetrated as far as Peru, told me the health of the crew was very good all the while the ship was in the river.

The extension of this first zone may be calculated as from the second degree north of the line to the tenth south. With regard to its diseases, there are none *peculiar* to the country, and certainly none which are not more the result of carelessness or unhygienic habits than of climatic or topographical defects.

Manáos is only some inches above the sea, and Pará about 22 feet, yet, surrounded as it were by water, they present the following remarkable figures:—

	Lat.	Absolute max. temp.	Absolute min. temp.	Death-rate per 1000
Pará ...	1·27	91° (Fahr.)	66° (Fahr.)	20·2
Manáos...	3·8	97° ,,	64° ,,	

Compare this with Madras, mortality 58·7; Bombay, 48·6; Mexico, 48·5; Lima, 34·7; Cairo, 34·6; Calcutta, 34·4.

The second division comprises the interior of the northern states of Brazil. The prevailing winds are from the N.W. and from the S.E. They are now warm and humid, now dry and cold, causing variations in the temperature of as much as 68° Fahrenheit. In the month of August the day temperature has reached over 90° Fahrenheit, whilst at night the thermometer has gone down to 44° Fahrenheit. However hot the weather may be, the wind and the rain cause it to sink rapidly. The dry season lasts about two months, with, at most, two days' rain during this time, but an exception must be made of the States of Ceará, Parahyba, Piauhy, and Rio Grande do Norte, where the dry season sometimes extends to three or four months.

The old chroniclers were unanimous in their praise of the climate. Pero Vaz de Caminha (*vide* History) said, the bodies of the Indians were so beautiful, well developed and devoid of blemishes that they could not be excelled. Gabriel Soares, in his "Roteiro Geral," wrote that none of the invading Europeans came across deformed or sick aborigines, they were always healthy and vigorous. Jean de Lery, the old French historian, stated as a fact

that it was rare to find a blind, lame or deformed person amongst the Indians, and that their longevity was proverbial.

The famous Jesuit, Padre Nobrega, noted that in spite of the labour to which the settlers were subjected and the change in diet, the climate is so good and the air so beneficial that the few who became sick speedily recovered in most cases. Every writer of note during Colonial times emphasized these facts. Dr. Sigano, one of the founders of the National Academy of Medicine in Brazil, wrote, in 1844: "The climate of Brazil is justly reputed the best of the whole of the great region in which it is situated, compares with that of Italy, and centenarians are found in great numbers amongst all classes, in city and country alike."

The climate of the plateau of Matto Grosso is exceedingly healthy, the water is excellent, the air dry, and the temperature mild. There are no endemic diseases. Although this is within the torrid zone, frosts are frequently seen during the winter. There are also many parts of the States of Parahyba, Pernambuco, and Piauhy, where the average temperature does not exceed 68° Fahrenheit. It must also be particularly noted, in comparing such a temperature with that of Great Britain, for example (of about 50° Fahrenheit), that the latter is greatly reduced by the low winter ratio. Presuming that in England we had winters such as in the south of France, the mean temperature would not be much less than that of the whole of Brazil. The maximum heat encountered in London is quite as high as Rio de Janeiro (or even Pará, with a difference of 50 *degrees of latitude*), whilst, as everyone knows, the extremes of temperature are

extraordinary in the British Isles. I have noted a November reading of 12° Fahrenheit, and an August one of 95° Fahrenheit in the shade.

The extension of this zone may be reckoned from 10° south of the Equator, to the line of Capricorn, $23\frac{1}{2}$° south (about), comprising Sergipe, Bahia, Goyaz, Espirito Santo, Rio de Janeiro, Minas Geraes, almost all Matto Grosso, and the western part of São Paulo.

At Quixada, Ceará, rain falls on only 69 days of the year; at Aracajú, 150; at Therezina, 82; whilst at Victoria the average is 80·576 mm.

The third zone may be said to extend from the tropic of Capricorn to the southern frontier, and it must be divided into two parts, the first comprising the coast-line of Rio Janeiro, São Paulo, Paraná, etc., where there is an average temperature of not more than 66° Fahrenheit. The climate along the whole of this zone, and indeed much further north, is very equable. The Serra do Mar being steep on the Atlantic side, and covered with luxuriant vegetation right up to its summits, or to within four or five hundred feet of them, attracts the rain and retains humidity. The highest point attained by the mercury at Rio Janeiro, shut in as it is by high mountains, is quite 6° lower than at Paris. If we take the train northward, after crossing the bay at Rio, we shall find two summer resorts; one, 3,250 feet above the sea, has a mean temperature of 60° Fahrenheit, with a maximum of about 89° Fahrenheit, and a minimum, July-August, of perhaps 28° or 29°. The other, situated 2,500 feet above (and so near Rio that the city may be seen from the summit of the pass in fine weather), has a mean heat of 64° Fahrenheit, a maximum of

91° to 92° Fahrenheit, and a minimum of 1° below freezing point. Novo Friburgo, situated some little distance further on another line, is 2,845 feet in altitude, and has a mean annual temperature of 62° Fahrenheit, a maximum of 75° Fahrenheit, and a minimum which marks freezing point. The salubrity of the capital itself is unquestionable, being about as low in death-rate as Paris and Berlin. Santos is now quite healthy, and yellow fever may be said to have *entirely disappeared* from both cities. The greater part of the State of São Paulo, and southern Minas, and the higher parts of Rio Janeiro, as well as all the land still further south, is subject to frosts during some weeks of each year, but of course the days are delightfully fine and invigorating. The wet season is usually from December to April, but at the beginning and end of it the rain frequently comes on after 3 or 4 p.m., and although it may pour in torrents all night, the morning will most certainly be fine.

At Curityba, and on the tablelands behind, snow often falls, and in July-August, 1917, the water-pipes were frozen for several days. In the State of Santa Catharina, at Lages, in 1858 snow covered the ground for two weeks, 30,000 cattle being frozen to death. In 1885 the city of Rio Grande had a fleecy covering exceeding 15 centimetres in thickness, and in other parts of the same State there were over 20 centimetres. In Rio Janeiro the average July temperature is 19·2° centigrade, and in February it may attain 25·8 degrees. Warning is generally given of the approach of a wet spell, by a week or two of oppressive heat during the day. At Villa Jaguaribe (São Paulo) the mean

annual temperature during 1909 was less than 60° Fahrenheit. There were 65 days of frost, the maximum winter temperature was 70° Fahrenheit, and the minimum 24 Fahrenheit. After a good storm the air is crisp and invigorating, and one feels impelled to get out and up the hills. I should hardly imagine that there is a more agreeable climate than that of the mountain resorts during the winter (April to September). It is hardly possible to say there are more than two seasons, as flowers are blooming in profusion all the while, and one need never complain of either the heat or the cold. In 1907 there was an influx of new diplomats, and it was rather amusing to notice their complaints about the weather. They said that it was unnecessary to come to Brazil in order to suffer cold. I have transferred to the Geological Section some remarks with reference to the diminution in the rainfall throughout Brazil, but it may be noted that there is a notable loss of humidity everywhere, the average in the north and north-east regions being as much as 20 per cent., and in the southern, or temperate zones, attaining 8 or 9 per cent. This is coincident with the gradual elevation in the temperature, noted in most parts of the country, in contradiction with phenomena being observed in the Northern Hemisphere, even in England, where the summers are decidedly shorter and less constant, and the weather generally more changeable than even a score of years ago. Average temperatures throughout Brazil may be found under the heading of *Gazetteer*.

Fletcher and Kidder (*see* Bibliography) say, on page 268: "It would seem as if Providence had designed this land for the home of a great nation."

Bigg-Wither (*Pioneering in S. Brazil*): "There is ample timber, water and pasture, and *air than which none purer or more invigorating can be found in the whole world.*"

It may be a recommendation or not, but within the short space of time of three years in the mountains I gained not less than two stone in weight, in spite of the most active life, passing at least half my time either in the depths of the virgin forests or attacking the most difficult peaks, sometimes marching sixteen and eighteen hours a day, and getting but six hours' sleep in the twenty-four.

A few extracts from the report of Mr. Milne Cheetham (First Secretary of the British Legation) in 1908 may not be out of place here, and they are the more noteworthy as being from a source entirely unprejudiced in favour of Brazil:—

"The climate of Rio de Janeiro is salubrious, and the yellow fever has to all appearance been practically stamped out, as it has at Pará since March, 1911. Sanitary measures, both in it and Santos, have been taken with beneficial results, the health of both cities having entirely changed during the last few years."

In conclusion, it may safely be stated that a constant influx of colonists from every part of Europe, and even from Asia (Syria), has largely increased the mortality in all the more accessible parts of Brazil. This has been due to the abominable conditions under which the greater number of these people travel to Brazil, and also owing to the too frequent incapacity of the ships' doctors. It is notorious that the steamship companies pay usually a nominal wage to such medical men, who are either without means to establish a practice of their

own, or prefer such service for the sake of their own health. Frequently there are more than 2,000 persons crowded together within a limited space, with one physician to attend to their needs. Many of the poor emigrants either embark with the germs of disease within their systems, or contract it on board, owing to the bad diet and want of exercise. This is more especially true as regards the little ones, but a great deal has been done of late by most of the better-class lines in the provision of new steamers, fitted with 2, 4, and 6-berth cabins for families.

A great part of the mortality in the Brazilian cities is due to the newcomers, who live under the worst possible conditions. Their habits are difficult to eradicate, and the exceedingly backward state of public and private hygiene in Spain, Portugal, Italy, Russia and Poland is reflected in the annual returns of the Demographical Department. The death-rate is, of course, greatest among the children.

It must also be fully understood that the Negro and the lower-class Mulatto between them account for some 75 per cent. of the mortality in Brazil.

The following figures may be interesting:—

Davos Platz.—Sunny hours annually, 1,844. Altitude, 1,560 metres. *Villa Jaguaribe*, São Paulo (via Pindamonangaba), sunny hours annually, 2,343. Altitude, 1,595 metres. Here there are only 33 sunless days in the year. Average temperature, 13·1 centigrade. Minimum, minus 7, maximum 28.

Birth Rates.—São Paulo, 35·00 per thousand; Rio, 29·47; London, 24·34; New York, 25·65. Deaths (1917), São Paulo, 17·50 per thousand; Rio, 23·98. In Rio Janeiro there are 178 centenarians to

a million population, and in France 184 to 38 millions.

Density of population (1912): Rio, as compared with London, 20 times less, Berlin 40 times, and Paris 50 times less. The Brazilian capital has more houses than the latter city, with about a third of the number of inhabitants. Rio may be fitly termed a garden city, the population being spread over an area greater than that of New York.

When one comes to analyse the colonization statistics given in another chapter, it will be better appreciated, considering the fact that over 40 different nationalities flock into Brazil.

Mortality (Rio Janeiro)

Yellow Fever.—Total number of cases during the worst period, 1850, 4,160 deaths; 1891, 4,456; 1892, 4,312; 1894, 4,825; 1896, 2,929; 1898, 1,078; 1903, 584; 1911, 2 (brought in from another port). Since then, none. Total mortality from this scourge in 63 years, 59,074.

When Dr. Oswaldo Cruz first took in hand the campaign against the mosquito, he met with great opposition, especially when house-to-house visitation was determined on. Attempts were made (even in Congress) to stifle his energies under the plea that citizens' liberties were endangered. Fortunately Dr. Rodrigues Alves, President of the Republic, was on his side, and a most vigorous and highly successful warfare was carried on. Seventy-two doctors and a host of students set to work, and every house in the Federal District was thoroughly disinfected. Not a single open tank, gutter, fish pond, puddle or other deposit of stagnant water was

left at the mercy of the larvæ of the noxious insect. Nearly 1½ million reservoirs, tanks, etc., etc., were cleaned in 1906.

A brigade 1,500 strong of *Mata mosquitos*, as the sanitary inspectors and their men are termed, is still engaged in the good work. The sewers are visited daily, and kept continually purified by means of Clayton's pumping apparatus, and the same means is employed in disinfecting ships lying at anchor in the bay. Every public elementary school has large coloured pictures illustrating the life history of the mosquito, and demonstrating the means of preventing its propagation, and giving instructions in the use of quinine, etc.

Pest.—1903, 360; 1904, 275. This disease was introduced for the first time in 1900, but was stamped out by 1912, after a most rigorous house-to-house inspection and severe sanitary measures.

Venereal Diseases.—Total number of deaths, over a long period, 53,888. In 1916, 3,933; July, 1918, 41 in all.

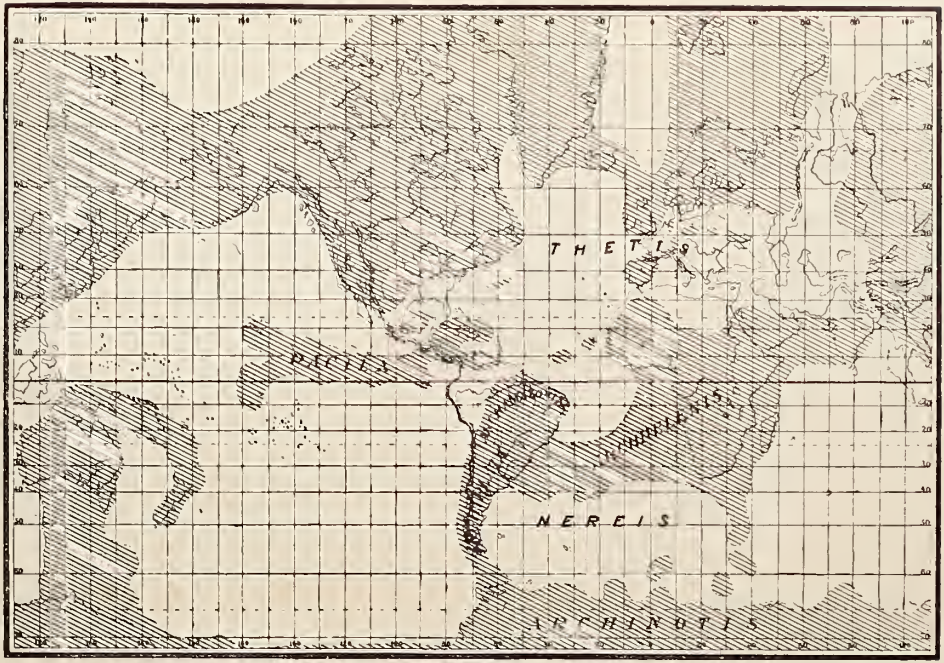
Small-pox.—First authentic figures go back to 1859 only. In 1904, 3,566 persons died; in 1908, 6,545; 1909, 274; 1911, 6 only.

Malaria.—1896, 2,294; 1902, 1,217; 1911, 176 cases. May, 1918, 4 only.

The greatest mortality is caused by affections of the digestive and respiratory organs, consumption carrying off 3,080 victims in 1902, 3,321 in 1903, and 3,566 in 1911. In June and July, 1918, 697 persons died of this disease. Comparing the great increase in the population during the last decade, the percentage is undoubtedly less, being reduced from 6·46 per thousand in 1872 to 3·87 in 1906.

(In Paris, before the war, it was 3·90.)

Type of Cabral's Flagship, 1500.
(From *Revista da Sociedade de Geographia, Rio-Janeiro.*)



DISTRIBUTION OF LAND (SHADED PORTION) AND WATER IN THE EOCENE PERIOD.
(From *Rev. do Mus. Paulista*, Vol. VIII, article by Dr. H. von Ihering.)

Grippe (*Influenza*).—Like all the rest of the world, Brazil did not escape the visit of this unwelcome guest in the autumn of 1918. The total deaths in June and July were only 73, but the plague, or *peste*, as it was popularly termed, took a hold of the city in October, 814 dying on the 22nd, and the greatest mortality attained on the 25th, with 1,054 deaths. On the 31st this was reduced to 572, and by November 8th, 239. It is calculated officially that in greater Rio 12,000 fatal cases occurred between October 12th and December 8th, when this epidemic was presumed to be stamped out.

At the most critical stage, at least half the population were down with grippe, and most public services partially suspended.

In some towns of the interior, the mortality is not so great as in similar places in Europe; indeed in some cities, as Ponta Grossa, in Paraná, there are years without a single death. St. Hilaire, in speaking of this region, says, "There is no place in this world where a European might establish himself with greater advantage." The words of Wallace will prove a fitting termination to the unanimous chorus of appreciation: "In Brazil a man may, with six hours of labour, obtain more of the comforts and necessities of life, than by twelve hours' work in Europe." The adventurer has nothing to fear. The death-rate of this vast country will bear comparison with any other. Medical science is undoubtedly as far advanced there as anywhere, and as far as sanitary hygiene is concerned, Brazil took first prize at the great International Congress recently held in Germany.

Compare the mortality from malaria with that in Russia, the Balkans, and Algeria. In this latter

country there were 250,000 cases in 1904, 10,000 proving fatal. The statements of many foreign medical men are often entirely at variance with the true facts. The fall in the death-rate has been rapid of recent years, especially when one studies the parallel increase in population, and the great influx of European settlers, naturally more liable to infection than the natives, and it must also be emphatically asserted that a great percentage of the new-comers are especially liable to disease, owing to their enfeebled physical condition after a long voyage under deplorable conditions, both as regard sleeping accommodation and diet.

During 1917-18, both in and out of Parliament, speeches of the most alarmist kind were made with reference to the sanitary condition of the smaller cities, Parahyba and Maranhão being cited as examples, and also that of the hinterland in general. I have left these remarks until last because the subject deserves special attention. In spit of all assertions, pro and con, the concensus of foreign opinion given above is an effective reply to critics of Brazilian climate. It is true that some complaints, not peculiarly indigenous by the way, are prevalent wherever the level of education is low, and this is essentially the fact amongst those classes recruited not only from the coloured races, but from the inhabitants of such European countries as may be said to ignore public instruction.

How is it possible for an, to all intents and purposes, *infantile* community, such as this, to keep pace with the times, when no attempt is made by the Government to close the national doors to undesirables, from a social point of view, and to foment the introduction of peoples on a higher plain of civilization.

Malaria, consumption, etc., and wasting diseases caused by the minute thread worm (still existing in many places in the British Isles) take their toll of the unprotected population, but it must be at once stated definitely. Almost all the diseases which are said by learned doctors to flagellate the country *are imported,* in very many instances, in the bodies of foreign immigrants. Any degree of insalubrity which exists in Brazil, at least in populated centres, is due to the neglect of Brazilian legislators to vote measures of *defence.* I have travelled as an immigrant myself and know exactly what I am talking about. Parliament is now alive to these facts, and a campaign of sanitation, aided by the Rockefeller foundation, is about to be taken in hand all over the country. Once again, in spite of all national defects (and some of these are radical, as are those of all races), Brazil has done wonders in its short 30 years of Republican life. It is somewhat premature to discuss questions relating to transport of third-class passengers, but, as the different problems involved are vital to the interests of all colonizing nations, it would be well to have an international accord by which illiterate and unhealthy immigrants will be refused by every country, and another under which lines of demarcation shall be drawn, limiting immigration to those nationalities within the pale and prohibiting definite settlement of any coloured races amongst white peoples.

This note might, perhaps, be more appropriate in the colonization section, but as the health of a people is the first requisite in its progress and formation as a nationality, the question is not out of place under the heading of diseases.

CHAPTER III

ANTHROPOLOGY AND ETHNOGRAPHY

Accepting the hypothesis of Dr. Lund, the Danish scientist who spent most of his life in Brazil, that the country was the first part of America to be thrust up out of the sea, the theory of the settlement of South America by immigrants from Yucatan, or the Pacific, loses its value. W. Foster (*Prehistoric Races*, Chicago, 1873) said that all America was peopled by autochthonous wanderers from the Brazilian Highlands. Cerneau (*Histoire du Canada*, Quebec, 1859) expressed his belief that all the American languages had a common origin.

Dr. Vicenzo Grossi (Lecture at the Geographical Society, Rio, September 19, 1891) gave it as his opinion that Brazil was inhabited by a dolicocephalic race, not autochthonic; no Cattarine monkeys inhabiting America, and that this people came from the north, being later superseded by a brachycephalic folk from the east.

Keane divides the aboriginal Brazilians into four great groups, or families, namely, Cariban, Arawakan, Gesan, and Tupi-Guaranian. The physical features of the country closely connect themselves with the inhabitants, but there is no correspondence between the configuration of the interior and its political divisions. Both the racial constituents from which the American type was developed appeared in

Brazil. The later neolithic Mongolian immigrant, who came by way of Behring Strait, represented advancing peoples probably more numerous than their pleistocene predecessors, and also possessing a much higher development. Survivals of the type would, therefore, seem as if they should be more widely scattered, and distinctly marked, when compared with the ruder, fewer, or less formidable men. There is, however, no doubt about these Brazilian Proto-Mongols. As Burton remarks, this strain demonstrates itself in big, round Calmuck skulls, flat faces, with broad, prominent cheek bones, oblique oriental eyes, rather brown than black. They have also dark, thick eyebrows and thin moustaches fringing large mouths, with pointed teeth, and sparse beards, hardly covering the long, pointed chin. Variation, through vast ages of wandering, produced another sub-race. It came to the southern continent when the climates of the far north were much milder, and there were no spaces of open sea between Scandinavia and Greenland. These (the first arrivals in all probability) were scattered widely over the country, principally due to the pressure exerted by the hordes of invading Asiatics. They seem to have become more or less concentrated in Minas Geraes, and it is supposed that this state is the centre whence subsequent migrations took place.

In the new world these stout, dark men, with narrow skulls, receding foreheads, flat-crowned incisor teeth, and projecting jaws, form a separate group that was exterminated, absorbed, or driven into remote and isolated regions. Keane supposes them to have held their own for some time against the invaders, but according to the scientific dogma

of Von Virchow, prognathism is not compatible with normal intelligence, and, therefore, this stand could not have been of long duration.

Tribal catalogues and philological analyses will go but a very little way towards bringing these groups into view as they are. Information contributive towards this end is very unequal with respect to different families, while for all of them the constant intercrossing, wandering, regrouping, and decay, have done their work in the way of modification and destruction. Whole populations have vanished, leaving hardly a trace behind. In others they have been so broken up, that their very tribal names and original languages have been entirely lost. The mode of their life, in very small communities, continually subdivided by the slightest dispute or difficulty, was a very potent factor in their disappearance. Mirhanas, for example, is an arbitrary title for a multitude of indistinguishable ethmic fragments, including about half of the Indians in the valley of the Amazon.

Carayas is a term similarly applied to those in the basin of the Xingú and Aragauya Rivers. Those Indians called Coroados are so termed, because of their tonsures. Botucudo means one who wears a botogue or labret (an ornament of shell or bone inserted into the lip).

Tapuyo, originally signifying stranger or barbarian, is now synonymous with a savage well disposed towards foreigners. Caribs cannot be traced beyond Central Brazil, where they appear to have originated. Although these latter had a reputation as warriors, the fugitive slaves, fighting by their side, far excelled them.

Carijones, with Witotos, on the Amazon, are also

affiliated to this group, as are likewise some scattered bands of Pimentaires roaming the borders of Pernambuco and Piauhy. The manners and customs of these tribes were (and are) so dissimilar that it is easy to understand how it is they never formed a real nation, and even to-day do not advance a single step towards civilization, unless taken in hand by the white man. It is supposed that the flat heads found in certain regions of the plateau are derived from unions between the conquering Europeans and the Caribs. The Arawaks of Guiana call themselves Loconos (or natives). They are widely distributed in Brazil, but their origin is impossible to discover. Like many other groups, the tribes are hardly more than large families, each under its own elder. They are, contrary to the Caribs, very cleanly in their habits. They have adopted many European articles, whilst the latter live in filth, and reject all foreign improvements. There is, however, an offshoot of the Arawak group (Warrans) possessed of much ability in canoe construction, and having the virtue of thrift, but indescribably dirty in their ways. The Carib distorts his limbs by ligatures, uses the labret, arrays himself in feathers, skins, and hand-made fabrics, while the Warran seems to be entirely destitute of personal vanity, is more stolid than his neighbours, and not being so well developed physically, hard work soon exhausts him. Both these loosely connected hordes build temporary huts of branches of trees, and wherever the Warrans are permanently established, they construct pile dwellings.

All of these races living in the wide river basins are in the habit of proceeding to the most extravagant excesses. These orgies are, of course, suc-

ceeded by periods of morose, surly depression, culminating in destructive impulses. Primary traits having a true value for classification purposes, are more marked amongst the Gessan than in any of the other families inhabiting Brazil. They had this name from Von Martius, who took the common terminal of tribal names for a collective designation. This individuality (Botucudo, as Keane calls it), in large measure, escaped the process of evolution, which created a distinct American type out of entirely different elements coming from opposite quarters of the globe. They preserve those characteristics which distinguished their paleolithic European progenitors. When taken *en bloc* the mental inequality shown by divergent branches of other stocks is here scarcely recognizable in varying degrees of aptitude, more or less skill or ingenuity, and an unequal response towards incitements that initiate progress. Gessan tribes have hardly become modified, they remain undeveloped, and no group of this family is otherwise than completely savage.

Caribs, Arawaks and Tupis are sometimes indistinguishable. Structural survivals cut Aimores or Botucudos off from these, and closely unite them with proto-Europeans. Kayapos, Akuas, Cholengs, Kames, and several minor hordes represent a single group, extending from Amazonia to La Plata. These are true aborigines, fragments of a mass broken up by Tupi-Guarani invaders, and the nearest representatives, and probably the direct descendants of that primitive race whose osseous remains have been found in the Lagôa Santa caves, and Santa Catharina shell mounds.

Botocudos, Tapuyos, Capayos, &c.. in eastern

Brazil, have not even reached the stone age, but although on the great Solimões one may travel for weeks without seeing a fragment which might be worked, every tribe within this latter region has contrived to remedy this deficiency. Butocudos use wood almost exclusively, and until lately were without hammocks, and lived entirely on such poor provision that badly equipped hunters could supply; their diet consisting of every kind of insect or reptile that might by any stretch of the imagination be termed edible.

These groups, in common with most others, crossed in all directions, have mingled foreign strains amongst themselves, until by far the greater proportion are now Mamelucos (descendants of aborigines and white men); Mulattos, Cafuzos (crossed between Negroes and Indians); Curibocos, who combine Cafuzo with Indian blood, and Xibaros, the progeny of Cafuzos and Negroes.

Bates uses the term Tabuza for what he calls semi-civilized Tupis. Properly speaking none have reached this degree of social development, although in some instances there has been a greater or lesser adoption of civilized appliances. At certain places aborigines, or at least barbarians, masquerade as cultivated Christians, but this is all outside show. The savage remains at bottom.

When Cabral reached Brazil he found Guaranis established from Paraguay to Uruguay, in southern Brazil, and already united to Tupis. They were without clothing of any kind, although they used some personal decorations, which have since been abandoned. Nadaillac reports them as living in commercial settlements, usually consisting of four long houses built in a square.

Tattooing and scarification is still common, and they paint themselves with red and black designs, and use the labret.

This country exhibits every kind of stone implement, from the rudest paleolithic wedge, to finely-shaped arrow-heads of rock crystal, and the polished neolithic axe. There is no possibility of explaining why Botucudos use wooden arrow tips when plenty of shells, stone, and metal are at hand, or why Caribs, Arawaks, and Tupis often prefer stone to iron.

The Gessan tribes advanced less than any others, and accomplished nothing representing the lowest degree of human life in communities. An average Botucudo hut is a rude bamboo erection, about 7 feet high and 9 feet wide. The openings are barely large enough to crawl through, and the interior is black with soot. Bugre settlements consist of a few of such structures standing in partial clearances in the forest.

These Indians are not more than 5 feet 4 inches in height on an average, and their lower limbs have generally grown crooked. They cut off their coarse, black hair in front, and ornament it with toucan feathers, stuck on with wax. Every Bugre pulls out his eyebrows and eyelashes, and pulls down his under lip with a huge appendage, besides ornamenting himself (if fortune be kind) with a necklace, composed of rows of teeth; their bows and arrows are very inferior, and a kind of snare made of creepers is more effectual against big game. They still carry stone axes, counterparts of those used in prehistoric times in Europe. Attempts to civilize these wretched beings have generally proved entirely in vain, and of 27 taken prisoners by Mr.

Bigg-Wither, all except one boy died of a mysterious complaint, in spite of washing, clothing, and proper feeding; or, in all probability, because of these improvements in their condition and appearance.

Conto de Magalhães (see Bibliography) mentions a primitive race of powerfully built Indians whose males were noted, even amongst other tribes, as possessing virile members of exceptional size.

These were, in all probability, a branch of the Nhambiquaras, the darkest hued aborigines.

The same author notices an extraordinary sexual peculiarity of the tribe of Chamboias on the Araguaya. This tribe kept apart selected males, exempting them from all kinds of labour, as they were destined to act as *vires riduarium*. The Caipos practised polygamy, the women being permitted to change their husbands at pleasure, the new spouse, however, being responsible for the offspring of a previous father. The Guatos, in Matto Grosso, on the other hand take one wife only, and she must not even raise her eyes to another man. This tribe still maintains an intense hatred of the Spanish speaking peoples, descendants of the men who, centuries ago, ravished some of their women.

The Chamboias even went so far as to burn an adultress, and permitted no intimacy between the sexes until the female attained her full development, and the man 25.

The Machaduras destroyed the hymen at birth (Mechnikoff, *Nature of Man*). Arauquis celebrated the feast of the dead with great pomp, on these occasions. *Cocorons* burning the body and guarding carefully the bones in an earthen pot. They

danced, and sang around the funeral pyre, and after reducing the skeleton to ashes, these were mixed with the red dye of the Urucum, and, partaking freely of a special kind of fire-water, anointed themselves with the coloured ashes, and kept what was left over as a sacred treasure.

Many tribes are adepts at drying fish and meat over a slow fire for three or four days, after which it is pulverized, and kept for a time of scarcity. They make a blaze by the time honoured process of revolving sharply a stick of hard wood in a grooved block of a softer kind, round which some fine shavings have been assembled. They have never been known to employ any smelting process whatever, gold plates, used for ornament, being beaten out of the native metal.

On the Araguaya river, smoke signals are raised, conveying news more than 30 leagues, and warning isolated groups of the approach of strangers.

In 1796, there were at least 10,000 camp fires on the Rio Negro alone, but this number had been reduced to 100 by the year 1914.

Dr. Roquette Pinto (Rondonia, Rio, 1914) says that the Nhambiquaras of Matto Grosso are in the habit of eating locusts. These Indians have not advanced beyond the stone age, sleep on the bare ground, and know nothing of the use of hammocks or pottery, except when a tribe manages to obtain these luxuries from other Indians. They have learned, however, the rudiments of agriculture, planting maize of the most varied colours and strangest form, cultivate mandioca, and make rude flutes from the thigh bones of deer, and also from bamboos.

These Indians are decidedly omnivorous, eating

almost everything which comes their way. Their women work hard, but are not brutally used, and a great deal of jealousy exists through petty intrigues.

The Parecis, living by the headwaters of the Paraguay, Jurená, and Guaporé rivers, are polygamists, marrying early, many of the men bringing up female children in their huts until puberty arrives, usually at 12 years of age. These tribes have little consideration for the sex.

A peculiar characteristic of the whole of the Inrian races is a deeply seated superstition. They believe in lunar phantoms and beings of light, who are spirits of good. They are afraid of certain dark shadowy forms, powers of ill, vengeful, and awful, whom it is necessary to propitiate. These are supposed to be the souls of their ancestors. They call God Tupa, and say that dead men's souls are converted into demons. They also believe in a water sprite or syren (Mãe d'Agua), and are afraid of bathing in the dark, except in company, as traditions are current that many had been dragged down into the lakes and rivers, and never returned.

A little reflection would have taught them the real, tangible reason for the loss of their fellows, alligators being common enough in these waters.

Piso, a Dutch physician, says that amongst the Brazilian Indians, the husbands go to bed when a child is born, and eat the most nourishing food they can get, in order to recover their lost strength.

This practice (*Couvade*) is of course known amongst savage tribes all over the world. The tribes on the Paraguay river had many customs quite different to those of the north, or the sea coast. They took Turkish baths, and were very

careful of their appearance in many ways. Their women who had given up hopes of marriage frequently claimed a prisoner as a husband, thus saving his life. A wife could be banished from her husband's hut if she was barren. Old men committed suicide by strangling themselves with a cord, believing they would have eternal youth in the next world. Like nearly all the Indian tribes, however, they had faith in the transmigration of souls, either into animals or other human beings. The Sun was a great and good spirit, *Guichemanitou*, and the Moon an evil one.

The forest deity is called Curupira and protects the game. An Indian wounded a deer which was followed by its young. He caught the latter, and hiding behind a tree, caused it to cry out. The mother returned and he slew her with an arrow, only to find that he had killed his own parent, thus falling a victim to the evil spirit Anhanga.

Ruda, the Goddess of Love, had a serpent as her avenging weapon, and parents who were doubtful of the daughter's virginity took them to an island in the midst of a lake, and leaving them there for a time, when, if impure, the serpent came and devoured them.

The legend of Mani (mandioca) is a quaint one.

An Indian girl was supposed to have conceived whilst yet a virgin, and later a white boy was born in a hut on the site of Santarem (Pará). This died after a year, and was buried on the spot. It had been called Mani, and by and by the earth opened and a plant grew up. Later, the Indians sought for the child's body in the hollow space beneath (oca), but it was occupied by the roots, which they called Manioca, now corrupted to Mandioca.

In common with other primitive races, their natural powers of observation are very highly developed. Many of the tribes are capable of producing artistic ceramic ware, and they have some ability for wood-carving, and making grotesque masks. Some of them plant maize and mandioca, weave baskets, and construct large canoes, of course by the slow process of hollowing out by fire and rough stone implements.

One war canoe made by the Caraja Indians of the Tocantins, and now in the Pará Museum, is 18 metres long and 1 metre wide. This is made of a single cedar trunk.

Brazilian Indians are of a great variety of colours, some, on the upper Amazonas, being quite pale, whilst the Chavantes, in São Paulo, are the darkest copper or bronze. Cayúas are dull yellow brown. Their women wear a cloth round their waist and the men a belt only.

The Kainganags in São Paulo weave a fine cloth out of the nettle (*Urtiga Brava*) and work in many artistic designs.

Fernan Cardim refers to the great modesty of many of the tribes, and their affection towards their children. Von den Steinen, writing in 1887, said that after a short residence amongst the Indians their nudity appeared quite rational, and even more pleasing than the habit of wearing clothes.

Tupi-Guarani tribes are distributed by Denniker, over the plains of the Amazon and Orinoco, and in Guiana, and on the tablelands of eastern and southern Brazil. This is a composite group, as indicated by its name, although the difference is largely geographical. Their ethnical constituents are, in fact, similar, but the Guarani branch are pre-

sumed to have come from Paraguay. It may be remarked in this connexion that this country is full of the Guaranis to-day, the bulk of the menial service being performed by these Indians, so much so, that it is frequently necessary for employers to learn Guarani in order to make themselves understood, even in the capital. Early missionary work was hampered by the want of a common language, so by degrees a Lingôa Franca being evolved, and this was known as "Tupi," although the real language had a great range, covering at one time about a fourth of South America.

Tupan was supposed to be the deity who sent the thunder and lightning. This Lingôa Franca predominated near the coast amongst the Indians who made fheir way thither from the central plains.

These natives, who have thus come into contact with the white man, are generally docile, but it is very difficult to teach them habits of order and cleanliness.

Tupi communities, purer in blood, and far more powerful than now, or at any rate much more numerous, were established on the Amazon itself, and all its branches. At present each has dwindled, and, except along the Solimôes, it is impossible to find an unamalgamated population.

Amongst the Tubinambas, a suitor of the chief's daughter had to give three or four years' service to his prospective father-in-law, and prove his moral and physical fitness for such a prize.

They pulled out all their hairs, except those of the head, and the women stiffened their straight locks with resin.

To cure fevers and ague, it was the practice to bathe the head in a spring.

The Mundurucús of the River Tapajós eat almost anything, and their women are veritable better halves, as they make nearly everything in use. Amongst these people the widow usually marries her brother-in-law. No one may marry who has not been tattooed. During pregnancy the husbands take care not to kill any animal in case they should injure their future offspring. Each tribe has its own medicine man, and they take care to bury their dead within their Malocas (huts), and if they die at a distance the head at least is brought home. These Indians fattened up their prisoners, and gave them wives during the time they remained in captivity, previous to being eaten. They also made a pretence of carrying off their brides by force. They believed that the virtues and physical strength of their enemies entered their bodies, if they were careful to preserve the head of a warrior whom they had slain.

They used the skull of their victims as drinking vessels, as horns, or as trophies. The mummified head shown in full-page plate (No. 2) is described by Dr. Hermann von Ihering in the *São Paulo Museum Review*, Vol. VIII, as follows. The eyes, tongue and all other fleshy parts of the head were removed, but the skin left, and it was then washed daily and impregnated by urucú oil and exposed to the hot sun, becoming hard and looking like a well-tanned object. The thick shining black hair offered a great contrast to the brown skin. The orbits were filled with resin, and on each side two agouti teeth were placed to imitate half-closed eyes. In each ear hung a tassel of cotton threads, from which was suspended a decoration in yellow and blue feathers. The contents of the skull were removed

with great skill through an orifice in the back, 6 centimetres in length. The trophy was supposed to be carried by its owner wherever he went, being, as a rule, suspended from his back during battle.

After a successful combat, the waists of the victors were ornamented with a cotton belt having the teeth of the victim set round it. The widows of those who fell in personal combat with the enemy were adopted by the tribe, and were considered a sacred charge.

Scalping is entirely unknown amongst these or other of the numerous tribes, but some use the skull of their fallen foe as a drinking cup.

The Munducurus drove all their rivals into the forest. Mawe (*Travels in Brazil*) related that two, who had been left behind, found their way 300 leagues by the light of the stars. Their sense of smell was very keen, a camp fire being discovered by this means a league away. They made wine out of many kinds of plants, smoked aromatic herbs, and were skilful in curing arrow wounds or common maladies of any kind.

Amongst the River Indians harpoons are used, which are fitted with heads that become detached on entering the fish, or manatee, the shaft acting as a float. The tradition of a flood is current amongst them. It is related that the Chief Tamandaré, on the rising of the waters, took his wife in his arms, and climbed up into the crown of a palm tree; there he remained for three days and nights, until the flood began to recede. The palm, which had become uprooted, had floated into the middle of a plain, where it stopped, and Tamandaré descended, and saw that all other human beings had perished. He remained on the spot with his wife, and

originated the great Guarani race, like himself, mighty hunters. Very few traces of the early inhabitants of Brazil exist, Dr. Lund being the pioneer of ethnographic discoveries.

There are many legends besides the one relating to Mandioca, and all the tribes are fond of sitting around the camp fire listening to tale-tellers.

Sometimes they keep vigil the whole night long. The dominating note is a sad one, and the spirit of the aborigine is melancholic.

Fetishes are found in all parts of Brazil, an idol recently picked up on the shore of Lake Jacupá, near the Trombetas river, and carved very cunningly out of red sandstone, representing the nude figure of a woman, seated in the jaws of a huge fish. This had two holes to enable it to be attached to the prow of a canoe, and is supposed to have been a mascot intended to propitiate the mother of waters (Mae d'Agua), which the figure personated.

The Mahués of the Rio Negro differ from most Indians in not using the labret, and the nomads of Espirito Santo are the only ones in the south who use poisoned arrows. These savages play a bamboo flute with the nose, repeating continually a series of doleful notes ranging from B to F natural. Bamboo tubes are also used to convey water on journeys. In the north, in Pará, etc., consumptives are segregated in camps, usually on the opposite side of a river, and looked after by old women, the young and healthy members of the tribe being forbidden to go near. The traces of picture writing seen by Bates and other travellers on the upper Xingú, in Amazonas, are now found to extend on one side into Columbia, and southwards through Maranhão, Ceará and Parahyba, almost always executed in inaccessible

situations on the face of high rocks in a cañon. This record of the Odysseys of a lost race has not yet been read.

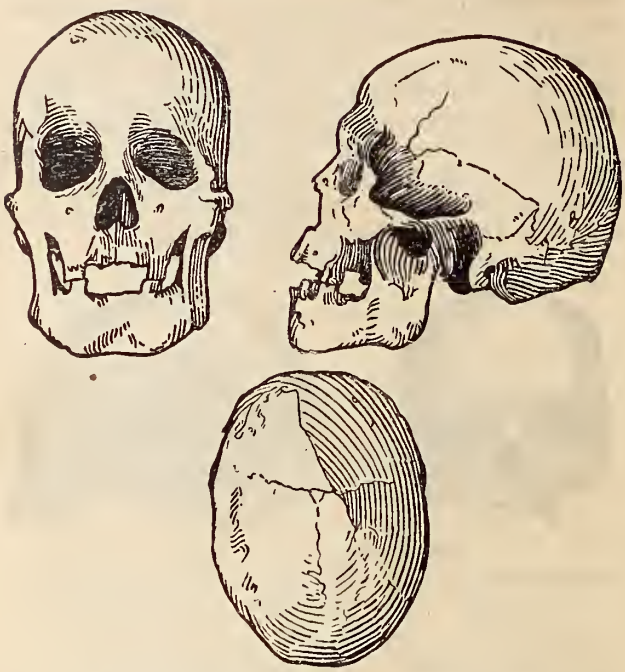
Dr. Lund, the celebrated Danish scientist, was the first to discover the remains of cave-dwellers in Brazil, near Sête Lagôas, in Minas Geraes, where he spent many years in researches. The great cave is entered through a fissure in a vertical wall of limestone, forming part of a series of similar formations in this part of the valley of the Rio das Velhas. Ripple marks are plainly visible on the rocks 70 feet above the plain, and other indications show that the whole of the country was an immense inland sea at some period in the world's history. The fossil human bones were found in connexion with those of a vast number of extinct animals. The remains are estimated to be at least 3,000 years old, and have been entirely transformed into limestone, having an outward appearance like bronzed metal (*see* illustration No. 1). A large number of caverns were examined by Dr. Krone in the valley of the Ribera river (São Paulo), in 1908, but traces of human life were almost non-existent. A skull from the cavern of Babylonia, Minas Geraes, of Botucudo type has a large capacity and an extremely brutal outline (No. 2). On the island of Maracá, north of the Amazon, an immense number of funeral urns have been found containing remains of a race far superior to existing types. Two skeletons were carefully examined, and the principal characteristics of the craniums are—Broad fronts, prominent sinuses and long faces, with an angle of 70°, as compared with 62° to 67° in the skulls from Marajó Island. The cranium from Ceará (No. 3) differs widely from those of Lagôa Santa, these latter showing marked

dolicocephalic formation with an index of 69-72°. No. 3 is of a more recent type with a frontal inclination so pronounced that the forehead disappears entirely. The funeral urn (No. 4) from Maracá Island is one of a large and very varied group found a number of years ago. In many cases plants had found their way into the vessels and the roots forced their way out below, through the pottery, twisting and twining amidst the human remains.

No. 1.—Lagôa Santa Skull.

Described by Drs. Lacerda and Peixoto, *Archives of the National Museum*, Vol. I (1876).

The Lagôa Santa Caves are not far apart. One of the principal ones is on the border of a lake, whose waters passed through it in the wet season. Human remains were found therein, in all stages of petrification. Some of the fossil bones were so heavy that they appeared to be of metal. Remains of a horse LARGER than the present type were discovered in Sumidouro (another cave). It is an open question whether man in Brazil existed prior to the extinction of the gigantic mammals, although his bones have been found in juxtaposition with those of these terrible beasts. The quaternary period is,



No. 2.—Botucudo Skull, Minas Geraes.

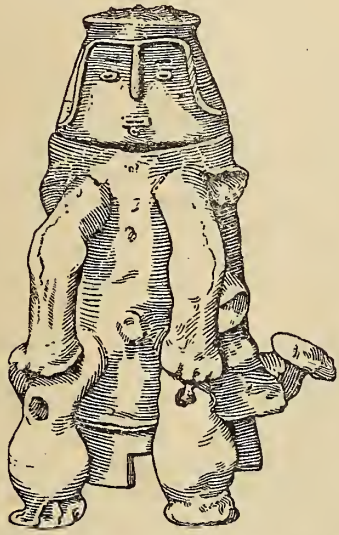
No. 3.—Skull from Ceara.

Described by Drs. Lacerdo and Peixoto, *Archives of the National Museum, Rio* Vol. I (1876).

however, usually assigned to the time in which he lived first in this central, elevated region of the country. Sören Hansen examined seventeen Lagôa Santa skulls in 1888.

The average dimensions were:—

Length, 18·4 cent.; width, 13 cent.



No. 4.—Funeral Urn from Maraca Island off North of River Amazon.

Described by Dr. Ladislau Netto, *Archives of the National Museum*, Vol. VI (1885).

Index, 70·5 cent.; lowest, 67·0 cent.; highest, 80·7 cent.

The longest skull was 19·6 cent.; widest, 14 cent. Shortest, 16·6 cent.; narrowest, 12·4 cent.

The Cephalic index of the present day Botucudos is 74·4 cent. (H. von Ihering).

Hansen says that the Lagôa Santa race was a very robust one, with little or no organic defects. The men were short rather than tall. All the skulls are very high, very long and prognathic, with a pronounced oval vault. Their general characteristics resembled those of the Papuans.

Here, and at Pacoval, a small island on a lake in the great island of Marajó, the idols, ornaments and funeral urns buried in the mound dwellings, represent every type of human physiognomy, as if the ancient inhabitants had studied all races of mankind. The figures have in many cases the same characteritsics as those in the Aztec monuments in Mexico. Amongst the most finished and artistic specimens of ceramic art, one finds cheek by jowl, rudely executed designs on coarse unglazed pottery. The funeral mounds of Pacoval were evidently raised when the level of the lake was high, and were largely constructed of mud, etc., extracted from the lake, mixed with vegetable matter and mould from the surrounding plains. The bodies had apparently been buried temporarily elsewhere, and when the bones were quite destitute of flesh, they were placed in one of the Igaçabas or funeral urns in their proper position as in life, with the skull resting on the top; and a cover being placed on the urn, it was deposited in the mound in a vertical niche. The mound builders evidently believed that the departed had no necessity for a fleshy covering to the bones, and curiously enough, broke up all the cooking and other vessels of the defunct individual. An extraordinary thing with regard to the decorations on the Igaçabas is, that although a uniform scheme prevails, no two pieces are alike, and not a single leaf, flower, or fruit is represented on the funeral urns or other ceramic ware of the district.

Amongst other curiosities are rattles containing pebbles, labrets, or lip ornaments (Tembetás) in beryl and rock crystal, taking a lifetime to shape and pierce, basalt, syenite, amazon stone (No. 5), fossil resin and bone. Cornelian is only found in Rio Grande do Sul. Those made of crystal and harder substances were (and are) only used by chiefs. Jadeite and Nephrite were also in use, and were supposed until recently to have been brought into Brazil from the Far East, but at Amargosa (Bahia) large blocks of Nephrite have been found *in situ*, and used as paving stones in places. The specific gravity is 2·951 (Hussak). No ornaments of this stone had been found in tombs or urns anywhere in the south until June, 1913, when a smooth pebble was discovered at Nictheroy (*see also* Mineralogy).

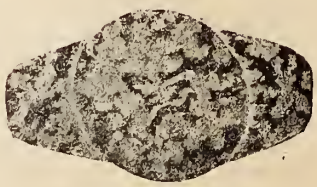
A remarkable fact is that all Indian remains in the southern States are inferior to those of Pará, the present day Kaingangs in São Paulo only taking the trouble to heap a mound two metres high on top of their dead.

The Tembetá was used as an amulet to ward off danger, and the Indians of Espirito Santo use at the present time large discs of wood. Soapstone has also been worked up into various ornaments, a curious instance of which is seen in No. 6. Beads of glass supposed to be of Phœnician origin, and various tools and weapons fashioned out of oligistes, porphyry, fibrolite, agate and serpentine, etc., have been found in the Sambaquis (kitchen middens), or shell mounds in the south of Brazil. These curious conical-shaped hillocks are found all along the coast from Amazonas southwards, but yield very little indication of the degree of civiliza-

tion of the extinct Indians, that is, in the way of human remains.

Seventy have been counted in São Paulo alone, some of which are 20 metres high. Stone hatchets of grey, brown or chocolate diabese are mixed with many varieties of shells. Fish and whale bones, and very rarely silex arrow heads come to light. The oyster shells are of a contemporaneous kind, and no pottery or personal ornaments have been discovered. Dr. H. von Ihering (Sambaquis of Rio

No. 5.—Tembeta, or Labret of Amazon Stone, National Museum, Rio de Janeiro.

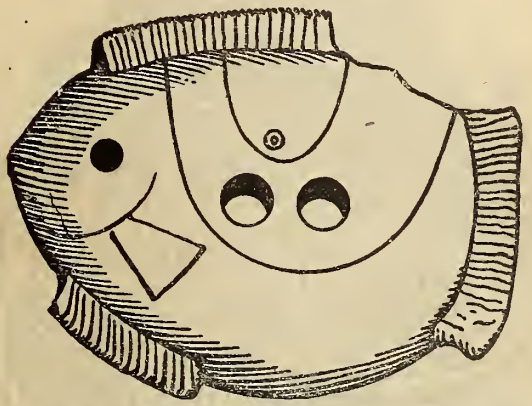


No. 5a.—Syenite Labret, or Tembeta.
From the *Archives of the National Museum, Rio*, Vol. VI, 1885.

Grande do Sul) says that there is no doubt the Indians who were responsible for these accumulations of *débris* were cannibals, and he places the maximum age of these deposits as far back at least as the pre-Columbian period. Some of the stone pestles which are found resemble roughly birds and fishes in their form. The ornament illustrated in No. 8 is a Tanga reduced from the natural size of $14\frac{1}{2} \times 11\frac{1}{2}$ centimetres. The greatest thickness is 4 C. These were used by women to cover their *partes pudentes*, especially when on the march and

in crossing streams. The male members of the tribe encased the virile member in a finely plaited bag, closely fitting, for the sake of protection. The Tanga was always made of the finest glazed ware, and suspended from the waist by a cord of vegetable fibre by means of the holes near each end of the top.

The Rio Doce Indians (Espirito Santo) use a cloth Tanga, but the females often go entirely



No. 6.—Soapstone Fetish found in the River Trombetas. This Mascot was hung round the Neck of a Fisherman for Good Luck.

Archives of the National Museum, Rio, 1115.

nude. Both sexes on the Panca river dispense with clothing, but paint their bodies with the red dye of the Urucum (Annato).

Very few cave dwellers have been found in Brazil, but some of the Bugres in Paraná live in burrows scooped out in the earth in the Campos Geraes, in the western part of the State.

No. 7.—Vessel of Ceramic Ware. Marajó Island (Para).

By the courtesy of Dr. C. Moreira, National Museum, Rio de Janeiro.

Vol. VI of the *Archives of the Rio Museum*, already referred to, contains a number of illustrations and descriptions of all the rock inscriptions of importance in Brazil. A few specimens are illustrated fig. 9.

Dr. D. Ferreira Penna said that the three strata of vases in Pacoval represented distinct phases of a

No. 8.—Tanga, in fine glazed Pottery, from Marajó Island, Para. In National Museum, Rio de Janeiro.

vanishing civilization, but we have now to describe a find which is the most remarkable in South Eastern America.

The funeral caves on the Igarapé do Hollanda, Rio Counany, in Brazilian Guiana, are the only examples of artificially constructed tombs in Cis-

At Cachoeira Savarete.

Near Moura.

In the Valley of the Rio Negro.

FIG. 9.—SELECTED FIGURES FROM AMAZONIAN ROCK INSCRIPTIONS.

Archives of National Museum, Rio de Janeiro. Vol. VI (1881).

andine South America, according to Dr. Goeldi (*Excavações Archeologicas em* 1895). They are 2½ metres deep by 1 metre 20 centimetres in diameter, and were both covered by heavy granite discs.

Eighteen funeral urns were discovered in all, but the only implement found was a green diabase axe, similar to those used by the present-day Indians of the lower Amazon basin. No ornaments, utensils or any other belongings of the dead were found. For a considerable time no tribes have existed throughout this region, and Dr. Goeldi calculates the age of the urns at 400 years at most, no data, however, existing to link the makers of this beautiful pottery to any race of Indians, except, perhaps, those of Marajó, whose art was more or less on a par. Dr. Barbosa Rodrigues cites in his *Antiquidades de Amazonas*, two vases found in the Ilha das Múras, in the upper part of the river, having a rectangular form similar to the finest Counany specimen, but the quality of workmanship and materials in the latter is superior, representing, as it does, the highest form of ceramics. The clay was first covered by a thin layer of white Tabatinga, on which the design was drawn before being burnt, most of the ornaments on Indian pottery in Brazil being produced by a mould, which gave them a bas-relief ornamentation. The raw material, or clay, of which the urns are composed is bluish-grey, common to the alluvials in the delta of the Amazon, and the same as that of which the Marajó ware is made.

Fig. I represents a longitudinal section across a cavern and projection showing position of urns as found.

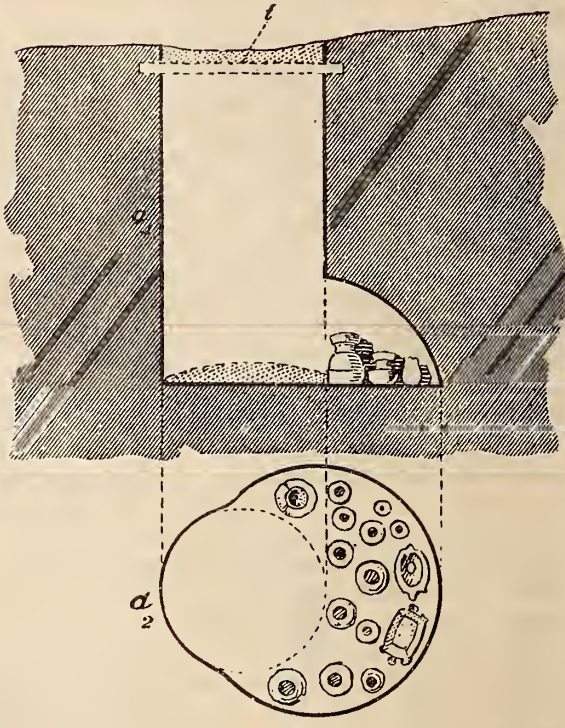


FIG. I.

By kindness of] [*Dr. Roquette Pinto, National Museum, Rio.*

CARAJA INDIAN (GOYAZ).

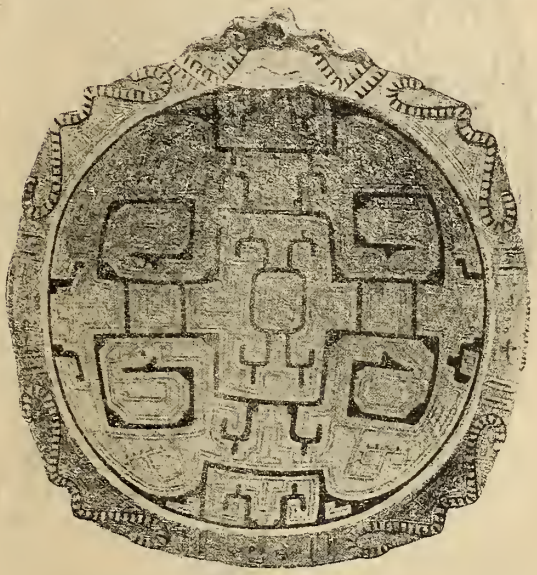
Photo by] [*Indian Dept., Min. of Agriculture.*

JAVAHE INDIANS, BANANAL ISLAND, GOYAZ, RIVER ARAGUAYA.

No. 1.

No. 2.

No. 3.



No. 4.

EXAMPLES OF MARAJÓ POTTERY.

No. 1.—Engraved vase in bas-relief.
No. 2.—Engraved vase painted in red and black on white.
No. 3.—Vase with two orifices, similar to those of ancient Peru.
No. 4.—Beautifully engraved vessel. The interior painted. Decorative and symbolic reliefs on the rim.

Archives of National Museum, Rio de Janeiro, Vol. VI, Plate 5.

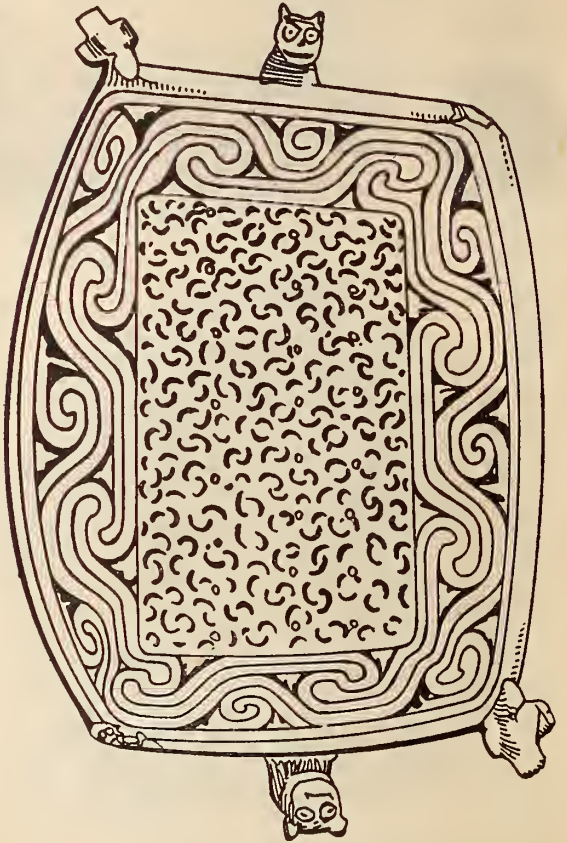


FIG. II.

	Centimetres
Length . .	outside, 50; inside, 33·5
Width . .	,, 41; ,, 23
Height . . .	24; Depth, 9

Figs II. and IIA show a vase, or tray. Practically unique in Brazil. The small animal is a Scirius (acutipurü) (agouti?), a rodent, the symbol of sleep amongst Indians in South America. Baena, *Ensaio Chorographico* (Pará, 1839), quotes their lullaby: *Acutipurü ipuru nerupecê cimitanga miri uquêre uaruuama* (Acutipurú, lend me thy slumber, so that my child may sleep also). The corner figures repre-

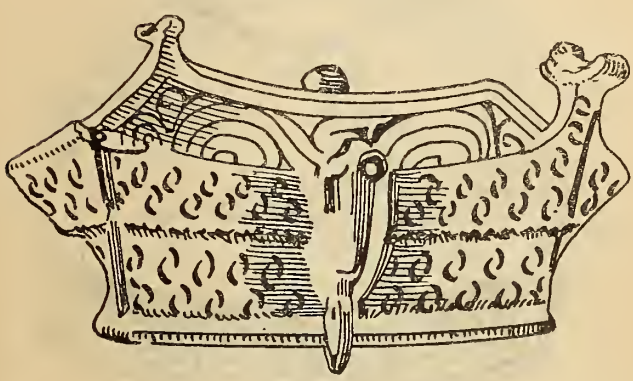


FIG. IIA.

sent birds. In the bottom are three parallel series of circular holes, found in most of the urns and supposed to have been made in order that worms might enter to devour the flesh off the bones. It contained ashes, earth and calcined bones. The colouring is red, urucú (Annato), and the ground is yellow.

FIG. III.

	Centimetres
Maximum diameter . . .	38
Diameter at mouth	18
Depth	32

Contained ashes and bones.

FIG. IV.

Fig IV.—A wonderful example of the ceramic art. Contained bones, including those of the thigh, broken evidently by violence. No perforations in base.

DIMENSIONS.

	Centimetres
Length of mouth . . .	51·5
Width of mouth	37·5
Greatest depth	31·5
Greatest width	50
Diameter of base	22·5

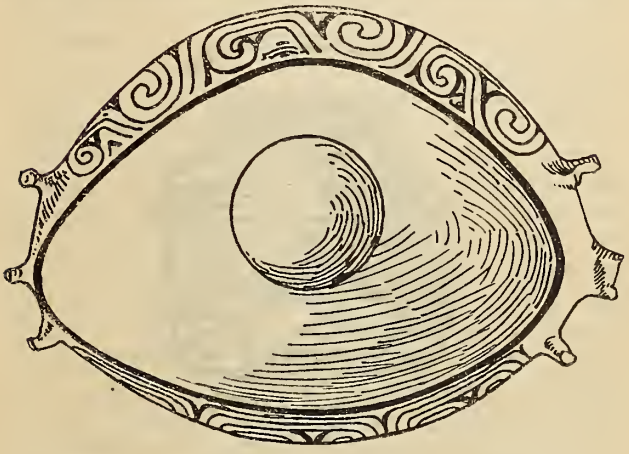


FIG. IVA.

Fig V.—This vase has fine circular holes in the bottom. Contained fragments of bone.

Almost all the records existing show the Indians as possessing low foreheads, a configuration of skull characteristic of the primitive American races from Canada to Tierra del Fuego.

Dr. Lacerda (Director National Museum, Rio de Janeiro) in his brochure, *Sur Les Métis de Brésil,* states his opinion that in another century not only these but all the other coloured people in Brazil will

have disappeared. The same eminent writer deals with the question of the descendants of the slaves, of whom the Portuguese introduced no fewer than 2,000,000. These Negroes died *en masse*. The national character to-day reflects the result of the too intimate relations between the black and the white races. The creole is weaker physically than either, but more intelligent and has attained to the

FIG. V.

Diameter of mouth, 21 cent.; Depth, 34·5 cent.

highest positions, especially in political life. In colonial days the favourite slaves were admitted to their master's table, accompanied his children everywhere, admitted them to their secret rites and saturnalia, and even degraded the noble Portuguese language with a host of Negro words. Too often the white settlers from Portugal were of the lowest order, and the marvel is, not that the slave states are still somewhat backward, but that they have

attained such a high degree of civilization and prosperity. The female creole is often beautiful in face and form, with expressive brown eyes. She is usually of an ardent disposition, gentle and docile and essentially feminine, but frequently an easy prey to consumption and kindred scourges. In German Brazil the Negro and the Mulatto are looked upon as inferior beings and made to feel their social ostracism.

As in North America, the first intercourse between the white man and the red man in Brazil was marked by diabolical atrocities on both sides. In 1537 a Royal Decree from Lisbon made legal the slavery of the Caethé tribe, and the aborigines were gradually brought under subjection until the Marquez de Pombal designed more human laws in 1605 and 1607. In spite of these, persecutions and massacres still took place until quite recent times. Padre Vieira says in 1615 that in the province of Maranhão alone there were no fewer than 500 Indian villages, some of which could supply 4,000 to 5,000 warriors, but in less than 30 years not more than 800 armed savages could be united, more than 2,000,000 Indians having died of sickness or succumbed to the brutalities to which they were subjected by the white man. In the eighteenth century the Jesuit fathers had already done a great work, and they were ably backed up by Pope Benedict XIV, who issued a Bull excommunicating *latae sententiae* any who enslaved the red man. In 1808, however, a Royal Decree of May 13 ordered the Governor of Minas Geraes to make war on the Botucudos, and regulations of November 5 of the same year, and April 1 of 1809, promulgated the same inhuman ideas. In 1823 José Bonifacio

de Andrade e Silva, deputy, and the patriarch of independence, presented a memoir with regard to the civilization of the Indians, and the department for the Protection of the Aborigines, created in 1910, has based its charter on the noble and practical ideas emitted by the great statesman. In 1842 the Indian was considered as a minor and subjected to the disabilities of an orphan, as a ward in chancery. In 1845 the provinces were split up into sections, each in charge of a director, and the Church was given full powers.

None of these measures, however, produced any practical effects, and on June 20, 1910, the President of the Republic, Dr. Nilo Peçanha, and the Minister of Agriculture, Dr. Rudolpho Miranda, signed a decree creating the present service of Protection of the Indians, the exposition of motives of the latter, demonstrating the necessity of, according to the constitution of the Republic, substituting the word Protection for that of Catechism, as the Church being permanently separated from the State, the Government could not make any efforts to convert the Indians to this or that creed, but could lend them all the assistance in its power in an endeavour to establish peace, confidence and friendly relations, associating the aborigine with the people as fellow-citizens, but by keeping them as far as possible in separate settlements to so work as to gradually modify their habits and institutions. With regard to missionary work, the functionaries of the service are enjoined to aid in every possible way the civilizing efforts of each and every religious body that cared to send workers into the wilds.

The present decree divides the Indian territory into ten districts, each in charge of an inspector,

obliged to present an annual report to the Director-General, Colonel of Engineers Rondon.

It is proposed to settle the Indians in their own districts as far as possible, these being often unsuited to European colonists.

The aborigines will be granted the same advantages as the immigrant from over seas, and the inviolability of their allotments will be guaranteed. With regard to their peculiar tribal customs, and internal organization, the Department proposes to proceed with the utmost care, enlisting the aid of their Caciques (chiefs), and endeavouring that the red man shall reform himself as far as possible, but at the same time taking care to protect him from the rapacity of his fellows, as well as from that of the white man, either Brazilian or alien.

In order to legalize the possession of lands over which they have hunted, or in their effective power in any other manner, the State Governments are being appealed to, to assist in the demarcation of limits, and prevent encroachments. The Federal Government will also open free schools, and administer professional instruction, always voluntary, and wherever necessary create model colonies for the instalment of tribes unable to subsist in the districts they formerly inhabited.

Agricultural stations will also be established in each State, equipped with day and evening schools, workshops, experimental farms, etc., etc., and principally for the use of Indians who are already pacified.

In short, every inducement will be given to the native to adopt a civilized existence, and to make him a source of profit to the nation, as well as to improve his own position, both moral and physical.

In the State of Matto Grosso, the Director himself had already laboured hard whilst engaged in superintending the construction of telegraph lines in the extreme west of Brazil. Coming in contact with the terrible Nhambiquares, he has succeeded little by little in obtaining the friendship of several groups of this tribe, once even, when attacked by surprise, retaliating by giving presents and whenever possible by means of an interpreter sending forth a message of goodwill and fraternal feeling. The above tribes are quite savage, have no contact with civilization, and nourish an inborn sentiment of hostility to the white man, yet in less than two years they have been pacified so far that instead of destroying the work of the telegraph department, they have been won over not only to protect it, but frequently to aid in the heavy service of opening out a path through the virgin forest. The Borôros, Parexis, Iranches, Apeacás, etc., have also been pacified without any loss of life, and in Goyaz the Javahés of Bananal island on the Araguaya were for the first time brought into contact with civilization. Besides this numerous tribe the Inspector has entered into relations with several others.

The ordinary difficulties of the service have been greatly increased in Amazonas, owing to the necessity of restoring confidence lost through the atrocious treatment received at the hands of many of the landowners in the rubber district, who, emboldened by impunity, had reduced all the Indians they could lay their hands on to a condition of slavery.

Amongst the tribes dealt with more or less successfully in their region are the Jauperys and Maués, and the Tembés, etc., in Pará. In São

Paulo, the so-called intractable Kaingangs, after a year's patient and persistent labour, were induced to come in contact with the officials of the department, with highly satisfactory results. Observation posts were erected in the virgin forests, in the branches of a tall tree, and from this coign of vantage an interpreter would call his savage brethren and expound to them the theory of the department and the earnest wish of the Government for their welfare. The services of the gramophone were enlisted, and a liberal distribution of useful presents made on every available opportunity. To aid in approaching the hitherto secluded tribe, a road was cut for many miles into the heart of the woods and the camp of the officials pitched in a locality where they were more or less at the mercy of the savages. In Paraná, the river Tibagy supports some 1,100 Indians, and these have been dealt with, as well as the Aymores in Espirito Santo, several tribes in Bahia, Maranhão, Minas and Rio Grande do Sul, etc., where the white settlers had driven the natives away from their hunting and fishing grounds.

In 1612, Ruy Diaz de Guzman wrote that there were no fewer than 365,000 Indians along the course of the Rio Grande, round Lagôa dos Patos, and between the Paraná and Paraguay rivers.

In October, 1917, I visited the Botucudos in Santa Catharina, on the middle course of the Hercilio, or Itajahy do Norte, at the mouth of the Plate tributary.

Owing to the floods I narrowly escaped drowning (*see* Gazetteer). These Indians number from 200 to 300, and they are hardly to be described as pacified. The men throw a piece of blanket (given

them by the Government) over their shoulders, and pass a girdle of fine cords round their middle, using this latter as a sort of suspender for protection. The women wear a waist cloth, either of the blanket nature, or woven from the *Urtiga brava* (wild nettle). Their chests and legs are, however, quite bare.

The labret, or botuque, is a prerogative of the male sex, and consists of a pine kernel, a piece of bone, or similar material. I saw no hard stone labrets.

Men and women alike are well-built and robust, the young females being quite good-looking, but they are in a very backward condition, and have no notion of comfort. They sleep on a pile of leaves on the ground, with a fire near at hand, knowing nothing of hammocks, neither have they thought out the means of fishing by net or line. Their huts, if this name can be applied to such erections, are open on all sides to the weather, and at least under the supervision of their tutors, they are subject to influenza and other ills of civilization. A child died of grippe during my visit, and was buried a little distance away, with every reverence and sign of grief. Adults are usually burned. They were greatly interested to find that I was, like themselves, minus a couple of teeth in the front, and also that I was no more hirsute than they, at least on my chest, and forthwith brought a pair of scissors, and wished to cut my hair in their fashion as a prelude to considering me one of themselves. This I explained through the interpreter would not do, as I had to return to the outer world to give an account of their difficulties to the great Cacique (chief). They use roughly made, but powerful

bows, and arrows, and lances pointed with iron which they have obtained by fair means or foul. Indeed, before being brought under the ægis of the Indian Commision, they were in the habit of waylaying pack trains and murdering the armed guards, not from any feeling of personal hatred, but merely to possess themselves of the coveted metal.

This tribe lived quite isolated, having no affinity, racial or otherwise, with the Paraná Indians, and the latter, who were brought south when tamed, to act as interpreters, failed to make themselves understood by the Botucudos. The latter are superior from a physical point of view, and as the Director of this post aptly classified him, the chief was more like a tower than a man.

The Paraná Indians have a much more Mongolian cast of features, and it would be easy to take them for Japanese at a distance, if they were dressed in oriental style. The Plate natives were extremely wild and savage a few years ago, but it is strange that the tiny children had no fear when I took several of them in my arms, so long as their mothers were within sight. These people are polygamists, the men taking two or more wives, and the latter work for them like any slave.

The principal complaint was that they were no longer able to procure game, and they demanded a supply of meat, evincing the greatest disgust at being obliged to live on mandioca, maize, beans, etc. They are Coroados, in the sense that a tonsure is worn by the males, even the tiny boys, and it is always kept carefully cut.

These poor folk are shut in on all sides by the ever encroaching tide of white settlers, and they complain, plaintively, that in a couple of days'

march in any direction they can see the camp fires of the new-comer, who, as a rule, impelled by fear, promptly attacks the dreaded Botucudo.

I was struck by the poverty of their language, the same words being used over and over again to emphasize their meaning, and, in order to prevent any possible error, in a long dumb show conversation with the Chief, he repeatedly gave me a sharp blow on the chest with the flat of his lance.

Poor Hoerhann! the Director of the post. "*Kantanghara*" as his Indian children called him. If ever he should see these lines, he will know that I have not forgotten him, our escape from death in the raging Itajahy, his sacrifices for the cause, or his hospitality. As I told him, our adventure of October 15, 1917, will never be erased from my memory. I hope he will get a better opening.

In Matto Grosso the Salesian Fathers are engaged in the work of reclamation, and the Capuchins find ample scope for their labours in Minas.

Altogether, the result of some two years has been highly gratifying, and the department has fully justified its creation.

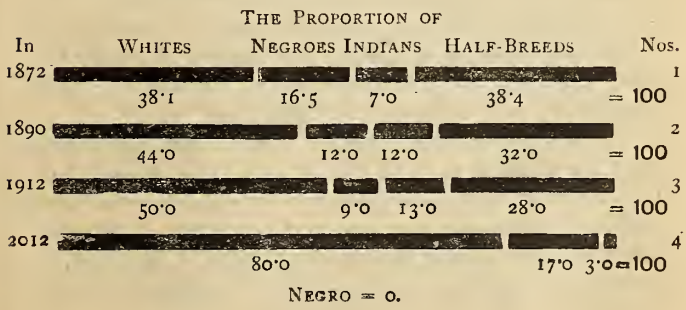
A quite distinct work is being carried on by various Catholic bodies in different parts of Brazil, and the State Department has no responsibility for any good or bad results which may be the consequence of purely religious propaganda.

At the present time there is a mission of the German Franciscan Sisters at Itambacury in Minas Geraes, some six leagues from Theophile Ottoni. There are 1,200 Indians, counting nomads and semi-civilized tribes, in this district. Here, in the schools, the nuns teach spinning and weaving, and artificial flower-making, and find the Indian girls most apt pupils.

It may be appropriate to mention in connexion with this subject the conditions subject to which the Government granted a substantial subsidy to Mr. Savage Landor, to assist him to carry out his expedition in 1911, across the eleventh parallel, from the Araguaya to the Mamoré river. He was explicitly told that the journey being through a country entirely without resources, the Government could not be held liable for any loss or injury caused to himself, or to any member of the expedition, and he was especially charged to avoid any difficulties with the Indians, and to treat them with every possible kindness and forbearance; and was to present a minute report to the Minister of Agriculture, with regard to the language, manners and customs of all the tribes with whom he came into contact.

I write this in order to remove any misconception from the mind of any of the audience at the lecture of the explorer in London.

The following diagram, prepared by Dr. Roquette Pinto (National Museum, Rio de Janeiro), demonstrates the gradual decline in the negro and half-breed population in Brazil.



Dr. Roquette Pinto says that he has not been able to include all the Indians, but I think myself that the proportion in 2012 will be much less than he gives in No. 4.

The Brazilians are a very musical people, and hardly a town of any pretensions is without its band, in spite of the great cost of instruments (all, of course, imported). Many of these orchestras are quite good, and we find *free* schools of music established in the most unlikely places. Undoubtedly the aboriginal character is preserved amongst the white people now inhabiting Brazil. Traces are found of its influence in the mode of celebrating the carnival, in the very character of the national music, in its literature, and sometimes its art. The Negro, on the contrary, has not made himself felt to any great extent, of course, owing to his thraldom, as well as to his natural characteristics. The evolution of the Brazilian type is proceeding slowly, but surely, and out of the Sclavo-Teutons, Ibero-Tuscan-Romanos, Franco-Iberians, Syrians, and remaining aboriginal elements, is being constructed a composite, but none the less virile race, destined to play a great part in the future history of the world. The predominance of the white is assured. Colonization is the question of the day, and although such experiments as the introduction of Asiatic settlers (Japanese) are somewhat dangerous, there is no doubt as to the final result. Envy and ignorance may work hard to stay the progress of Brazil, but her advance to the position of a great nation is sure, and even now she demands and obtains a prominent place in the world's councils. Who knows what the future holds in store for the "Colossus of the South," as she may fitly be termed.

The greatest problem is, not the civilization of the Brazilians, but that of the nations who send forth their multitudes across the seas, to the smiling valleys of the great Republic. If the right sort of colonists are sent to Brazil, the country will soon prove her fitness to take a place in the forefront of nations.

It seems very apropos of the subject of ethnography to consider two diametrically opposed points of view, as far as the introduction of Anglo-Saxon colonists are concerned. The British Government warns its subjects that Brazil is not a desirable field for emigration, and as a retaliation, Brazilians frequently say—The Englishman is not suited to Brazil.

We shall see in an Appendix, "The German Question," how racial antagonism has soured relations between the new-comers and those who claim a national birthright.

I will not discuss the question here as it is rather a delicate one.

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CHAPTER IV

HISTORY

Discovery and First Settlement

At the beginning of the sixteenth century, Portugal was in the throes of transition from the middle ages to the modern era. The Church had lost many of its powers, and was obliged to relinquish a number of its pretensions. Its political force was a thing of the past, except through the astuteness of the prelates. The desire for expansion, stimulated by the triumphs of Bartholomew Diaz (1486), and Vasco da Gama (1498), had turned men's eyes in the direction of the new world. The time was ripe for further discoveries, and the rivalry between Portugal and Spain served as a greater stimulus. Times were hard, and laws severe; death was the penalty for such crimes as robbery of a mark. Moreover, the King was the absolute lord of his people. He could make war, and force the people to provide for themselves whilst fighting his battles. The animals, carriages and vessels of his subjects were all his; the roads, rivers, ports and port dues, minerals and fisheries, all belonged to him. Small wonder then, when Brazil offered opportunities of greater riches and freedom, that the Portuguese flocked thither. The expedition against Ceuta, in 1415, consisted already of several hundreds

of vessels. The first European who can be said to have cast eyes on the southern half of the new world was Vicente Yanez Pinzon, a Spaniard of Palos (Murcia), and one of the companions of Columbus. He sighted Cape Augustine (as it is now called), some twenty miles to the south of Pernambuco, on January 26, 1500.

Here he disembarked, and took possession in the name of the Spanish Sovereigns, but, being attacked by the Indians, who killed some members of his crews, he abandoned the spot and set sail for the north.

Before Pinzon reached the limit of his voyage, the Amazon river, an expedition of thirteen ships left Belem (Lisbon). This convoy departed on March 9, that is, seven months before the return of Pinzon to Spain, and the news had reached Lisbon of the discovery of Cabral, in July, or two months previous.

The expedition of Cabral consisted of 1,400 soldiers, and a number of merchants, who were en route to the Indies, and conveyed a goodly store of products of all kinds. Amongst the passengers was Pero Vaz de Caminha, the historian, and we shall endeavour to use his own quaint phraseology, in the letter to his King, announcing the discovery. The fleet arrived off the Canaries on March 14, and sighted Cape Verde Islands the 22nd. Caminha wrote: —

On the Wednesday (April 22 of the Julian Calendar, and May 3 according to the Gregorian), early in the morning we saw birds, and on the same day, at vespers, caught the first glimpse of land, in the form of a great hill of a round form, and then lower lying ranges to the south of this, and of a flat land with much vegetation, our Captain christen-

ing the first named Mount Pascoal, and the land itself Vera Cruz. He ordered soundings to be taken, and finding 25 braças in depth, and the sun going down at this hour, we came to anchor in clean sand at 19 braças, and remained until morn. At dawn on the Thursday, we set sail, making towards the shore, the smaller vessels leading the way, until within half a league of the beach, where we dropped anchor at about 10 in the morning. (This, called Bahia Cabralia, lies in 16. 17. 30. S.) Here we saw a matter of seven or eight men wandering on the beach, close to the mouth of a river, and Cabral sent Nicolau Coelho in a boat to inspect the surroundings. No sooner had he begun to row in direction of the shore, when men in twos and threes arrived, so that by the time he had reached the mouth of the stream, there were no fewer than eighteen or twenty naked savages there, stark naked, so that nothing hid their shame. They bore bows and arrows with them.

We remained here until the next morn, when by council of the masters, sail was set at 8 oclock, and we proceeded along the coast. Two Indians had been taken, and were treated with kindness, but they rejected almost everything that was offered them to eat, neither did they take wine or water.

One of them seeing a rosary, made signs that it should be given to him, and, pointing to the land, and to the gold collar of the captain, made us understand that the precious metal was to be found there and would give it in exchange for the beads.

He gave the rosary back to its owner, and lay down all naked as he was to sleep, the captain ordering that he should be covered by a cloak

Saturday. Sail was made in direction of the

coast, and we made an opening in the reef, and anchored in a wide and safe haven, in 5 or 6 braças. The bay was so wide, that there was ample place in it for more than 300 vessels. This harbour was named Porto Seguro (16. 47° S.), and from here, Mount Pascoal was plainly visible inland. The two captives were liberated the same night, and a careful watch was kept until day broke. A party of armed men were then landed from the ships, and at first a hostile crowd of Indians surrounded them, but after a while, these were persuaded to throw down their arms, exchanging them for the most trivial toys.

We found the women, especially the very young ones, possessed of *certain* physical charms that most of our court ladies would have greatly envied had they been there to see. Our commander resolved to hear mass as it was Sunday, and Father Henrique, aided by the other sacerdotes, officiated with great solemnity. A huge cross was raised, and the whole company performed their devotions most fervently. The banner of Christ was raised there for the first time, and the naked savages listened with attention and decorum, and also to the sermon which dealt with the story of the Evangelist, and our coming to this land.

Two convicts were left on the spot, with the natives, and the ships pursued their route to the east, one fast sailer returning to Lisbon with the letter of Pero Vaz. When the tidings reached Portugal, Don Manuel ordered that three ships should be victualled, and invited the Italian Amerigo Vespucci to take command.

The little fleet set sail the following year in the middle of May, reaching the Brazilian coast in about five degrees south of the line. Two men were sent

on shore to negotiate with the Indians, who were seen spying them from the top of a hill. Days passed but no news came to hand, and another sailor went as messenger of peace. No sooner had he reached the beach than he was surrounded by a crowd of natives, many women being seen amongst them. They seized him, and examined him all over, being plainly enough filled with wonder and curiosity.

Suddenly one of the females came behind him, and dealt him such a blow with a club that he fell senseless to the earth. He was dragged away out of sight at once. Immediately a great cloud of Indians rushed down to the beach and discharged a cloud of arrows at the sailors who were remaining in their boats a little way off. Several guns were fired at the savages, who then fled to the woods. The barbarous Indians cut the poor youth's body in pieces, and boiled it within sight of his enraged comrades, who would have landed to revenge their three fellows if they had been permitted. Disheartened at the non-success he met with, Amerigo returned to Lisbon in 1502, but set out again with six ships the ensuing year. Four of the caravels were cast away owing to the incompetence of their commander, but the other two reached All Saints Bay (Bahia), where they remained five months on friendly terms with the natives, and then returned home laden with parrots, monkeys and Brazil wood, leaving behind them twenty-four men who had been saved from the wreck of the flagship (at Fernando do Noronha Island). Thus was formed the first settlement in Brazil.

The Brazil wood had become so noted in Europe, that the name which Cabral had given to the country (Vera Cruz) became lost in the denomination which it universally received of the Brazils, or the Brazil

wood country, finally becoming Brazil simply. The harmony which marked most of the first intercourse betwen the aborigines and the discoverers did not continue for very long. The former found little reason to be satisfied with their neighbours, and, like most savages, passed from the one extreme of attachment and veneration, to that of hatred and fear, and their minds were soon filled with the idea of taking revenge for some provocations which they had sustained. Warfare of the most sanguinary sort succeeded, the Portuguese being frequently defeated, and suffering such tortures that cannot be related. A temporary end was thus put to voluntary emigration to Brazil. At this crisis the Government adopted the plan (borrowed by the English at a later period) of making the country a penal settlement, banishment thence taking the place of capital punishment. Owing to the character of the new colonists, the Indians naturally lost all awe for those whom they at first regarded as vastly superior beings to themselves. Hardened by crime, and rendered desperate by their circumstances, the new-comers were well fitted to contend with the difficulties that awaited them. In the sanguinary battles that ensued, atrocities were committed not unsurpassed in enormity by those which attended the conquests of Peru and Mexico. It was said to be their practice on storming a village to massacre all the old men and children, and carry the rest off as slaves. During this time, Amerigo Vespucci had returned to the service of the Castilian King, and undoubtedly counselled the latter to take possession of the territories which he (Vespucci) had discovered. The Spanish sovereign sent out Don Juan de Solis in 1509, with Vicente Yanez Pinzon as pilot. The

King of Portugal did not act tardily in remonstrating with the Castilian on this proceeding, and on the return of Solis and Pinzon the idea was abandoned.

Seven years later, De Solis, coasting along the Brazils, came to the harbour of Rio de Janeiro. From thence he proceeded southward until he reached what he presumed to be a strait communicating with the Indian Ocean, but which turned out to be the mouth of the great River Plate. With this important discovery the career of the great navigator terminated, for in attempting to make a descent on the coast, he and several of his crew were slain in sight of the ships. Discouraged by the loss of their commander, the survivors set sail for Europe without attempting any further discovery. The King of Portugal claimed their cargoes, and remonstrated so effectually against the interference of Spain that Magalhaes, when reaching the coast three years afterwards (1518), purchased nothing but necessary provisions from the inhabitants. Meanwhile the French had formed settlements on the northern coast of Brazil, and when Christovão Jacques, a Portuguese commander, entered All Saints Bay, he found two Gallic vessels laden with Brazil wood. These he attacked and succeeded in destroying, after a gallant defence. The first settler in Bahia was Diogo Alvarez, a native of Vianna do Castello. He was wrecked upon shoals on the north of the bar. Part of the crew were drowned, others were slain and devoured by the Indians, and Diogo himself only saved his life by making himself useful to the savages. By design he secreted a musket and barrel of powder, and when an opportunity offered to astonish his masters, he promptly

brought down a bird with a shot. He was in a moment translated from a slave to a great personage. The Indians gave him the title of Caramurú (man of fire). He became a chief, led his followers against the Tapuyas, and the fame of his terrible engine of war having preceded him, his tribe gained a bloodless victory. He fixed his abode upon the spot where Villa Velha was afterwards founded, and living as one of the patriarchs of old, soon saw a numerous progeny rising round him. It is undoubtdly true that the best Bahian families owe their origin to him.

At length a French vessel entered the bay, and Diogo Alvarez resolved to take the opportunity of once more seeing his native land. He loaded the ship with wood, and embarked with his favourite wife Paraguassú. They were received with great honour at the French Court. His wife was baptized by the name of the Queen of Portugal (Catharina), and the King and Queen were her sponsors, and her marriage was then celebrated. Diogo would have proceeded home, but the French would not permit him. By means, however, of a young compatriot (Fernandez Sardinha), he sent the information to Lisbon, that he was not permitted to carry personally, and exhorted the Portuguese monarch (João III) to colonize the province in which his own lot had been so strangely cast. After some time, however, he bargained with a wealthy merchant to take him back, and leave him the artillery and ammunition of two ships, together with a large store of useful goods for trading. In return for this he undertook to fill the vessel with Brazil wood. The arrangement was faithfully performed on both sides, and Diogo fortified his little capital. The

Portuguese Government had continued to neglect their Transatlantic possessions, and for more than thirty years the attempts to colonize it had been of the feeblest description. Finding, however, that the French were profiting by their apathy, and that the Spanish were forming settlements on the bank of the Paraguay River, the Portuguese Court took alarm, and a plan was formed for the division of the country into Capitanias (captaincies), each containing about fifty leagues of coast, which were bestowed by João III upon such grandees as had distinguished themselves by their services to the Crown, and were able and willing to embark on such an adventure. They were either to go in person, or send colonists at their own expense, and in return they were invested with complete powers, both civil and militant, over their respective jurisdictions. We thus see that the policy of the Portuguese King and Cortes was the same as that of the Spanish, i.e., to colonize and enrich the nation at the expense of the people, not of the royal treasury.

Before proceeding with the next chapter in Brazilian history, the parcelling of the coast into a series of semi-independent communities, we will glance at the actual state of the country at this time. The first arrivals found no difficulties in procuring wives amongst the Indians, as the latter had a peculiar ambition to possess children by a race of men whom they at first deemed a sort of demi-gods, when they saw them apparently call down the thunder and lightning at the pointing of a sort of wand. Besides, according to their ideas, the only side of parentage worth anything was the male. They were further seduced by the store of trinkets, such as looking-glasses, scissors, knives, rings, etc.,

which were profusely displayed by the mariners. On the other hand, of course, the new-comers brought no women with them on their first voyages, and so it is easy to understand that a large number of mestizos soon sprang up wherever the Portuguese were settling. Some of these became quite as savage as their mothers, and forgot their partial white origin in the primeval instincts of the Indian. Others assisted in the brutal massacres of their relatives, and were even more ferocious than their fathers. An intermediate type is presented in Diogo Alvarez, and being the first, as well as one of the best of colonists, it is small wonder that the little port he founded soon rose to be the capital of all Brazil. From the time of his shipwreck (1510) to 1557, when he died, progress was slow but never failing.

CHAPTER V

THE CAPITANIAS, AND STRUGGLES WITH THE FRENCH, BRITISH, SPANISH AND DUTCH INVADERS

Previous to the division of Brazil into Capitanias, it had been handed over to various adventurers who possessed parallel sections (Donatorias), drawn arbitrarily from E. to W. This system continued in force from 1532 to 1534 only, and was modified because it brought insufficient revenue to the Crown. The Capitanias were instituted under Don João III shortly after the abolition of the previous form of administration.

The first concessionary was Martin Affonso de Souza, who, with his brother's aid, fitted out a considerable expedition. He first began to survey the coast near Rio de Janeiro, and gave the place its name, being discovered on the first day of the year, and thought to be the mouth of a river. The allotment was situated near São Vicente. Pedro Lopez, his brother, had two sections, one part, São Amaro, immediately to the south of São Vicente; the second considerably to the north, not far from where is now Pernambuco. João de Barros, the celebrated historian, obtained Maranhão, and Pernambuco became the portion of Duarte Coelho Pereira. The territory adjacent to the Southern Parahyba River was

conceded to Pedro de Goes. The country between the River São Francisco and Bahia was allotted to Francisco Pereira Coutinho. The next portion of territory southward was known as the Captaincy of Ilheos; it was granted to Jorge Figueiredo Correá. Cabral's Porto Seguro was included in the range of coast which formed the Capitania of the same name, and came under the control of Pedro Campo Tourinha. Espirito Santo was the appellation given to the next in rotation, and fell to Vasco Fernandez Coutinho.

Few of the settlements were founded immediately by the Crown, and the lords proprietors enjoyed feudal privileges and most regal rights, except issuing a coinage. They made their own laws and imposed taxes. This system of Government was, as might have been expected, attended by serious evils. An authority so absolute, and so uncontrolled, was inevitably abused by the adventurers to whom its administration was entrusted. Complaints of their brutal and arbitrary conduct became at length so frequent that it afforded the Crown a fair pretext for revoking the powers which had been so hastily conferred on the proprietors, and *de facto*, the settlements had been entirely alienated from the Government.

A Governor-General was appointed with plenipotentiary attributions, and the only thing left the adventurers was possession of their lands, as fiefs.

Thomé de Souza, a fidalgo (or noble), was appointed to this high office, and he was given instructions to build and fortify a city, which was to be called São Salvador. He arrived at Bahia April, 1549, accompanied by six Jesuits, the first who had set foot in the new world. It should be noted that

the introduction of slaves had already taken place, most of them brought from the West Coast of Africa, and were principally of Bantu race. They came especially for the purpose of agriculture, but were made use of in the extraction of the precious metal, and as we shall afterwards see, entered into the whole life of the country at a later period.

Amongst the Jesuits was Father Nobrega, a contemporary of St. Francis Xavier, and his rival in disinterested exertions for the good of his fellows. He has been truly called the Apostle of Brazil. Of noble birth, he had been disappointed in some position looked for, and renounced the world in disgust, little thinking that his future was destined to be far greater than as a simple and useless aristocrat. His memory deserves to be held by the Brazilians in everlasting honour.

Some have ascribed the appointment of Thomé de Souza to other causes than that of the misdeeds of the feudal lords. Many Jews had found their way to Brazil, being banished thither by the Inquisition, after having been stripped of all their possessions. Here they founded a colony, imported sugar-cane from Madeira, and soon were so flourishing that the Crown became imbued with the idea of forming a new city in Brazil, and making it the seat of the Government. The Jews had hardly been a year exiled when the new Governor arrived, so it can hardly be said that they were the cause of his appointment.

On De Souza's arrival at Bahia he found old Caramurú settled there. This man was of great assistance to the Portuguese in promoting a friendly understanding between them and the Indians, and the latter helped them to build the city. Within

four months a hundred houses were erected, a cathedral was begun, batteries were made, commanding both sea and land, and a mud wall was built to defend the place against any sudden attack from the natives. Supplies of all kinds were received next year from Portugal, and the year following several young orphans of noble families were sent out by the Queen as wives for the officers, with large dowries in cows, mares, and slaves.

This was the very first royal settlement, and its prosperity was attended by advantages to all the Captaincies. De Souza did not, however, bring a sufficient force to cope with the disorders and repress the insubordination which began to prevail. By building São Salvador he gave a central government to the colony, but the honour of settling and extending it, and of making it really useful to the Mother Country, was reserved for the Jesuits.

These men, by their arts of insinuation and address, have been surpassed by none, and they dispersed themselves amongst the savages, and seemingly inspired by peace and charity, succeeded in obtaining their attachment and confidence. The obstacles which they had to encounter were most formidable, but their fiery zeal and assiduity rose with the difficulties met with, and the most salutary effects resulted from their exertions. They began by instructing the native children in the Portuguese language, and thus whilst fitting the Indians to become interpreters, they acquired their tongue, and, as we have seen, formed a Lingôa Geral. Nobrega had a school near the city, and the children were taught the elements of reading, writing, and arithmetic, to assist at mass, to sing the church service, and were frequently led in procession

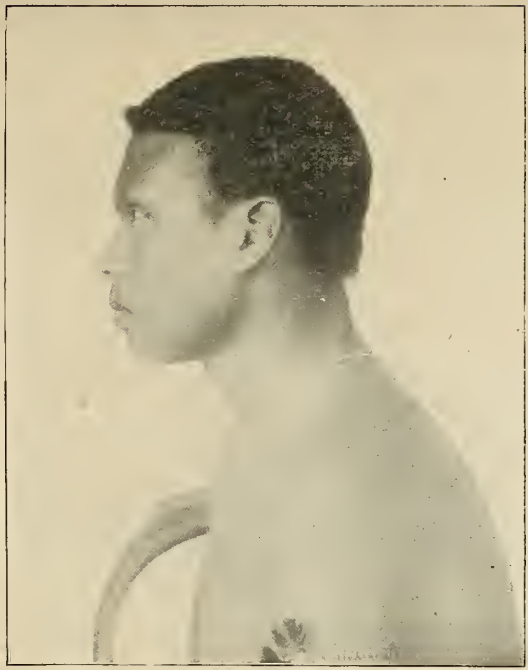

Photo Museu Nacional Rio]

[by courtesy of Dr. Rouquette Pinto.

A Bóróró Indian, Matto Grosso.

TROPHY OF THE MUNDURUCU INDIANS: MUMMIFIED HEAD.
(*Rev. do Mus. Paulista*, Vol. VIII, S. Paulo.)

through the town. Great pains were taken to substitute the folklore of the Indians by legends from Holy Writ, and as to these poor people it was only a case of exchanging one set of stories by another, they did not lose by the substitution. Unfortunately for posterity, through this policy most of the Indian lore had been entirely lost.

The greatest obstacle in the path of the missionaries was the cannibal propensities of the Indians. Their very pride and beliefs were implicated in these horrid orgies. In spite of their curing the savages of drunkenness, of polygamy, and of the custom of the vendetta, they still possessed the propensity to delight in human flesh. Southey (*History of Brazil*) relates a story of a Jesuit, who, having administered extreme unction to a very old Indian woman, desired to know whether he could get her anything to eat. Said the old convert: "My stomach rebels against everything, but if you could only get me the little hand of a tender Tapuyo boy, I think I could pick the little bones; but woe is me, there is nobody to go out and shoot one for me." The priests, who were already established in the country, were in continual opposition to the Jesuits. Their interests were at stake; for what the missionaries did gratuitously, they demanded payment, for the priest maintained that slavery was lawful, because the Indians were beasts, although their own habits were not less dissolute than those of the savages, and they hated the Jesuits, who sought to humanize the natives. The first settlement consisted of an array of officials, directly responsible to the Governor-General, and who were deputed to visit the Capitanias to transact the business of the Crown; four hundred soldiers, six hundred exiles, and many mechanics, and others.

Hardly had the place taken the aspect of a permanent settlement when the first Bishop (Don Pedro Fernandez Sardinha) arrived in 1552. The following year Thomé de Souza, having been four years in Brazil, asked for and received his recall, and was succeeded by Duarte de Costa, who came, accompanied by Father Anchieta and six other Jesuits, who soon after established a college in the Plains of Piratininga (now São Paulo) on the Tieté River, in a secluded and beautiful spot. Southey, on visiting it, complained of the tremendous ascents, and the thinness of the air, although its elevation is not more than about 2,500 feet above sea-level.

Difficulties arising between the new Governor and the Prelate, the former embarked for Lisbon, with the intention of stating his grievances to the King, but was wrecked, and, together with a hundred Europeans, was murdered by the Cahete tribe of Indians. In revenge for this the Portuguese hunted them until they were almost all exterminated, the remainder being condemned to perpetual slavery.

Da Costa was replaced, in 1558, by Mem de Sa, a man of enlightenment and humanity. On his arrival he immediately set to work to reclaim the natives, and to make them fully understand that they might expect justice in the future, he issued an order that all who had been wrongfully enslaved should be set at liberty. He also took vigorous measures to enforce the laws against cannibalism, pursuing and chastising such tribes as were found to continue the abominable practice. He soon had to turn his attention to a foreign enemy. Durand de Villegaignon, a native of Provence, and Knight of Malta, a man high in the French naval service, had taken possession of one of the islands in the bay

of Rio de Janeiro, for the avowed purpose of founding an asylum there for the persecuted French Huguenots. For this project he had obtained the patronage of Admiral de Coligny himself, and by this means had succeeded in inducing a number of respectable colonists to make their way to Brazil. The French Court was inclined to view the scheme with entire satisfaction, as it afforded a means of forming colonies after the fashion of their Iberian neighbours. Villegaignon having landed, he began to build a fort, calling it after the name of his protector, Coligny, and although the whole territory was hardly a mile in circumference, the continent was already honoured with the name of Antarctic France. On the return of his ships to Europe for another cargo of Protestants, a considerable zeal was kindled by the establishment of the reformed religion in these remote regions, and the Church of Geneva took such interest in the expedition that two clerics and fourteen students from that city determined to brave all the hardships of a new climate and mode of life.

Repairing to the seat of Admiral Coligny, they soon found their numbers swelled, and new recruits being continually enrolled as they made their way towards the sea. Their departure was hastened by a disagreeable venture. At Harfleur the Catholic inhabitants, instigated by the priests, rose in arms against them, and one of their best officers was killed. On their passage they met with very bad weather, and on arriving off the Coast of Espirito Santo they had a slight brush with the Portuguese. Finally they reached the settlement of their countrymen at Rio de Janeiro, where they were received at first with great apparent cordiality. But Ville-

gaignon was a scoundrel; he soon threw off the mask, and those who had come so far to enjoy liberty of conscience found themselves brought under a worse yoke than that which they had previously suffered from. They, therefore, demanded permission to leave Brazil, and he gave written permission to the captain of a ship to convey them to France. When they got on board, however, the vessel was found to be in such a state, that five of the party returned on shore, rather than put to sea in her. Jean de Lery was one of the others who thought death better than the cruelty of the traitor Villegaignon, and they pursued their voyage, and after having endured the utmost miseries of famine they reached Hennebonne. They had been forced to devour the leather coverings of their trunks, and hunted the rats and mice until none remained. Several died of hunger, and the frightful thought came to them that they would have to draw lots and devour each other. Villegaignon had given them a box of letters wrapped in cloth, and amongst them was one addressed to the chief magistrates of whatever port they might arrive at, in which this worthy servant of the Guises denounced the men whom he had invited to Brazil to enjoy the peaceable exercise of the reformed faith. His devilish malignity was, however, frustrated, and his treachery exposed, as the authorities at Hennebonne happened to favour the Protestants. Of the five who had trusted to his tender mercies, three were executed. Others fled to the Portuguese, and were compelled to profess a religion which they despised as much as they hated.

The attention of the Portuguese Government was soon directed towards this fine port, and the nephew

of Mem da Sa was sent to Bahia for such assistance as might enable him to extirpate the French and take possession of the place. An expedition was fitted out accordingly, of two ships of war, and several merchantmen, and the Governor himself took command, and was accompanied by the Jesuit Nobrega. Early in January, 1560, they reached Rio de Janeiro. The intention of the Governor was to enter in the dead of the night, and effect a landing by surprise. They were, however, seen by the sentinels, and in consequence obliged to anchor off the bar. The French retired to their forts with a company of eight hundred native archers.

Mem da Sa now saw that he needed small craft, and sent to São Vicente for aid, and for men who had some knowledge of the harbour. When reinforcements arrived the Portuguese won a landing, but they vainly battered the solid rock fortifications for two days and nights, and uselessly spent all their ammunition, besides having many of their men wounded. There was no lack of courage amongst them, though they had evinced little skill, and in a desperate assault they won the largest of the outworks, then stormed the rock which hid the magazine. This so intimidated the French that they abandoned the other works in the ensuing night, and fled, some to their ships, and others to the mainland. As this action took place on January 20 (St. Sebastian's Day) Mem da Sa called the place São Sebastião, in honour as well of the young King of Portugal, who bore that name. Here the city was founded, and the whole of the work of construction was performed by the Indians, under the control of the Jesuits, without any expense to the State. The troubles of the Governor

were not at an end, however, for he had now to contend with the most formidable and savage of the Indian races, the Botucudos who were continually attacking the outlying settlements in Bahia, and even threatened the capital itself.

English adventurers were at this time making endeavours to settle in the country, and they fixed themselves in some considerable numbers at Parahyba do Sul. Allying themselves with the natives, they might have succeeded in becoming a serious menace to the Portuguese, had not Mem da Sa attacked and exterminated them. This successful administrator had been in control of the colony for an unusually long period, when Dom Luiz de Vasconcellos was appointed to succeed him, and brought out a new concourse of Jesuits, headed by F. Ignacio de Azeredo. Nearing the Azores they met with several French and English vessels. The new Governor was killed in action, and the Jesuits made to walk the plank by a French pirate, named Jacques Sore. Only one escaped in a lay habit. Nobrega had spent his last breath before, prematurely worn out, and thus was spared hearing the sad fate of his brethren. Luiz de Almeida being appointed Governor, he reached Bahia, and was welcomed by Mem da Sa before the latter's death (1572). Later, when Luiz de Brito took the place of De Almeida, the growth of the colony had been so rapid that it was found necessary to divide it into two distinct parts, each with its own head. These were, however, re-united in 1578, under D. Diogo Lourenzo da Veiga. This coincided with the passing of Portugal and Brazil under the Spanish dominion for sixty years, owing to the death of the Portuguese King and his chief nobility in a memor-

able expedition against the Moors. The colony was offered to the Duke of Braganza, with the title of King, provided he forfeited all claim to the Portuguese crown. Neither Philip of Spain, in making the offer, nor Braganza, when he refused it, had any conception of the importance of the country and its destiny. Little either dreamed that the then insignificant colony was fated to eclipse Portugal itself, and to furnish an asylum to the Court in two hundred years' time. In spite of the search for gold and precious stones that had been going on for twenty years, very little intimation of the real riches of the interior could have been given then, or probably the fate of Brazil would have been quite different.

Bahia, Pernambuco, and Rio de Janeiro were in a most flourishing condition at that time, and would doubtless have made far greater progress had it not been for the temporary placing of the power in Spanish hands. Philip had too many affairs to consider at this time to bestow proper attention to Brazil, and his subjects were filled with dreams of the better known El Dorado on the western coast. This was also undoubtedly the reason why the attempts of the Earl of Cumberland, under whom Raleigh served, and Cavendish, and Sir James Lancaster were fated to produce no lasting results, although their filibustering expeditions were temporarily crowned with success. At this time Roberto Diaz, a colonist said to have discovered a great mine of silver, and who lived in such magnificence that everything used at the table or the toilet was of the precious metal, offered to disclose the secret to King Philip, on condition he was made a marquis. The crafty Castilian was not willing to comply with

this suggestion, but sent out emissaries with instructions to discover the mine. In spite of his offers to show as much silver as there was iron in the mines of Biscay it was not forthcoming. The Governor-General set out with some miners for the Serra Itabayana (Bahia), but could discover nothing, and only the timely death of Diaz saved him from the vengeance of the King. The probability is that he had, in common with many of the old colonists, amassed his fortune through other means. The exploitation of the Indians was a vast source of riches. In two years no fewer than 80,000 arrived on the coast, in the neighbourhood of the capital, to be employed in the sugar mills, &c. Almost the whole of these died in a very brief space of time, and were replaced by Negroes. Astounding stories are still current as to the means employed by the first settlers to enrich themselves at the expense of the natives, and when these failed, by traffic in black ivory.

In 1611 the French renewed their efforts to form a settlement, and established themselves until 1620 in the Island of Maranhão. The Dutch now turned their eyes in the direction of Brazil, and in 1624 the West India Company fitted out a considerable armament under Jacob Willekins and Peter Heyne. Their instructions to attack the capital were completely carried out, and Bahia was taken almost without a struggle. The Hollanders soon set to work to strengthen the place, and prepared to renew hostilities, which were conducted with the greatest barbarity on both sides. The Portuguese Bishop, Marcos Teixeira, hoisted the crucifix for his standard, and commenced guerilla warfare with such success that São Salvador was soon blockaded.

He died shortly after, in consequence of the hardships he had undergone, but his successors carried out the campaign. The Dutch were weakened by the return of Willekins to Europe, and the departure of Heyne, as well as by the loss of their General, Hans Vandort, who was killed in ambush. In 1626 the Spanish King sent forty ships and 8,000 soldiers to retake the place, under the leadership of Fabrique de Toledo, and the Dutch capitulated on condition of being permitted to return to Holland with their personal belongings and arms. New attempts were made by the Dutch West India Company, but the enormous expense delayed an expedition. They, however, harassed the Spanish and Portuguese merchant fleets on their homeward voyages, and in thirteen years took 546 vessels, the proceeds of which amounted to £7,500,000.

Early in 1630 Admiral Hendrick Lonck appeared off Pernambuco, and took the place after a feeble resistance on the part of Albuquerque, the Governor. A predatory warfare, with the aid of the Indians, was carried on by the vanquished, but in three months they had to accept defeat, and were transported to the Dutch Indies. Disaster overwhelmed every fleet sent out by the Portuguese to recover the lost city, and in 1636 the Dutch had made themselves masters of the Provinces of Pernambuco, Parahyba, and Rio Grande do Norte, in reality the whole of Brazil lying northward of the São Francisco River.

These successes inspired the Dutch with the hope that they might, by a great effort, complete the conquest of Brazil, and Count Maurice of Nassau arrived at Pernambuco with fresh troops, and made himself Master of Sergipe and Ceará. His entire force at this time amounted to 6,180 European

soldiers, and about 1,000 Indians. His efforts to reduce the capital were unavailing, and in 1639 Spain dispatched 46 ships of war, and 5,000 troops under Mascarenhas. Half the fleet was lost, and the rest arrived at São Salvador in a melancholy condition. Mascarenhas was, however, enabled to raise a total force of 12,000 men, and proceeded against Pernambuco. The result of an engagement lasting three days was the total defeat of the Portuguese, and of that mighty armament, but six ships returned to Europe. Negotiations took place, and hostilities were suspended for some time.

In 1640 Portugal regained her independence, and in 1641 an alliance was concluded between the Dutch and the Portuguese, marking the limits of the territory of each in Brazil.

The West India Company now recalled Count Maurice, and a large number of the troops, and the commissioners appointed were foolhardy enough to sell to the Portuguese vast stores of ammunition. Their conduct became so intolerable that peace was not possible for any length of time, and it was left to the colonists themselves to finally expel the invaders in January, 1654. The Portuguese Crown received its Empire of Brazil from the hands of the patriot, Fernandez Vieira, and although desultory attempts were made by the Dutch to regain a footing in Brazil, they were speedily obliged to relinquish all pretensions to dominion.

The 10th of August, 1661, a treaty was signed, by which the whole of the country was finally ceded to Portugal, on payment of 8,000,000 florins in sixteen instalments, and free commerce being allowed Holland in all commodities, except Brazil wood. The Portuguese now appreciated fully the value of their

possession, and João IV conferred on his heir apparent the title of Prince of Brazil.

In 1710 a French squadron, under M. du Clerc, arrived off Rio de Janeiro, and an attack on the city was made. After a short but desperate struggle the Portuguese were victorious, and massacred all who fell into their hands. Du Clerk, himself taken prisoner, was murdered in his bed. Next year France sent her great Admiral Duguay-Trouin to inflict vengeance on the Brazilians, and he led his fleet daringly between the lines of batteries which defended the city, and carried it by storm, holding it until a heavy ransom was paid.

Thus ended the last attempt to wrest Brazil from the hands of its discoverers. During the two hundred years that had elapsed since the first settlement, the opening up of the Sertão (as the interior was called) proceeded slowly. Most of the settlements were due to the discovery of gold and precious stones, and the convenient course of the rivers provided a highway easily acessible. The State of São Paulo (as it is now) was prominent in the work of pioneering. Groups of adventurers (bandeirantes) forced their way over the serras, in search of slaves. They marched under a chief who was completely equipped with the fullest power over his subordinates, and a priest was an obligatory member of the band. Montaya speaks of these wolves in sheep's clothing whose office was to Christianize the natives, whilst the others despoiled them. Making use of the poor Indians for all the purposes of beasts of burden, and for every kind of labour, by this means the bandeirantes made their way into Minas, Goyaz and Matto Grosso, and linked up the great plateau with the Amazon. Those of the six-

teenth century devastated the whole basin of the Tieté, and the districts to the south and south-west. By 1610 the Jesuits established in Paraguay had extended their work by the Uruguay, Paraná, and Iguassú Rivers to the Paranápánema (Paraná). In spite of the unspeakable barbarities perpetrated by these bandeirantes, it is undoubtedly true that credit is due to them for opening up the country. Many of the Paulistas never made their way southward again, remaining in certain spots, and forming the beginning of future prosperous cities.

CHAPTER VI

CROWN COLONY AND EMPIRE

In 1699 the first discovery of gold took place, and was followed thirty years later by that of diamonds. Amongst the other charges made against the Jesuits was that they had found the precious metal in many places, and were working it by slave labour, without giving the Government its share. The missionaries at first were of serious, earnest character, and entirely devoted to good works, but little by little they became contaminated by the greed of their lay neighbours, and were gradually losing their influence, and being hated by the people. On Sebastião Joseph de Carvalho e Mello becoming Prime Minister he determined to remove them. They were the only persons whom he feared, and the great multitude of clericals, and the continual conflicts between them, gave him an excuse to expel those whom he considered the propagators of intolerance, ignorance and superstition. The priests were let alone, as they were good servants to the Crown. One of his most legitimate ambitions was to lessen the influence of Rome. The future Marquis de Pombal was 50 years of age when he entered into his ministry. He found the country in a state of decay, largely due to the pernicious influence of the clerics over the Court and the

people, and he resolved to purge Portugal of as many of its most undesirable elements as possible. It was said of him by his enemies that he acted first and thought afterwards, and persisted in his plans whether they were right or wrong. It is possible that he had not at first conceived the thought of extinguishing the Jesuits, but when events arose which seemed to render such a measure necessary, he pursued this scheme with characteristic perseverance. His brother, Xavier de Mendonça Furtado, was appointed Captain-General of Maranhão and Pará. He used all his influence to deprive the missionaries of their authority, and finally, in 1760, they were expelled from Brazil. Their colleges, churches and other property were confiscated. They were sent home under inhuman conditions, by which many died, and others were cast into prison, to remain there for eighteen years, until, on the disgrace of Pombal, they were set free.

Brazil suffered many injuries at the hands of this tyrant. He granted licences to a number of exclusive companies, and ordained that their stock should bear a certain price, and in order to enforce this regulation, decreed that the script should become legal payment. In 1762 the Spanish Governor of Buenos Aires seized on Colonia, a port on the opposite side of the River Plate, and it never fell into the power of the Portuguese again. The following year the Conde da Cunha, on being appointed Viceroy of Brazil, was instructed to take up his residence at Rio de Janeiro, which being more convenient to the mines, and to the River Plate, had become of much greater importance than Bahia, and presented a more secure and more easily defended port. From this period down to the

emigration of the Royal Family from Lisbon, the development of the country was uninterrupted, in spite of the exactions of the Crown. In 1704 the Brazilians got the better of the Portuguese in the municipal elections, and in 1708, 1710 and 1720 revolts occurred in São Paulo, Pernambuco, and Minas Geraes (as the mining province was now called). The conduct of the home Government was little calculated to soothe the Brazilians. The colonists were taxed for the benefit of Portugal as heavily as they could be. The Brazilian capital was filled with a tribe of functionaries and other Portuguese, who found life much more agreeable in Rio than in Lisbon. The appearance of a printing press was the signal for an order from the Court for its destruction, and every means was taken to prevent the fostering of a national spirit. In 1755 and 1758 laws were passed forbidding the enslavement of the Indians, and by others in 1761, 1767 and 1776 the introduction of Negro slaves into Portugal, including Madeira (which formed part of the Rëino, or Kingdom), as well as the Azores, was prohibited. No mention was made of Brazil, where the number increased rapidly. After the establishment of the capital in Rio de Janeiro, when the population of the city exceeded 30,000, the coffee berry was introduced into the country, and many other kinds of industries were stimulated, all of them, however, depending for their profits on the supply of forced labour, which was increased by every means in the power of the colonists.

The revenues obtained by Portugal from Brazil at this time were very great, one-fifth of the production of the gold and diamond mines going to the Crown. From 1728 to 1734 this amounted to an

average of nearly £500,000 yearly, and, with the many other iniquitous taxes, reached an annual sum of not less than £2,000,000. All goods imported from the Mother Country paid 12 per cent. duty. Salt and iron were taxed 100 per cent., and most of the impositions were farmed out to the highest bidder. Every article introduced into the mining districts was surcharged 2d. per lb. Foreigners were prohibited from entering Brazil. Laws were in force against making new roads. No goldsmiths or workers in precious stones were allowed in Minas Geraes, and all private letters were liable to be opened.

Royal taxes comprised one-fifth of the gold exported, and 25 per cent. of the value of merchandise brought to Brazil in foreign ships. Local products paid 10 per cent., and 5 reis per lb. was levied on all provisions sold in the principal cities. Each mule passing a ferry paid 1 $000 the load, and goods were charged duty not accordng to value, but to weight. No trade of any kind was allowed between the natives and the British, although the latter often found means to evade the vigilance of the fiscal agents, who, on their side, frequently found it worth their while to turn their backs when any contraband trade was going on. Under such circumstances the development of the country was retarded, and the aspirations of the Brazilians for freedom could not be realized, owing to the sparsity of the population and difficult communications. At the beginning of the nineteenth century, Brazil is said to have contained 12 cities, 66 towns, and 430,000 inhabitants of pure blood, as well as some 1,500,000 Negroes and 700,000 Indians. These figures are as near as can be obtained from various sources, but, of

course, are quite liable to be somewhat erroneous. The colonies were, however, outstripping the Mother Country, and the exports had reached £2,500,000, and the imports £2,100,000. Twenty thousand slaves were being annually imported, and 5,000 were sold in the market at Rio de Janeiro. Many of these poor wretches were the property of the Crown, 10,000 being employed in the diamond fields. Others were attached to convents, the Benedictines having 1,000 on the plantations. Social life at this time was of the most degraded kind. The habits of the lower orders were filthy, and those of the rich abominably vicious. The monks swarmed in every street, and were at once sluggards and libertines. For the sum of two dollars any coward could hire a bravo to waylay and stab his enemy. The Negro population were employed in every description of labour, both agricultural and domestic.

In Mawe's time the average value of a Negro was 100$, varying from one conto of reis to fifty milreis, according to age, sex, and abilities. The traffic was first prohibited in 1830, and repressive measures were taken in 1850. It was the custom of a slave-owner in Rio and other large cities to turn them out in the morning without anything to eat, and compel them to produce a sum of money at night. Any surplus they might keep for themselves. Builders used to impose a further condition that each Negro should bring back with him a large stone suitable for construction. If one hired a mechanic for any trifling work about the house, he would bring a slave with him to carry his tools. In my lady's chamber would be found a group of females ready to perform her slightest behest.

Events had been hastening to a crisis in Portugal since the beginning of 1807, and on November 29 the Prince (João VI), who was Regent, hastily embarked on board the squadron of Sir Sidney Smith, with his retinue and all the valuables that could be got together at a moment's notice.

The Queen, on her way down to the landing stage from Queluz palace, cried out to her driver, who was making his horses gallop their hardest—"Not so fast; they (the populace) will say we are running away."

The Royal family tried to leave in secrecy by night, but an immense crowd gathered on the quay and insulted the fugitives in the most shameful manner.

Many of the old nobility refused to abandon Portugal, preferring the French invader to the Braganças.

Oliveira Martin's *History of Portugal*, Vol. II, pp. 237-9, says—They (the Sovereigns) paid none of their debts, not even the wages of their servants, fleeing in disgrace, and, reaching Bahia on January 22, 1808, and Rio Janeiro 16 days later, obliged the Brazilians to surrender houses, slaves, and almost everything else.

Pombal had, long before, foreseen the necessity of transferring the seat of the Monarchy to Brazil.

The first beneficial consequence of the arrival of Royalty in this country was the opening of all ports to international commerce. In the first year 90 foreign ships entered Rio harbour, and many visited Maranhão, Pernambuco, and Bahia. In 1810 a treaty was concluded with England, which gave a preference to British goods, these paying 15 per cent. duty, whilst commodities of other origin were

taxed to the extent of 24 per cent. Gold and silver, however, still continued to be prohibited. Santa Catharina Island was declared a free port, and privileges were granted to employ the splendid woods of the Brazils for the purpose of constructing British men-of-war. Before 1814 a number of English merchants took up their residence at Rio and the place soon became a great commercial centre, and later the seat of a British plenipotentiary ranking higher than his colleagues elsewhere in South America.

The abrogation of the colonial laws, which took place soon after the arrival of the Regent, the introduction of the vine, and the encouragements given to improvements in horticulture, the adoption of vaccination, and better sanitary laws, and some reform in the courts of judicature may be enumerated among the benefits for which Brazil is indebted to the residence of the Court. The most vital stimulus in promoting improvement, and in forming a national character and feeling, arose out of the decree which gave to the country equal rights and privileges to those enjoyed by Portugal herself. The important declaration of this measure was fixed for the Queen's birthday in December, 1815.

The new title of the King's dominions was the United Kingdom of Portugal, Brazil, and the Algarve.

When the merchants of Rio met to congratulate their Sovereign, they subscribed a large sum of money to form a fund for general education. Schools multiplied, and even the slaves were sent to learn to read and write. The classical languages began to be taught, and public libraries were established at Rio and Bahia, and printing offices

throughout Brazil. A botanical garden was opened at Pernambuco, a medical college at Bahia, a museum, a school for engineers, and a naval college started at Rio. In 1821 the Cortes invited the Regent (now King) to return home. The invitation was couched in such language as might have been considered minatory, but it was coupled with the information, or pretext, that the English were about to take possession of the country. The truth was that they were jealous of the rising influence of Brazil, and to mark their displeasure, ordered the schools and other institutions in that country to be closed, and the central Government at Rio to be dissolved.

A manifesto, issued by order of the Cortes, bore the following significant phrase—"Commerce and Industry seemed almost entirely destroyed by the unlimited licence granted to foreign vessels in all the Brazilian ports, and by the *fatal treaty with England*." On February the 18th, 1821, the King nominated a commission to draft the Constitution, which had already been framed by the authorities in Lisbon. Shortly afterwards a Royal proclamation was made, Dom Pedro taking a solemn oath to observe the Constitution faithfully.

His example was followed by the Governors of Pernambuco, Bahia, etc., and the King confirmed all that had taken place. Having resolved to return, João VI embarked on April 24. As soon as he arrived in Europe, he found himself in the hands of his Cortes, and found it necessary to lend his authority to a Constitution which treated the Brazilians as mere colonists. A rupture between the two countries became inevitable. Measures taken by the Government at Lisbon to compel the

abasement of Brazil, and the recall of the Prince, hastened a crisis. The decrees reached Rio on December 10, and, listening to the entreaties of his subjects, the Prince decided to disobey the obnoxious laws and remain. Independence was finally proclaimed September 7, 1822, and the Prince was proclaimed Emperor Pedro I. The first assembly was opened in 1823, and the Parliament was inaugurated in 1826. The reign of the first Emperor was, however, unfortunate. The southernmost part of the Empire was lost for ever, and now became the Uruguay Republic, acting as a convenient buffer state between Brazil and Argentina. Revolts succeeded each other, and Pedro abdicated in favour of his son on April 7, 1831. He then embarked for Portugal to take the Government of that country into his hands. After a number of insurrections the Regency was placed in the hands of Father Diogo Feijo, who exercised a wise control until 1840. He was succeeded by Araujo Lima, and the young Emperor came into his own at the age of fourteen on July 23, 1843. Disturbances had now become chronic, and pacification was a long way off. For five years the reign of Pedro II was marked by revolt and insurrection. In 1851 the slave trade was abolished, and was entirely achieved by Constitutional means. The fact of the Royal Family emphatically refusing any compensation to the practically ruined planters turned against them a great majority of the agricultural class of Brazil, who were almost entirely dependent on this enforced labour.

About this time the economic crisis was terrible, the Regent being obliged to give up his city palace owing to debts, and return to the Quinta da Bôa

Vista at São Christovao (now the National Museum and Park).

In 1820 Dom João VI had stated in his annual *Falla do Throno*, or message, that the expenses might reach 15 million cruzados, a sum which the province (Brazil) could not possibly raise. Ramalho Ortigão, the Portuguese historian, wrote—"Portugal, at the birth of the nineteenth century, was immersed in a condition of brutal stupidity, profound corruption, and hypocrisy; foulness and filth spread from the cells of the nuns and the confessional boxes over the whole country. In 1830, two hundred years of cowardice, treason and satiety weighed heavily on the nation's soul." A terrible denunciation, and, unfortunately true in the main, and in consequence reflected in the administration of Brazil, by those very individuals who had closed their eyes to the state of affairs in the Mother Country, for which they had been partially responsible.

Under the Empire there was little chance for a foreign man of science unless he became naturalized; that is, until Dom Pedro II came to the throne.

Vice, engendered in the Mother Country, had stained everything, and the Indians, who, as Southey wrote, were notable for their docility, were driven wild and savage by the cruelty of their white brothers.

Now begins an heroic page of Brazilian history. In 1851 war was declared against the Argentine Dictator, Rosas, in defence of the Republic of Uruguay, and, although not very sanguinary, lasted three years. The second was an affair of quite a different kind. It cost Brazil £63,000,000, and many thousands of lives. She was engaged in a

petty struggle (1864) with Uruguay, when Lopez, the Paraguayan Dictator, invaded Brazil and Argentina. This led to an alliance between the two countries attacked and Uruguay, and in 1865 operations were commenced. At first the allies were under the command of the Argentine President, General Bartolome Mitre. In the battle of the Riachuelo the Brazilian Navy, under Admiral Barroso, destroyed the Paraguayan ships engaged, but the operations on land were not so decisive. A victory was won at Uruguayana (1866), but Lopez preserved intact the whole of Paraguay. The allied forces were now placed under the Marshal Duque de Caxias, and Paraguay was invaded. General Osorio was already there, and the Brazilian battleships forced the passages of Curupaito, 1867, and Humaytá, 1868. The latter was a feat worthy to rank with the most famed in history, as the Paraná was lined with heavy batteries, and the gallant Brazilian commander forced a passage, after several failures, by disobeying the commands of his chief. The army was now able to push its way into the interior of the country, repulsing the Paraguayans at Itoróró, Avahy, and Valentinas (1868), and forcing Lopez to take refuge in the inaccessible parts of the country to recruit fresh forces. The last campaign, 1869-70, was conducted by Conde d'Eu, son-in-law of the Emperor, who defeated the enemy at Campo Grande, and so ended the war. Lopez, in attempting to escape, was surprised by General Camara, and killed. This war secured for Brazil the free navigation of the Paraguay, placing Matto Grosso in fluvial comunication with the capital. It was almost the financial ruin of the country, however, and the results were so disastrous

to Paraguay that she has never recovered. Almost depopulated, there were very few men of mature age left in the country. The movement for the complete abolition of slavery had been growing for a long time, but the war with Paraguay had occupied the entire attention of the country for years, and in consequence the advocates for manumission had no opportunity of appealing to the country on this momentous question. Visconde Silva Paranhas do Rio Branco, the great statesman (father of the late Foreign Minister), succeeded in obtaining Parliamentary sanction to a bill providing that every child born of a slave should be free. The Emperor at this time was in Europe, and the Regent, Princess Isabel, signed the law, Baron Cotegipe remarking to her that in redeeming a race she was destroying the Empire. These were prophetic words, as the sequel will show.

In promulgating such a law, the whole framework on which Brazilian prosperity was built threatened to collapse. This "*Lei do Ventre Livre*," as it was called, was followed by another in 1885, setting free sexagenarians.

In 1884 the Emperor had started a subscription with 2½ contos, signing himself "Um Brasileiro" (A Brazilian), towards the liberation of sundry slaves in Petropolis. The Condessa d'Eu followed with 500 mil·eis, and the slave-owner himself deducted a small sum from the market-price of one man. The franchise was voted on January 9, 1881; proposals were soon made for completing the good work already commenced, but were not successful until May, 1888, when a clean sweep of the whole system of slavery was made, by a law promulgated by both chambers, signed by the Princess, Regent

for the second time, owing to the ill health of the Emperor, and received by great demonstrations of approval on the part of the populace. There is no doubt whatever that the act was premature. Sage reflections showed that the supply of free labour was entirely inadequate, and that the Negro was, through centuries of dependence on his master, quite unfitted to suddenly find his relations with the latter entirely changed. In place of security of tenure and in many cases great licence, which he had under the old régime, he found himself looked upon as a creature with no right to a living, and was all too frequently an outcast. The time was not ripe for such a *coup d'état*, much less to place the franchise in the hands of such a class as the ex-slaves were. Chaos resulted, hundreds of plantations were abandoned or only half-cultivated, and in the State of Rio de Janeiro to-day, within fifty miles of the capital, one may see the melancholy result of what was intended to be an act of humanity.

It must be distinctly understood that the author is no advocate of slavery under any circumstances, but the black man, moulded on Portuguese lines as he was, and permitted far greater freedom than his confrère in the United States of North America, where also he was made to feel his inferiority to the white man more pronounced, was in no condition to take his place amidst a free people. The whole history and original origin of the Portuguese themselves should be studied, in order to see what resulted.

Nowadays, the question of colour is settling itself automatically, but one finds the low class nigger very insolent at times, for the sole reason that he is on absolute equality with the white Brazilian.

The coffee-producing states, and especially São Paulo and Rio de Janeiro, were the fertile soil in which was sown the seeds of revolution, and certainly the Republic, impossible to delay much longer, was precipitated by that law which gave freedom to the many, and penury to the few. The death-knell of the Empire was tolled. The Emperor had alienated the sympathies of the leading statesmen during the last few years, and his voyage to Europe was doubtless a most injudicious act. Isabel was disliked, both with regard to her ultra-religious principles, and owing to her partisanship of the slaves. At this time the doctrines of Comte had found many disciples in Brazil, and Masonry had become a force to reckon with. Many circumstances were responsible for the *débâcle*, but the most important have been stated. The leading spirits amongst the planters formed a Republican Party. It had, however, been organized on a small scale in 1870, by Saldanha Marinho, in São Paulo. The Church itself became an enemy to the Crown, throwing its weight (as always) into the side of the balance that appeared heavier. The demagogues hated the Emperor for his assumption of so much power.

The number of slaves in 1883 was 1,211,946, and by 1887 this was reduced to 720,000, still a great burden. The Army and the South may be said to have raised the standard of revolt, but Benjamin Constant became the apostle of a movement that in one day gained a bloodless and stupendous victory. In place of the fratricidal struggle in North America the death-knell of a dynasty was rung in peace, and the curtain dropped on the second act in Brazilian history without a shot being fired on either side.

Changing, at a word, an Empire to a Republic, surely no magician's wand could work a greater marvel. At the fatal hour Dom Pedro found himself without a single powerful friend, and bent his venerable head to the blow without hardly a murmur.

It was said that want of discipline in the army (7,526 officers and men out of 13,500 being under arrest in a single year) was largely responsible for the fall of the dynasty.

The Conde d'Eu was charged with having greater regard to the financial interests of the Emperor (and his own) than the dishonour of the abdication. Five thousand contos of reis were voted by Congress for the expenses of installation abroad, but the Emperor, at first accepting this, afterwards refused any subsidy. The night of November 16 the whole party embarked on the Parahyba, in spite of the reluctance of Dom Pedro, who said that he was no fugitive slave.

Marechal Deodoro da Fonseca took provisional charge of the Government, and the first Republican flag, green and yellow stripes, with a blue corner covered with stars, was flown almost immediately.

A fine statue in one of the beautiful public gardens of Petropolis perpetuates his memory. This was inaugurated in February (1911), in the presence of a distinguished assembly, and it is hoped that the proposal made in Parliament, to have his remains brought back to Brazil, will bear fruit. Surely Republicans are more noble-spirited than Monarchists.

At the time of the Empire, the cities of Brazil were in a very parlous state indeed. The streets of the capital were narrow, unpaved and sparsely

illuminated with fish oil. Sewers and waterworks were not in existence, and the necessities of the people in this direction were confided to private enterprise. Most of the houses were one-storied, and those more elevated generally possessed a store on the ground floor. The few mechanics were careless and improvident, and scarcely any of the smaller master men had their own materials to choose from. Take the case of carpentry work. Friends had to be found who would travel into the country to buy the timber. None would work whilst possessed of money. Ladies scarcely ever went out, and when obliged by the necessity of attending mass, were carried in a sort of sedan chair, surrounded by a group of attendant Negresses. In the house, they usually sat, without stockings or slippers, in a very bare sort of deshabille indeed, listening to all the small talk and scandal collected by their favourite body-woman. They occupied themselves by lace or sweet making. (The Brazilian ladies are great adepts even to-day at concocting all kinds of delicious preserves and similar dainties.) At 18 they were quite women, and too frequently began to age before the age of 25. The men occupied themselves in gambling, frequenting cafés and discussing politics. A shop was a convenient place of assignation, and apparently the last business transacted there was to sell the commodities exposed. Lucock and Burton relate many amusing stories of the apathy and indifference of the tradesmen, as well as of their profound ignorance of the arts of which they called themselves masters. There was no social life, because there was no society, properly speaking, apart from the aristocratic and bureaucratic element. The home life of the planter was of the

simplest and most unpretentious description, and there were no hotels or inns deserving of the name. Rich mine-owners did without anything but the merest necessities of life in their wretched houses, and on their persons. Children were hardly clothed.

Simplicity of customs died hard in the interior of the country. Even to-day the inhabitants of the more isolated parts of Minas Goyaz, etc., are exceedingly plain in their tastes, and unpretentious, honest and hospitable to a fault. Muleteers in the old times took pack trains of most valuable goods hundreds of leagues, and never a cent's worth was stolen. The Church held great power over the people, and away from the populous centres does so to-day.

I remember travelling on horse-back through some pleasant, fairly well populated country in Minas Geraes, and passing a well-cultivated farm, asked to whom it belonged, and was told "Seu Vigario" (the vicar); again, a fine orchard was also the property of his reverence, as well as a large house and garden, and, curious as to the identity of a buxom young woman with a babe in her arms, standing at the garden gate, my informant said naively that she also was the property of "Seu Vigario." Of course I put a charitable construction on this reply, and asked no more indiscreet questions.

In all probability the most primitive part of Brazil, from the point of view of so-called civilization, lies between the São Francisco river and Maranhão. One finds the Sertanejo (*Hinterlander*) representing the best type of settler of the old school. He is moral, honest and hospitable, his wife is modest and retiring, and is very seldom

seen when strangers are in the house. (This is characteristic of Brazilian women in general.) Here, where men live from hand to mouth, the race is frugal, and simple in its habits, whole-hearted, with primitive virtues and vices. The greatest curse is parochialism, and men take very little interest in the outside world.

Somewhat previous to the declaration of independence, it was a pleasant custom of the Prince to ride round with his entourage and point out a house he fancied. The door was accordingly marked "P.R." (Principe Real), and the owner compelled to dispose of it at an arbitrary figure, or too frequently make a gift of it to his august master. In 1826 the Imperial carriage was accompanied by an escort armed with whips, and woe betide the unfortunate wight who remained covered. Brazilians were expected to alight from their horses and carriages whilst the cortège passed. Small wonder, with the exactions of the Royal Family and the nobility, the people sought to avoid display, or anything which brought them under the notice of their rulers. These customs die hard. I know a tradesman, rich, even from an English point of view, yet he sleeps in a dirty little hovel, dresses in the most ordinary of clothes, and eats at the poorest kind of chop-house. His manners are as uncouth as his habits, and he represents a type still common amongst the Lusobrasileiros of the present age. You may meet with them in the steerage of homeward bound steamers, and little dream that they could in all probability make you feel small, from a financial point of view. In spite of the encouragement given under the Empire to education, yet at least 50 per cent. of the popu-

lation were quite illiterate. Lindley said that when he was there, the ignorance evinced on most ordinary subjects was startling. During the height of a sanguinary campaign, many never knew that the country was at war, and if they were aware, didn't care a rap. One or another reader of a European book might speak of the possibility of future liberty. The proletariat had no interest in social and concrete questions, and were more inquisitive in parochial affairs than in national ones. Out of this people has sprung, in spite of their natural indolence of character, a race imbued with life and vigour. It seems as if the nation slept and required gigantic efforts to be awakened. If it has done nothing else, the Republic has breathed the breath of life into Brazil. The whole country is astir, and if the early travellers, who found so much to decry, were enabled to step from their graves and revisit it, their amazement would be great, and they would admit that they themselves were quite out of date.

CHAPTER VII

THE REPUBLIC

The 15th of November, 1889, saw the advent of the Republic.

The military dictatorship of Marshal da Fonseca was brief, but remarkable for the formulation of the new constitution, which took place in February, 1891; the same year Parliament was dissolved, and he was obliged to resign, and place the reins of Government in the hands of another soldier, but an abler man, Marshal Floriano Peixóto. The crisis caused by the sudden emancipation of the slaves now came to a head, and the country was plunged, in addition, to a state of disorder and civil war.

In 1892 a revolution broke out which lasted nearly three years in Rio Grande do Sul. The Federal Government was called in by the State to restore order, but soon afterwards the revolters were joined by nearly the whole of the fleet (September, 1893). A monarchical character was given to the affair, in spite of the efforts of one of the admirals. This was one of the most severe crises through which Brazil passed, and, contrary to the general rule, the army was the saviour of the country. Marshal Peixóto played a great part in the struggle, and on one occasion the bombardment of Rio de Janeiro was commenced, and only stopped through the

Photo] [*Commissão Geologico de S. Paulo.*

SUCURY (WATER) SNAKES, S. PAULO.

Photo] [*Commissão Geologico de S. Paulo.*

A Day's Sport.

(1) Tapir. (2) Capivary. (3) Mutum. (4) Monkey.

intervention of the foreign war vessels at that time in port.

In 1894 Peixóto was succeeded by the first civil President, Dr. Prudente de Moraes, who concluded the civil war, and started the work of reconstruction, so well followed by his successors. An attempt was made on his life by a fanatic, but the political disturbances were becoming fewer, and the state of the country improving, in spite of the terrible financial depression. During this period the first efforts of the Methodists to make active propaganda met with but little success, owing to the attitude of the priests, especially in Bahia, where Bibles were publicly burned in the squares, without the slightest attempt on the part of the authorities to keep order. This can hardly be wondered at, considering the origin, and want of discretion, tact, and tolerance, on the part of the Protestant colporteurs.

The majority of these men were drawn from a class ill-fitted to do pioneer work in such a country. I remember a case where one occupied rooms in the same house as a Catholic father. He used to enter the apartment of the latter and place testaments on his bed, and lost no opportunity of insulting the faith and character of his religious enemies. Another fellow, ex-Bible agent, blossomed out into a reverend after a couple of years in the country. Another took in paying guests, contrary to the expressed rule of the society.

American girls' schools are springing up in many cities, but their Methodist propaganda is not at all judicious at times, and they lose many pupils through obliging daughters of Catholics to submit to their particular brand of Protestantism. The great colleges of the nuns are carried on with much

more liberality, Jews, Positivists or Mohammedans being equally free to practise their own creeds. For the credit of the Anglo-Saxon race, it is quite time there were a few schools run on non-religious lines.

During the administration of Dr. Moraes, the limits between Argentina and Brazil were fixed in favour of the latter, after a dispute of more than a hundred years' standing. This was owing to the good offices of the United States as arbitrator.

Dr. Campos Salles became President in 1898, and the rehabilitation of Brazil proceeded rapidly. The boundary between French Guiana and Pará was fixed Treaty of Berne.

Dr. Salles was a Paulista, and had the mortification of seeing the country, and his own state in particular, in very bad financial straits. His chief task was to re-establish the national credit, and to do this it was necessary to take serious measures. Specie payments were suspended for some time, and paper money, in large quantities, withdrawn and burnt. Another President from São Paulo (Rodrigues Alves) came on the scene in 1902, and found things on a much better footing all round. During his term of office railway construction was pushed on rapidly, and the City of Rio de Janeiro in great part pulled down and rebuilt on magnificent lines. 1904 saw a great triumph at the St. Louis Exhibition, and the wonderful white palace in which were housed myriads of splendid examples of Brazilian products, was transferred to Rio de Janeiro, and rebuilt in a *few weeks* on a site in front of the bay, surrounded by gardens and fine promenades. In honour of the Monroe doctrine, it was called by the name of the American President who was responsible for that much-discussed definite exposition of United States political views.

The Monroe Palace is constructed of marble and granite, and is a distinctive landmark. Its first noteworthy use was a meeting place for the third Pan-American Congress, attended by 80 representatives of 20 nations.

The Brazilian Government installed in the building a complete telegraph, telephone, and postal service, entirely free to the delegates. It also maintained translators, typists, and clerks, and nothing in connexion with the comfort or convenience of the delegates was left undone. The conference was opened by Baron Rio Branco (Foreign Minister); and a few words from his address are perhaps permissible: —

"As young nations still, we should not forget what we owe to those who have furnished the capital with which we have entered into the world of competition. The very immensity of our territories, in a great part unpopulated and unexplored, and the certainty that we have ample resources for a population twenty times larger, would suggest to us the advisability of strengthening our friendly relations, and trying to develop the commercial interests which we have in common. From Europe we came; Europe has been our teacher, from her we receive continual support and example, the light of science and art, the commodities of her industry, and the most profitable lessons of progress. What in exchange we can give for this, by our growth and prosperity, will certainly constitute a more important field for the employment of her commercial and industrial activity."

Another success was that of the Sanitary Department at the Berlin Congress, where Brazil took first prize.

In 1906 Dr. Affonso Penna became President, but did not live to end his term of office, as he died after a very short illness on June 14, 1909.

The Presidential Election that came to an end early in 1910 was a remarkable one from several points of view. For one thing, it was the first in which two redoubtable candidates found themselves in opposition, and in which a struggle was assured right up to the date of the poll.

Dr. Ruy Barbosa, leader of the Civilists, was opposed by the ex-Minister of War, Marechal Fonseca, nephew of the Dictator, Deodoro da Fonseca. Ruy Barbosa had been Finance Minister, and de facto, Vice-President, under the same provisional Government. He is well known as a jurist, and as one of the principal speakers at the Hague Peace Conference.

The anti-militarist party were, however, left standing, and Marechal Hermes da Fonseca became President of the Republic. He took over the reins of Government at a most critical moment, record exports being counter-balanced by great imports, the debacle set in, and his term of office ending shortly after war broke out, many *schemes* of reform initiated under his administration proved failures, rubber defence, fishery protection, and foresty laws becoming dead letters; reforms, begun without previous judicious study, being abandoned prematurely, leaving hosts of functionaries to be provided for, and the treasury still being burdened by the support of hundreds of idlers.

Many projects, such as the encouragement of cotton, rice and maize cultivation, and the support of pastoral industries, have, wisely, been carried into effect, thanks to the efforts of the National and other Agricultural Societies.

The want of a settled policy has been greatly felt, owing to the constant changes in the Ministry of Agriculture, Industry and Commerce, no fewer than eight persons filling this post in a few years, and of these, some with vested interests in trade, etc., which should have rendered them absolutely ineligible for election.

The late Baron Rio Branco was Foreign Minister until his death on February 12, 1912, and was succeeded by Dr. Lauro Müller, a Catherinense of Teutonic parentage. This gentleman had been a most successful Minister of Public Works under Dr. Rodrigues Alves (1902-1906), and it may be said that the Foreign Ministry has shown the best record, taken on the whole.

Dr. and General Müller resigned in 1917, his portfolio being taken by Dr. Nilo Peçanha, a most astute and intelligent Minister, fully alive to the best policy for the time being.

The Minister of Finance, ex-leader of the Chamber of Deputies, has, deservedly, gained a reputation as a statesman and reformer; the military Ministers, Admiral A. de Alencar, a veteran, and General C. de Faria, have played a due part in the war policy of the Government; and Dr. Maximiliano, Minister of Justice and the Interior, has left to his credit the Civil Code, educational reforms, and some much-needed measures with regard to judges of the lower courts.

Dr. Pereira Lima, ex-President of the Commercial Association, took office in 1917, his predecessor being a wealthy sugar planter of Pernambuco, now Senator José Bezerra, and was unfortunate enough to incur the enmity of the class from which he came, two important new departments, viz.—Commission

of National Production and Food Control, more or less independent of this Ministry, being generally considered as needless, and created solely for the purpose of finding lucrative posts for a number of officials, the Food Controller, for instance, becoming a sort of dictator, and having his salary fixed, not legally, but by the President of the Republic, a most irregular proceeding.

On November 15, 1918, Dr. Rodrigues Alves should have resumed office as President for the second time, but his place was taken for the time being by Dr. Delphim Moreira, Vice-President, Rodrigues Alves dying shortly afterwards, and the General Election taking place in March (1919).

Almost at the close of 1918 an abortive attempt was made to create a social revolution. On New Year's Day the state of siege ended, Brazilian ports being opened, and on January 2 the Brazilian Delegation to the Peace Conference, Drs. Epitacio Pessôa and Committee, left for Paris, the two other members, Dr. Pandia Calogeras and Dr. Magalhães, Minister to France, being already there. Brazil has been honoured by a seat on the Council of the League of Nations. Dr. Pessôa was elected in March President of the Republic for the period ending November 15, 1922.

Chronological Landmarks in Brazilian History

1435.—Presumed discovery by an unknown Portuguese navigator.

1448.—Map of Andre Blanco registering the "Terra dos Papagaios," 1,500 miles west of Cape Verde Islands.

1494.—Treaty of Tordesillas between Ferdinand and Isabel of Spain, and John II of Portugal,

creating an imaginary line running north-south, 370 leagues west of the isles, and decreeing discoverers' rights to all new lands within this area.

1500.—January 26th. Cape St. Augustine, 20 miles south of Pernambuco, sighted by the Spanish captain, Vincente Yañez Pinzon, one of Columbus's commanders.

April 25th. Pedro Alvares Cabral reached coast of Alagôas. Portuguese chronicles maintain that he was really charged with a mission to land in this country, and not, as the general opinion is, driven thither by contrary winds.

May 1st. Letter of Pero Vaz de Caminha to the Portuguese King announcing the discovery of Brazil.

1501.—Expedition of Amerigo Vespucci. Landed in 5 S. Latitude.

Sixteenth and seventeenth centuries. Attempts of British, Dutch, and French to settle in Brazil.

1750.—Treaty of Madrid. Abrogating that of Tordesillas.

1777.—Treaty of S. Ildefonso, demarcating Spanish and Portuguese territories in America.

1801.—Treaty of Badajoz. Confirming possessions of both countries.

1802.—Treaty of Amiens. Limitation of Dutch possessions in South America (Guiana).

1807.—Secret Convention with England regarding transference of Portuguese Court to Brazil. Dated October 22nd. Signed in London by George III, and the Regent D. João VI.

October 27th. Treaty between Spain and France, abrogating Portuguese rights to Sovereignty.

1808.—January 22nd. Arrival of D. Maria I, and D. João at Bahia.

January 28th. Opening of Brazilian ports to foreign commerce.

March 7th. Arrival of the Court at Rio Janeiro, provisional capital of Portugal.

1815.—Limits with French Guiana.

December. Brazil given equal rights with the mother country.

1821.—April 26th. Capital transferred to Lisbon.

April 24. D. João VI embarked for Portugal.

1822.—September 7th. *Declaration of Independence* by the Prince (D. Pedro I of Brazil).

1824.—Adherence to the Monroe Doctrine.

1825.—May 13th. Brazilian Independence recognized by Portugal.

August 29th. Treaty of Peace with Portugal.

December 27th. Recognition of Independence by Austria.

1826. Recognition of Independence by France, Prussia, &c.

1831.—April 7th. Abdication of Dom Pedro I.

1831-40.—Minority of Pedro II (Regencies).

1840. July 23rd. Accession of the Emperor, Dom Pedro II.

1851.—Abolition of the Slave Trade.

1859.—Limitation of *Venezuelan* frontier.

1865-70.—War of the Triple Alliance (Brazil, Uruguay, Argentine) against Paraguay. Foundation of Brazilian indebtedness. Cost £63,000,000.

1871.—Law of the Free Born, or Ventre Livre. Referring to children of slaves.
1872.—Limitation of *Paraguayan* boundary.
1888.—Abolition of Slavery.
1889.—October 12th. First Pan-American Conference (Washington).
November 15th. *Proclamation of the Republic.* First Dictator, Marechal Deodoro da Fonseca.
November 20th. Recognition of the Republic by the United States.
1890.—Recognition of the Republic by France, Italy, Germany and Great Britain. In order named.
1891.—Customs Convention with the United States. First of its kind.
November 23rd. Second dictator, Marechal Floriano Peixoto.
1894.—First civil President, Dr. Prudente de Moraes.
1898. October 6th. Treaty of Limits with *Argentina.*
November 15th. President Dr. Campos Salles. Finance Minister Murtinho.
Reorganization of Brazilian Finances.
1899.—Treaty of Arbitration with *Chili.* First signed by Brazil.
1901.—Second Pan-American Conference (Mexico).
1902.—Adherence of Brazil to Convention against White Slave Traffic.
November 15th. President Dr. Rodrigues Alves. Foreign Minister, Baron Rio Branco.
1903.—Treaty of Limits with Bolivia (Petropolis). Cession of the Acre to Brazil.

1904.—Treaty of Limits with Ecuador. Idem, with British Guiana. Arbiter, King Victor Emmanuel. Decision against Brazil.

1905.—Arbitration Treaty with Argentina.

1906.—Third Pan-American Conference (Rio).
November 15th. President Dr. Affonso Penna.

1907.—Treaty of Limits with Colombia.
Hague Peace Conference. Brazil signs every Convention.

1908.—Centenary Exposition at Rio Janeiro. Commemorating the opening of her ports.

1909.—January 23rd. Arbitration Convention with the United States.
Idem, with Portugal, France, Spain, Mexico, Honduras, Venezuela, Panama, Ecuador, Costa Rica, Cuba, Great Britain, Bolivia, Nicaragua, Norway, China, S. Salvador, Peru, and Sweden, in the order mentioned.
June 14th. President Dr. Nilo Peçanha.
Treaty of Limits with Peru.
October 30th. Treaty of Limits with Uruguay. *All frontier questions settled.*

1910.—Arbitration Treaties with Haiti, Dominica, Colombia, Greece, Russia and Austria.
Fourth Pan-American Conference (Buenos Aires).
November 15th. President Marechal Hermes da Fonseca.

1911.—Arbitration Treaties with Uruguay, Italy, and Denmark.

1912.—February 12th. Death of the great Foreign Minister, Baron Rio Branco.

1914.—August 4th to 24th. Declarations of neutrality as regards Great Britain, France, Russia and Japan, versus Germany and Austria.

November 15th. President Dr. Wenceslau Braz.

1916.—March 10th. Neutrality declared as regards Portugal-Central Powers.

August 29th. Neutrality declared as regards Italy-Central Powers.

1917.—February 13th. Warning to Germany that neutrality would only be maintained so long as Brazilian interests were respected.

Acts of Hostility

"Paraná" torpedoed near Barfleur, May 3, 1917. Three lives lost.

Diplomatic relations broken off on April 11th, 1917.

Interests of Germany in Brazil confided to the care of Swiss Minister.

Interests of Germany in Brazil confided to the care of Dutch Minister.

This month, the Federation of Labour addressed a message to the President of the Republic, declaring: ". . . . We are absolutely against the participation of Brazil in the European conflict."

Resignation of Dr. Lauro Muller, Foreign Minister of Brazil, May 5, 1917.

Appointment of Dr. Nilo Peçanha as Foreign Minister of Brazil, May 3, 1917.

Representation of the Federation of Labour (of Rio de Janeiro), to the Chamber of Deputies, as follows:—

The intervention of Brazil in the conflict signifies for the worker, now, and in the future, a painful submission to excessive and insupportable taxes, as well as sacrifices of lives in questions which the workers did not bring about, and which they condemn. We are a democracy, and if in democracies the voice of the people has any weight, the Federation of Labour make the following peremptory declaration. . . . The Brazilian people are opposed to the war, and the labouring classes will combat it by every means in their power.

"Tijuca" torpedoed off Brest, May 20, 1917.

Decree ordaining utilization of German ships in Brazilian ports, June 2, 1917.

Revocation of declarations of neutrality, June 2, 1917, and June 28, 1917.

The *Black List*. Correspondence between Brazil and Great Britain, August 9, 1917, to September 12, 1917. Brazilian Government maintains its right to protect legitimate Brazilian firms, but at the same time defend Allied interests.

Coffee imports in Great Britain. Pourparlers, Brazil—Great Britain, June 1 to September 18, 1917. Brazil definitely refuses to accept any restriction as to employment of certain ships in the transport of this product.

War proclaimed between Brazil and Germany on October 26, 1917.

Note.—Immediate steps taken to institute safe conducts and examine passports.

Fiscalization of German banks, November 9, 1917.

Decree relating to commerce with the enemy, November 13, 1917.

Constitution suspended, and a state of siege declared for the Federal capital, São Paulo and other Southern States, November 16, 1917.

Measures taken to protect Brazilian sovereignty.

Accord relative to *Black List*, Brazil—Great Britain, suspended, November 30, 1917.

Brazil resolves to establish special measures to this end, ceasing to relegate any powers to a third party.

Naval co-operation of Brazil with Allies. Decree confirmed by telegram of Foreign Minister, Rio, December 31, 1917.

1918.—*Note* (July, 1918).—The United States special agents continue to exercise pressure on private individuals in Rio de Janeiro and other cities in the absence of inhibitory decrees.

During the first six months of 1918 various decrees have been signed with a view to intensify the production of cereals, etc., and creating a Commissioner of Public Alimentation, charged with verifying stocks and fiscalizing sales and imports and exports.

Congress having failed to vote powers for the practical application of such measures, a message was transmitted by the President demanding such authorization the beginning of July.

Medical Mission to France with hospital and and all necessary equipment, July, 1918.

August 17. Brazil recognizes Polish Nationality.

1919.—January 2. Brazilian Delegation to Peace Conference leaves in "Curvello." Chief: Dr. (Senator) Epitacio Pessôa. Other Delegates: Dr. Pandiá Calogeras, Dr. Olyntho de Magalhaes (Minister in Paris). Deputy: Raul Fernandes.

January. Death of Rodrigues Alves, President-Elect.

February 13. First merchant ship to enter Antwerp, s.s. "Taquary" (Brazilian).

Convention between Brazil and France for the lease of 30 ex-German steamers of 249,500 tons dead weight. Valid to March 31, 1919.

Amongst indications of Brazilian activity on behalf of humanity may be mentioned the Red Cross organization, really arising out of the state of war, and more or less on a par with its congeneres in other countries not very actively engaged in hostilities.

A Liga "Pro Alliados," extremely enthusiastic, and, in accordance with the Latin temperament, not always discreet or temperate, but undoubtedly imbued with good ideas, had, in addition to the parent body, many affiliations in the States.

As an example of pre-war extravagance and bad taste, I must note the following phrase in a book otherwise essentially and sensibly patriotic:—

"Whether Argentina and her hot-headed neighbours oppose it or not, in three centuries more

Brazil's flag will wave over the whole of the South, and all America will be divided between the two United States." (Carlos de Vasconcellos: "Cartas da America," pp. 147-148.)

In spite of her taking up the cudgels on behalf of Allied interests, there is no doubt whatever that Brazil has greatly suffered in respect to transport facilities, but I will deal with that subject under its proper heading.

Some War and Anti-war Literature

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These two pamphlets had their origin in the difference of opinion between Argentina and Brazil over the war.

(2) *Brazil-Germany.*

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The above data are given as simple statements of fact, and the author of this book offers no criticism of any sort, and cannot be quoted as expressing any opinion on the matter.

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CHAPTER VIII

THE ARMY AND NAVY

Army

By the law of 1907, every citizen found capable of bearing arms is liable to serve from 21 to 44 years of age.

The first enlistment consists of men from 21 to 30, who are divided into nine classes, from which the youngest are chosen by lot to fill vacancies in the establishment.

(1) *Infantry.*—The peace footing in 1915 consisted of fifteen line regiments of three battalions, four companies of sharpshooters, with twenty-five sections of Maxim guns.

(2) *Cavalry.*—Nine regiments of four squadrons, five regiments of mounted infantry of two, five companies of scouts to serve with the infantry columns, and seven companies for the other services.

(3) *Artillery.*—Forty-five batteries of four pieces of horse artillery, five batteries of howitzers, nine of light guns, six of mountain artillery, and thirty-six batteries of field pieces.

The total number of regular troops amounted to 18,000 men.

In 1917 measures were taken to reorganize the service, and it now consists of 54,000 officers and men, the total number available for the first line of

defence being reckoned at 402,940, and that of the reserve (ex National Guard) 493,346.

Rio Janeiro alone has 4,100 officers and 33,400 men belonging to this branch.

Regular troops serve two years with the colours and seven with the First Reserve.

Volunteers are accepted between the ages of 17 and 28, and usually serve from one to two years, being then given their certificate as reservists.

A military aviation school is in full working order, French instructors having arrived, together with a large number of machines, during the course of 1918. It has steerable balloons, hydroplanes, and batteries of anti-aircraft guns. Another will be started shortly at Santos.

The Aero Club of Brazil is also hard at work, and boasts of a special organ.

The National Rifle Association, started in 1906, has an immense number of branches, São Paulo boasting 115, Minas 114, Rio Grande do Sul 97, several others over 30, etc.

There are at present more than 50,000 members (atiradores) belonging to 448 societies (linhas de tiro), besides 150 colleges giving military instruction.

In November, 1915, a cavalry ride was undertaken in Rio Grande do Sul, forty leagues being covered in two days.

São Paulo has its own first-class military police force of several thousand men, trained under French officers for some years.

The Federal Government is authorized under the 1919 Budget to contract a foreign mission for instruction purposes, and it goes without saying that this will be French also.

Brazil is divided into seven military zones as follows: (1) N. and N.E., limited by Maranhão and Piauhy (Centre Pará). (2) Southern limit, Pernambuco (Recipe). (3) To Bahia inclusive (Bahia). (4) Espirito Santo, Rio Janeiro and Minas Geraes. (5) The Federal District. (6) M. Grosso, Goyaz, São Paulo, Paraná and Santa Catharina (São Paulo). (7) Rio Grande do Sul (Porto Alegre).

There are arsenals at Rio and Porto Alegre, factories of smokeless powder at Piquete (São Paulo) and black powder at Estrella, near Rio, besides a small works in connection with the Ipanema (São Paulo) iron mine.

The parade of September 7, 1917, was a memorable one, 22,000 men filing before the President in the Campo de São Christorao (Rio). There were contingents from the three American cruisers then in port, the Naval Reserve, Military Colleges and Riflemen from eight states, the finest section being that from Cunityba (Paraná), boy scouts, for the first time in Brazil from Campinas (S. Paulo), &c. The 1918 budget of about £4,000,000 has been increased over £250,000 for 1919, and is heavily charged with pension allowances to nearly a score of Marshals, over 100 Generals, 50 Colonels, and a host of officers of lower grades, *vide Journal de Commercio*, Rio (Retrospecto Commercial, para 1916).

The new Minister of War expresses himself very pessimistic with regard to disarmament.

The Navy

The official programme, initiated in 1908, was terminated in 1914, but, had it not been for the crisis and the war, there is no doubt the Navy

League, 40,000 strong, would have carried out its plans for the addition of two more first-class battleships to the fleet.

The personnel consisted, until quite recently, of 4,000 able seamen, 2,000 contracted men, 5,000 apprentices, 2,500 stokers, and 600 marines. This latter corps is certainly a first class one, and presents the finest appearance on parade of all Brazilian armed forces.

The officers included, 1 Admiral, 4 Vice-Admirals, and 8 Rear-Admirals, 140 Captains and Commanders, 200 Lieutenant-Captains, 200 First Lieutenants, and as many Second Lieutenants as may complete their course of instruction in the Naval School and training ships.

The Engineers Department has 1 Rear-Admiral, 14 Captains, and 8 Lieutenant-Captains, and the Medical, Mechanical and Commissariat staffs are quite adequate.

Naturally, there is now a Naval Air Service, and instructors have arrived from the United States, England, &c.

Ships in Commission

	Tonnage.	Dimensions in Metres.	Speed Knots.	Armament.
Battleships.				
São Paulo *Minas Geraes*	21,000	159 long 25·6 wide 7·5 draught	21·4	12 12-in. guns in six towers 22 4·7-in. guns
Coast Guard.				
Deodora *Floriano*	3,162	—	15	16 guns
School Ships.				
Barroso	3,450	—	21	28 guns
Benjamin Constant	2,820	—	14	16 guns

Also *Tamandaré* and *Caravellas*.

	Tonnage.	Dimensions in Metres.	Speed Knots.	Armament.
Scouts.				
Bahia, *Rio Grande do Sul*	3,500	—	27–28	10 of 120-mm., 8 of 47-mm., 2 torpeno tubes
Torpedo Cruisers.				
Tupy, *Tymbiró*, *Tamoyo*	1,190	—	22	10 guns
Tiradentes	800	—	14·7	10 guns
Gustavo Sampaio	500	—	18	6 guns
Gunboat.				
Republica	1,300	—	16	10 guns
River Gunboats.				
Acre, *Amapá*, *Juruá*, *Missoee*	250	—	14	1 gun and 7 maxims
Cananea	250	—	12	
Destroyers.				
Pará, *Piauhy*, *Alagôas*, *Amazonas*, *Espirito Santo*, *Santa Catharina*, *Rio Grande do Norte*, *Parahyba*, *Sergipe*, *Matto Grosso*, *Paraná and 3 others*	700	—	27–28	6 guns and 2 torpedo tubes
Monitor.				
Maranhão	600	—	—	2 4·7 guns

Torpedo Boats, four of 25 knots (1914). Three Submersibles: F1, 2 and 3, 250 tons each. Two Transports: *Carlos Gomes*, 1,800 tons; *Sargent Albuquerque*, 4,550 tons. Four Vedettes for river service, *Jutahy* and *Tefft*, 120 tons; *Oyapock* 195, and *Grumete Joviano* 80 tons. One Tender, *Ceará*, 4,100 tons (1916). Two Colliers, *Mearim* and *Pindaré*, 1,600 tons.

The Super-Dreadnoughts, *Minas* and *São Paulo*, were the first in the world to have two tiers of 12

inch guns, 10 of which could be fired as a broadside. The Rio de Janeiro, launched on the Tyne in 1913 and completed in 1914 was the largest vessel built up to date on that river. She carries a crew of 1,100, and cost nearly £3,000,000. Driven by quadruple screws. The contract speed was 22 knots. Turbine engines. Displacement, 27,500 tons. Main armament, 14 12-in. guns, 20 6-in. and 10 3-in. Many quick firers, and 3 21-in. torpedo tubes. The whole of the big guns can be fired as one broadside. This ship never entered into commission, being bought by Turkey but commandeered by the British Government.

Three Monitors taken over at the same time may be said to have made history, having saved the situation at a very critical moment on the occasion of the race to the coast in Flanders (October, 1914). These ships called: Severn, Humber, and Mersey, are 250 feet long but have a draft only of 8 feet 6 inches.

Their armament consists of 2 6-in. guns, 2 4·7-in. howitzers, and 4 3-pounders; and they were able to get so close in shore as to drive the Germans back, and subsequent attempts to torpedo them met with no success owing to their shallow draught.

In April, 1918, Armstrong-Vickers made a proposal for the construction of a great naval arsenal in Brazil, equipped with machinery for the production of aeroplanes, and ammunition of every description, as well as the largest type of war vessels. Conditions as to extra-territorial rights, and a monopoly, entirely precluded the proposals being studied under their present form.

Budget of the Ministry of Marine, 1918, £2,250,000. For 1919, £2,600,000.

Naval Establishments

Marine Arsenal, Rio Janeiro, and Floating Dock, Affonso Penna; Arsenals at Pará and Corumbá; Naval Schools (2).

Naval Apprentices.—Schools at Pará, Maranhão, Ceará, Rio Grande do Norte, Parahyba, Pernambuco, Alagôas, Sergipe, Bahia, Espirito Santo, Rio, São Paulo, Santa Catharina, and Rio Grande do Sul.

CHAPTER IX

AREA, DISTRIBUTION OF POPULATION AND COLONIZATION

(*Official Statements*, 1918).

State.	Area in square Kilometres.	Population, 1916.	Railways in Kilometres, 1916.	Exports, 1917.
Amazonas . .	1,897,520	610,070	8	£3,729,597
Matto Grosso . .	1,500,000	165,211	1,117	470,170
Pará	1,350,498	467,698	351	4,167,190
Goyaz . . .	856,439	326,013		*
Minas Geraes . .	490,421	5,110,870	6,228	*
Maranhão . .	459,884	599,470	78	693,713
Bahia	426,427	2,811,273	1,628	5,433 332
Piauhy . . .	300,000	395,614	Nil.	
Rio Grande do Sul	280,000	1,623,348	2,664	1,986,792
São Paulo . .	252,880	2,021,982	6,562	22,184.003
Santa Catharina .	192,810	603,325	1,013	548,688
Paraná	190,415	680,000	1,069	1,390 009
Ceará	161,000	1,137,034	875	911,718
Acre. . . .	152.000	77,000	Nil.	†
Pernambuco . .	122,210	1,345,903	867	2,718,133
Parahyba . .	74,731	612,184	328	154,560
Alagôas . . .	58,491	731,393	221	204,125
Rio Grande do Norte	57,485	372,460	328	93,799
Espirito	44,000	269,426	608	1,008,210
Rio de Janeiro .	41,309	1,391,301	2,824	14,171,125‡
Sergipe . . .	39,500	653,019	357	
Federal District .	1,116	1,305,481	Included in	Rio State.
Total . . .	8,849,136	23,231,786	27,816	

* Through Bahia, Espirito Santo, Rio de Janeiro and Sao Paulo.
† Through Amazonas, Peru, etc.
‡ Comprises some of the Minas and Goyaz exports.

Estimated total population (1918) 25,500,000.

According to the constitution, the Federal Capital must be established in the centre of Brazil, and a site was selected in Goyaz, a syndicate making the Government most advantageous offers as regards construction of all necessary offices, palaces, lighting, sewerage, water supply, and railway communication, in short, to create a model city free of all cost to the State.

Naturally compensation was asked for in the way of exemption from taxes and land concessions. The scheme was, however, dropped. Judging by the relative increase in growth of population, greater salubrity in climate, and other factors, São Paulo will one day outstrip the Federal Capital, and become the largest city in Brazil.

COMPARATIVE AREA OF BRAZIL, &c.

Scale : 1 centimetre per million kilometres.

	Population
Brazil 8,849,136 sq. kils.	
Canada 8,250,000 sq. kils. (Larausse, 1912)	7,000,000
Australia and Oceania 8,250,000 sq. kils. (Atlas Hickman, 1909)	5,683,000
U.S.A. minus Alaska 7,850,000 sq. kils. (Hickman, 1909)	82,000,000 (1905)
British Possessions in all Africa and Islands 6,900,000 sq. kils. (Hickman, 1909)	43,074,000
Russia in Europe 5,300,000 sq. kils.	111,300,000
British Possessions in Asia 5,200,000 sq. kils.	301,742,000

I have already dealt with the average mortality, in the demographic statistics shown under the heading of Climate and Diseases. In all probability the next ten years will show a great alteration in these figures, as the interior states have their com-

munications with the seaboard improved, and without a doubt, Goyaz will be one of the divisions of the Republic to profit most.

The fact that from many parts of the United States repeated requests for concessions were coming in, shows that the conditions of life in Brazil are not such as certain Europeans imagine. A society, numbering 1,600, desired to come all the way from San Francisco, California, to São Paulo, and the great interest taken in Brazil generally in the United States shows that the shrewd farmers of that vast Republic know a good thing when they see it.

The Japanese societies of emigration have also succeeded in inducing some 5,000 Nipponese to leave their native land. 787 arrived at Santos on June 18, 1908, and to crown all, came in a Japanese steamer, the *Kasato Maru*, which made the passage from Yokohama in less than six weeks.

A Colonization Company under the presidency of Viscount Sakai has been organized with a capital of £100,000 with a view of settling 20,000 Japanese labourers in the Iguapé Valley in São Paulo, for the purpose of cultivating rice, tea and silkworms. 1,500 landed at Santos early in 1913. It is, however, doubtful whether the introduction of this race will prove an unmixed blessing.

Colonization

Regulations of the State of São Paulo, December 27, 1906

Every immigrant intending to settle in the State, and who gives notice to the official of the department before leaving the ship at Santos, will be conveyed, with his luggage and other belongings, free

of charge to São Paulo. The families of such immigrants are received into the home at São Paulo, and the head of the family is franked as far as the colony he intends to settle in, and back again to São Paulo. On arrival at the lot selected the colonists are sustained there for fifteen days, and receive tools, and seeds necessary for the first crops, without any charge.

Of the colonies under Government protection, it may be said that they are situated along the railway lines. The annual payments vary from £6 5*s*. to £18 15*s*. Recent arrivals, without resources, are given three days' work weekly if required, in order to maintain themselves and their families until the harvest is in.

Immigrants are considered to be persons under sixty years of age, either in families or single men, who, as agriculturists, enter the country with the intention of remaining, and come third class or steerage from Europe. In the case of those over sixty, they must be accompanied by a family of two or more male adults, in order that their support may be assured. The price of land ranges from 5s. to 35s. per acre, according to its quality and situation. Free schools are established in each colony, and there are always physicians and ministers of religion at hand.

The Colonization Department has in the hostel in São Paulo a very complete service of information, post and telegraph office, hospital, crêche, pharmacy, steam laundry, bank and exchange office, and a table d'hôte restaurant at a special tariff.

Every facility is given the head of the family to visit the district in which he proposes to settle, at no cost to himself.

During 1911, 51,000 immigrants entered the port of Santos, including 17,849 Italians, 13,796 Portuguese, and 11,276 Spaniards.

The principal colonies in the State of São Paulo are:—

Nova Europa (German, Russian, Spanish, &c).—Price per lot of 25 hectares, 2½ to 3 contos. Population about 1,500. Polyculture, like all the other colonies in this State

Nova Odessa, founded principally by Russians.—25 hectares cost 1½ contos.

Jorge Tibiriça (Russian, Italian, &c).—20 hectares cost 1½ contos.

Extracts from Federal Decree, No. 6,455, April 19, 1907.

Regulations regarding Immigration and Colonization in Brazil

Art. I. The peopling of the soil will be promoted by the Union in agreement with the States Governments, railway and river navigation companies, other companies or associations, and with private individuals, provided that the sureties and rules hereby guaranteed and laid down are observed.

Art. II. There shall be counted as immigrants all foreigners of less than sixty years of age who are not suffering from contagious diseases, nor plying illicit trades, and who are not criminals, rogues, beggars, vagabonds, lunatics, or invalids, who arrive at Brazilian ports, travelling third class. Persons over sixty years of age, or unfitted for work, will only be admitted when accompanied by their families, or when coming to join them, provided that there is in the family at least one or two against the member who is over sixty years of age.

Art. III. To immigrants who establish themselves in any part of the country, and devote themselves to any branch of agriculture, industry or trade, or to any useful craft or profession, the following guarantees will be granted: complete liberty of action and freedom to engage in any trade, provided that the same does not endanger public safety, health or morals; complete liberty of religious belief; and finally, civic rights as enjoyed under the Constitution and laws by Brazilians themselves.

Art. IV. The Union, without interfering with the liberty of similar action on the part of the states, will enter into an accord with them to direct and facilitate placing the immigrants who desire to settle as owners of their own land, and will protect and advise such spontaneous immigrants as need material aid for their first instalment.

Art. V. The colonies shall be of sufficient extent to admit of development, easy and convenient means of transport, on land chosen as fertile, where conditions are healthy, and there is abundance of drinking water.

Art. VII.

(5) The State will provide the immigrants with tools and seeds free of charge, on first being installed, whilst the Union (Federal Government) may grant them these, and other favours.

Art. VIII. The State may give any assistance to the immigrants, independent of that given by the Union.

Art. XIII.—Localities will be chosen which conform to the conditions in Art. V, as well as the following:

(1) Convenient altitude and soil fitted for all kinds of cultivation.

(2) A position on or near railways or navigable rivers, or close to populous centres, where the holders of the lots will find a ready market.

(3) A constant and ample supply of water, both for domestic and drinking purposes, and for agricultural and industrial purposes.

(4) Topographical configuration, and other conditions permitting the use of agricultural machinery.

(5) Forests which will afford a sure and cheap supply of timber for building and other works.

(6) A large enough area to permit of the increase of the nucleus, so that relatives or descend--ants of the first immigrants may be invited to come and form new households, and hold lots in the same vicinity.

Art. XX. The lots will be classified as rural and urban.

(1) Rural lots will be devoted to agriculture and cattle breeding, and will be of sufficient extent for the colonists who own them.

(2) As a general rule, rural lots will not exceed 25 hectares (about 62 acres) when situated along or near a railway, or river navigated by steamers, but otherwise they may be up to 50 hectares.

(3) Urban lots will be those situated at the headquarters, and will ultimately form the township,

(4) No urban lot may exceed 3,000 square metres, unless set apart for some special purpose.

Art. XXII. Rural lots will be sold either for cash or for payments in instalments. In the former case a definite title will be handed over immediately, and in the latter a provisional title, which will be

substituted by a definite one as soon as all payments have been made.

(1) Any one purchasing a lot on the instalment system, may pay off the debt in full, or in part, before the due date, at any time, in order to shorten the period for receiving the definite title.

(2) Under the conditions of the preceding paragraph, the purchaser will enjoy the privileges of paragraph 2, Art. XL.

Art. XXIII. Urban lots will only be sold for cash.

Art. XXVII. *Immigrants not accompanied by their families may only purchase rural lots for cash.*

Art. XXVIII. Immigrants accompanied by their families may acquire a new lot after obtaining a definite title to the first. When the family consists of more than five workers, or when the immigrant has improved the first lot, he will be allowed the preference for the purchase of a second, near the first.

Art. XXIX. The foreign immigrant (agriculturist) who has been less than two years in Brazil, who marries a Brazilian woman, or the daughter of a Brazilian born in the country, or the Brazilian who marries an alien woman, who has been in the country less than two years as an immigrant, will be given a lot with a provisional title, without having to pay anything, provided that they have lived in harmony for a year, and have improved the said lot.

Art. XXXI. On the provisional title shall be written the full price of the lot, and the conditions to be observed for the obtaining of a definite title.

Art. XXXIV. Immigrants will be transported to the colonial nucleus free of charge.

Art. XXXV. Immigrants will be given (free of

Photo] [*Commissão Geologico de S. Paulo.*

FISHING EXTRAORDINARY.

Photo] [*Dr. Miranda Ribeiro, Mus. Nac. Rio.*

THE PIROCULU MONKEY (CHIROPOTES ALBINOSA).

charge at first) seeds, hoes, spades, picks, axes, and scythes.

Art. XXXVI. During the first six months, from the date of their arrival at the nucleus, and until the harvest and sale of their produce, immigrants coming from abroad, and settled as owners of lots shall, when necessary, be granted means for the maintenance of their families.

Art. XXXVII. For the space of one year, under the conditions of the preceding article, all immigrants will receive medical attendance and medicines free of charge. This period may be prolonged at the discretion of the administrator of the nucleus.

Art. XXXVIII. Stores, where provisions and other articles of prime necessity will be sold at moderate prices, will be established in the colonies, to guarantee supplies to the inhabitants, who, however, will be entirely free to purchase where they like.

Art. XXXIX. During the first year after his instalment (or for a longer period if the Government so decrees), aid may be given to such immigrants as desire it, for the purchase, or hiring, of agricultural implements and machinery, live stock and vehicles necessary for the cultivation of the lots, and the preparation and transport of the produce.

Art. XL. The price of the lots, with or without a house, when the same are purchased on the instalment system, as well as any aid granted, except for work done, or classed as gratuitous, shall be written in a book and handed to the debtor, in the form of a current account, and shall constitute the debt of the immigrant, for which the head of the family is responsible. He shall begin amortization by yearly instalments, not later than at the end of the second

year after his establishment. After this date, if no payment has been made, interest will be charged at the rate of three per cent. per annum on the instalments due.

(1) When the colony is situated on or near railways, or rivers navigated by steamers, the period for amortization shall be five years, counting from the first day of the third year of the instalment of the immigrant. In other cases, or when the Government deems it advisable, the period will be eight years, under the same conditions.

(2) The immigrant who pays his debt in advance will have a right to rebate at the rate of 12 per cent. per annum on instalments that are outstanding.

(3) The immigrant who pays the full value of the lot will immediately receive a definite title to the same, even though he has still other debts outstanding, contracted with the administration of the nucleus.

Art. XLI. In the event of the decease of the head of the family, in whose name the provisional or definite title has been drawn up, the lot will pass to his heirs, or legal representatives, on the same conditions on which he himself held it.

If the nucleus has not yet been emancipated, the transfer will be made by an official order of the administration without any legal intervention.

Art. XLIII. If the lot was purchased by instalments, and three had been already paid by the deceased, the remainder will be remitted in favour of the widow and (or) orphans, and a definite title granted.

Colonies Due to the Enterprise of Railway Companies

Art. LXIII. The choice of the localities will depend on careful study of all the circumstances essential to the development of the colony.

Art. LXIV. The site must be examined and approved by the Federal Government.

Art. LXV. In addition to the foregoing, the plans, roads, divisions of lots, types of houses, etc., must be approved by the Government.

Art. LXX. The Government may authorize, or promote at its own expense, the introduction of immigrants from Europe to these colonies.

Art. LXXI. The service of settling the immigrants shall be at the expense of the company, which shall furnish the new-comers with tools and seeds, and when possible give them paid work on the railway or near the lots, and shall supply them, whenever necessary, with advances of food or money until harvest time.

Art. LXXIII. The price of lots, and houses, and conditions of payment depends on the approval of the Government, which reserves to itself the right to fiscalize anything in the colonists' interests.

Art. LXXIV. The company binds itself to grant a rebate of 50 per cent. on the ordinary tariffs, on colonial produce for five years, dating from the instalment of the first family on a lot.

Art. LXXV. The company will render every aid in its power, and will stimulate the formation and increase of small industries. It will create free primary schools, and build churches for the immigrants, regardless of denomination.

Reception of Immigrants

Art. XCVII. Immigrants will receive board and lodging at the port of disembarkation, and free transport to their destination inland, with all their baggage.

Art. C. Immigrants' baggage, including tools, will be admitted duty free.

Art. CXVII. The service of reception and distribution of immigrants will be carried out at the expense of the Union at the port of Rio Janeiro.

Art. CXVIII. In State ports (as Bahia, Santos, etc.) the service will be at the expense of the State interested, aided by mutual arrangement by the Union.

Repatriation

Art. CXXVII. Government will repatriate such agricultural immigrants who may have been brought in at their own expense, if they have resided less than two years in Brazil and are incapacitated from earning their living, and have none of their family to support them.

Minas Geraes

There are flourishing colonies at Rodrigo Silva (Barbacena) on the Central Railway, principally devoted to silk culture, with saw mills, ice factory and other industries. A journal is published (*O Sericultor*), and the population of 1,500, mostly Italians, is thriving and increasing.

Carlos Prates, near Bello Horizonte, has a stocking factory, and grows a large quantity of fruit.

The colony of João Pinheiro, near Sete Lagôas, is also very prosperous, the average net profit per family in 1911 being £100. Population 442.

Some half-dozen of other centres are in full activity, and the State possesses five model farms in different districts.

In Bello Horizonte, within 2½ kilometres from the city, land may be had from 200 to 300 reis per square metre. This offers a splendid opportunity to capitalists, as the electric trams must shortly pass through the district.

In Minas Geraes, colonies must be situated within four miles of the railway, and lots have an area of 25 hectares. Urban lots may not exceed 3,000 square metres. Colonist's houses, ready for occupation, must be built on each lot, and not cost more than 1 conto. Lots must be paid for within five years.

Colonists possessing capital (say, £200 upwards), and not being in need of pecuniary aid from the State, may be given free concessions of lots, on condition that they cultivate them, and reside on the site for not less than seven years.

Colonists who are State aided may be allowed 60 milreis monthly as a maximum subsidy for maintenance during six months, as well as seeds, plants, cuttings, etc., for cultivation, but any sum of money advanced must be repaid, as well as the cost of medicines, physician, etc., if needed, and must pay reasonable hire for agricultural machinery, such as ploughs, as well as draught animals, and the value of tools, and instruments furnished on credit. He *may* be given work during part of the time whilst waiting for his harvest, but is obliged to assist towards the conservation of irrigation channels and other necessary works, whilst holders of urban lots must furnish labour for the unkeep of roads, &c., &c.

In Paraná, most of the recent arrivals are Poles, and some of the centres have over 3,000 population. Their situation is excellent on the high campos of the interior, at altitudes varying from 700 to 1,200 metres. Cereals are largely grown in this State.

Bahia has established a department of colonization, and issued literature in various European languages. The only state to offer free rural lots at present is Matto Grosso, but the cost of land in all the others is quite low, and payments are spread over a number of years. The special inducements offered also quite justify a normal price for the lots, as they are surveyed and selected by the Government, and the colonists are transported thither at the expense of the department.

Rio (State)

The most interesting of the colonial centres is that of Itatiaiá, consisting of seven states. The cost of the land amounted to £25,000, apart from any outlay in connexion with surveying or administration expenses and assistance given to colonists. The altitude of the colony ranges from 2 to 8,000 feet, and the average annual temperature of the highest part of the estates is 54° Fahrenheit, and the lowest 68° Fahrenheit. The colony is laid out for some 500 families as a preliminary essay. The Central Railway (São Paulo branch) has two stations (Campobello and Itatiaiá) convenient to the colony. The cost per lot of 50 hectares will be £63 to the first comers. The Visconde de Mauá colony in the same state is situated 1,050 metres above sea level. The annual mean temperature is 64° Fahrenheit. That of Vera Guarany (Paraná), 2,400 feet altitude,

has a mean temperature of only 59° Fahrenheit. Colonists in the State of Rio are mostly Swiss and German; in Paraná, Austrian Poles and Russians. The São Paulo Government has established many liberal measures for the benefit of colonists, those having passed through the hands of the Immigration Department in the State capital being enabled to send for their families and relations at Government expense, and are entitled to free legal advice with regard to contracts with employers, &c. Both the Federal and São Paulo Governments are prepared to enter into contracts with responsible firms, for the introduction of agricultural workers and their families.

There are also great areas of virgin lands available in the Central and Northern States of the Republic, but these are more suitable for plantations on a large scale, or for exploitation in other ways by wealthy syndicates.

To those who are used to tropical climates, purchases of land in the "Baixada" or marsh in the State of Rio should prove a good investment, as it is all alluvial and lying practically at the door of the Capital, with first-class transit facilities on the Leopoldina Railway for the rapid delivery of market garden stuff, offers great scope to any able concern. Drainage is proceeding rapidly, and every month a fresh area becomes available. Most of this district was worked in former times, but abandoned when Yellow Jack made his appearance. Now modern measures are too much for the fever-carrying mosquito, it should not be idle very long.

The National Congress has under consideration a proposal to concede free grants of land to suitable immigrants in groups of families, definite title deeds

being given after proof that reasonable improvements have been carried out, and the land properly cultivated. The State of Pará has organized a new system of settlement, and the price for 100 hectares is 100 milreis, the price *increasing* by 200 reis the hectare for each 1,000 hectares or fraction. The cost of land for mining and quarrying purposes will be double the above.

Urban lots will cost from 50 to 100 reis the square metre. Estates covered with the Brazil nut palm will be sold at the same rate as mining lots. All State lands must be paid for by three instalments, one on completion of purchase, and the third at the end of the second year.

The colonies in Rio Grande do Sul are principally in the hills and forests, not in the campos or prairies.

The soil is derived from eruptive rocks, and is much richer than that further north, which is largely composed of the elements of disintegrated gneiss and granitic rocks.

Most cereals are grown, and wheat is becoming one of the staple crops. A great many of the German, Italian, Russian, Swiss and other settlers go in for bee culture on a large scale.

The average cost of land is 1 real per square metre. Five years is allowed in which to pay for the lot, but cultivation must be commenced within six months.

The Leopoldina Railway has deposited in the Federal treasury the sum of £125,000 for the purpose of colonization in the zone served by its lines, principally for centres (neuclii) in the State of Minas Geraes.

In the State of São Paulo a family of six, of whom five are able to work, should earn the following in one year.

Average	£	s.	d.
Excess of production of live stock . .	30	0	0
Coffee harvesting (per head, £16) . .	80	0	0
Daily labour on estate, £6 . . .	30	0	0
Net minimum savings . .	£140	0	0

The influx of colonists during the last four years has been so great, that only in very exceptional cases (*see* note *re* Portuguese) will the Federal Government grant passages.

It is the policy of the State at present not to use any means of inducing any persons to emigrate from the United Kingdom to Brazil.

This is in accordance with the strongly expressed views of the British Government on this subject.

It is, of course, well known that the latter does not wish its subjects to settle anywhere, except under the flag.

Average temperature of the entire zone at present being colonized = 15° to 25° Fahr., according to latitude and topographical position. Altitude varies from 300 to 1,000 metres above sea level. Density of population: maximum, 10 per sq. kilometre; minimum, 1 per sq. kilometre.

Italians in S. Paulo

In a long list of Italian colonists averaging some twenty years in the State, and most of them turning over £400 yearly or more, four are mentioned with an income of £1,400, five with £1,600, one with £2,000, three with over £2,300, one with £3,200, another with £3,600, and finally a man who has now three factories, half a million coffee trees and an annnual income of £6,600. Nearly all these colonists came to Brazil with hardly a cent in their pockets.

In the case of hired labour, the colonist's wages are always first claim on an estate, and if he contracts through the medium of the Government, the latter will see it is entirely in order, and enforce its provision. I speak, however, more to the man who will plough his own furrow, he who wishes a stake in the country, and I say with St. Hilaire, if ever there is a place that could do without the rest of the world, it is Minas Geraes, and I go further, and add to Minas at least one-half of the *whole* of Brazil, from the Amazon to the Paraná. There is room for all, and the only condition necessary is ability to work, and the leading of moral lives. There are no religious disabilities of any kind, and one may find members of almost any faith, scattered over the Republic, including Mohammedans, Jews, Evangelicals, Positivists, as well as the majority, who are Roman Catholics. There are, as we have stated in another place, Methodist churches in plenty, especially in the State of Minas Geraes.

Agricultural labourers with families, are given free transport to the place selected.

The lots vary in price from 200 milreis to 750 milreis for 25 hectares, without a house, and may be paid for in instalments extending over seven or ten years, without interest. Houses vary in cost from 500$000 to 2,000$000.

The colonist will be given some tools, and in the case of being without means, can obtain work in road construction, &c., for the first six months. The immigrant arriving without a family, must pay cash for any lot.

To those who have been misled by malicious and interested statements, I would recommend the perusal of any of the books mentioned in the ap-

pendix at the end of this work. Hear what Wallace has to say, laugh with the incomparable Burton, and study Fletcher and Kidder, Bates, Mawe, &c. The overwhelming testimony of the greatest scientists, the most practical business men, and ordinary tourists during the last 100 years, is that Brazil is a country eminently fitted for the European.

I have done my best in this book to show the varied resources of Brazil. As far as Americans are concerned, no doubt there will soon be a steady stream of settlers, with some capital to ensure success, and what is wanted is men who are not likely to prove a burden to the country, such as farmers and stock breeders, and specialists in all branches of agriculture.

Guide to the Immigrant in Brazil

Reception and Lodging of Immigrants in the Port of Rio de Janeiro

Steamers from foreign ports, anchoring in the port of Rio, are visited by uniformed interpreters, who speak most of the principal European languages, and offer, in the name of the Brazilian Government, to all healthy persons of good character free disembarkation and provisional board and lodging in the home in the Ilha das Flores.

This island is situated in the bay, about fifty minutes' distance from the city.

The immigrants are conducted thither, and after declaring their names, ages, nationalities, professions, and place of origin and destiny, if any, are permitted to remain from three to eight days. The immigrants may go in parties to the city to perform any necessary business, and will, if required, be accompanied by interpreters.

In the city will be found a bureau of immigration where every information will be furnished, as well as free passages to any part of the Republic in the case of agriculturists recently arrived.

During the period in which Brazil was at war with Germany, the island was used as a place of internment, for the sailors of the various ships taken over by the Government; but there was no definite policy in this respect, some of them being at Novo Friburgo, a quiet place of compulsory villegature.

The Land Question

Brazil versus British Colonies

It would be impossible to institute comparisons, as conditions are so different, but as far as tenure accessibility of suitable and available lands are concerned, Brazil does not fear the contrast. Prices of lots are undoubtedly much less in this Republic.

I have before me as I write the Sydney, New South Wales, *Farmer and Settler* of July 30, 1912, and will make a few quotations from it, and leave the reader to draw his own conclusions.

1. Land in the hands of speculators *(impossible in Brazil)*. A great deal of it without water supply.

Wheat farms.—No railway, per acre, £4 to £6 for lots of 400 to 650 acres. Another, 25s. an acre. Another, 50s. per acre. Another, 160 acres, £325. Survey fees, and 5 per cent. interest charged until account is paid. No interest is charged in Brazil on lands sold on the instalment plan.

Grazing land.—259 acres, £6 6s. per acre. Twenty acres, near Sydney, cottage, &c., stock, £800.

Fruit growing land, £4 10s. Others from £4 to £6 per acre.

Prices of Crown Lands

2. Balloting for Crown Lands.—Barmedman: 3 blocks, 225 applicants. Wyalong, 1 block, 35 applicants.

16 acres odd, £72; covered with timber.

12 acres, £120; 10 acres, £78; 5 miles from railway.

100 acres, £300. No natural water supply.

A farmer writes: I get 3s. a bushel for wheat We are at the mercy of the speculator.

Irrigation lots. Water charge, 5s. per acre foot. Rent paid half yearly in advance.

Any alien becoming the holder of a farm must be naturalized within three years, or he will lose *all interest in such farm, together with every improvement he has made on it.*

Quoting from the semi-official *Colonial Journal* (July, 1913):—

Demand for land in New Zealand is so great that balloting has to take place and there is invariably an excess of applicants for each section.

The plain truth is, that in Australia, &c., all the best lands have been squatted on long since, and what is left is either offered as more or less unsuitable, or sold at high prices. Land companies have evidently got a good grip down under, as well as in British North America, and the incautious immigrant usually becomes a victim of their machinations. At present these gentry have not put their foot in Brazil, and will not be able to take advantage of the greenhorn, if they do land there, as long as the Government remains as honest and wide awake to the interests of the proletariat as it is to-day. The great Railways, possessing rights (*and duties*) of colonization, are well looked after, and there is

no parallel to the well-known case of a similar concern, that is busy advertising its *rich* lands in another part of the world.

The Brazil Railway Company has already surveyed over 2,000,000 acres for colonization purposes. These lands are situated in the valley of the Rio Peixe, on the Itararé-Rio Uruguay Line, and up the Iguassú Valley. São Francisco, Rio-Paraná Line. These estates are situated in Paraná and Santa Catharina, and lots of 50 acres have been sold at an average of 21s. per acre.

Other plots in São Paulo State have fetched up to 40s. per acre.

Not a single lot is offered in any part of Brazil where irrigation is necessary, and no pressure *whatever* is placed upon any foreigner to change his nationality, and he has an absolute right to his farm and all thereon.

No Colonization Company in Brazil can fix prices for land unless they are previously approved by the Federal Government.

Additions and Alterations to Federal Colonization Laws

Lei. 2,924. January 5, 1915. Article 86. Suspension of subsidized immigration.

Lei. 3,454. January 6, 1918. Article 115. Colonists' passage money is not to be refunded in specie, but the amount credited to them, on account of the value of their lots, &c.

Article 116. The percentage of Brazilian citizens on the Colonies may be increased according to public necessities.

Article 128. Holders of rural lots on emancipated Colonies, wishing to liquidate their debts with the State, are granted discounts of 15 to 25 per cent., in the case of seltlement within 3 to 12 months.

Homestead Law

The domicile of a colonist is not to be subject to execution, except as far as taxes on the same are concerned.

Some land prices (State).

Paraná, 12$, 10$, 8$ per hectare.

Bahia, 10$, 5$, 3$ (for cocoa planting).

The first attempt at colonization in Brazil was in 1815, D. João IV locating 1,700 Swiss in Novo Friburgo. Two German villages sprung up in Bahia, 1818-19, and the first contingent to arive in Rio Grande do Sul, consisted of 400, in 1820, followed by 600, four years later.

These colonies suffered greatly from neglect, and want of markets, and up to 1830, attempts to make definite settlements in Paraná (Rio Negro) and Santa Catharina, met with little success. The present thriving little towns of Jainville and Blumenau, in the latter state, date from the early fifties. Petropolis, near Rio Janeiro, being formed at the same period.

Up till 1859, Germans were in a great majority, but in that year, emigration to Brazil was prohibited. This decree was, naturally, owing to certain abuses under local administration.

In Espirito Santo (and Petropolis) a great many of the children and grandchildren of the original settlers have inter-married with Brazilians of Portuguese extraction, and, in many cases, have entirely forgotten German. The cephalic range of these people has been lowered from 83-84 to 76·3, and their physical characteristics are not the same as those of pure Europeans.

In Rio Grande do Sul, the colonial population is (according to the " Report of Public Works, 1916)

made up as follows: Germans and their descendents, 300,000, Italians, 230,000, Poles and Russians, 70,000, other nationalities, 30,000, and, *elements of purely national character*, 120,000.

Obviously, a very great proportion of the first named are Brazilians of the second generation, and it would be difficult to define exactly *what is a purely national* type. The annual report mentioned, states that at least half of the colonial debt of 6,000 contos (£300,000) is due to immigrants introduced between 1908-1912, owing to their precarious productive qualities. Nearly all the latter were from Southern and Eastern Europe. We must note that the land settlements contain at least a third of the whole population of this state.

An Italian invasion took place in the South from 1875 to 1878, and several districts, especially in Rio Grande do Sul are almost exclusively inhabited by this race. Here, taking the whole area at present available (270,000 sq. kilometres), equal to that of several smaller European countries, 70 per cent. is pasture land, and 22·5 per cent. forest, consisting of Araucaria pines, generally speaking. It is necessary to mark out 3,000 lots annually (1,000 sq. kilometres), and within 30 years the whole may be occupied, judging by progressive increase, at present about 20,000 souls being added to the rural population annually. Rio Grande do Sul is the only state in Brazil able to settle its surplus population on the soil in such a manner that immigration from abroad is quite unnecessary. On an average, every 20 years, the colonists seek fresh lots for their growing families, and, in many cases, follow them.

On pages 363, 383 of the Government report cited, complaints are made that the colonists form com-

munities apart, and slight the native element, and that each new settlement made was followed by an exodus of the original *squatter*, who *alleged* all sorts of things, including *pretended rights*, some of them doing good strokes of business, by disposing of their presumed ownership to the first foreigner who offered to buy. This, in spite of a rebate which the States gives to a native born settler.

In 1896, 1899 and 1905, the State of Minas Geraes created laws dealing with this problem, and Paraná, Bahia, Matto Grosso, &c., followed suit. On April 19, 1907, the Federal Government issued a national decree regarding immigration and colonization, the text of the principal articles of which is herewith appended.

The *raison d'être* of this decree lies in the position of irresponsibility of the several states before the Federal Government, and, in consequence, as regards propaganda in Europe. This has been the cause of the obnoxious laws passed by most of the European Governments, as regards Brazil, and the most important results, of an immediate nature, achieved by the new Government department is the practical revoking of these measures.

British authorities in particular, have drawn the attention of would-be settlers to the widely diverging habits and customs of Brazil.

The question is one for International study and a Conference of all interested as soon as the war is ended. Thse things must not be left any longer in the hands of provincial authorities in any colonizing country, however broadminded they may be. Parochialism is bound to get the upper hand in this case. Patriotism itself, must also be re-considered.

More than a quarter of a century of concentration

on this subject, has given me more right to talk than those who know nothing of any country but their own, and that very little, or only in theory.

The immigration of races possessing only the most minute rudiments of civilization, is a great and increasing peril to the new lands, and represents a powerful brake on the chariot of progress. No colonists are too good for Brazil.

Undoubtedly, the German, like his English cousin, is too often rude and cold, most unsympathetic in manner, and, surrounded in Brazil by races of another type, has developed certain qualities which might have been suppressed. As one might say of some Scots, he is stark, stiff-necked and canny, but for all that, a real God-send to South Brazil, and it is only those with an axe to grind, or the really ignorant, that can possibly find flaws in this rough jewel.

Naturally, had it been the Britain, Gaul, or any other nationality maintaining a level of existence superior to that of the mass of the people, he would have been looked upon with equal distrust and dislike.

Almost the entire Teuton population is settled on the land, and of the 988,367 Portuguese, at least 90 per cent. inhabit the cities.

Of the Santa Catharina Colonies, those on the Itajahy river have 2,627 persons of Brazilian birth, 406 Germans, and 90 Austrians. That of Hansa, on the Rio Negro, 2,533 native born and 174 German, and in the S. Bento Colony the entire population of 1,034 is Brazilian born.

Basilio de Magalhães, *O Estado de S. Paulo*, Rio, 1913, after giving his northern countrymen some exceedingly hard knocks, says, referring to

Italian settlers, these people send home yearly £4,000,000, and the Portuguese £1,500,000 (about a tenth of the total revenue of Brazil). This is a true but terrible statement when one analyses it, and it may be said that the 1,800,000 Italians in Brazil spend less than half the 1,620,000 souls of German extraction (*Almanac Garnier*, Rio, 1914, page 82).

Germany herself, in 1912, was Brazil's best customer in Europe, buying goods worth 10,685 contos, the United Kingdom following with 8,864, and France with 7,308, Italy being a long way behind, and, like her Gallic neighbour, charging prohibitive duties on the very staple (coffee) which had enriched her exiles.

With regard to the Garnier statement, let us see official figures (*Retrospecto Commercial Jornal do Commercio*, Rio, September 8, 1917):—

Total German immigration, 1820-1916=123,194.

Taking the Rio Grande do Sul statement (300,000) as a base, and giving 150,000 for Santa Catharina (a very liberal allowance), 50,000 in Petropolis and district, and possibly another 50,000 elsewhere, I cannot count anything like half the French figures, or with the wildest flight of imagination 4 per cent. of the total Brazilian population. During the period stated no fewer than 988,367 Portuguese, 478,889 Spaniards, 366,506 Italians, 110,000 Russians, 80,000 Austrians, 55,000 Syrians, and at least forty other nationalities.

The grand total was 3,484,042, high water mark being reached in 1891 with 275,808 persons, nearly 50 per cent. being Italians. Figures fell off rapidly from this date until 1910, when a revival took place, and in 1912 no fewer than 180,182 entries in second

and third class were registered, of which 76,530 were Portuguese, 35,492 Spaniards, and 31,785 Italians.

During the Empire each colonist cost the State 12$862, and at present 6$180, at a far lower rate of exchange.

From 1908 to 1912, 78·34 per cent. of the settlers on the twenty Federal colonies were foreign born, and from 1913 to 1916, 73·74 per cent. The produce of the Federal colonies in 1917 was worth over half a million sterling, and will doubtless double in value by 1920.

During the past two years about 20,000 unemployed have been given free passages from Rio to the different colonies. About 60 per cent. of these people (of both sexes) were Brazilians.

The Brazil Railway Company has thirteen colonies dotted along the main line between Taxima in São Paulo and Rio Uruguay.

The total area of rural lots is 58,931 hectares, the average being 24 hectares, and the price of this 1,035$000, or about £60. At present (1918) there are only 804 families located, principally Russians and Poles.

Rio Janeiro State has a colonization service; restrictions regarding concerns establishing settlements being quite favourable to immigrants (Decree No. 1307 of May 22, 1913).

Matto Grosso and other States have schemes under foot.

Work in Espirito Santo has been suspended during the war, but the Leopoldina Railway has some Italian and German settlements on the main line to Victoria.

In São Paulo there are ten colonies, with lots of 25 hectares, selling from 250$ to 1,500$000 per lot. Minas Geraes has about the same number.

The regulations regarding land settlement in the former State are consolidated under Decree No. 2400 of July 9, 1913. Most of the regulations remain in force at the time of writing (January, 1918), but may be superseded as soon as the world gets to work again under normal conditions.

For the benefit of those who wish to study more closely the different problems connected with the building up of national character, the following may be consulted: —

1851.—St. Hilaire. "Voyage dans St. Paul et Sainte Catharine."

1876.—Carvalho, A. de. "Colonisação do Brasil." Oporto.

1905.—Vieira da Rosa, Major. "Chorographia de S. Catharina." Florianopolis.

1909.—Denis, Pierre. "Le Brésil au XXème Siècle."

1910.—Carvalho, D. "Le Brésil méridional." Paris.

1912.—"Relatorio do Servico de Povoamento." Agricultural Ministry, Rio.

1912 (and 1916).—Walle, Paul. "Paraná." Santa Catharina. (Guilmoto, Paris.)

*1916.—"Annuario Estatistico do Brazil." Ministry of Agriculture, Rio.

1917.—Ribeiro, J. Dr. "Imparcial." Rio (November 26).

1917.—"Revista de Industria e Commercio." Rio (December).

1918.—Lauro Müller, General. Florianopolis January 27. Speech.

1918.—Chauteaubriand. "Correio da Manha." Rio, February 1.

1918.—Annibal Amorim. "Viagens pelo Brazil." Garnier. Paris-Rio.

1918.—Mario Brant. "Imparcial." Rio Janeiro, March 23.

1918.—Fernando de Abreu. "Um livro como os demais." Inst. de Artes Graphicas." Rio.

1918.—Abdias Neves, Senator.—"Das Deutschum in Süd Brasilien." (Also speech in Congress, January 10, 1919.)

1918.—Medeiros e Albuquerque. "Noite." Rio, September 8.

†1919.—*Literary Digest*. New York, January 11. Pp. 27-28.

Dealing with the degree of instruction of foreign elements in Brazil, official statistics give the following percentages of illiteracy:—

Unable to read or write (1820-1916): Portuguese, 80 per cent.; Spanish, 70 per cent.; Italians, 60 per cent.; and Germans, 3 per cent. (see * and †).

In 1916 there were in the Federal colonies twenty-five public and sixteen private schools. On January 1, 1918, 18 per cent. only of the children were receiving any instruction, *vide* statistics published by the Colonization Department itself. No such figures are to be found in any of the State colonies in the South. See under Santa Catharina and Rio Grande do Sul. The Paraná Government has neglected to send me data of any kind, so I cannot make a comparison.

CHAPTER X

FINANCE AND COMMERCE

A Financial Barometer.

Year	Debt, in contos	Loans outstanding, in sterling	Population, in millions	Paper in circulation, in contos of reis	Receipts per capita	Exchange, in pence
1824	D. J. 6 to 12,000	—	—	11,400	—	—
1827	— Pedro I	—	—	21,574	—	—
1831	540,000	—	—	—	—	—
1843	36,000	—	—	—	—	—
1888	800,000	£11,731,000	—	—	—	24
1889	—	—	14	179,364	6$515	27 (par.)
1895	—	—	16	337,351	5$163	$9\frac{5}{8}$
1898	—	— (1889-1901)	17	779,965	3$435	$7\frac{3}{16}$
1901	— (Sterling)	£38,429,510	18	680,451	4$640	$11\frac{1}{8}$
1902	£57,020,000	—	—	—	—	—
1903	—	—	19	674,978	4$781	12d
1906	£60,608,000	£7,698,100	—	—	—	—
1908	—	—	$20\frac{1}{2}$	634,682	6$335	12—15d
1909	—	—	21	628,452	6$112	$15\frac{1}{2}$
1910	£86,931,000	—	$21\frac{1}{2}$	621,005	7$677	$10\frac{3}{32}$
1911	—	—	22	612,519	8$632	$16\frac{1}{8}$
1913 June 21	—	—	23	601,488	8$868	$16\frac{7}{8}$
1914 Dec 31	—	—	—	600,340	—	—
1914	£104,482,000	—	$23\frac{1}{2}$	822,496	4$263	$14\frac{11}{16}$
1915	—	—	$24\frac{1}{2}$	982,089	2$703	$12\frac{1}{4}$
1916	—	—	25	1,112,559	—	$12\frac{1}{8}$
1917 Nov. 1	£115,488,198	—	—	1,135,232	—	$12\frac{5}{8}$
1918	—	£116,000,000	26	1,619,398	—	$12\frac{1}{2}$

Internal debt in round figures, 937,730 contos of reis.

Debt per capita in 1912: Union, 97 $074; States, 40 $440.

Lowest exchange under the Empire, 18¾ pence. Highest during the Republic 16⅛.

Negotiations for raising a loan in 1914 cost £2,000,000, out of a total proposed of 25 millions. This fell through, but a funding loan of 15 millions was raised. During the Government of Hermes da Fonseca, 201,490 contos of paper were added to the amount in circulation, and in three years of the last (Wenceslau Braz) administration, this was increased by 796,686 contos. (*Vide* page 5985 of the "Diario do Congresso"(for January 10, 1919) Senator Abdias Neves.

Under the terms of this loan Brazil was inhibited from raising fresh capital abroad for three years, dating from August, 1914.

Normally 18 to 19 millions sterling are needed per annum for the purpose of liquidating indebtedness.

The interest payable on loans has, since 1827, exceeded the total amount of principal.

The internal debt has been incurred in the following proportion:—

Railway Developments, 26 per cent.; the Paraguayan War, 15·63 per cent.; Balancing Deficits, 20·29 per cent.; Cost of Civil Warfare, 11·57 per cent.; and Consolidation of Floating Debt, 9·77 per cent.: no other item reaching 2 per cent.

It should be noted that the decline in amount of inconvertible paper, has almost always been co-incident with a rise in the exchange, and in the amount of revenue per capita. (See figures for 1906-1913.)

A recent decree prohibiting the exportation of specie, and an arrangement with the two gold mines to take the whole of their output, will enable the Government to accumulate a bullion reserve.

On August 19, Deputy N. de Nascimento made a ferocious attack on the present Administration, charging the Government with having spent £150,000,000. He said there is no less a sum than 15 millions sterling in paper, in deposit in the Rio banks alone, and the total exportation of Brazil is only equal to the amount of inconvertible paper in circulation.

On the 23rd of the same month, an official exposition of the Financial situation was made to the House by Deputy Piragibe.

He said: "Foreign debt has increased 40 per cent. from November 15, 1914, to June 30, 1918. Customs revenue reduced over £5,000,000.

"In 1913, it was 22 millions sterling, or 60 per cent. of the whole receipts of Brazil, and by 1917, it had dropped to £8,700,000, but, in spite of this, expenses had been reduced over 30 per cent., revision of contracts made at a saving of £25,000,000, and the payment of foreign loans re-commenced in species."

The present Government was left with compromises of over 20 millions sterling.

Emissions of Treasury bonds to the amount of 350,000 contos in August, 1915.

Emissions of Treasury bonds to the amount of 300,000 contos in August, 1917.

Application	*Contos*
Loans to the Bank of Brazil	101,000
Loans to São Paulo for Coffee Purchase	110,000
Purchase of Rubber	17,000
Payment in Cash of Debts previous to 1915	140,000
Balancing Deficits (1915-18)	169,000
War Credits	80,000
Acquisition of Conversion Notes	10,000
Loans to Coal Mining Companies	3,000
Balance Existing in Execution of the Convention with France	10,000

Of the 1914-1918 emissions, 261,000 contos represents very profitable investments in connection with the valorization of Coffee and Rubber, and the emancipation of Brazil from foreign monopoly, as regards coal supplies at this most critical time.

The previous Government had spent most of the first emisison of 250,000 contos within 3 months (from August 24 to November 14), leaving a remainder of only 27,000 contos.

In 1918, for the first time in Brazilian history, issues were made on a gold basis, according to a decree of April 10, which authorized the acquisition of all the Conversion notes on the market.

In August, 1918, there was a bullion reserve of £4,800,000, measures having been taken the previous month to fiscalize all transactions between banks, and the transmissions of funds abroad.

In September, 1917, Rothschilds sent a telegram to the retiring Finance Minister, Dr. Calogeras, to congratulate the Government on its financial posi-

tion, which, the famous bankers said, had never been so bright. There is no doubt that this statement must be taken *cum grano salis*, and the greatest economy will be necessary for a considerable number of years.

Dr. Braz, the President, said in his valedictory message to Congress, May, 1918: "Brazil can look forward without fear, payments are duly met, and there was every reason to think that both interest and principal of foreign loans would be paid regularly."

Dr. Rodrigues Alves, in his programme, disclosed in a banquet in Rio recently, pointed out. that as long as the Government authorized fresh emissions of paper money, it was impossible to institute new schemes of taxation.

As far as financial operations are concerned, the only market open at the present time is the United States, and money could only be obtained there at a very high rate of interest, and for a short term.

The problems in connection with finance are, of course, complicated by the present International anarchy, new redemption funds are needed to put things on a solid basis, and as the *Jornal do Commercio* (Rio, January 1918) remarks, "Clever accountancy only enabled the Government to balance its books."

The burden imposed by excessive Customs duties is, to quote the same journal, "aggravated by the tax in gold, which is, of its kind, all that is most cruel."

This, however, is not peculiar to Brazil, and the new "Society of Nations," when in working order, needs power to sweep away these abuses wherever they may be found.

The most interesting thing as regards finance at present, is that money from England is now finding its way here *via* New York, and American manufacturers pay their bills direct, by means of the National City bank, now established in Rio.

According to Dr. Leopoldo de Bulhões, ex-Finance Minister, the total riches of Brazil amounts to £1,500,000,000 (*Revista de Industria e Commercio*, Rio, May 30, 1918). Divided as follows:—

Land, 10,000,000 contos; *Buildings*, 5,500,000; *Furniture etc.*, 7,000,000; *Cattle*, 5,000,000; *Railways and Ports*, 2,000,000; and *Factories*, 500,000, making in all, 30,000,000 contos, which, at 12 pence the milreis, or £50 the conto, amounts to the sum first mentioned.

Decree No. 3546 (October 2, 1918), provides for the emission of a sum up to five times the gold reserve, in accordance with the bullion in Treasury, deposited abroad, or which may be bought.

This specie shall remain deposited in the "Caisse de Conversion," as a guarantee fund, and not be removed from there except by authorization especially voted by Congress. The notes emitted under the bill will be at par (27d.), and must be destroyed in proportion to the value of checks drawn against gold existing abroad as a guarantee fund.

Of this emission, 50,000 contos is destined for rubber valorization in Pará, Amazonas and Matto Grosso.

Federal Budgets

Dr. Murtinho, Finance Minister during the Administration of Dr. Campos Salles, said that deficits under the Republic were being covered by the same means as during the Empire, that is, by loans, or

emissions of paper. In 1902, the last year of his term of office the position was as follows:—

	Contos			Contos
Expenditure	297,721	...	Receipts ...	343,813
In 1910 ...	608,046	...	1910	506,449
1912-14 ...	264,594 gold	...	—	—
	1,852,309 paper	...	—	—
1915-17 ...	263,425 contos gold	...	—	—
	1,524,999 contos paper	...	—	—

At the end of 1913, there was a deficit of £1,715,000.

In 1917, revenue and expenditure were about alike, or 33 millions sterling.

Receipts were obtained from the following sources: Customs, 34·13 per cent.; Internal Taxes, 30 per cent.; Funds in London, 6·28 per cent.; Consular Receipts, 0·35 per cent. All other sources of revenue, 18·65 per cent. Expenditure on personel cost, 239,758 contos, and material, 384,422 contos. This was divided amongst the different Ministries as follows:—

	Staffs	*Materials*
	Contos	Contos
Finance . . .	52,000	232,000
Public Works . .	72,000	96,000
Interior . . .	31,000	13,000
Foreign Affairs . .	3,000	2,000
Marine	27,000	10,000
War	44,000	20,000
Agriculture . . .	6,000	8,000

In 1914, the revenue from taxes on manufactures yielded 52,240 contos, at 14$\frac{5}{8}$d. the milreis, and in 1917, it had risen to 114,819 contos, exchange averaging 12d.

In 1892, Consumption (food products) taxes

brought in only 265 contos, and by the end of 1917, this had increased to 65,000 contos.

The 1918 Budget amounted to 84,456 contos gold, and 461,958 contos paper. For 1919, it is reckoned as 80,953 contos gold, and 504,482 contos paper. The *apparent* deficit is about £5,000,000, but the real balance, according to Government statement, will be quite 3 millions sterling.

Customs revenue diminished 30 million pounds in 4 years, owing to restricted imports.

Total receipts of the Federal Government States and Municipalities, 925,000 contos. This is from all sources. Annual value of production, 2,394,000 contos, paper.

State Finance

Rio Grande do Sul. Receipts (1917), 24,869 contos; Expenses, 20,803 contos.

Rio Grande do Norte. Receipts (1916-17), 4,618 contos; Expenses, 4,618 contos; Debt, 132 contos.

Rio Janeiro (State). Foreign Debt (1917), £2,952,100; Internal Debt, 25,500 contos; Receipts, 17,000 contos; Expenses, 14,056 contos.

Federal District (Capital). (1916.) Receipts, 41,769 contos; Foreign Debt £4,228,980; *Expenses, 56,850 contos; Internal Debt, 127,219 contos.

São Paulo. (1918.) Receipts, 91,194 contos; Expenses, 91,193 contos; Foreign Debt, £6,861,000; Internal Debt, 73,615 contos.

Sergipe. (1917.) Receipts, 4,032 contos; Expenses, 3,117 contos; Passive Debt, 3,403 contos.

Santa Catharina. Receipts, 2,457 contos; Ex-

* Due to great improvements made in all directions.

penses, 2,360 contos (1916); Foreign Debt, £203,167; Internal Debt, 3,547 contos.

Amazonas. Receipts, 11,885 contos; Expenses, 22,675 contos; Foreign Debt 3,259 contos (1916).

Piauhy. Receipts, 1,315 contos; Expenses, 1,490 contos (1916).

Maranhão. Receipts, 3,163 contos; Expenses, 3,043 contos (1916).

Alagôas....Receipts, 2,674 contos; Expenses, 2,672 contos (1916).

Espirito Santo. Receipts, 4,375 contos; Expenses, 4,365 contos (1916); Foreign Debt, 16,529 contos.

Goyaz. Receipts, 619 contos; Expenses, 946 contos (1916).

Bahia. Receipts, 25,410 contos; Expenses, 24,554 contos (1917). Extraordinary expenses to a large amount are not included. Foreign Debt at 27 pence the milreis, 43,555 contos.

Minas Geraes. Receipts, 34,554 contos; Expenses, 30,379 contos; Foreign Debt, 125,264 contos, at 15 pence the milreis; Internal Debt, 197,405 contos (1917).

Pará. Receipts, 11,693 contos; Expenses, 11,079 contos; Debt, December 31, 1916, Foreign, £3,016,000; Internal, 25,250 contos.

Parahyba. (1917.) Receipts, 4,882 contos; Expenses, 4,000 contos. Owes nothing. Has owing 454 contos.

Paraná. (1916.) Receipts, 6,912 contos, Expences, 10,003 contos; Foreign Debt, 43,763 contos; Internal Debt, 2,000 contos.

Pernambuco. Receipts, 14,769 contos; Expenses, 16,551 contos; Foreign Debt, 35,202 contos; Internal Debt, 21,331 contos; Floating, 2,822 contos.

Ceará. (1918.) Receipts, 4,882 contos; Expenses, 5,012 contos.

TOTAL.

	Revenue	*Expenditure*
1909	148,579 contos	193,353 contos
1915	£10,722,400	£12,843,000
1916	214,428 contos	256,876 contos

Banking Operations

The *Caixa de Conversão*, authorized in 1906, was instituted in order to substitute inconvertible notes by others having a gold guarantee The first issues of these latter were quoted at 15 pence, the Caixa accepting bullion at par, and all other coin at market rates. Emission of ordinary paper were to be superseded as soon as sufficient gold reserves entered this bank, and its operations suspended when £20,000,000 were in hand. In 1910, exchange having been improved to a sufficient extent, the Conversion notes were withdrawn, and replaced by an issue at 16d., it being hoped by this means to entirely supersede the inconvertible paper money, and, automatically, as economies were effected, and gold reserves reached a certain level, to raise the monetary value of the milreis to par, 27 pence. In 1911, cash in hand amounted to £24,000,000, in 1912, £25,780,000, but the notes in circulation reached a value of £1,289,318 more than this amount. In 1913, coin in the case had diminished to £18,400,000, and in 1914, half that sum, and since 1915, the total gold reserve has not exceeded 5 millions sterling at any time (up to the end of 1918).

Operations of the Caixa have been suspended for the last three years, and such conversion notes in the hands of the public are at a high premium.

Two Brazilian Marconi Stations.

Some Brazilian Stamps, 1843-1919.

By decree of April 10 (1918), Government sanctioned the removal of sixty thousand contos (four million pounds) to the Treasury, authorizing the destruction of this amount in the corresponding notes, and the emission in their place of a similar sum in ordinary paper.

This 60,000 contos was worth, at the then exchange, at least 88,000 contos, and is destined to form part of the redemption fund, or gold guarantee, with, in addition, the bullion requisitioned from the two mining companies now operating in Brazil. This and a little from other sources it reckoned at £750,000 annually.

Banco do Brazil.—This has no powers of emission, and, in spite of the able exposition of its President in 1917, demanding such, with exclusive rights, also that all paper money should pass through it, the President refused to sanction any abrogation of the sole power of the Treasury (Ministry of Finance) to emit either paper or coin. Expert opinion has also decided against the National Bank, on the ground that without a gold guarantee such issues would be subject to certain depreciation, as well as the caprices of the money market.

This bank made a profit of only 382 contos in 1916, but in 1917 this was increased to 2,346 contos. Branches have been opened all over Brazil, and it is proposed to extend operations to London, Buenos Aires, etc., and, later on, Paris, Berlin, Lisbon, New York, and other important cities.

Total assets, 1918 (June 30): 1,007,743 contos.

Cash in hand: 87,130 contos.

Shares (September, 1914) worth 178 $573. September (1918), 235 $000.

London and Brazilian Bank.—Capital, £2,500,000.

Dividend (1917), 16 per cent. Fresh deposits, £766,000; 6 per cent.

London and River Plate Bank.—Capital, £3,000,000.

British Bank of South America.—Capital, £2,000,000.

Française-Italienne.—£1,000,000.

Hollandsche Bank.—?

The three German banking establishments—Brasilianische, Südamerikanische and Transatlantico—are working under State fiscalization up to the end of the war.

Portuguese interests are well looked after by the Banco Ultramarino, and a new concern, Banco Portuguez do Brasil, possessing a capital of £1,250,000.

The Consulate has maintained for a number of years a Financial Agency, which, according to Dr. Camello Lampreia, former Portuguese Minister, paid the expenses of the Legation and all the Consulates in Brazil through its profits.

Other banks include: The National City Bank (American), Banco Española (now being closed through difficulties in the remission of funds), Banco de Lavoura e Commercio, Credit Foncier du Brésil, etc., and in all probability the Yokohama Bank will open a branch here this year.

Total Bank Movements

December, 1912.—2,725,988 contos, at 16 pence the milreis.

March, 1918.—4,953,307 contos, at 12 pence the milreis.

Circulating medium, June 30, 1917.—£58,876,000.

Of the total assets in March last, the Banco do Brasil, with branches, held 20 per cent.; S. Paulo State, 1,456,029 contos; and the whole of the banks in the Federal Capital, 2,248,888 contos. Rio Grande do Sul, 673,337; Pernambuco, 172,609; Minas Geraes, 140,748; Bahia, 93,146; and Pará, 63,575 contos, no other State reaching anything like this amount.

Savings Banks (Caixas Economicas)

Balance existing in all Federal and State banks, December 31, 234,732 contos.

	Contos	Per capita	
Rio Grande Do Sul ...	18,062	... 15$435	Federal Bank deposits, 1916
Santa Catharina ...	6,399	... 15$137	
S. Paulo	51,416	... Third	
Paraná and Ceará about	5,600 each	Fourth	

No other state having 5,000 contos deposited.

The Federal Capital itself has, however, 73,942 contos in hand, 1917.

S. Paulo State banks had entries of 10,099 contos, and withdrawals of 3,006. There are now (1918) over forty-five branches in the State.

Bahia local savings bank.—Deposits, 362 contos. Withdrawals, 901 contos.

In October, 1918, there were seventeen banks of note operating in Rio Janeiro, the *active* of the most important ones being as follows:—

London and Brazilian . .	219,673 contos
Banco Nacional Ultramarino (Portuguese) . . .	186,923 ,,
Banco Mercantil do Rio .	180,285 ,,
New York City Bank . .	175,234 ,,

London and River Plate Bank	160,548	contos
British Bank of S. America .	142,791	,,
Banco Commercial . .	120,132	,,
Banco Italo Belga . .	117,412	,,
Banco Portuguez do Brasil .	116,179	,,
Banco do Commercio . .	90,251	,, paper

Exports and Imports (Totals)

	Exports	Imports	
1912 ...	£74,849,000 ...	— ...	—
1913 ...	£64,849,000 ...	£67,166,000 ...	Balance against, £2,317,000
1914 ...	£46,803,000 ...	£35,473,000 ...	Balance in favour, £11,054,000
1915 ...	£53,951,000 ...	£44,518 ...	In favour, £15,365,000
1916 ...	£56,642,000 ...	— ...	—
1917 ...	£61,000,000 ...	£44,510,000 ...	In favour £15, 365,000
1918 ...	£61,168,000 ...	£53,262,000 ...	Subject to alteration

Exports per capita.—Argentina, 185; U.S.A., 76; Brazil, 45. Third in America (1912). Thirteenth place in the world, per capita.

Values per ton.—1913: £47 4*s*. 1918: £34 5*s*. Owing to drop in coffee and rubber prices.

Proportion of Imports,

From			Per cent.			Per cent.
Germany ...	...	1912 ...	16½ ...	1917 ...	nil
France ...	...	,, ...	9¼ ...	,, ...	4
U. S. A.	...	,, ...	13½ ...	,, ...	47
Argentina	...	,, ...	8½ ...	,, ...	13
Italy ...	...	1914 ...	4⅕ ...	,, ...	2

	Imports in tons		Ton value
1913	... 5,873,040	...	1914, £11 0 0
1917	... 1,986,114	...	—
Jan.—Oct. 1918	... 1,476,861	...	1918, £29 3 0

Imports (General Classification)

	1913		1917	
	Tons	Value	Tons	Value
Raw materials	3,432,266	£14,063,000	1,049,000	£13,444,000
Manufactures	1,205,108	£37,685,000	374,747	£20,591,000
Food products	951,022	£15,061,000	426,487	£10,398,000
Iron and steel	79,815	£791,000	18,321	£599,000
Copper	6,320	£795,000	2,205	£544,000
Petroleum	106,699	£970,000	88,421	£1,431,000
Coal and Coke	2,518,561	£4,613,000	825,984	£5,012,000

Imports value per ton £11 4s. 1913; £30 6s. 1918.

International Commerce

Retrospect

Without a doubt the war has proved a blessing in disguise to this country, as to many others, the production of cereals having *triplicated*, and industries of every sort springing up all over the Republic.

There are, however, several factors at work since 1914 which hamper the economical progress here as elsewhere.

Transports have diminished to a degree hitherto considered impossible, and shortage of tonnage has been accompanied by a colossal rise in freights and cost of imports, as will be seen, when the tables attached to these notes are examined.

There has been a great misuse of the freight space available, and the restrictions placed on ocean-going vessels by the Allies, in accordance with their own pressing necessities, fully justify the statement made by *The Americas*, organ of the New York City bank—"Hardly a ship leaves a single port in the neutral or Allied world except by permission of the anti-Germanic union of nations."

King Coal, as it is fitly termed, has proved a

deciding factor in this direction, steamers being delayed and detained indefinitely, and even definitely, through the lack of combustible.

Customs revenue has fallen off considerably, and this represents a tremendous loss to the country.

Foreign capital has practically ceased to enter Brazil since 1913, and the great drop in comparative and absolute values of the two staple exports, rubber and coffee, has counterbalanced the increases in other directions. Fortunately there has been a sharp rise in the price of the latter item since the early part of the year.

The Government, like others, took the most tardy, and, at first, half-hearted measures to protect national interests by means of:—

(1) Prohibition of exports of gold, copper and iron.

(2) Prohibition of transference of funds abroad, and operations in exchange except by sanction of the Ministry of Finance.

(3) Nomination of a Commissioner of Public Alimentation, with full powers to requisition stocks, fix wholesale and retail prices and freights, and in general control the whole economical movement of the country.

A tariff has been fixed with regard to many articles of prime necessity, and, after four years of war, for the first time, bread must be sold by weight and at a given price.

Some of the items in the tariff which came into force on September 20, 1918, are evidence of a terrible amount of profiteering going on somewhere.

Petroleum, for instance, is sold at a higher price than crude cane spirit.

The tariff will, no doubt, be altered periodically as occasion arises.

In connection with these measures, and the wise limitation of exports, vested interests in the wholesale trade have revolted, threatening proceedings against the Government for damages, and, in view of possible claims, the books of several protesting firms will be examined, not in the fashion demanded by the merchants, but as far back as the beginning of the war.

A proposal has been made by a group of important houses to sell the stocks to the Government at 5 per cent. above the cost as indicated by their factures.

Labour has had little to say, not possessing as yet any official representative in Parliament, and it may at once be said that the working classes have failed to receive any reasonable share in the fortunes made by the "*Profiteurs de la Guerre*" which have fattened on the nation.

In S. Paulo one firm, with a nominal capital of 10,500 contos, shows a balance of 73,528 contos for 1917, another possesses over four times its capital, and in Rio a shipping company presents accounts showing 27,000 contos to the good, enormous profits having been made by middlemen who were wise enough to hold stocks for a rise.

Not one cent of income tax has been paid on any of these shameful profits, and the Government failed to institute any special *impot* on war profits.

Meanwhile the elementary schools of the capital are filled by children of the comparatively well-to-do, whilst the bare-footed, half-naked and hungry offspring of the labouring classes must go to work in factories, etc., at an age when they should be at their studies.

Some Customs Tariffs

The following are admitted duty free:—

Coal, petroleum, coal and shale oils, machinery for their application, aeroplanes, machinery, etc., for shipbuilding and for motor-car construction, manures, etc., imported by recognized agricultural societies, printing paper, models of inventions, pedigree cattle, veterinary instruments, gold and silver, salvarsan, neosalvarsan, arsenobenzol, nova-arsenobenzol, manuscripts, single copies of any book, most machinery for factories, especially new industries, boats, canoes, etc., and nearly every other sport requisite.

A stamp duty is, however, usually payable, and it will be safe to reckon at least 5 per cent. *ad valorem* on all imports.

Passengers' baggage and ordinary effects, including used furniture, and a reasonable amount of clothing, entirely free, if accompanied by the traveller.

Prohibited.—Sculpture, pictures, etc., of an indecent nature, arms and ammunition (whenever the Government so decrees). Everything prohibited in its place of origin.

Chemical and Mineral Substances

Alabaster, 50 per cent.; asbestos, 20 per cent.; bitumen, 50 per cent.; cement, 60 per cent.; chalk, 60 per cent.; slates, 50 per cent.; pumice, 50 per cent.; tiles, 50-60 per cent.; fluor-spar, 25 per cent.; graphite, 50 per cent.; talc, 50 per cent.; glass, 50 per cent.; porcelain, 50-60 per cent.; copper ware, etc., 50 per cent.; most of the other minerals, 50-60 per cent.; ink, 50 per cent.; paint, 25 per cent.:

artists' colours, 50 per cent.; varnish, 50 per cent.; volatile oils, 50 per cent.; perfumes, 60 per cent.; rouge, 50 per cent. Perfumes, etc., in crystal, gilt, or other expensive pots, etc., pay 120 per cent.

Acetates (usually 25 per cent).; potassium, 50 per cent.; acids, 25 per cent.; albuminates, 50 per cent.; alkaloids, 30 per cent. (quinine, 20 per cent.); alcohol, 50 per cent.; ammonia, 20 per cent.; arseniates, 40-50 per cent.; gun cotton, 25 per cent.; antipyrin, 15 per cent.; lactose, 40 per cent.; balsams, 40 per cent.; benzine, 40 per cent.; benzoates, 50 per cent.; borates, 50 per cent.; bromurets, 50 per cent.; cantharides, 50 per cent.; capsules, 25 per cent.; carbonates, 50 per cent. (average duty); chloral, 50 per cent.; chloroform, 30 per cent.; chloruets, 50 per cent.; chromates, 15-30 per cent.; citrates, 40 per cent.; collodion, 50 per cent.; cyanurets, 25-50 per cent.; disinfectants, 25 per cent.; ethers, 50 per cent.; extracts, 50 per cent.; emulsions, 40 per cent.; flourets, 50 per cent.; fluosilicates, 50 per cent.; formiates, 50 per cent.; glycerine, 50 per cent.; iodoform, 25 per cent.; iodurets, 25 per cent.; lactates, 50 per cent.; lanoline, 25 per cent.; laudanum, 50 per cent.; liniments, 40 per cent.; naphthaline, 50 per cent.; nitrates, 50 per cent.; oxalates, 50 per cent.; oxides (pure), 50 per cent.; pepsin, 50 per cent.; peptonates, 50 per cent.; permanganates, 50 per cent.; phosphates and phosphites, 50 per cent.; salts and saccharates, 40 per cent.; salycilates, 50 per cent.; silicates, 20 per cent.; sulphates, 50 per cent.; sulphurets, 50 per cent.; tannates, 50 per cent.; tartarates, 25-50 per cent.; rennet, 50 per cent.; tar, 15 per cent.; oils, 50 per cent.; camphor, 25 per cent.; opium, 50 per cent.; dyes, 25 per cent.; indigo, 20 per cent.; medicinal

oils, 40-50 per cent.; resins, 50 per cent.; ochres, 50 per cent.; medicinal barks, 30 per cent.; medicinal plants and roots 25 per cent.; mineral waters, 60 per cent.

Sundry Vegetable Products

Spices, 25 per cent.; onions, 50 per cent.; mushrooms, 50 per cent.; hops, 15 per cent.; cloves, 50 per cent.; tea, 50 per cent.; pepper, 50 per cent.; essences, 30 per cent.; fruit juice, 50 per cent.; vinegar or wine, 50 per cent.; cider, 60 per cent.; beer, 60 per cent.; oils, 50 per cent.; wax and gum, 50 per cent.; buttons, 50 per cent.; fruit, 50 per cent.

Animal Products

Butter, 50 per cent.; tinned fish, 50 per cent.; soap, 50 per cent.; candles, human hair, 30 per cent. (prepared in wigs, etc., 50 per cent.); gold fish, 50 per cent.; cage birds, 20 per cent.; hats, 60 per cent.; leather goods, 60 per cent.; brushes, 50 per cent.; pearls, 2 per cent.; ivory and mother-of-pearl, 15 per cent.; horn goods, 15 per cent.; sponges, 50 per cent.; buttons, 50-60 per cent.; bone fans, etc., 50 per cent.

Sundries

Lead pencils, 40 per cent.; shoe polish, 50 per cent.; wooden objects, 50-60 per cent., also bamboo, wicker and straw wares at same rate; Panama and straw hats, 50 per cent.; fishing nets, 50 per cent.; sacks, 50 per cent.; felt hats, 80 per cent.; fine papers, 50 per cent.; memos, bill heads, etc., already printed, 100 per cent.; string and twine, 80 per cent.; lenses, 15 per cent.; spectacles and opera glasses,

50 per cent.; surgical and dentists' instruments, 15 per cent.; scientific apparatus and instruments, 15 per cent.; cinemas, etc., 40 per cent.; arms, 50-60 per cent.; bullets, 80 per cent.; cutlery, 50 per cent.; musical instruments, 50 per cent., others usually 50 per cent.; motor-cars, average total fees, 10-15 per cent.; carriages up to 30 per cent.; carpets (wool), 300 reis a sq. metre up to 100 sq. metres, after 100 reis; *idem* in cotton or jute, 150 reis per metre; cotton socks, 3 $200 to 6 $000 the 12 pairs, according to length of foot; stockings, *idem*, 6 $800-14 $000 the dozen pairs; cotton piece goods, average 50-60 per cent. finest; including lace, 80 per cent.; woollen goods, *idem;* silk goods are all rated very high, usually by weight, reckon over 100 per cent. in any case. Every year some minor changes take place in the duties payable here. Refer to Brazilian Consulate before quoting prices, or ship subject to all duties being payable by importer.

Alterations in Customs Tariff for 1919.

Ropes and cords, of all descriptions, 1$ to 1 $200 per kilogramme; belting for machines, 900 reis; needles for machines manufacturing stockings, etc., etc., 16$ per kilo.; insulators of porcelain, etc., for electrical installations, 200 reis; machinery requiring winding by a spring, etc., 6$; aluminium wires or cables, the same as copper; common paint, 500 reis; asbestos, 200 reis; ribbons in artificial silk, same rate as silk; those in half silk, 50 per cent. less; cardboard, linseed oil, 50 per cent.; formol, 40 per cent.; dry piles (each), 350 reis; mother of pearl shells, 50 per cent., or 200 reis the kilo.; ultramarine blue, 25 per cent.; some increases in earthenware goods.

Free of Duty.—Articles for sports, as well as

clothing, shoes, etc., for football, running, rowing, etc., etc., also gymnastic apparatus.

Factories subject to the "Imposto do Consumo" or local (internal taxes).—Tobacco, etc., beverages, matches, salt, boots, perfumery, medicinal products, preserves, vinegar, candles, walking sticks, corsets, wall-paper, playing cards, gramophone discs, earthenware and china, glass, ironmongery, coffee, and butter.

The Prefect of Rio has sanctioned a new tax of 1 per cent. on the capital of any industrial establishments within the Federal district.

Warehousing Charges

Example.—One barrel of wine weighing 100 kilos at 240 reis a kilo pays 24 $000 duty. Strength, 14 degrees.

Thus 1 per cent. a month of its value, i.e., 48 $000, 480 reis warehouse charge.

For two months the rate is 1½ per cent. of value, for three, 2 per cent., for over three months, 3 per cent.

Taking an object with duty at 10 per cent. of its value, the warehouse charge for thirty days would amount to, on 100 $000 value, 1 $000.

Goods destined for the River Plate are free of warehouse duty in the Custom Houses of Rio Grande, Porto Alegre and Pelotas for six months.

Many articles are subject to double warehouse charges, including all inflammables and most bulky goods.

The tariff may be calculated with ease, milreis gold being worth 27 pence. Paper, fluctuating, but nominally at 16*d.* the milreis.

See Kelly's "Customs Tariffs of the World," also

a new publication by the *Shipping World*. Both issued in London.

For up-to-date information on trade with Brazil, consult *The Bulletin of the Pan-American Union*, Washington, D.C., U.S.A., English, Spanish, Portuguese and French editions, also *British and Latin American Trade Gazette*, English, Portuguese and Spanish editions, monthly. See also *Tropical Life* and *South American Journal* (oldest established journal of its kind). These three in London.

Manufacturing Industries

In 1912 the total factory production of Brazil amounted to 482,605 contos of reis, 25 per cent. credited to textiles. The total amount in 1915 was 551,232 contos, and in 1916 there were 26,493 factories and workshops in the Republic, of which 13,577 were producing beverages, 5,993 boots and shoes, 2,036 tobacco, cigars and cigarettes, 945 chemicals and drugs, 690 hats, 657 conserves, 475 perfumes, etc., etc.

By the end of 1917 the total output of the larger concerns employing machinery amounted to 741,536 contos, the capital engaged 66,576 contos, and the number of workers 151,841.

In 1917, of the revenue from the above sources, S. Paulo yielded 26,860 contos of taxes; Rio (city), 24,583; Rio State, 8,880; Rio Grande do Sul, 8,723; Pernambuco, 5,664; Bahia, 5,227; Minas Geraes, 4,449; Paraná, 4,387; Pará, 2,667; and Santa Catharina, 1,294 contos of taxes on industries.

New companies in 1917 include:—

Lloyd Nacional (shipping), 8,000 contos capital; Comp. Brasileira e Brittanica (chilled beef, etc.), 4,000 contos; Jacuhy Coal Mines, 3,000 contos;

Brazilian Meat Co., 2,000 contos; Armour's (Brazil), 2,000 contos; and Companhia Frigorifica (Santos), 1,000 contos, all, however, paling before the Companhia Agricola F. Schmidt (S. Palo), 15,000 contos.

Water Power and Electricity

Pará has electric light, and 55 kilometres of tramways, and Manáos is said by Paul Walle to be the best illuminated city in Brazil. Maranhão, Bahia, Campos, Friburgo, Bello Horizonte, Curityba, Porto Alegre, *enfin*, most Brazilian cities of any importance, use electricity both for power and lighting. Even such out of the way places as Diamantina are indebted to this wonderful force as yet in its infancy. Brazilian towns in general are so situated that it is only necessary to make use of the water power close at hand. Here then is a great opportunity for the electrical engineer to call into being forces that are still lying dormant.

The Rio de Janeiro Tramway, Light and Power Company disposes of a dam at Ribeirão das Lages, 84 kilometres from the capital, having a capacity of 220 million cubic metres of water.

Regulations of the State of Minas Geraes regarding Concessions of Waterfalls for Light and Power Companies.

Petitions must be addressed to the Secretary of Agriculture, at Bello Horizonte, stating—

The purpose for which needed, horse-power, position of power station, and distance from falls, description of lands over or under which the cable pass, description of the site for dam, and all buildings existing on it, as well as the total estimated H.P. of the falls.

A provisional concession will be granted, for the purpose of preparing all technical plans, etc., and this will be available up to eighteen months, within which time they must be submitted to the Government for approval, in default of which, or failure to sign a definite contract within three months after approval of the same, the concession will be null and void.

No monopoly will be permitted, and all expenses of permanent fiscalization must be paid by the concessionaire.

One-third of the energy evolved may be reserved by the State for public works, and payment per kilowatt hour will be made, according to equitable rates.

The concession may be granted for thirty to sixty years, at the end of which all the installations become State property.

Many other conditions are embodied in the above decree (No. 573, of September 19, 1911), especially as regards terms of payment for the concession, and safeguards to protect public interests.

Some Prices in Minas Geraes

Sixteen-candle-power lamps (per month): Bello Horizonte, 4 $400; Juiz de Fóra, 4 $000; St. João d'El Rey, 4 $000.

Per Kilowatt

Juiz de Fóra, 60 reis.

Per Horse Power

Leopoldina-Cataguazes: 5 H.P., 128 $000; 10 H.P. 216 $000; 20 H.P., 360 $000; 50 H.P., 805 $000. Juiz de Fóra: 5 H.P., 75 $000; 10 H.P., 120 $000; 20 H.P., 200 $000; 50 H.P., 500 $000.

CHAPTER XI

NATURALIZATION, CONSTITUTIONAL AND COMMERCIAL LAWS, AND EDUCATION

United States of Brazil (Estados Unidos do Brazil)

Federal Republic of twenty states, one national territory, and one federal district.

Flag, green, charged with a yellow diamond extending almost from end to end and top to bottom. On the latter is placed a blue sphere, traversed obliquely by a white band bearing the device ORDEM E PROGRESSO. Above the band is a solitary white star, and below twenty others, representing the States. National colours are green and yellow.

The arms are—A five-pointed star, each ray half green, half yellow vertically. On the left a spray of coffee, and on the right one of tobacco. Within the star a double circle in blue, the outer of which contains twenty stars, and the inner five, to form the Southern Cross. In the centre below the circle a vertical sword. The label at foot contains in the centre—Estados Unidos do Brazil, and underneath—15 de Novembro, de 1889.

Notes on the Constitution (February 24, 1891), and Form of Government of Brazil

The Republic consists of the United States of Brazil, and the internal affairs of each state may not

be interfered with by the Union, unless to repel foreign invasion, or in the case of civil war between two states or to re-establish order within the territory of any state, by request of its authorities.

Each state must provide for its own necessity, except in the case of an attack by an outside enemy, or in the event of great and unforeseen disaster.

It is the exclusive prerogative of the Union to decree duties and taxes on imports and port dues, stamp duties, and postal and telegraph charges, to maintain banks, and create custom houses, and the laws of the Union shall be executed by its officials, but they may be entrusted to State Governments by consent. Interstate duties are prohibited, but states may create export duties, taxes on real estate, and charges of a state nature in relation to postal and telegraph services.

Interference with, or aid of religion, is prohibited. Coasting traffic must be carried on in national bottoms (i.e., under the Brazilian flag).

Legislative powers are vested in the National Congress, with the sanction of the President. The elections for Senators shall be carried out simultaneously throughout the country. Legislature shall last for three years. There shall not be less than four Deputies for each state. The Senate shall be composed of citizens over thirty-five years of age, and include three from each state, and three for the Federal District of Rio de Janeiro.

The President and Vice-President of the Republic shall be elected by direct suffrage of the nation, and the mandate of a Senator shall last for nine years. The Senate alone shall have the power to try and sentence the President of the Republic, and other members of the Government. The President must

be a Brazilian born, and be over thirty-five years of age. He may choose and dismiss at will all Cabinet Ministers, and declare peace and make war.

Adult suffrage is the law, with certain exceptions. The Cabinet consists of the Ministers of the Exterior (foreign affairs), Interior and Justice, Finance, Marine, War, and Public Works, and since 1907, Agriculture, Industry and Commerce.

The judical power consists of a supreme court of fifteen justices, who hold office during life, and ordinary Federal Courts scattered through the country.

The Senate consists of sixty-three members, three for each State, and three for the Federal district.

The Chamber of Deputies comprises 212 members (one for each 70,000 inhabitants), elected for three years.

Brazil forms part of the Postal Union, and is a party to the international agreements with regard to telegraph, submarine cables, marine signals, and protection of industrial property.

Foreigners enjoy the same civil rights as Brazilians, including trade marks and patents privileges. The army consisted of forty battalions of infantry, six of siege artillery, six regiments of field artillery, and fourteen regiments of cavalry, but since 1902 has been reorganized and increased. Conscription has also been adopted. No aliens are admitted into the army or navy.

With regard to marriages, the civil ceremony is obligatory, and the religious services are not officially recognized. Both are the rule, however, amongst Brazilians of all classes. The laws for the protection of single women are very severe, and in case of rape every possible attempt is made to com-

pel immediate marriage, thus avoiding heavy punishment. Registration of births is compulsory, but the law is frequently evaded, as is also the new vaccination decree, although schools are obliged to publish a notice refusing to take pupils who have not been subjected to the operation.

Synopsis of Naturalization Law of May 14, 1908

Art. I. The following persons are considered to be Brazilian citizens: —

(1) Those who are born in Brazil, although the father may be a foreigner, provided he is not employed in the service of the nation to which he belongs. .

(2) The children of Brazilian fathers, and illegitimate children of Brazilian mothers, born in foreign countries, if domiciled in Brazil.

(3) The children of Brazilian fathers employed in the service of the Republic in foreign countries, although not domiciled in Brazil.

(4) Foreigners who resided in Brazil on November 15, 1889, and who had not up to August 24, 1891, declared their intention of retaining their original nationality.

(5) Foreigners owning real estate in Brazil, married to Brazilian women, or having Brazilian issue, provided they are resident in Brazil, and have not declared their intention to adhere to their original nationality.

(6) Foreigners who apply for naturalization under the present law.

Art. II. Naturalized foreigners shall enjoy all civil and political rights, and may hold *any* public office, except that of President or Vice-President of the Republic. The office of Senator may be held

after six years' citizenship, and that of Deputy after four years.

Art. IV. Foreigners who desire Brazilian citizenship must apply to the President of the Republic, through the Ministry of Justice.. Applications must be signed and authenticated by a notary public, and must state nationality, parentage, domicile, profession, condition, and legitimate issue must also be mentioned.

Applications must be accompanied by certificate of personal identity, legal age, residence of not less than two years in Brazil, good moral and civil conduct, and proof that applicants have not been indicted in Brazil or elsewhere for the offences enumerated in Art. IX.

Art. V. Necessity of actual residence shall not be obligatory in the cases of foreigners married to Brazilian women, those with real estate in Brazil, those interested in some industrial undertaking, or who are inventors or introducers of some industry useful to the country, and those recommended by their talents or literary attainments, or by their professional skill, and finally, sons of naturalized foreigners born abroad before their fathers' naturalization.

Art. VI. Certificates from public departments, or given by judicial, municipal, or police authorities of Brazil, are sufficient proof of identity. Certification of signatures by notaries, or in case of application through the latter, power of attorney is sufficient, and birth or baptism certificates, or passports, or other admitted documents, will be proof of legal majority, and certificates from the authorities of his place of domicile, from his consul or diplomatic representative, will be accepted at proof that he has

not been convicted of the crimes mentioned in Art. IX.

Art. VIII. *Papers relating to naturalization are exempt from all costs, stamps or fees.*

Art. IX. Foreigners who have been convicted of homicide, theft, bankruptcy, perjury, smuggling, forgery, counterfeiting, or immorality, will not be permitted to naturalize.

Art. XVI. The titles of naturalization must be claimed within six months by persons living in the Federal Capital.

Art. XVII. Persons residing in the states must claim their titles within one year.

Elementary Education

Free but not obligatory. The schools are of two grades. In the purely elementary section, pupils remain from 7 to 13, and in the second until 15. At this age, the student should have an all round knowledge of the usual subjects, besides the rights and duties of citizenship, some smattering of French, algebra and trigonometry, also first principles of common law, political economy and natural history.

Physical punishment is absolutely prohibited in Brazil.

Recent figures give the number of pupils in the Rio Janeiro Gymnasium as 529, the Normal School having 568, the Pedagogium 225, the Polytechnic 124, whilst the two Law Schools are positively crowded, and the School of Medicine possessing no fewer than 1762 students.

There are also in the capital of the Republic Schools of Fine Arts and Music, an Academy of Commerce, Lyceu de Artes e Officios, a Correctional School, &c.

In São Paulo there are schools of Music and Dramaticism, also of Law, a Polytechnic, School of Pharmacy, a Gymnasium, &c.

Recife has a Faculty of Law, as also Bahia, Pará, and Porto Alegre.

There are Polytechnics also at Bahia, Recife and Porto Alegre, the latter possessing a great number of elementary schools, like Minas Geraes and São Paulo.

At Pará is the Lauro Sodré Institute, and at Itajubá in Minas, in addition to the following list, there is an Engineering College.

Education in Minas Geraes

The capital (Bello Horizonte) has nine Colleges and a Gymnasium, a Faculty of Law, one of Medicine, one of Dentistry with a three years' course, a free School of Music and a Gymnasium with primary and secondary courses comprising French, Latin, German (or English). The total fees payable in the Gymnasium amount to some £10.

The Normal School is so successful that the courses have to be doubled or trebled, the fine building in use being entirely inadequate to the number of students. My impressions of the above, and of the Technical School, and Elementary School and Kindergarten visited in July, 1913 are, that it would be very difficult to improve upon the earnestness, enthusiasm and capacity of the professors and teachers, and the average intelligence and good conduct of the pupils, drawn from several nationalities as they are. The equipment of all these establishments appears to be quite up-to-date, and I look forward to paying another visit in a year or two.

Besides those mentioned already, there is an Engineering School in the capital, an Anglo-Brazilian College, several other private colleges, night and rural schools. The João Pinheiro Institute, a little out of the town, is of a mixed nature, combining ordinary elementary education with manual training and an agricultural course. There are at present seventy-five orphans here, and they are considered wards of the State. After two years each boy receives 5 per cent. of his earnings in cash, and 15 per cent. is placed to his credit. He rises in winter at 6 a.m. and summer at 5.30 a.m., and goes to bed at 8 p.m. Takes coffee at 6.30, breakfast at 9.15, lunch at 3.30 and dinner ends shortly before bedtime. There is no stint as regards food.

The Institute has its own band of music, a library and recreation room, pharmacy, etc. Each boy costs the State 332$777 yearly for board, clothes, doctor, etc. He learns to make his own shoes and working clothes, tin ware and wooden vessels. Dairy work, vegetable and grain crops, etc., take up most of his time. There are also at the Institute prize stock for breeding and sale. The boys conduct their own affairs largely, by means of a Parliament, a Cabinet exists with full powers, the intelligent youth who conducted me over the farm being Minister of Finance *pro tem.* Leaving the Institute at 17 years of age, the boys are well prepared to make their own way in the world.

There are in Minas two other establishments of a similar nature, one, Dom Bosco, administered by Salesian Fathers at Cachoeira do Campo, in a very healthy situation, 1,100 metres above sea level. There are only thirty-one boys here at present, most of whom pay 100$ per quarter, the State, however,

having the right to nominate twenty indigent pupils. The students remain until the age of 16, have their choice of agricultural or other pursuits to some extent, and work six hours daily. The other Institute, Bueno Brandão, is in the Colony Barão de Ayuruoca, and maintains forty-five pupils.

There are in the State (1918) over 100 private colleges, and 1,650 elementary schools, the attendance of the latter exceeding 140,000.

Formerly, besides the great colleges, there were many schools all over the country that were able to give their students a degree, and invest them with the coveted cap and gown. A great reform was made in 1911, and no longer callow cubs are respectfully titled "*Seu Doutor.*" The graduate receives only a diploma, as a certificate that he has completed his course as a doctor of law or medicine, dentist or engineer. Every school properly equipped and staffed is on an equal basis before the law, subject to its students being obliged to submit to entrance examinations as well as periodical ones. The result of this revolutionary process is already manifest in the opening of a number of preparatory schools, as well as professional coaches. Formerly the gilded youth sought the title of Bacherel, as an aid in his social life, like one still finds in England men who claim status, by reason of a bare pass, after having crammed at one of the 'Varsities.

The great evils perpetuated under the extinct system bore fruit in abuses of all sorts, especially in connexion with official employment. In many cases, men with real practical ability were left behind in the race for promotion by those whose greatest claim to consideration was their title. To-day this is all changed, and a new era has arrived, in

secondary and higher education, as in many other ramifications of daily life. Whereas not 20 per cent. of the students exercised their professions, or continued their studies, conscious that their future was assured, now it is very difficult to get employment in the Government service without passing a competitive exam., or to make progress, unless able to demonstrate their proficiency in whatever branch of the public work they are connected with.

There are fine public libraries all over Brazil. The National Library in Rio possesses more than 400,000 printed books and manuscripts. There is also a National Museum and Academy of Fine Arts, and a splendid, world-famous Botanical Gardens. The Brazilian Academy of Letters has forty members.

In São Paulo there is a very fine modern museum (Ypiranga), on a site said to commemorate the declaration of independence. There is also there the McKenzie College, with nearly 600 students. The pupils are mostly Brazilians, but there are representatives of nearly all the nationalities to be found in Brazil. The states of São Paulo and of Minas Geraes are probably the best equipped with elementary schools in the Union. The former has also a fine agricultural college.

Law Relating to the Exercise of the Medical Profession, and Pharmacy in Brazil

Doctors may practise in Brazil under the following conditions:—

(1) Possessing diplomas given by the Faculties of Medicine at Rio Janeiro, Bahia and Porto Alegre.

(2) Passing a new examination before a Brazilian board of examiners.

(3) Professors of Medicine at a foreign University or School of Medicine, who present proofs of ability to a Diplomatic Agent of Brazil, or a Consul in default, and solicit permission of the Department of Public Health to practise their profession.

(4) Foreign doctors who are authors of valuable works on medicine, surgery or pharmacy, and have obtained the sanction of the Health Department.

Persons pretending to cure by means of spiritualism, magic or other occult means, or who pretend to cure diseases recognized as incurable by the faculty will be prosecuted.

It is forbidden to practise medicine and pharmacy at the same time, even though the person possesses two diplomas.

Doctors, chemists, dentists and midwives must present their diplomas to the Department of Public Health and become registered.

Midwives are forbidden to do anything which should be performed by a doctor, and may not prescribe medicines, except antiseptics or urgent remedies.

Dentists are prohibited from performing operations which are not connected with their professions, may not administer internal remedies nor anæsthetics.

No pharmacy may be opened without the consent of the Department of Public Health, which will examine the stock, the utensils, and the books which must be kept, according to law.

No druggist may sell toxic medicines or make up prescriptions.

Quacks and other Charlatans

Recent decisions of the Department of Police

have emphasized the fact that public credulity is not allowed to be made the excuse for exploitation, and the Rio authorities even forbade the advertisements of a so-called AUTO curer, on the ground that even if he failed to prescribe drugs, science was necessary if satisfactory results were obtained, and he had no professional right to call himself doctor.

Criminality (Punishments)

Lesions caused by a blow are liable to condemn their inflicters to three to twelve months' imprisonment, and if the attack causes more than a month's illness, sentence of one to four years may be given, and if deformity arises, as much as six.

Accidents due to professional neglect are punished by detention up to six months, and if the act is caused by an unregistered practitioner, three years' imprisonment may be given.

Death resulting from a medical or other operation by a physician, surgeon, or dentist renders the guilty person liable to two years.

If a secondary result of an assault, the criminal may get four to twelve years in the penitentiary, and the penalty for homicide may vary from twelve to thirty years.

The Federal Jury consists of 12, and the verdict of a distinct majority is necessary to secure conviction.

Appeal may be made to the Supreme Tribunal of Justice.

Law Sittings

Criminal Courts open all the year. Civil Courts are closed from February 1 to March 31, and during Holy Week.

Holidays

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
National ...	1	24	—	21	3	—	14	—	7	12	2/15	—
City of Rio	20	—	—	—	—	—	—	—	10	—	—	—
STATES												
Alagôas ...	—	—	—	—	—	11	—	—	16	—	—	—
Amazonas ...	—	—	—	—	—	10	1	17	5	—	21	—
Ceará ...	—	—	25	—	—	—	12	—	—	—	16/24	—
Espirito Santo	—	—	—	—	2/23	12	—	—	2	—	—	26
Goyaz ...	—	—	—	—	—	1	—	—	—	—	—	16
Maranhão ...	—	—	—	—	—	—	28	—	—	—	18	—
Matto Grosso	22	—	—	—	—	13	—	15	—	—	—	9
Minas Geraes ...	—	—	—	—	—	15	—	—	—	—	—	—
Pará ...	—	—	—	—	—	—	—	15	—	—	16	—
Parahyba...	—	—	—	—	—	—	20	5	—	—	—	—
Paraná ...	—	—	—	7	—	—	—	—	—	—	—	19
Pernambuco	27	—	6	—	—	17	24	—	—	—	10	—
Piauhy ...	24	—	—	—	—	13	—	—	—	—	16	—
Rio Grande do Norte	—	—	19	7	—	12	—	—	—	—	—	—
Rio Grande do Sul	—	—	—	—	—	—	—	—	20	—	—	—
Rio de Janeiro ...	—	—	—	9	—	—	—	—	18	—	—	—
Santa Catharina ...	—	—	—	—	—	11	—	—	—	—	17	—
São Paulo	25	—	—	—	—	—	8	—	—	—	—	15
Sergipe ...	—	—	—	—	18	—	—	—	1	1/24	—	—
Saints' Days	6	2	25	—	—	24/29	—	15	8	—	1	8/25

Bankruptcy Law

This law came into force in December, 1908. It contain 15 chapters, and the principal items are:—

In case of debtors offering 60 per cent. of amounts due, any agreement between creditors must be approved by 60 per cent. of the claims. Bankrupts offering 40 per cent., at least two-thirds of the creditors must be in accord and represent 75 per cent. of the debt. If less than 40 per cent. is offered, the composition should be approved by three-fourths of the claimants owning not less than 80 per cent. of debits. No agreement or composi-

tion will be considered valid unless at least 20 per cent. is offered by the debtor.

Food Laws of Brazil

Article 40, Law 428 (December 10, 1896), prescribes as follows:—

Wines, lard, and all other food substances condemned by the National Laboratory shall be destroyed, and the importers fined 500 $000.

There shall be condemned as injurious to health *all* food products containing boric or salicylic acid, inferior alcohol, free mineral acids (sulphuric, sulphurous, azotic, chlorhydric), sulphide, alum fluorates, and alkaline fluosilicates, saccharine, compounds of strontium, and other minerals in the proportion of 15·4324 grains (2 grams) per litre (or 1·0567 quarts) of wine. Hop substitutes in beer, as quassia, absinthe, aloes, etc. Also any essentials prepared with ethereal oils, colouring matter prepared from coal tar, and of a lead base; mercury, copper, arsenic, antimony, or *any other substance* which science has recognized as injurious to health. The importation of artificial wines is prohibited under *all* circumstances. Wines with more than 20 per cent. of alcohol may have four grammes of sulphate of potassium per litre.

In 1898 and 1905, additions were made to the list of prohibitions, including adulteration, purposely so made, of wines and spirits, and also naturally generated noxious properties, *due to chemical reaction on hops in transit, etc.*

Immense quantities of beverages of *all kinds* have been condemned, owing to their containing salicylic acid, excess of sulphates, colouring matters (aniline), and free sulphurous acid.

Among other products destroyed have been meats, (*particularly hams*), preserved vegetables, sweets, and fruit preserves, butter (containing boric acid).

Analysis (fee 25*s*.) is obligatory of every kind of food or beverage sold within the country. This fee may be increased under special circumstances.

It should be noted that the Custom House and the Federal District have separate laboratories, the latter being very finely equipped.

On April 24, 1918, *Decree* No. 12,982 was promulgated.

This establishes measures for the inspection of all food products which are destined for export, and enacts the heaviest penalties for any contravention of the regulation enforcing certificates for all shipments. These fines may be as high as 5 contos.

Patent Law

1. The invention must be described fully, and all plans, drawings, samples, etc., etc., be presented in duplicate to the first section of the *chief office of the Ministry of Agriculture* (Department of Industry).

2. All details must be in the vernacular (Portuguese) without any corrections or erasures, initialled on each sheet, and signed by the inventor or his representative.

3. Weights and measures must be according to the metrical system.

Temperature by centigrade thermometer, and density according to specific gravity.

4. Plans to be on white paper without folds or joins, and in black indelible ink. Sheets to be 33 centimetres in height by 21, 42 or 63 breadth, enclosed in a single lined frame, with an all-round margin of 2 centimetres.

6. A receipt may be had for the plans (free of charge) if desired.

7. After deposit of plans and specification, petition must be made to the Minister of Industry for a patent. This must be distinct for each invention, and must contain name, nationality, profession and residence of inventor, and the purport of the invention.

8. The petition must contain also a list of the documents, etc., and in case of being presented by an agent, a power of attorney (procuração), and the original patent, if it is a case of an invention already protected abroad.

9. The President of the Republic will sign all patents, and then publication of the Presidential dispatch will be made in the *Diario Official*, and the inventor invited to personally demand the titles, pay the fees and dues, and witness the opening of the envelopes containing the documents, on a day and hour fixed within one month.

10. In case of Provisional titles, no duplicates are required. Such a title may be given, up to a period of three years, without formalities, but if the invention is worked industrially during this period, the inventor shall lose the right of priority. Stamp duties on Provisional titles are 11 $000.

11. In case of an invention of a dangerous or dubious nature, or one dealing with food, chemicals or materia medica, *a secret examination is made by the Government.*

There are in Rio de Janeiro now, several patent agents, and it is better to entrust the conduct of negotiations to one of these.

Trade Marks Regulations

1. Trade marks showing designs of medals, prizes or diplomas must be authenticated by presentation of said medals, etc., etc.

2. All other signs, arms, blazons, names, must be authorized.

3. Words, signs or pictures offending decency are prohibited.

4. National (Brazilian) arms are not to be used as a trade mark.

5. Registration lasts 15 years (cost 12 $000), and at the end of that period may be renewed.

Depositing of trade mark 4 $000.

To obtain Registration

Three copies of the trade mark must be sent in, containing: —

1. Description and characteristics.

2. Reproduction, with all accessories, including sample of ink to be used.

3. A declaration of the business for which to be used, and the profession and domicile of the petitioner.

4. The petitioner may declare that said mark may vary as to size, colours and their arrangement.

Petitions and copies of the proposed must be on strong paper 33 centimetres high, and 22 centimetres wide, with a margin for binding, and no folds or joins, all to be stamped, dated, and signed. The secretary of the Commercial Board (Junta Commercial), or the official appointed, shall certify the day and hour of presentation of models, etc., and register same, and as soon as registration is granted, the secretary of said Junta, or officer of Department of Commercial Inspection, shall certify

Botafogo Bay and the Sugar Loaf, Rio de Janeiro.

... BEIRA MAR, RIO.

same on each copy of mark, and cause the petition to be filed together with one of the copies, numbering it, and also the remaining copies, which shall be returned to the petitioner. Publication shall be made within 30 days in the *Diario Official*, or in the official organ of any state, together with a full description of the trade mark, and as soon as the preliminaries are concluded, the *Diario Official* shall publish a certificate of registration.

Appeals for annulling registration must be made within 5 days, or in case of non-residence of the appellant 30 days. *As in the case of patents it is advisable to employ a local agent.*

Copyright

Full protection is now given to foreign authors, artists, and musical composers in case of reciprocation only. The Convention between Brazil and France was ratified in Rio on September 11, 1917.

Power of Attorney

Any person of adult age, and in possession of civil rights, may sign a power of Attorney (Procuração). This must be written in Portuguese, according to established formula, and signed and stamped with a 2$000 federal stamp, and must bear the signature of a witness of local standing. Cost of this 5$200. It should be drawn up in the office of a Tabellião or Notary.

Guarantee of Rent

Any person wishing to guarantee the payment of house rent should specify (in the vernacular) that the landlord may deliver to Mr. So and So the keys of the house situated at No. . . Rua . . . . . Cidade . . . (or Villa, etc.) . . .

The undersigned being responsible for the monthly (or yearly) payment of Reis . . . $ . . ., as guarantor until the keys are returned to the owner of the house. The document must be signed across a stamp of the necessary percentage on a year's rental, and witnessed by a person of repute.

It is, however, a frequent custom in Brazil to demand one to three years' rent in advance from persons having no previous legal domicile in the Republic.

Subsidies

The President of the Republic is authorized to grant a subsidy, at the rate of £250 per kilometre (0·62 mile), to companies or private individuals building roads, and organizing automobile services for passengers or goods between two states, or across one only. The roads shall be made in accordance with Government regulations, and the subsidy shall be paid when 120 kilometres have been completed, inspected, and approved.

India-rubber Goods

Fifteen per cent. export duty is charged on raw rubber, and at least 50 or 60 per cent. on manufactured goods entering the country, of which a very large quantity indeed are used.

There are openings for biscuit, fancy soap, starch and chemical works, box makers, canneries, steam laundries and saw mills.

There are hardly any lines of steam trawlers, but one piano manufactory (Paraná), and few factories where jams, jellies and marmalade are made on English lines, although there is a good market for the best European brands.

There are, in fact, openings for all kinds of factories, works and mills, and inducements are offered by various municipalities, such as free sites and lighting and power for a period, and exemption from local taxes. A nominal duty is charged on machinery for manufactories, and in many cases it is admitted entirely free.

Marks on Packages

English	Portuguese
Top	Tampa
Bottom	Fundo
Open this side	Lado a abrir
Fragile	Fragil
Keep dry	Afasta da humididade
Keep cool	Afasta do calor
Keep in a vertical position	Colocar no senso vertical

Consumption Tax

All articles subject to this impost must be plainly labelled, or branded on the case or other receptacle, as well as on every piece of cloth or packet. In the case of boots and shoes, on the soles.

House Duty (Federal District)

Twelve per cent. on rental. Outer Zone, 6 per cent.

Stamp Duty on Bills and Posters on Hoardings

Thirty reis each.

Emission and Circulation of Cheques

By decree of August 7 (1912), the President of the Republic sanctioned the following law:—

ART. 1.

Any person possessing funds in banks or other financial establishments may draw cheques payable at sight or otherwise.

Cheques should bear the date and place of emission, the signature of the drawer, and the name of the person to whom payable.

ART. 4.

It should be presented within five days if payable in the city where it is drawn, or within eight days if in another city.

ART. 6.

Any drawer of a cheque omitting the date, or putting in a false one, is subject to a fine of 10 per cent. of the amount.

ART. 7.

Any person drawing cheques without sufficient credit to meet them is also subject to the same penalty.

ART. 14.

Cheques are exempt from stamps, but the cheque books are subject to the tax established by law.

Clearing houses may not function without authorization of the Federal Government.

State and Municipal Loans

1. The Federal Union will not be responsible for loans contracted by states or municipalities, either in Brazil or abroad, unless these have been arranged after authorization by the National Congress.

2. Bonds, etc., representative of such debts, may not be offered for sale on the Brazilian Stock Ex-

changes unless approved by the Federal Legislative Power.

3. In case foreign creditors endeavour to exert pressure on states or municipalities with regard to repayment of such loans, the Federal Government will intervene to maintain the integrity of national territory, and the form of the federated republic, according to the Constitution.

Labour Insurance

In January, 1919, a law came into force which guarantees an indemnity to all workmen disabled in the course of their occupation, and insures against death, as well as permanent or temporary incapacity for work, providing also that the entire process shall be terminated within twelve days of the accident, and limiting the maximum compensation to a basis of 200 $000 monthly (£10).

Landing Restrictions (Rio Janeiro)

No foreigners are allowed to land in Rio for the present, unless having been previously resident in the country, or possessed of undeniable papers, proofs of respectability, etc. This is a measure of the Chief of Police, and may be subject to abrogation at any moment. It is, moreover, positively illegal, and without a single justification from the point of view of justice, but undoubtedly a wise regulation.

Civil Marriage

Requirements

1. Either birth certificates, or other proofs of adult age. If minors, the consent of parents or guardians must be obtained.

2. Two witnesses to the condition of contracting parties, with proof of the absence of impediment, and in the case of a former marriage, either the death certificate or that of annulation of marriage.

(There is no divorce law in Brazil at present).

Particulars of Birth Registration

Date and place of birth, sex, if twin or not, legitimate or otherwise. Name, nationality and residence of the parents and grandparents, and godfathers and godmothers, if any.

Particulars for Registration of Death

Day, month, year and place of death, name, sex, age, condition, profession and nationality, and domicile of deceased person. If married, the name of the surviving partner, if legitimate, or not.

Name, business and residence of the parents. If a will was made, or not, if children alive, how many. Mode of death, and the place where burial will take place.

Official Burial Charges (Rio de Janeiro)

Including coffin, hearse and certificate:—

First class, 591$; 3rd, 241$; 5th, 106$; 8th, 20$.

Tombstone, 250$.

Intervening classes at proportionate rates.

Taxes and Stamp Duties

All receipts for amounts over 25 milreis must bear a 300 reis stamp, as well as cheques, petitions (each page), memorials, letters of exchange, and all other documents.

Commercial houses with a capital of over 5 contos

must have their books registered and stamped in the Junta Commercial.

The following articles are subject to Stamp Duty: All beverages, manufactured tobacco, matches, perfumery, salt, candles, boots and shoes, vinegar, drugs, umbrellas, hats, textile fabrics, etc. Everything must bear the necessary stamp before being exposed for sale. Heavy fines are exacted for non-compliance.

PROPORTIONAL TAX.

		Stamp Reis
Documents to value of 200 dollars	=	400
200 ,, ,, 400 ,,	=	800
400 ,, ,, 600 ,,	=	1$200
600 ,, ,, 800 ,,	=	1$600
800 to 1,000 dollars (1 conto)	=	2$000

And per conto in addition, 2 milreis stamp duty.

Bills of ladings (outwards), 300 reis.

All petitions, memorials, &c., 600 reis per foolscap page.

Most other documents, Customs certificates, etc., 2$000, and each *leaf* of books kept by factories, auctioneers, anonymous societies, &c., &c., 80 reis (1918), besides a stamp duty of 6$000 on the opening or closing of such books, and Chemists or Druggists (in states which have no special legislation to this effect) are also subject to this tax.

Contracts or other documents referring to commercial firms, pay 11 milreis, 11$000.

Nomination of book-keepers, valuers or other commercial experts, 22$000. Rehabilitation of bankrupts, 8$800. Dispatching agents (custom's) and their clerks, 77$000.

All other stamp duties are double those of 1915, &c.

Financial Aid

Loans may be granted to the owners of cotton and other mills up to six months, and amounts may vary from 50 per cent. to 70 per cent. of the value of stocks, interest being charged at the rate of 6 per cent. Credit to the amount of 50,000 contos (£2,500,000) will be opened this year (1919) in accordance with Decree 13,407, of January 13. The Bank of Brazil will charge a commission of 2 per cent. for its services in this connection; and an insurance policy must be taken out by the borrower, as security for any loan granted.

Coinage

Unit.—1 real. Base-Milreis (1$000). 1,000$000 equals 1 conto of reis.

Copper Coins.—(Being withdrawn from circulation.) 20 reis, weight 7 grammes, and 40 reis, weight 12 grammes.

Nickel.—20 reis, 50 reis, 100 reis (weighs 5 grammes), 200 reis (8 grammes), 400 reis (12 grammes).

Silver.—500 reis (5 grammes, 90 per cent. pure), 1$000 (10 grammes), 2$000 (20 grammes).

Gold.—(Not Circulating.) 10$000(8 $\frac{96}{100}$ grammes). 20$000 ($17\frac{92}{100}$ grammes). These coins are $\frac{917}{1000}$ pure.

Paper.—1, 2, 5, 10, 20, 50, 100, 200, 500, and 1,000$000. Beware of issues being withdrawn from circulation. Those of 1$, series 6 and 7; 2$, series 6 to 9 (printed in England); 5$, series 8 to 13, all of these commencing to lose value in December, 1917, and becoming worthless by March, 1920.

On and after June 30, 1919, the following notes will become subject to discount. 10$000:—Series 8 to 13; 20$, numbers 10 to 12; 50$, series 9 to 12;

100$, numbers 10 to 12; 200$, *idem*, and 500$, series 8 and 9.

Weights and Measures

The metric system is in general use, but some of the old Portuguese measures, &c., are still in use, as:—

Weights:	Oitava	3·586 grammes
	Onça	2·1916 ,,
	Libra	·4595 kilogrammes
	Arroba	14·6896 ,,
	4 arrobas	1 quintal
	13½ quintals	1 tonelada
Long Measure:	Pollegada	·0275 metres
	Palmo	·22 ,,
	Pé (foot)	·33 ,,
	Jarda (yard)	·91 ,,
	Passo (pace)	1·65 ,,
	Tolsa (6 pés)	1·98 ,,
	Vara	1·1110 ,,
	Braça (10 palmos)	2·2219 ,,
	Estadio	262·7484 ,,
	Milha	1,955·3127 ,,
	Legua (geographical)	5,555·5 ,,
	Legua (kilometrical)	6 kilometres
Land Measure:	Braça Quadrada (square)	·0484 acres
	Prato de tierra	10·89 ,,
	Geira (400 braças)	19·36 ,,
	Quarta de tierra	37·12 ,,
	Alqueire (São Paulo)	2·42 hectares
	,, (Federal)	2·468 ,,

CUBIC MEASURE:	1 braça cubica	10·648 cubic metres
	1 palmo cubica	·9106 ,, ,,
LIQUID MEASURE:	Tonel, 2 pipas (pipes)	958·32 litres
	Pipa (15 almudes)	479·16 ,,
	,, (commercial)	480 ,,
	Almudes (12 medidas)	31·944 ,,
	Medida (4 garrafas)	2·662 ,,
	Garraffa (bottle)	·666 ,,
DRY MEASURE:	Alqueire (Bahia)	36·27 ,,
	,, (Rio)	39·9970 ,,
	Quarta	9·07 ,,
	Canáda (Rio)	2·7715 ,,
	Selamin	2·27 ,,
	Sacca (sack) 3 alqueires	109 kilos
	,, ,, 2 alqueires	73 ,,
	,, ,, sugar	50 ,,
	,, ,, ,, (Pernambuco) for Rio, Santos and Paraná	60 ,,
	for other ports and export	75 ,,
	,, coffee	60 ,,
	1 barrica (barrel) sugar	105 ,,
	½ ,, ,, ,,	88 ,,
	¼ ,, ,, ,,	58 ,,
	⅛ ,, ,, ,,	38 ,,
	⅓ ,, ,, ,, (refined)	52 ,,
	1 barrica flour	88·95 ,,
	1 sacca ,,	88·95 ,,
	1 barrica cement (net)	50 ,,
	1 sacca cotton	80 ,,
	1 bale	180 ,,

Some Other Measures

Alagôas	Taréfa	3,052m. 2 sq. metres
Amazonas	Hectare	10·000 ,,
Bahia	Taréfa	4·356 ,,
Ceará	Taréfa	3·630 ,,
Espirito Santo	Alqueire	48·400 ,,
Goyaz	Alqueire	48·400 ,,
Maranhão	Quadra	48·400 ,,
Matto Grosso	Braça Quadrada	4·084
Minas	Alqueire	48·400 ,,
Pará	Hectare	10·000 ,,
Parahyba	Cincoenta	12·100 ,,
Paraná	Alqueire	24·200 ,,
Rio Grande do Sul	Quadra	17·424 ,,
Rio Grande do Norte	Braca Quadrada	3·052 ,,
Santa Catharina	Alqueire	24·200 ,,
Sergipe	Taréfa	3·052 ,,
Amazonas	Alqueire	50 litres
Pará	Alqueire	50 ,,
	Frasqueira	25 ,,
Maranhão	Alqueire (paneiro)	50 ,,
Piauhy	Quarta (seccos)	50 ,,
	Frasco (liquid)	2 ,,
Ceará	Alqueire	128 ,,
Rio Grande do Norte	Alqueire	160 ,,
Parahyba	Alqueire	320 ,,
Pernambuco	Cuia	8 to 12 litres
Alagôas	Cuia	12 litres
Sergipe	Alqueire	32 *salamin* (640 litres)

Bahia	Alqueire	40 to 80 litres
	Pipa	80 canadas of 5 quartilhos
	Canada	7 litres
Espirito Santo	Quarta	10 litres
	Medida	20 litres
	Alqueire	40 to 50 litres
São Paulo	Alqueire	40 & 50 litres
Rio de Janeiro	Alqueire	40 litres
Paraná	Alqueire	40 „
Santa Catharina	Alqueire	40 „
Rio Grande do Sul	Alqueire	40 „
Minas Geraes	Alqueire	49, 50 and 80 litres
Goyaz	Alqueire	40, 128 and 100 litres
Matto Grosso	Alqueire	50 litres
	Canada	30 „

Stockbrokers

New Regulations for Stockbrokers. Decree No. 9264 of December 28, 1911

Art. 1.—The number of brokers in the Federal District shall be limited to 30, of which 10 shall be shipbrokers.

Sole Paragraph.—This number may be increased or diminished by the Minister of Agriculture, Industry and Commerce whenever necessary, owing to the development of trade; but may only be decreased when a vacancy occurs. In any case the Stockbrokers' Association (Junta) must be consulted.

Art. 2.—Brokers shall be nominated or dismissed by the above Minister.

Sole Paragraph.—Pupils of the Academy of Commerce of Rio de Janeiro, possessing the necessary diplomas, shall always have preference for the above positions.

Art. 3.—In order to be nominated as a broker, a petition signed by the applicant must be presented to the Minister, and be accompanied by the following documents:

The petition will be delivered to the Secretary of the Stock Exchange, and it should be returned to the Minister duly annotated within five days.

(1) Proof of having attained 25 years of age.

(2) Certificate of neither having been prosecuted nor condemned for any crime which renders a person incapable of public office.

(3) Certificate from the Commercial Junta that the applicant is not an undischarged bankrupt.

(4) Proof of residence for over a year in Rio Janeiro.

(5) Attestation of at least two years' experience in the office of a broker or merchant.

Not being a Brazilian born, the applicant must produce his naturalization papers.

Art. 4.—Women, minors, aliens and dismissed brokers may not be nominated.

Art. 5.—In order to enter into possession of the position, the approved applicant must deposit security within thirty days, sign the necessary papers and legalize the books relating to the business.

Art. 6.—A deposit of 5 contos of reis as security, either in cash or policies, must be made in the Treasury as security.

Table of Brokers' Fees

Sugar, paid by buyer and seller, each	½ per cent.
Cotton, paid by buyer and seller, each	½ per cent.
Coffee, paid by buyer and seller, per sack	100 reis
Flour, paid by seller only	1 per cent.
Other goods, paid by seller only	1 per cent.
Classification of merchandise, paid by the person employing, per sack	100 reis
Per bale of cotton	300 reis
Per bale (or package) of other goods	200 reis
Certificate of contracts to one month	5$000
After first month	10$000
Examination of merchandise (each broker)	100$000
Attestation of quality of goods	20$000
Sale of vessels, percentage of value	2½
Freight paid by consignee or owner of goods	5 per cent.
Translations of manifests for each one of the three first pages	7$000
For each one after	3$000
Copy of manifests, for each of first three pages, 3$000; for each one after	1$000

Some Rural Laws (1917)

From "Consolidação das Leis Ruraes do Brazil," por Dr. C. Freire de Brito.

Art. 37. Every rural proprietor may oblige his neighbour to proceed with him to mark the limits of their ownership.

Art. 44. Fencing, walls, or ditches which divide properties, are to be made at the cost of both parties.

Art. 52. Fruit, etc., falling on a neighbour's ground, belongs to the latter.

Art. 92. Any wounded game taking refuge on another person's property must be either yielded up to the hunter, or driven out of the grounds.

Art. 94. Insectivorous birds, and other animals useful to the agriculturist, are, together with their eggs and young ones, absolutely protected by law.

Art. 103. (Three.) Swarms of bees, if not immediately claimed, belong to the person on whose land they settle.

Art. 202. Providing there is no stipulation to the contrary, a rural property may be sub-let, the new lessee being made responsible for the rent in any case.

Art. 226. In case of contracting the services of an illiterate person, the necessary document must be witnessed by four persons.

Art. 229. The maximum validity of such a contract is four years.

Arts. 246-247. The purchaser of live stock may reject it in the case of any vice, or hidden defect, ignorance of the matter being considered no excuse in point of law.

Art. 338. Injuries or losses caused by any domestic animal which strays, must be made good by the owner of the beast, unless he is able to prove proper care and due attention to the housing and guard of such animal or animals.

Law Relating to Commercial Travellers

Commercial agents are not required to take out any special licence, or to have passports or certificates, but owing to the new regulation providing for deportation of undesirable aliens, it is advisable for such travellers to register. Without this precaution they cannot bring a suit to enforce payment

of a debt, and persons buying off an unregistered agent can refuse to pay for the goods if they choose. Most firms who send out representatives establish relations with some local house, and the collections are taken over by the latter. In this way it may be possible to avoid paying taxes in the larger cities. Samples are subject to duty, and the latter is not refunded, but such samples are not liable to a special duty of 10 per cent. (vide No. 560 of Customs Regulation). All merchandise must be accompanied by a consular invoice, except in cases of small samples not exceeding £10 in value. A rebate has been granted of 25 per cent. on the tickets of commercial travellers on the Central Railway, on producton of a voucher from the Commercial Association of Rio, that the bearer is a *bona fide* commercial traveller. Agents' trunks must pay duty, but it is intended to remedy that abuse, as also the taxes on samples in each port. In the future a certificate of charges will be obtained from the first custom house entered.

Some Taxes on Commercial Travellers

Bahia (State), 100 $ each visit.
Maranhão (State), 250$.
S. Luiz (city), 100$.
Minas (State), 55 $. Municipal, varied, some up to 500 $.
Pará (State), 300 $; (city), 365 $.
Ceará (Fortaleza city), 53 $
Rio Grande do Sul (State), 80 $ to 150 $. Municipal, 200 $ to 800 $.
São Paulo City, 1,000 $.
Santos, 500 $.

Shipping Goods

Weight of both goods and cases (or other covering) should be given separately. Catalogues should be accompanied (whenever possible) by fair samples.

No tenders can be accepted from any European or other firm not having an agent in the Republic, and not being officially authorized to do business in Brazil.

In the future the only vessels permitted privileges of mail boats will be those fitted with refrigerators suitable for fruit carrying.

No new railways will be given concessions, and no old ones renewed, unless the companies possess and employ cold storage wagons.

In order to do business successfully in Brazil, several things are necessary. First, the goods sold must be of a high grade, and before exporting a visit should, if possible, be made to the country, or the consular reports (both British and North American) carefully studied. Catalogues *must* be in Portuguese, and a clerk employed who writes and translates that language correctly.

Representation on the spot, by a good traveller knowing the country, is essential, and the short-sighted meanness of the common exporting houses is strongly condemned. First-class German houses paid their men equal to £60 monthly, with commission and travelling expenses, *as incurred*. This may amount to £2 or £3 daily. Hotel charges are not less than 12s. 6d., and porters and baggage charges are proportionately high. Every pound of luggage put in the brake van pays. Credit is also necessary for at least three months. Packing requires the greatest care and attention, and, as suggested by the results of experiments made in

the sewing machine and phonograph trade, a stock may be advantageously carried at a central depôt (Rio de Janeiro), and goods sold on monthly payments. Singers' charge 5 $000 a week (6s. 3d.) for hire of machines. Almost any goods can be sold in this way, such as musical instruments, furniture, ornaments, etc. A common way of doing business locally, is to form a club of 60, 80, or 100 members, and draw weekly chances for clothing, jewellery, etc. Probably the best way of doing a large and profitable trade in Brazil is to open locally with the latest novelties, and employ Brazilian salesmen, under European supervision. If travellers are sent to Brazil they must be good men, tactful, sympathetic, well read, gentlemanly above all, and possessed of tenacity and patience, and should be *well paid*, properly supported, and able to speak Portuguese.

Interpreters

The Secretary of the British Legation in Brazil suggests the employment of interpreters to commercial travellers. This is not a practical idea, first because of the difficulty of getting a suitable man, and secondly because of the great expense entailed. Again I *insist* on the *necessity* of the traveller knowing Portuguese *himself*.

Consular Factures

Consular factures must be presented in three copies to the Consular Agent, or Consul of Brazil, abroad, who, having authenticated them, will proceed in the following manner.

(1) Send one copy together with the ship's papers to the Customs Department of the port to which the vessel is bound. The second to the Direction

of Commercial Statistics in Rio de Janeiro. The third will remain in the archives of the Consulate.

(2) The first copy (written in indelible ink by hand or machine) must be stamped before receiving the visa of the Consul. The other copies may be made by any process, and are exempt from stamps.

The value of the goods will be regulated by the first copy, which is sent to the Customs Authorities.

(3)* Any difference between the goods and the facture will make the owner or consignee liable to double duty.

(4)* The declaration of the gross weight in the facture, when the goods are liable to payment of duties on the net weight, or vice versa, will subject the owner or consignee to the above-mentioned penalty.

Declaration to be made by Exporter, Shipper, or Agent

(1) Name and nationality of the ship, and whether sail or steam.

(2) Port of shipment and ultimate destination.

(3) Total value of goods, including freight and all other charges.

(4) Value of the money standard in the country from which the goods are exported.

(5) Marks and numbers on back of invoice in places provided.

(6) Quantity and class of packages, specification of goods and gross weight, except where goods pay duty on net weight.

(7) Country of origin of raw materials, or of manufactured goods produced in several countries.

Goods may be specified in the language used, where they are manufactured, but a sworn translation (in Portuguese) must be produced.

Consulates will supply printed invoices in the latter language.

Stamp duty, 3 $000 gold, i.e., 27d. per milreis on each invoice (manifest).

Table of some Consular Emoluments

Authorized by Decree No. 11,967, February 23, 1916

Legalization of ships' manifests, to 500 tons, 25$ per ton after, 5 reis at 27d. the milreis gold.

In the event of calling at one or two ports only, fees are 50 per cent. higher.

Supplementary manifest, in same port, 25$. (This rate applies from any foreign port, to all Brazilian ports.)

Certificate that no cargo is taken for Brazil, 6$. Visé on cargo certificates, 2 $500.

Bill of health, 12 $. Visé on same, 6 $. *Idem* on list of crew, 6 $.

Roll, or list of crew, 12 $. For each man signed on or discharged, 1 $500.

Ships' passports, over 200 tons, 25 $, under, 7$. Endorsements, 4 $ and 1 $500 respectively.

Certificate of proceeding in ballast, 5 $ to 15 $, according to tonnage.

Inventory of a vessel over 200 tons, 30 $, under, 15 $. Examination, *idem*, 40 $ and 30 $000.

Examination of cargo on shore, 20 $, on board, 30 $.

Authorization of new log and rubricating, each sheet, 250 reis.

Change of flag, Brazilian to foreign, 50 $, and other expenses in addition.

Change of flag, foreign to Brazilian, 25 $, and other expenses in addition.

If vessel is freighted, 3 per cent. and 1½ per cent. on annual rate.

Nomination of captain, 12 $. Freight charter, 12 $. Visé on a log, 3 $.

Public sale of freight, etc., to 1,000 $000, 2 per cent., over this sum 1½ per cent.

Inventory of a wreck, 3 per cent. of value of same.

Registry of a Brazilian citizen, and certificate of nationality, 2 $500.

New certificate, 2 $500. Visé on same, 2 $500. Annual visé on same, 1 $500.

Marriage, gratis; certificate, 5 $. Registry of birth, gratis; certificate, 1 $500.

Death, gratis; certificate, 1 $500. Life certificate, 1 $500 to 4 $500.

Will, 25 $. Approval of same, 12 $000. Opening a will, 12 $000.

Inventory, up to 2 contos, 3 per cent., over this sum, 1½ per cent. in addition.

Registration of sale and purchase (writings), *idem*. *Idem*, acts of a society. *Idem*, modification, etc., of statutes, up to 50 contos (50,000$), 1½ per cent., over, 1½ per cent. in addition. Power of attorney, 1 $500 to 12 $000.

Certificate, 100 words or fewer, 2 $500, per hundred in addition; *idem*. Certificate or attestation for any purpose, 5 $000. Registration of documents, *idem*. *Idem*, search in the Consular archives or books, 1 $500 besides the certificate, if necessary. Translation to Portuguese, besides certificate, per 100 words, 5 $000. Portuguese to a foreign language, *idem*, 12 $ per first 100, after, 10 $000.

Verification of translations made outside the Consulate, 100 words, 3 $, after, 1 $500. If transla-

tion is from Portuguese, 2 $500, and 1 $500. If another language than that of the country, double fees.

Copy of documents in Portuguese, 2 $000 and 1 $000. In other languages, 2 $500, and 1 $500.

Legalization of Consular factures, 3 $.

Attendance of Consul at a sale, etc., 3 per cent. on value of goods.

Nomination of experts, for each one, 6 $. Interrogation of witnesses, each 6 $.

A protest or declaration, 10 $000. Passport, 8 $, visé on same, 2 $500. Visé on foreign passport, 4 $000.

Registry of contracts up to 5,000 $000 (5 contos), 1½ per cent., 5 to 100 contos, 1 per cent., over 100 contos, ½ per cent.

Money deposited by private individuals, 3 per cent. Spent on behalf of same, 7 per cent.

Arbitral sentence. Up to value of 5 contos, 2 $000. Up to 10 contos, 5 $000. For each conto of reis in addition, 1 $500. If value is unknown, 12 $.

Legalization of manifests on articles on imports into Brazil by land, 12 $.

Any document not mentioned in this table, first 100 words, 5 $, after, 3 $.

Legalization of ships' manifests out of Consulate hours, per hour occupied, first hour, 24 $, after 12 $.

All bills of lading must be authenticated before ship sails. Failure to produce Consular facture subjects goods to double duty.

At present at declaration of place where goods were first bought is imperative.

Consular hours are usually from 10 to 3 or 4 o'clock, but in practice, each bureau formulates its own time table.

CHAPTER XII

POSTS, TELEGRAPHS AND TRANSPORTS

The Post Office was first organized in 1663, with a service by contract, between Lisbon and Brazil, but the Government took this over in 1797, paying the then holder of the concession a sum of 40,000 Cruzados, giving the title of Condé and a pension for his mother, brother and sister, of 400 milreis.

The very first postage stamp in America saw the light in Rio, in July, 1843, only 3 years after the origin of this form of franking correspondence (1840).

The first stamps were of 30, 60, and 90 reis, consisting of large figures (see illustrations), and they were followed by a series of smaller labels, bearing values from 10 reis up to 300, and afterwards by portraits of the Emperor, D. Pedro II in various guises, and up to 1,000 $000 face value.

Inland Postal Rates (1918)

Letters: 100 reis for 20 grammes. Postcards: 50 reis each. Reply postcards: 100 reis.

Journals and Magazines: 10 reis per 100 grammes or fraction.

Manuscripts: 100 reis per 50 grammes or fraction.

Printed matter (books): 25 reis per 50 grammes or fraction.

Registration fee: 200 reis. Advice of reception: 100 reis.

Samples: 100 reis per 50 grammes; maximum, 350 grammes.

Parcels (limit 3 kilos): 50 grammes, 100 reis.

Money Orders:— 25 $000 premium, 300 reis.
50 $000 ,, 600 ,,
100 $000 ,, 1 $000 reis.
150 $000 ,, 1 $500 ,,
200 $000 ,, 2 $000 ,,

And 500 reis for each fraction of 200 $000.

Postal Rates for Foreign Correspondence

Brazil adheres to the tariff approved by the International Postal Union. Stamps are issued of the following value:—

10, 20, 25, 50, 100, 200, 300, 400, 500, 600, 700 reis, and 1, 2, 5 and 10 $000.

Official stamps, from 10 reis to 10 milreis.

Postage due stamps, from 10 reis up to 2 milreis.

Letters.—20 grammes, 200 reis. No limit as to weight or size.

Letter Cards.—200 reis each. *Postcards.*—100 reis. *Reply Postcards.*—200 reis.

Newspapers and Magazines.—50 reis per 50 grammes.

Manuscripts (up to 2 kilos).—200 reis per 50 grammes. Limit in size, length 45 centimetres, in a roll 75 centimetres long by 10 centimetres diameter.

Registration Fee.—300 reis. *Advice of Reception.*—150 reis.

Sample Post.—150 reis per 50 grammes. Maximum weight, 350 gr., maximum size, 30 by 20 by 10 centimetres, or in roll 30 by 15 centimetres.

Money Orders to Great Britain, etc., in francs up to 1,000 francs premium, besides postage and registration up to 25 $, 400 reis; 50 $, 700 reis; 100 $, 1 $200; 150 $, 1 $750; 200 $, 2 $250; and 500 reis per 100 $ over.

Insured Boxes (must be in wood or metal as in all other countries in the postal union).—Up to 300 francs premium, 2 $200; per 300 francs after 620 reis. For Germany, France, Holland and Portugal.

Insured Letters.—300 francs, 1 $120; and per 300 francs after, 640 reis.

Austria, Italy, Spain, Belgium and Greece.—Premiums, 2 $540 and 640 for boxes, and 1 $140 and 640 for letters respectively.

Boxes and letters may also be sent to Chili, Argentine, Turkey, Egypt, Japan and Norway.

Maximum value of declared and insured boxes or letters.—10,080 francs.

Minimum thickness of boxes.—20 millimetres.

Insured letters: 2 per cent. of their value, besides postage and registration limit of value in any one letter—300 $000 or £20.

The organization of the postal service in Brazil dates from 1829, and the first postage stamps were issued in 1843, Brazil being the first American country to adopt them.

Parcels Post

Conventions have been signed with Great Britain, U.S.A., Austria, Italy, Portugal, Germany and France:—

Germany: 1 kilo, 3 fr. 25 centimes; 2 to 5 kilos, 4 fr. 25 c.

Portugal: Up to 3 kilos, 4 fr. 25 c. (Madeira included).

U.S.A.: Per 460 grammes, 600 reis. Thus, 2,300 grammes, 5 francs.

France: 5 kilos, 3 fr. 75 cents.

The United Kingdom: Limit 3 kilos, SIX FRANCS SEVENTY-FIVE CENTS.

Up to quite recently all parcels destined to Brazil had to be forwarded via Portugal, and no parcels could be sent from Brazil to the United Kingdom.

Parcels reaching Brazil have to be examined by the Customs authorities, and the usual declaration must be made by the senders in the country of origin. Parcels may be sent to Rio, Bahia, Pernambuco, São Paulo, Santos, Petropolis and Bello Horizonte at present.

There are at present (1917) 3,612 post offices in the Republic.

Number of objects transported in 1914: 226 millions. In 1917: 165 millions.

In 1912, 114,107 parcels were received from abroad, and in 1917, only 15,497, the *increase* from U.S.A. being over 300 per cent.

Total numbers of postal employees 11,000, the Federal Capital possessing only 100 postman, whose wages commence at 3 $000 daily.

Revenue	1889,	1,129 Contos
,,	1913,	10,717 ,,
,,	1916,	9,225 ,,
Expenditure	1916,	18,318 ,,

For the duration of the war all postal transactions with Germany and her allies have been suspended,

and up to the time of writing (October, 1918) foreign correspondence is subject to censure, but no doubt all restrictions will have been removed before the book goes to press.

Telegraphs

At the end of December, 1912, the extension of telegraph wires amounted to 33,962,400 metres, with 658 stations in December, 1911, and in 1916, 38,329,000 m.

The electric telegraph was first introduced into Brazil in 1852. Communication is established between all the States, and the rates are as follows:—

Federal district: 20 words, 500 reis.

From Rio de Janeiro: Within the State, 100 reis per word.

From São Paulo, Minas, or Espirito Santo: 200 reis per word.

To any State not mentioned: 300 reis per word.

From São Paulo City to Santos or Campinas: 10 words, 500 reis.

From São Paulo City to any part of the State: 100 reis per word.

Besides a fixed tax of 600 reis for each telegram.

The usual press abatement for inland or foreign cables.

The number of stations is 750. Revenue in 1914, 11,305 contos. In 1916, 15,431 contos. Expenditure during the latter year, 18,593 contos. Receipts in 1917, 17,298 contos. Expenditure, 19,267 contos.

The Rondon Commission has been engaged for several years past, in linking up Matto Grosso and Amazonas, all Brazil being now in telegraphic communication.

Foreign Rates.

*Per Western, or German Cable (via Monrovia)**

From	Per word fr.	c.
Rio Janeiro to England	3	25
France, Germany, Holland, Belgium	3	63
Russia	3	95
Canada	4	45
Cape Town	5	75
Cuba	4	60
Texas	4	25
Louisiana	same rate	
Other States (U.S.A.)	4	45
Uruguay	1	25
Argentina	1	75
Chile	2	55
Paraguay	2	05
Peru	3	80
Colombia	5	55
Equador	4	55

Urgent wires, triple tax. Copies, 500 reis for 30 words.

Telegrams in plain language at half above rates. These must be marked PRETERIDO, and are liable to be delayed in transit.

Telegrams are dispatched by pneumatic tube in the urban district of Rio, as well as letters bearing express fee. During 1910, $2\frac{1}{2}$ million dispatches were transmitted.

The rate of exchange per franc is fixed periodically, and may vary between 600 and 800 reis.

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* German, or any other language but English or French, was not permitted to be used during the war, and the use of codes was suspended.

Wireless Telegraphy*

By decree No. 10090 of February 19, 1912, the President of the Republic approved the new organization of the wireless service in Brazil. The principal stations are:—

No. 1, Belém (Pará). 80 kilowatt power. Extreme range, 4,000 miles. Communicating with New York, Madeira, Dakar, Clifden, and the interior of Amazonas, Goyaz, Matto Grosso, as well as the other coast stations.

No. 2, Cabo S. Martha.—The same power as Belém. Will communicate with Chili, Argentine, Uruguay, Paraguay, South and Western Brazil and Cape Town.

No. 3, Rio de Janeiro (Morro da Babylonia).—25 kilowatt power. Radius, 2,000 miles. Will operate in connection with Olinda (Pernambuco), Fernando Noronha, Bahia, Trinidade, Santa Martha, Matto Grosso and Goyaz.

No. 4, Fernando Noronha.—Same power as Rio de Janeiro. In touch with Brazilian stations, and with St. Helena and African stations.

No. 5, Trinidade.—Equal to the preceding.

Stations Nos. 3, 4 and 5 will transmit Greenwich time to ships and Continental stations, in accordance with the conditions established by the Paris Congress.

Group No. 2

The stations of São Luiz (Maranhão), Fortaleza, Olinda, Bahia, São Thomé, Cabo Frio, Rio, Santos,

* Private wireless messages were not accepted during the latter part of the war.

Florianopolis and Rio Grande do Sul will be devoted to marine service as a rule.

A new and exceedingly powerful station will be opened in Rio bay (Governador Island), also others at Barra do Rio Grande. (Radius 750 miles.) Cabo de S. Thomé, *idem*, (Marconi system). Cruzeiro do Sul (Acre), 500 miles. Senna Madureira, 500 miles. Rio Branco, 200 miles (Telefunken).

Group No. 3

Fluvial Stations, used for Postal and Strategetic Purposes

Amazon and tributaries: 5 stations, at Santarem, Itacoatiara, Manãos, Teffé and Fonteboa.

River Xingú: 2, at Porto de Móz and Porto Grande.

River Tapajóz: 1, at Itaituba.

River Madeira: 3, at Borba, Manicoré and Humayta.

River Purus: 5, at Berury, Campina, Paripy, Labrea and Cachoeira.

River Juruá: 3, at Ypiranga, Caranary and S. Felippe.

River Negro: 3, at Moura, S. Joaquim and S. Gabriel.

River Branco: 2, at Carmo and Vista Alegre.

Also 6 posts on the Paraguay, Cuyabá and Guaporé rivers, the principal being at Corumbá and Cuyabá.

Four on the Paraná and Uruguay rivers, and five on the São Francisco, at Pirapóra, Januaria, Barra do Rio Grande, Joazeiro and Paulo Affonso.

There will also be a fourth group of 15 stations, at various frontier posts.

Taxes for Radiogrammes

Coastal Tax.—6 francs up to 10 words; per word after, 60 centimes.

Ship Tax.—4 francs up to 10 words; per word after, 25 centimes.

In the event of the station accepting the telegram not being in direct communication with the wireless stations, a special tax of 25 cents per word is charged in addition.

Stations in Rio accepting Radiogrammes.—Praça 15 de Novembro, Av Central No. 117, Largo Machado and Lapa, as well as that at the Central Railway Station. Receipts for radiogrammes in 1911 — 1,599,996 francs. Expenses for radiogrammes in 1911—1,547,930 francs.

Maximum Delay after leaving Port, within which a Wireless Telegram may be Dispatched.

To or from Rio de Janeiro—

	Fastest steamer hours	Slowest steamer hours
Via Fernando Noronha	80	100
Via Olinda (Pernambuco)	60	80
Via Bahia	30	40
To steamers (via Rio Janeiro)	7	10

Marconi Company's Rates

Ship's Tax.—From or to a German or Dutch ship: 1s. 4d. a word, with a minimum of 3s. 4d.

From or to a Spanish ship: 3d. a word; minimum, 2s. 6d.

From or to British and other ships: 4d. a word, no minimum.

This company has a school for wireless operators in Rio.

The s.s. *Kelvinbank* was recently in touch with Olinda Station at 1,500 miles distance, and *L'Avenir* (sailing ship) at 2,220 kilometres, and with Fernando Noronha at a distance of 2,225 kilometres.

Telephones

In January, 1917, the State of Rio Janeiro had 2,268 telephone subscribers and the Federal District 13,936. São Paulo having 20,641 in the state, Rio Grande do Sul 10,710, Minas Geraes 2,069, and Bahia 1,601. Total for all Brazil, 57,000, as compared with 45,240 in 1916.

Communication is now available between most of the towns in the states of Rio and São Paulo, besides many in Minas Geraes, the great concern operating the system, having connections with over 200 cities and towns.

Fee from Rio to São Paulo or Santos, 8 $000 for 3 minutes' conversation.

Railways

The first line opened in Brazil was the Mauá line, which, leaving the little port of the same name, made its way across the low lands to the foot of the Estrella Range. This was inaugurated in 1854, and was soon climbing the Serra to Petropolis, and running down the valley of the little Piabanha towards Entre Rios.

The first section of the Central Railway (then called Dom Pedro II) was opened in May, 1858, from Rio to Queimados (48 kilometres).

This (Government) line has now instituted a

PRAÇA TIRADENTES, RIO.

[Pan American Union.

system of carnets kilometricas, or 1,000 kilometres tickets. The rate is:—

3,000 kilometres, 200 $000; 6,000 kilometres, 363 $000; 12,000 kilometres, 653 $000.

Surburban rates, 200 and 300 reis, according to distance. Return tickets, 500 reis 1st class and 300 reis 2nd class. Monthly and other cheap tickets are issued, including 60 days' excursions to the various thermal resorts in Minas.

Baggage rates up to 100 kilometres *per ton*, per kilometre 500 reis. From 100 to 1,000 or more kilometres, a progressive abatement.

Sleeping trains on ordinary night trains are available for 1st class passengers at the following rates: top berth, 10 $; lower berth, 15 $. Where lower berths only are in use, 20 $ per berth.

These books of tickets may be bought at Rio, Entre Rios, Juiz de Fóra, São Paulo, Bello Horizonte and Ouro Preto, or at other stations if 3 days' notice is given.

The Central Railway reached the São Francisco river at Pirapóra in 1909, and surveys are in progress with a view to continuing the line via Formosa and Palmas, 935 kilometres; Porto Caroline, 713 kilometres; Gurupy, 426 kilometres; Candirú, 220 kilometres; and Pará, a total of 2190 kilometres, at a cost of about 260,000 contos of reis.

Distance by this route from Rio, 3,360 kilometres.

The journey will take 5 to 6 days instead of 15, as at present.

The engines used on the extremely heavy grades, from Belém to Barra do Pirahy (Serra do Mar), are of the Mallet type, weighing 138 tons each, and are capable of drawing 500 tons at 25 kilometres per hour on the outward journey.

A sum of £1,000,000 may be expended during this year for the electrification of the section.

Sleeping and dining cars are run on all the principal trains; return tickets cost 25 per cent. less than double fares.

New branches are authorized as follows:—

(1) From the Montes Claros line to the Central Bahia Railway near Tremendal.

(2) Rio Janeiro to Santa Rita de Jacutinga, 259 kilometres; thence by Sul Mineira Railway to Soledade, 196; Sapucaby, 260 (Mogyana Railway), 50; Campinas, 70; Itaicy, Mayrink (Soracabana Railway), 113; Baurú, 365; Itapura, Porto Esperança (N. Oeste Railway), 1,273, same gauge throughout, thus shortening the time considerably to Corumbá (Matto Grosso) and eventually to Paraguay, etc.

Central Railway receipts, 1913 = 43,824 contos, 1917 = 55,872 contos.

Expenditure, 49,404 contos, and 78,714 contos.

Fuel prices had increased 350 per cent. Extension of lines, 2,289 kilometres (Jan., 1917).

Mogyana Railway, São Paulo (see Gazetteer).

Paulista Railway (S. Paulo). From the capital, joint: S. Paulo Railway — Central — Paulista — Station, "Luz." (See Gazetteer.) This line, the Mogyana and Soracabana Railways have mutual tariffs.

Total extension of lines in S. Paulo State, 6466 kilometres.

Receipts, 111,661 contos. Expenses, 64,527 contos. Net profits, £2,500,000.

Passenger rates, 1 to 50 kilometres (per kilometre) 70 reis, 1st class; 40 reis, 2nd class, falling to 30 and 15 reis respectively for over 250 kilometres.

Dearest line in Brazil: Victoria-Diamantina,

10 $000 per 100 kilometres, 1st class. Cheapest: Bahia, 5 $000.

New railway lines authorized (1919). State of:— *Amazonas, etc.*: Labréa to Acre (Rio Branco, Senna Madureira, and Xapury, narrow guage). *Pará:* Bragança to Cedó (Maranhão). *Minas Geraes*: Theophile Ottoni-Arassuahy. Marianna-Ponte Nova. Piquete-Itajubá, and Buenopolis-Montes Claros. *São Paulo-Minas:* Canôas-Arceburgo-Monte Santo. *Rio de Janeiro:* Angra dos Reis-Barra Mansa. *Paraná*: Branch to Imbituba coal mines, Santa Catharina. *Idem* to Massiambú mines. *Rio Grande do Sul:* Jaquary-Santa Borja-S. Luiz, Cruz Alta-Foz de Ijuhy.

Brazil will soon be united to Bolivia, via Corumbá (Santa Cruz, Cochabamba, etc.), and thence to Mollendo (Perú), this port even now being reached by rail via Uruguay, Argentina, Chili and Bolivia, a run of 4,000 miles. Cost, £44 (15-20 days). By water the first class fare would be £40.

Freights

Dr. Affonso Costa, Questões Economicas, Rio Ministerio da Agricultura (1918), says on page 241:

Sugar pays 7 $ per sack Recife-Rio (by water) and from S. Paulo to Matto Grosso (rail) 19 $500, or from Rio to Minas 600 kilometres, 5 $ (Central Railway).

Average rate for all Brazil per ton, kilometre, 180-200 reis.

Total extension of railways open for traffic: 1889, 9,583 kilometres. 1913, 23,074 kilometres. January, 1918, 27,608 kilometres. 1919, 28,000 kilometres.

Shipping

Tonnage of all vessels entered inwards shows a great diminution during the war, but conditions are likely to improve considerably this year.

Of the 43 German steamers in Brazilian ports since August, 1914, no fewer than 30 were ceded to the French Government the beginning of 1918, all their names having been changed, and local crews put on board, their original personnel being interned in the vicinity of the Federal Capital.

A great many of these ships were left in a bad state, the machinery temporarily disabled, many pieces being missing.

In 1914, 862 German ships, of 2,832,971 tons, entered Brazilian ports.

In 1912, the total tonnage amounted to 26,505,884, 8th place in the world.

The next year showed record figures, 29,170,259. 1914. 24,000,000. 1917, 14,500,000.

Present fares to and from Europe are quite abnormal, and it is useless to make any attempt to quote them. *Should the war end before this chapter goes to press*, a full list will be given as well as some details regarding the finest ships on the route.

Time from French or Italian ports to Rio Janeiro about 1 month.

Services to Pará and Amazon ports very uncertain.

Frequent boats from Rio to New York, mostly Scandinavian, also occasional Japanese steamers to Cape Town and the Far East.

Total gross tonnage of Brazilian mercantile marine in 1913, 174,705. Ships, 173. In 1916, the tonnage had increased to 321,490, number of ships, 403.

The two principal national lines are the Brazilian Lloyd and Navegação Costeira, which maintain sailings between all Brazilian ports from Manãos to Porto Elegre, with services to Montevideo, and in the case of the first-named, to Buenos Aires, Asuncion and Matto Grosso ports.

The Brazilian Lloyd fleet consisted in 1917, of the following elements:—Steamers, 54; tonnage, 86,376 net. The largest boats are the *Rio-Janeiro*, *São Paulo* and *Minas Geraes*, of 3,580 net tonnage.

Thirteen of the ex-German boats have been handed over to this company for the time being, the total extra tonnage amounting to 68,421. The largest steamer amongst these is 9,751 tons. Amongst the 30 ceded to France, is the *Leopoldina*, late *Blücher*, 12,350 tons. These steamers must make at least 40 voyages to Brazil before April. 1919, the Brazilian Government receiving 110 million francs for their charter, and the French undertaking to purchase coffee, etc., to the value of 100 millions, and transport it to Europe in these ships.

A very good stroke of business for Brazil in any case.

Three dry docks are in working order in Rio, one having a capacity for the largest battleships. The latest, belonging to the Companhia Commercio e Navegação, is 550 feet long, 79 wide, and 31 deep.

The Lloyd Nacional, a new concern, is engaged in the freight trade to Italy.

The Companhia Commercio e Navegação, owning most of the salt refineries in N.E. Brazil, has a large general trade between the ports in this zone and Rio, also Europe.

The Amazon and other great rivers in its valley are served by several companies, one of which has

47 steamers, totalling 16,440 tons, but at least 12 of these are obselete. The newer boats have stern wheel. Other concerns own 75 steamers, of 13,560 tons.

Profits of Brazilian Lloyd, 1917 = 19,000 contos.

Some Freights

Italian lines Santos-Genova (1918), per ton, £50 to £60.

Italian lines Buenos Aires-Genova (1918), per ton, £25 to £30.

French lines to New York. American Government rates 5 to 6 dollars. Price paid by exporter (according to *Rio Jornal*, of 9-8-18), 16 to 28 dollars per ton.

BAHIA—FRANCE—ENGLAND

	Dec., 1914	June 1917
Cocoa	56 $250	456 $250
Coffee	45 $	365 $000
Green Hides	75 $	260 $000
Dry Hides	108 $333	433 $333
Tobacco	*idem*	608 $000
Piassava Fibre	87 $666	350 $000

Coastwise and River Steamers

(All under Brazilian Flag)

(1) *Amazon River and Tributaries*

Pará-Obidos Manáos. 975 miles. Very frequent voyages.

Pará-Santarem-Itaituba (Rio Tapajoz), 729 miles.

Pará-Faro-Parintins-Maués. Pará-Teffé-Tocantins, 1,544 miles. Tabatinga (Frontier), Remate dos Males, 1,743 miles. Pará-Silves-Manicoré-Santo Antonio (Madeira), 1,617 miles. Pará-Rio Perú-

Senna-Madureira, 1,934 miles. Pará-Chaves (Marajo Island), Amapa - Counani - Oyapock river. North Coastal line (to be continued to British, French and Dutch Guiana). South Coast line to São João. Manáos and Rio Negro to Barcellos and Santa Isabel, 423 miles. Manáos to the Japurá river (Jatuaraná). Manáos to the Juruá river. Cruzeiro do Sul, 1,090 miles.

Companhia de Navegação de Maranhão.

S. Luiz to Vizeu, Bragança and Pará, 599 miles (North). South to Fortaleza, 77 miles; Camocim, 302 miles; Mossoró, 589 miles; Macaú, 629 miles; Natal, 754 miles; Cabedello, 814 miles and Pernambuco, 884 miles.

Companhia Pernambuco de Navegação

Recife to: Cabedello, 74 miles; Natal, 148 miles; Macaú, 289 miles; Mossoró, 318 miles; Aracaty, 350 miles; Fortaleza, 412 miles; Camocim, 570 miles; Amarração, 614 miles; and S. Luiz do Maranhão, 803 miles (North).

South to Maceió, 117 miles; Penedo, 195 miles; Aracajú, 235 miles; and Bahia, 385 miles.

East to Fernando do Noronha Island, 239 miles.

On the S. Francisco river, between Januaria and Pirapóra, this service has been greatly improved during the last half of 1918.

Hoepke Line

Two or three small steamers between Rio Janeiro and most ports south to Laguna. Ribeira do Iguapé, S. Paulo. Up-river services, 150 kilometres.

Steamers also run on the Paraná, Rio Grande, etc., and there is a line between Rio Grande, Pelotas,

Victoria, etc., and to Porto Alegre, on the Patos and Mirim lakes, in Rio Grande do Sul.

Naval Construction in Brazil

(1) *War Vessels over* 1,000 *Tons*

1867. Corvette, *Vital de Oliveira*. 1,425 tons (steam).
1873. Cruiser, *Trajano*. 1,592 tons.
1874. Battleship, *Sete de Setembro*. 2,179 tons.
1879. Cruiser, *Guanabara*. 1,911 tons.
1882. Cruiser, *Almirante Barroso*. 1,960 tons.
1890. Cruiser, *Tamandaré* . 5,535 tons.

(2) *Merchant Marine*

1818. *Imperatriz*. 1,100 tons (sailing ship).
1862. Steamer *Nicthéroy*. 1,820 tons.

The "Lloyd Nacional" of Rio laid the keel of 2 large steamers on September 14, 1918. They will be of 3,200 tons displacement, rigged as 4-masted schooners, and equipped with 420 h.p. Diesel-Sulzer motors. The names are *Italia* and *Brazil*.

This company (started the last year or so) has already 50,000 tons of craft, the largest being the ex-Austrian steamer, *Asia*.

The Company de Navegação Costeira of Rio has a most ambitious programme worked out, and the French Government has sent M. L. Salel, a well-known engineer, to Brazil, in connection with the creation of a large factory of Diesel motors of an exclusive type, in the Ilha do Viaana.

It is proposed to utilize the Brazilian Shale oils for propulsive purposes, the consumption being only 200 grammes per H.P. hour, and the supply inexhaustible, once extraction is properly organized.

It is proposed to build 30 steamers in the yard

already existing, when necessary improvements and enlargements are effected.

Each ship will be of a fixed type, and 2,000 h.p. motors will be installed in them. Tonnage, 3,500.

Another series will, with 3 motors, steam on an average 14-15 knots per hour.

Distances from Rio Janeiro, and time under normal conditions:—

Northwards—Victoria, 270; Bahia, 738; Aracajú, 904; Maceió, 1,015; Recife, 1,125; Parahyba, 1,195; Natal, 1,273; Fortaleza (Ceará), 1,533; Amaração (Piauhy), 1,739; São Luiz (Maranhão), 1,915; Belem do Pará, 2,280; Manáos, 3,204.

Southwards—Santos, 199; Paranaguá, 364; Florianopolis, 523; Rio Grande, 875; Porto Alegre, 1,008; Montevideo, 1,180; Corumbá, 2,803; Cuyabá, 3,242.

Distances—From Rio to New York, 4,748 miles; time 17-19 days, *via* Barbadoes (Lamport and Holt Line). Rio to Genoa, 5,040 miles, 13½-15 days. Trieste, 5,838 miles; Bordeaux, 4,894; Southampton, 5,034; Bremen, 5,507; Hamburg, 5,519; Antwerp, 5,244; Odessa, 6,341; Libau, 5,900; Valparaiso (*via* Magellan's Straits), 4,241 miles. Time *from* Wellington (New Zealand), 23 days to Rio de Janeiro. From Rio de Janeiro *to* Montevideo, 4 days. By coasting steamer up to 15-16 days. Rio to Paris, *via* Barcelona, 13 days; Rio to St. Helena, 2,131 miles; Ascension, 1,217; Punta Arenas, 2,368; Cape Town, 3,265 miles. New York to Bahia, 4,067 miles.

Mails, baggage and any belongings of foreign warships or diplomats, as well as boats, launches and other craft in their service or engaged in the transport of passengers of any kind are entirely free from port taxes.

Some of the Principal Lighthouses on the Brazilian Coast

North to South

		° ′ ″		° ′ ″		
State of Pará	Salinas	0 35 10	S. ...	47 21 30 West of Greenwich	... Visible	15 miles
„ Maranhão ...	Itacolomy	2 10 40	S. ...	44 22 35 W.	... „	18 „
„ „ ...	Santa Anna ...	2 16 20	S. ...	43 36 25 W.	... „	20 „
R. Grande do Norte ...	Mossoró	4 57 12	S. ...	37 07 10 W.	... „	12 „
Pernambuco	Recife	8 03 22	S. ...	34 51 55 W.	... „	20 „
„	Fernando do Noronha Island ...	3 48 30	S. ...	32 23 26 W.	... „	20 „
Alagôas	Maceio	9 39 20	S. ...	35 42 30 W.	... „	20 „
Sergipe	Aracajú	10 58 20	S. ...	37 03 55 W.	... „	17 „
Bahia	Barra	13 00 37·4	S. ...	38 22 05 W.	... „	18 „
„	S. Paulo	13 22 35	S. ...	38 52 09 W.	... „	25 „
Abrolhos Islands ...	— ...	17 57 30	S. ...	38 41 05 W.	... „	23 „
Espirito Santo	Rio Doce	19 37 10	S. ...	39 49 15 W.	... „	18 „
Rio Janeiro	Cabo Frio	23 00 40	S. ...	42 00 00 W.	... „	30 „
„	Ilha Rasa	23 03 40	S. ...	43 08 15 W.	... „	25 „
S. Paulo...	Moéla	24 03 05	S. ...	46 15 30 W.	... „	24 „
Parana	Conchas	25 32 40	S. ...	48 18 48 W.	... „	18 „
Santa Catharina ...	Ilha de Paz ...	26 11 30	S. ...	48 30 44 W.	... „	20 „
„ „ ...	Santa Martha ...	28 38 00	S. ...	48 49 45 W.	... „	17 „
R. Grande do Sul ...	Barra	32 07 29	S. ...	52 06 00 W.	... „	16 „

CHAPTER XIII

NATURAL HISTORY—PART I (FAUNA)

During the long pre-glacial period there were, presumably, three distinct migrations of Fauna, one from Europe to Africa and South America, another from the Antartic regions to tropical America and Africa, and a third principally from Arctic America southwards.

Shortly before the ice age, two currents were in motion, the first from South to North America, and the second in the contrary direction.

Most of the fossil remains hitherto discovered in Brazil, are akin to those of the same geological periods in Europe.

Here I propose to confine myself to living animals, as paleontology will be dealt with elsewhere.

Fishes

Rio Janeiro is a great market for fish of every description, but now, thanks to cold storage facilities, S. Paulo and B. Horizonte, and other inland cities get their share in the finny spoil, although at outrageous prices.

In the vicinity of the Federal Capital, the small ports of S. João da Barra, Cabo Frio, Angra dos Reis, Paraty, etc., all in the State of Rio, are largely occupied in the trade. Steam trawlers are

very few, and, naturally, local fishermen do their best to oppose such enterprises.

Dr. Affonso Costa, Director of the Information Bureau of the Agricultural Ministry, has called attention to the great abundance and excellent quality of most sea fishes. One concern, operating steam trawlers at Santos made net profits for a season, of £10,000.

The principal kinds of fish found in the market are the following: Robalos, a variety of sturgeon, sold at 6s. to 18s. each; dourados, weighing up to 50 kilos; sword fish, anchovies, shads, flounders, soles (*Solea vulgaris*), etc., etc., up to 20 inches in length by 20 in breadth, mackerel, dog fish, ray, king fish, needle fish, cavalla (*Scomber scombrus*), sardine, garoupas (3s. 6d. to 6s. a kilo), corvinas, badejos (cod), bijupirás, meros, mullet, whiting, xernes, tainhas (tench), found principally in southern waters and caught in huge quantities (maximum weight 3 to 4 kilos), congers, etc.

The king of all fresh-water fishes is the pirarucú, representing in the Amazon the daily substitute for meat.

This monster grows up to nearly 9 feet in length, and its maximum weight may reach 200 pounds. It is usually sold dried. Known also as peixe vermelho (red fish), *Vastres gigas*, is found in river and lake indifferently. The tongue is 8 inches long, containing a flat spiny bone, used to scrape the guaraná. Its scales are 1½ inches in diameter, of a beautiful silvery colour, deepening on the dorsal part to a brilliant vermilion. The fisherman is almost always an Indian, and he sets out in a small canoe, usually accompanied by a boy, who sits in the stern, steering and propelling the craft at the

same time, with a short, broad paddle, the man standing or squatting in the bows, with his harpoon poised, ready to transfix his prey. It is extraordinary how his eyes perceive a movement or shadow in the water which would be invisible to any one else. The barb becomes detached from the handle as soon as a fish is struck, and the stout cord is brought into play and the creature brought alongside the canoe as soon as it is exhausted by its struggles with the fisherman. If it is too large for him to manage alone, and no help is at hand, he makes fast the cord to a buoy, and lets it go for the time being. At times a second harpoon is driven into its body if the first is not effective. As soon as the fish is within reach of the canoe, a slip knot is placed over its body, below the pectoral fins, and a blow with a club on the head ends its career.

Eight, ten and twelve fish are sometimes caught in a single morning.

It is believed that this fish sits on its eggs, as it has been frequently observed to deposit them in such a way that the open gills protect them as soon as deposited, and the young fish almost immediately becoming hatched, and taking refuge in the opening of the fins whenever pursued. The Indians assert that the pirarucú scoops out a sort of nest in the sand and that the male and female fish alternately watch the eggs until they are hatched, and then the mother accompanies the fry until they are able to look after themselves, the male fish always swimming in the rear to guard them from surprise. It is on these occasions that the greatest number are caught, just when they ought to be exempt from the fisherman's persecution. In flood time hooks and lines are often used in the dis-

coloured water, extending a long cord, with a number of smaller ones, well baited, hanging from it, across a river at night.

In 1916, a Pirarucú was caught on a line at Manáos over $2\frac{1}{2}$ metres in length.

THE PIRARUCU OR ARAPAIMA.

PIRANHA. SERRASALMO RHOMBEUS (LINN.)

Many fish are stupefied by the use of *Cocculus indicus* (poisonous berries), or other venomous plants, myriads of small fry being killed by this abominable means.

The Gymnotus, or electric eel (Puraqué), common in many of the lakes in Matto Grosso and

Amazonas, may attain 8 feet, and weigh 20 kilos. Two new species have been found recently in the river Araguaya. Its shock is equal to that given by a battery of Leyden jars.

José Verissimo, "A pesca na Amazonia," reckoned the entire population of this vast region at 600,000, and calculated that the total consumption of fish was 22 million tons annually. Agassiz wrote: "There are more varieties of fish in the Amazon than in the Atlantic Ocean." He classified over 1,800 species, and numbers have been added since the middle of last century. Dr. Miranda, of the National Museum, Rio, has written several monographs in the Archives of the Museum.

In spite of the great profusion of fish food in the rivers and coastal waters, Brazil, in 1915, imported dried salt cod (bacalhau) to the value of £1,250,000, Japan entering this market, and supplying a quality, put up in a manner superior to that of all her competitors. Possibly the fish itself is not cod, nor even anything of the same nature, but its appearance is undoubtedly first rate.

Rio Grande do Sul has begun to send to Rio and S. Paulo some dried fish but I would not care to classify it, from an alimentary point of view.

Amongst other fishes are the frade (Chætoden), a very flat, bony creature, some varieties being barred from head to tail, and a rarer species, black, with silvery stripes, exactly the contrary to the commoner type.

Bagres. These are said to hatch their eggs in the mouth (a variety of cat fish).

Gold Fish, found in São Paulo as far back as 1560. The *Cará*, a small creature, makes its nest in the river bank. *Gata Marinho*, a needle-like

pest, which has the exceedingly dangerous habit of introducing itself into the urethras of bathers, causing painful, and at times fatal wounds.

In the State of Matto Grosso may be found the mud fish, piramboia or *Lepidosiren paradoxa Fitz.* The adult male of this strange animal is sometimes a metre in length. The Indians dig it out of holes in river beds, where hardly any moisture remains. It is also found in the Amazon and other rivers of the N.W. Piranha (scissors fish).

In the Aquarium, attached to the National Museum in Rio de Janeiro, they snapped at my fingers as I drew them along the glass outside their tank. Perch exist in the Amazon, reaching 14 to 15 inches in length; the acará, 9 to 10 inches, is found almost everywhere, and fish are so bold and fierce in all the rivers where they are left in peace, that it is a common occurrence for a person pulling a small fellow out of the water to have it snapped out of his hand almost by a large fellow dashing at the prize.

Carp do very well in São Paulo, some imported fry put into the reservoir of the waterworks growing from 1½ to 19 inches in eighteen months, and having to depend entirely on the natural food found in the water. Many have been transferred to lakes in Rio Grande do Sul and grow quickly, one of 3½ years old weighing 10 kilos.

This is undoubtedly larger than any fish of the kind found in European waters.

The method of taking fresh-water fish in Brazil is not regulated in any way by the appointment of fishery commissioners or other officers. The splendid natural preserves for trout are entirely

without inhabitants. Most of the mountain streams are quite fishless, or inhabited by such kinds as lurk in the more sluggish and muddier parts. Where there are good fishing stations, the stocks are decimated by means of dynamite, and the immense reserves of crustaceans, clams, oysters, mussels, etc., have been decimated ruthlessly for centuries.

It is certain that careful introduction into the mountain streams of such hardy varieties of the *Salmonidae* as the rainbow trout would pay very well, especially if care were taken to avoid contamination by sewage, and to protect the fisheries from poachers. The variety named can support a temperature of 25 Centigrade, and this is higher than that of the water at any time of the year. As far as food for the adult fish is concerned, there should be no difficulty about that, as many kinds of fly are found, and fresh-water insects, but the main difficulty would be the alimentation of the small fry during the first few months of their existence.

Approved fishing companies will be granted concessions of land, for the purpose of installing their warehouses, and for quays, etc. Trawlers may be manned with half European crews for the first five years. Steam trawling will be prohibited within the 5 miles radius, and the mesh of the nets must be at least 7 centimetres from knot to knot. The State of Paraná has long since forestalled the national Government in respect of fisheries protection, and instruction is given in the elementary schools.

In the great rivers of the south there are many large fresh-water fishes, the jahú weighing a hun-

dred kilos, and the surubim, dourado, etc., not very much less. The piranha (quite a small fish) is extremely voracious, attacking any living thing that gets into the water, and is unable to swim fast enough to escape it. Cattle suffer considerably from it, frequently being entirely consumed by the multitudes which hurry to the spot, attracted by flowing blood.

Cetacea

Whale fishing first commenced in 1603, a Spaniard bringing two ships with their crews complete from Europe, in order to teach the Portuguese. In 1798 concessions were granted to persons who desired to go in for this industry at a cost of 600 $.

Whale fishing is carried on along the coast-line of the State of Bahia. The animal caught is a roqual (*Balænoptera musculus*). It contains 360 pieces of the so-called whalebone, but their shortness (32 inches) renders them of little commercial value. The animal is from 30 to 70 feet long, and yields up to 5,000 quarts of oil. The season lasts from May to December, commencing in the south of Caravellas. There are thirteen whaling stations, eight of which are near Bahia city itself, five of which are on the island of Itaparica in the bay. The others (with the exception of Caravellas) are more to the north. The boats are about 30 feet in length, very strongly built, with ribs not bent but hewn to the shape required. On each side of the bows is a sort of cleat of natural bent wood. There is a single mast, stepped a little forward, with a huge mainsail, square in shape. Each boat has eight to twelve harpoons with 10 fathoms of

1-inch manilla line. There are also several spear-pointed lances mounted on long poles, with 6 fathoms of ¾-inch rope attached to them.

On each bow of the boat there are coils of 2-inch rope nearly 100 fathoms long, and down aft two more coils of 70 fathoms for emergency use, as well as oars, stores and cooking utensils. Each boat has a crew of ten; all under the orders of the harpooner. The whalers go out each morning at sunrise, and return at nightfall. The method of approaching, striking and killing the animal does not differ much from that employed elsewhere, but after it is killed one of the crew must dive under it and pass a rope round its mouth to secure the latter with, otherwise the animal would fill with water and sink. The whale is towed to the beach and cut up there, and the flesh is frequently sold and eaten. There are no modern appliances for trying out or refining the oil, and no means of utilizing the refuse as manure. The average catch per season is 300 to 400. Salaries are small, but for each whale caught the harpooner gets £6 10s., the boat steerer £3 5s., and each of the others 12s. 6d. The total number of men engaged is about 900, and there are some 50 boats engaged in the trade, those from Caravellas being of about 15 tons burden each. The proceeds in 1903 were £30,000.

The whalers only give up the blubber, fat, and tongue, and sell the rest of the carcase privately.

On the southern part of the coast porpoises are captured for the sake of their fat and frequently measure 26 feet in length, yielding as much as 50 kilogrammes of oil from the liver alone. Up the Amazon the manatus (*Peixe-boi*) is eaten. One

young one was taken alive to Europe, being suckled by a cow during the voyage, but died in the English Channel owing to the coldness of the water in its tank.

These creatures vary from 1 to 4 metres in length, and are said by the Indians to be sirens and seduce their women. The eyes are used as amulets and believed to serve as charms to soften the hearts of beloved persons, whilst the teeth are worn as safeguards against dental complaints.

Fish Glue

The silurus (catfish) is the one which supplies most of the above, and the price obtained for it in the market at Pará is 3s. per kilogramme, in comparison with 1s. 6d. from other sources.

The exportation of fish glue from Pará and other places in 1905 was 72,429 kilogrammes, worth £15,508. Export tax 7½ per cent., plus 50 reis per kilo municipal tax. Freight to Liverpool, 45s. per ton; Havre, 50 francs.

Game and Other Animals

The supplies of the capital, in the way of game, come from the Serras of Tinguá, Estrella and the Organ Range principally, as well as from Barra Mansa, Merity, and as far as Novo Friburgo. Besides rabbits, hares, 2s. 6d. to 2s. 9d. each, deer, pigeons, pacas, agoutis, otters, peccarys and wild boars are occasionally seen.

Over 50 species of simians are peculiar to Brazil.

The bearded monkeys (*Mycetes*) (The Howler) go in bands. They live in the dense forests in the tops of the tallest trees.

The coatá (*Atelespaniscus*) dwells in Upper Amazonas. One of the largest Brazilian monkeys, he

is easily domesticated, and is often seen amongst the Indians.

The largest of all is the muriqui (*Eriodes hypoxanthus*) preferring the virgin forest, especially in São Paulo and Espirito Santo.

The capuchin (*Sapajou*) has light coloured fur and a round face.

The Douroucoli is greyish white with three transverse bands across the forehead.

Midas rosalia is found on the coast near Rio: it has beautiful yellow fur which gleams golden in a bright light.

Cebus are common all over Brazil.

On the Peruvian frontier is found the smallest living simian (*H. pygmœa*). Its extreme length is 32 centimetres, and half of this is taken up by the tail.

The anteaters are very varied in size, the greatest (*Tamanduá bandeira*) being over 4 feet long. He is a somewhat dangerous beast at close quarters, being able to give a severe hug, and causing deep lacerated wounds with its sharp, curved claws.

Sloths are found north, the two toed, and south, the three toed only. The fur is a dirty grey or light yellowish brown, but the face is almost black. Their extreme length is 2ft. 3 in.

The tree porcupine (*Coenda*), beaver, raccoon, opossum (fish-eting) and otter are common, as well as the gambá (a small marsupial), hare (Rio Grande do Sul), the great and little armadillo (Tatú). The largest variety (*Cheloniscus gigas*) has a shell so immense that it serves for a cradle, being used for that purpose at times amongst the aborigines. Of typical Brazilian animals, the most noteworthy is the tapir, living in the reedy lakes on the top of the

coast and other ranges. Sometimes he is hidden in a dense forest of grasses 7 or 8 feet high, and growing in tufts with deep holes between. This unwieldy animal is found within four or five hours of Petropolis, or two of Theresopolis, and a couple or leash of good dogs are necessary to make him move out of his retreat. His hide makes excellent harness. When pursued by a jaguar, he rushes with tremendous force through the undergrowth, and in many cases where the great cat has succeeded in lodging on his back, the shock of the encounter with saplings and cane brakes has not only torn the attacker from his hold, but smashed his skull.

There are three species of tapirs, the largest being 2 metres long by 1 metre 7 centimetres high. It is the most imposing South American quadruped as far as size is concerned.

Amongst the rodents, Brazil possesses the largest in the world, the capivary, a metre long and 70 centimetres in height. The paca is over 2 feet long, and the agouti 19 inches. The two first-named are amphibious and are usually shot from a boat, as they lurk amongst the rushes in the rivers.

These animals are very destructive to all sorts of crops. Squirrels and hedgehogs abound, and *Lepus brasiliensis*, the wood rabbit, is common in south Brazil.

Altogether there are 200 rodents in the country, including both varieties of rats, the grey and the black.

Amongst the smaller carnivora, the guará (wolf) is noteworthy. His appearance is not unlike that of a greyhound, but the coat is covered with long, light red hair. Living in the open Campos, he

hunts pacas, coatis, hares, etc. Not found in the north.

A jackal, the size of a European fox, is found all over Brazil, and the Cachorro do matto (*Canis brasiliensis*) is a near relative, and is particularly partial to hen's eggs, like his transatlantic cousin.

The irara (*Papa mel*), or honey eater, is of a blackish-brown colour, with a greyish head and neck. His length is 18 to 24 inches. This animal is easily tamed, and I have seen one jumping over his master's hands like a cat.

The great felines are aptly represented by *Felis onça*, the jaguar. He is hunted in the most courageous manner in Brazil. The native seeks him out of his den, and armed only with a long knife and a stout fork with two prongs, awaits his onslaught, transfixing the beast and stabbing it to the heart. This animal comes next in size and power to the lion and tiger. Its height is nearly a metre. May be seen now and then in the Organ Mountains near Rio de Janeiro.

The puma (*Suçuraná*), or onça vermelha, is nearly the same size. It inhabits the forest for preference, and unlike the jaguar, avoids the rivers as a rule. Exceedingly agile, and a far better climber than its greater rival, it is able to spring a distance of 20 feet in length or 10 feet high.

Three or four varieties of tiger cats are found in different parts of Brazil.

The peccary, or wild pig, 3 feet 3 inches long, is a most ferocious little beast, and the only animal known to have successfully attacked a jaguar, who had seized one of the band. The rest turned immediately on it and literally tore it to pieces.

The largest deer is *Cervus paludosus*, 1 metre 70 centimetres long, and 1 metre high. It inhabits central Brazil. Fifteen varieties in all are known.

The chiroptera are exceedingly widespread, one of the most disagreeable varieties, the vampire, being, of course, well known by reputation. The effect of its bite is greatly exaggerated, inflammation hardly ever setting in, and the loss of blood very small.

Most of these bats are essentially frugiverous, and do a large amount of damage to banana and other plantations. Brazil possesses over 100 varieties.

Sea lions and seals are met with all along the coast of Rio Grande do Sul, and the lontra (*Lutra-platines solitaria*), in Paraná.

The hedgehog, and préa (*Corea operea*), are common enough in the south.

CHAPTER XIV

BIRDS, REPTILES AND INSECTS

Birds.

According to Dr. Goeldii (*As Aves do Brazil*), there are at least 1,680 species of birds in the Republic, a number superior to that of any other country in the world. There are, however, few songsters of note, but many screamers. One variety of sabiá (*Mimus lividus*), worth in the Rio market up to £7, is greatly esteemed. The sabiá-una (*Turdus flavipes*), bicudo (*Fringillidae*), worth £2, and encontro (*Icteridae*) are amongst other birds with pleasing notes. Dealing in the most brief manner with the subject, one may note amongst the *Vulturides* the corvo branco, or urubú-rei (*Sarcorhamphus papa*). This magnificent bird measures over a metre in length, including its tail. The exterior of its wings is black, the breast white, the interior of the wings whitish red, the neck and head yellow, orange, and red, and the throat grey. The common urubú is protected by the State as a useful scavenger, but Dr. Paschoal de Moraes, of Rio, denounces this variety as a propagator of carbuncle amongst cattle, as well as every other contagious disease to which animals are subject. It is, he says, sufficient for the urubú to have made a meal off a diseased beast for a whole pasturage to become infected.

Of the *Falconidae*, the caracará (*Polyborus brasiliensis*) is about the size of the European bustard. Its predominating colour is white, with transverse black bands on the breast and on the neck and upper part of the back.

The place of the crow in the European pastures is taken in Brazil by a small hawk (caracará branco) which renders good service to the cattle in removing from them a variety of ticks, especially the carapato. The gavião real, or uraçu (harpy) (*Morphus harpyia*), is a truly formidable bird over a yard long and with claws and beak more powerful than those of any other of the predatory species. Fortunately it is relatively rare in populated centres, preferring forests near the margin of rivers. On the Xingú and Araguaya it is frequently kept in captivity by the Indians, as well as a large variety of other birds, commonly toucans and parrots. The whole of the tribe of the *Falconidae* are *inveterate* enemies of the monkey, and I have seen two animals of a size apparently large enough to protect themselves from most enemies shrink chattering and terror-stricken into the remotest corner of their cage when a distant speck appeared in the sky, so small that the human eye could not distinguish any resemblance to a bird. The fish hawk is common all along the coast and on the banks of the larger rivers. Owls are well represented, and the jacurutú (*Bubo crassirostris*) is the most notable, the female in order to feed her young not fearing to attack pacas or agoutis. A whole chapter could be easily written on the parrots and macaws alone, but I must limit myself to describing the following. *Sittace coccinea* (macão), a metre in length frequently, with a scarlet vermilion body and tail, and part of the wings bright blue with

orange-yellow feathers in the middle. Another macaw (*Sittace chloroptera*) reaches 33 inches, and has plumage of a darker red. The hyacinth macaw is much rarer, and grows larger than any other. It is of a cobalt blue colour, with a huge black beak, and, contrary to the habit of the *Conurides* in general, is not usually met with in bands. The largest green macaw is the *S. militaris*, attaining 30 inches. These birds are exceedingly long lived. Dr. Goeldii (op. cit.) relates the story of Humboldt, who in the Maypures found a parrot speaking the language of the Atures, an extinct tribe. The paroquets are common all over Brazil, extending as far south as the river Paraná.

The true parrots also appear in hundreds, especially in the tropical zone, and the *Androglossa farinosa* is doubtless the largest in South America, being frequently over half a yard long. Green in general, speckled in front, with the abdomen clear yellow, having a red border to the wings, this papagaio has a regal aspect, but cannot compare for beauty with *Deroptus accipitrinus* (anacã). The neck feathers are brownish-red with wide blue borders, the back green and the breast red. This parrot does not exceed 30 inches in length. Most of the Brazilian parrots and some of the macaws have great capacities for learning songs, and imitating other animals of every kind. Dr. Goeldii became acquainted with a feathered philosopher who used to scream out "Viva" in a fervent manner whenever rockets were fired, but immediately afterwards, in an undertone to those near by, he would remark, "Tolo! tolo!" (foolish! foolish!), thus expressing his contempt at the ridiculous custom of letting off fireworks on every saint's day, or other appropriate

or inauspicious occasion. The toucans are fitly represented by *Rhamphastus toco* (tucanuçu), sometimes almost 2 feet long. The enormous beak is orange, and the colour of the body blood red, and whitish on the upper breast. It is rare in the State of Rio, unlike several other and smaller kinds, which are most destructive in the plantations, as they are (like the parrots) gregarious, and are said not only to rob other birds of their eggs, but to destroy the young. They are noisy, quarrelsome creatures, and were they not shot for food, would become a plague in some districts. Their beaks are commonly used as powder horns by the inhabitants of Minas, etc.

Woodpeckers form a numerous family, no less than 65 varieties being catalogued. Allied to the cuckoo are the anús, small sombre-plumaged birds, especially common in the north of Brazil. The taquara (*Momotus levaillantii*) is a splendid creature, some 19 inches in length, with the body and wings olive and the abdomen rusty-orange red; it is somewhat rare. Trogons cannot compare with the variety well known in Guatemala, but *Pharomacrus pavoninus*, of the Amazon and Rio Negro, is the most resplendent Brazilian representative. It is dark golden green on the back, and in front purple vermilion, with the base of the beak rose vermilion.

Martins and swallows are well distributed both north and south. The humming birds vary in size from topaza pella, the largest known variety, over 8 inches in length, with golden green throat, violet head, back and abdomen red, with patches of garnet hue; to tiny fragile creatures that would easily go into a large thimble. Some are like flashes of electric metallic blue; others evanescent gems of every imaginable combination of hues. One and all,

however, are most courageous, attacking everything that comes in their way, and pursuing with the greatest ferocity the large moths that venture forth in daylight from the dark shades of the forest into the open glades. Contrary to the general opinion, the principal aliment of these tiny living jewels consist of minute, almost microscopic insects, found within the calixes of many flowers, or snatched from spider's webs. Curiously enough, the equatorial region is comparatively poor in the *Trochilides*.

The whole of Brazil possesses 80 species, and from Ega down the Amazon to its very mouth, and over the whole of the lower basin, not more than ten kinds are known.

We have already spoken of two kinds of sabias, but *Turdus rufiventris* (sabia larangeira) must be noted by reason of its brilliant iron-red plumage, and because it is perhaps the most common variety.

Troglodytes inhabit the tropical zone principally. Corvos and tanagras are hardly worth notice, but one of the *Cassicines* (gauxes), called japú, is curious by reason of the contrast afforded between the black plumage of the body and the yellow tail. The araponga is well known by its harsh metallic voice, and it may be termed the blacksmith, because of the perpetual ringing note, like a hammer striking an anvil.

João da Barra (*Furnarius*) has a disagreeable habit of building its clay nest on the top of telegraph poles, covering the insulators and wires, and often intercepting the electric current. It is said that this bird is a good Catholic, as he never works on Sundays.

The perna lavada is a fine game bird, but only 10 inches in length.

Pigeons are a plague in many parts of the interior, and although hosts are slaughtered every year, their numbers do not appear to diminish.

Amongst the *Gallinacæ*, the mutum is one of the finest game birds. The plumage of the male is a metallic dark blue, almost black, with iridescent green sides, and white underneath; the female being yellowish in the same part of the body.

Mutum Cavallo (Mitú), body blue-black, beak coral red, legs rose. Sometimes measures a metre in length, and weighs as much as a plump turkey.

Jacú (*Penelope*). There are more than 20 varieties of this handsome bird. It is somewhat smaller than the mutum, metallic green in hue, or brown with greenish sheen on the legs, and brownish red underneath.

Macùco (*Tinamus solitarius*). Common in the forests near the coast. Resembles a large hen, but is dark brown in colour, the breast showing lighter shades.

Perdiz (partridge) *Rynochotus*. Lives, like its European relative, in the campos of the interior in flocks. A very shy and wary bird.

Inhambú-tona. Larger than the macùco. The plumage is of a beautiful blue hue. An excellent bird for the table.

Capoeira (urú) *Odontophorus capoeira*. Weighs as much as 6 kilos, and measures a metre in length. Back and sides reddish-brown. The male is crested, with darker markings, and yellowish patches in between.

Pato do Mato (*Cairinha moschata*). This so-called duck is as large as a goose. Body blue-black, with white markings on each wing. Belly lighter coloured.

Yapurú. In Amazonas. This small bird has such

a sweet note that it is said to be surrounded by an admiring throng of rivals, everytime it bursts into song.

Jacamin. Another denizen of the equatorial zone. Black or grenish black plumage. Easily tamed, and often acts as foster-mother to bereaved chickens. It is known as "Juiz de Paz" (Justice of the Peace), through its curious habit of rushing in between quarrelsome feathered brethren.

Birds of Paradise, waders, including the garça real, a metre high; egrets, from whose bleeding breasts the beautiful white feathers for Aigrettes are torn; blue herons, spoonbills, the scarlet ibis, flamingos in bands of hundreds, or even thousands, add life to the dismal swamp and lakesides throughou the country.

Some of these long-legged fowl seem to be imbued with a very keen sense of humour, which is not likely to appeal to a student of harmony. Evidently telling each other the funniest of stories, as they stalk solemnly about in pairs, suddenly by mutual accord, emit the most extraordinary cries, which are (undoubtedly) what corresponds to human laughter.

Many purely aquatic birds, such as the pelican, wild duck and goose, the black-necked swan with its blood-red beak (the largest and handsomest of its species), this latter being peculiar to south Brazil, its white brother, and sea fowl like the stormy petrel, frigate bird, and several kinds of divers, make up the feathered throng, completed by the rhea, or ostrich of Rio Grande do Sul, etc., etc.

Nests and Eggs

Very little pains has been taken to examine the nests and eggs of Brazilian birds, but Drs. Hermann von Ihering and Carlos Euler have noted a good

deal in the south (see Bibliography) with regards to the habits of the following:—

Sabia branca.—Makes a nest of twigs, lined outside with clay and moss. The eggs are greenish-blue, with brown spots.

Sabia laranjeira.—Builds for preference in orange trees, as its name suggests, 2 to 4 metres above the ground. The eggs are yellowish-green, with light and dark brown patches.

João da Barra lays white eggs, and builds one nest on the top of another.

Humming birds make their homes of almost as light a material as they themselves are composed of—moss, creepers, feathers, etc.—and suspend them from a light branch or climbing plant.

The *Anú preto* is not by any means particular as to his nesting place, just placing a few twigs together mixed with leaves, in a fork of some high tree, and laying on them seven to twenty bluish-green eggs covered with a thin calcareous crust.

The *Urubú rei* nests at the extremity of withered branches and deposits but two eggs at a time. The common urubú seeks out a crevice or hollow in the rocks in some inaccessible situation. The eggs are the same size as a duck's, and are covered with brown and blue patches.

The rhea has a peculiar custom, all the hens of a flock laying in the same nest, which may contain sixty eggs. Brooding commences in July, and the male birds sit and take care of the young ones.

The bemtivi finds a convenient nesting place in a hollow, amongst parasitic plants, high up in a tree.

The jacú lays two to four eggs on a nest of twigs, and the flamingo does not trouble about one at all, sitting on its two eggs on the ground.

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Praça Antonio Prado, S. Paulo.

The mutum lays eggs with a very hard roughly granulated surface, and a shell almost a millimetre thick.

The proportion of birds to quadrupeds and other mammals is six to one at least, according to Wallace, Natterer, Bates, Goeldii and the Prince Max von Neuwied.

Feathers, Scales, etc.

The following are the principal birds furnishing feathers for export:—

Emu, parrot, macaw, toucans, humming bird. The most valuable are those from the garça (white heron), and are taken from the head of the male; they are known in England as ospreys, and are worth one conto of reis per kilogramme locally. Most of these feathers (few in number in each bird) come from the northern states. In 1905, 158 kilogrammes 627 grammes were exported. Export tax 600 reis per gramme. Tax in Pará, 37½ per cent. In 1910 this state exported 12,400 ounces of aigrettes, of a value equal to 5,691 $300 paper. In the previous year three times the value was exported.

The feathers of the emu are from 3 to 8 inches long, and the best are used in the manufacture of boas. Exportation (1905), 1,983 kilogrammes, value £1,600. Of the feathers from the immense variety of multi-coloured birds (exportation 25 kilogrammes, worth £65 only), a great many are used in the country, made up into ornaments, flowers, etc. The scales exported are from the sturgeon, gropers, etc. These are nearly all made up in Santa Catharina and Parahyba do Norte. Flowers are also made of shells, leather, etc. In Rio de Janeiro there are two or three houses making a speciality

of ornamental work of all kinds, including butterflies' wings, bettles' wing sheathes, etc., made up into an infinite variety of designs, and costing absurd prices, considering the mite given to the countryman who brings them in. Profits of 200 to 300 per cent. are very frequently made in this sort of business.

Snakes

Of the Ophidians, the cascavel (rattlesnake), corals, boa-constrictor, jararaca, and surucucú are the best known. The latter is sometimes 2½ metres in length, and its bite is almost always fatal.

The sucury is a water snake which at times attains 45 feet and it pursues the manatee and the largest fishes, and sometimes attacks human beings.

This is the largest animal of its kind in the world, and, fortunately, it is limited to the more tropical zones of Brazil.

The mussurama (*Rhacidelus brazilii*) is an entirely harmless reptile that subsists exclusively on other serpents, and the poisonous ones for preference. It has a very flexible blackish-grey body, covered with iridescent scales, and may attain the length of 7½ feet. An individual measuring 1 metre 70 centimetres, kept in the Institute Serumtherapico of Butatau (S. Paulo) devoured a poisonous snake 1 metre 40 centimetres in length (see illustrations).

This institution is engaged in breeding the above mentioned reptile, in order to distribute it to planters. It also prepares anticrotalic and antibothropic serum, for the bites of rattlesnakes and jararacas.

The great Surucucú, or bushmaster, as it is fitly termed, is fortunately rare. It reaches the length of 12 feet, and is the largest poisonous reptile in the world. The ground colour is rose, or rather

yellowish pink, with brown patterns, and tints of purple. The fangs are an inch long, and as much as 10 ounces of venom has been extracted from them at one time.

Amongst other snakes are the urutú, sometimes 1 metre 40 centimetres in length. It has a thick brownish body with whitish patches, and a design of V-shaped convex curves, with their points directed to the centre of the body, and a Y-shaped design on its head. It is, like the *Surucucú tapete* (carpet snake), very venomous. This latter reaches over 2 metres in length, its head is perfectly triangular, the body black above, marked with oblique yellow lines. The belly is yellow with black patches.

Jararacas (*Pytas pantherina*). The largest may reach 2 metres. This oval-headed jararaca is not poisonous, but it is similar in colour to those which are, but are generally considerably smaller.

Spilotis variabilis (*caninana*). 3 metres long sometimes. Its body is a bright steel blue, with white markings.

Other jararacas include *Bothrops lachesis*, *B. disporus*, and *B alternatus* (most dangerous varieties).

Vibora da Cruz. This serpent has a kind of cross mark on its head. The body is thick and may attain 2 metres.

Crotalus horridus. Rattlesnake (Cascavel). The deadly nature of its bite is well known, and fortunately it is not common.

The mortality per annum from snake bites has been considerably reduced, and is principally amongst the bare-legged field workers and small farmers, most of whom are extremely reckless. There are 180 varieties of snakes in Brazil, of which not 10 per cent. are venomous.

Some extraordinary kinds of frogs and toads are

found, including *B. marinus*, who measures 6 × 4 inches.

Turtles are not so common on the Amazon as fifty years ago, owing to the wantom destruction in taking them, and thinning out their eggs for the purpose of extracting oil. The turtle is largely used for food, and in Pará at the present time the meat costs from 6s. to 25s. a kilogramme, according to season. There are also six kinds of tortoises which form important additions to the diet of this region.

Altogether, there are 25 species of turtle in Brazil, the largest, *Sphargis mercurialis*, now being very rare. It is over 6 feet long, and may weigh more than 800 kilos. Colour, blackish brown. Some towns on the Amazon obtain good revenues from taxes imposed on those engaged in the business of turtle catching, mainly for the purposes of oil extraction.

Saurians number 100 varieties, the commonest being the small brown or yellowish grey Geckos, 5 kinds existing. *Iguanas* are well represented, including the legendary chameleon, which really does change its colour, apparently through effects of *ch'aroscuro*. Some of these lizards are most brilliant in hue. They number 41 species, and 19 genera.

Telidæ. Twenty-nine species occur in Brazil.

Tupinambas. Of this class, *Texuixin* is the undoubted king. It is at times over 2 yards long. Body black and blueish, yellow patches.

Insects

Fire flies, so-called, include the giant *Pyrophorus noctilucus*, sometimes an inch in length. One big fellow has a dark olive brown wing covering.

Amongst the beetles, *Dynastes hercules* is a monster which attained 16 centimetres, the larva being even larger.

Some of the insects are extremely powerful, and an infinite variety are met with, some a brilliant metallic blue or green, others red, yellow, gold, spotted, one with a distinct cross on his back, many meriting the title of living jewels.

The monarch of all flies is, undoubtedly, *Pantophthelatis*, as long as its name, $3\frac{1}{2}$ inches across the wings, and a body over 2 inches.

Scorpions (*Tytius*) as long as 20 centimetres.

The Praying Mantis (*Louva deus*) is a most cruel and treacherous insect, and hidden amongst the foliage under the protection of its mimicry of green leaves, pounces suddenly on some unfortunate fly or other defenceless creature, and tears it limb from limb, holding it securely between its two powerful fore-legs, whilst it devours the victim at leisure. Convicted of cannibalism, the female attracts the opposite sex and, biting the head in two, feasts on the brain, rejecting all the rest.

Other leaf insects are numerous, but the most curious denizen of the insect world is the uncanny beast which exactly resembles a long dead twig with sundry small offshoots. Needless to say, this creature is a terrible foe, and, attaining over a foot in length, and possessed of extremely long legs and arms, escape is difficult.

The underworld, if one may so term it, teems with examples of mimicry, which seems to be given as a cloak to the most awful attributes.

Grasshoppers are in great variety, some red with black bars, others green, and the well-known locust forming a plague, and seeming to divine by instinct where new plantations have been made.

Laternaria phosphoria, the Jequitiranaboia, is a grotesque insect about 10 centimetres long. Popularly supposed to inflict a poisonous wound.

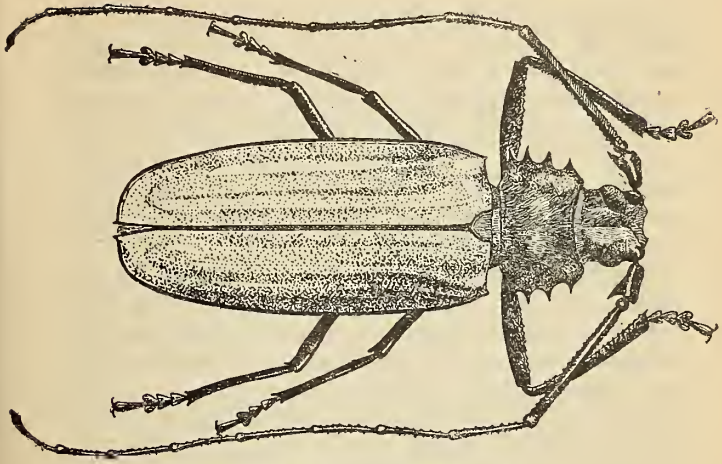
Amongst the mosquitoes, the most dreaded of all is *Stegomyia fasciata*, now recognized as the propagator of yellow fever. This has been exterminated in Rio Janeiro. The female is considered the dangerous sex.

The *Anopheles*, another of the mosquitoes, is the species responsible for malaria, and yet another, *Culex fatigans*, introduces the terrible disease known as filariasis. Needless to say, the sanitary corps in all parts of Brazil are fully alive to the necessity for waging constant war against the whole tribe of mosquitoes.

Hairy caterpillars are common in some parts of Brazil in the spring and early summer. They are known locally as *tataranas*, a word signifying in Tupi false fire, in allusion to the fact that the slightest touch causes severe burning pains that extend all over the side of the body affected, and lasting for a number of hours. Relief may be had at once by instantly pressing a dahlia leaf firmly over the place of contact.

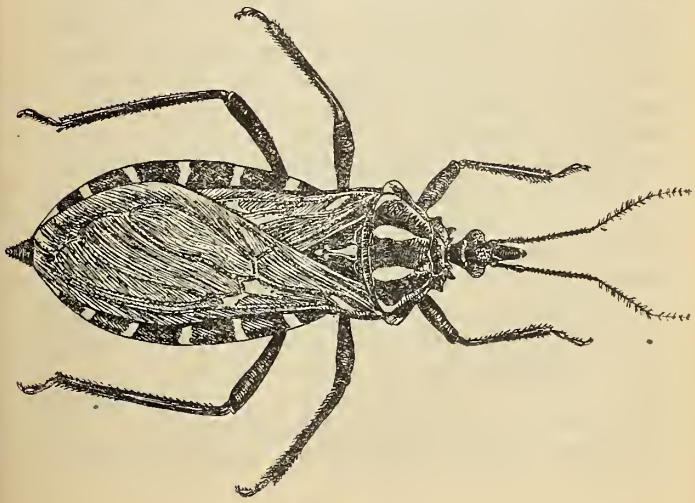
In the old wooden huts in Minas, Parana, etc., one sometimes finds a terrible insect which has a most perfect battery of puncturing and blood-sucking instruments. It is known as the "Barbeiro," but the scientific name is *Triatoma megista* Burmeister. In colour it is blackish brown, with scarlet bands across the body, and round the fore section. The design is life size, and is taken from the Memorias do Instituto Oswaldo Cruz, at Manguinhos.

It lives during the day in crannies in the wall



ENOPLOCERUS ARMILLATUS (LINN.)

11½ centimetres long. Found at Pará, November, 1897.



BARBEIRO.

or under the floor, sallying forth at night in considerable numbers, and biting animals or human beings in the room. The mark is hardly noticed and the pain insignificant, but the effects, especially on young children, serious in the extreme.

The microbe is known by the name of its discoverer, Dr. Chagas (*Trypanosomi-cruzi Chagas*), and is said to be the cause of parasitic goitre (Doença, Carlos, Chagas).

There are some fifty varieties of ticks (*Ixodides*), called carapatos, two or three of which attach themselves to man, and the rest to almost every description of animal, even the boa-constrictor, tortoise and armadillo being subject to these plagues. They vary in size from a minute speck to that of a large bug. They are usually found amongst brushwood or where cattle frequent. The common carapato, *Margaropus annulatus*, causes Texas fever. The chigoe (*Bicho de Pé*) is met with in parts of Minas, São Paulo, Bahia, etc., etc., and sundry other insect plagues may be encountered, but careful attention to the clothing and footgear, and avoidance of sleeping without mosquito netting, will usually be sufficient to protect the traveller. Of course a small medicine chest is a necessary part of the equipment.

Spiders abound everywhere. The most extraordinary variety is the *Mygale avicularis*, or bird-eating spider, found in the warmer parts of Brazil, and more or less common in the Abrolhos islands. Here it spins a web strong enough to catch lizards and even small fowl. One of these insects caught on the Madeira-Mamoré Railway in 1911 measured $6\frac{3}{8}$ by $8\frac{3}{8}$ inches, weighing 18 ounces. *Vide Bulletin of the Pan American Union*, Washington, May, 1912.

Tarantulas are too plentiful in Matto Grosso and

Amazonas, and it is necessary to shake one's boots before putting them on in the morning, as these Carangueiras, or crab spiders, take refuge therein from the humidity. See "Revista do Sociedade de Geographia," Rio, 1918. Sometimes, far out from the land on the great rivers of the south, or even on the Lagôa dos Patos, silken threads are wafted on board the ships, floating gossamer-like in the air.

Wasps are innumerable and receive the generic term of Marimbondes. In the Acre territory, one kind builds its nest in the rubber gatherers' huts, and lives on friendly terms with the legitimate occupants, sallying forth to battle whenever strangers disturb their tranquillity.

These insects construct huge nests of clay in the branches of trees, making a series of sealed chambers, in each of which a living but paralysed spider or other victim is deposited. When the larvæ of this *Vespa solitaria* comes to life it proceeds to eat its way from cell to cell, breaking down the divisions, and at last emerging a fully developed insect, to, in its turn, help on the same cycle, and enact the same tragedy over and over again.

One great striped creature is known as hunter or Caçador, and another, Manganga, from its loud and continual buzzing as it goes about its daily affairs.

Ants are everywhere. One sort, Cuyabanas, attacking and destroying the Sauvas, or common ants, which become veritable plagues to the farmer. These latter are such a nuisance that they have been known to carry off a litre of maize in the course of a single night.

The Cuyabanas made a descent on an island in the Araguaya river, and cleared 24,200 square metres

of Sauva territory in 2½ years. In Matto Grosso and Upper Amazonas these or allied species have been known to make such marches in dense columns of untold millions that nothing stopped their progress or resisted them. The largest and most poisonous insects, snakes, young birds in their nests, and all other animal life incapable of escaping by rapid flight, fell a victim to the relentless creatures. These multitudes are followed for hours by swarms of birds, immense numbers being devoured, but no interruption seems to occur.

Other ants make off with one's clothing during the night, literally tearing the garments to fragments. Add to these plagues, the termites (white ants), which pierce hard timber, and at a winged stage in their existence find their way everywhere.

Butterflies and Moths

A whole book could be written about these beautiful creatures.

The most precious of all, is *Copiotoryx semiramis*, queen of the 5,000 species which are known at the present time in Brazil. This insect is 12 centimetres across the wings. *Morphos* number some rare varieties, a noteworthy example being the large bright blue butterfly, which has been seen by every traveller in the interior. It flashes with a metallic blaze in the sunlight, like a gleaming brand, and is plainly visible a quarter of a mile away.

Hecubas are worth as much as £10 a single specimen, and some other species have wings so transparent that they may be easily read through.

Amongst the moths, *Dysdaemonia*, or Emperor's Mantle, is highly appreciated, and some of these denizens of the forest are more than 20 centimetres

across the wings. Some are decidedly addicted to frequenting carrion. *Heliconi* are amongst the commonest species of butterflies.

Professor Goeldi, of Pará Museum, wrote of the migrations of *Plerides* and other pale hued (white or sulphur yellow) species in the Amazon valley, where they appear at times to resemble snow-storms. They fly from north to south in search of the nectar in the flowers of the Arapary tree. (See *Boletim do Museu Paráense*, Tome 9, pp. 309-316.) Spruce noted the same phenomena in 1849, when he saw such clouds that they literally darkened the sky.

Animals for Collections

The bulk of the stuffed, or simply dissected birds, such as toucans and humming birds, seem, according to official data, to be exported to the United States and Argentina, at least as far as those are concerned which are not set up and mounted. There are always better prices obtainable locally for natural history specimens, but the demand is very small for the more expensive kinds.

For export: stuffed and prepared. Alligators 2 feet 6 inches fetch up to £1 10s., lizards same length £1 5s., monkeys of various sorts £1 to £1 10s., serpents (3 feet and longer) £1 5s. to £2, falcons £1 2s. 6d., water hens, woodpeckers, humming birds (assorted kinds) £1 2s. 6d. to £1 5s. a dozen, penelopes (jacús) £1 10s., crabs and lobsters, mounted and varnished, £1 16s. a pair. Armadillo coverings or shells made into workbaskets, etc., etc., up to £2 10s. Myriads of beetles and butterflies and other curious insects are also caught, of which the semiramis, up to £7 and £10 for a single specimen,

is most noteworthy. More ordinary coleoptera and lepidoptera cost 12s. 6d. to £15 a case.

Amongst the butterflies are morphos (four kinds), caligos, heliconidæ, dandædæ, papilionidæ, T. agrippina, darius, codomanus, etc., etc. A class of ants (tanajuras) from S. Paulo are also exported; these are dressed in various costumes and put up in little boxes with a landscape painted in the background. Thus arranged, they sell for 12s. 6d. to £1 a box. These same ants are cooked and sold in large quantities in the interior of the State, and are considered a great delicacy. There are also various bizarre-tinted fishes, varnished and exported, or sold locally at high prices. Apropos of this, a man came into a shop in Rio in my presence and sold a toucan for 200 reis. I asked the owner of the store (a personal friend) how much he would sell the bird for when stuffed and prepared? The answer was 10$000. *Verb. sap.*

There is yet room in the capital for a clever naturalist, who is at the same time a linguist (French and German being essential). The proprietors of the small businesses already existing have very little scientific knowledge, and their abilities as taxidermists are rather mediocre.

Amongst animals which render services to man in Brazil may be mentioned the Cangambá, or skunk (*Conepactus chilensis*), possesing the same fœtid odour of its North American brother, or cousin. This is a terrible foe of all kinds of serpents, suffering with impunity repeated bites of the most poisonous kinds. Using, in combat with dogs or other large animals, its exceedingly effective arm, and sometimes discharging such a stream of virulent liquid, that the aggressor flies in haste. The skunk,

in his attacks on snakes and lizards, just makes for the head of his victim and, heedless of the fatal fangs, devours it calmly."

There are also birds which make a speciality of such animals, and may be truly classed as *ophiophagos*. Amongst these are the Sereima and the Caná (*Herpetotheres cachinans*). Demonstration of these facts was made recently before the National Agricultural Society of Brazil by Dr. Francisco Iglesias.

CHAPTER XV

FLORA

Part I.—Rubber, etc.

Brazil may be, from the point of view of its vegetable products, divided into five zones. The northern and lesser known and populated includes the States of Pará and Amazonas and the Acre Territory, covering the enormous extension of 3,235,436 square kilometres, a world in itself, as Dr. Huber, director of the Pará Museum, aptly terms it. Throughout the whole of this region the rubber-producing tree flourishes in a state of Nature, and the Brazil-nut is found almost exclusively in the eastern section of this zone. Its maximum elevation does not exceed 1,000 feet, and the greater part is true virgin forest, rising from the alluvial or sedimentary deposits in the Amazon basin. This forest extends in an almost unbroken line from the foothills of the Andes to the Atlantic Ocean, over more than 25 degrees of longitude. Mangrove covered swamps extend for hundreds of miles along the Guiana and Maranhão coasts, forming a natural and ever increasing protection against the erosive action of the sea. The whole of this gigantic zone is almost depopulated, there being less than one person to the square kilometre.

The second zone reaches from Maranhão to Bahia,

covering an area of 1,630,510 square kilometres, and is not only more favourably situated as regards its development, but presents a greater variety of produce: sugar, tobacco, cacão, cotton yielding large crops, in addition to rubber and other minor staples. The density of population is greater, attaining 10 to 22 per square kilometre on the southern coast section, and from 1 to 10 on the north and inland. The greatest elevation above sea is 3,000 feet. The middle section of this zone is by far the poorest, suffering as it does from drought, and the principal crop in this district is carnauba. Here one finds the mimosas, acacias, cacti and other similar plants luxuriating in the dry soil. Most of the vegetation in this middle section is like that of all sandy deserts, spinous; but the vast irrigation works now in course of execution are likely to change the face of Nature in the hitherto flagellated States of Ceará, Parahyba do Norte and Rio Grande do Norte. Along the coast, especially between Natal and Bahia, the graceful coconut palm holds its sway.

Coming still further south, one enters the third zone, comprising Espirito Santo, Rio, São Paulo and Minas Geraes, having a total area of 2,096,145 square kilometres, at once the richest and most thickly populated of the five great divisions. The coastal region contains the highest mountains in Brazil, and the average elevation is over 3,000 feet, and practically the whole is covered by dense forests, presenting, according to Dr. Hermann von Ihering (Director of the São Paulo Museum), the richest display of tropical vegetation in the whole world. Nowhere else can be seen such luxuriance; gigantic palms, tree ferns and bamboos, forest trees, half hidden by a network of creepers, rising to their very

summits; undergrowth which to the novice appears absolutely impenetrable, and hiding in its verdant depths an enormous variety of floral gems, including the most beautiful and rare orchids in the world. Here one carves his way through a dense thicket, there struggles through bracken with stems a couple of inches thick and fronds spreading out some 6 feet above one's head.

Many a time I have been lost to sight and hearing within a short half-kilometre of a farmhouse in the midst of its little clearing. The forest dominates everything between the sea and the Campos Geraes. It spreads its threatening and enveloping folds round the suburbs of the great Metropolis itself, and unfortunately man has not been content to reduce it to impotence: he has, wherever any centre of population arose, destroyed and banned it until such time as the new forestry laws begin to work out the salvation of the land. Where the forest reigns, there one finds water, as the present generation has found to its cost, the result of the devastation of the woods for fuel purposes being a shortage in the rainfall, or rather in the reserve held in store in the mountain streams. The moment that the coastal range is passed, the coffee zone is reached, and afterwards, in Minas Geraes especially, a vast extent of pasture lands. In favourable localities great quantities of fruit are grown, and on the lowlands north of Rio the sugar cane flourishes, whilst the littoral of São Paulo produces an immense crop of bananas. Coffee is, of course, the great staple in the southern part of this zone, and the plantations extend westward towards Matto Grosso and Goyaz, as the railways open up the country. The greatest density of population in this zone is almost equal

to that of a well-developed European country, towns and villages succeeding each other every two or three miles. The great area behind Rio Janeiro, at present dreary swamps in the main, will in a few years become a wonderful fruit and vegetable producer.

All the forest land in this zone is very rich in cabinet and dye woods, and the narrow sandy strip between the mountains and the sea is covered with a variety of bromelias. The climate of this zone corresponds of course to its topography.

The fourth zone is undoubtedly that most suited to European agriculturists. Its area is 295,475 square kilometres. This is essentially the region of conifers, th stately *Auricaria brasiliensis* predominating, and it is without a question that part of Brazil in which wheat, oats and barley are likely to do best. Paraná produces nearly the whole of the maté exported, and fruits of every kind flourish. The coastal belt is of course tropical or semi-tropical, but the high tablelands of the interior are essentially temperate. Population is not so dense as in the third zone, but it is very cosmopolitan, and the European colonists have initiated many cultures which although foreign to the soil thrive exceedingly.

The last zone, Rio Grande do Sul, Goyaz and Matto Grosso, can hardly be said to possess a characteristic vegetation. It really forms a continuation of the first, second and fourth divisions, according to its geographical situation. The total area is 2,362,647 square kilometres. Rio Grande do Sul stands apart as a State almost entirely pastoral. Flat pampas for the most part, really a continuation of the alluvials of the River Plate estuary, the coastal range of mountains is here reduced to its most

insignificant altitude, hardly exceeding 2,000 feet in its highest part. Inland there are many small ranges of hills of low elevation. Here the vine grows to best advantage.

Goyaz in the south and centre forms the continuation of the Minas and Paraná, Campos Geraes; and in the hot valleys produces very fine tobacco; some cotton, sugar and rubber, the latter especially, in the region coming in contact with the first zone.

Matto Grosso contains in a wide stretch of country, the greatest rubber reserves in Brazil, that is to say, in a broad belt extending from the Paraná to the Amazon basins in the western part of the State. Here also are found many medicinal plants, such as ipecacuanha, salsaparilla, etc.

The eastern part of this State is mountainous, or rather forms a species of plateau, and is highly adapted for pastoral industries. This great State is hardly explored, and almost without population; and it is perhaps the richest in vegetable essences in all Brazil. It possesses a variety of climates, and only needs improved communication to become highly prosperous. Thus it will be seen that it is futile to speak of Brazilian vegetation as a whole, where climatic and other influences cause the average temperature to vary between 18° and 27° Centigrade, according to the topography and prevailing winds of the region, these factors having quite as much to do with the climate as the difference in latitude. The influence (small as it may be) of the Gulf Stream also might possibly affect the extreme north of the country just as the cold currents from the Antarctic probably exert some influence on the vegetation of the south.

Rubber

According to the great text-book, *Flora brasiliensis* of Martius, there are ten species of hevea, besides a similar plant, *Micranda siphonides;* and in Minas, *Micranda etata*, and in Bahia, *Micranda bracteosa.*

In Amazonas exists also the tapurú, the *Castilloa elastica*, and the *Hancornia speciosa*, of some six kinds.

The heveas are true forest trees, reaching at times 100 feet in height, with a diameter of a metre, or even two. They are without branches for three-fourths of their altitude. Most of the varieties producing the best and most abundant supplies of rubber are found growing in a humid situation, very frequently in alluvial soil periodically covered by the floods. They are, with the latter mentioned plants, found over an area of a million square miles. Some of them are capable of economic production up to an altitude of 950 feet. The rubber gatherers are hardly in the habit of discriminating between the various sorts, mixing the produce of many trees together, regardless of the quality of the gum. The riches of the valley of the Amazon are scarcely touched. It is sufficient to journey a few miles from the river banks to find virgin forests, and this over a distance of at least 1,000 leagues.

In the islands of the delta one finds other varieties, including white, red and barriguda (*Hevea spruceana*). These trees live to as much as 100 years, taking 20 to arrive at maturity.

There are at present over 50 companies in operation, with a total capital of £2,000,000. These have been organized in two years, 1906-7. A French traveller, Auguste Plane, who made serious studies of the Amazon basin, says that the production of

rubber can be doubled whenever necessary, and as soon as the cost of living is decreased, prices of even 1s. 3d. or 1s. 6d. a lb. for rubber will prove sufficiently remunerative.

Castilloa ulei Warb., the caoutchouc tree, was discovered in 1892 on the Rio Branco, near Obidos. In 1899-1900, 30 tons only were exported, but this quantity increased to 1,000 tons in 1906. This tree is much smaller than hevea, hardly ever exceeding 65 feet high and 2 feet in diameter. The varieties of hancornia are relatively diminutive, about 10 feet high, and 2 to 3 feet in circumference. In São Paulo the plantations or forests are worked on the share system, the employé receiving usually a third part. The system employed is destructive, as both owner and worker concur in taking from the plant its entire store, not economizing the sap in any way.

Referring to the other rubber-producing plants, we find the tapurú, reaching 80 feet, and having an average diameter of 3 feet, with a feathery palm-like top.

In Ceará, Piauhy, and somewhat to the north and south, another variety is found, known as maniçoba. Contrary to the habit of the heveas, it is a native of the higher lands of the interior. The leaves are used to feed cattle. Tapioca is extracted from the roots, and the seeds are in the form of almonds, and either in their natural state, or after the oil has been extracted, are a valuable food for cattle, pigs and fowls. This tree is found as high as 1,000 metres above sea level, but its usual habitat is from 200 to 300 feet in altitude.

Many other entirely different classes of plants are rubber producing, including the wild fig, Plumeria, sorveira, *Lucuma laurifolia, Platonia insignis, Sym-*

phonia globuluris, and massaranduba (*Mimusops elata*), a gigantic forest tree, whose timber is very valuable for constructive purposes. Rubber-producing plants grow in every State except the most southern or below 24° S. latitude.

The seringa thrives down to 16° S.

From Cuyabá (Matto Grosso) to the Madeira river, the telegraph line passes through a zone of virgin forests, for the most part heveas. At Vilhena, 832 metres above sea-level, Colonel Rondon found the gateway, as it were, to a dense forest hundreds of miles in extent every way, and with an excellent dry climate. Thousands of rubber trees are at least a century old. There are reckoned to be 300 million in Brazil, not 6 per cent. of which are exploited. On the lower Amazonas, a tree yields 3 kilos of latex per annum. For every ton of rubber that comes down stream twenty-five of provisions and other goods have to go up, 95 per cent. of the manufactured articles being imported.

The tax on exported rubber in Pará varies from 15 to 26 per cent., according to the quality, including in the latter case 22 per cent. on the official value, 2½ per cent. additional, 1 per cent. municipal tax and ⅜ per cent. Stock Exchange tax. The freights are proportionally high for river transport, never being less than 7½d. a kilogramme.

Freights in 1911 were: to Liverpool, 50s.; Havre, 67 fr. 50 cent. per ton; and New York, 0·34 cents. per cubic foot plus 15 per cent. In Manáos the various local taxes amount to 28 per cent. of the value when put on board, in addition to the Pará tax (18 per cent.). Undoubtedly the result of such abominable fiscal measures is to encourage all kinds of abuses and attempts at evasion. As the author

of the "Monograph" in *O Brasil* says, such a state of affairs must not, and cannot, continue. It means ruination to an exceedingly profitable and great industry. Acre charges, 23 per cent.; Piauhy charges, 12 per cent; Parahyba, 10 per cent.

Balata.—This is produced by *Mimasops globosa.* The tree is very large, but of slow growth, and the latex inferior in quality. It is found in Brazilian Guiana.

Exploitation of Rubber.

The concessionary, or owner of the seringaes (rubber forests, or collection of trees producing rubber), is called the master seringueiro, or aviado. At the most convenient point he establishes a store (*barraçao*), where may be found every necessity and even luxury that man may require. We must presume that this aviado is a capitalist on a somewhat large scale. He may employ 200, 300, or even 500 men. Each man will be transported at the expense of the aviado to the forest, and will be advanced £40 to £70 worth of different goods, including provisions, arms and munitions, medicines, and clothing. The aviado is in his turn exploited by the wholesale merchants (*aviadores*) of Manáos or Pará. Sometimes these latter give credit up to as much as £40,000. These latter are furnished with funds and goods by Yankee speculators, who receive payment in rubber at the end of the season. Each year 20,000 collectors are employed, mainly from the States of Ceará or Bahia, and the rest are semi-civilized Indians, or natives of the rubber-producing states themselves. Proceeding up the river in a launch, on arriving at the selected points, each family lands, and whilst some of its members set up their encampment,

others proceed to blaze with a cutlass a line (or road) of rubber plants, up to 150 or 200 in number. This number of trees may cover a length of three or four miles, and no more can be properly tapped. Each line is made in a zig-zag fashion in such a manner that the whole forms an oval, and the entrance and exit come together just where the seringueiro has established his smoking place.

His tools comprise: (1) A machette of soft iron to make the incisions (which are made obliquely), a rifle, fishing tackle, and half a dozen pots and pans.

(2) Balde, or pail, a vessel which will hold ten litres of latex.

(3) 700 to 800 tigelinhas (little basins) with a tube at one end to insert in the incision.

(4) A form round which the rubber is moulded.

(5) Boulhão, or iron chimney, through whose orifice passes the smoke to coagulate the rubber.

(6) The bacia, or basin, which contains the latex.

The incisions are made early in the morning, about 4 to 6 inches apart round the trunk, and the tigelinhas placed in each. Not more than 1½ minutes is taken up at each tree. As soon as the whole of the trees are tapped he (or another) proceeds with the balde to draw off the contents of the basins (*tigelinhas*). Each line or set of trees generally yields from eight to ten litres of fluid (*latex*) daily, producing four to five kilos of pure dry rubber. The maximum amount given is about 15 to 18 litres.

Care is (or should be) taken not to make too many incisions in a tree, and wise collectors stop up the incisions when the latex is all collected, in order to protect the tree from insects. The cuts are made some 5 feet from the ground.

The latex in the bacia is subjected to a temperature

of 35° to 45° Centigrade (95° to 113° Fahr.) to purify. Afterwards a fire is lit with the nuts of the urucury palm (*Attalea excelsa*) which grows in the vicinity, or with others similar mixed with resinous woods. When a dense smoke is emitted the chimney is put over, and with the aid of a calabash (*cuia*) the collector places a quantity of latex on the mould. The handle of this is rested on the knees and a rotary motion is given to it whilst over the smoke.

The bolacha (biscuit) of rubber may weigh from 5 to 100 lb., and is formed by continually adding fresh coats as soon as one is dry. The average daily production of rubber is 12 to 25 lb. and up to 40 lb.

The collector, or seringueiro, commences work at 5 or 6 a.m., and is generally finished by noon. At the time of writing the rubber is worth 6s. a lb.

According to a general rule, the contractor fixes the price, and the gatherer is frequently never out of debt. This is in the first season, of course, and in the second he may clear something for himself.

Prices on the lower Purus in November, 1911, were 4 milreis a kilogramme, and in Manáos 11 to 12 milreis at the same time (*Almanack Garnier*, 1912) The late Euclydes da Cunha wrote a few years ago —The passage of the gatherer from Ceará to Pará is 35$000, with advances of 950$000 for necessaries, tools, quinine and food for three months. Transport and other items bring up the bill to over 2 contos of reis. If he should fall ill, he is charged 10$000 daily. Should he be a single man, and manage to extract 350 kilos of fine rubber, and 100 kilos of ordinary (sernamby), at the rate of 5 milreis and 2½ milreis respectively), he has nothing to spare. Under favourable conditions he may, however, pre-

pare as much as 700 or 800 kilos. In this case he makes a clear saving of £100 to £130 for the season.

Presuming the seringueiro owes the aviado £80, and he is paid at the rate of 4s. to 5s. a kilogramme for the rubber collected, some idea of his saving may be obtained. It is true that he pays nearly three times as much for his provisions as they cost the aviado, but the latter has to put up with every risk, including the dishonesty, or perhaps the death of the collector. The transport of one family to the Juruá will run into £10 even under the most favourable circumstances. Some gatherers save £200 in six months. The usual outfit comprises carne secca (dried salt meat), rice, beans, mandioca meal, salt and flour, butter, sugar and matches, with sometimes condensed milk and tinned meats and sardines.

15,000 men are employed in the business of collection in the forests.

The average price of rubber (fine Pará) in 1912 was 5$709 a kilogramme.

Dr. Huber calculates that in the vicinity of the city of Pará a rural labourer earns 3$000 daily (4s.). He should be able to collect 3 kilos of plantation rubber per diem, and reckoning the *total* cost of each kilo at 1$500 (2s.), we get the same price as a maximum which is in force in the Far East.

In Ceará a well-known planter has made the following estimate with regard to the cultivation of seringa on a piece of land half a league square, or eighteen million square metres.

The cost of clearing and setting each plant works out at 2$000 (2s. 8d.). Labour is very cheap in this State, hands being available at 2s. a day.

Taking *half* the area given above as a base, and 10,000 metres to each 1,100 plants, we find that 750,000 can be set in the quarter of a square league.

and the planting can be distributed over a period of three years.

The expense the first year should be 187 contos.

The 2nd year (including 95 reis per plant for cleaning the ground) = 195,075$000.

The 3rd year = 203,150$000.

The 4th year (cleaning only) = 24,225$000.

The 5th and 6th years = 48,450$000.

Add the first year = 187,000$000.

The total expense in six years = 657,900$000.

In ten years, producing 250,000 kilos of rubber at 4$000, the profit is reckoned at 1,000 contos of reis, nearly £70,000 at present exchange.

A Commercial Congress was held at Manáos from February 22 to 27 (1910), when most of the rubber-producing countries were represented, and an exhibition held, and prizes offered for various essays on the subject of rubber cultivation, collection and preparation.

In Matto Grosso the manner of collecting is on somewhat similar lines to Amazonas, but the aviado is here called abonado, and he sends out his men in groups under a foreman, and the forests are reached as a rule in about two weeks, the journey being made on foot in daily marches of 18 or 20 miles. Each man bears with him a small figure of his patron saint, for luck, and woe betide the fetish if Dame Fortune does not smile on the bearer. The poor saint is either burnt, hung or chopped up, and another protector chosen. A strange superstition exists that a stolen mascot brings great luck to the stealer, and misfortune to the former owner.

In this state the rubber (*latex*) is treated with a solution of alum, boiling hot, and as soon as it is coagulated the mass is subjected to great pressure, and the rubber resulting is in the form of cakes.

30 inches long by 6 inches wide, and weighing up to 50-55 lb. Best quality is worth 10s. a kilogramme; 2nd, 7s. 6d.; and mangabeira, 4s. 6d. to 6s. a kilogramme.

The minimum output of each worker in the Matto Grosso district should be 200 kilos in 4 months' work, and the net earnings (savings) 400$000. Debts are usually due to carelessness or ignorance. Each tree will yield as much as 3 kilos in the season. Cost of transport per arroba of 15 kilos varies from 4$500 to 15$000, according to the distance from the river. Freight, normally, from Corumbá to Montevideo is 30$000 the ton, and thence to Europe it has been as low as 15$000. The Corumbá district produces not less than 3,000 tons yearly.

Some prices in Matto Grosso (1912-1913, Cuyabá). These have been enormously increased during the war.

A Winchester rifle, 80$; litre of petroleum, 2$; Idem, salt, 1$; a kilo of lard, $4; Idem, charque, 2$500; Idem, sugar, 2$500; coffee, 3$; soap, 2$; rice, beans or flour, 3$; a cotton short, from 6$; tin plate, 1$500; spoon, 600 reis; packet of matches, 1$500.

Prices in same period in the Acre Territory: 1 case (2 tins) of petroleum, 100$000; 1 kilo butter, 10$; charque, 5$; beans, 3$; and rice, 4$000.

In Pará the collection of latex continues from July to February, and in Amazonas it lasts from 100 to 140 days.

Favours conceded by the State of Pará

Concession up to 20,000 hectares of public lands for rubber cultivation.

Reduction of 50 per cent. on export taxes for 10 years, and 30 per cent. up to the 20th year.

Reduction of 30 per cent. on the Bragança railway

rates, and reduction in the freights of steamers subsidized by the State for 20 years. Free transport by rail of rolling stock and other effects especially relating to colonization.

Five per cent. interest will be guaranteed up to half of the company's share capital, to £400,000.

The company or companies must plant not less than 20,000 trees a year, maintain elementary schools, and all necessaries for the housing of at least twenty foundlings, cultivate other products, use the most modern machinery, and present a complete annual report to the State.

Use the registered mark of the Commercial Junta on all packages exported.

The concession will be for 99 years, at the end of which time the property as it stands will revert to the Government.

Premiums are also offered for general agriculture, and 250 milreis for each 500 cocoa trees, properly planted.

Federal Decree for the Protection and Stimulation of the Rubber Industry

No. 9521 (April 17, 1912)

Art. 2. Materials and utensils destined for the cultivation of rubber-bearing trees, or for the collection and refining of the rubber, are to be admitted into Brazil free of duty.

Chapter 2. Art. 5. To each person (1) planting rubber trees, or (2) replanting native trees, a subsidy will be granted per group of 12 hectares. For (1) 2½ contos for seringueiras, or 1½ contos for caucho or maniçoba, or 900 milreis for mangabeiras. For (2) 25 hectares replanted with seringueiras, 2 contos; with caucho or maniçoba, 1 conto; with manga-

beiras, 720 milreis. Subject to the following conditions: —

Plans to be submitted to the Minister of Agriculture with indication of area, navigable rivers, routes, ports, railway stations, and a report as to the production of the plantation and the salubrity of the locality.

Art. 6. The minimum number of trees per hectare for new plantations must be 250 for seringueiras, or 400 for maniçoba, etc., and in the case of replanting a distance of 6 metres and 5 metres respectively between the plants.

Art 7. Planters who cultivate food crops on an area not less than one-third part of that devoted to rubber, will receive an addition of 5 per cent. to the subsidy, paid annually, until the first crop of rubber is gathered.

Experimental stations will be established in all the rubber-producing states, and will furnish information with regard to all matters connected with the industry.

Each station shall possess—

1. A laboratory of phytopathology, equipped for seed testing.

2. Laboratories of agricultural entomology and chemistry, and microbiology, etc., and the station will be obliged to distribute selected plants and seeds, analyse (gratuitously) any manures or fertilizers submitted, and publish a yearly bulletin dealing with the work of the station for free distribution. Besides the above, each station will contain a museum of agriculture and forestry, a permanent exhibition of machinery, and a meteorological observatory.

Art. 23. To the first rubber refinery treating seringa, established in Pará and Manáos, and dealing with maniçoba, etc., in Piauhy, Ceará, Rio Grande

do Norte and any other rubber-producing state, as well as to the first manufactory of rubber goods which is established in Pará, Manáos, Recife (Pernambuco), Bahia, and Rio de Janeiro, will be conceded the following subsidies:—

A. Up to 400 contos for seringa refineries,
Up to 100 contos for maniçoba, etc, refineries,
Up to 500 contos for rubber manufactories,

subject to the following conditions:—

Presenting to the Department of Agriculture a full description of the proposed factories or refineries, with plans, etc., and proofs of the financial stability of the promoters and competence of the management.

Premiums paid will not exceed 25 per cent. of the cost of first establishment.

Title III

Art. 26. Hospices will be established in Pará, Manáos and the Acre Territory, equipped with hospitals, pharmacies, and every necessity for the use of colonists in the rubber districts, who will be transported free of charge, together with their baggage, to any point in the above zone with which communication is maintained.

Title IV

Chapter 1. Narrow gauge railways will be constructed on the rivers Xingú, Tapajos, and others in Pará and Matto Grosso, and on the Rio Negro, Rio Branco, etc., in Amazonas, and up the valleys watered by these rivers.

Branch lines from the Madeira Mamoré Railway by Villa Rio Branco, and to the Peruvian frontier by the valley of the river Purús.

The rivers Negro, Branco, Purús and Acre will be

deepened to enable steamers drawing 3 feet of water to navigate them the entire year.

Coal deposits will be established in every port where it is possible, and they will be floating so as to facilitate coaling in any desired part of the river. Oil reservoirs will be also installed where convenient. All such deposits and machinery in connection, as well as the river steamers, shall be exempt from petty administration charges and import duties.

To companies renting and cultivating the national estates on the Rio Acre, Amazonas (Rio Autaz), and in Pará, the following favours will be conceded: —

Exemption from duty on all machinery, building materials, seeds, fencing, live-stock, etc.; and—

Premiums of 30 contos per 1,000 hectares of pasture land planted, and 100 contos per 1,000 hectares cultivated with rice, beans, maize and mandioca, and 10 contos per 500 tons of dairy produce or preserved meat produced within 5 years.

Any company devoting themselves to the fishing industry, with head office in Pará or Manáos, will have exemption from duty on all their necessary materials, and premiums of 10 contos annually for 5 years for an excess of 100 tons of dried fish annually.

In case of such contract, the property to revert to the Federal Government after 15 years.

All material to be used for rubber cultivation will be admitted duty free.

It should be noted that the Commission for Rubber Defence has been dissolved for some years, but many of the above favours, and some of the measures for the protection of the industry, are still in force.

Exports, 1913 = 36,232 tons, worth £10,375,000. In 1918 = 22,662, £3,998,000. This drop in average

value is partly due to the fall in exchange. (See Finance.)

It is calculated that there is a reserve of 180,000,000 rubber trees in the Amazon valley, and with more scientific methods of coagulation, etc., there is no reason to fear the future, the principal trouble lying in the want of an adequate supply of labour and satisfactory transport facilities, in order to lower the extraordinary cost of living in the region.

In 1910 the Orient plantations produced 4 tons only, and in 1917, 210,000 tons, or over five times the total Brazilian output.

Plants Producing Tannin

The following are the principal sources of extractives used for tannin purposes in Brazil:—

	Percentage of tannin
Striphnodendron barbatimão	25 to 48
Acacia angico (bark and fruit)	40
Physzophora mangle (bark and leaves)	20 to 30
Buranhem	30
Murici guassú	15 to 20
Quebracho vermelha (red)	4 to 16
Ingá sapida, edulis, vera, dulcis	10 to 15
Acacia jurema	8 to 15
Quebracho branco (white)	12
Carapa vermelha	4
Compared with oak (in Europe)	30 to 45

Many plants used in Europe do not possess more than 8 per cent. of tannin.

The barbatimão is the most generally used in Brazil, and furnishes also fine woods for the cabinet maker. In the States of Minas, São Paulo, and Rio Janeiro this bark is extensively employed; but in

NEW OPERA HOUSE, S. PAULO

Photo by] [*Papf, Petropolis.*

São Paulo, where there are more than fifty tanneries, the local supply is insufficient, owing to the devastation of the forest. This applies, more or less, to the other two States, but especially to Rio de Janeiro, where the extraordinary clearances have made a great difference in the wet seasons, the rainy weather coming on now quite out of the usual time, and in volume generally less than heretofore. Many tanneries have had to close down in different parts of Brazil owing to lack both of hides and tanning material. With improved methods, and great increase in stock of store cattle, this is not likely to occur in the future.

With the barbatimão, some 7 or 9 months' treatment are necessary. The usual price in the State of Minas Geraes is about 1s. 6d. per arroba (15 kilos), or about 32 lb. There are also five other species of stryphnodendron used in Brazil. Exportation has commenced of various barks to Europe (Germany and Portugal) from Paraná, Rio Grande do Sul, and São Paulo. The embaúba (*Cecropai palmata*), etc., whose tender leaves are the favourite food of the sloth, furnishes also a large percentage of tannin, as well as being very useful in the manufacture of cordage. The number of plants used in Brazil for this purpose is so great that it has been found impossible to quote more than the principal and most widely used ones.

Fibre-Producing Plants

Undoubtedly one of the greatest sources of wealth in the Republic, it is as yet, perhaps, the least exploited. Everywhere there are myriads of malvaceas, and, doubtless, Brazil is the country richest in the branches of this family.

In comparison with the canhamo (hemp) it is con-

sidered that the guaxima vermelha would rival the former, if properly prepared. Many of these latter plants have been used in making ship's cables in Brazil since colonial days. The urena and the triumpheta are used under the name of aramina.

These plants, in favourable situations, not too dry, produce fibres of 8 to 9 feet in length. In São Paulo 12,500 acres are under cultivation, and produce about 800 tons of fibre annually. Nearly the whole is consumed by one factory in the capital of the state. The usual price paid is, rough, 2d. per lb., and prepared, 6d. to 8d. a lb. The cultivation is carried on near the coast, and some 60 quarts of seed are used to the hectare (2½ acres). The harvest commences in February, and ends in June or July. The principal use of the fibre is in the production of sacking for coffee, 60,000 to 70,000 bags being made monthly.

A group of the malvaceas, known as vassouras, is so persistent and universal in its growth that, if Brazil possessed a department similar to that in the Australian Colonies, they would become *proclaimed plants*. They are, however, very useful, the more delicate fibres making good paper, and the others furnishing material for brushes, ropes, and twines. This family is allied to that of the jute. The one kind that is likely to prove of most value is known as *Canhamo brasiliensis* (Brazilian hemp). Very similar to our own flax, it is now known locally by the name of linho *Perini*, from the name of its supposed discoverer. It grows in the valley of the river São Francisco principally, in some places in great profusion, and also in the States of Minas and São Paulo. It appears to be a variety of hibiscus. The stalk grows to the length of 10 to 13 feet, without branches. The strength of the fibre, as com-

pared to hemp, is about four to three. Cultivation on a large scale has been commenced at Rodeio, in the State of Rio. Production of 1,000,000 square metres of land, three crops yearly, 380 tons of best quality, and 2,214 tons of second quality fibre. Prices offered in Europe, £40 and £12 per ton. Can be sold at a profit of 1 $200 and 600 reis a kilogramme respectively.

Some 2,500,000 square yards have been planted with the fibre. Each acre produces at present 3,194 lb. The earnings per acre run up to £60. Experiments have been made in growing elsewhere (Texas), but no information is forthcoming as to commercial results.

The family of bromeliaceas present also varieties of pineapples suitable for textile fibres. The north of the State of Rio, along the coast, is covered with this (*Bromelia lagenaria*) type for 60 square kilometres. The exploitation of this plant is purely local, in spite of the great opening in Europe for the fibre. A London house offered £30 a ton, and asked for an immediate lot of 4 tons for experimental purposes. Price offered at Hamburg was £15 a ton.

In the family of amaryllidaceas we must note the *Fourcroya gigantea* and *Fourcroya cubensis* (pita).

Both these plants are common in Brazil, and may be found at all altitudes. Length of leaves, 10 to 12 feet.

Compared with sisal, the following figures demonstrate the value of this plant:—

Dimensions of leaf		Weight
Sisal, 4 to 6 ft. × 4 or 5 in.	...	1½ to 3 lb.
Piteira, 8 ft. × 7 to 9 in.	...	3 lb.
Weight 1,000 leaves		**Fibre, 1,000 leaves**
Sisal, 1,500 to 2,000 lb.	...	50 lb.
Piteira, 2,500 lb.	...	50 lb.

The sisal lives 10 to 12 years, the piteira 12 to 16 years.

Pita requires 3 years to mature. The minimum yield per acre is 1,500 lb. of fibre, worth £13. An estate of 1,000 acres (400 hectares) would produce £13,000 after 3 years.

Expenses calculated in planting 5,000 acres, machinery, freight, etc.	£1,200
Wages, etc (4 years)	10,000
Instalment, etc.	1,800
Depreciation, etc.	1,000
Freight, etc.	6,000
	£20,000
Expenses, first 4 years	£20,000
Result (one crop)	60,000
Profit	£40,000

If we add £5,000 to expenses, and allow no crop in the fourth year, we have then—

Five years' expenses	£27,500
One crop, result	60,000
Profit	£32,500

Calculating £20 per ton, and a minimum crop of 3,000 tons per 5,000 acres.

Experts calculate the crop, after 3 years, at £13 per acre, thus 5,000 acres = £65,000.

An ample margin is thus shown, and land is not wanting for planting. If we reckon value of land at 5s. an acre it will be an outside estimate.

In 1904 the price of pita (Mauritius hemp) was

from £25 to £35 a ton (London). An estate of 25 alqueires in Minas will produce 75 tons of leaves, worth at least £1,800.

The exportation of cocoa fibre, etc., is very far from being equal to the demand, the total amount in vegetable fibre in 1905, coming to 7,377 kilos (less than 7½ tons), valued at about £300.

Kapok (*Paina*) is another vegetable substance which is produced in Brazil from the fruit of various families of paineras. The finest white fibre (*Paina branca*) is capable, when used in lifebelts, of supporting 175 times its weight; it is especially suitable for the manufacture of life-saving waistcoats. It will not rot, and the thread spun from its fibre is impermeable.

Mr. de Saint Remy has invented machinery for treating the fibre, and weaving it into a light cloth. It is also vermin proof.

Not yet cultivated systematically in Brazil, but grows wild in most of the states. Trees 5 to 6 years old, should produce ripe pods. They are 6 or 8 inches in length, the downy fibre and seeds being mixed up together. Used locally for stuffing mattresses, pillows and cushions. Rio prices 1-2$000 the kilo.

A blanket made of paina, weighing only 1½ kilos, is as warm as three woollen ones of 2 kilos each.

Lyrio do Brejo (*Hidichium coronarium*)

This wild lily is very common in marshy lands near the coast, often choking watercourses. The fibre is tough and strong, the roots produce starch, and the flowers are suitable for the manufacture of perfume.

(See Paper-making.)

Tucum (*Bactris sedosa*)

Another plant yielding a soft silky fibre; common in the forests.

Loofah

This useful spongy fruit of a climbing plant is found in many parts of Brazil, north and south, and is known as bucha. It is used in São Paulo for hat making, but is not planted. If cultivated, the yield per hectare would amount to 150,000 loofahs, or converted into fibre 2,250 kilos. The fruit in its early stages is quite edible. Cut when 3 months old, washed and dried.

The cost of preparing, planting and harvesting per hectare amounts to 2 contos, or 4,800$000 per alqueire, giving a net profit per alqueire of 7,200$000.

Ramie

Up to the present this is not cultivated, but the Government has resolved to plant it wherever possible in the new colonies.

One hectare should yield four crops yearly of 40 tons each of this fibre = 160 tons in all (at 16s. to 20s. a ton). A very valuable fibre indeed.

Aramina

This fibre is used by the Sack Manufacturing Company in São Paulo, which has a monopoly, and uses some 350,000 kilogrammes of fibre annually, making 800,000 sacks.

Piassava

Piassava (*Attalea fumifera*), yielding the fibre from which brooms, brushes, etc., are made (as well as the coquilho nut), is found growing wild in Bahia,

mostly along the coast, and in the south. It is a kind of palm, with just a cluster of tall leaves, growing in a sandy soil. Forests contain to an acre, as a rule, about 75 trees, which produce generally from 10 to 20 lb. of fibre each annually. Several estates are very large, and one company has 450,000 acres under operation containing 6,000,000 palms. A large quantity of the fibre is from State territory, exploited under Government concessions, the price usually payable per arroba (15 kilogrammes) extracted being fixed by the State. An export duty of 21 per cent. is levied, and from July to December, 1908, this tax brought in 300$000 per ton. In this year 1,318 tons were exported. Land is worth from 4s. to 8s. an acre, and labour costs 2 to 3 milreis per arroba. The British Company owning the above large estate north of Bahia uses modern machinery, but the native companies do all the work by hand.

RELATIVE STRENGTH OF FIBRES.

m/m = millimetres	Diameter of cord (dry)			Diameter of cord (wet)		
	1·5 m/m	2·5 m/m	3·5 m/m	1·5 m/m	2·5 m/m	3·5 m/m
Aramina (*Urena lobata*)	14·0	24·0	—	—	—	—
Canhamo Perini (*Hibiscus unidens*) (prepared by Dr. Perini)	10·2	20·5	—	11·7	22·5	—
Prepared by the Agricultural Institute	9·5	18·2	—	15·7	22·7	—
Sisal (Pernambuco) (*Agave vivipara*)	14·5	22·5	25·0	—	—	—
(Manilla) Canhamo (*Cannabis indica*)	7·0	15·5	31·5	22·5	27·0	68·5
(Madagascar) Raffia	12·5	24·0	27·5	17·0	27·0	34·0

Banana

Unexploited in Brazil for the purpose of textile fibres.

Bambonassa (*Carludovica palmata*) (Panama hat palm).

This palm grows spontaneously in Brazil, but is not made use of at the present time, although a good workman can make a hat worth £30 to £40 in ten days. The commoner hats (machine made) are worth in Brazil at the present time £4 or £5.

Curahuá.—Native to tropical Brazil. Height 2½ metres. Very strong, silky white fibres, resisting the effects of weather more than any others. In St. Louis exhibition it obtained the highest prize amongst Amazonian fibres.

Burity Palm (*Mauritia vimifera*).—Grows in damp places. Takes 8 years to develop. Fibres suitable for hammocks, fishing lines, etc.

Flax.—Has been grown successfully at Nova Baden (Minas Geraes). The colonists here make their own clothing from the cloth woven by hand looms.

The above are only a few of the plants which occur in profusion all over the Republic, and offer a hundred different kinds of utilities to the world of commerce. The thing which is most astounding is not the extraordinary richness of the vegetable kingdom in Brazil, but the meagre way in which these sources of wealth are utilized. Fortune awaits any capitalist who will venture to take up the study of any one of a thousand different kinds of cultivation, or even the commercial exploitation of those multitudinous species growing wild in every state, from one end of the Republic to the other. The very cursory

glance given in the previous pages to this subject is entirely inadequate to give the reader any idea of the wealth nature has so bounteously bestowed upon this fair land, only now beginning to take its proper place amongst the productive countries of the world.

CHAPTER XVI

TIMBER, ETC.

Brazil possesses 988 million acres of forests. In the south there are over 20 million of these covered with the Araucaria pine, 48 per cent. of the total area of the Republic being woodland.

Brazil is undoubtedly the country possessing the richest store of valuable woods. The majority are so hard that furniture made from them resists the worm. Many possess perfumes as aromatic as any invented by modern science. In spite of the wonderful exuberance of nature, especially in the north, and the unequalled fluvial system of those most favoured states, the melancholy fact must be confessed that it does not pay to export any but the finest timber. Not only this, but as yet an enormous quantity of pine is introduced into the country for the purpose of box and case making, general carpentry work and building construction. This is the case even at Belem (Pará), where the forest is at the gate of the city. The explanation of this lies in the fact that freights are prohibitive, a cargo sent to Liverpool hardly paying cost of transit, and that the more beautiful forest trees are growing isolated. One finds, in a great wood, a hundred different kinds of huge and stately trunks, hardly two alike in proximity. The all-pervading quest of rubber renders labour unavailable, and again some of the timber is so hard that it resembles iron rather than wood. The future of such trees as the massarandubá is in

the hands of the railway constructor, the enduring qualities of the wood making it very useful indeed for sleepers. The so-called cedar of Brazil (*Cedrela odorata*) is found throughout the Amazon region, and is principally used in cabinet work and internal fittings of houses. It grows plentifully from Bahia southwards.

The jacarandá (pallisander), mahogany and ebony are the woods most commonly used in local furniture and cabinet making. For exportation, the former, of the best quality from 18 to 25 inches in diameter, and from 12 to 14 feet in length, weighing over 800 kilogrammes, is worth in Havre 600 francs.

Peroba grows over 100 feet high, a single trunk weighing as much as 30 tons, and taking three men four days to fell it. It costs 7 milreis a ton on the spot (Rio State) and four times this price in the capital. At São Joã da Barra the cost is £1 per cubic metre. In São Paulo this tree is frequently 18 metres in circumference.

The Imbuia is valued at over 100 milreis a metre in Rio, and Vinhatico, Ipé, Piuna, and many more trees with Indian names, conveying no idea whatever to the lay reader, are so fine that they fetch locally as much as £7 the cubic metre.

In Paraná there are 800 million Araucarias, spread over some 100,000 square kilometres. This wood (red or white) is 20 per cent. stronger than Swedish pine. The tree reaches nearly 200 feet in height, with a base diameter of 10 feet.

The only exportation from the north in 1906 was as follows:—From Manáos, £5,800, and from Pará, £9,900, this latter paying in exportation taxes £567, at a percentage of 8½. In 1910, timber to a total value of 213,557$166 paper was exported from Pará. The two woods predominating were the acapú and

pau amarella (yellow wood), for flooring purposes, as the dark and light colours alternating are very pleasing to the eye. Many of the finest houses in Lisbon are floored with these woods.

In Paraná most of the owners of pine forests have entered into an accord to raise the price.

The monopoly created at the great European market (Hamburg) is considered to be one of the principal causes of the failure to develop the timber trade.

It is stated that a ring of buyers fixed the prices paid to the exporting firms, and then dealt for whatever was needed amongst themselves. The greatest consumers of timber are the Brazilian railway companies and the sugar mills. Two lines in São Paulo alone burnt wood to the value (locally of nearly £100,000 in the year 1904. This state consumes 6,600,000 cubic metres of timber annually, devastating 228 square kilometres of forest. Some idea of the extraordinary state of affairs in Brazil may be gathered from the fact that in the capital of the Republic it is sometimes cheaper to buy coal imported from England than wood, which is to be found within a couple of leagues of the metropolis. In the vicinity of the city it has been found necessary, not only to prohibit the destruction of the forests, but also to form reserves, the Federal Government having, July, 1912, closed four zones in the Acre District.

Paraná has had its own laws since 1907.

In the State of São Paulo a veritable marvel of the vegetable kingdom has been discovered, in the shape of a tree with luminous foliage showing a magnificent spectacle of phosphorescence at night.

The Paulista Railway Company has been engaged for some time in experiments with eucalyptus, plant-

ing a large area with various varieties for use as sleepers, telegraph posts, fencing, piles, etc. According to the experience of this line, the above tree is eminently suitable for any of these purposes, yielding good material in less than 10 years.

A plantation of 1,000 trees at Jundiahy cost as follows:—

Clearing the ground . . .	30 $000
Planting, etc.	83 $800
1,000 plants at 30 reis . . .	30 $000
Replanting dead slips . . .	5 $200
Cleaning (4 years' work) . .	100 $000
Pruning	10 $400
Total .	269 $400

(Working day, 8 hours.)

These plants produced in 20 years 5,121 $000 worth of timber. The tree, flowering as it does at an epoch when there are no other blossoms, is of the greatest utility to bees, and with a selection of ten to twelve varieties, a constant succession of flowers may be obtained.

The bark is richer in tannin than oak.

One ton of leaves will give 7 to 9 litres of essence.

The timber is most valuable for cabinet work, hardly ever being attacked by insects.

Many of the great creepers are exceedingly useful for cabinet making. One, cipô florão, having a diameter up to 2 feet 6 inches and markings of the most beautiful kind. A series of climbers quite common near Rio have a distinct Maltese cross in their section.

Timber Exports

1911, 8,922 tons.

1918, 179,799 tons, worth £1,139,000. Thanks to the war this valuable export has come into its

own, and it is to be hoped that means will be found of largely increasing the output.

Paper Making in Brazil

Adapted from "Le Brésil" (article by M. Emile Lecocq.)

One hectare of forest in the south should furnish 1,500 stères of logs 1 metre × 10 to 15 centimetres, and after 2 months' drying the percentage of moisture is reduced to 37. Each stère will weigh 350 kilos on an average. Three tons of wood should easily yield 1 ton of cellulose, consequently each hectare will produce 150 tons of material. Manufacturing 6,000 tons of pulp annually, or 20 tons in each of 300 working days, in 20 years from 800 to 1,000 hectares of forests are denuded of their trees.

The expenses of manufacturing a metric ton of wood pulp should not exceed:—

	fr.	cent.
3 metres 90 centimetres of wood at 3 francs the cubic metre	27	00
yielding—		
200 kilogrammes of sulphate of soda .	20	00
9 metric tons of firewood	13	50
400 kilogrammes of lime at 15 francs per ton (manufactured)	6	00
Wages (at 4 fr. daily average), 150 hands	30	00
Repairs, upkeep, etc., etc.	23	00
Bleaching	20	00
Total	139	50
Cost of imported pulp per ton	300	00
Difference in favour .	160	50

Profits if exported—

	fr. cent.
Cost per ton as above	139 50
Freight, etc.	20 50
Total cost	160 00
Deduct bleaching	20 00
Total	140 00
Price per ton (unbleached) C.I.F. at a British port	157 50
	17 50

Thus per 1,000 tons exported = 17,500 fr. 00 cent., or roughly £700 profit.

Piri-Piri (*Papyrus brasiliensis*)

Some attempt has been made to utilize this reed for the manufacture of coarse paper, but it is as a combustible that I propose treating of it in a later chapter.

The Brazil Railway Company has acquired 560,000 acres of pine forests in Paraná and Santa Catharina, and one mill which was put into operation in November, 1911, is expected to turn out from 4 to 5 million feet of timber per month, and another smaller one 450,000 feet monthly. Experiments have resulted in absolute success in kiln-drying the planks. At the beginning of 1913 lumber will be exported to Uruguay and Argentina by the Company's own railway as far as the frontiers. The first mentioned mill will be running 20 hours daily with two shifts of hands.

Mr. Willis, late Director of the Rio Botanical Gardens, wrote in July, 1913, that *Hedychium Coronarium* (Lyrio do Brejo) is a truly *magnificent*

material for paper making. It is not a native plant, but has spread all over the marshy parts of the south with incredible rapidity. The stalks are usually 1 to 2 metres high and nearly an inch thick as a rule. When cut down they grow up again to their full height in 4 to 5 months. Experiments in Kew Gardens proved the value of the plant, and Messrs. Clayton, Beadle and Stevens presented to the eighth International Congress of Chemists a memoir on its qualities as a raw material for paper manufacture.

Two analyses were presented, as follows:—

	(A)	(B)
Moisture . .	9·7 per cent.	11·2 per cent.
Ashes . . .	4·5 ,,	4·8 ,,
Cellulose . .	43·0 ,,	48·0 ,,
Chemical extracts . .	42·8 ,,	36·0 ,,

The green stalk (B) can be treated with 5 per cent. of soda at a pressure of 3 to 5 atmospheres, the material being then washed, 60 per cent. being left.

If the impure cells are left in the paste, the paper has a fine parchment-like appearance, and is especially adapted for receiving ink or any oily material, the paper being stronger than any manilla. If these cells are removed, the paper becomes softer, but is not so strong.

The paste in the first instance does not need the addition of any filling or body. The water leaves the paste in a fourth part of the time it does in the case of wood pulp.

Ramie fibre has given very good results from the experiments made by Mr. Gaston Devimeux, a French chemist of repute in Rio Janeiro.

Several mills have recently been started, one at Morretes, Paraná employing Lyrio do Brejo.

Paper imports 1912 = 16,406 tons.
1914 = 32,368 tons, worth £903,000.
1917 = 35,157 tons, worth £1,799,000.
Unit values per kilo 1913 = 245 ries, 1917 = 600 reis.

Nuts, Oils, Wax, etc.

The castor oil plant, although not indigenous to Brazil, has adapted itself locally with great success. In spite of the most rigorous methods taken to extirpate it, including fire, once introduced into a district it is never destroyed, and is considered as a plague. Largely used for many years as an illuminant, it is employed more and more as a machine oil, mixed with other oleos or alone. The Leopoldina Railway Company has established a factory for the purpose of extracting the oil as a lubricant. There are some twelve or thirteen more mills distributed over the different Brazilian States. Several other plants of the same family are common in the country. Each plant will produce from 2 to 3 kilos of seed, and an alquiere should yield 5 tons. The value of the seed in Pernambuco is 160 reis a kilo, and the oil 500 reis (1913).

In 1917, exports to U.S.A. realized 8½ cents per pound. F.O.B. Yield in oil 45 to 60 per cent. Will produce fruit in 4 to 6 months.

Copaifera officinalis (copaiba). There are twenty species of this family of leguminosas, of which seven are found in Brazil. The oil is extracted from the trunks by means of an incision, and in Bahia a suction pump is employed. The limitation of the tree is about 20 quarts. The principal places of

export are Bahia, Maranhão, Pará, and Manãos, and the largest importing countries are the United States, Great Britain and Germany.

Brazil Nut.

Castanha do Pará (as it is called in Brazil) grows best on high and dry lands, and forms extensive woods of lofty trees of great size, attaining the height of 150 feet, and having a girth of 12 to 20 feet at 50 feet up. The nuts are contained in a shell about the size of a cocoanut. Those called sapucaiás produce a fruit excelling the Brazil nut in quality and worth two or three times the former. The State of Pará has almost a monopoly in the exportation of the Brazil nut. The extraction of the oil is generally performed locally, for use in the country. The whole of the woods are uncultivated, and the collection of the nuts is fraught with great difficulty.

These are found in the silvas, or elevated plains, and each shell contains 15 to 20 nuts arranged somewhat like the sections of an orange. The outer pod is so strong that a loaded cart could pass over it without cracking the shell. The trees are too high to climb, so only those pods which fall to the ground are collected.

The retail price of the new crop has advanced steadily during the last 10 years from 4d. to 6d. and 8d. per lb.

This nut contains 17 per cent. of protein, and 66·8 of fat, and only 5·3 per cent. of water, comparing very favourably with other foods from an alimentary point of view.

The green nut contains a milky liquid which may be used in tea or coffee. According to Mr. Young,

of the Laboratory of the Department of Agriculture in the United States, the scientific name of the Brazil nut tree is *Bertholletia nobilis*, Miers.

Pea nuts (*Amendoim*). These kernels yield 50 per cent. of oil, and the shells contain 85·48 per cent. cellusose. The residue of the crushed nuts forms an excellent feeding cake for cattle, containing more than 31 per cent. of albuminoids, 11 per cent. of oil, and 31 per cent. of starch and saccharine matter. The plant thrives only in a limestone district, or in soils where an abundance of calcareous matter has been added. It should be planted in rotation with tubers or maize. In favourable circumstances $2\frac{1}{2}$ tons of nuts to the acre is not an out of the way crop.

Enormous nuts are grown by the Matto Grosso Indians, some being three times the usual size.

In the sandy wastes of Goyaz and parts of Piauhy it is of perennial growth.

Exports, 1912. 343,382 hectolitres, worth £388,680.
1916. 190,800 h. = £300,367.

Export taxes. Amazonas, 10 per cent. Pará, 12 per cent.

Sapucaias. Grow in a pod with a closely fitting lid, which, when the nuts are ripe, falls, and most of the crop is lost, as the monkeys are very fond of these, the pod being fitly termed *Marmita do Macaco* (Marmite de Singe).

Cocoanut Palm. In its green state the nut contains more than a pint of liquid. The substance, in a gelatinous state, is highly considered in Bahia, and should be much better known in Europe than it is. The nuts, which are so common and cheap in the English markets, are in comparison with the green ones not at all palatable. The production on the spot of cocoanut butter, fibre and oil seems to

be needed, and the enormous quantity of plantations existing might find a ready market for their nuts. As it is, freights are so high, and consumption so small, that a cocoanut costs twice as much in Rio de Janeiro as it does in London. The value of each nut on the spot (Pernambuco or Bahia) is about 1¼d. There are about 100 million cocoanut palms in Brazil, principally along the coastal belt (central). Nuts from Cannavieiras yield 63 per cent. of oil.

In Pernambuco there are 230,000 trees, covering an area of 2,817,500 square metres; all ages are represented, the oldest being 60 years. Planting is done in May or June, and a distance is kept of 6 to 10 metres between each. Fruit is produced after 6 years. The cost of planting a thousand trees is 1,200 $000, and labour amounts to 20 $000 per hectare. Each tree produces 40 nuts, or per hectare, 6,280, sold at 20 $000 a hundred green and 8 $000 to 15 $000 a hundred dry.

In Ceará the entire expense per plant the first year is 1 $000: 10,000 = 10 contos.

From the second to eighth year, 14 contos.

Purchase of land, 10 contos.

Incidental expenses, 6 contos. Total, 40 contos.

From the eighth to the twentieth year, 9,100,000 nuts should be produced, selling at 40 reis each, yield 364 contos of reis.

Taking living expenses and labour at 20 contos yearly from the eighth to the twentieth year, a balance of 84 contos is left.

No copra is exported as yet, but a factory is being started at Bomfin, near Cabedello, and 5,000 nuts will be used daily. A contract has also been entered into with a French syndicate which will start operations in 1914, and obtain a subvention up to 30 contos a year to 1917, when 130 contos may be

paid. Plantations on a large scale are likely to be made.

Carnaubeira (*Copernica cerifera*) is found as far south as Bahia, and grows sparsely in the more temperate parts of Brazil, thriving best in hot dry zones, like Ceará, where there are over 1,000,000 trees, and in Rio Grande do Norte, etc., in the river valleys.

Humboldt speaks of this palm as the tree of life, and its wonderful utility may well entitle it to lay claim to that designation. The roots are useful in skin diseases as depuratives, the leaves make excellent cordage and twine, and are commonly employed to stuff mattresses and pillows; the fruit is agreeable and nutritious, the timber makes fine furniture, taking a high polish, and resists putrefaction so well that it is in use in a hundred different ways in salt and fresh water. The young shoots are used as the palmito cabbage; the sap of the adult palm contains a very wholesome kind of tapioca, and makes a pleasant fermented drink, whilst even the stalks and other residues furnish food for cattle. The principal product of the tree is, however, the vegetable wax which is found in the young leaves. 100 leaves from one tree give about 4 lb. of wax on an average, but under good conditions as much as 13 lb. has been obtained. To collect the wax, the leaves are dried and beaten. The value, per kilogramme, is about 2s. (1905). The exportation of this wax, the same year, was valued at less than £200,000. Exports (1908), 2,592 tons.

1913 . .	3,867 tons =	£440,000
1917 . .	3,661 ,, =	£411,000
1918 . .	4,215 ,, =	£1,098,000

It shoots up to within 30 to 40 days after planting, just below the surface, in a moist soil. 2,000 plants is the maximum per hectare, and each hectare should yield 412 $000 in wax alone. Irrigation is necessary if a very dry season ensues. Fifty candles, made from 1 kilo of wax, are sold locally for 1½ to 2 milreis. The fibres are also used for hat-making, headgear woven from them being worth from 80 reis to 2 milreis a piece.

This wax has a higher specific gravity than any other vegetable kind, 0·999. Fusion point, 88° F. Contains picric acid. Has aseptic properties. Average price (1918), £5 the 15 kilos for best quality.

The Avoeira produces the palm oil of commerce, but is quite unexploited as yet.

Gergelim or *Sesamun orientalis* furnishes 40 to 50 per cent. of sweet odourless oil from its seeds.

Coquilho Nuts (Vegetable Ivory)

Produced by the piassava palm. They are contained in a great burr, which opens at the bottom and lets the 60 to 90 nuts drop out when ripe. The nut itself is generally used for making beads, buttons, and other small articles. The Government levies an export duty of 8 per cent. on this product, working out at 100 $000 per ton. During 1908, 429 tons were exported.

Pinhão, pine nut. Paraná, Santa Catharina, and Rio Grande do Sul. Of high food value.

Andiroba (*crab wood*) (*Carapa guyanensis*). This tree grows all over Brazil. Forests occur in Amazonas, Bahia, etc. Produces 60 to 70 per cent. of oil from the husked seeds, rich in stearine, etc., of a concrete dark yellow colour. Two crops yearly,

Zones of Production

Some of the Principal Textile, Tanniferous, Oleaginous and Rubber-producing Plants and Cabinet Woods of Brazil.

(From the *Bulletin of the Ministry of Agriculture.*)

Local name	Scientific or Englisb name	Relative strength	Proportion in cellulose	Proportion in oil	Pro-portion in tannin	Zones wbere found	Economical value
			%	%	%		
Algodoeiro ...	Cotton	—	—	20	—	2, 3, 5	—
Bananeira ...	Banana	—	75	—	20	All	Fibres, fruit, vegetable, silk
Barbatimão ...	*Strýphnodendron barbatimão*	1·045	—	—	40	All	Tannin
Cacaoeiro ...	Cacao	—	—	49	—	1, 2, 5	—
Carnaubeira ...	*Copernicia cerifera*	—	—	—	—	1, 2, 5	Wax, fibre, timber
Cajueiro	Cashew	—	—	28	—	All	Nuts, resin, medicinal
Caucho	*Castilloa elastica*	—	—	16	—	1, 2, 5	Rubber
Castanheira ...	Brazil nut	—	—	67	—	1, 2, 5	Nuts, oil, timber
Coco	Coconut	Fibre supports 39 kilos	—	66	—	All	Fruit, oil, fibres
Copahyba ...	Copiaba	878	—	up to 80	—	All	Medicinal oil and timber
Guaraná	—	—	—	3	8½	1	Fruit, cafeine, etc., medicinal
Jatobá	*Hymenœa courbaril*	758	—	—	—	All	Resin (medicinal)
Jequitibá	*Couratari legalis*	375	—	—	—	2, 3, 5	Timber
Jacarandá ...	*Machærium*	1·048	—	—	—	All	Cabinet wood
Lyrio do Brejo ...	*Hedychium coronarium* ...	—	48	—	—	All	Fibre and paper
Mangue vermelho	Mangrove	—	—	—	31	All	Tannin
Mandioca ...	Mandioca	—	—	—	30 starch	All	Flour, tapioca, etc.,
Piri-piri	*Cyperus brasiliensis* (papyrus)	—	30	—	—	All	Fibres
Piteira	Agave	Fibre supports 50 kilos	—	—	—	All	Fibres
Pau rosada ...	Rose wood	—	—	—	—	2, 3, 5	Cabinet wood
Piqui	Satin wood	626	—	—	—	All	,, ,,
Peroba	*Aspidosperm*	804	—	—	—	2, 3, 4	,, ,,
Seringueira ...	*Hevea brasiliensis*	—	—	—	—	1, 2, 5	Rubber
Sapucaia... ...	*Lecythis ollaria*	729	—	39	—	All	Oil, nuts, timber, etc.
Urucüm	*Bixa orellana*	—	—	—	—	1. 2, 5	Red dye (20 per cent.)

February to June, and September. Serves for illumination and for soap manufacture.

A factory capable of producing 120,000 litres of oil monthly would cost to fit up 110 contos, and the monthly supply of raw material 40 contos. With taxes, publicity, etc., besides the staff, the cost of a litre (at Manãos) is reckoned at 609 reis, and may be sold on the spot at 913½ reis, according to J. Cruz Zany (Manãos, 1917).

The wood contains also an abundant yellow powder, deposited annually in the concentric layers and central pith. This is called "Bahia powder," and holds a large percentage of pyrogallic acid (sometimes 80 per cent). Said to have been used (1916-18) in the manufacture of lachrymogeneous shells, owing to the extremely pungent effects caused by its emanations. Houses built of this wood are exempt from fleas, etc.

CHAPTER XVII

MATTE, ESSENCES, DYES, RESINS, FLOWERS, ETC.

Matte (*Ilex paraguayiensis*)

Matte is to the Southern Republics, Chili, Paraguay, Brazil, Uruguay, and Argentina, what tea is to the European. It is even more drunk in many places than its rival, coffee. Here we find a plant which has its habitat exclusively in the temperate region, at an altitude of from 1,500 to 3,000 feet above sea level. Its Latin name is, of course, due to its being found, probably, in the first instance, in Paraguay, but the State of Paraná is the great seat of its exportation.

The tree, or rather bush, is 12 to 20 feet in height, and it rarely reaches 30 feet. It belongs to the hollies, but is without spinous leaves. The area over which it is distributed in Paraná alone is some 140,000 square kilometres, but it is found in six other states, as well as in a small part of Argentina and Uruguay, near the Brazilian frontier. The leaves are prepared in two distinct ways. (1) Ground up into powder to be used in the cuia (or gourd), and the decoction, made with boiling water, is sucked up through a perforated tube. (2) Prepared as a sort of tea in flakes, with some fine stalks, and taken in cups, like the Chinese or Japanese liquor. The infusion is of a green colour, and when brewed

in a pot, a Brazilian custom is to put a piece of glowing charcoal in the teapot with the dry leaves, shake it about until they are partially roasted, and then pour boiling water on them, letting the beverage infuse a few minutes. The effect is to turn the liquor into a dark brownish green, and undoubtedly much stronger. It improves also by boiling. Matte has one great advantage over tea, and that is, that two brewings may be made with the same handful of leaves, and sometimes the second is stronger than the first. Its greatest quality is in its effect on the human system. Take a good bowl with a crust of bread at 4 a.m., and you may work in the harvest field till noon. It has no aftermath, no injurious influence on the digestive organs, and its action is stomachic and laxative. During the war with Paraguay the soldiers marched and fought day after day without any food but matte.

I have noticed a remarkable fact with relation to its medicinal properties. In the Argentine cattle lands an enormous quantity of meat is consumed, indeed, the staple diet of the people is flesh. I have myself breakfasted on huge beefsteaks for months together, 7 days a week. The beef, however, goes together with the matte usually *a bombilla* (in the cuia or gourd). The bombilla is the tube, spoon-shaped at base, and commonly of silver, through which the matte is drawn.

The cowboys are great beef eaters, but rarely suffer from the effects of the diet. Certainly the matte is a blood purifier, at least taken in native fashion, and without sugar. This beneficent herb can be placed on the market in Europe for 1s. a pound, and if imported direct in large quantities would cost no more than 9d. (1913).

Each bush produces 200 lb. of leaf and fine stalk, which is reduced in the factory to about 90 lb. of herb. In its natural state the matte is found in company with the monarch of the temperate zone of Brazil, the majestic and graceful araucaria (the southern pine). The only cultivation the bush receives, under these circumstances, consists in clearing the obstructing growths from its vicinity. This is done every 2 or 3 years, under favourable circumstances. The harvest is collected in the late summer, commencing usually in March, when the workers go out into the forest, some to build huts to live in and others tatacuas or curing places. The branches measuring less than half-inch in diameter are nearly all cut down, and then the finer twigs and leaves separated from the mass. They are first rough dried over a fire in the open, and then cut up by a machine, and put into sacks, and transported perhaps 100 miles by road or river to the factory. The matte (maté) is now dried again in patent ovens (Brazilian invention), and then separated into different qualities by sieves. The powder (maté chimmarão) is usually exported to Rio Grande do Sul, the River Plate Republic, and Chile, to be consumed *a bombilla*. In the Paraná Campos the matte tree alternates with the araucaria. Its limit in this zone is from 500 to 1,000 metres above sea level.

There is ample scape for combining saw mills and matte factories.

Exportation during the last quarter of a century has increased at least 300 per cent. The most encouraging thing about this trade is its development without artificial aid, solely through the excellence of the article. The annual consumption in

the State of Paraná per head of the population is about 10 lb. The exterior trade is carried on through fourteen ports, in six different states, but of the total, Paranáguá and Antonina between them account for more than one-half. It is calculated that the bush requires 3 years before being fit for harvest again, if the precaution is taken of leaving a few branches covered with leaves at the top, to protect the rest from the elements.

The Société Française d'Hygiene (9th July, 1909) votes unanimously its expression of the necessity of the authorities employing matte as a beverage.

The French Red Cross has been using it recently, large quantities having been sent to Havre entirely free of charge. It was, however, reported in the Rio press that the local Customs authorities demanded duties before admitting it into the country.

A great chorus of physicians proclaims its sovereign virtues, not only as a food beverage, but as a gentle stimulant and a corrective of many stomach, liver and kidney complaints.

It has also been found of great efficacy as a cure for alcoholism.

Exports,	1913.	65,843 tons	= £2,372,000.
,,	1918.	72,781 ,,	= £2,151,000.

To Replace Tea or Coffee

Two grammes of matte to one cup of water; or roughly speaking a handful of the herb serves for a quart. Costing 1s. a lb. each quart of matte would amount to $\frac{1}{10}^{th}$ of a penny.

A very good drink may be made from 2 grammes of matte and $\frac{1}{2}$ a gramme of centaury tops to $1\frac{1}{2}$ quarts of boiling water.

It would be possible to cover many pages with

attestations from well-known physicians of the high therapeutic value of matte, but it is quite unnecessary. During 1910-11 the Spanish army made very beneficial use of it in their campaign against the Riffs, etc., in Morocco.

It is known to be useful in the treatment of diabetes (Dr. Monin), and, according to Dr. M. de Tours, another French physician, it is a general but harmless stimulant, acting on the brain, the genital system, etc., and is of great value from the alimentary point of view.

Excellent as a water purifier, causing rapid precipitation of calcareous impurities, etc. Now made up in the form of tablets, and also put on the market in the same form as tea, also in tonics and refreshing drinks and elixirs.

Experiments have been made to cultivate it by means of seeds, which are immersed in water densified by the addition of potash until an egg floats in it, and allowed to remain twenty-four hours, after which they are planted 3 metres apart.

Medicinal Plants, etc., etc.

Quinas, furnishing cinchona, or Peruvian bark. There are no less than fourteen or fifteen native kinds, and the true Peruvian cinchona has been introduced with great success. Angelica, quassia, gentian, centaury, rue, and many purely Brazilian species of bitter tonical plants abound in all the states.

Ipecacuanha is found in the shady places along the banks of rivers in Amazonas, Matto Grosso, Goyaz, Minas, São Paulo, etc. Collectors take up the roots and dry them, observing that one is left to propagate wherever a plant is found. The price

(in Brazil) is about £1 per kilogramme. Exports (1908), 24 tons = £13,500. 1914, 38½ tons. Cost (in Corumbá), 140$000 the arroba (15 kilos). Now used in French military hospitals with great success for antiseptic purposes.

Salsaparilha. Well known as a depurative. Grows all over Brazil. The roots are often 4 centimetres in diameter and 2 metres long.

Salva officinalis (the plant of life). Flowers in winter. Grows everywhere. 30 to 60 centimetres high. Violet blossoms. Cold infusions of the flowers, root, etc., are used as remedies for typhoid and indigestion. Is said to prolong life. Contains gallic acid and essential oils.

Folha Santa (Echites macrocalyx). Most powerful resolvent. Fresh leaves applied with sweet oil to the body cure archites very speedily.

Guaraná (*Paullinia cupana.* Kunth).

This exceedingly valuable plant is cultivated by the Maués Indians in Amazonas, but grows wild in many parts of this region. It can be grown to advantage in nearly any tropical or sub-tropical part of Brazil. Planted 6 metres apart, it flowers in the third year, and sometimes bears fruit as soon, or in the fourth or fifth season, the crop is picked in November. The Tapajoz Indians did not take the trouble to cultivate it, just gathering the fruit as they wanted it until 1866. It propagates best by shoots, as the seeds take three months to germinate. The Maués dry its seeds in the sun till they are able to remove the tough skin by rubbing between their hands.

The fruit is cleaned in water, and the seeds are

roasted on the same day, to prevent fermentation. They are then crushed, and made into a moist paste, which is rolled into sticks and dried. Price locally, 6 to 8 milreis a kilo. The prepared paste is sold at 20 to 25 milreis a kilo in Matto Grosso. If carefully treated, each plant will produce 8 lb. of seeds annually for 40 years.

The pure Guaraná hardens into a very dense mass, and it is fashioned into all sorts of figures, such as fishes, snakes, monkeys, etc. It is very frequently adulterated with mandioca flour, cocoa husks, quinine bark and other foreign elements which the natives have learned to employ in order to keep level with the buyer, always endeavouring to exploit their labour.

The Indians use also the roots and leaves of the Guaraná itself, as well as the flowers.

Total crops of the Maués district, the seat of its preparation, 20 to 25 tons yearly. A small piece of the chocolate-coloured cylinder is ground up into fine powder, and a spoonful is mixed with one of sugar and taken in a glass of cold water. The plant is now grown in the neighbourhood of Rio Janeiro, and used by a local chemist in the preparation of various specialities.

With regard to its effects on the system, it acts on the intestines, on the digestive apparatus and in cardiac affections, due to the great percentage of caffeine, the pure powder contains. It has also been of utility in neuralgia. It prevents fatigue, but persons who use it to excess suffer from insomnia. In 1844, according to Castelnau, an arroba (15 kilos) of Guaraná cost 50$ in Santarem (Pará) and was sold in Diamantina for 128$. Von den Steinen says, that whilst it could be bought in

Cuyabá for 16 marks a kilo, it was sold in Germany for 90 marks.

During the Paraguayan war an arroba cost 500 milreis.

The plant is a climber, bears a yellow fruit, with black seeds somewhat larger than a grain of maize.

Silva Coutinho in his *Noticia sobre o Guaraná*, published in 1866, relates the following legend. Amongst the Maués lived a most virtuous couple, whose only son was considered by the tribe as a sort of guardian angel. Through his influence they were rich, happy and in good health and friendly to each other.

One day, however, Jurupari, the evil spirit, profited by a moment in which the youth climbed a tree to pick fruit, transformed himself into a serpent and slew the boy.

The Indians found the latter extended on the ground as if asleep, with his eyes, strange to say, wide open. Whilst the Indians were bewailing the loss of their semi-divinity, a flash came from the sky, and the boy's mother said that Tupá (God) had come down to console them that they were to plant the two eyes of her son, and from them would spring a plant which would give life and strength for ever.

So came forth the guaraná.

Full details with regard to the plant may be found in the brochure by Dr. Roquette Pinto of the National Museum. This is No. XII of the Agricultural Propaganda pamphlets of the National Agricultural Society, Rio.

Export tax (Pará) 2$000 per kilo, plus 5 reis for the Stock Exchange. Freight to Liverpool, 45s. per ton, plus 15 per cent.

By courtesy of the] VICTORIA, ESPIRITO SANTO. [*Leopoldina Railway.*

[Leopoldina Railway.

Analysis (per 100 grammes (Peckholt).

Caffeine	5·388
Resin	7·800
Sapoine	0·060
Starch, etc.	9·350
Essential Oil	2·950
Guaranic Acids	8·052
	32·500
Residues	67·500

Exports from Pará in 1908, 30,051 kilos, valued at 344,549$500.

The output has decreased since, possibly owing to local consumption.

Kola

The first trees were planted in the Botanical Gardens in Rio in the beginning of the nineteenth century, but it is only within the last two or three years that their cultivation has been attempted by private individuals. On the estate of the Barão do Paraná at Porto Novo da Cunha, perfect nuts are now being grown and used in connexion with guaraná in the preparation of a very efficacious proprietary medicine.

Other Medicinal Plants

We may mention capilaria (pectoral), colchicum, *Sagittaria dracaena* (dragon's blood), tamarind, sassafras, verbena, valerian, gentian, jalap, cochlearia, cashew, rue, digitalis, elaterium, *Strychnus toxifera* (nux vomica), and the well-known jaborandi, from which pilocarpine (the basis of hair tonics) is extracted. There are also Cha Mineiro (*Echinodorus machrophyllus*), the finest remedy

known in Brazil for rheumatism, skin and liver complaints.

Cocculus.—Anti-dyspeptic.

Seiva de Jatobá (*Hymenœa Courbaril*, Linn).—For consumption.

Piper.—Tincture for hemorrhoids.

Porangaba.—To reduce obesity.

Curatombo (a violacea).—For bruises or sprains, also (internally) a powerful aphrodisiac.

Tonic stimulants.—Bitter orange is a common specific of the country people in Brazil.

Anticatarrhic.—Extracts of the sapucaia nut are very beneficial.

Poisonous Plants

The most noteworthy are the uirari (*Strychnos castelnœi*), and icu (*Anomospernum grandifolium*), from which the Amazonian Indians prepare the paralysing poison, curare. The victim dies of asphyxiation, and from 8 to 15 centigrammes are a fatal dose. The only remedy is artificial respiration, which, if persevered in, and commenced in time, saves the person who has been wounded by a poisoned arrow. Special receptacles are used for the points of the weapons, and the poison is carried in reserve in various shaped vessels.

The preparation of this poison is attended by rites of a religious nature. Three persons are chosen by lot amongst the Guiacas, according to Dr. Bach (*Revista do Museu Paulista*). A small, slow fire is prepared and two earthen pans, the larger filled with a liquid of a light brown or chocolate colour (800 grammes more or less). The small pan has a capacity of 150 grammes. This is put over the fire half full and stirred for 2½ hours,

at the end of which time the whole of the 800 grammes had been used. The Indian engaged in stirring had become quite stupefied by this time, and a second one remained only 1½ hours. The third resisted the influence of the poisonous vapours for the same length of time. At the end of this last period, a small amount only of a concentrated extract, a darker colour than the original, remained in the pot.

During the operation, the rest of the tribe was drawn up to windward, to prevent the fumes being wafted away. The poison is so virulent, that two boatmen wounded in the legs by arrows dipped in it, died in a *few minutes*.

Dr. Roquette Pinto describes another dangerous plant, "Diamba," used in the N.E. of Brazil to stay hunger. It paralyses the stomach action, and is taken like snuff.

Canabi is a convulsive poison found in many parts of Brazil, and the *Solanum nigrum*, *Thevetia neriifolia*, *Curassavica* and *Vinca rosea* are venomous plants acting on the heart and as stupefacients, respectively. *Strichnos gardnerii* and *Bothryopis platyphylla* poison by dilation of the vascular system. Many plants used in Materia Medica are extremely poisonous if an overdose is taken.

Digitalis (foxglove) is cultivated in Novo Friburgo for commercial purposes by a firm of chemists in Rio.

Nux vomica is found in the Amazon basin, several kinds of spigelia all over Brazil, plumerias in the north, as well as the terrible mancinella, a euphorbia, known as the death tree, killing persons who are imprudent enough to sleep under it.

Croton is found in São Paulo and as far north as

Pernambuco, as well as *Erythrina*, *Mimosa*, *Farnesiana* and *Acacia angico*.

The sensitive plant, *Mimosa pudica* (Linn), is found all over Brazil, also solanum and wild nicotiana.

Sepsilosina is a liquid extracted from the mandioca root. It will preserve whites of eggs for months. By its means crystallized sugar is transformed, losing its form.

Lactic acid and mucilage is found in the poisonous mandioca, and also manholine and manihotic acid.

Ornamental Plants

Orchids naturally take pride of place amongst the above, Brazil occupying the chief position in the world, with 1,059 varieties, most having large and beautiful flowers.

Of the cattleyas, Pernambuco exports *labiata*, *Leopoldii guttata* and *granulosa*. Other species of orchids from this state are the *Burlingtonia fragrans*, *Oncidium devaricatium*, *Oncidium gravesianium*, and the *Miltonia spectabilis moreliana*. The *Cattleya labiata alba* is also found, with an exquisite white blossom, but it is extremely rare.

Plants with eight leaves are worth 4½d., those with fifteen leaves 9d., twenty to thirty leaves 1s. 4d., and thirty to forty leaves 1s. 11d. each. An extraordinary plant was found recently and sold for £1. In the United States or Europe it should be worth £30 at least. When in full bloom it is expected to bear 500 flowers.

Buyers representing great growers take up their abode at a central spot, and give notice of their intention of buying. Every market day the people come in with some plants, good, bad, or indifferent.

Pernambuco exported 15,000 of the *Cattleya labiata* last season,. An export duty of 2 milreis per 100 plants is charged. Properly packed they will stand 30 to 40 days' voyage.

The cattleyas and lœlias are found principally from Bahia southwards, in the coastal ranges. The following orchids are found in Itatiaiá:

	Altitude	
Epidendrum	800 metres	(July)
Isochilus	1,000 ,,	,,
Pagonia	1,000 ,,	(March)
Physurus	900 ,,	,,
Habenaria	1,000 ,,	,,
Octomeria	1,000 ,,	(July)
Phymatidium	900 ,,	,,

Pará exports mostly the *C. eldorada, C. superba* and *Oncidium lanceanum.*

Bahia—*C. aclandii, C. amethyst oglobossa.*

Espirito Santo—*C. labiata, C. harissonia, C. schofieldiana, C. schileriana, C. crispa, lœlia xantina, L. tenebrosa.*

Rio de Janeiro—*Lœlia perrinii, C. harrissonia, C. crispa, C. lobata, C. guttata* and *miltonias.*

Minas and São Paulo—The same classes.

Santa Catharina—*Lœlia purpurata. Lœlia elegans, C. intermedia, C. Leopoldii.*

Espirito Santa and Santa Catharina boast of the rarest varieties of these beautiful plants, some, as the *Cattleya autumnalis alba,* being worth £50, or the *C. warnerii* £200. Amongst the other noteworthy plants are the begonias, cannas, almonds, cardamum lilies, hortensias, magnolias, verbenas, jasmines, lycopodiums, gloxinias, bougainvilleas,

camellias, water-lily, heliconias, amaranths, and all flowers common to Europe, besides others without number. The plateaux at an altitude of 6,000-7,000 feet, which are found in several places in the States of Minas and Rio de Janeiro, are remarkable for a flora of a distinct nature, amongst which bulbous plants predominate, growing very frequently with the roots almost entirely exposed. In these elevated regions the climate is truly temperate, and most of the flowers are found blooming in the spring or early summer. The fuchsia, which is a sort of climbing, semi-parasite in Southern Brazil, is not found much above 3,000 feet, but between 2,600 and 2,900 feet is abundant in most places.

Another creeper is *Dipladenia insignis*, bearing beautiful rose-coloured flowers, 4 inches in diameter, the most sought after of 200 varieties, *every one* handsome. This grows in the forests in the low-lands near Rio de Janeiro.

The Passion flower (Maracujá) grows all over Brazil, 100 varieties being found; one, *Passiflora Macrocarpa*, bearing a fruit weighing up to 4 kilos. *Aristolochia gigantea* is another climbing plant that produces flowers 35 centimetres long and 30 centimetres wide. In the south the purple blossoms of one of the *Melastomaceæ* (Flor de Quaresma) are seen evrywhere.

The splendid Victoria Regia water-lily (Uapé) is found principally in the Upper Amazonas, one of its haunts being the confluence of the parent stream with the Rio Negro. On the smooth waters of Lake Januari the great blossoms open their rose petals, extending to 40 centimetres in diameter. The stalks and the backs of the leaves are covered with spines, so the roots are very difficult to obtain. The leaves

are often 2 metres across, and the stalks 5 in length from surface to lake bed.

PRINCIPAL FLORA OF ITATIAIA.

Flowers	Altitude in Metres	Bloom in
Amarylides	2,100—2,500	January and June
Anemones	1,500	May to July
Begonia	2,100—2,400	May
Bignonia	2,300	,,
Bromeliaceæ	2,000—2,300	March to July
Cannas	1,000	July
Cassias	2,100	March
Clematis	1,750	May
Convolvulus	2,000	,,
Fuchsia	2,000—2,300	June and July
Trunk up to 1½ in. thick, grows up to		30 or 40 feet high
Geranium	2,200	March
Lobelias	1,900—2,400	December to March
Lupins	200—2,000	February
Mimosas	2,200—2,600	March and December
Nicotiana	2,200	December
Oxalis	,,	March
Passiflora	2,400	,,
Primula	2.000—2,300	May
Saxifrage	2,000—2,800	February and July
Valerian	2,300—2,500	April to June
Verbena	2,100—2,300	May
Viola	1,200—2,200	February

Acacia splendens. Flowers in October.

Hibiscus tilliacens. Great masses of yellow blossoms.

Pampas Grass (Ubá). Flor de S. João. Changes from red violet to white, both colours, and intermediate shades being seen on the bush at the same time.

According to Dr. Löfgren, there are 12,000 species of flora in S. Paulo alone. In the Serra do Mar, the Lianas or creepers are prominent eveywhere, interlacing all the confused and bewildering forest

growths together in a veritable intricate network, growing upwards, downwards and horizontally, spreading a multitude of foot traps for the unwary wild beast, or the incautious traveller, who seeks to force a way through or over the twirling and twisting *cipós* spread in his path. Sometimes two or more are entwined and form ropes of several strands.

Where the soil ceases to be humid or rich, the woods suddenly cease, giving place to a stunted and starved undergrowth (caatinga).

Floriculture

The cultivation of flowers offers a splendid result to those who will dedicate themselves to it. In February, March and April, tubers and bulbs of all sorts should be put in, with the exception of dahlias, which require to be planted in August, September and October.

Gladioli, angelicas, scillas, amaryllides, etc., may be planted twice a year. In February and March pansies, anemones, vanilla, balsams, daisies, sweet peas, gloxinias, poppies, primaveras, phlox, ranunculi, petunias, violets, verbena, pinks, aquilegia, cinerarias, etc., may be sown.

In the spring (August and September) begonias, pinks, fuchsias, calceolarias, gloxinias, petunias, lobelias, forget-me-nots, etc., etc.

Transplanting and thinning should take place in November and December.

Pyrethrum. This well-known plant, from which the so-called Persian powder (insecticide) is made, can be grown easily in South Brazil, where the soil is not too sandy, or the climate excessively dry.

Petropolis and *Barbacena* (Minas) are the prin-

cipal flower-growing centres, which supply the Rio Janeiro markets with an abundance of blossoms, including fine camellias, pinks and roses. Asparagus fern is used freely for decorative purposes.

Essences, Resins and Dyes, etc.

The *Quebracho colorado* of Argentina is replaced in Brazil by several trees of the Brazil wood type, some dozen or more producing a red dye, including three kinds of dragon's blood trees.

Two anils with fine blue colours, both creepers (*Cissus tinctarea* and *Cissus sicyoides*), also the indigo plant itself.

Some of the fuchsias give a black, and other trees, as the *Ludwigia saparosa* and various bromeliaceas, a brilliant yellow. Gum arabic is obtained from acacias, cashews, etc., and copal from the *Amyris clemifera* and the *Hedwigia balsamifera*. Of the essences the vanilla plant is found nearly all over Brazil, especially in Minas Geraes. Cinnamon grows exceedingly well in Pará and Maranhão, and the famous Tonkin beans are common in the northern forests. Benjoim in Rio Sul do Norte.

Annatto (Urucum) grows in most places in Brazil. The seeds are crushed, and the red dye precipitated in hot water. The deposit is then evaporated, rolled into cylinders, and sent to market. The States of São Paulo and Paraná have made attempts, under Government supervision, to produce vanilla on a commercial scale, and the latter state has published directions for its successful culture. It may safely be asserted that there are many plants producing extremely valuable oils and extracts, that would repay a hundredfold the man who took up their cultivation in a scientific way. It is just the things which are

neglected that offer the best openings in Brazil. Undoubtedly the state most advanced in agronomical studies is São Paulo, possessing as it does at least two finely equipped and managed experimental stations. Here also meteorological phenomena are adequately registered, and the results profited by.

CHAPTER XVIII

AGRICULTURE

Part I.—Coffee

Coffee is grown in Brazil, principally in São Paulo, Minas Geraes, Rio de Janeiro and Espirito Santo. The plants flower from September to December; earlier in the north, and later in the south. The crops are gathered from April to July or August, or during the dry season.

Although many parts of the more central states (coastal) are adapted by nature to the growth of this plant, the fazendas have been reduced to less than half of their previous extent, owing to the state of the European market. The soil of the coffee-producing zone is of a red colour, and is presumed to be similar to the Devonian in England. Sember says that it is formed of decomposed lavas mixed with decayed vegetable growths. The element that seems lacking in most of the soil appears to be the oxide of cal. (or lime); this, however, does not appear to prejudice the coffee plant, as it requires but a fourth part of this chemical constituent as compared with wheat. Experiments carried out with samples of earth from Minas, Rio de Janeiro and São Paulo, demonstrate that the composition shown by analysis does not agree by any means with the result obtained by harvest; after all, the

most exact method of proving the suitability of the soil. The data that one finds infallible in cold ground in Europe, are hopelessly at fault in the cultivated zones of Brazil. Whilst in England one finds a maximum depth of soil of 24 inches in relation to efficacious agriculture, in São Paulo there is from three to five times as great a profundity. I have myself seen a solid wall of earth at least 150 feet high, and decomposition is said to have been effected in many localities to the depth of 1,000 feet. All scientific travellers in Brazil remark this extraordinary phenomena.

With regard to the selection of seeds for the propagation of coffee, the greatest care is taken nowadays. From 75 to 90 per cent. of those planted survive. The sites selected are generally cleared as soon as the summer rains have diminished, or ceased, at about the end of March. The fallen trunks and branches are left to dry until August, when the whole is set on fire. At the beginning of the wet season the young plants (previously brought up from seed) are selected and put in. The planting continues from November to February. The first crop is produced in the third year, and the system employed in São Paulo for the new plantations is sufficiently favourable to the colonist. By Decree No. 1,090 of January, 9, 1903, the situation of the planter became more untenable, and the Valorization Scheme was proposed as a remedy. This, as we have seen, is superseded (1908). See *Brazil in* 1909-10. Generally speaking, the new arrival (immigrant) has a definite contract with his employer, and his salary or share of profits is the first charge of an estate. He finds a house built, and a lot for his own use already cleared. Between May and Sep-

tember he can earn 5d. to 7d. a half sack (or 1½ bushels) picking the berries, and in the case of a large family the earnings are quite substantial, many Italians being able to return home for 3 or 4 months of each year. The Colonization Department in São Paulo furnishes labourers to approved planters, under stamped contract. Conditions are usually as follows:—

Pay from 2 to 3 milreis daily with keep for workers engaged in drying and preparing for export. Families of pickers on piece work are given a properly built house and ground for growing kitchen stuff free. Three persons ought to gather and sack at least 16 alqueires daily. Price per alqueire (50 litres), 400 to 800 reis. Each 1,000 trees should produce 60 alqueires annually. Maximum yield (at Baurú), 130 alqueires per 1,000 plants. Another method is to pay for each 1,000 plants tended, or hoed round, from £1 to £1 5s. This operation is performed five times in the year. Ample time is left to colonist to cultivate his own lot, for which he pays no rent whatever, not even for his house.

Some planters adopt a different system, allotting a third of the production to the colonist, and advancing him means for his subsistence until after harvest. The cost of marketing 50 kilos of coffee works out at about the same number of francs, or with interest on capital and depreciation reaching 66 francs for a fair grade of berry. This amounts to 6d. per lb. in round figures. From 1890 to 1895 coffee reached high-water mark of 97 francs, and once or twice even 130 francs. The lowest point touched (1900-5) was 40 francs. Whilst the present state of affairs continues the virgin lands in the State of São Paulo alone some (some 2,500,000

acres) must be reserved for other kinds of cultivation. Various measures have been taken by the planters themselves, including the burning of immense stocks of coffee. One great grievance the planter has, is the fact that his best efforts to produce a high grade of berry bring profit, now and then, not to him, but to the European merchant, who buys at the lowest figure, and sells the Brazilian production at the price and under the name of Mocha or finest Java. I asked recently the manager of a large wholesale house what stock of Brazilian coffee he carried, and the reply was—*none*. One can only judge that he didn't know what he was selling. The world's crop 1908-9 was 16,927,000 bags, Brazil alone producing 12,812,000 bags. That of 1906-7 was the greatest on record, totalling 15,392,000 bags from Santos alone, and 4,234,000 from Rio de Janeiro.

Exports from Minas Geraes (1911), 102,679,639 kilos. São Paulo (total production of State), 8,524,245 sacks.

All coffee passed until recently through the hands of brokers, or commision agents, in Santos or São Paulo. These houses were charged with classification of the grades.

When one compares the price received by the planters and that actually attained by the coffee in the retail market, one wonders where the difference comes in. A little study of the subject will be extremely enlightening.

The coffee broker in Santos is responsible for 3 per cent. to begin with, but he has four other sources of revenue.

1. 12 per cent. on current accounts.

2. 200 to 400 reis per sack, overcharge on the freight from the plantation.

3. Price of sacks, costing 11d., and being sold to the planters at 2s. 2d. each.

4. Profit made out of manipulation of the contents of the sacks.

The expenses per sack of coffee from Amparo to Santos (280 kilometres) are: freight, 3·500; sack, 1·700.

Export taxes, 5$659; commission, 0$720; stamps, etc., 1$800; total, 13$379, or equal to a value, f.o.b., of 46$000 the sack (1913).

With an increase of wages, 60 arrobas, or 900 kilos, the yield of 1,000 plants, cost from first to last, free on rail, 349$000, without counting anything for incidental expenses, interest on capital, depreciation of plant, exhaustion of the soil, etc., etc.

S. Paulo had in the beginning of 1918 nearly 800 million coffee plants, and Senator Alfredo Ellis, a well-known agriculturist, said in the house on January 14, 1915, that no less a sum than £4,000,000 is spent annually on their upkeep, and, reckoning 3 litres of berries per plant, each arroba of 15 kilos, cost 6$500, or at the rate of 26$000 the sack.

Since 1905 several companies have been formed to sell direct to the foreign buyer, and an English firm (Johnston and Co.) has formed a Warrants Company to unify charges, and put an end to this state of affairs, but the brokers have instituted a system of boycottage against it, resolving not to sell it any coffee.

A Propaganda Company was created in London (October, 1908) under the title of the San Paulo Pure Coffee Company. The São Paulo Government subsidized this concern to the extent of £50,000, payable in five yearly instalments. The

coffee is put on the English market in half-pound tins, hermetically sealed, the price being at first 1s. 4d. per lb., and now 1s. 10d. The roasting and packing of the coffee was put under the supervision of a delegate of the São Paulo Government.

In addition to the 3 francs surtax on each bag of coffee imposed for a period of 6 years by the Convention of Taubaté (São Paulo), signed by the Presidents of São Paulo, Minas, and Rio in 1906, the Government has organized a permanent service of propaganda in Europe. The State now purchases the coffee from the planters at 42 fr. 50 the 50 kilos. It is calculated that the whole of the loans contracted for this purpose will be redeemed in 1914, and a stock of at least 3 million sacks remain in its possession for sale; the proceeds are to be used for the purpose of stimulating the industry, and protecting the interests of the planters in Europe. In 1911 some 875,000 hectares were cultivated with coffee in São Paulo.

A fazenda, or coffee estate, of 50,000 trees in good condition is worth £5,000. These 50,000 plants should produce 240,000 lb. of coffee.

Many different kinds of vegetable crops may be grown between the bushes. On the higher lands (up to 5,000 feet) protection from the cold winds is frequently required.

In the whole of Brazil there are 1,320,000,000 coffee trees, occupying nearly 4½ million acres.

Each 50 kilos requires seventy plants. Thus to produce 1,000,000 sacks of 60 kilos each, a capital is necessary of no less than £13,430,000. The total sum invested in the business in this one state must amount to £100,000,000 at the present time. The probability is that São Paulo will follow the example

presented in England by the hop-growing counties; indeed polyculture has been the care of the Agricultural Department for some years past, and the tendency is to supplant coffee with more profitable growths. A remarkable fact is presented to the student of economics. In spite of the high prices in the nineties, Brazil was the only country to materially increase its production, rising from 5,547,000 sacks in 1890 to 20,000,000 in 1916.

In 1913, 13 million sacks were exported of a total value of £40,000,000. Per unit (sack) values in 1914 were 27$296, in 1917, 19$321, rising through reasons explained below to 60$000 in January, 1919.

The total crop for 1918 was reckoned at 18 million sacks for all Brazil, S. Paulo alone 13 million, Rio and Minas 4, and Bahia 1 million sacks. A neutral zone was established by the Federal Government, and coffee from Minas, etc., passes through to Santos without paying duty to the S. Paulo State Government.

Prohibitive taxes ruled for some years with regard to the laying out of fresh plantations, but it is unlikely these will continue in force. This measure undoubtedly has proved very beneficial to those planters farthest from the exporting centres, and it is a curious property of the business, that plantations recede further and further into the interior, being found over 460 miles from the sea, whilst formerly they were mostly situated near the coast.

The limit of cultivation south is Santa Catharina, but it does not flourish in the far north.

By Decree of July 22, 1911, the Government of Minas Geraes offers to Coffee Co-operative Societies, who instal up-to-date machinery for the

preparation of the berries, a subsidy of 12½ contos to each of two societies, and 2½ per cent. of the value of the coffee sold abroad by any such society, and 1$000 per arroba of roasted coffee sold abroad in cities indicated by its agents.

At present (1919) there is no active propaganda on behalf of any of the coffee states.

Loading facilities at Santos are excellent, the *Kroonland* taking on board 1,800 tons in 14 hours on one occasion.

It is, of course, well known that coffee improves in quality by keeping. The principal market for Brazilian coffees is the United States, but a persistent and highly successful campaign has been carried on in that country to belittle their qualities.

In 1916, 5,994,343 sacks were imported from Rio and Santos, and 2,845,717 from all other sources, but, to quote from the *Tea and Coffee Trades Journal*, New York, July, 1917, of the 6,218 brands of coffee sold at present in the States, two only are *called* Brazilian.

The same review says: "The most important feature of Brazilian coffee is its abundance and comparative cheapness. In all other respects, and above all in drinking qualities, it is far inferior to other kinds." This statement is extremely misleading.

Prices quoted in the same number of this journal are: Moka, 21 cents per pound; Java, 20 cents; Liberia, 18; Central America, 15 to 12½ cents; and Brazilian, 10 cents the English pound.

Freight from Santos to Victoria (Espirito Santo), 36 hours' run, is higher than that by the same steamer to New York, a voyage of at least 20 days.

Average coastwise freights by Brazilian Lloyd work out at 25 per cent. to 40 per cent. of the value of cargoes.

According to the Convention with France, by which 30 of the best of the ex-German steamers were ceded up to the end of March, 1919, this country undertook to purchase two million sacks of coffee before June 30, 1918, but up to the end of May (*vide Jornal do Commercio*, Rio, May 29, 1918) only a third of the stipulated amount had been bought.

Maximum prices in 1906 were 7$400 the arroba; in 1912, 13$100; 1916, 11$000; in the autumn of 1917 as low as 5$000, but the situation entirely changed after the terrible frosts of July, 1918, when S. Paulo lost over a third of its plantations, worth £15,000,000, the fortunate holders of stocks finding them automatically valorized, prices in September being 10$800, and now (January, 1919) 16$000 the arroba.

The State Government has made an enormous profit out of its purchases in 1917, and fortunate planters in Minas, Rio and Bahia became rich in a moment.

Exports, 1918, 7,433,000 sacks, worth £19,041,000.

Coffee Substitutes

In 1905 there were in Italy twenty-three manufactories of coffee substitutes, and in Austria and Hungary at present exist no fewer than 412 making fig coffee, 142 using chicory, and fourteen barley. In Germany (Saxony, Baden and Brunswick) there are 723 factories, and in France 166, whilst in Belgium 60,000 tons of imitation coffee are produced annually.

In England, Russia, Spain, Portugal, etc., chicory is the usual substitute, but the quantity used is not very great.

Coffee and Alcoholism

Dr. Casseús in *La Revue*, Paris, points out that this beverage represents a most powerful arm against the terrible flagellation represented by drunkenness in his country, where, according to official statistics, alcoholism is the direct cause of one-third of the total mortality.

Sugar and By-Products

Another important industry which has suffered greatly from a number of causes is sugar planting.

The sugar cane was introduced into Brazil shortly after the discovery of the country, and cultivation was commenced simultaneously in Pernambuco and São Paulo. It is stated that the soil and climate of Brazil are better adapted to the production of sugar than that of any other country in the world. The principal seat of the cultivation is along the N.E. Coast and Rio and Matto Grosso States. Not profitable in the far south. The planters have (as is the custom of their kind everywhere) taken advantage of the fertility of the soil to such an extent, that, extracting its vital elements without replenishing them, the yield per acre is now only about 20 tons. Instances are not uncommon where the same lands have been under sugar cane for two centuries, and the methods employed in the majority of the mills obtain not more than 6 per cent., out of 15 per cent., of saccharine matter.

Owing to the system of milling, and the small yield, the cost of sugar per pound placed on the

market is far too high. The principal sugar-producing states are Pernambuco and Rio Janeiro. The cane grows well in all the coastal states except perhaps the extreme south.

Consumption in former times was about two-thirds of the amount exported; a huge quantity of cane spirit is produced, and alcohol, largely used nowadays for illuminating purposes in increasing in consumption, as is also that of treacle. A mill has been started at Campos to make paper out of the refuse of the cane, and artificial silk could doubtless be manufactured at a good profit.

If we take the figures presented by the State of São Paulo, we find that the percentage of sugar as compared with other countries is as follows—:

	Tons of cane per hectare (2½ acres)	Proportion of sugar per cent.
Egypt (with irrigation)	38·5	11 to 15
Argentina	40	11 to 12
Java, intense culture	80	14 to 15·5
Sandwich Islands	82	15 to 15·5
Demerara	62	— —
Louisiana	50	11 to 13
Cuba	50	13 to 15
Queensland	46	— —
São Paulo	50	13 to 14·5
Campos (Rio de Janeiro)	50	14·5 to 15·5

The above calculations are sufficiently telling, and one can only marvel, and wonder what the result would be after the introduction of up-to-date methods. With sugar cane growing within the vicinity of Rio itself, prices appear to be excessive.

In the north the cane ripens in 14 months, and in S. Paulo within 20. Cost of production (1912):—

Preparation of land and planting 100 car loads of cane	1,800 $000
Cleaning	3,000 $000
Cutting	2,800 $000
Transport	4,000 $000
Expenses of crushing mill (primitive)	2,500 $000
Firewood	1,600 $000
Sacks and sacking	1,800 $000
Transport to rail or port	1,500 $000
Taxes and warehousing	600 $000
Freight	2,000 $000
Upkeep of mill	1,000 $000
Total	22,600 $000

The result of this outlay at present is 150,000 kilos of sugar. On arrival at the warehouses and weighing, each sack of 75 kilos has lost 5 kilos, on an average, reducing the net yield to 149,000 kilos.

Senator J. Bezerra, in speeches on August 30 and September 2 and 16 (1918), stated that the cost of production had increased 250 per cent. since 1900, such items as coal, 600 per cent.; machinery, 500 per cent.; and sacking, 500 per cent.; selling prices (wholesale) in 1915-16 being 10$ per arroba, and in 1917-18, 11$500. He said: The French Government bought at 1$400 the kilogramme, but the actual price at Pernambuco (August, 1918) was less than 800 reis for large shipments, freights from that port to Bordeaux by the Chargeurs Réunis line being 300 reis per kilo (a scandalous but official "Controle Maritime" rate), but which only made a total of 1$100. At the same moment, by reason of exigencies of the United States Government, a sack of 60 kilos was carried from Santos to New

York, a distance vastly superior, for 7 milreis, instead of the above tarif, 18$000.

In many cases, as may be seen, a loss is incurred instead of a profit made. This is *primarily due to faulty methods of production*, secondly because the planter cannot afford to wait for a rise, and again because he has to sell his sugar through a broker or commision agent, owing to the want of organization amongst the planters.

It is useless men embarking in enterprises in that country who are not prepared to work on the most approved lines; those who think they can reproduce in Brazil the rule of thumb methods by which they have impoverished their farms in Europe are prospective enemies to the Republic. On the other hand, bright, brainy farmers and planters, with sufficient capital, can reap rewards such as they never imagined in the old world. Sugar will pay in Brazil, and pay well if all is not taken out of the land and nothing put in, and if the by-products are properly disposed of.

In the Campos district of Rio state there are 34 modern factories, producing 3 million pounds sterling of sugar and alcohol annually, and in Pernambuco 1,300 of the primitive mills. In all Brazil, the total number of factories may be 3,000, of which about 120 are up to date. Calculating the 1919 population of Brazil as 27 millions, the total consumption of sugar per annum does not exceed 360,000 tons, whilst present-day production is over 600,000, a small amount proportionately, as compared with that of Cuba, over 5 times the quantity.

The Pernambuco crop for 1918-1919 will be about 200,000 tons, and that of Rio 110,000, Alagoas 70,000, Sergipe 50,000, and Bahia 40,000.

In 1917, a sack of sugar placed on the Rio market, cost from Pernambuco, 44$320, and from Campos (close at hand) 50$500, owing to extra taxes and higher cost of production.

This latter zone produced in 1918 no fewer than 18,003 pipes of spirit of 480 litres, 22 per cent. proof, and 5,595 tuns of 500 litres, 40 per cent. to 42 per cent. proof.

Sugar exports from all Brazil in 1908 were 31,577 tons, in 1916, 53,825 tons, and in 1918, 115,634 tons, worth £4,459,000. Per unit (ton) values in 1913, 181$, and in 1918, 870$000.

Cocoa

The theobroma is native to Brazil, in the regions of the Amazon valley, but to-day it is cultivated as far south as São Paulo and Southern Matto Grosso; but the coast of South Bahia, and Northern Espirito Santo, and Rio de Janeiro is admirably adapted to its growth when the swamps are drained. At a distance of six or more kilometres from the sea it begins to produce well, and thrives until the colder elevated regions are reached, doing best at an average day temperature of some 80° Fahr. The soil most suitable is an alluvium, light and porous. In some parts of Espirito Santo the climate is so favourable to its growth, that it forsakes its usual habitat and climbs up into the serras. Here it produces fruit in the second year, instead of the third. Contrary to cotton, cocoa requires a somewhat humid climate. The number of acres under cultivation in Brazil is continually on the increase, and there are immense territories yet available. Shade is necessary for its best development, but the trees should not be planted too closely together—12 feet

apart allows of 300 to the acre. The second crop is larger than the first, and the yield increases until maturity at about 10 years. The tree continues in full bearing for 20 to 30 years at least. Frequently flowers and fruit are seen on the trees at the same time. The best quality is that from Maranhão, containing a larger percentage of fatty matter than any other kind. One variety in Bahia is a veritable giant in relation to its fellows, reaching nearly 35 feet in height, with a trunk 9 inches in diameter. Frequently two crops are gathered the same year, the fruit being cut from the trunk, without any injury to either. Expenses of planting are not more than half those of coffee. Supply seems to be always less than demand. The tree is sometimes found in the depths of the Amazonian forests, where hardly any light penetrates, and, even under these circumstances, produces a small crop. Obidos is a great centre of its cultivation in this region. Cocoa grows from the Equatorial zone, to the limits of the tropics, or, in any case, as far as 20° S. latitude. Each tree produces an average of 200 pods, and one person can look after 1,000 trees. On some plantations the yield is as much as 20 lb. of beans per tree, which, sold at only 2 francs the kilo, will bring in about £800 the thousand trees. Taking lowest possible averages of 5 lb. per tree, and prices of only 2s. 6d. for this amount, a plantation of 4,000 trees would yield £500. Some growers in Bahia get an average of 13 lb. of beans, and the price paid is considerably higher than that last given. Each tree costs on an average 3$. Bahia possesses over 45 million trees, and the present (1918) total cost of production and transport (f.o.b) is not over 18$000 the sack. Minimum prices exceed 36$000 for 60 kilogrammes.

The local crop in 1915 amounted to 41,844 tons, and it is expected to reach 100,000 by 1920. It is now at least double that of 1914-1915. Prices, 1913, 38$652 the sack. 1916, 52$664. December, 1918, about the same. It is considered that the Bahia cocoa crop might be easily doubled. Some trees in the Belmonte area of the coast have yielded 32 lb. of fermented beans.

Export taxes. Bahia, 14 per cent. Pará and Amazonas, 5 per cent.

Exports in 1913, 29,759 tons, worth £1,594,000; in 1915, 44,980 tons, £2,894,000; in 1918, 41,865 tons, valued at £2,158,000. Prices are expected to rise considerably as soon as the world's markets are open, as there is not a single bean in Germany or Austria, and the former country was Brazil's principal customer.

World's output in 1911, 250,000 tons. Value per unit, 1911, 705 reis. In 1918, 1$900. 1918 freight rates to New York, 10$500 per sack. To England, £20 per 800 kilos; to Italy by Lloyd Nacional Brasiliero, 1,200$000 (over £60); and to Bordeaux by French steamer, under Government control, 38$400 per sack of 60 kilos.

Cotton

Booming during to American war of secession, and after suffering from a crisis, it is only recently that headway is being made again.

In 1904, 165,000 bales were produced. The price in the Rio market in 1907 varied between 13s. and 14s. per 10 kilogrammes (22 lb.). Exportation duties are highest in Piauhy, 12 per cent. *ad valorem*. Freight is high, the Leopoldina Railway (south) and Great Western Railway (north) both having a scale

which begins at something over £2 per ton for 150 miles. The lesser distances pay more in proportion, up to double, and the lowest rate is for distances exceeding 200 miles (Leopoldina Railway). Both these lines are English. The Natal and Ceará-Mirim Railway charges per kilometre, exceeding 300, 30 reis per ton; the Central Railway (national) charging something less. Ceará is one of the states most adapted to cotton owing to its dryness and peculiar climate, but the plant thrives in all Brazil. The most up-to-date states, as far as local industry is concerned, are Rio de Janeiro and São Paulo. In 1908 there were in Minas forty-three spinning and combing mills (mostly small), in Rio de Janeiro twenty-nine, but with an output vastly greater than Minas, and in São Paulo eighteen. In this state in 1903 there were 37,000,000 yards of cotton manufactured in calicoes, prints, etc., the largest mill, with 10,000 spindles and 600 hands, using up 2,000 tons of raw cotton.

In 1911, 6,598,411 kilos of raw cotton were produced locally, and 7,644,550 imported from North Brazil, to make up the amount necessary for the mills in this state.

In the vicinity of Rio city there are several very large mills, one at Petropolis (Cascatinha) employing about 1,500 persons all told. In 1910 the factories round Petropolis used 3,300 tons of cotton. In Rio State each alqueire yields 20 arrobas of cotton, worth 390 milreis, and 40 arrobas of seed, valued at 42 milreis; total per alqueire 432 milreis. Expenses, 100 milreis. The overseers of many of the Brazilian mills are English, or of English extraction. Without a question this is a flourishing business. Dividends are being paid of 20 to 30 per cent., and

even 40 per cent. at times, and it may safely be stated that every mill is making a substantial profit. Every state has its cotton fields.

Average price per 10 kilos of Ceará coton (1911), 15 milreis (£1), that from Pernambuco and Alagôas being worth 11 milreis. In Ceará the cost of land without a reservoir for irrigation is about 5 $000 per hectare. Each hectare should produce cotton to the value of 824 $000.

The Rio market alone handled 321,535 bales (of 80 kilos) of native cotton in 1912.

Subsidies are offered by the State of Minas for each 50,000 arrobas grown in a municipality, 5 to 15 contos for fine quality cotton grown from selected seed furnished free by the State, provided the best machinery is used and the area planted is not less than 400 hectares, producing a minimum of 12,000 arrobas. Also to the first cotton-seed oil factory producing a minimum of not less than 100,000 litres, a subsidy of from 5 to 15 contos will be paid.

These favours are especially designed for Co-operative Societies.

Naturally the bulk of the crop comes from the N.E. of Brazil, and São Paulo appears to be the southern limit of its profitable growth. This state produced 22,000 tons in 1910-11 and 50,000 may be picked in 1919.

The cost of producing a crop may be reckoned as follows:—

Preparation (clearing, ploughing, etc.): planting (10 litres of seed) and cleaning 255 $. Value (maximum) of land 45 $000. Total 300 $000.

Cost of picking 1,200 kilos, 120 $000.

Total expenses per hectare = at most 400 $000. Profits on first crop, at only 950 reis per kilo (1914

price), calculating 800 kilos per hectare, 385 $000. Second year, per hectare, 535 $. Present prices paid vary from 2 $250 to 2 $750 per kilogramme.

The total crop from N.E. Brazil may be 100,000 tons. 1918-1919, Minas, 25 to 30,000 tons, and with São Paulo figures already given, a grand total of 180,000 tons of cotton should be yielded this season.

Prejudices throughout Brazil through the Pink Boll worm, in 1918, are calculated at 110,000 contos of reis, more than half falling on the States of Ceará 40,000, Parahyba 23,000, and Pernambuco possibly as much. Salaries have mounted over 200 per cent. in this zone since 1914. Export duties, 10 to 12 per cent.

Exports in 1916 to 1918 have fallen off considerably owing to shortage of tonnage. In 1913, 37,428 tons left Brazil, and in 1917, only 5,941, but per unit prices rose from 928 reis to 2 $540 in 1918.

São Paulo has over 40 cotton mills with a capital of at least 4 millions sterling.

In all Brazil there are perhaps 240 spinning and weaving mills, employing 83,000 persons, and producing goods to the value of 14 millions annually at present.

There are 1,500,000 fuses, and as the average consumption is 60 kilos, the total amount of cotton used up in the country would be about 90,000 tons, leaving, perhaps, almost as much again available for export. In spite of this, at least 6 millions sterling is spent on imported thread and piece goods.

Tobacco

The cultivation of tobacco in Brazil dates certainly to pre-discovery of the country, for the first voyagers observed the Indians using the fragrant weed.

In 1500 the European conquerors commenced its planting, the first experience being in Bahia. In the latter part of the eighteenth century a large quantity was exported to the mother country (Portugal), and from thence until the year 1808 to Italy, Gremany, Holland and England. In 1845 seeds were introduced from Maryland, through the Government, in order to improve the local culture. Bahia is to-day the great centre of the trade, and a great deal is manufactured there by the firms of Dannemann, Stender and others. The best known factory in the south is that of Messrs. Poock, in Rio Grande do Sul, some really excellent cigars being now on the market. The city of São Felix, a short distance from São Salvador (Bahia), is the principal manufacturing centre. One thousand plants produce in this state some 300 lb. of tobacco. The cultivation requires much labour and care, and it is especially sensible to changes in the temperature or modifications of the seasons. Adopting the system employed in Sumatra, 150,000 square metres (equal 179,400 square yards) requires an outlay of some £1,580. The crop should be 10,000 kilos, worth £2,120. This is the result of one year's working, but of course is considering the plant to be cultivated and dried by really practical men. In Minas Geraes 4 months old plants yield leaves fit for use. November is the best month for planting in this state. The local Government offers premiums of 5 to 15 contos for lots of 10,000 to 30,000 kilos exported in roll or leaf respectively, if of fine quality.

The tobacco trade, like a good many more, suffers from the existence of parasites, and traders up to all kinds of sharp practices. It is very common to find in Bahia that the plant is adulterated with various

materials to add to its weight. In addition, many of the planters strip the leaves in a very careless manner, and send to market a product that is calculated to prejudice, not only their own interests, but those of the industry at large. Prices have been rising of late, owing to the improvements of the last few years in the growing and preparation of the leaf. In 1903 the municipality of Caravellas (south Bahia) instituted four annual premiums of £50, £37, £25 and £12 10s. (at current exchange) to the agriculturists who put in 50,000, 30,000, 20,000 and 10,000 plants of the first class. From 1901 to 1907 the exports of tobacco were 199,645,784 kilos, of snuff 106,281 kilos, of cigars 12,095,936 kilos, and of cigarettes 33,482 kilos.

The smallest planters in Bahia employ all the members of their families in the work, and hire their neighbours by granting them lots on condition of one day's service per week, others working on salary, but as a rule, no one being amenable to discipline, or caring for their labour, the cultivation is very desultory. Here, as in other classes of agricultural work, the need of hands is severely felt. The native Brazilian usually despises such toil, especially for another's benefit. One great evil is the horde of speculators who advance money on the crops; exorbitant interest is charged, and all too frequently the price paid is fixed at the pleasure of the usurer. Hardly any of the planters are able to deal directly with the exporting houses, and moreover are cheated abominably in the weight of the packages they hand over to the middlemen. The consumption of cigars and cigarettes in Brazil itself is very heavy, and the well-to-do still smoke those from Havana, Turkey, etc.

The expenses entailed in cultivating an alqueire of land in São Paulo is:—

Clearing and burning	40 $000
Weeding, etc.	35 $000
20,000 plants	100 $000
Planting	30 $000
Picking and transport	32 $000
Three cleanings	90 $000
Other expenses	85 $000
Curing the tobacco	25 $000
Total	437 $000

Or for 20 alqueires, 8,740 $000.

Yield of 20 alqueires, 30 tons of tobacco.

The tobacco-producing states are Bahia, Minas, São Paulo, Santa Catharina, Goyaz, Pernambuco, Piauhy, Sergipe, Ceará, etc., but it may be said that a little is grown in every state of the Union.

Exports from Pará were:—

1908	200,000 kilos worth	756,488 $
1909	220,747 ,, ,,	916,246 $
1910	260,999 ,, ,,	1,471,489 $

Nearly all of this was sent to Amazonas, and a little to Rio de Janeiro. Acará is a very fine quality grown locally.

Planting takes place between February and June, according to the lattitude. Crops being harvested in the autumn.

Factory production of cigars, etc., etc., 1915, 37,435 contos of reis. Crop 1917, 24,183 (in Bahia). Total exports from this state in 1908, 14,509 tons.

Ouro Preto, Minas Geraes.

Brazil's exports 1913 = 29,387 tons, £1,638,000.
Brazil's exports 1918 = 29,755 tons, £2,263,000.
Per unit prices 1914, 874 reis. 1918, 1,910 reis.
Total crop 1918-19, 50,000 tons.
Local consumption of manufactured tobacco = 99 per cent. of whole.

Tea

The first seeds were brought from Bourbon in 1810, and the premier (Linhares), began this cultivation with some hundreds of labourers engaged in Central China.

Large plantations were laid out on the Ilha do Governador, and, in 1837, a trial shipment was sent to London. In 1824, Frei Leandro cultivated the plant in the Botanical Gardens, and for some considerable time, Brazilian grown tea only, was drunk in Rio Janeiro. In 1834, 173 arrobas were produced in São Paulo. The principal plantations were at São Bernardo, between Santos and the capital. John Rudge, a settler, sent a consignment to Rio market, packed in Chinese canisters, and it was with some difficulty that the Customs were convinced that it was home grown. An award of merit was obtained at Vienna exhibition, but the industry languished until quite recently, when very good prices were obtained by samples from Pouso Alegre, in Minas Geraes. In 1861, it was shown at the National Exposition, these lots being from Paquequer, Valença, and Novo Friburgo in the State of Rio. Dr. Velloso grew an excellent quality on his estate at Thesoureiro, Ouro Preto. Here there were, until a few years ago, over 70,000 plants, and the owner obtained a first prize at the Centenary Exhibition in Rio in 1908. An Italian planter has now

in the same vicinity some 40,000 bushes, but only produces about 700 kilos of tea, which fetch 3 $500 the kilogramme. In Rio Botanical Gardens, there are, or were, over 150,000 plants, and the remains of a small plantation are to be seen at Petropolis, in which city it is common in the older gardens. July and August are the best months for transplanting here, and 6 crops may be picked yearly.

This culture is worthy of some attention, as the following figures will prove:—

In 1910, 250 grammes of Lipton's tea cost in Rio (retail) 3 $000.

In 1918, 6 to 7 milreis. Imports annually, Rio alone, 300 tons.

Cost of a plantation of 1 alqueire (24,200 square metres), which takes 11,000 seedlings:—

Seeds or plants, 96 $. Preparation of ground and planting, 735 $. Replanting, 114 $. Cleaning thrice yearly during 3 years, 720 $. Three prunings, 96 $. Picking 12 tons at 200 reis a kilo, 2,400 $. Wood for drying, 60 loads at 3 $, 180 $. Hand drying, 3,000 kilos, at 800 reis, 2,400 $. Spreading out, 1,200 $. Incidental expenses, 59 $. Total, 8 contos of reis, for 2,500 kilos of prepared tea. Profit on sale at 5 $000 the kilogramme, 4,500 $000 (£225,000), on first crop alone for a plantation of 6½ acres.

CHAPTER XIX

AGRICULTURE

Part II—Wheat and other Cereals

Wheat

Was first introduced into Brazil in 1584, when attempts were made to grow it near Rio itself.

In 1737, a colony from the Azores was established in Rio Grande do Sul, and had considerable success with this culture.

By 1816, the annual crop reached 388,000 tons, exports taking place to Lisbon. Rust set in this year, and harvests fell off, planting having almost entirely ceased in another decade. In spite of this discouragement, and the temporary abandonment of wheat growing, in 1857, premiums were offered by the Government to farmers who produced a certain quantity of wheat of their own growing. In the north, on the table-lands of Ceará and Parahyba, and in Minas Geraes, various attempts were made with more or less success, but with final result, nil. To-day the great English flour mills (the largest in the southern hemisphere) at Rio de Janeiro are supplied almost entirely with Argentine wheat. It is considered that, with more modern methods, such states as São Paulo, Minas, Goyaz, Paraná, etc., might produce immense quantities of this cereal, and experiments now being made are decidedly en-

couraging. The quantitiy *imported* 1902-7 was 1,244,460,259 kilos, valued at over £8,000,000. The best kind of wheat for Brazil is Indian, and it should be planted from March to May, and September to October. Rio Grande do Sul—The wheat crop from this state 1910-11 was 51,700 metric tons, from 53,323 hectares, and in 1912, 60,000 tons. This rose to 84,000 tons in 1916, and this year 1918-19, it is expected that 230,000 tons will be harvested.

Imports of this cereal for 1913 were 438,426 tons, and in 1917, only 181,955 tons, the total consumption of the Republic being reckoned at the extremely low average of 300,000 tons per annum.

The Minister of Agriculture has received details of experiences made in wheat culture (1908-9) in various localities, and in Novo Friburgo in the State of Rio de Janeiro (3,000 feet above sea level) the results have been very satisfactory. The States of Paraná, South Minas Geraes, and São Paulo, and Santa Catharina have all produced fair crops. Anywhere in Brazil, provided the elevation is sufficient, and other conditions equal, wheat should grow well, once a suitable variety is selected.

Experiments at Novo Friburgo and other places in the more elevated zones near Rio in 1915-17, produced very favourable results; as much as 80 kilogrammes of wheat to the hectolitre measure.

In Rio Grande do Sul some localities (Bagé, Rio, Negro, etc.) have a yield up to 300 fold, and in Minas Geraes 100 fold.

The importation of wheat from the United States had fallen to a value of some £10 in 1906, in spite of a preference customs tariff of 20 per cent. in return for the most favoured nation treatment which Brazil receives as regards her produce.

The world's production of cereal fell off 20 per cent. in 1916 as compared with 1915.

("*Revista del Mundo*," *N.Y., August*, 1917.)

Flour Milling, etc.).

The Legislature of the State of Rio de Janeiro has passed an act granting—to the first company establishing a flour mill—exemption from taxes on exporting wheat-flour *for ten years*, and a free concession of public lands for wheat cultivation.

Free entry of all machinery will be asked from the Federal Government.

A premium of 15 contos will also be paid for 5 years, if the mill has a capacity for over 11,000 bushels.

The Paraná Government has passed a law this year (1913) conceding to millers employing up-to-date machinery and local grain, exemption from taxes for ten years, for the mills, machinery and products.

The principal mills in Brazil are:—

Rio. Moinho Inglez grinds 13,000 sacks daily.

Rio. Moinho Fluminense grinds 3,000 to 4,000 sacks daily.

Rio. Santa Cruz grinds 1,500 to 2,000 sacks daily.

São Paulo. Matarazzo grinds 6.000 sacks daily.

São Paulo. Gambôa grinds 1,000 sacks daily.

Santos. Santista grinds 3,000 sacks daily.

Prices 1912 for imported flour, 22-24 $ per barrel.

Total imports of wheat and flour 1917. £6,337,000 (120,000 contos).

Rice

Brazilian farmers are not yet up-to-date in rice cultivation, and the recent arrival of Japanese coolies is presumed to be with the view to adopt more

intense methods. As with coffee, the forests are destroyed and burnt. No selection is made of the seed, and it is either dropped into holes, made with a pointed stick, or scattered by hand, and stamped in with the feet. In the north, planting is carried on between January and April, and preferably after a shower. Usually the rice is left to take its own course after planting. That sown in September generally produces two harvests, the grain of the first being cut away at the top of the stalk. At Iguapé (São Paulo) the cost of planting 2½ acres of land is as follows: Clearing, burning, and planting 50 quarts (litres) of rice, 55 milreis; cost of seed, 5 milreis; harvesting, 50 milreis; transport to farm-house, 8 milreis; thrashing and winnowing, 12 milreis; a total of 130 $000, equal to £8 2s. 6d., at fixed exchange of 1s. 3d. The harvest amounts to 2,000 litres, costing 3s. 2d. per 40 litres, thus 65 reis, or about 1d. a litre. Each 100 kilogrammes of rice, in husk, produces 60 kilos of grain and 30 kilos of bran, when treated by a proper cleaning machine, of which there are thirty in the State of Rio de Janeiro alone. Excluding wild rice, found along the rivers of the north, there are some fifteen kinds known in Brazil, one of which is native, and is responsible, with crossing, for other varieties. The most common is a Carolina type, and the place mentioned above (Igaupé) gives its name to a kind grown principally in that district. Importation has fallen off considerably. In 1902 over 100 million kilos reached Rio, mostly from Burmah (50 to 60 days by steamer). In 1907 only 11½ million kilos arrived, and it is safe to say that the next decade will see the entire disappearance of this importation. The State of Rio Janeiro has become one of the most

important productive zones, increasing its output tremendously under the Presidency of Dr. Nilo Peçanha. Being a staple diet, the home consumption is very great. Hardly a Brazilian family that does not have rice served up at least once a day. This grain is grown everywhere, but the most productive states are Santa Catharina, Paraná, São Paulo, Minas Geraes, and Rio de Janeiro.

In Rio Grande do Sul (Cachoeira district) 67 plantations yielded 400,000 sacks in 1911. Yield 30-40 fold. 1916-17 crop for this state 100,000 tons, Minas Geraes is now beginning to show up, and São Paulo, which, in 1910, grew only 11,500 tons, now has a crop exceeding 120,000. Each hectare in this state yields $55\frac{1}{2}$ hectolitres of grain in the husk, at a cost of 2 $548 per unit.

At S. Gabriel (Rio Grande do Sul) 240 hectares yielded (1909) 765 tons of rice.

The enemies of rice are numerous, and one of them is the little tico-tico, which answers to our sparrow. When planted near rivers, the capivary is an extremely destructive beast.

Near Pelotas (Rio Grande do Sul) careful statistics have been compiled with reference to rice culture. The production of 194 hectares exceeded 16,000 sacks of 50 kilos, and the total expenses, including interest on the capital employed, amounted to 300$ per hectare, and the product in money 560$, at 7$ a sack.

Another estate covers an area of 600 hectares, consuming 1,200 sacks of seed, the total yield amounting to 210,000 sacks. The proprietors of this estate are obliged to use imported coal, as their furnaces are not adapted for burning waste.

Total importation of rice (1912) 80,867 sacks.

compared with 97,635 sacks in 1911. In 1916 only 2,248.

Average price in Rio per sack of 62 kilos, 31$ to 38$ for foreign grain (1913).

In 1915. 42$ to 56$000.

Planting. January to April.

Harvest. October-December in Rio and S. Paulo.

Present average yield for all Brazil. 30 quintals per hectare.

Exports.	1916.	1,124 tons	= £24,000
	1918.	27,916 ,,	= £986,000

Oats and Barley, etc.

The remarks, with regard to wheat, may be applied with some reservations as regards climate, to the above-mentioned cereals, which have every prospect of success in such localities as the central plateaux, extending from Amazonas to Matto Grosso. Very few attempts have been made as yet to cultivate these grains, but results have proved satisfactory wherever experiments have been made under reasonable conditions.

Yield in Paraná

Oats	65 fold.
Barley	50 ,,
Rye	68 ,,

A fair amount of rye is consumed in Brazilian cities in the form of bread.

Maize

This grain was found growing in Brazil by the first navigators, and was known by the name of abati, or avati.

The savages had also discovered its utility in the manufacture of fermented beverages, as well as a food.

The whole of the work of clearing, planting and harvesting was, naturally, done by the women of the tribe, who also prepared the different forms of alcoholic beverages and the meal.

It is the practice of planting this grain everywhere that is responsible for the production of so many varieties, usually, of course, the result being the survival of the unfit. The kind which is most generally known, however, is the common yellow maize, popular not only by reason of its abundant production, but also for its resistance to the disease called *calandra-granaria*.

No less than nineteen other kinds are found growing in the different zones, and no proper classification has yet been made, nor any determination of which species is best adapted to this or that climate, beyond the commonly known fact that white maize resists the drought better than any other kind. There is no scientific treatment of the subject of this culture as yet, and the result is, that the yield is entirely out of proportion to the fertility of the soil, and favourableness of the climate. The localities principally favoured by Brazilian farmers are those with a western aspect, avoiding the south and south-east. With the exception of cold clays, or sandy ground, the plant is suitable to most soils, especially admixtures of sand and clay, and the red earths derived from diabase (Devonian type). Sloping lands are deprived of their woods, and burnt after the timber is dry (July to September). Furrows are made with hoes, some 4 feet apart, and five or six grains are planted together. This

work is done either from March to May, or August to October. As soon as the maize attains about 4 feet in height, the earth is worked up round it with the hoe. Sometimes this is done twice, at 3 and 4 feet high. Between the lines of maize it is customary to plant beans, pumpkins, melons, etc. Harvest takes place some 3 or 4 months after planting, and the cobs are taken one at a time, and carried in baskets to be spread out and dried. It is rare to find a planter who takes the trouble to manure the land in any way; they prefer to destroy the forests, and plant fresh fields. The cost of planting and harvesting an alqueire of land is reckoned as follows, in virgin forest zones:—

Clearing and preparing land . . .	180$000	
40 litres of seed . . .	4$000	
Planting and hoeing .	119$000	
Harvesting . . .	48$000	
	351$000	= £21 18 9
In second growth lands	£16 11 3	
Using modern agricultural implements	8 15 0	
		= $8\frac{6}{10}$ acres.

An alqueire is so-called, because it is just the area of land required to plant 40 litres of seed, and according to the metrical system, it equals in São Paulo and Paraná 2 hectares and 42 ares, or $4\frac{6}{10}$ acres. In Rio, Minas, and Espirito Santo, 4 hectares, 84 ares, or $8\frac{6}{10}$ acres. In Bahia the measure is tarefa—$2\frac{1}{2}$ tarefas equal 1 hectare, and further north the quadra-alqueire, or 100 braças square, is the land measure. Maize suffers from

rust, and from various roedors, as the agouti and cavy, and also from the armadillo (tatú), and above everything else, from the all-devouring locust, and a variety of other enemies.

Maize, never exported before 1916, has become a staple crop.

Cost of production in the state of S. Paulo.

Clearing the ground (per alqueire of 24,200 metres), 110$000. Planting, 6$. Weeding, 40$. Harvesting and transport, 60$. Cost of seed corn, 4$. Total, 220$000, or taking favourable circumstances into consideration, perhaps an average of 200$000. Yield, 6,000 litres, or 30 reis per litre cost. The average cost in Brazil generally is about 45 reis. Sale prices in 1912, 78 reis; in 1918, 137 reis. S. Paulo crop (1918), 720,000 tons, from 451,963 hectares. Rio Grande do Sul has 600.000 hectares planted, and harvested nearly 1,500,000 tons of maize, Minas, with 761,259 hectares, producing much less proportionally. Greatest yield per capita, in Paraná, least in the Federal District. Total 1918 crop, 5,500,000 tons, worth, at 100 reis the kilogramme, 518,000 contos of reis, or nearly £26,000,000.

In less than a decade Brazil has reached second place in the world as a maize producer, and planting is going on in all directions. Exhibitions have been held in Bello Horizonte, Curityba, and in 1918 in Rio Janeiro itself.

Exports in 1916 (first year), 4,933 tons = 45,000. In 1918, 14,175 tons = 195,000.*

* See "Estimativa da Producção do Milho no Brasil, 1916-17." Rio Typ da Estatistica, Ministry of Agriculture, 1918. 87 pp., large 8vo.

Beans

These legumes form, with rice and dry salted beef, the staple food of the majority of the lower classes in Brazil. The greater part cultivated are of a black colour (*Phaseolus niger, nanus,* etc.).

In a plantation made in September, using 42 litres of seed per hectare, in land previously manured, the result was 1,249 litres of beans. Many kinds of red and yellow beans are grown in addition to the above, and they are subject to the same attacks of rust as the other plants mentioned hitherto.

The bean being a very gross feeder, it is necessary to enrich the soil before planting, except in rare cases, with the first crop. The harvest is over in 4 or 5 months after planting, at which time three seeds are placed in a small hole, at a distance of an inch apart. Very frequently beans are planted together with maize, permitting the former to utilize the stalk of its sturdier neighbour for climbing purposes.

In addition to beans, peas (of a variety whose pod is eaten) and lentils are planted, but on a very small scale, and obtaining high prices in the market. As with maize, beans are grown more in the central and southern states.

Heavy taxes and freight rates weigh on this product, a sack costing in Porto Alegre 11$000, paying 5$940 in excess before it is delivered in Rio Janeiro, and from the interior of the first-named state to its seaport (Rio Grande) as much as 6$550 may be added, according to the distance, the original price being as low as 4$450. Exports in 1913 were seven tons, and in 1918, 70,914 tons, worth £1.689,000.

In 1917 S. Paulo harvested more than 3¼ million

sacks of 60 litres, Rio Grande do Sul 81,5000 tons, Minas Geraes 30,000, etc., etc.

Prices offered to producers in Minas Geraes were then 20 to 28 milreis the sack, the retailer in Rio paying 36 to 42 milreis.

Machinery has been set up in Rio for the immunization of all kinds of cereals at a cost of only 600 reis the sack, or 10$000 the metric ton.

Cost of production, etc. (2,000 litres), 92$000. Sale price, 140$000.

Mandioca. This root was utilized by the Indians before the discovery of Brazil, and they were fully aware of the necessity of removing its poisonous principle before preparing the meal.

It may be fitly termed a veritable underground storehouse of food. The dish of beans, rice and fat pork (toucinho) is always thickened by a handful of the coarse meal, and it takes the place of bread in many places. Found as far as 30° South, it is peculiarly a tropical and semi-tropical plant. There are three principal varieties, two of which are somewhat bitter, and the third sweet. There are, however, many minor sorts (twenty or thirty). The most prized (called aypim) has a root which weighs about 2 lb., and is used for a variety of purposes, making many delicious preserves. The bitter sort (brava or venomous) is used only to manufacture flour. This kind sometimes weighs 15 to 20 lb., and is full grown in 8 to 10 months. Before this root is fit for consumption, it must be pressed well and washed, and the water and residue must be thrown away out of the reach of animals, as it is distinctly poisonous. The largest roots contain 2 gallons of prepared meal. Some kinds contain 23 per cent. of starch. It is planted usually in August

or September, in any part of the country, from the coast up to 3,000 feet above the sea level. The plant, crushed and well washed, is pressed into a dry mealy mass, and roasted on hot plates, being continually turned until done. A good hand can prepare two or more sacks per day.

Each hectare should give from 70 to 100 tons of roots, yielding 300-400 hectolitres of meal, and 60-130 hectolitres of tapioca. The principal seat of the manufacture of the latter is Santa Catharina. This plant cannot stand frosts.

The finest qualities are worth from 12s. 6d. to 15s. a sack, and the coarser up to 7s. 6d. One disadvantage is, that the roasting must be done the same day as the plant is washed and crushed, otherwise it will turn sour. The water which has escaped from the mass in pressing contains a large quantity of very fine starch, and the deposit is washed several times and strained off. Tapioca is a product of the residue.

In Belgium the roots are used in the production of alcohol, in Holland as stock feed, and in England for making starch and dextrin. Desiccated mandioca is worth £12 per ton in Hamburg, and tapioca £22 10s. 625 kilos of roots produce 100 kilos of dried meal. Tapioca (when genuine) is a product of the root. Pure tapioca does not affect the taste of milk or soup, but imitations prepared from potato starch give a disagreeable flavour to any food.

The Minas Geraes Government offers premiums for co-operative factories manufacturing starch from rice and mandioca.

One hectare planted with this tuber will yield 160 to 250 hectolitres of meal, or 200 to 300 sacks. Each hectare will contain 10,000 plants a metre

apart, which, at an average of 4 kilos the root, should produce a harvest of 40 tons. Reckoning 10 tons net of meal, sold at 8$000 the sack of 80 litres, the result is 1,836$000. If, however, the mandioca is employed in the manufacture of starch, the net output will reach 250 to 288 sacks, which, at only 400 reis the kilo, would work out at 5,760$000. Total cost should not exceed 1,500$000, and presuming the price as low as 3 contos, profits are still handsome.

Planting takes place from August to October, and the crop may sometimes be realized in 8 months, but the tuber is better left to mature 2 years.

One hectare of mandioca is equal in nutritive value to 6 of wheat.

If 10 to 15 tons of manure are applied to the hectare, 48 tons of tubers may be raised. Analysis of meal: Water, 9·69 per cent.; fatty matter, 0·25 per cent.; azotes, 1·19 per cent.; starch and dextrin, 85·98 per cent.; fibre, 1·87 epr cent.; mineral matter, 1·02 per cent.

Exports to Europe in 1917: 18,498 tons, worth £278,000. In 1918: 65,322 tons = £1,516.000.

Arrowroot (*Araruta*)

This plant is native to Brazil, and gets its name from the fact that the Indians used it to cure the wounds made by poisoned arrows. To grow to the best advantage the root demands a porous, well-drained, alluvial soil. Planting is done by means of small slips, and as soon as the new growth makes its appearance, it is earthed up in a similar way to celery. Planted in March, it comes to maturity in from 8 to 11 months. The smallest fragments of root will soon strike, and throw out leaves. The root must be well washed to get rid of its impuri-

ties; it is then crushed or ground, and mixed with plenty of clean water, and passed through a bolting-cloth, or sieve, to separate the fibrous parts from the powder. The latter is dried in the sun, on perforated tables, and is ready for packing in 4 days. The price, locally, ranges from 6d. to 1s. a lb. The production is not nearly sufficient for home consumption. The State which is best adapted to the cultivation of arrowroot is perhaps Rio Grande do Norte, where each hectare gives an average of 900 kilos of flour. Like mandioca, this plant is very susceptible to cold weather.

Potatoes

The sweet potato is the most common in Brazil, the English potato, as it is called, being largely imported. Such as are grown in Brazil at present usually represent the kind which is given to pigs in Ireland. The anomaly is seen in the maritime cities of the Republic of large consignments of the tuber from England, and latterly from New Zealand, although those grown in Bolivia and Peru, at an altitude of 9,000 to 12,000 feet, are considered far superior to ours. In spite of the fact that the high lands, within a few hours of Rio de Janeiro, are admirably adapted to the cultivation of the English, or, as a correspondent corrected me, the Irish kind, and that two crops may be gathered annually, the cultivation is very small, and no pains are taken to select the right sort of soil. Planted in March, the tubers are fit to be pulled up in June; and sown again in August, the harvest is ready in November.

With manuring by means of sulphate of potassium, superphosphates and nitrates, a grower at Barra Mansa (Rio de Janeiro) obtained from 1

hectare 4 tons of potatoes. In Rio Grande do Sul, at Pelotas, 13¼ tons were obtained.

Close to Pedro Leopoldo (Central Railway) in Minas Geraes some land was ploughed 20 centimetres deep, then rolled, but not harrowed, and the seed potatoes put in 15 centimetres down and the ground rolled level again. Without a single shower of rain the plants did so well that the produce fetched 5$000 an arroba at the same time the market price was 3$000.

Another grower in Minas Geraes made a profit of 600$000, or £50 clear, per hectare (2½ acres).

The yield of the sweet potato is, however, vastly superior, being twenty times the amount sowed. The latter thrives in a different location, preferring the lowlands and depressions between the hills. Some of the kinds are ripe in 3 or 4 months, and they frequently take a disagreeable taste if grown in manured lands.

The red variety is most esteemed, and is the most suitable for the table, the white serving better for animals. To fatten pigs, the country custom is to let them loose in a sweet potato patch, thus saving the trouble of digging the land, and at the same time enriching it. The sweet potato is considered more nutritive than the European, as it contains more sugar.

Imports of potatoes in 1910: 28,909 tons. 1916, 3,863 tons.

Exports (1914), three tons. 1918, 5,209 = £46,000.

A sack of 60 kilos, which is worth in the vicinity of Porto Alegre only 7$200, costs by the time it is put on sale at Rio almost double this amount.

Mangarito (*Caledium sagittofolium*). A plant of the family of araceas, little grown, but more nutri-

tive, and easier to prepare, and pleasanter to the palate than any of the other tubers.

Chuchú (*Escunia flexuosa*). A creeping plant. Produces large crops of succulent vegetables of the form, but somewhat larger, and more flattened than a pear. Has a rough exterior. Colour, light green.

Cará. This tuber is hardly known outside Brazil, and is very little eaten in the large cities, although an excellent vegetable. Several kinds have been imported from Africa and the West Indies.

The native species are few but good, and the following are worthy of attention:—

Cará mimoso or doce (*Discorea brasiliensis*, Wills). The tuber varies in size from 1½ kilos to a man's head. The flesh is orange yellow when raw, but loses its colour when cooked, and resembles the sweet potato in flavour. Grows well in any sort of ground. Planted in September and gathered in June. Will keep several months.

Cará sapateiro (*Disc bulbifera*, Linn). Is a climbing plant, and produces fruit on the stalk and tubers underground, the former weighing from 150 to 200 grammes, and the latter several kilos. Needs good, dry earth. Is usually planted in an orchard and allowed to creep up the trees.

Six or seven other varieties are grown.

Yam (Inhame).

The Brazilian valleys are covered with this plant, which is considered as a *dernier ressort*, when all other cultures fail. At ordinary times it serves the same purpose as the commoner kinds of sweet potato. In virgin and fertile soil it develops fully in 6 to 12 months, the roots weighing 15 to 22 lb. Boiled, it is an excellent food for pigs, fattening them extraordinarily.

CHAPTER XX

TROPICAL AND OTHER FRUITS

Brazil possesses climates suitable for the cultivation of every possible kind of fruit.

In what corresponds to the European winter in the southern states, all of the varieties common in northern climes flourish and yield abundantly. Amongst the best known of the varieties belonging to the tropical and sub-tropical zones is the

Abacati

Grows as far south as Rio Grande do Sul. The part eaten is the inner pulp, surrounding the central mass of seeds. The fruit varies from the size of a pear to that of a very small melon. In Mexico a delicious salad is prepared from this pulp. Eaten alone, it requires sugar or lemon juice or both, as it has no acid or sub-acid flavour. It is planted by seed, hardly buried in the earth, but success has been obtained by experiments with shoots and seedlings. Fruiting only in the fourth or fifth year, it becomes ripe after January. No diseases are known, and it is a very profitable growth, being worth from 6d. up to 1s. 6d. each in the European markets.

Abacaxi or Ananá (Pineapple)

The first-named variety being the finest. Planted by shoots after September in the south, and from March to May in the north. It comes into flower in the spring (August to September) and ripens by January. Sometimes fine fruits are sold in Rio de Janeiro as low as 1½d. each (retail). Pernambuco is a great seat of the trade, mounds being piled up in the covered market, and at a hundred stores. The price asked to passengers in transit is usually 4d. to 8d., according to size. In 1907, 270,572 kilos were exported, of a value of about £5,000.

On an alqueire of land (220 metres square) 80,000 pineapple plants may be cultivated, which at 40 reis each will bring in £200. The cost of cultivation may be calculated at not more than £40.

Abieiro (*Lucenna Caimito*)

A plant only found in the more tropical states, and never below Santos. The fruit is oval, of a clear yellow, and has two to four seeds; only recently placed on the market at Rio de Janeiro.

Apricot (Pará)

The tree grows to 30 feet high and over, and bears a spherical fruit the size of a large orange. It has one large seed only. Eaten raw or used in all kinds of tarts, etc. It has been reproduced hitherto by seed only, but it is considered that slips or cuttings would produce a fruit of much better quality.

Araça

Araça, a plant belonging to the myrtaceas, the fruit of which is used principally for making a kind of preserve.

Bacuri (*Platonia insignis*)

Fruit found in a wild state in Amazonas. Usually sold preserved in syrup. Aromatic and sweet.

Bread-fruit

This tree is from 20 to 35 feet in height, and demands moist heat for its most perfect development. The colour of the leaves and fruit is of a light green, and the latter is usually of the size of a large orange. The part eaten is the central pulp, either roasted or boiled. Brazil possesses varieties entirely without seeds. The tree is only found along the coast-line, being entirely unknown in the higher lands of the interior. It flowers and bears fruit nearly the whole year round.

Cactus Fruit

Many kinds of cacti produce agreeable fruit in the warmer parts of the country. One of the best known is the Barbary fig, introduced from Mexico. It is more procured, however, for the purpose of cochineal, than for anything else, the fruit being insipid and somewhat acid. Another, the *Cereus triangularis*, bears a fruit equal in size to an orange. There is no exportation of these products, and they are little considered locally.

Caju (*Cashew*)

There are several kinds of this tree, of the family terebinthaceas, and all are indigenous to Brazil from north to south. It is found everywhere, high on the table lands, or down in the forests or near the seashore. In the Brazilian cities the fruit is used to make a very refreshing drink (cajuada), or pre-

pared as a preserve, similar in form to ginger. It is exceedingly agreeable in this latter manner, but the packing, leaves much to be desired. The syrup makes a delicious wine, and the curiously formed nut (outside the fruit) is the portion which is well known in Europe. Curiously enough, this plant disdains fertile and rich soil, prospering in an arid waste. The fruits are ripe in November. One type of tree (found only in the woods) attains 50 feet, but the fruit is very small.

Cambucá (*Eugenia edulis*)

Fruit, size of large plum. Grows on trunk o tree in tropical regions only.

Carossol (Sour Sop)

Brought originally from the West Indies. Th fruit is equal in size to the citron. It is not esteeme much.

Cherimolia (*Anona cherimolia*)

Derived from Peru, the plant is relatively sma (up to 7 metres high). The fruit, equal to a orange in size, is scaly outside, and formed of number of sections. The colour when ripe is of dirty yellow. Sweet to the taste, it has a very agree able perfume, and is considered the finest fruit o the anonaceas. It is known in Brazil by the nam of condessa (countess), to distinguish it from th conde (count).

Dates

Grown perfectly in Rio; a good crop having bee obtained on Governador Island (1915).

Fructa de Conde (*Anona scamosa*)

The fruit is about the size of an apple, with a very rough scaly exterior. The interior is composed of a delicious soft mass, eaten with a spoon. The plant is reproduced from seeds, slips, etc., and requires a dry fertile soil. Like the bread-fruit tree, it is only found in warm places. It is very much esteemed in Brazil.

The seeds should be planted 10 centimetres apart, hardly covered by the earth. September is the best month, and they may be transplanted in February if watered during the dry months: if not they must be left until a year old. When replanted, they should be put in 3 metres apart in holes 18 inches deep, half filled with manure. They commence to bear fruit at the end of the third year.

Guabiroba (*Abbevilea guaviroba berg*)

The size of a small fig, golden yellow to brown. Common on the campos of Minas Geraes. Not cultivated as a rule.

Guava (*Goiabeira*)

Previously exclusive to tropical Brazil, it has spread all over the country, and is one of the plants most commercially exploited. In the vicinity of Campos (State of Rio de Janeiro) it grows in profusion in the woods, and at least 20 per cent. of the preserves manufactured in Brazil are derived from this fruit. The locality named produces some 120 tons of this fruit. The average price, 1905-6, was 1l. per 32 lb. There are two crops yearly, January to March, and September to November. The preserve (named goibada) is frequently badly made,

but 1 or 2 marks are excellently turned out. In 1905 4,517 packages were sent from Campos district to Rio de Janeiro. Each packet represents 4·110 days' wages, and the total cost per package placed on the market works out at £5. Each tin (about a pound) is sold from 1s. 4d. upwards. Attempts at exportation to Montevideo and Buenos Aires have not proved renumerative up to the present, in spite of the freights being less to the River Plate from Rio de Janeiro (1,200 miles) than from Campos to Rio, a distance of not more than one-seventh part at most.

Jaboticabeira (*Eugenia cauliflora*)

The handsome tree which produces the jaboticaba grows abundantly in the forests of Minas, Goyaz São Paulo and Matto Grosso, and is frequently found near the coast. The trunk is extremely smooth, and reaches a height of 30 to 40 feet at times, with an abundance of foliage. The flowers grow, not on the branches, but on the trunk itself, from the ground to the top of the tree. The fruit is about the size of a plum, but rounded, and contains delicious white pulp and one large seed. The skin contains a large amount of tannin, and much colouring matter. This fruit makes a fine wine, and may be eaten as a dessert, or used as a preserve. The tree takes 6 to 8 years to come to maturity sufficient to produce crops, but has an exceedingly long life, and continues to bear till an advanced age. No attempts at improvement of the stock has been made, although it is considered that the fruit would be greatly increased by propagation through slips or grafting. Exportation of this fruit is very difficult, owing to the softness of the interior rendering it liable to smash.

In Paraná jaboticabas bear fruit in the fifth year. In the Paranápanema valley forests of this tree may be found, bearing twice a year.

Jaca (Jack Fruit)

Grows in most tropical and sub-tropical states.

Jambeiro (*Eugenia jambas*)

This myrtacea is found on the sea level, and high up on the table-lands, and bears fruit at almost any altitude. The tree is small, hardly ever exceeding 20 feet. The flowers are beautiful, and are succeeded by fine fruit, the size of a plum, and of a rose colour. The perfume emitted by this plant is very sweet, reminding one of the queen of flowers itself, and thus it obtained its name of jamba-rosa. It is produced from seed, and the kernel is loose. The above is the most highly-prized variety of the jambas, but there are several others grown, some of which are more ornamental than useful.

Kaki (*Diospyros kaki L.*)

Each tree yields 400-600 fruits. Size of a large tomato, but more orange in colour.

Litchi

Does well here.

Mamoeiro (*Mamona*) (*Caricaceas mart*)

The mamoeiro is a plant of 10 to 40 feet in height, with a straight trunk. The fruit is large, oval, somewhat pointed, and of a dark yellow colour when ripe. It is much esteemed in Rio de Janeiro. In Pará it attains 4 kilos in weight.

The dried fruit contains 75 per cent. of glucose,

6¾ per cent. of cellulose, besides oxalic acid. The tree bears fruit in less than a year, of a size varying from 1 to 6 or 7 lb., and examples have been shown weighing as much as 16 lb. Frosts are entirely prejudicial to its growth. An hectare of land will support 2,000 plants, and the result according to "O. Fazendeiro" of São Paulo, on the most pessimistic basis should be:—

	Cost
Manure, 30 tons	0,300 $000
Plants, 1,600 at 50 reis . . .	0,100 $000
Labour	0,960 $000
Extras	0,140 $000
First year	1,500 $000
Second, third and fourth years	3,000 $000
In 5 years	4,500 $000
Revenue, 1,600 plants, average 50 reis each	9,600 $000
Profits per hectare	5,100 $000 = £332

It does best in the north, but in sheltered places as far south as Paraná will yield fruit in the third year.

The flowers of the male plant may be employed in medicine as a specific against bronchitis, etc. The fruit is a gentle laxative, and is very well adapted for preserving, the leaves can be used in the place of soap, and the toughest meat wrapped in them becomes quite tender when cooked. The mamona is an aid to digestion, and a plantation of this tree serves to keep away noxious insects. The useful life of the tree does not exceed 4 years as a rule.

The crude oil is used in Brazil for soap manufacture.

Mango

Grows luxuriantly in all the hotter parts of Brazil, especially in Bahia, Pernambuco, and all northern states.

One tree at Realengo, near Rio, brought its owner 2,800 $000 in a single season.

Melon

Large crops are grown round Rio, the first (at Christmas) fetching as much as £1 the piece.

The Orange, Lime and Lemon

The bitter orange is common in many parts of Brazil, and from it is supposed to be derived all the other varieties. Grafted, it produces the finest kinds of the sweet orange. The fruit of the first has a loose rind, and it is somewhat flattened at top and bottom. The outside rind is frequently of a much darker colour than that of its sweet relative. The leaves are used as an infusion for various purposes, and frequently takes the place of tea. The rind is used for making preserves. The citrus aurantium is the better known, and the king of them all is the kind grown in Bahia, and called navel oranges in England. These grow up to 6 inches in diameter. This is the famous orange that has rendered the California groves noteworthy, although in its Pacific domicile the fruit has deteriorated. The first plants were sent to S. Francisco in 1873. Two survived only. As much as 5 dollars was given for the first cuttings. The Brazilian plants were grafted on native stock. In 1909 the exportation of oranges of

the above type was half a million, worth £2,000, a mere bagatelle when one considers the possibilities of this trade, and the annual consumption of England alone, amounting in 1904 to £2,500,000 for oranges and lemons. The mandarin or tangerine orange, brought from China, is much grown in Brazil, but the fruit is almost twice the size of that seen in the London market. A smaller one has a very delicate flavour. In 1907, 63⅓ tons were exported, worth £1,150.

In Paraná the tree produces in three years.

The lime is grown in most of the states, and in favourable situations attains a large size. I have eaten some that were as large as navel oranges, and were most delicious.

The Brazilian lemon is usually quite small, but very juicy when in perfection. Its rind is thick and of a beautiful dark green colour when it is usually plucked for the market. There are two other kinds of lemons besides the citrus of commerce, one growing in a state of nature in the woods. The other is called a sweet lemon and is obtained by grafting. Neither oranges, limes nor lemons are at all cheap in the more populous cities, if one considers the abundance produced. Like the quince in the Republic of Uruguay, the fruit is often left on the trees to spoil.

Cidreira (*Citrus medica*), the largest of the citrus family, the tree being small, and its branches borne down to the ground by the weight of the great fruit, some of which are a foot or more long. It is cultivated largely for the purpose of making preserves, and requires a fertile soil, and is reproduced from either slips, seeds, or by grafting. In spite of its not being native to Brazil it is perfectly acclimatized, being found in all parts of the country, and in all

orts of climate, doing equally well to all appearance verywhere it is grown.

Musæ (Bananas)

Grow from Amazonas to Santa Catharina, but ubject to cold and does not produce well below 'araná. There are many kinds cultivated, and we ıay enumerate the following:—Pacova (in Pará), very large kind, usually eaten fried or boiled. 'he outside is red. *Musa cavendishii* (anã) has a hort trunk, dark leaves, and produces huge bunches f fruit of a long, curved and cylindrical form, light ellow coloured. *Musa sapientum*—trees high and ounded fruit. Exportation of bananas in 1907, 878,904 bunches, worth £6,000. Each bunch eighs on an average 45 lb., and the heaviest attain 25 lb., or up to 300 bananas. Freights from the antations in São Paulo (near Santos) to Buenos ires (Argentina) total about 12s. 6d. per dozen ınches. In Santos there are 200 planters who only ltivate one class (the anã), most of them occupy- g the lands without any right of ownership, as ey are State property, and have never been con- lered worth selling.

In Cubatão (near Santos) one planter has 500 queires under bananas, and the whole of the district devoted to this culture. The whole of the banana ffic is limited to the coast-line from Rio de Janeiro uthwards. Pará and Pernambuco are so well uated, however, with regard to exportation to rope, that doubtless when their port works are mpleted, they will prove the shipping centres of immense trade. The best variety in Brazil is own as the Banana de São Thomé. This tree es from 1 to 2 years to come to maturity.

A plantation of 500 trees, properly treated, yields ten dozen bunches a month, and a grove of the second year only will produce fifteen dozen bunches per 1,000 trees. Some plantations more than 30 years old are still producing, the only attention given being the clearance of extraneous matter from the vicinity of the plants, and the bunches average seventy bananas, even after such extension of time. There are reckoned to be 2,000,000 trees within the district above mentioned. Labourers employed in cutting the bunches (still green) are paid at the rate of 4s. 6d. to 5s. daily.

Planting should be done in the spring, each shoot being put in 12 to 16 feet apart. The best situation is a low humid one, with a moist soil.

Exports are trifling at present except to the River Plate.

In 1914, fruit to a total value of 2,724 contos left Brazilian ports.

In 1916, 14 bunches or pencas which sold for 2$ to 3$500, fetched over double this rate in Buenos Aires.

Exports 1916, 2,980,271 bunches. Value £136,150

One hectare of bananas will feed 50 persons. It will contain 2,000 plants. The crop may be harvested in 12 to 18 months.

Analysis

Water, 72·45 per cent. Sugar, 15·90 per cent. Other saccharine matter, 5·90 per cent. Cellulose, 0·38 per cent. Azotes, 2·14 per cent. Pectine, 1·25 per cent. Fatty matter and Malic acid, 0·96 per cent. Mineral, *idem*, 1·02 per cent.

The State of São Paulo will pay subventions amounting to 200 contos in all, to persons engaged in exporting bananas and other fruit.

The subsidy is to be allowed as follows:—

For each bunch of bananas (1) sent abroad in vessels not freighted especially for this purpose, 100 reis. (2) If specially chartered, 150 reis.

For each 10 kilos of other fruit (1), 100 reis; for each 10 kilos of other fruit (2), 150 reis.

In the event of steamers being especially built for the above purpose, and possessing all the necessary installations, a premium of 10 contos of reis per monthly return trip.

Co-operative societies or other concerns claiming these bounties must have signed the necessary contracts with the Agricultural Dept.

Other Tropical and Sub-tropical Fruits

Mangostão. Better suited to the West Indies than Brazil. It is stated that Pará is the only part of the country where this delicious fruit can be grown to perfection.

Maracujá (Passion Fruit). Principally used for the manufacture of preserves, and also for concocting refreshing drinks. Sometimes weighs 3 kilos.

Pitanga. A myrtacea, purple or yellow-red fruit. Common enough. Grows wild in the sandy wastes at the entrance to Rio harbour, close to Ipanema. Contains oxalic acid. Excellent for jam or jelly manufacture, distinctly acidulated in flavour.

Sapoti (*Achras sapota*). The fruit is earthy coloured, oviform, sweet tasted, and the crop is abundant, and bears transport more readily than other kinds not so agreeable in flavour.

Laranjeira (*Citrus decumana*). Used for the manufacture of preserves. Of less importance than it deserves, and has had no attention paid to it.

The above represent a few of the numerous fruits,

which have so many forms, colours and tastes. Most of the purely Brazilian ones, it is safe to say, are entirely unknown in England, and it is very difficult to persuade a farmer to make any attempt to grow on a large scale, much less get him to run the risk of sending a consignment to Europe at his own cost. His system of business is exceedingly simple, i.e., to sell on the spot for cash and chance losing half the profit. Again, apart from such staples as oranges, guavas, bananas and pineapples, there are hardly any merchants or exporters who trouble themselves about fruit. If they do, it is to supply the markets of Montevideo, Buenos Aires, Rosario, and perhaps Chili.

A good opportunity exists in this direction for smart firms to dedicate themselves to exporting to the European and North American markets.

Plums. Abundance (Douglas Babcock), burbank, and yellow Japanese plums.

Damson. Like the oriental plum, this fruit does well in Minas, São Paulo, Paraná, etc.

Persimmon (Japanese). Does very well indeed, especially below 28° S. The varieties grown are: *Goshi kaki*, hachuja and kourod-kouma.

Mulberry. Acclimatized perfectly, withstanding both heat and cold. Not cultivated for the fruit, but for feeding silkworms.

Cherry (bigarreau, etc.). Experimented with recently, in the southern states.

Fig. Universal and highly successful.

At Correias, near Petropolis, there is a fig tree which will give shade at noon to 4,000 persons. It covers an area of 480 feet.

Gooseberry. Southern Santa Catharina and Rio Grande do Sul.

GOVERNMENT PALACE, FLORIANOPOLIS, SANTA CATHARINA.

IGUASSÚ FALLS, PARAÑA (2¼ MILES ACROSS).

Raspberry. Does very well in the south. There is also a wild fruit which grows everywhere on the mountains.

Apple. Produced to *perfection* in selected soils in the more temperate parts of Brazil. Some grown at Poços de Caldas (Minas Geraes) weighed nearly 1 lb. each.

I have seen perfect fruit from Alto da Serra (800-850 metres above sea level) near Petropolis. In the colonies on both sides of Itatiaiá, this fruit grows as well as in Europe.

Varieties especially suitable are: Bismarck, Belle of Pontoise, Codlins, Lord Suffield, Prince Albert, Ontario, the Queen, Crab and Peasgood's Nonesuch.

Peach. Of the fruits introduced from abroad, the peach has made itself more at home than any. Most of the European varieties are grown with some success, but the oriental fruit is not yet seen, except in the catalogue of a professional grower of Pelotas (Rio Grande do Sul).

Pear. Not so well adapted to Brazil, unless it is the sand or Chinese pear.

The following are successful: Alexander Lucas, Charles Cognée, Gen. Tottleben, Le Conte (Chinese), Kiefer (Chinese) and Lincoln Corless's Winter Pear.

Tomato. Will grow perfectly and produce fine fruit, but like most things, it requires more attention than is usually given. Does best in the more temperate states. Very badly packed for market at present.

Quince. Yields splendid crops. Is principally used for the manufacture of jelly. A large quantity of the preserves comes to Rio de Janeiro from the

small towns, high up in the Organ and Estrella Ranges in the same state, Theresopolis, for example. No proper attention is given to the cultivation of this fruit.

Strawberry. Fruits perfectly from Rio de Janeiro south (in the elevated regions).

Nespereira (*Photinia japonica*). This tree is improperly termed the yellow plum in Brazil. It is extremely common (or the Japanese variety is) in the south, but usually does not bear very well owing to want of proper cultivation.

Olives. At Caxiás, Nova Trento, Alfredo Chaves and other places in Santa Catharina and Rio Grande do Sul, olive trees have produced as much as 45 litres of fruit, an extraordinary yield as compared with Italy.

Chestnuts and walnuts. These are now being grown in Minas Geraes as well as in the extreme south.

Blackberries, logan berries, cranberries, cobnuts and almonds as yet have no attention paid to them.

APICULTURE

There are some twenty-one species of bees known as indigenous to Brazil, but none of these are domesticated, although several produce very fine honey, according to St. Hilaire superior to the European product. One variety is stingless, but most of these insects are very dangerous. The honey varies a great deal, and that produced by some kinds has drastic effects.

Apiculture is especially adapted to the south of Brazil, and most of the German and Italian colonists in Rio Grande do Sul have a number of hives.

There is a special review published, called *Brasilianische Bienenpflege*.

Customs duties on bee appliances are: For farmers, 8 per cent. *ad valorem;* for merchants, 20 per cent. *ad valorem*.

A bee farm at Campos consists of 160 primitive hives composed of boxes measuring 24 × 12 × 16 inches. The bees are of Italian origin, and are derived from some imported in 1904. São Paulo, Minas Geraes and Paraná also produce an amount of honey and wax for exportation. The most modern apparatus in Paraná yields 30 kilos of honey and 2 kilos of wax per hive as a maximum. In 1909 ten farmers in Rio Grande sold 54 tons of honey and 126 of wax . Local prices (1911) in Porto Alegre: Honey, per kilogramme, 600 reis; wax, 1$700.

Most of the honey sold in Brazil is in bottles, and frequently has the appearance and taste of treacle, owing to being largely adulterated with the latter (Melado). The south, and only that part with a definite winter, is alone suitable for bee-farming, as in two or three seasons the imported bees cease to store up honey where there is a constant supply of nectar, and in the sugar-refining districts even learn to abandon the flowers altogether.

Exports of wax bear no relation to the production, as huge quantities are used for church candles. No exact figures are available with regard to the foreign trade, mostly with Germany.

SERICULTURE

The above industry is still in its infancy, but there is a great future in store for it. As we have already seen, the mulberry thrives splendidly, and neither

it nor the silkworm suffer in any degree worth noting from the diseases so common in Europe. One of the principal reasons for the non-development of sericulture has been the great cost of mounting factories capable of dealing with the raw silk. In Petropolis, however, there are two mills, one Italian and the other German. The climate of this delightful little city (justly termed for its beauty—A Rainha do Brasil) is so well suited to the growth of the mulberry tree, that cocoons produced locally prove superior to many foreign ones, not only in brilliant colour, but also in elasticity of thread. The two Petropolis mills consume 45 tons annually between them, but most of the thread is imported. In Nova-Trento (Santa Catharina) the whole municipality is inhabited by colonists from Trente, in Austrian-Italy, and most of the inhabitants are engaged in silkworm culture, the proceeds being used by two small factories belonging to a religious order (Brazilian), where the nuns themselves are the actual workpeople. The first factory was started in 1900, and the products obtained three gold medals at the St. Louis Exhibition. The annual output is now 3,000 yards of silk, 216 scarves, and over 100 pairs of stockings. The other factory is somewhat smaller, the production amounting to about £1,800 in value last year. Besides the above there are many hand looms scattered throughout the country. In Rio Grande do Sul the industry is further developed, two large and various small factories being established, and in Minas Geraes, Barbacena is the seat of this culture, already well advanced. The colony of Rodrigo Silva, in the above municipality, produced 5,158 kilos of cocoons in 1907, and distributed no less than 38,600 mulberry

slips. The cocoons are generally collected from August to September, October, and November to December. 39 grammes of eggs produce an average of 36,000 caterpillars, which consume 800 to 850 kilogrammes of fresh mulberry leaves, to produce from 50 to 70 kilos of cocoons, the silk being of excellent quality, but somewhat coarse in thread. Barbacena is, it is worthy of note, 3,400 feet above sea level, and slight frosts are not at all uncommon in the winter. Many other districts in this state are taking up silkworm culture with success. In São Paulo a factory has been started, and the silk produced took the first prize at St. Louis, three medals at Rome, and one at Milan, besides others at Campinas and São Paulo city. This state produced 22,400 cocoons in 1908. The following figures illustrate the profits to be obtained from this industry in Brazil, even under present conditions.

EXPENSES

30 grammes of eggs . .	9$500
Mulberry leaves . . .	20$000
Labour, etc.	65$000

Result—say 60 kilos of cocoons, worth 240$000. (15 milreis equals £1.)

Profit, 145$500. This is the result of 30 days' work only, utilizing the services of women and children. From these figures one may easily calculate the profit to be obtained from an outlay of say £1,000. It must be remembered that the duty on imported manufactured material is enormous. Notes just to hand from Minas Geraes inform me that the Government of this state has decided to open the following credit for three prizes: (1) 10 contos of

reis (£625), being 1s. 3d. per kilo, to those producing 10,000 kilogrammes of cocoons; (2) £312 10s. to the planter with at least 2,000 mulberry trees properly cultivated; and (3) 45 contos of reis, equals £2,722 10s., to the two first factories possessing modern machinery, employed in the weaving of silk, produced from national cocoons. The Federal Government has also resolved to pay premiums on each plantation of 2,000 mulberry trees, on each kilo of cocoons, and to subsidize the first two silk factories using native material, and equipped with modern machisery.

By Federal Decree No. 9,671 of July 17, 1912, it has been resolved to establish experimental stations, with a 3 months' course for men, and one for women, where the culture of the mulberry and silkworm will be taught, and how to prepare the cocoons and silk for market.

Handbooks, pamphlets and bulletins will be published regularly.

VITICULTURE

Grapes have been known in Brazil since early colonial days, and the kind mostly grown are white muscatel, lady's finger, and ferrar. Amongst others introduced more recently, the *Uva americana* or isabella dates back 50 years.

In the states of Rio, S. Paulo, Paraná, etc., from October to April, the vine suffers from diseases engendered by the humidity, such as fungi. In spite of this, here are found the finest sorts. An expert grape cultivator (Dr. Fialho) near Petropolis has some hundreds of varieties growing, and exhibits the most magnificent bunches in the capital (3½ hours by rail and water). Even in the City of

Belem (Pará) a vine exists which produces three crops annually; this is under adverse conditions, as it rains daily in that place.

Two crops yearly are fairly common, even in Central Minas Geraes.

In the valley of the river São Francisco the climate is best adapted to grape culture, and particulars are given in a Government report by Dr. João Silviera in 1906 of the results obtained from 175 acres of alluvium. To a depth of nearly 20 feet the soil is composed of sand, mixed with clay and black earth, without stones or foreign matter of any kind. The low lands of this area are flooded from December to January for a distance of 1,300 yards. The climate is dry, with not more than twelve or fourteen heavy rains in the year (October to May). The highest summer temperature is about 100° F., but the nights are always agreeable. In the winter the highest point reached by the mercury is 85° to 90° F., and the lowest 45° to 50° F. Irrigation is carried out throughout the dry season. The area is divided into two parts. The first has 640 vines, remaining from 1,000 originally planted, and there are 150 varieties from the four continents. The most delicate and finest European sorts give three harvests annually, with a supply of 70 to 80 quarts of water daily, and the ground is well manured. The quantity of grapes produced under such conditions is enormous. In the city (Joazeiro) one vine of 3 years of age had 542 bunches. At the trial grounds, white muscatels have weighed over 4 lb. the bunch.

This experience has proved one of the most successful, and has encouraged the Department of Agriculture (Bahia) to further outlay. From this

trial ground slips have been distributed all over the country (more than 34,000). The Agronomical Institute of Campinas (São Paulo) has also sent out 30,000 to 40,000 per year. The state most occupied with the vine for wine making is Rio Grande do Sul. Between 27° and 34° south the climate is entirely suited to the vine, and corresponds with Southern Italy, except as far as the topography is concerned. In this Brazilian state the vine is not attacked by its terrible enemy, phylloxera. Already native wines have received high recognition (Milan Exhibition), in spite of the competition of European growers with long experience and great reputation. Most of the vineyards belong to Italian colonists, and the harvests are usually exceedingly good. The following are typical results: (1) 2½ acres equal 7½ tons of grapes. (2) 2½ acres equal 17½ tons of grapes. (3) (Caxias) 18 tons per hectare (2½ acres), and Guaporé and Bento Conçalves 25 tons per 2½ acres, average 11,480 litres of wine. In Portugal the average yield is 1,870 litres; France, 3,300 litres; and Chili, 5,000 litres. In Nova Trento a vine exists 17 years old, from which has been taken 1½ tons of grapes, producing 792 litres of wine.

In Rio Grande do Norte two crops are produced yearly.

In Rio Grande do Sul grapes sometimes sell at 1½d. per 11 lb., and the wine is worth the same price for one-third of a dozen bottles, retailing in Rio de Janeiro 7½d. to 1s. a bottle. The Caixas Co-operative Society, making its own wine, pays from 60 to 100 reis a kilo prompt cash for approved grapes.

Wholesale price per pipe in Rio Janeiro (1912), 115$ to 160$.

In the vicinity of the Federal Capital itself, Senhor Gonçalves Correa has 1,500 vines of eighty-two distinct kinds. He obtained a Grand Prize in 1908 for the excellence of the fruit.

In 1902 the entire export was 288,000 litres, and in 1906 it rose to 2,700,000 litres. It is stated that the production, including local consumption, totalled 10,000,000 litres the same year.

In 1917 the Caxias district of Rio Grande produced 60,000 tons of grapes, the wine resulting amounting to 350,000 quintals.

The 1918 production in this state rose to 60 million litres, worth 23,000 contos of reis.

Local (Porto Alegre) prices for good brands, 12$000 a dozen. Rio Janeiro, 25$000 to 30$000.

Balance Sheet of a Vineyard in R. G. do Sul (1914).

Year	Expenses. Items	Total Amount. Milreis	Produce per Hectare	Value
1	Labour, 120; Manure, 500; Planting, 200; Plants, 1,000; Stakes, 250; Administration, 360	2,430	—	—
2	Fencing, 1,500; Labour, etc., 650	2,150	—	—
3	Total expenses	1,040	—	—
4	Including wine making ...	2,000	5 pipes of wine of 480 litres each	1,000
5	,, ,, ,, ...	1,000	10 pipes	2,000
6	,, ,, ,, ...	1,000	20 ,,	4,000
7—10	,, ,, ,, ...	4,000	80 ,,	16,000
	Total	13,620	115 pipes	23,000

Net profit per hectare, £160.

Grapes in Rio Grande, 200 reis the kilo. Rio Janeiro, 2$000 or more.

The average percentage of alcohol in these national wines is 7 to 13, the proportion of acid 0·866 to 0·1050. Those of France are 0·28 per cent. to 0·39 per cent. The above figures relate only to wine made from the grape. As already mentioned, the pineapple, jaboticaba, cashew and other fruits are extensively used for the purpose of making wines.

If table grapes are grown, the expenses will be about £1,050 and receipts £2,100 for the 10 years per hectare.

In spite of the increase in acreage of vineyards, the importation of wines is on the up grade in Brazil. In 1908 45,521 tons were received from Portugal, and 19,941 tons from Italy, Spain, France and Germany in the order named.

Of spirits, cognac is the most consumed, with whisky a good second.

Present prices of wine per pipe (1914):—

Portuguese (red) . .	325-340$000
Rio Grande do Sul . .	125-130$000
(8 per cent. alcohol.)	

Hops, 2 crops yearly on the Paraná-Santa Catharina plateau. Some plants produce a kilo of flowers.

Green vegetables need very little notice in this section, as one may grow almost anything in Brazil if the local climate is taken into consideration. Onions grow up to 2 kilos in Paraná, and according to the farmer who exhibited them at São Paulo, not even his grandchildren would need to manure the ground in the Paranápanema valley where he lived,

In the vicinity of São Paulo city, each acre produces 140 kilos, and they are sold locally at 4$ or 5$ per arroba. Rio Janeiro price (1912), 1$600 to 4$000 per hundred.

The following figures relate to the environs of São Paulo (1913-1914):—

Cabbages. 15,000 heads per hectare. Price, 100 reis each.

Beans. 600 cases of 40 litres per hectare, at 2$500 a case.

Lettuce. 60,000 heads per hectare. Fetch 300 reis for a dozen.

Tomatoes. 13,000 litres per hectare. Fetch 8$000 per case of 40 litres.

Chicory (for salad). 60,000 heads per hectare. Fetch 300 reis a dozen.

Cucumber. 1,000 cases of 40 litres per hectare. Fetch 4$ per case.

Watercress. Grows freely everywhere in the temperate parts of Brazil.

See appendix for present (1918) prices.

CHAPTER XXI

THE PASTORAL INDUSTRY

Dr. Gonzago de Campos, Director of the Geological Survey, in a report to the Minister of Agriculture in 1911, vol. 3, page 76, gives the following figures relating to proportion of grass lands (pasture) in the different states of Brazil adapted to the raising of live stock. Area in *thousands* of square kilometres: —

North to South: Pará, 298 (24 per cent.); Maranhão, 195 (57 per cent.); Piauhy, 168 (73 per. cent.); Rio Grande do Norte, 41 (74 per cent.); Pernambuco, 62 (66 per cent.); Bahia, 372 (63 per cent.); S. Paulo, 88 (35 per cent.); Minas Geraes, 329 (54 per cent.); Goyaz, 461 (72 per cent.); Matto Grosso, 947 (61 per cent.); and Rio Grande do Sul, 194 (69 per cent.). Total area of grass lands (Campos) in Brazil, 3,527,304 square kilometres, or 42 per cent. of the whole.

Forage Plants, etc.

With regard to pastoral conditions, Brazil must be divided into three zones, i.e., tropical, semi-tropical, and temperate. The first is naturally the north; the second the central territory; and the third the whole of the south. Before dealing with the stock it will be necessary for the benefit of practical farmers to consider the grasses.

Grasses (*Gramineas*)

Root grass. Not exceeding 10 to 12 inches in height, always green, and springing up as if by enchantment, after being cropped quite close by thousands of beasts. The local cowboys say that it contains sufficient salt, impelling the cattle to drink. This grass is found from Goyaz to the Araguaya and Tocantins.

Capim branco (white grass), considered to be *Andropogon glausens*. There are two or three kinds of this graminea, and they are found in patches amongst the first-named grass, but are not so resistent.

Mimoso. Grows along the central part of the São Francisco River.

Marmelade grass. A giant reaching 16 to 17 feet high, peculiar to the lower parts of the Araguaya.

Rice grass. On the margin of the river generally.

Beach grass (*Panicum fistolarum*). The principal green food of stock in Matto Grosso.

Capim gordura (*Tristegis glutinosa*). The commonest in Brazil, growing wild everywhere.

Jaragua (*Andropogon rufus*). Grows in rich soil, more than a metre high. The young shoots are preferred by cattle. The campos are burned the end of August, and the plant springs up again in September or October.

Catingueiro (*Melinis minutiflora*). Thrives on poor lands, and is very free from insect plagues. Several other varieties are cultivated in São Paulo, most of which yield five to seven crops a year.

Dr. L. Glaziou collected, in a short time, no less than 155 *new* varieties of gramineas on the central plateaux of Brazil. It is impossible to enumerate the names of a tenth part of the plants suitable for

forage, and, if it were, undoubtedly their names would be entirely unknown to the general reader. Suffice it to say that there is no lack anywhere, either of food or water, and the latter is abounding, and as pure as virgin snow.

Alfalfa

This leguminous plant is hardly cultivated at all in Brazil, to the great prejudice of the stock breeder. Some is imported from the River Plate in the form of hay. In the model farm at Gamelleira, various experiments have been made, demonstrating that ten crops may be had yearly, giving 173 kilogrammes from 100 square metres. Dr. Carvalho Britto on his farm at Pedro Leopoldo (Minas Geraes) planted in 1908 10 kilogrammes of alfalfa seed in 1,200 square metres, and on December 10 harvested 926 kilogrammes of green alfalfa and 300 kilogrammes of hay. The local (Rio de Janeiro) price would be about 150 reis per kilogramme. To achieve the best results, the soil should be of a good depth and fairly light and porous. To each hectare 700 kilogrammes of lime. 40 kilogrammes of seed will suffice to the hectare.

Live Stock in Brazil

Totals, according to census for 1916:—

Cattle	28,962,000
Horses	6,065,000
Asses and mules	3,222,000
Swine	17,329,000
Goats	6,919,600
Sheep	7,204,000

Value: £251,606,150.

Of these, Rio Grande do Sul has over 7 million

cattle, 3,745,000 sheep, 2,200,000 pigs, and a large proportion of the horses.

Minas Geraes possesses nearly as many cattle, 2,523,000 horses, etc., and 6,716,000 swine.

Bahia has 3,000,000 goats, 2,224,000 horses, and 2,410,000 pigs, and Ceará, Pernambuco, Piauhy, a great number of goats and cattle.

In Rio de Janeiro the average amount of beef eaten per inhabitant is 22 kilos annually. In the State of Minas there are more than 100 butter and cheese factories producing merchandise to the value of 6,000 contos, equal to £370,000. Exports in 1909 amounted to 2,279 tons of butter, 4,511 of cheese, and 7,003½ of milk. The exportation of butter from Santa Catharina, 1907, was 667⅔ tons. The Brazilian oxen, derived from the primitive and isolated herds, probably natural to the country, are quite small, weighing on an average not more than 400 lb. when dressed. These animals are noteworthy for their immense horns.

In Goyaz, and adjoining states, a variety called "Mocha" is much esteemed. The Zebu has been widely introduced, and Malabar stock is found in several zones in the north.

Recently, Durhams, Jerseys and Herefords have been brought over, as well as various specimens of the Simminthal (a Swiss type). Apart from Rio Grande do Sul and S. Paulo, the Brazilian states employ the most primitive methods of stock raising, the herdsmen limiting themselves to visiting the pastures now and then, and somewhat more frequently at breeding time, when the calves are immediately separated from the cows and shut up in corrals, where they are allowed to feed twice daily, morning and evening, when the cows return

voluntarily to the enclosures. The cowboys of the great plains of Goyaz, Matto Grosso, and other central states, are dressed entirely in leather from head to feet. They are usually paid by a fourth or fifth part of the production. Each stock-raising district of Brazil has its own dress and customs, and technical language.

Rio Grande do Sul has about 30,000 square kilometres at present (1918) available for stock-raising, mostly in the north.

Twenty square leagues cost at least .	2,000 contos
3,000 native cows may be worth . .	600 ,,
1,000 Devon bulls	150 ,,
20,000 native sheep	60 ,,
400 Merino or Romney rams . . .	20 ,,
Machinery, etc.	170 ,,
Total, say	3,000 contos

This estimate is by Dr. Assis Brazil, a well-known breeder in that state, and he reckons that such an estate should yield a net profit of £50,000 within 4 years. It should be noted that these figures apply to 1913-14, store cattle costing *treble* the price a quarter of a century previous.

Here the bolas is used, as in some parts of Uruguay and Argentina, and ranches are known as *estancias*, in contrast with the Portuguese word Fazenda. The best pastures are in the elevated regions near the southern boundary. Average weight of a fat ox, 450 kilos.

In the pantano, or swamp district of Matto Grosso, in the Paraná valley, beasts attain as much as 1,000, cattle in Minas and Goyaz averaging 450-500 kilos, but a larger proportion is bone than in the

Rio Grande oxen, where the stock is of a superior quality. The animals are usually marked by cutting their ears in a distinctive form. Where it is necessary to give salt, this is done in January, May, and September, in the proportion of one sack to seventy oxen. The drover, who is accustomed to complain of travelling 10 or 15 miles with a few beasts over good roads in England, would, doubtless, open his mouth at the thought of a hard journey, varying from 450 to 600 or more miles, with hundreds of wild oxen, many of them laden with stores. From Matto Grosso to the south of Minas Geraes is 1,050 miles, and the whole of this distance is annually travelled by many indefatigable horsemen. It is not only the vast distances traversed that render the drover's life an onerous one. Sometimes at dead of night the cry of a panther in the woods will suffice to stampede a thousand head. The noise *en route* of the clashing horns of the beasts can be heard for leagues, and resembles a distant clap of thunder. As the only time possible to drive stock is the rainy season, the camping grounds become quagmires, with the animals breast-deep in mud. The average number of oxen in a drove is from one to two thousand, and this frequently represents the whole capital and credit of the herdsman.

Sometimes the owner loses the whole drove before reaching his destination. The animals are emaciated, living skeletons on arriving at the resting and fattening place, where they remain 8 to 12 months. From Barreto (Minas) they are sent to São Paulo on foot, or by water.

In Ceará cattle are brought from Piauhy to fatten during the autumn or wet season. In Matto Grosso

an animal 2 years old is worth from £1 to £2, 4 years old, £2 10s. to £3. For a saddle or draught ox, from £3 to £5 10s. In Goyaz an ox, more than 5 years old, is valued at £2 to £6 5s., according to the number of heads available. In Piauhy the top price is £1 5s. The cost of a journey of 2 or 3 months is about £1 per head. The most important cattle fairs are, Tres Corações (Rio Verde), Bemfica, near Juiz de Fóra (Minas), Sitio (Minas). Nearly the whole of the stock sold at these fairs is destined for the municipal slaughter house of Rio de Janeiro, at Santa Cruz, where, in spite of the immense population it has to supply, not more than 400 beasts are killed daily.

The Devon probably represents the best all-round type for breeding, and in Brazil puts on more weight in flesh than the Durham or Hereford ox. Texas fever must, however, be guarded against. Farmers in Minas Geraes who wish to import stock, deposit the value of the animal, and the State defrays all transportation expenses. The Leopoldina Railway has a model farm at Bemfica (near Rio), where a complete course in any particular subject costs £4 a month, including board and lodging.

A syndicate has been formed in London, with a capital of £1,000,000, for the purpose of stock-raising in South Brazil, and an American company has obtained a large concession of lands in Piauhy for the same end.

Quoting from the report of the Brazil Railway Company, there are *vast* expanses of pasturage available in Brazil for cattle-raising, and a large and growing business is bound to develop in the Republic. This concern has purchased 7,000,000 acres of grazing land, and its investigation proves that the

area is quite as suitable for the purpose as the best North American prairies, and that there is sufficient supply of native stock to ensure the rapid development of a prosperous industry on a very extensive scale.

Charque (Salt Beef)

In 1913, Rio Grande do Sul exported 64,000 tons of this product, valued at 31,751 contos, each ox yielding 100 kilogrammes. Price locally in 1917 was 900 reis the kilo, and in Rio Janeiro, 1 $400. Only 40 per cent. of the animal's dead weight is convertible into Charque. In the curing establishments (Charqueadas) of this state, an average of 678,000 beasts have been slaughtered per annum since 1910, the total yearly value being reckoned at £5,000,000. Estimated cost of live animal in Minas (Tres Corações fair), 1918, 15 arrobas of 15 kilos, 225 $000. 55 kilos of salt at 300 reis, 16 $500 (six times its cost in Mossoró). Other expenses, freight and commission, 34 $20. Total 275 $000.

The hide fetches (locally) 27 $, fat (15 kilos) 18 $, and the tongue, etc., 3 $, leaving a net prejudice of 29 $700, according to the tariff fixed by the food controller in the autumn of 1918.

Total number of cattle slaughtered for export 1915-17, 617,000. Home consumption, 744,000 at the most liberal estimate, calculating an increase of population amounting to 3 millions. There is no cause for alarm if an average of only 20 per cent. in the amount of live stock is maintained, as compared with 30 per cent. in Europe.

There is no restriction as to the imports of live stock in Brazil, except as regards that destined to immediate consumption, this being subject to customs duty.

Exports of chilled beef began in January, 1915, the "Orcoma" taking two carcases to Liverpool. The "Re Vittorio" followed, conveying 10 tons to Genoa, and the "Araguaya," 90 to England. Total shipments that year, 8,591 tons, and 773 tons of charque.

In 1916, 33,660 tons left Brazil = £1,409,000.

During 1917 (six months season), nearly 600,000 oxen were slaughtered in Rio Grande do Sul alone.

EXPORTS, 1918

	Tons	£
Chilled beef	60,509	3,246,000
Preserved meat	17,223	1,403,000
Lard	13,270	1,410,000
Charque	4,809	382,000
Hides	45.584	3,991,000
Skins	2,215	669,000

Brazil is the only country in the world which has doubled its live stock within 20 years, and it is estimated that a million cattle may be exported annually from 1920.

There are, at present, four large cold storage plants in Brazil, besides one in construction at São Paulo, for Armours, and another at Livramento in Rio Grande, where there are 26 factories preparing charque, and 6 which can beef. Amongst these latter, one, Osasco, is in São Paulo, and this has facilities for slaughtering 1,000 oxen, as many pigs, and 1,500 sheep daily. This company employs 450 hands. At Caçapava, the packing house of the same name, produced (in 1915) meat products to the value of 1,430 contos of reis.

At Barretos, São Paulo, 450 oxen are killed daily,

and the total value of output in 1915 was 5,100 contos, that of The Continental Products Company (Osasco), 5,500 contos.

Wool, a new item, has hardly begun to figure as an export.

Decree No. 13,026, of May 15, 1918, prohibits the slaughter of calves and cows suitable for reproduction, but the local governments of Rio Grande, Minas, etc., have raised great opposition to its application.

Sheep

We must turn again to the Paulistas, if we wish to see what has been accomplished in the way of sheep-breeding. Amongst these enlightened farmers one may come across splendid specimens of the Oxford, Southdown, Hampshire, and Rambouillet sheep. In Rio Grande, the Southdown, known locally as black face (cara negra), is preferred, and the wool produced is abundant and fine. The Romney Marsh breed is suitable for most parts of Brazil. Rams should be imported, not ewes. Not only the south, but as an illustrious Brazilian, Dr Assis Brasil, says, the plateaux of Paraná, and Santa Catharina, and Rio Grande, with an average of 2,000 feet elevation, are well suited to the sheep, more perhaps than even Argentina or Australia. How much more, then, Central Brazil, with 3,300 to 4,000 feet of altitude, and the most delicious climate in the world. In Goyaz experiments have proved that the sheep is entirely adapted to this zone.

A contract has been signed by the President of the State of Minas Geraes with a breeder, who will take over 30 square leagues at Santa Luzia (Rio das Velhas), and a concession for ninety years has been granted him, on one condition, that 3,000 sheep are

introduced at once (1914) and 54,000 within fifteen years of the date of signing the concession (1913).

Goats

Here we find the beast who (as in Europe) will get a living where any other will starve. Where the Cearense has to emigrate sometimes, owing to the drought, his goat finds ample subsistence, and this state (Ceará) exported in 1906 more than 400 tons of skins, worth 1,500 contos of reis. In Piauhy a splendid milch goat is found, of a remarkable size, and all over the northern hills, from Maranhão to Bahia, hardly a family exists without possessing a herd. The cost of their keep is less than that of any other kind of stock, and the pecuniary results are almost immediate. One may say that this animal is found everywhere in Brazil, especially where others cannot be profitably raised, amongst a vegetation composed of cacti and agaves of every kind, the most spinous sorts naturally predominating. It is said that the goat can pass months without needing water, and furnishing milk all the time.

Swine

Introduced soon after the discovery of Brazil, the Portuguese types still preserve their distinguishing marks. One kind is an enormous beast, nearly 6 feet in length, thick skinned, short legged and snouted. It is known by the name canastrão (big basket). Most English pigs are now found, as the Yorkshire, Berkshire, Hampshire, Tamworth and Leicester, as well as others from Italy, Poland, etc. The food given to these animals, all over Brazil, consists of maize, mandioca, pumpkins, skimmed milk, etc., and as our hogs are let loose in the woods to profit by the fallen acorns, so their

Brazilian brothers fatten on the fruit of the *Auracaria brasiliensis*.

The State of Rio Grande do Sul is the centre of the lard trade, having eleven factories, supplied with 8,500 tons of fat. Minas, Santa Catharina, Goyaz and Rio Janeiro are other pig-breeding states. Bacon, such as Englishmen know, is not cured, and a Portuguese once asked me what was that meat, with a piece of lean and a piece of fat alternately, that they gave him for breakfast on the Royal Mail steamer. Brazilian bacon (toucinho) is nothing but a great mass of fat, 3 or 4 inches thick, with quite an unappetizing look.

Horses

The principal credit for scientific study of the pastoral industry belongs certainly to São Paulo. This state has now taken in hand the improvement of the national race of horses (which is undoubtedly Arab, or a degenerated variety of this famous breed). In some parts there are Russians and Anglo-Normans, some worth £62 10s. when broken in. In Minas there exists a good stock, derived from Arab stallions and national mares. In the northern pastoral zones there is a race of horses capable of covering 60 miles daily. The Brazilian horses are not, as a rule, large, but they are very wiry. By the initiative of the present Minister of War, the Brazilian cavalry is being remounted with national equines, the regulation demanding 1 metre 40 centimetres in height (about 14½ hands), and no difficulty is experienced in getting animals over this size.

The Compte Le Hon offers some very pertinent observation in the Paris Journal, *Le Brésil*, with regard to the horse.

He is of opinion that the native race requires crossing with the pure bred Arab at first, and that the result of this union should be united to the Anglo-Arab, in order to produce size and power sufficient for remounts. The sires should be obtained from stallions that are accustomed to run wild or semi-wild in the vast campos in the interior of Minas and Goyaz, etc., and animals selected that are not much taller than the average in order to prevent the breeding of ungainly and disproportionate stock.

A large trade is done between Goyaz and Bolivia, horses and mules being transported by road to the Paraguay River (sometimes 1,800 kilometres), and thence by water to their destination. Rio Grande do Sul contains over one million horses, mainly of Arab origin but crossed with Andalusian and German stock. The smaller animals are the most resistant.

Mules and Asses

The bulk of the carrying trade in Brazil rests on the backs of the former of those two useful animals, and no others have been so despised and ill-cared for. They are sometimes distorted in the legs, and this is attributed by the breeders to the insufficiency of lime in the pastures. The only states that have devoted any attention to the raising of this kind of stock are Rio Grande do Sul, Paraná, São Paulo, Minas Geraes, Goyaz, and Bahia. The greater proportion of the animals in use in the Republic, are, however, imported from the Argentine Republic. Whatever progress has been made in recent years is principally due, not to the breeders themselves, but to the efforts made by the Governments of such

up-to-date states as São Paulo, Paraná, Minas Geraes, etc.

To sum up, Amazonas is suited to oxen, but not to goats or pigs. Pará is, more or less, in the same conditions, and all the other states are well adapted to the introduction of almost any stock. Rio produced, in 1906, no less than 3,707 *tons* of milk, and 61 tons of cheese; Petropolis district being one of the richest, making 6,984 kilogrammes of butter, and 18,012 of cream cheese in 1907. Santa Catharina, in 1905, already made 419 tons of butter, and Minas Geraes exported (principally to Rio), in 1907, 5,100 tons of milk, 4,635 tons of cheese, and 1,420 tons of butter, nearly all of this passing over one line of rails (The Central). All the milk was used in the Capital of the Republic. The total value of products of the pastoral industry in this state amounted to £2,891,599 in 1904, and has, undoubtedly, very much increased since then.

EXPORTS OF MINAS GERAES

	1910 (kilos)	1911 (kilos)
Milk	8,704,654	11,833,485
Butter	2,557,689	3,059,686
	(worth 10,000 contos)	
Cheese	5,406,751	6,079,515

Nearly all this went to Rio Janeiro and São Paulo. A great feature of Brazilian cities in the south is the dairies, where one may sit and drink milk, either hot or cold. Most of the cafés themselves supply it also.

Poultry

There is very little to say about this subject except that undoubtedly it is a branch of farming

which would be most lucrative, more especially because up to now very little care has been taken with either fowls, ducks, geese, or turkeys. Petropolis again is one of the most up-to-date centres, and a low estimate calculates the annual production of eggs (hens) as 10,000 dozen (1907).

There is a more or less plentiful supply of scraggy fowls, but it is a very rare thing to be able to buy plump birds in the ordinary way.

As there are now several poultry farms in Rio, São Paulo, etc., one or two of which are under foreign management, it is preferable to buy prize birds in Brazil, unless able to choose and accompany them yourself on the voyage. Plymouth Rocks and Leghorns do very well, but local advice is necessary before selection.

Exportation of eggs (Rio State), 1911: 1,468,231.

The Leopoldina Railway Company has a model farm at Bemfica (Macuco), Rio State, where 6 months' courses in practical poultry, dairy and mixed farming, and bacon curing are given. Board and lodging is only charged 60 milreis a month, a very moderate fee indeed.

Trial sowings yielded—

40	litres of	maize:	60	sacks of	80 litres
40	,,	beans:	18	,,	,,
40	,,	rice:	50	,,	,,

One alqueire of land produced 40 tons of sugar cane.

This company is now doing very good work in its agricultural propaganda, and I heartily recommend interested persons to apply to the director in Rio Janeiro for information, especially with regard to dairy farming, bacon curing, etc.

Premiums for the Introduction of Animals for Breeding Purposes

subject to conditions as follows:—

1. A presentation of certificate in payment of local taxes, or proof of registry as a breeder in the Agricultural Department.
2. Consular factures, etc.
3. Custom House (receipt for duties, etc.).
4. Photographs of animals in duplicate (birds excepted).
5. Pedigree of bull or stallion.
6. Veterinary certificate given in country of origin.
7. Certificate of inoculation for tuberculosis in case of bulls.
8. Receipt for steamer and railway freight.

The whole of the above must be in Portuguese, or translated.

Animal	Europe to any port in Brazil	From U.S.A.		From River Plate.	
		To North	To South	To North	To South
	$	$	$	$	$
Bull	500	300	500	400	250
Stallion	600	350	600	450	300
Jackass	400	250	400	250	200
Hog	150	100	156	120	80
Ram	120	80	120	90	60
Goat	120	80	120	90	60
Sheep-dog ...	100	70	100	80	45
Poultry	10	6	10	8	

The Government will also import stock, providing the cost of same and partial expenses of freight is deposited in the Treasury previously.

The Federal Government has a Zootechnic Station (Pinheiro, E. do Rio), where prize stock is kept for the benefit of breeders.

The State of Minas Geraes offers premiums to co-operative dairies producing at least 50 tons of butter or 100,000 of cheese (5 to 15 contos). Also 10 to 30 contos for the first co-operative condensed milk factory, or one producing milk powder, or caseine, and using at least 1,000 kilos of milk daily.

Also 5 contos to the first salt refinery, producing salt chemically pure, fit for butter manufacture, and sold at equitable prices.

Also 20 contos of reis to the first manufactory of tins, producing at least 2 million butter, etc., tins annually.

Agricultural Inspection

The Federal Government has created a service of agricultural inspection throughout the Republic, which is divided into twelve districts, which are planned as follows:—

1. Amazonas and Pará.
2. Maranhão and Piauhy.
3. Ceará, Parahyba, and Rio Grande do Norte.
4. Pernambuco and Alagôas.
5. Bahia and Sergipe.
6. Rio de Janeiro and Espirito Santo.
7. Minas Geraes.
8. São Paulo.
9. Paraná and Santa Catharina.
10. Rio Grande do Sul
11. Goyaz.
12. Matto Grosso.

As well as a special division in the Acre.

Experimental Stations

To five or more syndicates combining to establish laboratories and experimental stations for the study

of agricultural chemistry, etc., a bounty is offered of £1,250.

Each district will be under the control of a delegate of the Federal Government, who will present a most minute monthly report. He will be charged with lecturing, the organization of agricultural shows, and of demonstrations of the use of various machines; in short, his duties will be those of an agricultural expert and adviser, and he will be especially charged to initiate new cultures and improve existing ones of every kind. There is no doubt that this measure will be productive of great benefit, especially in those states without organized agronomical stations or agricultural colleges.

Several European and American travelling teachers are now at work.

Decrees Relating to Premiums and Special Cultures, etc. (Ministry of Agriculture, Rio de Janeiro)

No. 2543A. January 5, 1912. Encouragement of the Rubber Industry.

9521. April 17, 1912. Encouragement of the Rubber Industry.

9917. December 7, 1912. Encouragement of the Rubber Industry.

No. 8843. July 26, 1911. Relating to a Forest Reserve in the Acre.

No. 8843. July 26, 1911. Relating to a Forest spection.

8319. October 20, 1910. Organization of Agronomical Teaching.

9452. March 20, 1912. Registration of marks on horses, cattle, etc.

10105. March 6, 1913. Regulations regarding unoccupied State lands.

8546. February 1, 1911. Regulates the aid to be given to States, Municipalities, etc., etc.

10050. February 14, 1913. Establishing an experimental station for the purpose of cultivating Seringa rubber plants in Amazonas.

Some of these are no longer in force, and interested persons should apply to the nearest Brazilian Consulate for information.

New Decrees, 1918

(Ministry of Agriculture)

No. 12889. February 27. Establishes premiums for sheep and goat breeders.

No. 12890. Concedes free transport for prize stock, seeds, fertilizers, plants and agricultural machinery.

Apply also to the Colonization departments of S. Paulo, Minas, Paraná, Rio Grande do Sul, etc., etc.

Agricultural Societies and Institutions in Brazil

National, Rio de Janeiro; Sociedade Paulista, S. Paulo.

Agronomical Institute, Campinas. Institute at Piracicaba.

Zootechnic Station at Ribeirão Preto.

Bahia, Sociedade Bahiana de Agricultura. Alagôas: Do., Alagoana.

Fortaleza: Sociedade de Agricultura. Cuyabá: Sociedade Matto Grossense.

Curityba, Do., Therezina, Do., Natal, Florianopolis, Aracajú, Manáos, Bello-Horizonte, Parahyba do Norte, Maceió, Victoria, etc., etc.

See also monthly and yearly Bulletins of Direc-

toria da Estatistica Commercial, Rua 1° do Marco, 42 Rio.

Dr. Léo de Affonseca is the most competent and amiable chief of this bureau.

See his "What Brazil Buys and Sells." Pp. 101. 4to. Imp. Nac. 1918.

Dry Farming and Irrigation

The only part of Brazil demanding the earnest attention of the Government from the above point of view is that situated in the north-eastern extremity of the Republic between 2 and 7 degrees south of the Equator, comprising parts of the States of Ceará, Rio Grande do Norte and Parahyba.

Reservoirs are in course of construction in several places, some finished, and others repaired, and the River Ceará-Mirim deepened, and a large number of artesian wells sunk.

The largest reservoir in the world is Oros, in Ceará. It will be 62 kilometres in length, by 5 wide, having a capacity for 2,200 million cubic metres of water. It has a dam 50 metres high, and the work will cost 5,500 contos. It will contain enough water after two years of drought to irrigate 100,000 hectares of land.

The dimensions of this gigantic artificial lake render it twice the size of those in Egypt, and more than 25 per cent. greater than the famous Roosevelt on the Salt river in the United States.

These works should put an end to the sporadic emigration of the Cearense, which commenced in 1871, and cause the recruiting agents from the Amazonian rubber plantations to look elsewhere for their labourers.

Carlos de Vasconcellos (Cartas da America,

1911) complained about the traffic going on between the British West Indies and Amazonia, a constant stream of negroes arriving at Pará, etc., and retarding considerably progress in this zone. He alluded also to the crowd of cosmopolitan adventurers who swarm in the land, vitiating the cities by imported vices, and maintaining labour in a perpetual state of semi-serfdom. See *Gazetteer*, Pará, etc.

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Partial View of Curityba, Parana.

Photo by the kindness of

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CHAPTER XXII

GEOLOGY AND PALÆONTOLOGY

If we glance at a large scale map of Brazil, the general scheme of topography is plainly perceptible. The whole country is cut into by the erosion valleys formed by the rivers belonging to the Amazonian and Paraná systems, respectively N. and S. A great central mountain mass divides the two basins, but the head waters of most of the great streams are hardly separated, notable exceptions being the Amazon and its northern affluents, and the Madeira.

These two great rivers rise in the Cordillera, most of the tributaries of the former, on its left bank, having their origins in the Guiana-Venezuela massif. We have, then, a great number of secondary mountain ranges running in an E.-W. direction, the Serra do Espinhaço, or backbone, which commences in S. Bahia, and dies away in S. Paulo, having a general S.W. trend, still further east the Mantiquera, and eastward again the Serra do Mar, running parallel with the coast line, all the way from Espirito Santo to Rio Grande do Sul.

Tertiary formations, mainly horizontal, predominate in the upper Amazon, but the lower part of this immense basin is Quartenary.

The Acre territory, and most of the western Matto Grosso and Goyaz have never been properly

surveyed, but the work done up to the present goes to prove that the predominating rocks in this region are Archean.

North and N. East of the Amazon the entire mountain mass is quite separated from the main Brazilian system.

As we have seen, the Araguaya, Tocantins, Paraguay, Paraná, S. Francisco, etc., rise in the centre of Matto Grosso. The latter river flows S.W. for hundreds of leagues, forced into its course by the chains of mountains which form the eastern side of the central plateau, and as soon as it finds an outlet, it descends abruptly by a wide gorge or cañon to a much lower level (see Paulo Affonso falls), having evidently forced its way through fractures or joints in the gneissic and granitic formation, and rushing over the rocks with incredible violence, precipitates the entire mass of water over the principal fall, below which an elbow is formed by the gorge, the river being shut in by high cliffs of purple syenite. In its middle course the bluffs are at times 30 to 40 miles apart, and consist principally of limestone, similar to those in the Paraguassú and Rio das Velhas valleys, and like the latter contain a number of caverns of a remarkable nature. Above Pirapóra, and at the mouth of the Rio das Velhas, sandstone again predominates, and below the Paulo Affonso Falls, the same formation is met with all the way to Penido near the mouth of the great river.

The coast, from the Abrolhos group of islets, consists of low hills of cretaceous origin, especially near Bahia and Sergipe, and thence in an unbroken line to Parahyba.

These rocks are sedimentary, but the central plateau is composed of crystalline elements (granite,

gneiss and schists) as a rule. Limestone is found near Jacobina, and most of the Chapada Diamantina in Bahia consists of new red sandstone, outcrops of this rock occurring on the lower Amazon, and in Piauhy, with calcareous nodules containing fossil fishes of Cretaceous age; as well as intrusive dykes of Diorites, Porphry, etc.

In Matto Grosso, the rivers rising in the plateau, flow over sandy schists, and near Diamantina there are outcrops of basalt on the sandstone formation of Devonian age, and the series found in the upper Paraguay valley consists of the following (Report of Dr. Euzebio de Oliveira, Commissão Rondon):—

At Porto Murtinho, diopside-syenite. Pão de Assucar, phonolites, foyaite, etc. Coimbra, limestones, with geodes containing crystals of quartz (amethysts, citrines, etc.). At Urucum, iron and manganese is met with, and at Corumbá, limestone bluffs. At Caceres, canga and diabase, and in the highest part of the valley, sandstone, diabase, outcrops, etc.

The Serra do Tapirapuan contains many amygdaloids of augite-plagioclase nature.

Further N.W., on the Madeira, Mamoré, Gy Paraná, Xingú, Tapajoz and other rivers, the rock masses obstructing navigation belong generally to the crystalline series, gneiss, granite, syenite, etc.

Trinidad and Fernando do Noronha islands, Tinguá peak, and Cabo Frio in Rio state, Poços de Caldas region in Minas, as well as the culminating point in the Brazilian mountain system, Itataiá (2,994 metres), Xiririca and Iguapé in S. Paulo, are mostly composed of phonolites, and other nepheline rocks, including foyaite. The late Dr. Orville Derby pointed out that plutonic rocks containing

the latter element, become transformed into true volcanic masses.

These localities represent the only distinct vestiges of volcanic activity. Tinguá, within sight of the Federal capital itself, rises in a conical mass over 1,500 metres above sea level.

In Minas there are many hot springs, especially in the Caldas region. The Serra da Mantiquera is separated from the coastal range by the Parahyba River, and at the head waters of the latter it forms part of the massif of Itatiaiá and the frontier of the States of Rio, Minas and São Paulo. Northwest, the Espinhaço forms the watershed of many rivers, extending to the Jequitinhonha.

The Serras do Mar and Mantiqueira belong to the Laurentian system, mainly composed of gneiss, estimated by Liais to exceed 20,000 feet in thickness in the Organ Mountains. The high lands of Minas, in the Espinhaço, Canastra and Matta da Corda ranges, are presumed to be Huronian, and contain most of the mineral deposits.

In the Espinhaço range, we find the older crystalline rocks subordinated to a series of metamorphic schists, quartzites and limestones, the latter being especially remarkable in the valley of the Rio das Velhas, at Gandarella, and also, beyond the true limits of this Serra, in central Bahia.

The schists are sharply folded, and a new series of sandstones (Itacolumites) rests unconformably in layers on the upturned edges of the older rocks. The most prominent exposition of this formation is Itacolumi mountain itself (5,400 feet), behind the city of Ouro Preto.

The quartzites, and conglomerates formed at a later date by the binding action of natural cements

are diamondiferous, and the schists are rich in iron, manganese and gold deposits.

In Goyaz, the Pyreneus attain 1,400 metres, and the Matto Grosso plateau over 1,000 in many places.

Returning to the state of Rio, the highest point in the Organ range, an offshoot from the Serra do Mar, is Itaiassú (Pedra Assú), whose gneissic mass is 2,230 metres above sea level. This is the culmination of the mountain range running N.-S. at the back of Rio bay, its most noteworthy point being the series of sharply pointed pinnacles forming the so-called pipes of the Organs and the Finger of God (Dedo de Deus).

The main mountain range (Serra do Mar) has many elevations over 1,500 metres, and is mostly composed of gneiss, syenites, gabbros, diorites and granites, which, as Dr. Gonzaga de Campos, Director of the Geological service, says, are more recent than the schists with which they are associated.

In Espirito Santo the range has a large percentage of tertiary rocks, with argillaceous silicates, limestones, etc.

In S.E. Minas, Livramento-Bom Jardim, etc., gneiss and mica schists occur, with intrusions of granite and basic eruptives, in the midst of which are frequent dykes of pegmatite, and considerable deposits of kaolin, charged with schorl, and occasionally transparent tourmaline, crystals, etc., etc.

These rocks are usually profoundly decomposed.

N.W. of Bom Jardim the gneiss is characterized by a profusion of garnets, which give it the aspect of conglomerate, and in the valley of the Rio Grande the formation is of a very complex nature.

On the western plateau in this state facetted

pebbles are found in large quantities, absolutely similar to those in the dwyka conglomerate in S. Africa, in approximately the same latitude, i.e., 25·35 S.

The S. Paulo Geological Commission surveyed an extensive zone in 1916 along the Soracabana Railway as far as Itapetiniga.

This comprises Permian strata, and lies between the ancient glacial formation, consisting of sandstone, conglomerate and tillite, and the limestones and clayey schists, containing flint nodules.

The southern limit of these observations is in the glacial sandstone, and further N., Tatuhy lies on the schists.

The Permian series forms a broad band of triangular form, with a N.E.-S.W. trend, having its apex about 24 S. and 8.25 W., the inner side being hollowed out. On the N. it is bounded by Botucatú, Avaré, Pirajú and Jacarézinho, and on the W. by the Campos Geraes of Paraná. Tertiary formations are well marked at Taubaté in the North. Cretaceous outcrops occur in the sandstones at Baurú (N.W.), and on the thalweg between the Paraná-panema and Tieté rivers.

Dr. Branner, "Geologia Elementar" (Alves, Rio, 1915) says: During the Permian period glacial action took place in Brazil south of S. Paulo, boulders of tillite being met with all across the plateau to Rio Grande do Sul.

This series has been named "Itararé," from the locality where first recognized, and appears to be identical with similar formations in India and Africa.

Earthquakes (*op. cit.*, page 155) have occurred at intervals from 1560 to 1912, but the shocks have been quite feeble, 60 in all being registered.

The most marked areas are in Ceará, Bahia and Matto Grosso.

The coast line from Rio de Janeiro south has evidently been submerged, and the depth to bedrock increases gradually from 15-20 metres to 100 at Pelotas, Rio Grande do Sul.

A map facing page 20 of "Regiões Carboniferas dos Estados do Sul" (Dr. E. de Oliveira), published by the Geological Commission of Brazil in 1918, shows the different strata in a typical zone, which extends from Ipanema in S. Paulo to Paraná.

The following notes are taken from "Geologia de Paraná," issued 1917, by the same department: The submerged terrace, already mentioned, extends as far as 45° W. of Greenwich, and to a depth of 200 metres below sea level, an abrupt descent occurring in this meridian to 1,000-2,000 metres.

From the coast line a narrow belt of alluvial extends as far S. as the foot of the Paraná land terrace, or lower shelf, which is broken up into a series of jagged peaks, rising to over 1,400 metres above sea level, or more than 400 higher than the mean altitude of the terrace, composed of pre-Devonian rocks. North of Curityba there is a great depression formed by the valley of the Ribeira do Iguapé near the southern limit of S. Paulo state.

Below the Paranaguá-Curityba Railway, the serra dies away towards the Rio Grande do Sul, showing isolated masses, and the typical cochilhas, or narrow ranges of hills.

In Southern Santa Catharina the main range falls below the ocean level, being hidden under the carboniferous strata.

Westward from Curityba a third terrace, partially

Permian, and partially Devonian in age, forms the Campos Geraes, and extends N.E. and W. beyond Castro and Jaguarihyva, penetrating N. into S. Paulo, under the name of Serra das Almas.

The Yapó, Capivary, Itararé, and other rivers which rise further E. traverse this terrace in deep beds, at an average level of 900-1,000 metres.

Guarapuava and Porto do União are in the Trias.

The fourth and last terrace, further W., is comprised principally of traps, degenerating into sandstones, and has an average elevation of 1,000 metres.

This zone is noteworthy for the fantastical groups of isolated rock masses, typically exemplified at Villa Velha near Ponta Grossa, where the softer strata have entirely disappeared.

In this terrace there are vast intercalations of eruptives, and, here and there, beds of shales and schists which pass into conglomerates.

Most of the rivers rising in this terrace flow W. towards the Paraná basin.

N.W. of the Paranápanema, the cretacean formation is separated from the Permian by a band of Trias, which forms the rocks fronting the Uruguay and Paraná valleys.

The latter river, and its affluent, the Tieté, are plain evidence of the great upheavals to which the country has been subjected.

The famous red earth of the coffee zone in S. Paulo is disintegrated trap, and the many cascades and tremendous falls of the Iguassú, etc., are nearly all due to intrusive dykes of eruptives, over which the rivers have had to force a passage.

Most of the rocks forming the Serra do Mar chains are extremely ancient and of a very laminated

nature, at times intermingled with crystalline schists.

Spurs are thrown out in Santa Catharina, one, the Serra de Jaraguá, S. of the Rio Negro, and another, the Serra do Mirador, presenting a great mountain mass which divides the river Itajahy into N. and S. branches. Quite recently a new volcanic area has been discovered in this range, the nepheline rocks being similar to those in the state of Rio. The sandstones of the southern plateau are frequently vitrified, and nearly always covered by a thick sheet of diabase-porphyry, containing augite, plagioclase, magnetite, ilmenite and traces of olivinite.

At Itajahy micaceous schists form the cliffs at the harbour entrance.

In the southern part of Santa Catharina the (Orleans) conglomerate is 6 metres thick, and below this is 27 metres of shales and sandstones covering the granite.

At Tubarão the Permian formation attains 32 metres, and at S. Jeronymo, Rio Grande do Sul, only 16. On the road from Estreito, opposite Florianopolis, to Lages, in the Serra Geral, the depth to bedrock is as much as 272 metres, and further W., north Paraná-S. Paulo, it increases to upwards of 350 metres.

One of the most pressing problems in connection with Brazilian progress lies in the assurance of a constant water supply in the future.

Rainfalls have diminished all over the country, and are due to various causes.

Many rivers have gradually evaporated or sunk to lower levels. Waters are, strangely enough, cool by day and warm in the evening. The decrease

has been notable during the last 150 years, and is not always attributable to devastation of forests, as, in the Amazon valley, whole districts are now permanently above high water mark, where formerly subject to periodical inundation. Manáos itself was on the River Amazon in 1750.

Dr. Alvaro de Silveira, "As Florestas e as Chuvas, B. Horizonte, 1916," remarks that it is not many years since steamers could proceed from Pirapôra to Sabára on the Rio dos Velhas. The latter river, whilst still possessing some deep reaches, is hardly navigable by canoe to the city named, and the Morro Velho Mining Company is actively helping to silt it up by depositing every day many cubic metres of sands into its stream above Sabará.

Since the foundation of the Republic, more than a million persons have left Bahia and N. Minas for a less arid part of the country, state authorities having no means of combating the evil.

Dr. Branner is of opinion that the whole of the lagoons in S. Brazil (Rio Grande do Sul) will eventually be choked up through the deposit of detritus, not because of evaporation, although the rainfall in this zone is far less than that in the semi-tropical regions of Brazil. (See Climate.)

In Matto Grosso and Goyaz, where no population ever existed except a few tribes of nomad Indians, the same phenomena is apparent.

In Minas Geraes, such rivers as the Verde, 138 kilometres long, Calhão and other tributaries of the Arassuahy in the N.E. are almost dry after April.

The same thing happens on the Bahia plateaux, and there is a strange diminution of the electrical

or dry storms so common formerly on the table lands.

Many towns in the state of Rio itself are short of water, and in the Federal Capital the supply per head dropped from 59 litres in 1847 to 20 in 1860.

The rainy system is no longer normal, hot, dry spells being succeeded by the most violent and sudden storms, two downpours in 1918 (February and December) being responsible for tremendous damage. On one night of the latter month a display of the most vivid and continual *blaze* of lightning lasted several hours, and, strange to say, was almost entirely unaccompanied by thunder or rain.

Palæontology

The pioneer of this science was undoubtedly Dr. Lund, and the results of his explorations may be seen in the National Museum at Rio de Janeiro, and in that of the Museum of Northern Antiquities at Copenhagen. The famous Danish scientist explored more than 250 caverns in the Lagôa Santa district of Minas Geraes. More than 100 species of Mammiferes were discovered, in these relics of what is presumed to have been the Quaternary period, many of which show near relationship with those from deposits of a similar age in Europe. Of these, twenty were of rodents, including two cavies, *Myopotamus*, *Lepus*, *Carterodon* and *Lagostomus*. Twenty-six species of edentata, amongst which a *Pachytherium*, two *Megatheriums*, *Heterodon*, *Sphenodon* and *Coelodon*, were conspicuous by their size. Several kinds of marsupials were represented. The fossil armadillo was equal in size to an ox, the *Smilodon* had fangs four inches long, and some of the other animals were larger than the

living hippopotamus and rhinoceros. Simians belonged to the *Cebus, Hapale, Callithrix,* and *Protopithecus* families. Amongst other noteworthy remains those of *Canis speculæs, Tapirus, Equus lundi* (Boas). This is a prehistoric zebra with cloven hoofs, and was larger than the horse. The *Mastodon*, five felidae, antelopes and a leptotherium, may be noticed, as well as an emu and a rhea. In all 115 mammals (50 genera) were found. Fifteen of the species were entirely new to science. The fossils were, in many instances, metamorphosed into marcasites and calcites. Dr. Wallace says quaintly enough, that it was fortunate for man that he did not exist in any numbers at the same time as these monstrous beasts.

Dr. Goeldi said that judging by a very degenerate modern survivor (*Bradypus tridactyles*), that he had in captivity for some time, they had no intelligence beyond that of knowing when it was feeding time.

Dr. Richard Krone found in the limestone caverns of Yporanga in the Ribeira do Iguape, São Paulo, in 1897, under ancient stalagmitic encrustations, the fossil bones of rodents, *peccaries, Cervus, Felis onça* and a *Megatherium* the size of a tapir; and Dr. Ule in more recent explorations in the same locality came across remains of the mylodon in the Corrego Grande cavern.

At São José do Rio Preto, in the same state, at a depth of 26 metres, many fossil remains were discovered including those of saurians, and the gigantic miocine tortoise, of the same family as those in the Argentine Pampas. Here, in the hard rock, below alternate layers of sandstone and red earth, well preserved bones of the Dinosaurus and alligators were found mixed with pebbles and ferru-

ginous clay, etc. In the Baurú sandstones many fossil molluscs (*Mutelidas*) as well as a *Pleidon* of a species hitherto found only in the Central African lakes, were excavated from the bed of a lacustrian deposit, together with the remains of many ganiod fishes.

In Ceará the Mastodon was evidently of colossal size, a tusk more than a metre long being found.

Other fossil remains include those from the Turundundum cave in Goyaz, some rib bones dug out in 1906 being $2\frac{1}{2}$ inches wide.

Most of the caverns and grottos in the valley of São Francisco river, etc., are in the limestone, a few only excavated in soft sandstone formations.

Fossils of the Coal Measures, etc.

The most interesting fossil remains discovered in South Brazil were those of *Mesosaurus brasiliensis*, a reptile of small size, at its largest not exceeding a metre from tip of snout to end of tail. Many fragments of this saurian were found near Iraty station (S. Paulo-Rio Grande Railway), Paraná, in bituminous shales. It was an aquatic creature with a long jaw and numerous fine needle-like sharp teeth, well adapted to enable it to subsist on small fishes. It is considered by Professor MacGregor, of Columbia University, N.Y., to be a new type of proganosaurian. From the Permian rocks.

Scaphonyx Fischeri. This fossil reptile was discovered by Dr. Jango Fischer in 1902, at Serrito (Rio Grande do Sul). Probably a *Dinosaur*, it is the first fossil land reptile found in South America, which belongs to the same extinct fauna as that of the South African karoo. It was considered by Dr. A. Smith Woodward of the British Museum to go back to the primitive Mesozoic period.

Fossil fishes have been obtained in the bituminous schists of Taubaté (São Paulo), including fresh water silurians, characinidæ and small acarâs, bagres, lambarys and other contemporaneous varieties, although several kinds are quite unknown at the present time.

Erythrosuchus. This fossil reptile has been found at Santa Maria (Rio Grande do Sul), thus forming another link between the Santa Catharina system of Brazil and the South African karoo.

In Vol. VII of the archives of the National Museum at Rio an exhaustive account of most of the Brazilian invertebrate fossils is given by Dr. White, the American geologist who examined the coal measures recently, and the trilobites of the Devonian series of Pará are studied by Mr. Clarke in Vol. IX of the same publication.

Dr. Branner (*op. cit.*) says that the fossils of the coal measures in South Brazil are of fresh water origin, whilst those in the corresponding formation in the Amazon valley are distinctly marine, another proof that the whole of this latter region was at one time covered by an immense gulf, which, as already stated (see Geography), at one period was converted into a sea, separating North and South America.

The fossils principally studied up to date, are those from the cretaceous rocks lying in detached basins, from Amazonia southwards, extending to 18°. In the opinion of Dr. White, the fossil remains differ considerably from those of contemporaneous age from any other part of the world.

Of the 82 species of conchifera examined, most are from Sergipe,and the remainder from Pará and Pernambuco. The gasteropods predominate in the river Piabas, in Pará, and at Maria Farinha in Per-

nambuco; cephalopods and echinoideas in Sergipe. Usually these conchifera are imperfect, but they present many beautiful forms. Some ammonites have a diameter of 20 centimetres. Fresh-water molluscs occur in layers, forming at times calcareous strata, in the Monserrate shales in Bahia, and near Pojuca (São Thiago) in the same state, including sphærium ativum, pleurocera, neritina and planorbis; besides varieties of liaplacodes, and other small fossils, not exceeding 5-6 centimetres in length; the types in every case corresponding to living species from the same basins.

A monograph issued in 1913 (Dept. of Geology, Ministry of Agriculture, Rio de Janeiro), deals with fossils from Paraná, and includes many trilobites, cephalopods, gastropods, etc., nearly all of which occur in the sandstones which, according to Dr. John M. Clarke, the author, belong to the early Devonian (old red sandstone) period; later and sedimentary forms being entirely absent; and he maintains the close relationship of the fossils of this region with those of other austral or southern formation of the same geological age.

(See pages 279-380 (" Geologia Historica ") in the 2nd (1915) edition of Dr. Branner's work; Alves, Rio Janeiro.)

CHAPTER XXIII

MINERALOGY. PART I

Achroite (colourless tourmaline)

Sometimes found amongst the other varieties in Minas Geraes. Most specimens have a faint tinge of race.

Actinolite (near Nephrite)

Small clear crystals at Brumado (Ouro Preto) in the talcose schists. Hardness 5·5. Specific gravity 2·98.

Albertite (solidified petroleum)

Near Lages (Santa Catharina).

Amethysts

Occur in nearly every state in Brazil, but principally in Rio Grande do Sul, where a great drusy cavity was discovered in the Serra do Mar, 2,000 feet above sea level. From this exceedingly valuable deposit no fewer than 15 tons of crystals, more than an inch long and of the deepest purple colour, were extracted and sent to Dusseldorf Exhibition in 1902. Amethysts are also plentiful at Itaberava (Ouro Preto) and at Bom Jesus das Meiras (N.E. Minas Geraes) and S.W. Bahia. Specimens have been found half violet, half yellow. The export tax from

Minas Geraes is 300 reis per gramme, or 4 per cent. of the estimated local value.

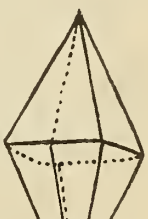
It is found near Coimbra (Matto Grosso) in druses. A crystal belonging to Dom Pedro II was 8 × 3 centimetres, a perfect prism, and deep violet in colour. One cut gem (see "Brazil, 1913") in the British Museum of Natural History weighs 334 carats. The world-famed house of Krantz (Bonn) advertised a crystal 25 × 16½ centimetres. This stone is found in banded zones, alternately purple and colourless. It has a peculiarity. When the violet hue fades on exposure to great heat, it may be restored and even intensified by contact with radium emanations.

Analcime (analcite)

At Itapura, N.W. Railway (São Paulo), and amongst the Zeolites at Rio do Peixe (Santa Catharina).

Anatase (Brookite)

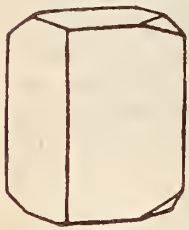
Has a brownish, adamantine lustre. Common in the diamond-bearing gravels in Minas Geraes, in small, clear octahedrons, often mistaken for the precious gem itself. Too soft for cutting. Occurs also as prisms in the schists and alluvials at Capão da Lana, amongst the topazes, near Ouro Preto. Found imbedded in quartz, and in detached crystals. This (Titanium Dioxide) is sometimes encountered in rose-coloured octahedra, with sub-metallic lustre in the valley of the Ribeira do Iguapé, São Paulo, in the old gold placers.



ANATASE.

Andalusites

In fine crystals and rolled pebbles at Minas Novas, in different shades of grey, flesh colour, brownish-red and green. When encountered in perfect pieces (now very rare indeed) is dichroic to such an extent that it may be taken for an alexandrite. This latter gem is, however, not known to exist in Brazil. Some specimens from the Serra do Botucatú (São Paulo) are pale salmon pink. A nice ring stone when clear, and of sufficient size. A splendid gem exists in the Museum of the School of Mines at Ouro Preto, and it is in all probability one of the best, if not the finest, in existence. That in the British Museum, weighing 0·62 grammes, is not to be compared to it.



ANDALUSITE.

Early in 1913 two were sold by auction in Paris. They weighed about 2 carats each, and were described as exceedingly rare. Their colour, and that of sixteen others, was a clear green.

These rare stones are found at times quite dichroic, hyacinth red in one direction, and green in the other. They are also to be encountered in the Ribeiro do Iguapé, in radiations, and as flesh coloured, water-worn crystals up to a centimetre in length, showing strongly marked plechroism (dark purple and clear green). Dr. Costa Sena, Director of the Ouro Preto School of Mines, presumes that they have originated in quartz veins.

Anglesite

At Macahubas (Bahia).

Anthophyllite

In the Itabirites, near Ouro Preto.

Apatite

In the limestones of Jacupiranaguinha, São Paulo, at Salinas, N.E. Minas, also attached to mica crystals in the "Tunnel Novo" at Leme, Rio Janeiro. These latter are pale yellow-green, 1 to 2 centimetres in length.

Apophyllite (Albin)

At Araráquara, São Paulo, in white and green crystals, also from Uberaba, Minas Geraes, and in opaque, flesh coloured nacreous crystals from the Rio do Peixe (Santa Catharina).

Arsenic

Minas do Rio de Contas, Minas Gereas, and Cannabrava, Bahia.

Asbestos

Deposits formerly existed at Taquaral, near Ouro Preto, and the mineral exists in Rio State, Serra da Estrella, at Piabas, in Bahia, and other places, but I have not seen any of the first quality.

Atopite

In the manganese workings at Miguel Burnier, Minas, close to the railway line, in red and honey yellow crystals, also in octahedra, on pyrolusite, at the same place.

Azurite

At Conceição da Serra, Minas, with mamillary masses of Malachite, and in the well known copper deposits of Central Bahia, near Bomfin.

Baddleyite (see Brazilite)

Was discovered by Dr. Hussak in 1892, at Jacupiranga, São Paulo, in pyroxenitic sands. Distinct crystal forms. Dr. Orville Denley named this mineral Jacupirangite. Sp. Gr. 5·006 (Hussak). Analysis: Oxide of Zirconium, 96·52 per cent.; Silica, 0·70; Iron, 0·41; Aluminum, 0·43; Calcium, 0·55; Alkalis 0·42. Found also in the Caldas region. A botryoidal variety from this zone gives an average of 96-97 per cent. of zirconium oxide.

See Mineral "Foote-Notes" (Foote Min. Coy., Philadelphia), November, 1916, March, 1917, March, 1918.

Barytes

At Araxá (Oeste de Minas) in green masses, and close to Antonio Pereira (Ouro Preto) in white crystalline deposits. In 1916, 45 tons were mined by the company working Passagem gold deposits. Occurs also on the Capenema property a little beyond Marianna in the same district.

Beryls

All shades of blue and sea green. Aquamarines, colourless, and pale gold beryls are found in the N.E. of Minas, especially in the Arassuahy, Minas Novas, and Theophile Ottoni Municipalities. The principal area commences at the river Itamarandubá, running thence N.E. to the Piauhy, near the mouth of the Arassuahy, and on to Boqueirão, Porteiras and Salinas. The stones are found in pegmatites, or in the surrounding debris.

In the Itamarandubá, the finest gems are taken out of the quartz veins.

One of the principal centres of the export trade in these stones, was, until the outbreak of war,

Marambaia island, and vicinity, on the river Mercury.

The world's record in precious stones belongs to the Aquamarine found in a cata or pit at Marambaia, in 1910. A Syrian, named David Mussi, was the lucky finder of the wonderful mass, weighing 112 kilogrammes. Its length was 45 centimetres, diameter 38 and girth 1 metre 23 centimetres. It was dug out of a vein of pegmatites, which had long before been considered as worked out. In form, an almost perfect prism, the gem was absolutely transparent, and a beautiful greenish-blue in colour. Sold locally for 58 contos of reis (£3,000), it was taken 72 kilos on mule back, as cart traffic was impossible. Sent to Idar, in Germany, its value was estimated at £50,000. Unfortunately, owing to the want of a wealthy private purchaser, it was cut to pieces and distributed all over the world.

A splendid sea green stone is in the National History Museum in London. It weighs 875 carats (cut). This is known as the Hope beryl, is of an oval form, measuring $1\frac{1}{2}$ inches in length, $1\frac{1}{2}$ in width and 1 inch in thickness, having cost the banker £12,500.

Other fine gems include: A stone from S. Matheus, Minas Novas, 15 lb. in weight, found in 1811, together with one of 4 lb. In 1814, excavations at Vallongo (Rio City), brought to light a beryl of 14 lb., and several others, all found in pegmatites in the gneissic rocks. The largest stone was sold for £1,500, and another, 7 inches long and 1 inch thick, £600. Many opaque, valueless crystals have been found near by.

A beautiful greenish-blue stone weighing 12 kilos, was sent to the Brussels Exhibition in 1910, and

later, bought for 35 contos by the National Museum at Rio. In June, 1915, this was stolen, and the police were only able to trace some fragments.

Another splendid gem from Ilha Alegre, Arassuahy, was recently sold for £45,000, and a Golden Beryl discovered at the same place weighed 180 grammes. This is probably another record in Beryls.

The Marquis de Dree (Paris) had a *faisceau* (sheaf) of 7 hexagonal prisms of a clear greenish blue, 14 × 10 centimetres.

Some new forms of aquamarines have been put on the market by Dr. Krantz of Bonn. They were found at Barra das Salinas (Minas), and are of a curious tabular construction, occurring in lepidolite (lithia mica) with Rubellite. (See Tourmalines.) Prices from 150 to 450 marks.

These stones are also found at Bom Jesus das Meiras, and Jacobina (Bahia), etc. Specific gravity, 2·68-2·75. Hardness, 7·51-7·69. Also in the River Goaratúba in the state of Paraná.

Bindheimite (Antimonate of Lead)

With Blende, at Morro do Bule, Ouro Preto.

Bismuth

Radio active sulphides, with Uranium, at Encruzilhada, on the chapada, S. of Porto Alegre, also at Campo Formoso, Minas.

Blende

Sulphuret of Zinc, at Henrique Hargreaves, on the Ouro Preto branch railway in the eruptives of the Parahybuna valley, in contact with Calamine, and Argentiferous Galena at Abaeté, and other localities in Minas, also near Milagres in Ceará, and in the Spitzberg hills by Blumenau, Santa Catharina.

Brazilite with Baddleyite (Limestone District of Jacuperanga).

See "Revista Brazileira," Rio Janeiro. 1 de Maio, 1918. Fibrous, botryoidal and columnar types. Specific gravity, 5·533 (Hussak). Oxide of Zirconium, 97·19 per cent. The Foote Mineral Company has registered the title "Zircite" for this mineral in the United States. It contains traces of Titanite. Analysis of (eleven) different samples varied as follows: Slate grey pebbles (favas), 93·18. ZrO_2, TiO_2, 69·0. Specific gravity, 5·245. Brown pebbles, 81·75 per cent. ZrO_2. 50/$Ti.O_2$. Specific gravity, 4·850.

Average grade massive ore, 84 per cent. oxide. Maximum Titanium contents, 1·84 per cent. Lowest grade ore, 68·93 per cent. oxide. Some of the ore is blue black, but it varies greatly in colour, being found in all shades of grey and brown. A new *unnamed* (1918) silicate of zirconium, 67 per cent. pure, is associated with zircite.

The mines lie in the well-known district of Caldas, on the Mogyana Railway, via Campinas, S. Paulo, but some distance from the line. Blocks and boulders occur up to 30 tons in weight. This district is noteworthy in many respects. See *Thermal Springs*.

Value of output in 1916, 16.647 dollars for 104 metric tons. In 1917, 620 tons.

This mineral is said to have been used by the Germans in 1918 in the manufacture of the cannon which bombarded Paris. First exports took place in 1905.

See *Ueber Brazilit ein neues Tantal* (niob), *Mineral von den Eisen mine, Jacupiranga, Sud S.*

Paulo. "Neues Jahrbuch für Mines," 1893. Vol. 2, page 89.

Cachalong

This curious variety of opal is found with the Zeolites, in Basalt at Rio do Peixe, Santa Catharina.

Cadmium (Greenockite)

At Gonzaga de Campos, S. Paulo, and at Bomfim and Santa Luzia (Bahia).

Calamine

Lenções, Bahia, and Rio Formoso, Pernambuco.

Cassiterite

Agglomerations are found in the Euclase deposits near Ouro Preto. (See Tin.)

Cerium

See Monazite, Euxenite, etc.

Cerussite

With Galena at Gonzaga de Campos, S. Paulo, and at Areia, Bahia.

Chabazite

On amethystine quartz. Barra do Rio do Peixe. Occurs as rhombohedric crystals with vitrous lustre.

Chalcocine

With *Dioptase*. Cattas Altas. Minas Geraes.

Chalmersite

A new, rare mineral from Morro Velho gold mine. Bronze yellow or reddish crystals. Very slender.

Chiastolite

Short square prisms. Serra de Brotas, Botucatú, S. Paulo.

Chillite

A great deposit is said to have been discovered in 1917 at Sumidouro de Marianna, Minas.

Christianite (Anorthite)

In Pyroxene at Abaeté (Minas).

Chrome (Lead)

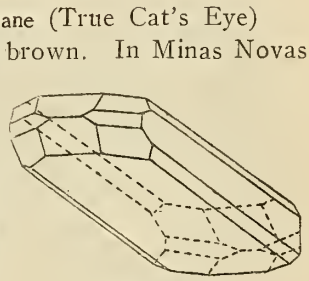
Crystals of chrome (and Chromite of Lead) are found at Congonhas do Campo, near Ouro Preto, in micaceous schists.

Chrome (Iron) in the Serpentine

Recent finds on the Central Bahia Railway are said to be amongst the largest in the world. Hardness, 5·5. Specific gravity, 4·32-4·57. Exports have begun to the U.S.A.

Chrysoberyl and Cymophane (True Cat's Eye)

Yellow green to golden brown. In Minas Novas district in small pebbles. In the Gravatá, Neves, Novo, Calhão and other streams in quartz veins, cutting the gneiss, and in auriferous clays and gravels. Mawe, "Precious Stones," 1816, mentions a crystal $\frac{9}{10} \times \frac{6}{10}$ inch. A gem (cut) in the British Museum of Natural History, London, weighs 43 carats. It is a clear yellowish green in colour.



CHRYSOBERYL.
Typical crystal form.

New localities include Itabira do Campo, Minas Geraes, and the river Canóas (Rio Grande), São Paulo.

The Marquis de Dree had what was considered a unique Cymophane of a dark green colour measuring 10 × 9 millimetres. The ray was perfectly defined.

Herr Richard, a collector in Rio, found a few years ago in the serra above Collatina, Rio Doce (Espirito Santo) a number of fine green Chrysoberyls of the classical hexagonal shape loose amongst the quartz fragments at the top of a hill. These crystals (4 or 5 centimetres in diameter) were evidently derived from a vein of this mineral.

Cinnabar

At Tripuhy (O. Preto) in grains in the river bed, also in other parts of Minas, and at Minas do Rio de Contas, Bahia.

Citrine (False Topaz; also Smoky Quartz)

Splendid crystals have been found in the Serra do Crystaes (Goyaz), one of which, a clear yellow brown, was $4\frac{5}{8}$ × 4 inches and valued at £8. This variety of quartz occurs in most of the states, and masses of gem quality are found in the lower parts of the Serra da Estrella near Rio de Janeiro. It is common in Minas, Rio Grande do Sul and Bahia. Colour varies from smoke grey, brown, yellow brown to opaque black. Commonly sold by jewellers and even stone merchants as topaz, but may be easily scratched by a point of the true topaz, and is also much lighter, and possesses no dichroism. A golden-yellow gem weighing 875 carats was bought in Rio for £100, to be presented

to Mascagni, the celebrated composer. A beautiful stone found near Petropolis weighs (cut) 108 carats.

A crystal found in 1913 at Barra das Salinas measures $14\frac{1}{2} \times 10 \times 9$ centimetres. Value £6.

Coal, Lignite, Peat, etc.

Coal

I am indebted for most of these notes to the report of Mr. White, the American geologist charged by the Brazilian Government to examine the southern coal fields in 1904-1906, and also to the *Bulletin* of the Geological Commission by Dr. Eusebio de Oliveira, published in May, 1918.

The geological features have been dealt with elsewhere.

Commencing in the State of Rio Grande do Sul, near the Uruguay, frontier, outcrops appear all the way from Serro Chato Station (Bagé-Rio Grande line), in the Herval district, through Candiota, where 4 veins are separated by clay bands, and where the seam has a total thickness of 9 metres, and rests on clay iron stone, with a very high percentage of mineral. Below this, sandstone with veins of limestone and patches of Iceland Spar, and lower still, deposits of graphitic and mica schists.

Continuing N.W., the coal beds are visible at intervals at Rio Negro, Suspiro, S. Sepé, and Irapuá, and thence run more inland towards the river Capivary.

Butia mine, 30 kilos from S. Jeronymo, on the Jacuhy, judging by soundings taken to the 60 metre level, contains mineral calculated at 3 million tons.

The calorific power of this fuel is calculated at 5,500-6,000.

Recent borings have been made, with results as follows at Xarqueadas, where shales and sandstones continue to about a thousand feet in depth, with the following seams of coal intercalated: At 275 metres, 78 centimetres, 10 centimetres of coal; at 278 metres, 78 centimetres, six feet of coal; veins of 60 centimetres, 13 centimetres, 80 centimetres and 30 centimetres occurring between the above depth and the bottom of the boring. At another trial, 18 kilometres South, a vein of 13 feet in thickness was found, as well as 14 small ones totalling 7 feet 3 inches, in a depth of 645 feet in all.

The S. Jeronymo Company at the end of 1918 is in a position to extract 20,000 tons a month, and hopes to get three times this amount monthly during 1919.

Shares of this concern, nominally worth 50$, fetched 167$ in August, 1918.

Two thousand persons are employed in and around the mine.

This coal, when purified or washed, is separated into two qualities, the first, 32 per cent of the whole, containing only 14 per cent. of ashes and 0·6 per cent. of sulphur, and the second, 42 per cent. of total, 27 per cent. of ashes and a very slight percentage of sulphur.

The S. Jeronymo Company has contracted with the Central Railway to supply 50,000 tons of coal during 1918.

Another concern is already in working order, and it is expected that at least 600,000 tons will be exported from the district this year.

Serious remedies are really necessary, the mineral costing at least four times pre-war prices.

Cost of coal from S. Jeronymo is reckoned as follows: —

Price at the pit's mouth . . .	5 $ to 7 $000
Transport to Rio Grande port .	5 $ to 5 $500
Pulverization on spot	1 $ to 2 $000

Total F.O.B. 11 $500 to 14 $000. Freight to Rio Janeiro 12-$ to 15 $000.

Total maximum price, say 28 $000. Coal from Cardiff cost in 1914, 35 $.

It is unlikely that prices will ever descend again to this level, but it must be borne in mind that Brazilian coal, at least in bulk, is equal to not more than 70 per cent. of the best Welsh, in any case.

The Rio Grande do Sul beds continue on into Santa Catharina, but sink below the alluvial basin of the former state, to a different level.

At Tubarão, the region consists of yellow and white felspathic sandstones, intersected by bluish-grey shales, in which the carboniferous strata occur.

The Santa Catharina fields run south to north through Cresciuma, Treviso, Rio Bonito, Urussanga, etc., to Tubarão. A railway extension will reach the south limit before long.

The two basins, Barro Branco and Rio Bonito, have an area of great extension.

The different veins at Rio Bonito in borings to a depth of 190 metres, through clay, shale, and slate, contain 4½ metres of coal, the narrowest sections measuring 3 metres.

Barra Branco coal contains from 14 to 28 per cent. of ashes, and about 1 per cent. of sulphur.

Tubarão. Present monthly output, 1,500 tons.

Trevisto and Belluno. Not yet exploited.

Crissiuma. Exported *via* Laguna, and burned by the coasting steamers using that port.

Urussangá. The coal available for use in this basin is estimated by Dr. Gonzago de Campos, at 30 million tons.

Coal measures in Paraná commence on the Rio Negro, at Barra do Rio Canivete, and, pursuing the north-west direction common to all the fields, cross the main lines of the São Paulo-Rio Grande Railway at Teixeira Soares, 80 kils. south of Ponta Grossa, and pass near Imbotuva and Cedro, to Marçal, and the basin of the Rio Tibagy, in the valleys of the Cinzas and Peixe rivers, the country rock consisting of sandstones and shales. A branch line from the Jaguarihyva-Paranapanema railway, will be constructed in the current year.

In São Paulo there are narow seams between the Rio Feio and Tatuhy, also close to Cerquilho on the Soracabana Railway.

Analysis of the best qualities of coal in Brazil, gives the following results: Combustible, 42 per cent.; Sulphur, 0·6 to 1 per cent.; Ashes, 27 to 28 per cent.

New fields have been discovered in the Itapicurú valley (Maranhão), but the mineral is very bituminous.

At Quixambinha (Pernambuco), a new area covers 18 square leagues, and the coal is found 20 metres below the surface, under clay, mixed with sand and carboniferous matter. The percentage of cumbustible is about 58, and the contents in ashes 21 per cent.

Dr. Gonzago de Campos, Director of the Department of Geology, says, "There are very extensive coal fields in Matto Grosso and Amazonas, but they lie at a much lower level than those in the south, being covered by the Cretaceous and Tertiary formations."

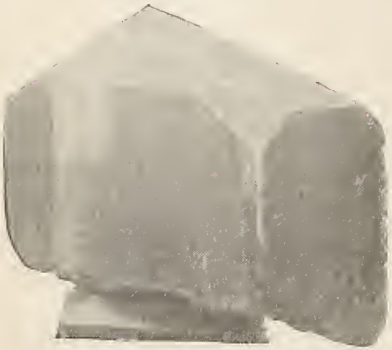

C. CUMPRIDA

ESTRELLA DE MINAS DIAMOND, 1909, 174½ CARATS. FOUND AT BAGAGEM.
Slightly reduced in size.

WHITE TOPAZ. 2⅜ inches high.

THE ESTRELLA DO SUL DIAMOND, FOUND AT "BAGAGEM" (MINAS GERAES) IN 1853.
Weight, rough, 250 carats; cut, 125 cts.
Natural size.

EUCLASE.
28 × 20 × 10 millimetres.
Value £75.



GREEN TOURMALINE.
2½ inches high.

BLUE BERYL. Natural size.

Many coal deposits which have been neglected hitherto by reason of the inferior quality of the mineral, are extremely valuable as producers of low power gas for the purpose of driving machinery of all descriptions.

Experiments have shown that all the Brazilian coal, when pulverized, gives results equal to any other, waste being eliminated in this process.

Works have been set up at Barra do Pirahy, the São Paulo-Minas Railway junction, for the purpose of crushing and washing the mineral, and others will be installed at convenient points on the Brazilian Railway system, and, probably, at the mines themselves.

Lignites, Peat, etc.

There are two great deposits of lignites in Minas Geraes, one at Fonseca, and the other, and better known, at Ganderella, near the line to Santa Barbara (32 kilometres).

The thickness of the brown coal here is a little under 4½ metres, and it contains 43 per cent. of fixed carbon. A company is already organized for the purpose of exploiting the mineral contents of this basin, which, besides 4 million tons of lignite (calorific power 6-7,000), contains a great deposit of fine marble, etc. A branch line of rail must be built.

At Caçapava (Rio-São Paulo Railway), there is a minor basin, with perhaps half a million tons of lignite. This is now being worked.

At Bom Jardim (Sul Mineira Railway), a peat bog is successfully exploited, and it is said to yield mineralized matter containing from 60 to 70 per cent. of carbon. The seams of peat are intercalated with fine white kaolin veins 20 centimetres thick. With

135 to 152 lb. of pressure, locomotives burning briquettes made from this mineral can easily mount the very heavy gradients to this deposit, lying quite close to the railway.

Sir B. Redwood, an English expert, says, however, that many of the presumed peat bogs are bituminous shales or schists, of eocene age, lying between the spurs which run east-west from the Serra do Mar in Tertiary basins.

A well-known area is that of Macahé (Rio State; Leopoldina Railway).

Substitutes for Coal

Piri-piri (*Papyrus brasiliensis*). A process has quite recently been perfected by Professor Hoering, and a technical report presented to the Egyptian Government by Dr. Hollander, of the Berlin (Charlottenburg) College, is most encouraging, from the point of view of the utilization of the vast quantity of this plant found in the swamps near Rio de Janeiro. A company was floated in London (February, 1912) to exploit the Egyptian deposits, and there is no doubt whatever that a great opportunity lies in front of capitalists prepared to take out a licence and exploit the plant in Brazil. Analysis of prepared stalks gives 89 per cent. of combustible matter. A factory capable of turning out 50,000 tons of briquettes yearly will cost £35,000 to erect in Egypt, and probably considerable more in Brazil, but the cost of production should not exceed £1 per ton and the sale price reach 30s. a ton easily. This plant is a great hindrance to navigation, and its growth is so rapid, that when cut down to the water's edge, it springs up again several feet in 6

weeks. Expenses in Egypt are assumed not to exceed 12s. a ton.

Cobalt Bloom (Erythrite)

With asbolite and wad, near Diamantina.

Cohenite

In minute crystals in the Bendigo meteorite.

Columbite (Tantalite)

At Ramalhete, near Peçanha Rio Doce valley, Minas Geraes. A block weighing 3 kilos was shown at the Centenary Exhibition of Rio Janeiro, 1908. Samples from Santa Anna de Suassuhy were several kilos in weight, and were found in a mica deposit. They contained 77 $\frac{8}{10}$ per cent. of niobic and tantalic acid, 14 $\frac{1}{5}$ per cent. protoxide of iron, 5$\frac{1}{2}$ per cent. of manganese, and 0·28 per cent of tungstic acid.

Copper

The principal deposits are at Camaquam (Rio Grande do Sul). The mineral occurs here in gabbro and sandstone. Four veins have been worked, and the ore concentrated on the spot to 28 per cent. pure. Each ton of mineral contains 30 grammes of gold. Exportation in 1907, 1,464 tons. In Serra Martinho, the mineral is a sulphuret, with pyrites, and contains 7 to 25 per cent. of copper. In the State of Bahia the Carnahyba deposits are in the form of carbonates, Chrysocolla, Azurite and 70 per cent. Malachite. The field is large, but at present is unworked. There are also copper deposits at Minas de Pedra Verde in Ceará, and at Grajahú in Maranhão.

A large mass of native copper is exhibited in the University Museum in Lisbon. It was found isolated in Bahia, and no other pieces of any size have ever been discovered. Its weight is 1,224 kilos. It was excavated at Cachoeira, 120 kilometres from Bahia city, and is now in the Polytechnic Museum at Lisbon. Mawe speaks of masses of native copper on the surface of the earth sixty leagues from the capital in the same State.

Some native copper is found in the diorites in Santa Catharina, near Joinville.

See chapter "Brazil," in the "Copper Handbook," published at Houghton, Michigan, U.S.A.

Corundum

In São Paulo, occurs in connection with Monazite, and prismatic brown Tourmaline, in striated masses, full of rutile needles, and white mica in flakes. Found usually in quartz veins, half full of altered and decomposed Andalusite, some of which remains in crystal form up to 12 mm. long. Composition: Silica, 46·49 per cent.; Alumina, 36·62 per cent. Also at Cannasari, Bahia, in white and grey fragments, and crystals, and at Datas, Diamantina (Minas), in rare white tabular crystals.

See Sapphires.

Crocozite

At Goiabeiras, in São Paulo.

Cyanite

From Itabira do Campo. In iron deposits of Cova da Onça, Ouro Preto, and in Passagem mine, in mica schists, and in the peat deposits of Bom Jardim, in the same state. Also Serra do Caraça (Rhaëticite).

Delessite (Chlorite)

At Paranápanema, São Paulo, and in the Rio de Peixe basalts. Main line of São Paulo-Rio Grande Railway.

Derbylite (Antimo-titanite of Iron)

At Tripuhy, Ouro Preto, in conjunction with the Cinnabar, in the river gravels. Resinous lustrous, black hexagons. Sp. Gravity, 4·5. Hardness, 5.

Desmine (Stillbite)

Fine crystals are found at Serra do Botacutú, São Paulo, and reddish radiations and tabular crystals at Rio de Peixe.

CHAPTER XXIV

MINERALOGY. PART II

The Diamond

History

This gem was first recognized in Brazil in 1721, when a gold miner, Bernardo da Fonseca Lobo, working near Diamantina, secured a number of stones, which had been found some years previously, and were used as counters by card players. In 1729, Te Deums, and religious processions took place in Lisbon to celebrate the discovery.

All gold mining in the district was abolished the following year, and a poll tax of 5 $000 established for the slaves engaged in procuring the precious stone, 30 braças of the best land being set aside for the Crown in each Comarca, or municipality. A parcel of selected diamonds had been sent to the Pope in 1729, but in compensation for the purchase of his good will all monks were expelled from the mining zone, and to protect certain interests, no business establishments were allowed within 2 leagues of any mine. Discoverers of all workings were obliged by law to expel all strangers. In 1731, private operations were entirely suspended, and any persons found washing the river gravels were, with their families, subject to banishment to Angola

for 10 years, all their property being confiscated to the Crown. Mining was, however, permitted for the time being, on the Jequitinhonha and Inferno rivers, but the lowest rental exacted amounted to 60 $000 yearly per braça, an impossible tax, especially as prospecting was not permitted in advance.

Ship loads of treasure were sent to Lisbon to bolster up the decaying fortunes of the Court, and provide means for the perpetual and abominable dissipation of the King, Dom João V, a dissolute, false, licentious, and cowardly ruler, who made Portuguese and Barzilians alike pay for his vices. He was, however, a good son of the Church, and did not fail to maintain the traditional position of his country in this respect, paying liberally for a long series of "Compensations" and "Indulgences."

His title, "Rey Fidelissimo," cost him 450 million cruzados, and was transmitted to his male issue.

This profligate wretch pauperized the country, destroyed its agriculture, ruined its industries, army and navy, and died so poor, that there was hardly enough money left in the Treasury to pay for his obsequies.

In 1732, the tax previously mentioned was reduced to 20 $000 annually, but raised again gradually to double this amount in 1734.

At this time, all clandestine mining was forbidden, every diamond having to be weighed, and a declaration signed by the "Intendente Municipal," or Government agent, and a receipt delivered to the seller.

1740-1743. The first contract was made by the Crown. A limit of 600 slaves being fixed, with a poll tax of 230 $000 per annum for each.

The number of miners was raised, undoubtedly with the connivance of the local Government, to 4,000, the contractors becoming virtually masters in the region. They possessed powers of almost unlimited nature, and could, at will, expulse all suspected persons, and confiscate their belongings.

To protect their vested interests, and prevent judicial proceedings, every lawyer was driven out of the whole of the Diamond district, and, in 1741, all persons without definite means of livelihood.

This arbitrary decree was, naturally, directed against those who might seek to bridle their ambition and absolute powers.

In 1732, no fewer than 40,000 were employed in Minas Geraes in this industry, and from this date up to 1771, at least 1,666,500 carats of diamonds, worth £3,600,000, were sent to Europe.

Sugar plantations and spirit distilleries were prohibited under Colonial law, and when the Goyaz mines were discovered, only one road was constructed, in order to facilitate fiscalization of the output.

In 1739, a new decree ordained that all rough stones were to be sent to Lisbon, and every miner was obliged to clear a certain area of ground, and plant it with maize, beans, etc.

About this time, Indian hunting took place on a properly organized plan, in the Province of São Paulo, for the purpose of supplying labour for the mines at Sapucahy in that district.

A splendid crimson gem was found in the Abaeté river in 1739, and sent to the King, but there is no record available as to its weight.

Mawe, the English mineralogist, wrote in 1814, "In all probability, not less than 400 kilogrammes

(2 million carats) of stones, finer in quality than those officially declared, left the country as contraband, in spite of the terrible penalties imposed on all detected."

Negroes who fled from their masters, were branded on the shoulder with the letter F, when recaptured.

In 1746, the diamond was found in Matto Grosso, on the Rio do Ouro, and all miners were incontinently driven out of the Province.

1748. Initiation of third contract, with Felisberto Caldeira Brant and his brothers, the poll tax being reduced to 20$000 per slave, 400 being allowed in the Serro Frio, now Diamantina, district, and 200 in Matto Grosso and Goyaz. A fourth contract was in force from 1753 to 1758, the poll tax being elevated to 240$000, and the fifth and sixth contracts with the same family, from 1759 to 1771.

A certain placer on the river Jequitinhonha, was known as "Lava pés," because the slaves who worked there were able to find so many stones that the day's labour was over at 10 or 11 in the morning, they having, as they said, just washed their feet (lavado os seus pés).

In this placer (serviço), 10,000 oitavos of stones were found, besides a great deal of gold. One of the contractors at this time, João Fernandes, was a king in his district of Tijuco (Diamantina), and one of the most fortunate miners, finding on one occasion a pocket so rich that he fell on his knees beside it, exclaiming, "Lord, if these gems are to be the cause of my damnation, may they be transformed into dross." He took care, however, not to lose any of them.

This man had an ex-slave for his paramour, a

great, gross monster of the colour known in Brazil as Parda, or, in other words, a Mulattress.

She was invariably decked out in the most costly array, and accompanied by a retinue of 12 females a shade darker in hue than herself, and almost as extravagantly dressed, and covered in jewels.

Fernandes built a chapel in his own park for his lady love, and caused a splendid palace to be reared hard by, as well as an extensive lake, on which rode stately a perfect model of a ship, combining amusement and instruction for Madame, as she had never seen the ocean.

He had his own theatre, and was always accompanied by a throng of papa janares (parasites) and bullies.

His fame reached Lisbon at last, and the King sent Condé de Valladares to summon him home. He saw his peril, and did everything to cajole the envoy, offering him nightly for dessert a soup plate full of virgin gold, and paying all the debts of the needy aristocrat.

All his efforts were in vain, and urgent dispatches came from the court, commanding him to leave Minas within three days from their receipt.

He arrived in Portugal safely, but never saw Brazil again, being condemned to pay the Sovereign eleven million cruzados, and was said to have died of a broken heart at the loss of his mistress and his fortune.

Felisberto Brant, of whom we have written, was more successful for a time in hiding his riches, but by some mysterious means the Royal tyrant learned all there was to know; he fell under the displeasure of the Crown, was conveyed to Lisbon in chains, but when the great earthquake took place his prison

was destroyed, and, although free to escape, he threw himself on the tender mercies of the King, who graciously pardoned his enormous iniquities.

Meanwhile his immense properties in Brazil had been sold for a tithe of their real value, fetching, in spite of this, no less a sum than 2 million cruzados.

Descendants of this man are still to be found in Minas, some counting amongst the notabilities of the state (1918).

In 1772 the Government took over all exploitation of the mines, work commencing with 3,610 slaves, all the finest gems being sent to the metropolis as Crown property. In 1801 Portugal was obliged by the treaty of Badajoz to mortgage all the output to the banking houses of Hope and Baring Bros. of London for 12 million florins to pay off its debts to these firms.

The same year Napoleon demanded 10 million cruzados as ransom for the capital, but only a tenth part of this sum was actually handed over to the French.

In 1804, however, another million was paid in order to guarantee Gallic neutrality, Marechal Lannes having, two years previously, received 100,000 cruzados as a free will offering.

Hope had 162,000 carats of diamonds at first, and continued to receive all the output until 1817, when the debt was finally liquidated.

The Royal family carried off with them all available property when they fled from Lisbon to Brazil, but 2,000 carats of stones remained in the hands of the lapidaries at Campo Pequeno, a little outside the city, and these fell into the hands of Marechal Junot when he reached Lisbon.

Dom João VI is said to have sent back to Portugal over 40 millions cruzados' worth of diamonds.

During greater part of the 18th century the gems were sold in parcels by contract, the Portuguese Government entering into arrangements, under which the entire proceeds of the mines were turned over to the firm interested at a given price, and, to enhance their value, Brazilian stones being insufficiently appreciated, they were often sent from Rio Janeiro to Gôa, and from thence to the Mother Country, passing as Indian gems.

Prices averaged as follows: Stones from 2 to 3 grains, 7$600 the carat. 2 to 3 carats, 9$100 per carat. Those weighing an oitava, 608$000 per stone.

From 1743 to 1790 values fluctuated between 7$600 and 9$100 the carat, but in 1788 Cohen, of Amsterdam, contracted to purchase annually at least 40,000 carats at 9$200 per carat for gems under 20 carats each.

In 1832 the diamond fields were freed, but the supply had fallen off considerably. The discovery of a stone of 18 carats purchased the freedom of any slave, and the greatest care was taken to avoid pilfering; but, in spite of all, a great deal took place, as an ancient chronicler pointed out, it being relatively easy, for "it is not possible to prevent a negro the colour of night and shadows, extracting from the earth as many stones as he finds without being perceived." José de Azeredo Coutinho: "As Minas do Brasil" (Lisbôa, 1804).

An immense amount of smuggling was carried on between the diamond district and Rio, etc., one tropeiro (muleteer) travelling to and fro many times,

with the barrel of his matchlock chock-full of the gems, but, like the famous pitcher, he came to grief at last, being denounced by a jealous comrade.

Coutinho (*op. cit.*) said: "Our mines are being exhausted, many of them not paying expenses."

The cost of production from 1772 to 1795 averaged 126 $500 per oitavo, from 1796 to 1801, 121 $775, and from 1801 to 1806, 101 $570.

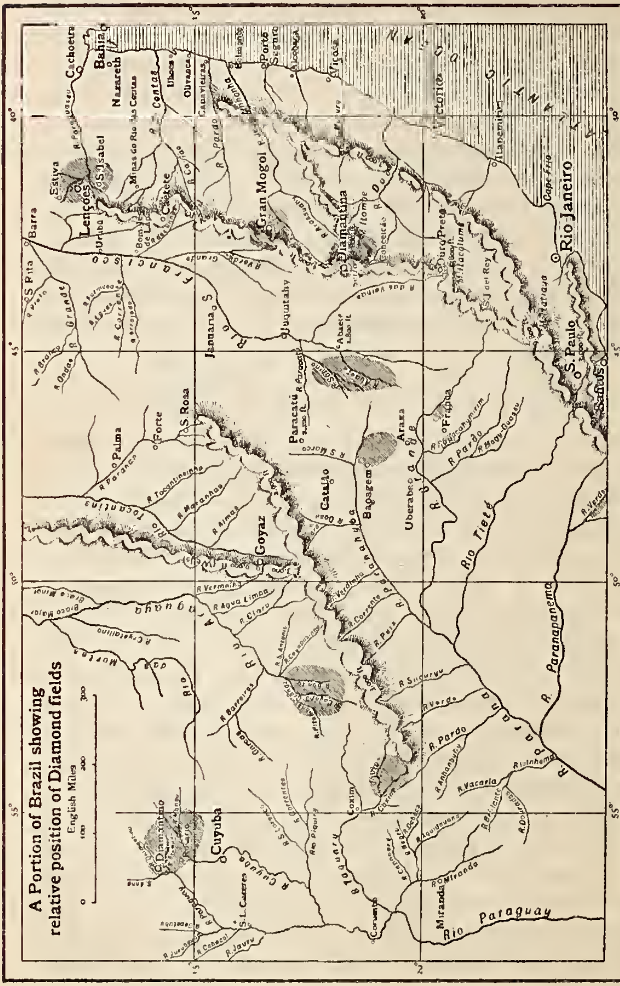
From 1772 to 1843, 1,354,720 carats were sent to Europe, 51,464 stones being taken out of the Poção do Mosteiro on the Jequitinhonha river. Labourers' wages were lowered from year to year, falling from 1 $200 *weekly* in 1772 to 675 reis in 1783.

Diamond Fields and Mode of Occurrence

That of Diamantina is one of the most important. The city is situated 800 kilometres north-west of Rio de Janeiro, and 250 miles in a direct line from the sea coast. It is accessible *via* the Central Railway to Curralinho, and thence by branch line. Time from Rio, 3 to 4 days. The elevation of the district is from 3,500 to 5,700 feet, and the city is situated 18°29′ south and 43°30′ west.

Here are the head waters of the Jequitinhonha, Arassuahy, and Doce rivers. In 1904 there were two lapidaries at work, with sixty wheels, each of which cut 10 carats a month at a cost of 5 milreis a carat, female labour of course being employed.

There is one lapidary in the city of Serro, lying to the south. This area is full of deep ravines, worn by a multitude of streams arising in a saucer-like basin that is filled by the drainings from the tops of the isolated chapadas. This origin of rivers is common in Brazil. The ground in the small hollowed-out plateau is damp and spongy and



THE DIAMOND DEPOSITS OF BRAZIL.

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studded with clumps of high grass. The outer scarps are very precipitous, and in the summer the streams soon attain a rapidity and volume that works out potholes in their beds where the diamond is most likely to be found. In 1847 one of these yielded 10 lb. weight of diamonds and 28 lb. of gold.

The mine at S. João da Chapada, 4 leagues from Diamantina, has been carefully examined. The gems are found in a clay deposit of blue-black colour, with thin layers of kaolin and oxide of iron, as well as in another bed in the same mine, in decomposed schists, with angular fragments of quartz, specular iron and organic matter. The surrounding rock consists of sandstones and schists. The stones here are quite small and of a greenish colour, not averaging above 6 to 8 grains each. The two mines (Barra and Duro) were visited by Dr. Orville Derby. They were abandoned for many years.

Bagagem (Estrella do Sul) and Agua Suja district. The former town is 33 leagues from Araguary on the Mogyana-Goyaz Railway, and is situated on the river Bagagem, a tributary of the Paranáhyba. The fields lie 100 to 140 kils. from Uberaba, 18° 45-19′ S. latitude, and the country rock is Augite porphyry and mica schists. From Uberaba to Agua Suja is 112 kils., and thence to Catalão (Goyaz) 107 kils. The elevation of the country is from 2,500 to 3,500 feet. The distance from Diamantina is 250 miles, and it is situated in latitude 19° 50′ S. and longitude 47° 30′ W. Here the Dresden diamond was discovered, as well as the Estrella do Sul. Agua Suja is 12 miles from Bagagem. The geology of the district consists of schists with granite dykes, crossed by quartz veins, overlaid by level beds of

sandstone, having layers of trap intercalated. In conjunction with the diamonds here are staurolite, rutile, anatase, tourmaline, phosphates, mica, garnets, and pingos d'agua. A large diamond has been found at Uberaba, 60 miles from Bagagem. This town is accessible by rail. Although the Bagagem and Agua Suja workings have been neglected for many years, the discovery of a fine gem in 1910 at the former place has revived public interest, and a new rush has taken place.

Hussak said that the diamond in the latter workings came from the eruptives, which are of a similar nature to those at Kimberley, and later investigation confirms this opinion. Here, in the peridotites, one finds cubic pyropes of 3·69 specific gravity, as well as other satellites peculiar to the Cape diggings.

The region was studied recently by Mr. Draper, who found vestiges of volcanic chimneys. In 1917-1918 Mr. Williams, an American geologist in the service of the Government, made minute studies in this and neighbouring zones, especially in the Matta da Corda, where the chimneys had been located in 1915. Dr. Rimann, then attached to the Geological Commission, having written a memorial on the subject. He said: "According to studies which I made in 1913, in the tunnel of the Serra das Lages, in the state of Rio, I was able to identify dikes of *pikriptoporphyrite* and kimberlite of a dark green colour similar to that of Arkansas, U.S.A., where diamonds were found in 1908, and it is stated that the eruption of these kimberlites took place after the Cretaceous period."

Experiments proving that most of the diamonds in the world were crystallized in the above-mentioned rocks, the greatest interest is attached to the occurrence of these eruptives in Brazil.

During excursions which occupied a great part of 1914-1915, Dr. Rimann was able to investigate carefully the whole of the Matta da Corda region, and definitely locate the volcanic pipes.

Most of the rocks in this region are composed of crystalline schists, with layers of sandstones superimposed, having a thickness from 40 to 100 metres.

Later, enormous sheets of volcanic rocks forced their way through the above strata, and a long period of erosion and formation of sedimentary rocks took place, a crust of sandy conglomerate 10 to 20 metres thick being formed.

This, containing conglomerates of kimberlite-pikritoporphyry, is probably of Jurassic or Cretaceous age. Between Carmo do Paranáhyba and Areado the eruptive intrusions contain a large proportion of Perofskite and Apatite, and Dr. Rimann succeeded in separating the classical yellow, red, and blue grounds.

Crystals of olivine are easily recognized in the breccia.

Mr. Williams, 1917-1918, has defined this area as the table lands between the S. Francisco and Paranáhyba rivers.

Kimberlite (peridotite) was found at Capatezas (Tiros) on the vertente of the river Abaeté, forming an eruptive sheet extremely rich in Perofskite and other typical minerals. Dr. Rimann left the Geological Survey, and kept most of the results of his work to himself.

Dr. Gorceix had, long ago, found diamonds in veins of vitrous quartz.

The pipes, or chimneys in the above, Matta da Corda region, are in the vicinity of the head waters of the Somno and Almas rivers, and at an average altitude of 1,000 metres.

In the Patos district, near by, diamonds have been actually washed out of the decomposed kimberlite.

Grão Mogul, N. Minas Geraes

The discovery of diamonds in this zone took place in 1771, and the gem has been taken from the rock itself. In "Zeitschrift der Deutschen geologischen, 1859," Drs. Heusser and Claraz wrote: "At Corrego do Boi, a quarter of a mile from G. Mogul, there is a great isolated block of itacolumite, which was being slowly broken up by the miners. Dr. Derby denied the presumption that the above was itacolumite, classifying it as a true sandstone, and noting that the former stone is not met with N. of the thalweg of the Jequitinhonha and Doce rivers, near Diamantina, nor S. of O. Preto." He added: "The sandstone is a secondary deposit of the diamond, proving that it, the gem, was formed first, itacolumite and its derived schists being anterior to the G. Mogul sandstone."

S. Paulo

Now and again small stones have been found in the rivers Paranápanema, Paraná and Verde, and this region is a continuation of that of S. Minas Geraes.

A new deposit has been found in the Rio Grande of small clear gems, one of 18 carats being a great exception to the general rule.

Matto Grosso

The principal seat of the diamond mining is the Coxim district. Dr. Reinoehl has found petrified volcanic clays here, identifying them with the *blue ground*. The depths of the cascalho, or pay gravel,

varies, but the maximum is 14 feet. Many stones are also found in the Jurena and tributaries.

The satellites are extremely numerous, and comprise various jaspers, amethysts and chalcedonies, rose zircons, anatase, almandine garnets, white topazes, sphenes, native silver, etc., etc. The diamonds are small, the largest found being 5 carats. The form is usually dodecahedron with well curved faces. The surrounding formation is schists and quartzites. No carbonates or boart is found.

Several dredges have been at work in the river Coxim.

Dispatches from Cuyabá in the month of June, 1913, refer to the discovery of a great number of fine stones in the Rio das Garças, eight leagues from the above city.

Goyaz

A great many of the rivers in this state are known to contain the precious gem, but no systematic exploration has been attempted. Early in 1911 a prospector came into the capital with over 300 fine stones, which he stated came from the Garça, a tributary of the Araguaya, in the Rio Verde district.

Paraná

Diamonds are found, as a rule, in the Tibagy, Yapó, Pitanguy and Cinzas rivers only, but they are found now and then in the tributaries of each of these streams, especially in the Jordan, and close to Tibagy town itself.

The best finds have been in the pot-holes, and sometimes the gems have been taken out of the gravels in the river banks, or in the dry beds of narrow brooks. Here and there, in old water-

courses, the gravel has paid for the labour of washing. Dr. Derby examined this region carefully a number of years ago, and wrote: "It is almost certain that the diamond originated here in the metamorphic series, the sandstones of this plateau corresponding to those of Paleozoic age in Bahia. The finest stones are found in *a hard bluish cement*, with satellites of a different nature to those which occur in the sandy conglomerates of Devonian age, which surround this. Most of the stones are below $\frac{1}{4}$ carat."

Bahia Fields.

Salobro. This region is reached by steamer to the port of Cannavieiras, and thence 56 miles up the river Pardo by canoe to Jacaranda. The deposit, now (1918) almost abandoned, is 12 miles from the river in a swamp which covers the old bed of the stream, the gravel lying 15 feet below layers of soil and whitish clay. These workings date from 1881. Sandstones and decomposed schists occur here, with a thick sheet of conglomerate between, from which the gems appear to have been derived. Carbonates are not found here. Satellites include Monazite, specific gravity 5·15; Almandine Garnet, 4·9; Zircon, 4·39-4·42; and Corundum, 3·7-3·8. Such stones as are found are generally of the finest quality.

The average altitude does not exceed 100 metres, and the locality is unhealthy, the work always being interrupted during the wet and dry seasons, or for greater part of the year.

Chapada Diamantina (Bahia)

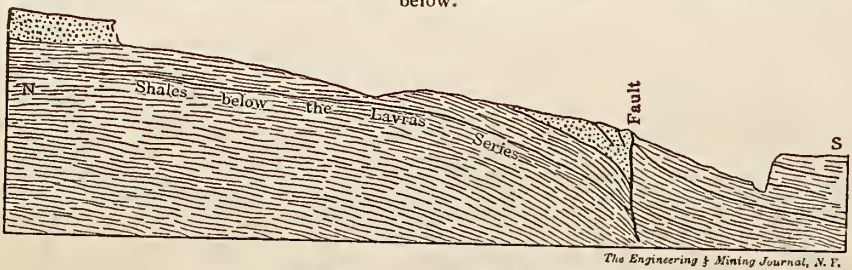
The diamond first discovered in 1839 at Serra Assuruá, and in 1841 at Chique-Chique; also in the

rivers Paraguassú and Montcuge, where 50,000 miners were at work by 1850. From 1852 to 1862 876,250 carats were exported. The chapada is reached from Bahia by steamer to Cachoeira and rail to Bandeira de Mello, thence by canoe or mule up the Paraguassú, the diamond fields being entered above the Andarahy cataract. Dr. Orville Derby quotes 4 distinct geological regions: the first from the source of the river to Andarahy. This consists of a series of hard red sandstone strata, which, after passing the conglomerate, is at least 1,600 feet thick. Very pronounced folds are seen everywhere. See plan by Dr. Branner. This authority terms the main beds *quartzites*, giving the formation a total thickness of 2,200 feet.

This zone is the only one in which the gem is found in any quantity, and Dr. Derby refers their origin (secondary?) to a thick bed of conglomerate in the midst of the sandstone. He calls this *fossil gravel*, giving it a maximum thickness of 23 feet, and says: "On nearly the whole of the Eastern fringe of the serra, between Santa Isabel and Lençōes, the conglomerate forms the surface of the mountain slopes, dipping at an angle of 20° to 30°, and disappearing at the bottom of the Piabas, Chique-Chique, Andarahy, and S. José river valleys, which flank the mountain range, the other sides of these valleys being formed by the sandstones.

The matrix is of carboniferous age. Dr. Branner has the credit of being the first to study the geological sequence of the rocks of Central Bahia, and his discoveries are of the greatest value from the point of view of economical exploitation of this diamond field. Strange to say, although the derivation of the gem may be said to have been finally

Section across Pico Nabuco, showing diamond-bearing beds at the summit, and caboclo shales below.



N.W. section across Riachão da Boa Sorte.
Sitio Cachoeirinha, near the village of Alagoinhas, showing the diamond-bearing strata between the shales, through a fault.

Section N.W. to S.E., from the River São Francisco to the Salitre valley. Showing the general geologic character of the country, for a distance of about 160 kilometres. (By the courtesy of *The Engineering and Mining Journal*, New York.)

discovered, yet very few prospectors have seen the stone *in situ;* almost all the diamonds are found in the débris in the streams, the conglomerate in the dry diggings, in the banks of the rivers, or in pockets below the gravels in the bed rock. Though the most elementary methods have been employed for centuries in winning diamonds, yet the search in all easily accessible localities has been so thorough (as far as the surface gravels are concerned), that it is only in the most out of the way places that the ordinary prospector can expect to find a bonanza.

Each Sunday in the principal centres of the district a sort of open-air market is held. These are attended by the Bahia merchants, who often advance money to reputed miners. The official value of carbons and diamonds is reckoned at 70 $000 the gramme for the purpose of calculating export duty. Monthly remissions abroad before the war did not exceed 500 contos of reis.

Dr. Branner is of opinion that pink quartzites form the main beds, the streams which rise in the Chapada traversing these everywhere. According to geological evidence, the diamond came originally from these rocks, no eruptives occurring in this zone in connection with the quartzites. There is, however, a possibility that the original matrix was a peridotite which has entirely disappeared. Recognition of the present formation, discarding entirely the genesis of this gem, determines the area in which the gem may be sought.

The most productive area up to the present lies between Sincora on the south, and Morro do Chapeu in the north. This may be due to one of two reasons, either the richness of the deposits, or to the abundant water supply. The stones are not

confined to any particular part of the lavras. At Morro do Chapeu they are found in one section of the series, and at Lençōes and Andarahy in another.

At Mosquitos there is a sharp line of demarcation between the upper (productive) beds and the lower (barren) ones. The deposits are in all probability the richest in the hitherto unworkable swampy districts, where dredges would be necessary to deal with the gravels buried beneath 20, 30 or more feet of sedimentary deposits and water. It should be also noted that for many years prior to the discovery of the value of the carbonates these were thrown away, finding a resting place in the rubbish heaps.

Carbonates are harder than crystallized diamonds. Their colour is yellow brown to black. Specific gravity, 3·20-3·78. Surface, rough, opaque. They resemble scraps of scoria from a furnace more than anything else, being difficult to distinguish from the ferrous pebbles amongst which they are found.

Above Bandeira de Mello boats may be used on the river Paraguassú, and the railway will soon be extended to Andarahy and Lençōes. It is interesting to note that the white and highly coloured stones have their angles straight, and the neutral tinted gems rounded.

Itapicurú (Bahia). During 1908-10 a somewhat extensive discovery of diamonds has been made, and it is probable that this small field is a continuation of that of Central Bahia.

Brazilian stones are considered to be 50 per cent. better on the average than those from the Cape, owing to the constant attrition they have undergone for many centuries, thus removing all impurities and incidentally providing for the survival of the hardest and most flawless stones. The largest piece

of amorphous diamond, or boart, came from Bahia in 1895. It weighed 3,078 carats, and at present prices would be worth £50,000. The main source of the diamond lies in an area extending 200 kilometres from north to south, and a hundred from east to west, but the gem has been found in various localities, extending from Northern Bahia to Paraná and Matto Grosso, or from about 10 to 25° south latitude. It is, however, quite possible that the gem may be found in the north of Brazil, and in that part of Guiana within the confines of the Republic. The diamonds in Matto Grosso are presumed by Dr. Arrojado Lisboa to have come from the thin layers of old conglomerates which have almost entirely disappeared, and which rest on the sandstones at the base of the central tableland. Where the rivers are rapid and the country hilly, the climate in most of the diamond fields is quite healthy, but in certain swampy districts in Bahia and Matto Grosso a supply of quinine and mosquito nets ought to form part of the prospector's equipment.

In the Minas Geraes fields, as elsewhere, the potholes and deep pools are of course the richest, but frequently an immense amount of débris from ancient workings has been deposited on the diamond-bearing cascalho, in the lower parts of the rivers.

The deposits above water level have also proved worthy of attention. The Abaeté River is 170 miles long, and varies in width from 200 to 500 feet. Its course is between the Serras Canastra (east) and Matta da Corda (west). The cascalho (gravel) contains jaspers, garnets, gold, platinum, osmium, and iridium, besides thirty other minerals, more or less rare. The Sonno flows into the Paracatú, and has

a total length of 140 miles. The table-lands consist of itacolumite and schists, containing sand and clay. The upper series is a grey weathered sandstone. The formation in the Somno gravels consist of pingos d'agua (rolled quartz pebbles), jaspers, black tourmalines, limonite, rutile, kyanite, martite, and gold, and an abundance of small garnets. The whole of the rivers in this district, and the small plateaux between, are diamondiferous, and contain gold in connexion in almost every case.

Method of Winning Diamonds in Brazil

The diamond industry in Brazil is carried on in quite a different way to that of South Africa. There are no great companies that hold a monopoly of the gems in a very extensive area; and, of course, there are no equivalents of the I.D.B. laws; indeed, such a thing would be quite impossible in Brazil. A licence is easily obtained, and the whole of the diamond fields are full of isolated prospectors, and small groups of men that have amalgamated their capital.

They use the following simple tools: A batea, or basin of hard wood, in which the gravel is washed; a carimbé, similar to the batea, but smaller, and used to carry earth or gravel to a distance when water is not available on the spot. The other implements comprise a crow-bar, a scraper or hoe, and a scoop for clearing out holes, as well as a hammer to break up the masses of conglomerate.

Some of the miners dive into potholes, taking down with them a small canvas bag, kept extended by an iron ring. They fill this with gravel and rise to the surface, continuing until sufficient material has been accumulated to last them for some time.

Those more up-to-date employ a primitive sort of diving-suit, or even an old-fashioned kind of diving bell. In this case, one or more canoes are employed. When sufficient capital is available, the bed of a stream is turned, and a dam constructed.

Storekeepers sometimes make advances and supply provisions, tools, and other necessaries. Others buy claims, and secure perhaps 25 per cent. for allowing more impecunious miners to do the rough work. They take good care, however, to wash the pay-dirt themselves, or to entrust this to those in whose good faith they have confidence. Travelling merchants buy up stones here and there, but most of the trade is done in Bahia. The bulk of the gems go to France, Germany, and the United States.

The miners work only in the dry season, three or four together in line, the first with the largest batea, sometimes 45 inches in diameter and 12 inches deep, and the last one with a small pan, sifting the finest gravel and sand, whilst women go through the débris to pick out the stones which may have been missed. The large pieces of conglomerate are broken by means of a hammer weighing 20 kilos. Explosives are used to break up the boulders blocking streams, so as to get at the pockets, usually the most productive places.

In Matto Grosso and Minas Geraes several dredgers and elevators have been at work during the last 2 or 3 years, but results have not been divulged. The great difficulty to combat is the immense depth to bed-rock in many places, and the interruption to navigation by rapids and waterfalls. What seems to be needed is a light, easily portable dredger with ability to go down to bed-rock, as much as 40 feet sometimes below the ordinary level

of the rivers. At the same time it is a *sine qua non* that expenses be cut down, as that is a very big item, especially in the case of a large dredger. In Bahia and Minas Geraes lands are usually sold to the highest bidder. One good feature of the laws of this state is, that in the case of disagreement between the owner of land and a company proposing to exploit the minerals thereon, the Government acts as arbitrator, fixing the value of the property. Again, no one may refuse leave to prospect undeveloped properties.

Diamonds with flaws, or the rough skin very common to Brazilian stones, are put into a crucible at cherry red heat, heaped round with charcoal and submitted to a blast for 3 to 4 minutes, when the crucible is removed from its charcoal bed and a tablespoon of nitrate of potassium thrown over the stones, and the vessel shaken and held over cold water. As soon as the fumes have gone, the gems are taken out, washed and counted, and are found to have lost 8 per cent. in weight, but doubled in value. The old workings in Bahia are now being washed to recover the carbons formerly thrown away, and there is very little scope for the prospector, except above Andarahy.

In the Diamantina district of Minas Geraes, a good deal of work is still going on on a small scale, in the Garimpos, or placers. The coarse gravel is first passed through a sieve, in order to separate the pebbles, and the material is then put into wooden troughs alongside the stream, built so that the current washes the gravel automatically, the labour is aided by hand, the batea being used to pour water over the cascalho. The fine sand, naturally, is washed away, and the remaining concentrates removed in

smaller wooden basins (gamellas) and carefully washed by hand. Rich ground, of a clayey nature, containing a large proportion of gems, is called sopa. The labourers in this work earn but little, living from hand to mouth, as most of the work is done for the holder of the licence. The average price of land in the district is 2 $000 per hectare, and the lots are presumed to be sold by auction. Some lucky miners have made 500 per cent. on their outlay recently. A new find was made in 1916, in the Curralinho region.

Diamond Cutting

The first lapidary's workshop was started at Lisbon in 1801, by Rodriguez de Souza Coutinho, but the wheels were stopped 6 years later. Cutting was commenced in Rio Janeiro as far back as 1802, by José de Rezende e Costa, work continuing until 1827. The cost per carat was then 5 $000, and the lapidary took 3 $200 of this sum. Apprentices were paid 160 reis daily. Two wheels were put in motion in Bahia in 1870, and small works had been established at Gavea, Rio Janeiro, and were run at intervals between 1852 and 1866, and at the present time, there is little done there, as well as in another shop in the heart of the city itself.

At Diamantina, 1873-1874, cutting cost as much as 20 $ to 24 $ the carat, but a few years later prices fell as low as 7 $. From 1812 to 1830, most of the cutting was done in the National Mint. In 1915, only 3,370 carats were exported from Rio, the official value being 450 $000 the gramme of 5 carats. Total exports from Brazil in 1917 were estimated at £150,000.

PRICES IN BAHIA FOR ROUGH STONES IN 1910

Bons (fine stones), 25s. to 50s. a carat.

Vitriers (small, but good), 50s.

Fazenda fina (small coloured gems), 40s. to 45s.

Melée (imperfect), 20s. to 25s.

Fundos (small, off colour), 10s.

Export tax (Minas Geraes): Rough, 152 $800 a gramme; cut stones, 450 $000 = 1 per cent.

Diamond weights. Oitava, 16 to 17½ carats (nominally). Oitava really equals 32 vintems. 1 vintem ½ carat = 1 $\frac{1}{16}$th drachms avoirdupois. 4 graos = 1 quilate (carat), 2½ grains (1 vintem). Otavo = 3,586 grammes or 64 grains.

Senhor Augusto Brill, of Avenida Central, Rio de Janeiro, has kindly furnished me with the following figures regarding local prices (1911):—

Rough diamonds up to ¼ carat, 15 $000 to 40 $000.

Rough diamonds from ¼ to 1 carat, 50 $000 to 80 $000.

Rough diamonds from 1 to 2 carats, 80 $000 to 130 $000.

Above 2 carats no fixed rates.

Brilliant cut stones up to ¼ carat, 80 $000 to 120 $000.

Brilliant cut stones ¼ to 1 carat, 150 $000 to 250 $000.

Brilliant cut stones 1 to 2 carats, 300 $000 to 450 $000.

SOME BRAZILIAN DIAMONDS

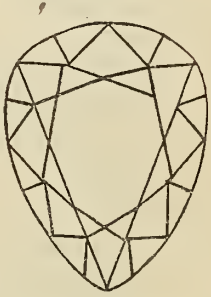
The River Abaeté produced a stone of 161½ carats in 1797, and another of 48 carats later, and Curralinho one of 70 carats (1806). The Bagagem district is famous by reason of the discovery of the Estrella do Sul in 1853, weighing in the rough 255 carats or 52,276 grammes.

In shape it was a rhomboid dodecahedron. When cut it was reduced to 125 carats (see illustration in plate), measuring 35 millimetres long, 29 wide and 19 thick.

This famous gem was found by a slave, who gave it to the negress with whom he was engaged, in order to purchase the freedom of both. Her master was a poor, ignorant fellow, and fell a victim to a group of pseudo friends, who arranged for the sale of the gem to Ferdinand Mayrat, then associated in business with the Dutch Consul in Rio.

ESTRELLA DO SUL DIAMOND.

DIAMOND.



DRESDEN DIAMOND.

Mayrat died raving mad a few years later in Switzerland.

The original cost of this stone was only 304 contos of reis, and the Gaekwar of Baroda gave £80,000 for it. He also purchased the famous Dresden diamond, which was found near the same spot in 1857. This weighed in the rough 119½ carats, and, when cut, 76½. The Indian prince gave £40,000 for the latter stone.

In 1910, a third gem was discovered, and received the name Estrella de Minas. Dr. Orville Derby, writing in September (1910) *American Journal of*

Science, advanced the theory that the three above mentioned stones were of the same original form, i.e., a combination of curved faces, forming a dome rising from a plane surface. The reproduction, taken from a model of the latter gem, gives a somewhat false idea of its appearance, owing to distortion due to optical effects. Its greatest length is 38 mm., width 22 mm., and weight, in the rough, 225 carats. It is presumed to be worth at least a million francs, and 500 contos were paid for it first hand.

Caldcleugh, in his travels in South America, vol. 2, pages 262-263, relates that a diamond was found at Antonio Pereira, Minas Geraes, in brown iron ore, in the midst of scorodite. Heuland, the mineralogist, sold this to Baron von Eschwege.

A specimen as above is in the Natural History Museum in London, but I am not able to say that it is the same. Coster presented to the above Museum a specimen of diamond in a quartz crystal, also another which shows a coloured star through each face. Both are from Minas.

In 1811, one stone of 36 carats, one of 26, 21, 15 and 14 carats, four over 10 carats, fifty-eight over 5 carats, and 765 from 2 to 5 carats were sent to Lisbon. In 1818 thirty over 5 carats, and 625 from 2 to 5 carats were also exported. In 1741 a tax of 230$ was imposed on all persons who prospected for diamonds in the district of Tejuco (Diamantina).

The first big contractor under agreement with the Lisbon Government, R. Caldeira, employed at first 8,000 slaves. From 1729 to 1785, 13,937,876 cruzados' worth of diamonds were extracted.

Edwin Streeter in his book on Precious Stones says that Minas Geraes produced in the first 20 years 144,000 carats of diamonds.

The Prince Regent is said by Mawe (*Journey*

DIAMOND LAPIDARIES AT WORK, DIAMANTINA.

Mogyana Railway Head Office, Campinas (S. Paulo).

to Brazil, 1810) to have possessed no less than £3,000,000 worth of rough diamonds.

This luxury-loving ruler, when D. João VI, had a brilliant in the head of his cane worth 872,000 francs.

D. José I sported twenty waistcoat-buttons, each one of which was a perfect brilliant, and valued at 125,000 francs.

Up to 1850 5,844,000 carats, worth £9,000,000, were sold, and £2,000,000 worth of contraband stones escaped the hands of the authorities.

In 1909 there were 456 claims in the Diamantina district, producing gems worth £200,000 from an area of 250,000 hectares.

Total probable exportation of diamonds in 175 years, i.e., up to 1903, 4 tons. Carbonados, from 1894 to 1903 = 23,466 grammes.

Undoubtedly many fine stones are sold in London as South African, as the De Beers Company is the largest buyer of Brazilian diamonds. It is somewhat a mystery, however, where the Brazilian gems do go to, as inquiries in London last winter were fruitless, and judging by the inferior quality there are very few of the best Minas or Bahia gems on the European market. Careful search in the windows in Lisbon failed to bring to light a single fine blue-white stone.

It should be noted that the new international carat now weighs 200 milligrammes = 5 to 1 gramme.

Quoting from *Minas Geraes* of April 21, 1913: It is stated that four agents of the great South African Syndicate arrived at Diamantina in September, 1912, spending twelve days on the river Jequitonhonha, reporting afterwards to their company that the Minas Geraes diamond workings were

salted, and publishing in the American press statements that they were lucky to have escaped alive from the above city, having lost the best part of their baggage. Furthermore, the company was convinced that in the Brazilian table-lands the diamond did not exist in concentrated deposits, but it did not matter if the gem was found in such, as the industry would be crushed whatever it cost the company (De Beers, etc.). Another director, before ever putting his foot on shore, declared that the diamond in Brazil was a myth. This *gentleman (a member of Parliament for the Cape)* visited Diamantina, and after four days said he had visited the WHOLE of the municipality (one of the largest in Brazil) and asserted that his statement made in Rio Janeiro was well founded.

The *Minas Geraes*, taking up the cudgels on behalf of Brazil, took the trouble to point out to the American press that the persons who visited the Jequitonhonha opened six borings only, and these very superficially, over an area of more than 150 miles, if they had the time to cover anything like this enormous territory.

The above mentioned four, having declared all the Minas lavras SALTED, asked before leaving Diamantina for a six months' option, to take soundings in the bed of the Jequitonhonha, and being refused this, returned to the States to start a campaign of calumny. I have nothing to add to the above extract, it must speak for itself, and readers can form their own opinion as to which side justice lies.

Quoting again from the eminent authority first named, the upper Paraná diamond field and that of the Abaeté are the only ones in Brazil that have produced large gems. In 1906 a stone of 600 carats was discovered in the River Verissimo in Southern

Goyaz, not very far from Bagagem, but was unfortunately destroyed by being tested on an anvil with a sledge-hammer. A parcel of fragments shown to Dr. Derby contained nothing of note, the largest piece cutting an 8 carat stone only. The stone when found must have measured 60 × 36 × 16 millimetres. A splendid brilliant, near to ruby red in colour, weighing $2\frac{3}{4}$ carats, fetched £3,000 in London in 1909. This diamond dated from Colonial times. A vivid green one of $2\frac{1}{2}$ carats came from Douradinho in 1906, and two blue-white ones of 21 and 36 carats. Senhor Luiz de Rezende, a merchant of Rio de Janeiro, has a very fine collection of coloured stones, but owing to his absence in Europe details are not forthcoming for the present edition of this book.

M. Chabarihert, a Brazilian diamond merchant, had a splendid black stone of 6 carats, comparatively opaque, but reflecting light perfectly.

In February, 1910, news came from Abbadia dos Dourados that a stone weighing 12 oitavos and 3 carats was found in the river of the same name. It was sold in Uberaba for 1,000 contos. The same place has been long famous for out-of-the-way stones, one from Patrocinio weighed 7 vintems (1906) and another (ruby colour) the same weight was sold at once for 7 contos.

Sr. Luiz de Rezende, a well-known Rio jeweller, has a stone from Serrinha (1914) weighing 62 grammes. It is said to be of the first water. Another found at Mendanha the same year, weighed 135 grains, and a cleavage fragment from Douradinho, $49\frac{1}{4}$ carats; evidently part of a stone of 200-250 carats.

Recent finds include a gem from Diamantina of 32 carats, valued at £6,000.

CHAPTER XXV

MINERALOGY. PART III

Dumortierite

In No. 15 (1917), Annaes da Escola de Minas de Ouro Preto, Dr. Eberhard Rimann, writes on the occurrence of this rare mineral as a rock-forming element in the vicinity of Rio Janeiro, Leme, Cobacabana, etc. Dr. Orville Derby had, by the process of washing the kaolinized rock in a batea, identified the mineral in question at Sumaré on the lower slopes of the Tijuca massif. In druses in the localities previously mentioned, Dr. Rimann found schorl, beryl, albite, and other feldspars, apatite (Leme tunnel), calcite, rutile, limonite, siderite, malachite, and crystals of amethystine quartz with rutile needles in between (Morro da Viuva). At Ipanema, he verified cordierite and sillimanite, etc. At Copacabana, andalusite, greenish-blue beryl, graphite, zircon, topaz, wine yellow in colour, pinite, and such rare minerals as spinel with magnetite and dumortierite, greenish, violet, blue, red and brown.

Dunite

With platinum at Cattas Pretas, Minas Geraes.

Elaterite (Elastic Bitumen)

In blocks, up to 10 kilos, on the beach at Paranaguá, after high tides. Colour dark brown. Some-

times black. Takes a good polish. Analysis: Oil, 76 per cent.; tar, 16·18 per cent.; water, 1 per cent. Would furnish gas if found in quantity sufficient for commercial exploration.

Emerald

This beryl has been placed apart, owing to its extreme rarity, at least up to the present, and because of the historical interest attached to it.

Expeditions were sent to the interior several times during the sixteenth and seventeenth centuries, in search of the legendary emerald mines, all the stones found turning out to be either tourmalines or sea green beryls. Even at the present time, all sorts of stories have been current with regard to so-called wonderful gems. In 1916-17, a doubtful emerald was on show in Bello Horizonte, and Juiz de Fóra, etc. It was found at Arassuahy in 1914, and weighed 38 carats when cut. Naturally it was said to be the finest in existence. I made a long journey on purpose to see this marvel, duly armed with the means of identifying its character, but, alas, it had miraculously disappeared. A new wonder was found in 1918, at Nova Aurora, in Goyaz. This beryl weighs $12\frac{1}{10}$ carats, and fetched £150 in the rough. It must be an exceptional stone in any case, and the locality is a new one.

The only genuine emeralds I have seen which are undoubtedly Brazilian, are:—

1. A poor specimen in crystal form in the School of Mines at Ouro Preto. This is an imperfect hexagon, 4 by $1\frac{1}{2}$ centimetres.

2. Two finely crystallized stones from Bom Jesus dos Meiras, Chapada Diamantina, Bahia. They were bought by the British Museum of Natural History, from a German collector.

I wrote to this town in October, 1918, and endeavoured to obtain some definite information about the deposit, as a resident advertised emeralds for sale, but the gentleman replied that there had been no work done since the outbreak of war.

Emery (Corundum)

Found in São Paulo, 35 miles from the capital, at Matta do Paiol, on the Soracabana Railway. The matrix is a micaceous clayey schist in an advanced stage of decomposition, surrounded by eruptive and limestone rocks. The mass contains at least 70 per cent. of greyish blue mineral in lenticular blocks, some of which measure more than 2 cubic yards. Also occurs in the Serra de Itaqui, in the same state, with schorl, quartz and andalusite.

Epidote (Pistacite.) Hardness, 6-7

Found in argillaceous schists in north-east Minas Geraes, in fine clear crystals, in company with green tourmalines. Very pleochoric. Can be used as a gem stone if transparent. Brittle.

Euclase

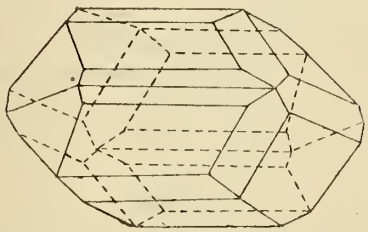
In the same matrix of chlorite schist as the topaz, at Boa Vista and Capão da Lana, near Ouro Preto. Good specimens very rare, a German who was two months in the locality failing to find a single stone and spending £150 in vain. Fragments have been recovered that would make a crystal 1½ lb. in weight, according to Eschwege in his *Pluto Brasiliensis*. It was formerly extracted without care and usually flawed, and sold amongst lots of topaz. A fine clear blue crystal (fragment) I measured in the Lisbon Museum is 44 × 10 millimetres. Dr. Hussak

found a fine gem at Lençōes (Bahia) in 1894, also many broken pieces.

Kranz lists some wonderful specimens, unique, he says, in prismatic rock crystals.

Strange to say there is no euclase worth looking at, either in the National Museum at Rio or that in São Paulo. Those in the School of Mines at Ouro Preto are good, but none are equal in colour to a deep blue one in the British Museum of Natural History, London.

I have seen this very rare gem in many shades of blue and green, and even colourless. Hauy,



EUCLASE.

tome 5, pp. 279, etc., "Mémoirs du Musée d'Histoire Naturelle de France," Paris, 1819, mentions two splendid euclases, both the property of Sr. de Souza, Minister of Portugal to France. The forms are most perfect. Design in sketch (see plate) is natural size. Specific gravity of these stones, 3·07. Hardness, $7\frac{1}{2}$.

Berzelius gives the following analysis on pages 294-296 of the same volume:—

Silica . . .	43·22 per cent.
Alumina . . .	30·56 ,,
Glucina . . .	21·78 ,,
Iron oxide . . .	2·2 ,,

He says: It differs from emerald by percentage of silica only, but, with due deference to the great chemist, this statement must be challenged. Emerald has a specific gravity of 2·79, and hardness of $7\frac{1}{2}$, refractive index varying from 1·578 to 1·585, euclase 1·651 to 1·670.

It is, with topaz, found in the great fault or cleft in the mica schists near Ouro Preto, in relation with martite, in perfect octagonal crystals, hydrargillite, oligiste (specular iron), magnetite, etc., etc., and also in limestone near Rodrigo Silva station, a little to the south. Krantz, of Bonn, had on sale a rock crystal, 17 by 11 by 15 centimetres, on which were two large topazes and several light green and yellowish green euclases, one of which was 37 millimetres in length, and another surrounded by tabular crystals of specular iron. This specimen is unique, and was offered for sale in 1913 for £600.

Euxenite

A black, pitch-like mineral recently discovered by Dr. Ferraz in the Ribeirão de Santa Clara, near Pomba, in Minas Geraes.

Analyses made in the School of Mines at Ouro Preto and in the National Museum, Rio, gives the following:—

Niobic acid	34·400 .	40·000
Titanic acid	24·500 .	19·000
Oxide of thorium . . .	1·000 .	2·000
Oxide of uranium . .	10·250 .	10·000
Yttrium, cerium, erbium .	22·700 .	28·300
Oxides of iron and aluminium	2·812 .	
Magnesium	0·812 .	

Dr. Paes Leme gives the following spectographic analysis of the residue:—

Metallic oxides . . .	30·000
Aluminum and graphite . .	3·300
Oxides of iron	3·000

He says it contains also stanium, arsenic, lead and gadolinite.

At Pomba it is associated with xenotime, and near Ubá, in the same district, with beryl, zircon, etc., in mica veins. Another locality is Cachoeira de Itapemirim, Espirito Santo. The deposits of the mineral in Central Minas are found in the pegmatites.

Fibrolite (Sillimanite)

At Diamantina, Minas Geraes.

Florencite

A basic phosphate of aluminium and cerium from Tripuhy. Also at Matta dos Creoles, Diamantina, and Morro do Caxambú, O. Preto, in red micaceous schists. One of a new group of rare minerals. Occurs in residues from diamond workings.

Fluorite

Occurs sparingly in various states. Sometimes sent to Rio in parcels of aquamarines from Minas. Easily recognized by its softness and clivage, usually in pale green crystals or octahedral form.

Fuchsite

From Bomfim, in Goyaz.

Galena

In limestone gangues, or in quartz veins in the Abaeté district of Minas, especially in the Ribeirão

do Chumbo. Known since 1717, but never exploited. Analysis made in Ouro Preto in 1825 yielded up to 150 grammes per 100 kilos of galena. See vol. 1 "Annaes da Escola de Minas de Ouro Preto," 1881, pages 39-105.

Found also at Montes Claros, Diamantina, Sete Lagôas and Caethé. The carbonates of Yporanga (Ribeira do Iguapé), S. Paulo, yield 450 grammes of silver per ton of lead ore. Found also near Joinville, Santa Catharina; also in Rio Grande do Sul.

Garnets

In quartzose and gneissic rocks in many parts of Brazil. May be found in large crystals at Sumaré (Rio Janeiro), and widely scattered through the rocks at Flamingo, Leme, etc., at the mouth of the harbour in the form of small grains and fragments of *Almandines*. Takes the place of feldspar in the veins in the gneiss, and enters largely into the composition of monazitic sands in Rio, Espirito Santo and Minas. Grossularites, pyropes and almandines are found in the rivers S. Antonio, Andarahy and Piabas, and at Cantagallo and Santa Rita in the state of Rio. Hessonite in Minas. Spessartite in limestone rocks at Arassuahy and at Registro on the Central Railway. In the Santa Maria, a tributary of the Calhão, and in the Abaesté, ranging from red to the rare hyacinthine hue.

The Hyacinth, or Rubicelle, is found in Minas Novas in water-worn pebbles, of a reddish yellow tint.

Almandines are found in the same place, and at Agua Suja, with pyropes, and grossularites at Gravatá, and in the Andarahy and Sto. Antonio

rivers, Bahia, also almandines and pyropes in the Mucujé and Utinga, and andradites in the former river.

Garnierite

See Nickel.

Gibbsite

In white mamillary concretions near Ouro Preto. Specific gravity, 2·3-2·4. Hardness, 2·5-3·5.

Gold

The first discovery of any importance is recorded in 1693 by the Bandeirante, Antonio R. de Arzao, of S. Paulo (Taubaté), who crossed Minas and Espirito Santo to the sea.

The precious metal was, however, found in 1560, in the state of S. Paulo itself, at Jaraguá, 6 leagues from the site of the present capital.

From the year 1714 Minas Geraes had to pay the Crown a tribute of 30 arrobas annually, Ouro Preto district furnishing 12, and Sabará about the same amount. In 1716 a poll tax was instituted of 2 oitavas for each slave who entered the province, and every store paid an imposition of 10. In 1719 all gold had to be smelted in the district, none being allowed to leave except in the form of stamped bars.

Gold dust could be used only in barter at the rate of 1$000 per oitavo. Bar gold was exchanged at 1$400 if 22 carats fine. 20 per cent. of the gold was the prerogative of the State, and any person caught smuggling this metal out of the province was banished to the Indies for ten years, and all his property confiscated to the Crown.

In 1722 Minas Geraes was taxed at 37 arrobas (555 kilogrammes), the Royal share amounting to 312½ arrobas from 1714 to 1724. In 1721 the first mining operations began in Matto Grosso, Sebastião Raposa having 120 slaves at work, and gold being found in great abundance, small flakes and dust being disdained. One nugget weighed 22½ kilos.

Slaves who brought in less than 500 grammes a day were severely flogged.

From 1735 to 1751 the total yield amounted to 2,066 arrobas. In 1748, 3,851 oitavos were sent from Jacobina, and 24,793 from Minas do Rio de Contas, both places in Bahia. Eschwege wrote in "Pluto Brasiliensis": "From 1700 to 1713 the output was only 9 arrobas; from 1714 to 1725, 402 arrobas; 1726 to 1735, 500; 1751 to 1770, 2,044; and up to 1820, 2,306 arrobas were registered."

These amounts are evidently much less than the real output, Miguel Couto exporting 400 arrobas from Cuyabá (Matto Grosso) alone.

The mining district was opened freely in 1803, Eschwege coming out on a journey of inspection in 1811, and taking over the entire direction of operations. He reckoned the total yield from 1700 to 1820 at 524 tons. Paul Ferrand, "L'Or en Minas Geraes," valued the ouput at £64,000,000. Dom João VI had, from this source of revenue alone, one hundred and fifty million cruzados, as well as 100,000 bars of gold, and 700,000 arrobas in dust.

From 1835 to 1851 each inhabitant of Minas paid a gold tax of 4¾ oitavos, shops being subject to imposition of 8 to 24 oitavos.

Mining operations gradually extended to Goyaz, 9,000 slaves being at work at Bôa Vista, in the year

1775, when the Royal quinto, or fifth part, yielded 352,914 contos of reis.

Many of the mines began to instal machinery in the 19th century, but most were obliged to shut down in a few years, and at the present moment there are only two in active operation.

Agua Suja, one of the richest finds, yielded huge quantities of gold.

Morro Velho Mine

This, the principal in Brazil, is situated at Villa Nova de Lima, formerly called Congonhas do Campo.

It belonged to a priest called Freitas, whose father had given £14,000 for it, and the first British Company that took it over, The St. João del Rey, paid £56,434, and lost £26,000 in the venture.

In 1867 the mine was a great open pit, a thousand feet deep, and the timber supports of some of the galleries took fire that year, and all the workings were destroyed. At this time the gold average was 23½ grammes per ton. It was reopened shortly after, 3 shafts being sunk, the lode being struck at 400 metres, and up to 1882, dividends averaged 31 per cent. per annum.

On November 10, 1886, another disaster took place, the main shaft was blocked up, and the mine closed until 1888, when the company was re-organized with a capital of £250,000.

In 1913 the total depth attained was 5,596 feet below the surface at Horizon 18.

Average temperature (Horizon), 1912-13, 99° Fahr.

The present objective is Horizon No. 22, 6,500 feet deep.

At Horizon 20, 1,770 metres = 110° C. (Rock Heat).

Ventilation has now been greatly improved, but it is extremely difficult to persuade the native miners to observe measures taken for their well-being, especially as regards wrapping up on leaving the mine.

The adit temperature in mid-winter is frequently 50° Fahr. below that of the level from which the men have come.

In spits of this the death-rate is very low.

Under the management of Mr. G. Chalmers, A.M.I.C.E., the mine is a marvel of organization and triumph over difficulties.

Thought to be exhausted at the end of last century, it is still paying dividends.

Formerly the most productive in the world, stiuated in an immense ravine, the workings were in the heart of a mountain of chlorite slate, with quartz veins, in which the gold was found in connexion with mundic and yellow iron pyrites.

The walls were encrusted with crystals of snowy white sulphate of alumina.

There were but three stamp mills in 1820.

A very complete account of the mine is given by Mr. J. Henwood, in vol. 8, Part I, "Transactions of the Royal Cornish Geological Society," 1871.

Mr. Chalmers expects to get down to Horizon 26 (7,700 feet), providing 6-hour shifts, necessary owing to the increasing temperature, yield sufficient labour to produce a profit. In this case operations will proceed to 1933 at least.

The population supported by the mine at Villa Nove de Lima cannot be less than 10,000. Brick and tile works, foundries, and wood-working

factories are in connexion. The ore is crushed by ten stamps of 1,200 lb. each, and 120 of 750 lb.

The mineral then passes over canvas strakes, which are flushed at intervals by boys with hose pipes, and turned over.

The lode contains 31 per cent. of iron and 20 per cent. of silica. Works will soon be established for the treatment of the tailings. During the year ending December 31, 1911, 192,600 tons of ore were treated, and 1,145,788 oitavos of gold recovered, or 6·438 per ton. Of the total gold contents of the ore, 92 $\frac{40}{100}$ per cent. were saved.

A crusher has now been put in which weighs 70 tons, and will break up a mass of rock 3 feet 5 inches by 2 feet 10 inches by 2 feet 6 inches, so small as to pass through a 3-inch ring. The length of lode at Horizon 17 is 1,020 feet, with an average width of 11 feet.

Freights per ton from Rio to Honario Bicalho station, 6 kilometres from the mine works out at £1 16s. 3d., and transport to the mine, 15s. 7d. Mules are mostly used in the workings and are brought up every eight days. An accident in the bottom of the mine can be attended to in 10 minutes, and in another fifteen the patient is in bed in hospital, thanks to an admirable system of telephones, extending to the lowest depth.

Visiting the mine in 1913, I went down to the bottom, but on returning in December, 1917, permission was refused after waiting about the works for several hours with a diplomatic friend. Requests made in writing for a report on the previous year's working were unanswered, and I cannot help comparing the welcome there with that at Passagem, where Mrs. Bensusan, although de-

cidedly ill, did the honours of her house in real colonial fashion.

At Morro Velho, on both occasions, the superintendent was at home, but offered no personal hospitality, although on the first visit my wife was with me, and we were obliged to sleep at the most wretched apology for an hotel. At this mine there is a boarding house where the unmarried Britishers live on very moderate terms. This is run at a loss, and the newest idea is a mineral water factory, in order to encourage the use of non-alcoholic beverages.

Output of the mine in 1912:—

Ore raised, 172,208 tons. Yield in gold, 99,906 ounces troy, £396,109. Gross cost of working, £277,638. Dividend, 10 per cent.

From September 1913, to February, 1914, the yield per ton was £2 2s. 7½d., or a total of £494,000. Mineral reserve, 887,000 tons.

In 1915-1916, 192,500 tons of mineral were raised, and the result amounted to £466,501, or £2 8s. 5½d. per ton.

Depth, February, 1916, 5,826 feet below the surface.

Last report for 1916 showed a depth of 1,473 metres. Ore crushed, 87,600 tons, yielding only 11·03 grammes per ton, worth £121,233. Net profit, £7,243.

Percentage of gold saved, 92·13. Ore reserves, 72,316 tons.

Number of workers, 1,375.

A report obtained from the State Government of Minas, referring to the 1917 operations of the mine, give the following figures:—

Gold output, £475,000, including a small percentage of silver.

Yield per ton, 24·37 grammes, a great improvement on old percentage.

Number of employees, 3,000.

From 1830 to 1898, 65 metric tons of gold were exported from this mine.

Up to March, 1862, 59,098,654 lb. troy were refined, valued at £2,229,487.

In 1849, 69,336 tons of ore were mined, the profit being £38,136.

In 1865, 78,883 tons yielded a profit of £80,438.

A peculiarity of this and Passagem Mine is that it is impossible to use pit props, first because they would have to be imported, and second by reason of the nature of the ore shoots. All the worked out stopes have to be filled or arched over with stone and cement. Last year 113,572 tons of material were used for this purpose.

The two most important veins are the Vianna and the Mina Velha. The former runs from north-west to south-east, for 300 yards, varying in width from 12 inches to 8 feet 6 inches. Mina Velha is only one hundred yards long, but it attains a thickness of 16 feet in places. At the time the open workings were abandoned, a depth of over 2,000 feet had been reached.

Sea level is 2,768 feet below the surface at Morro Velho.

The entrance to this mine is 478 feet higher than the peak of the Corcovado mountain at Rio de Janeiro, so a good idea of the magnitude of the undertaking may be obtained. The whole of the workings are illuminated by electricity, and this furnishes the motive power for the locomotives which run all over the property, and from the mine to Raposos station, on the Central Railway. This journey takes half an hour and costs 1 $000 each

way. Trams meet the train which leaves Rio at 7 p.m., and is due at Raposos early in the morning. 3,460 H.P. is used in the different services of the mine, as compared with 2,772 H.P. in 1911. 1,500 lamps are used above ground. The cost per H.P. for twenty-four hours is only 1⅛d. From August, 1888, to February, 1912, gold to the value of £5,246,570 was sent to Europe, and 30 tons of refined metal are presumed to be contained in the ore in sight.

Passagem Mine

This is the only other mine of any importance working at the present time in Brazil. It is situated 5 miles east of Ouro Preto in lat. 20° 40′ S. The railway was in course of construction to Marianna when I visited the mine in 1913, but has been concluded as far as the latter city for at least a couple of years. The present company has been operating the mine since 1884, but it was first worked in 1819. Passagem village and mine lies on the direct road to Marianna, 70 metres above sea level, and Itacolumi towers up behind to 1,750 metres. The erosion valley worked through the hills by the Carmo river, forms a deep ravine near the mine entrance, and on the cliff at one side the stamp mills have been erected (vide "The Passagem Mine and Works," *see* Bibliography).

Eschwege took over this mine in March, 1819, the preliminary capital being only £1,900. Seven stamps were set up and a dividend paid in 1824.

The deposit (massive quartz) contains about 8 per cent. of various minerals, including schorl and pyrites, and these dark patches merge insensibly into the quartz and quartzites in many places, mak-

ing the nature of the rock very complex. The hanging wall is a well defined and laminated itabirite which is separated from the lode by a strip of GUIA 12 inches in diameter at the most. This is a very hard rock. The average thickness of the lode has been 3 metres for the last few years, but the ore bodies or patches show a tendency to decrease as a greater depth is reached. In 1912 they were 2·49 metres thick. The mineral has to be worked round frequently as the country rock splits up suddenly, and is continually blistering and falling in large flakes. The foot wall consists of talcose schists which are not at all well defined.

The mineral is hauled up three inclined planes diverging at the surface, and one descends the mine in a low car operated by cables. The lowest level reached is 920 metres. The lode is reached by cross cuts, from which levels are driven to follow the hanging wall. Many other minerals are found in the mine, including almandine garnets, large and well crystallized, but always breaking on extraction from the quartz, kyanite, calcite, bismuth (some of which is recovered), andalusite, tellurium, as well as zircon, monazite, cerium and others which are as rare. See Hussak, *Die Goldfuhrende Keisige Quarzlagergang von Passagem*, also Ferrand, *L'Or à Minas Geraes*.

The mine is lighted underground by means of castor oil lamps, the material used costing 1s. 4d. a litre, and each miner uses 2·21 per month. A vertical shaft is being sunk to No. 3 inclined plane, which will be struck below the 680 metre level. At the time of writing acetylene lamps are on trial. Calcium carbide costs 8d. per kilo on the spot. A maximum of 8,000 gallons of water have to be

pumped from the mine every hour. The ore is treated in a different manner to that at Morro Velho. It is crushed to pass 30 mesh screening, and 12 tons of water is used to one of mineral. The pulp is passed over blanket strakes, these recover 50 per cent. of the gold, and they are washed three times hourly. Complete treatment of sands takes three days. The surface works and residences, as well as the village and the city of Marianna, are all lighted by electricity produced by the Company.

Eighty 750 lb. stamps are in operation, and under the expert management of Mr. Arthur J. Benusan, Assoc. R.S.M., F.C.S., M.I.M.M., the mine is carried on in the most economical manner.

Output (1917), £115,000 worth of gold.

There is a chronic shortage of labour. The company has options on the Santa Anna and Marquiné mines close by.

Dr. Eugene Husak concluded that the lode is of eruptive origin, and is in all essential respects of a typical quartz-pyrite nature, presenting evidence of three distinct processes of filling.

First—An extensive fissure opened by stress along (above, below and across) a bed of brittle rock (quartzite) enclosed between more tenacious schists, was closed by an invasion of pegmatite running off into clear quartz. At this stage the lode contained only the minerals characteristic of a granite magma such as is represented in the neighbourhood by a boss of granite, or, possibly, some others that may have been formed near the contact through reactions with the country rock.

Second—A subsequent stress, acting in substantially the same place and manner as the first, fractured this pegmatitic quartz, rendering it accessible to a

pneumatolitic action characterized by silica, boron, water vapour, carbonic acid and fluorine ("after effect" of the granitic eruption?), which filled its fissures with tourmaline, sericitized the feldspar of the pegmatite wherever fissures, often quite minute, permitted access to it, and probably produced the characteristic contact phenomena noted by Hussak.

Third—A third stress, coming near the end of the second phase of the lode, fractured the tourmaline filling and gave access to a pneumatolitic action characterized by sulphur, arsenic, metallic oxides and metals (gold and silver), which filled the fissures of the lode, invading to some extent its pre-existing portions, and probably also some of the adjacent and enclosed country rock.

(From an article on the mineralization of the gold-bearing lode of Passagem, by Dr. Orville Derby, *American Journal of Science*, September, 1911.)

The whole of this region of Minas was scarred and torn up by the old miners. Looking from a window of the School of Mines in Ouro Preto (ancient Villa Rica) tremendous pits and moulds are visible all round, where the precious metal had been sought. The panorama is most remarkable.

It has been stated in the Treasury, Rio, in 1918, that the immediate consequence of the Government's requisition of the whole of the gold output of Morro Velho, was the reduction of the yield to a third or a fourth part of the normal supply, but I have no figures at hand at this moment to back up the attack on the administration, or to contradict it, so cannot express any opinion as to its truth. Other, and more legitimate, reasons may be responsible for this.

Gongo Soco takes pride of place amongst the famous mines at present idle. From 1826 to 1856,

12,887 kilogrammes of pure gold were extracted here, more than half of the amount between 1829-1833. Profits totalled £349,514 (Paul Ferrand, *L'Or à Minas Geraes*. Pages 116-118).

The original proprietor, Barão de Cattas Altas, was so prodigal of his riches that he often offered his guests solid gold almonds for dessert. For two years, 15 lb. of gold were taken out daily, and, thinking it exhausted, he sold the mine to the Imperial Brazilian Mining Company for £90,000. This concern extracted 15 metric tons of the precious metal in 12 years. The deposit was first found by a negro, whose name it bears.

The Baron got his title as payment for a splendid entertainment he gave to the Emperor D. Pedro I.

This mine reached a depth of 114 metres, the matrix being Jacutinga, or micaceous iron ore, in its first stage being so rich that 170 kilos of gold were found each month. In 1850, a nugget was taken out weighing 10 kilos. From September 23 to 25, 1829, 193 kilos were obtained from this mine.

Santa Barbara (Parry). The vein is in decomposed schists, and contains arsenical pyrites, quartz, mica, garnets, etc. The mineral appeared very irregularly, in some places exceedingly rich, especially in buchos (pockets), where it was almost pure. Now (1918) re-opened, and yielding from 15 to 40 grammes per ton.

At Itabira a miner found 39⅛ lb. troy of pure gold in six days, with the aid of twelve labourers. The mineral here often held 40 to 50 per cent. of palladium. (Cleussen, *Bulletin of Ass. Roy. de Sc. de Bruxelles*, VIII. 1 re parte, p. 327.) Nests or bunches were also encountered in the Jacutinga.

At Antonio Pereira, the ore was 23⅞ carats fine.

In quartz the alloy is usually silver.

In talcose schists the alloy is usually silver, tellerium and bismuth.

In granite the alloy is usually palladium.

In iron slate the alloy is usually platinium.

In clay slate the alloy is usually silver, lead, copper antimony and arsenic.

Fine crystals were frequently found in Octahedra and Dodecahedra.

At Agoa Quente the degree of fineness = 22 to 23 carats.

At Bella Fama, a very rich mine, they tried to light part of the workings by means of fireflies.

Ouro Preto, the former capital of Minas Geraes, became very prosperous, and had a population of 30,000 at the end of the eighteenth century. To-day, this has been reduced to about a third. Houses, of a sort, extended formerly as far as Marianna, 12 kilometres, and their ruins are plainly visible at the present time.

In the Corpus Christi procession, the horses were shod with solid gold, now they wear silver *plated* shoes. At that time, the Governors were offered a soup plate full of the precious metal as a free will gift of the citizens.

The Imperial Brazilian Mining Company, already mentioned, was started by a Britisher who had been engaged previously in the Topaz workings near Ouro Preto.

The nominal capital was £350,000, and the mines of Cattas Pretas and Matto Cavallo were purchased, in addition to Gongo Soco.

At Maquiné, a little beyond Marianna, there is a noted mine, in the Itabirites, where friable Jacutinga is mixed with lithomarge.

This mine is now (1918) in the hands of the Passagem administration.

Below Marianna, the alluvials of the Rio do Carno, between this city and João Caetano, are estimated to contain $18\frac{3}{4}$ million tons of pay gravel which has yielded as much as $3\frac{1}{4}$ grammes of gold per cubic metre.

The Serra do Espinhaço for a length of quite 200 kilometres is auriferous. Recent analysis gave an average of 15 to 20 grammes per ton for some 200 deposits.

The Rio Gurupy yields	2/580	grammes,	
Tapera	,, 4/900	,,	
Maquiné	,, 80/000	,,	in veins of Itabirite.

The average for all Minas Geraes may be reckoned at 12 grammes per ton, and it is calculated that 8 grammes will give sufficient profit. It is difficult to point to any particular locality as being worth prospecting, as the whole of the Espinhaço and its spurs is impregnated, perhaps the most promising speculation being placer mining by means of dredgers, and hydraulic sluicing of the high banks of gravel left by the old miners in many places. The River Doce (upper portion), Rio de Contas, Pardo, Paraguassú and Itapicurú, all falling into the sea between Espirito Santo and the São Francisco, are undoubtedly worth trying, as well as many of their tributaries. The minerals usually associated with gold and diamonds in the deeper gravels, as yet entirely untouched, are porphyries, chalcedony, pebbles, black tourmalines, rutile, hematite, magnetite, emery, etc.

The precious metal was formerly worked by placers in the Cantagallo district (State of Rio). The gold

here was derived from gneiss, and the small deposits in the River Iguassú and others in the same state were from the same formation. The quality of the mineral wherever found in the alluvials is over 20 carats, but it is extremely fine as a rule. In spite of nearly 350 years of mining, fresh finds are still being made. At Montes Claros some nuggets were discovered recently weighing up to 1½lb. At Olho d'Agua an alluvial deposit yielded £200,000 of gold within the last 3 years. The entire output of Brazil up to 1903 was some 1,000 tons of refined metal.

The tax imposed by the State of Minas is 3½ per cent., charged alike on dust, bars or jewellery. The average cost of extraction varies from 11s. to 21s. per ton of ore.

Gold has been found on Limonite at Sabará, and was formerly found in free form (visible) in the gneiss at Campanha (South Minas).

Goyaz

The São Paulo bandeirantes were the first to discover gold in this state, and mining camps frequently contained as many as 30,000 persons. At Anincuns, 13½ leagues from the capital, 200,000 cruzados worth of metal was exported in 1809.

In São José de Tocantins and Agôa Quente, 16,000 slaves were employed, and nuggets of 43 pounds, many of 6 to 10 pounds, and innumerable smaller ones were found. The first named beats the records for America.

At Machadinho, close by, 900 oitaves were taken from the dry bed of a stream in a few hours. At Cocal there were 17,000 slaves, and 1,400 free miners continually at work; at Natividade, 40,000 slaves, in short, this state produced prodigious quantities

of gold for at least a century. The above figures are taken from, "Relatorio apresentado á Assembléa Provincial de Goyaz, 1862," by J. M. Pereiro de Alencastro; from Pluto Brasiliensis (Eschwege) and Memorias Goyannas.

Bahia

In a zone of 100 leagues square in the Chique region, where the cascalho has a thickness of a metre as a rule, and is covered by layers of limonite and clay, the average yield per cubic metre, especially at Gentio do Ouro, was 21 grammes. Other deposits, at Lagôa, Jardim, etc., varied in richness from 8 to 20 grammes of gold to the metre of gravel. These figures refer to the last part of the nineteenth century.

Maranhão

An English geologist, Mr. Bowers, has found many rich alluvials on the Gurupy, Turyassú, and other rivers near the Pará boundary.

São Paulo

Gold is found in the Ribeira do Iguapé, at Xiriricá and at Pedro Cubas, in the contact schists, etc.

Santa Catharina

In 1829, the Governor of the province was informed that a good amount of fine gold existed in the interior of the Itajahy district, and also in the Tijuca rivers. No mining has taken place in this state within recent years, and I found no traces of the mineral in the upper Itajahy, at least as far as the foot hills of the central plateau.

Dredging in Matto Grosso has hitherto not proved a success, largely owing to over-capitalization. The

rivers have gentle currents with little declivity, the bed-rock being soft and the alluvium fine. There is an ample supply of wood for fuel. Dr. Arrojado Lisboa estimates that a capital of £33,000 is sufficient for each dredge employed. Two grains of gold should be saved to the cubic yard, and the cost of working a dredge of 3 to 5 cubic feet capacity per bucket, working 120 hours a week, should not exceed £250 a month. Eighty cubic yards an hour ought to produce a profit of £4,000 per annum.

A great rush to the Rio das Garças (near Cuyabá) took place in the summer of 1913. (See Diamonds.)

At Lavras (S. Gabriel), in Rio Grande do Sul, the Brazilian Goldfields, Ltd., has 24 square miles of claims, out of 100 square miles in the district. The distance from rail is 30 miles, and transport to nearest port will be about £3 a ton.

Total Exports of Gold

1912:	4,024,775	grammes	= 6,551,000 $.
1916:	4,377,000	,,	= £474,194.
1917:	4,368,770	,,	= £473,152.

Gorceixite

Rolled pebbles of microcrystalline nature are found in many of the rivers in São Paulo.

Gothite

At Miguel Burnier (Manganese workings) and at Lagôa do Neto, Minas Geraes.

Grahamite

In veins between the shales at Iraty, Paraná. This (solidified) petroleum occurs in the coal measures.

"Graphite"

In Minas, near Ouro Preto, Marianna, Santa Barbara, etc., and in Bahia. At Emparedado, 18 miles from the right bank of the River Jequitinhonha, it occurs in veins from 19 to 40 inches thick, some masses weighing hundreds of pounds. The percentage of carbon varies from 50 to 85. Want of easy transport has prevented this valuable deposit from being worked up to date. There are also other occurrences of this mineral at Itabira do Matta Dentro, and in the State of Rio, at São Fidelis, 83 per cent. pure. At Tripuhy and the localities first mentioned graphitic schists occur in thick veins and yield 10 to 11 per cent. of carbon. Those at Tripuhy are now being worked, as well as those of S. Fidelis, the mineral from the latter being used in a pencil factory on the Ilha do Governador (Rio Janeiro).

The Jequitinhonha graphite contains monazite, zirconium, ilmenite, etc. (Dr. Orville Derby). Found also in Ceará, 75 per cent. pure, and at Tubarão, in Santa Catharina.

Heulandite

Red and yellow crystals, 2-3 centimetres in length, have been encountered in the Serra do Botucatú, S. Paulo, with *Mesolite*, *Calcite* and *Chalcedony*; also found at Rio do Peixe in the basalt.

"Iolite" (Dichroite, Cordierite or Water Sapphire)

This curious gem forms one of the numerous group of precious and semi-precious stones found in company in the river beds of north-east Minas. It is discovered in various shades, from greyish white to lavender blue. Frequently the stone is very trichroic, a single specimen showing grey, smoky

blue and white. Hardness usually somewhat above that of rock crystal, and specific gravity about the same, i.e., 2·86-2·66.

Iron

The first iron mines in Brazil were discovered in 1589 by the Paulista, Affonso Sardinha. Probably the foundry set up at Ipanema in S. Paulo in 1600 was the first at work on the American Continent. Eschwege says that when he arrived in 1811 the smiths in Minas made most of their own iron. The Ipanema foundry, closed down in 1620, was re-opened in 1765, but only for a short period. In 1810 it was started again, and kept going to 1895, producing 3 to 4 tons of metal daily.

These deposits are on the main line of the Soracabana Railway, south of S. Paulo city, and consist of magnetic iron up to 80 per cent. pure; the quantity is, however, comparatively small, and the ore refractory.

The Usina Esperança, at Itabira do Campos, Minas, started in 1888, is now (1918) producing 25 tons of pig iron daily. Cost of fuel (wood) 17 $500 per cubic metre.

The old foundry at Miguel Burnier (junction for Ouro Preto), called Usina Wigg, has a present output of 15 tons, and a new works at Sabará operates furnaces with a daily output of 20 tons, getting its fuel 2$000 cheaper than the first-named.

The electric furnace of Dr. Barbosa, in the School of Mines at Ouro Preto, has been producing small quantities of ferro-manganese for some time past.

Iron exists in every state in Brazil. In São Paulo, Parana, Santa Catharina, and Rio Grande do Sul the ores are magnetic; in Goyaz, Minas Geraes,

Bahia, etc., they are usually hematites. The Minas Geraes field is crossed for 90 kilometres by the Central Railway, between Lafayette and Miguel Burnier stations. The Leopoldina Railway is now only 80 kilometres from the great outcrop at Itabira do Matta Dentro, and the Victoria-Minas line would have reached there before this if it had not been for the war. The present rail head is at Serra Escura on the river Doce, 150 kilometres from Itabira.

The principal area in which iron deposits occur in Brazil is 500 kilometres in length by 50 in breadth.

The Hematites here are known as Itabirites, and the ores have been divided into three classes: (1) The hard metal outcrop; (2) loose rubble mixed with quartzites; (3) ferruginous sands in the valleys. Minimum quantity of ore, judging from visible deposits: 2,000,000,000 tons, one block containing 20,800,000 tons of rubble, carrying 50 per cent. of iron.

Analysis at Krupp's Works (Essen) and the United States Steel Corporation's Laboratory gives: Phosphorus 0·0024 per cent., silica 1 to 3 per cent. The whole of the fifty-two outcrops surveyed by the Government mining engineers are reckoned to contain not less than 12,000,000,000 tons of ore of the highest possible grade. This is in one district only (Central Minas Geraes).

Averages of 200 different samples give:—

Metallic iron . . .	69·2 per cent.
Sulphur	0·18 ,,
Silica	0·88 ,,

The region to be tapped by the Leopoldina, Santa

Barbara, branch of the Central and Victoria-Minas Railways occupies an area (as far as already studied) of 5,700 square kilometres. The distance from

THE IRON ORE DEPOSITS OF CENTRAL MINAS.

From the Bulletin of the Dept. of Agriculture, Brazil.

Victoria to Itabira is 630 kilometres. From Rio (Leopoldina line) 717, and via Central to Santa Barbara, 643 kilometres.

The Itabira deposits have been acquired by a

powerful English syndicate, and the railway will doubtless be electrified. It is proposed to instal the most modern machinery at the mines, and run a special line of steamers built for the purpose and possessing automatic discharging facilities. Before the war it was calculated that transport to the ship's side would cost only 8 reis per ton kilometre, or about 5s. per ton from the deposits, and it was proposed to ship 2 million tons annually. Mr. G. H. Robinson, in the *Jornal do Commercio*, of Rio (February, 1918), says:—

Before long Brazil may be able to manufacture most of the iron and steel needed by South America.

The S. João d'El Rei Mining Company of Morro Velho owns 90,885 acres of property which, according to Mr. Chalmers, contain iron deposits of enormous extent and most exceptional quality of ore (1912 Report). He says one can travel twenty-three miles in one direction almost entirely on canga, rubble or outcrops. In another direction, sixteen miles of the same sort of mineral occur. In one deposit alone the surface ore in sight is 30 million tons, averaging 60 per cent. pure; it may be safely estimated that the tonnage below is at least 160 millions. The assay from 570 samples averaged 67·3 iron and 0·053 phosphorus. This deposit is only one of many on the property of the company, and Mr. Chalmers points out that the *iron ores of Minas alone are worth the heavy outlay for railway construction for the purpose of exporting them*, putting all other traffic on one side. He says also that the actual tonnage of high grade ore will prove to be far greater than the estimates made up to date (beginning of 1913).

This company has (1918) at least 2 million

eucalyptus trees planted; the timber may be cut within two or three years, and sold at 3 $000 the cubic metre. Reckoning 12 metres as equal to one ton of coal, the equivalent in wood would cost 36 $000, or less than £2, and it would be impossible to get coal on the spot at such a price.

Gandarella (see Lignites)

Here is a deposit calculated at 125 million tons of Jacutinga 60 to 68 per cent. pure, with an ample supply of wood in the virgin forests surrounding the property, besides the lignite itself. The cost of charcoal here is reckoned at 18 $000 the ton, as compared with 33 $000 in Sweden.

Dr. Gorceix, founder, and first director of the O Preto School of Mines, said that Minas Geraes could easily furnish 5 *billions* of tons of highest grade ore. At the present time this estimate may be doubled.

Extensive deposits have been found in the Theresopolis district (State of Rio), and the local Congress has voted exemption of taxes to the first concern working these ores.

In Paraná there is an immense deposit at Bom Retiro do Mundo Novo (Antonina) which is situated only 3 miles from a seaport, accessible to vessels of 300 tons burthen. The quantity of ore is calculated as 6,000,000 tons.

The Federal Government has in operation (1918) decrees which accord many favours to capitalists wishful of exploring the iron mines of Minas or elsewhere.

Meteoric Iron

The Bendigo Meteorite. Discovered in 1784 by Bernadino da Motta Botelho, whilst herding his

cattle; he informed the Governor of Bahia, and in 1785 an attempt was made to remove it by means of a truck built on purpose.

It took 3 days to load it, and after going back for fresh water they harnessed eighty oxen and drew it 300 yards to the bed of the stream near by, where they had to abandon it.

Mr. Mornay, an Englishman in the State's service, visited it with the discoverer in 1811, and found it resting in a bed of rust. Spix and Martius saw it in 1818 and took 2 days to get a few fragments off with the aid of instruments and fire.

In 1883 Dr. Orville Derby, then Director of the Section of Geology in the National Museum, conceived the idea of removing the mass, as the railway was being constructed in Bahia. The line came within 114 kilometres, but a report of an engineer detailed to examine the road to Bendigo in 1886 was unfavourable on account of the great expense likely to be entailed. A young naval officer, however, became interested, and the *Sociedade de Geographia* of Rio discussed the affair in 1887; subscriptions were made, and on the motion of the President of the Society, the Marquis de Paranágua, the naval officer (José Carlos de Carvalho) was given charge of the operations, and Baron Guahy generously offered to make good any deficiency, and the Government promised its co-operation. On August 20 the same year, Lieutenant Carvalho proceeded to Bahia with two engineers, and a special truck was devised to work on rails if necessary, and the work was started on September 7, and the march commenced on November 26. The rail head was reached March 14, 1888, and the meteorite landed in Rio de Janeiro June 15. The distance to the

railway was covered in 126 working days, at an average daily rate of 900 metres. Free transport was given both by rail and sea, and the services of the staff at the Naval Arsenal requisitioned for landing. The dimensions of the mass are: Length, 2·2 metres; greatest width, 1·4 metres; weight at Bahia, 5,360 kilogrammes. A piece cut off in Rio weighed 60 kilos. It is the largest meteorite in any museum, and contains several rare minerals, amongst which are cohenite, kamasite, schreibersite, as well as chromite, copper and cobalt, and many globules of magnetic iron.

The above achievement is one of the greatest ever undertaken, as the country was very wild, and mountains had to be crossed in one instance 2,400 feet above sea level. Many streams had to be forded and tracks made through the forest. The undertaking may indeed be said to have been quite unique.

The largest piece is in Munich (3,115 grammes). A fragment in the Natural History Museum of Vienna weighs 1,933 grammes, one in St. Petersburg 25 grammes, and another in Berlin 20 grammes. A larger piece, 2,494 grammes, is in London, but whether in the Geological Museum (Jermyn Street) or S. Kensington, I cannot say.

Many smaller meteorites have fallen in different parts of Brazil, notably in Santa Catharina, where a great shower took place a number of years ago.

Some of these aerolites are in the National Museum at Rio Janeiro.

Itacolumite (rock)

Contains (Orville Derby) zircons, tourmaline, specular iron, etc.

Jade

This mineral has been found at Amargosa, Bahia, in blocks of several kilos. Here and there it occurs in the paving of the streets. Ornaments have frequently turned up in excavations in the Amazon valley. Specific gravity of these specimens, 2,951 (Hussak).

A large piece from Guarapuava (Paraná) was shown at the 1908 exhibition at Rio.

Jasper

Common in Rio Grande do Sul, in the river beds, with agates, cornelians, sards, etc. Also at Areia, Bahia. Fossilized tree ferns and other forms are found in the N. of Matto Grosso, and close to Paulo Affonso falls on the S. Francisco river, where a great number of silicified trees have been turned up, including a trunk 70 feet long and 3 feet 8 inches base diameter. Also, with hyaline quartz, on the Gurayras river in Ceará.

Kaolin

At Bom Jardin, Carinhanha and other places in Bahia and in Minas Geraes, and Rio Janeiro.

A large deposit in Rio Grande do Sul is now in the hands of a group of French financiers, who propose starting a porcelain factory, encouraged by reports from Limoges that the mineral is equal to the best from Japan.

At Vassouras (State of Rio Janeiro), 4 kilometres from the railway station and only three hours from the capital, a large quantity of fine clay has been found, one mass alone containing 200,000 tons.

Lanthanium (see Monazite, also Euxenite)

Leucite

Crystals in tristoctahedral form (hardness, 5·5; specific gravity, 2·45) have been found at Pinhalzinho, S. Paulo, also pseudomorphs at Tinguá mountain, Rio, in the nepheline rocks, together with analcime and diopside. Colour, white to grey.

Lewisite

At Tripuhy, O. Preto. In minute honey yellow or brown octahedra. Is an antimono-titanite of lime and iron. Hardness, 5·5; specific gravity, 4·94. Clivage perfect. A new, rare mineral.

Manganese

The principal mines of this mineral are at Miguel Burnier (in limestone) and Queluz in a granite gangue. At Morro da Mina the ore is 50 per cent. pure, each wagon fills in 1 minute, and wages only average 2s. 6d. daily. The mineral is remarkably free from sulphur and phosphorus. The Queluz deposit has a reserve estimated at 10 million tons. The Miguel Burnier deposit is 6 miles long, running from east to west. The figures relating to the working of these two mines for 1913 were:—

	M. Burnier	Queluz
Extraction . .	16 $000	6 $500
Freight to Rio .	6 $300	7 $500
Cartage in Rio .	4 $000	4 $000
Minor expenses .	6 $700	7 $000
Freight to Europe .	12 $000	12 $000
Total . .	45 $000	37 $000
	or £3 0s. 0d.	or £2 9s. 4d.

The distance from Queluz to Rio is 500 kilometres, equal to 300 miles.

Analysis of Manganese ore from Queluz (1913): Manganese, 48-55 per cent.; Iron, 3-5 per cent.; Silica, 3-4 per cent.; Phosphorus, 0·03-0·04 per cent.

Many fresh deposits have been exploited during 1916-1918, with a percentage of manganese as low as 43-45. The whole of the region between Sabara and Queluz being honeycombed in all directions in search of the mineral.

Bello Horizonte itself has not escaped, and researches have extended as far as Sete Lagôas in one direction, and the valley of the Rio das Mortas (Oeste de Minas Railway), St. João d'el Rei, J. Pinheiro (Cachoeira Station) 147 kils. from Sitio. The mineral exists in this zone in the form of Polyanite, occurring in parallel sheets. The latter deposit may perhaps be equal in value to that of Morro da Mina, Queluz, which has a reserve of 10 million tons of ore. The quality is, however, not uniformly good, being calculated as yielding from 44 to 53 per cent. of metal, with as much as 8 per cent. of silica and 0·08 per cent. of phosphorus.

Samples of ores from the S.W. of Minas Geraes, present a complex character, being classified as Mangano-cobalt-nickel with 15·9 per cent., 1·55 per cent., and 0·41 per cent. of metallic contents respectively.

Bahia (Nazereth) Deposits

Mineral usually psilomelane. Average metallic contents 46 per cent. Reserves (1916), 1,267,000 cubic metres of ore. In the above year, 53 claims were registered in Bahia.

Matto Grosso, etc.

A very large deposit exists at Urucum, 30 kilometres from Corumbá (Matto Grosso), with an estimated reserve of 30 million tons. Total expense of shipping from this to a Continental port would average not less than 45s. under the most favourable conditions. The Argentine Republic should prove a better market, if smelting difficulties could be surmounted. There are also deposits of this mineral, in the form of psilomelane, at Goyanna (Pernambuco) and in the Chapada Diamantina and the Serra de Jacobina in Bahia, at Villa Nova, 444 kilometres from Bahia city. Another locality is at Nazareth, close to the city itself. Manganese is also found at Perus in São Paulo, near Curityba in Paraná and in the State of Rio Janeiro.

Exports.

	Tons	Value per Ton
1914	183,630	25 $485
1915	288,671	36 $476
1916	503,130	54 $000
1917	560,000	105 $400

The Central Railway has been carrying the ore at 12 reis per ton. kilometre, a dead loss of 80 reis. Five companies made a profit of a million sterling in 1916.

Marble

The Gandarella lignites in Minas have, in their limestone surroundings, 800 millions of cubic metres of fine marbles, in 40 varieties, blue, white, and brecciated. Vermillion, yellow, and blue-black marbles are found in Bahia, and fine qualities near Paty do Alferes in Rio State, as well as black marble

at S. Roque, Soracabana Railway, São Paulo. In Paraná green and rose varieties occur at Lapa, black at Bocayuva, and snow white at Areias. In Rio Grande do Sul (S. Gabriel) a quarry containing fine white, rose, and blue marbles, was leased in 1917, for 20 years, for a sum exceeding as many thousand pounds.

Mesolite

With most of the other zeolites in the Rio do Peixe basalts, and in the Serra do Tapirapuan, N.E. of Matto Grosso.

Mica

The best quality comes from Goyaz, but the principal exportation was from Santa Luzia de Carangola (Minas). Average size of plates, 6 × 6 × 3 inches. It is put up in boxes of 100 lb. weight, and the expenses entailed are: Extraction, freight, etc., to the railway, £50 a ton; freight to Rio, £1; export tax, £6; freight and insurance to Europe, £7; total, £64; average value, £150. Exportation in 1908—43 tons. There are also important deposits at Itaperica (São Paulo), São Paulo de Muriahé (Minas), in Bahia near Paulo Affonso falls, in the Itapicurú valley, and near Jacobina, in beautiful crystals imbedded in pegmatites. In the State of Rio it occurs at Campos, Conservatoria, São Fidelis and Paquequer, plates up to 2 metres long being found at the latter place. This mineral is common throughout Brazil, but owing to the extraordinary manner in which the matrix is disintegrated, it is necessary to excavate to a great depth in order to obtain mica of a nature suitable for export. There is a great vein at Carangola (Minas) in the kaolinized feldspar, plates occurring up to 36 × 50 inches of fine quality.

Mines near Juquiá, south of São Paulo, near the coast, produce fine Ruby Mica. An American geologist, J. D. Jacobs, has found a new locality at Saquarema, Rio State.

Total exports of this mineral in 1915, 50,773 kilos, worth 142,236 $. 1917, 96,627 kilos, £27,000. Rio, kilogramme prices (1918) for Indian cut, finest clear A1 type, 50 $ Type 1, 35 $. Type 3, 20 $, and Type 6, 3 $500.

Mineral Oils

Dr. R. Arnold, an American geologist, defines the principal areas containing impregnated shales and schists, as those of Marahú (Bahia), Alagôas, 25 to 45 miles north of Maceió, and a district in the Serra de Araripe (Ceará).

All these are of high commercial value, and sufficient to entirely emancipate Brazil from foreign trusts.

Proceeding from south to north as in the case of coal.

Shale oil exists in small quantities close to the Tigre stream, near the track from Lages to Rio Negro, Santa Catharina, and on the left bank of the Jangada by Palmas, Paraná.

Several deposits have been located in São Paulo, notably a vast sedimentary basin at Taubaté (Rio-São Paulo line), in a bed of bituminous shales.

This has been exploited for some time for the purpose of gas production, but attention is now being turned towards the oil question.

Works at Tremembé, distil 14 to 15 per cent., giving 10,500 calorifics.

The output will reach 1,000 tons monthly in a very short time.

The percentage of carbon in these shales is reckoned at 21.

Other localities include Botucatú, on the Tieté river, Rio Claro, where petroleum is said to lie just below the surface in sheets and pools, also at Ibitinga, and on the Rio Pardo, close to the city of Ribeirão Preto, where the shales are reported to contain 25 per cent. of oil.

The Macahe, so-called peat beds, probably answer better to the description of schists, as they contain hardly any traces of vegetable matter.

There is no doubt they are worth attention as oil-producing mineral.

The deposits of Marahú are capable of yielding gas of high illuminative power, and each metric ton contains at least 3 barrels of oil, besides extracts, such as benzine, phenol, etc., up to pre-war values of £8.

The Alagôas district is presumed to contain 13 million cubic metres, and the present output of oil is over 200 tons a month, after all, a very small amount compared with the enormous value of this basin.

The schists contain other minerals of commercial value. The company at present operating the deposits, proposes to cover an area of ten leagues only, commencing two leagues from the capital of the state, and disposing of a port as well as roads.

The consumption of refined oil per H.P. hour is only 200 grammes.

Molybdenite

In diorites and quartz veins, also in pegmatites, in many places in Brazil, notably near Joinville, and on the Itajahy-Mirim, both localities in Santa Catharina. Quantities hitherto brought to light are insignificant.

Monazitic Sands

The origin of these sands from granite and gneiss was discovered and demonstrated in the laboratory of the Geological Commission in São Paulo by Dr. Orville Derby, the percentage in unweathered granite varying from 002 to 007.

In 1896 John Gordon obtained a concession to extract the Bahia sands.

He had proposed to the Auer Gas Mantle Company of Vienna to substitute the elements they had been employing by thorium, undertaking to supply sufficient material to keep the factory going. The change was made in 1895, but no fresh patent taken out, and in the same year the Eresenius laboratory in Germany discovered the secret of the substitution, and all rights of the Austrian Corporation lapsed, a German firm commencing to manufacture mantles and breaking the monopoly. See monograph on monazite in *Annals da Escola de Minas de Ouro Preto*, No. 6 (1903), by Dr. Arrojado Lisbôa.)

The Bahia sands are either greyish or with brilliant black particles (magnetite), or red, through the presence of garnet. Each labourer at work extracting gets per sack: crude, 200 reis,; clean, 300; and almost pure, 500 reis; and he can take out 10 to 15 sacks daily. The sands here are solidified and have to be broken up by picks or hoes. They go through a process of washing and drying in ovens and the magnetite is removed before exportation by electric separators.

These are very useful, enabling the operator to divide the wolfram, cassiterite, and monazite, etc. It is suggested by Professor Lacroix (Paris), that a profitable industry might be built up by utilizing the by-products for the manufacture of pyromorphic

briquettes on the spot, and he believes the sands contain iridium, in addition to the other minerals.

The deposits extend along the coast to Rio Janeiro, the northern limit, as known at present, being near Cannavieiras; and there are many banks on the rivers, in the States of Bahia, Espirito Santo, Rio and Minas Geraes. Exportation is now in the hands of one contractor, the Paris banker, Gabriel Chouffour, who has signed an agreement with the Federal Government for the exploitation of the monazite deposits, on the following terms:—

£12,000 to be paid at once.
£24,000 when 9,000 tons are exported.
£36,000 when 18,000 tons are exported.
£48,000 when 27,000 tons are exported.

The contract is for 15 years, and 50 per cent. of the profits from the sale of nitrate of thorium go to the State.

In 1910, 15,664½ tons, of a value of £212,376 were sent to Germany. The Federal treasury received in export taxes over £100,000. The present stock held in Hamburg amounts to some 8,000 tons (1913).

There was a working agreement between the two former concessionaries to fix the price, at £5 15s. per cent. of oxide of thorium, making the value of the sands £28 15s. per ton when concentrated.

A plant is being worked on the Parahyba River (State of Rio) at Lage near Sapucaiá, where the sands pass over eight Wilfley tables to separate the quartz, etc., and the concentrates pass after through seven Humboldt magnetic separators. From raw material containing 2 per cent. of thorium, mineral worth £28 a ton can be turned out, at the rate of 50 tons a month. A deposit of monazite at Corrego

da Onça (Minas) contains 5·72 per cent. of thorium. There are also important beds of these sands at Dattas (Minas) and in the Casca and Jequitinhonha rivers in the same state. The sands are concentrated naturally from deposits at Tertiary age, containing decomposed gneiss. The present total cost to Hamburg is reckoned at between £15 and £20 a ton. Professor Otto Haln, of Frankfort, estimates that the radio-active principles found in monazite will shortly quadruple the value of the sands, at present used only for making gas mantles, which are composed of 99 per cent. of thoria and 1 per cent. of ceria.

Mr. Jacobs, the geologist already mentioned (Mica), says a great deposit (62 per cent. pure?) exists at Saquaremba.

Various analyses give:—

Thorium (Esp. Santo), Benevente and Itapemirim, 5·2 per cent.

Thorium, Becca da Vella, 12·5 per cent.

Santa Cruz, 9·4 per cent. Curú, 11·5 per cent., and Mucury (Minas Geraes) 5·8 per cent.

Yttrium contents vary from 1 to 3 per cent. Lanthanium, 2½ per cent. Aluminum, 3 per cent., and Magnetic Iron, 2½ per cent.

Brazil's reserves of monazite are said to be greater than those of all the rest of the world.

Exports, 1910, 5,437 tons = 1,912,281 $.

Exports, 1912, 3,397⅞ tons = 1,629,350 $.

Exports, 1917, 1,136 tons = 528,000 $.

Value per unit in 1912, 479 reis.

Hardness, 5-5·5.

Sp. gravity, 4·64-5·3.

Occurs in magnetic iron ore in the Rio Doce valley with corundum and zircon, and in the Minas and Rio graphites.

CHAPTER XXVI

MINERALOGY. PART IV

Nickel

Found at Tiradentes, near Bom Jardim, Sul de Minas Railway, in the form of Garnierite, in greenish masses in narrow veins, and pockets in the eruptives, mainly Olivine, which has been transformed into Serpentine.

The mineral contains up to 50 per cent. of Nickel. Peridotite occurs in large masses in the neighbourhood. See "Nota sobre a occurrencia dum mineral de Nickel," por H. Williams. Service Geologico do Brasil.

This mineral is found also in Pyrrhotine in Santa Catharina, and occurs sparingly in the iron ores of Central Minas Geraes.

Ochres

Many coloured earths are found at Tiradentes, Oeste de Minas Railway, especially Sienna, Paris Green, Chrome Yellow, Red Ochre, and other greens, browns, and reds, besides mauve and black. These mineral colours are also to be encountered at Benevente, Cachoeira, etc., in Espirito Santo, in Alagôas, and less extensively, throughout Brazil.

Opal

Milky Opal has been extracted at Agua Suja, and other non-precious varieties occur at Diamantina, and in many districts of Minas, Rio, etc.

Palladium (see also Gold)

Mr. W. H. Wollaston wrote a memoir on the occurrence of this rare metal in the gold and platinum of Brazil in *Philosophical Transactions*, London, 1804-5. The mineral was then new to science, and attracted a good deal of attention. It has a density of 18·87, and besides forming a natural alloy with gold, exists as a native element, Berzelius in 1835 finding 9·85 per cent. in the former metal from Gongo Soco, etc., together with 4·17 per cent. of silver.

Palladic gold is found near Sabará, at Candonga, near Serro, and Itabira do Matto Dentro, all of which places are in Minas; also in Goyaz, at Arrayas, east of Palmas. The matrix is either limestone or Jacutinga, and its occurrence seems to be limited to Brazil.

See a monograph in the "Annaes da Escola de Minas," Ouro Preto, vol. 8, 1906, pp. 78-188. ("Palladio e Platina no Brasil," Hussak.) The text is translated from the German by Messrs. Miguel and Manoel Arrojado, Lisbôa.

This mineral occurs as a silvery white metal with radial structure.

The platinum from Conceição da Serra, Minas, is rich in non-magnetic Palladium. Found here principally in the Corrego das Lages, a small river.

Pearls

Coloured and other pearls are found in many rivers and lakes in Brazil, but no attempt has been made to organize fisheries. The Araguaya and tributaries, besides the lagoons formed in its course, all the way from Leopoldina, almost to its mouth, contain pearls.

First known at Cananea, in S. Paulo, in 1590. Some fine mussel pearls have been brought from S. João, near Pitanguay, in the same state. As a strict matter of fact, these stones should not be chronicled under minerals, but, although of animal production, their substance may be considered as belonging to the former kingdom.

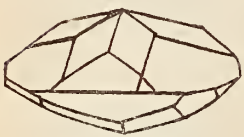
Perofskite

Already mentioned under other headings—Abaete, Agua Suja (Minas), etc.

Phenakite (see Palladium)

In No. 15 of the "Annaes da Escola de Minas de Ouro Petro," 1917, pp. 15-18, a posthumous article, Dr. Hussak describes the deposit of Phenakite at the old gold mine of S. Miguel de Piracicaba, near Santa Barbara, in central Minas Geraes.

Some of the crystals were 5-6 centimetres in length, flattened prisms in form, incolor, and often perfectly transparent.



PHENAKITE.

Inclusions of green mica and rutile needles were quite common. In the wood at the top of the hill a dyke was found, consisting of pegmatites, and here, below the kaolinized feldspar, in part consisting of beautiful clear green Amazonite, the Phenakites were found, sometimes grown on the feldspar, on hyaline quartz, or loose in the disintegrated rock. Washings in the batea gave fragments of smoky and clear quartz, and Dr. Hussak wrote that Amazonite crystals should occur lower down, as much as 50 centimetres in length.

Mica was common enough, sometimes in large hexagonal plates, black tourmaline (schorl) in infrequent prisms, as well as extremely rare crystals of honey yellow monazite, colourless zircon, oligiste, pyrite (cubic), Almandine garnet, and xenotime.

Some stones are of a pale reddish tint, and like many other Brazilian minerals, most of the best found their way to Germany. Usually the smallest crystals only are suitable for cutting. I learned from Dr. Costa Sena in 1917 that this deposit is entirely exhausted, and no other has been found in Brazil up to date. Hardness, nearly 8; specific gravity, 2·99.

Platinum (see Palladium)

Occurs only in the alluvials of the rivers rising on the east side of the Espinhaço range, especially in the tributaries of the S. Antonio, Rio do Peixe, and head waters of the Guanhaes, near Diamantina, in the Corrego das Lages, and (very magnetic) in the Abaeté river, with gold and other native alloys. It is heavier than Palladium. (Specific gravity, 20·5-21.) When found native has a rough spongy surface, with spherical protuberances closely united. *Vide* Wollaston, *op. cit.*, pp. 95-216 (1804), and 99-189 (1809). Has been found at Itambé do Matta Dentro in the Ouro Branco, and between here and Itambé do Serra in the diamondiferous gravels. In the Abaeté, is mainly derived from olivine matrices. Here grains are found up to the size of a large bean.

At Gongo Socco mine it is disseminated through the Jacutinga, and also occurs in quartz veins in crystalline schists. At Serro in the same formation, and in the state of Parahyba do Norte in the alluvials of the Coxim and tributaries.

In the Abaeté river it is also associated with chromite, magnetite, etc.

Test washings from this river yielded the following percentages: Burity, 158 grammes per ton of gravel; Jaguará, 182; and Brandão, as much as 741. A sample of gold from Sabará contained 30·60 per cent. of Platinum, and 1·42 per cent. of Iridium.

Has been found in the crystalline schists of Pernambuco. At Conceiçao da Serra, Minas, it is presumed to have been derived from quartz and tourmaline (schorl) veins. Said to exist in the river Muriahe in Rio Janeiro state.

Pumice

At Vizeu, in Pará, etc., etc. Sometimes large quantities are floated down the Amazon, from the Andes.

Pyrolusite (Manganese Dioxide)

Near Ouro Preto, and also at Curityba, Paraná. Common amongst the manganese workings.

Raspite (Sumidouro de Mariana, Minas)

In the auriferous alluvials. Found in tabular or prismatic crystals, 1 to 2 mm. in length. Colour, grey to yellow. Specific gravity, 8·4.

Rhodonite (Silicate of Manganese)

At Lafayette, Piguiry and Miguel Burnier, also close to O. Preto, in the Manganese mines. Colour, rose-pink. Hardness, 5 to 6½. Will take a good polish.

Rock Crystal

Common in many states, but exported principally from Goyaz (Serra dos Crystaes), *via* Uberaba and Santos. It is packed in wet hides and finds its way

principally to Germany. Worth locally 2s. a lb. for the best qualities. Abundant also at Congonhas do Campo, and some exportation is made on a small scale from Seté Lagôas and from the Jequitinhonha valley (rose quartz), and many other parts of Minas and Bahia. Sagenitic quartz (Fleches d'Amour) occurs in the Valle da Ribeira, São Paulo. These inclusions are generally needles of rutile.

A most extraordinary double-ended crystal was recently sent to Europe. It measured 10 × 9½ inches. Export tax (Minas) on all kinds of crystal, except citrine and amethyst, is 100 reis a kilogramme.

Ruby

Exceedingly scarce. A gem of half a carat has been discovered at Abbadia das Dourados, and another small stone came from the Agua Suja gold mine. Ruby corundum in a massive form occurs in several places in São Paulo.

One from the collection of the late Dr. Hussak is now in the Museum of the Department of Mineralogy, Ministry of Agriculture, Rio de Janeiro.

Rutile (Titanium Dioxide)

Magnificent crystals have been taken out of druses in the mica-schist at Corumbá, Matto Grosso, and prisms are encountered now and then in the Morro Velho gold mine. This mineral is found up to 2 centimetres in length, dark blood red in colour, also in the pegmatites of Bom Jardim, and at Jequie, Bahia; occurs in São Paulo with sagenitic quartz. Twin crystals from the first-named locality have been priced as high as 50s. each (Krantz, Bonn). In 1917 reports came to hand of

a great find of this mineral in the form of *Brookite*, at Limeoeiro, Pernambuco. 2½ tons are said to have been taken out in a single day.

Salt

The principal seat of this industry is Rio Grande do Norte, in the districts of Macau and Mossoró, where the sea salt contains 98 per cent. of chloride of sodium. The principal pans belong to the Companhia de Commercio e Navegaçao, which runs its own steamers, and carries as much as 10,000 tons monthly.

The four largest deposits have a capacity of 150,000 tons.

In Pernambuco, 40 kilometres from Buique, a salt lagoon exists, the mineral being derived from sandstone which lies over the gneiss. This lake has an area of 30 hectares during the dry season, when the salt is collected. The whole of the zone extending over Piauhy, Ceará, and as far south as Chique-Chique, Bahia, is dotted here and there with natural salt pans and other deposits.

Sea salt is collected near Cabo Frio, in Rio state. Since the war began, the concern mentioned at first has taken to refine its products, and has put a good quality on the market suitable for table purposes.

Saltpetre

There is an area containing this mineral in the Chapada Diamantina of Bahia, reckoned at 12,500 square kilometres, of limestone and shale formation.

In Piauhy a new and important area of 600 kilometres has been located, only 36 miles from the port of Camocim. The mineral here contains 89 per cent. of azotate of potassium.

That on the upper Paranahyba has 82·39 per cent., and 27 per cent. of sulphate of sodium.

In Matto Grosso, in the salt marshes of the Jaurú, etc., it also occurs.

Nearer at hand, in the caverns of the Rio das Velhas valley, Minas Geraes, and continuing N. into Bahia, there are extensive deposits in the same limestone rocks. Southwards, smaller finds have been made in S. Paulo.

Sapphires

As satellites of the diamond in the Coxim and tributaries in Matto Grosso. Usually small and cloudy. Called locally azulinhos. A parcel I saw in December, 1918, averaged 1 to 2 grammes each, but were very dichroic, green in one direction, and blue in the other, and evidently worth little from a commercial point of view. These gems are also found in the alluvials and detritus of Salobro, Bahia; in the Rio Doce, Esp. Santo, have been reported in the state of Rio itself; in the Sapucahy, and Rio das Canôas (Rio Grande), S. Paulo, associated here with diamond (rare), colourless topaz, cymophane, xenotine and zircon.

Small blue and colourless gems have been found near Diamantina (Minas Geraes).

Scheelite (Calcium Tungstate)

In Morro Velho gold mine, also from Sumidouro de Marianna, in acute pyramids of a clear yellow colour, and in lenticular masses.

Analysis: WO_3 79·75. CaO 19·84. Mg. 00·02.

Scolezite

In the Tubarão coal mines, Santa Catharina.

Scorodite (Arsenate of Iron)

Fine crystals have been found at Antonio Pereira, near Ouro Preto. Contains arsenical acid, 51 per cent.; sequioxide of iron, 34·52 per cent.

Siderite (Sapphirine quartz)

At Minas de Rio de Contas, Bahia, etc.

Silver

Recovered from the gold in Passagem and Morro Velho mines, and in the lead mines of Rio Grande do Sul, *vide* Galena.

Spessartite

This beautiful garnet is rarely encountered in Brazil. Specimens have been seen from Registro, Central Railway, Minas Geraes.

Sphene (Titanite)

I have a fine gem (flawed) from the Minas Novas District. This strangely lustrous stone is trichroic. Red-green-brown. Hardness only 5½, so, unfortunately, unfit for jewellery. Analysis: Silica, 32·29. Titanic acid, 41·58. Oxides, 4·46 per cent.

Spinel

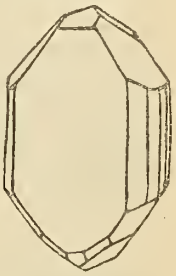
Many beautiful spinels (red), and balais rubies (crimson), have been discovered in the sands of the Puina in Espirito Santo. Blue, violet, and other fancy colours peculiar to this semi-precious stone, have been found in the same river. Most of these occur in perfect octahedrons, as in Ceylon. This gem is also known to exist in the Paraguassú in Bahia, near Machado Portella, accompanied by monazite and xenotime. An almandine spinel from

Ouro Preto? may be seen in the Natural History. Museum in London. Recently, finds have been made in the Sacramento, S. Paulo, and in the Muriahe, State of Rio. Red spinels are rarely found in the quartz of Encruzilhada, Rio Grande do Sul. Composition: Silica, 66·40; Alumina, 25·30; Lithia, 8·85; Oxides of Iron and Manganese, 1·45.

Spodumene (Triphane)

Found at Arassuahy, also near Diamantina, in greenish yellow and blue crystals. Called cambalaxo locally. Sometimes sold in mistake for chrysoberyls, but much softer.

The blue Diamantina stones may be taken for Lazulite. This mineral is also found in colour near to Hiddenite, and smalt and Berlin blue (Eschwege).



SPODUMENE.

Staurolite

In the mica schists of Arassuahy, in crystals up to ¾ by 2 inches. Forms also a part of the schistose rocks near Ouro Preto, and occurs also at França, S. Paulo, and in long brilliant yellow crystals at Xiririca, Ribeira do Iguape, in the same state.

Stibnite (Antimonite)

With Bismuth, at Furquim, in contact with gold, and also at Passagem, near Marianna. Native Antimony is found in the valley of Itapirapuan, S. Paulo. Stibnite crystals exists also in the auriferous deposits of Caethé, and near the base of the mountain at Itabira do Campo.

Stilbite

At Serra de Brotas, S. Paulo, also with most of the other zeolites in the railway cuttings at Barra do Rio de Peixe, in aggregations in basalt outcrops. Some of these are fan-shaped, and others well crystallized. The paving blocks of some of the stations of the S. Paulo-Rio Grande Railway in this section, are full of these and other zeolites.

A representative collection may be seen in the National Museum, Rio.

Stolzite (Tungstate of Lead)

At Marianna, Ouro Preto, in tabular crystals, also close by, at Sumidouro, and Itacolumy, in irregular grains in decomposed quartzites, up to 2 centimetres in length, and in cavities in the solid rock. Colour sulphur yellow to orange red. Specific Gravity 8·3 (Florence).

Sulphur

The most important deposit in Brazil, as far as is known, is at Curraes Novos in Rio Grande do Norte. This is 6 kilometres long and 5 to 7 metres thick. There are others smaller in the same State.

Talc and Soap Stone

Common near Ouro Preto, Santa Barbara, Marianna, etc., etc. Many churches in Minas and Bahia have their fonts and other ornamental vessels, and parts of their interior structure, made of an excellent variety of this stone.

Tantalum

Found in Columbite and Euxenite (Samarskite).

Tin (Cassiterite)

Stream tin is met with here and there in the sands of the Paraopeba, near Bello Horizonte, Minas, it is also associated with Monazite in the Mucury, and at Salinas, N.E. Minas. Occurs also at Sangue Negra, Caçapara, Rio Grande do Sul.

Titanium (see Rutile)

Topaz

Eschwege (Pluto Brasiliensis), 1833, reported this gem stone in magnetites and pegmatites at Pescaria, an island near Rio Janeiro, but defines the principal source as follows: A narrow belt extending from Saramenha, West of Ouro Preto (Minas), as far as Capão da Lana; a still narrower band running a few kilometres westwards. These stones were mixed in the eighteenth century; the soi-disant Bragança diamond, a colourless stone from Serro Frio, near Diamantina, weighing 1,680 carats. In 1833, 8,000 cruzados worth of the amber coloured topazes from near Ouro Preto were sent to Europe.

Dr. Gorceix, *Annaes da Escola de Minas de Ouro Preto*, 1881, says: "The country rock is seritic phyllites with a small residue of rolled zircons. The dark (iron stained) earth in which topaz is found contains rutile, tourmaline, green anatase, *Florencite*, a cerium aluminium phosphate, rutile, fluorite, and martites."

He states that they are derived from eroded rocks of Quaternary age, and the veins in which they lie may be termed metamorphic schists. They occupy a series of cracks (fendas) in the rocks with pyrites in addition to the minerals already mentioned, the basin, or hollow in which they occur, lying north of

Ouro Preto, the veins bearing east 15°-20° north-east.

In the Boa Vista workings, the formation was in 1880 (Gorceix): (1) Coarse conglomerate (schist and quartz); (2) yellow sands; (3) sands with thin layers of schist containing altered pyrites; (4) idem, more schistose in character; (5) idem, fibrous schists with pyrophyllite, and octahedra of specular iron; (6) compact blue schists; (7) clayey rock in which topazes were found; (8) black clay with veins of quartz containing topazes and *Euclases*, both gem stones being found at times grown on quartz crystals proving the latter to be an earlier formation. Rutile takes the place of cassiterite here in Brazil, and rarer accessory minerals are *Phillipsite*, *Fuchsite*, and Anthrophilite. Below stratum (9) black clayey schists and still further down, reddish schists are found.

The surrounding rocks are Itacolumites and clay slates. The gem is found in all shades of yellow, amber and brown, with occasional fine pale rose to crimson crystals. The largest stone I have seen was reconstructed, and about 30 × 6 centimetres, being made up of 4 pieces. Most of the topazes are faulty, the only mine open in 1912 (at Rodrigo Silva) yielding less than 2½ per cent. of good material. At the time of writing, nothing whatever is going on in this direction. A yellow stone from near here in the National Museum at Rio, weighs 2 kilogrammes. In 1913 and 1917, I handled, perhaps 20 kilos of crystals, 2-5 centimetres in length, and could not pick out a single perfect one. The most beautiful I have seen is a deep brownish-yellow cut gem in the British Museum of National History, London. The most reasonable explanation of the great percentage

of flawed stones appears to be that these crystals were cooled too rapidly and subjected to great pressure at the time. As regards the varied colours, Wada "Minerals of Japan," English edition, Tokyo (page 91), says, "This stone must have turned from brown to yellow and then to bluish and colourless."

Strange to say, the two latter varieties are *not* found in the Ouro Preto workings, but at a great distance, as rolled pebbles in the streams of N.E. Minas, derived from entirely different formations.

Dr. Orville Derby (*American Journal of Science*, January, 1901), reports colourless bi-pyramids from near Serro, Diamantina. These seem to be similar to the beautiful limpid gems from Japan (Museum of Geology, Jermyn Street, London). Janettaz (*Diamants et Pierres Precieuses*) mentions a fine yellow crystal, 10 × 4 inches.

The Marquis de Dree (Paris) had in his collection, one orange stone (cut) 20 x 19 mm. One jonquil yellow, 21 x 19 mm. One purple rose, 12 x 10 mm., and another oval, 20 x 16 mm. The most famous of all is, however, an engraved gem of 2½ lb. It was formerly the property of the Bourbons, and was presented by Dom Pedro II of Brazil to Pope Pius IX, who gave it to the King of Naples. Andreas Cariello, director of the local museum, engraved it with the figure of Christ breaking the Eucharist bread. This work in basso-relievo took 12 years to execute, at a cost of 400,000 lira.

Offered to the Brazilian Government recently for a million lira. Presumed to be the finest work of art of its kind in existence.

Strange to say, King in his work on engraved gems makes no mention of this masterpiece. Mawe (*see Bibliography*) gives a coloured drawing of a

sky blue topaz measuring 40 × 33 × 20 millimetres: this was cut as an oval brilliant.

Dr. Costa Senna, Director of the School of Mines at Ouro Preto, has a clear, bluish-white stone weighing 48¼ grammes. This came from Salinas in a parcel of aquamarines. It retains most of the crystal faces. I have one weighing about 100 carats, but somewhat pale in hue. Colonel Remington possessed some out of the way stones, amongst which a bipyramid and two crystallized in quartz were very rare. Topaz has been found in Ilha Grande, near Rio, in the same gangue (matrix), but very much water worn.

Greenish crystals occur at Olinda (Pernambuco). A ruby red gem weighing (cut) 12 carats sold in the nineteenth century in Rio for £5. It would be worth three times that price in London to-day, and probably 500 milreis in Rio Janeiro. Bohrer asked me 8 $ a carat for small pale pinkish stones.

M. Ratte, a Paris jeweller, had in his possession a cut gem of 31 carats, crimson with a yellow centre. Amongst notable crystals on the market this year may be mentioned a blue and white, 5 × 2 centimetres, £13; a white one, 5 centimetres long, £7; a blue, 7 centimetres long, £6 5s.; a blue, 6½ centimetres long, £5. A *really* blue stone would be a great find. Those called blue are quite pale as a rule, but when clear are very brilliant.

The white and blue gems are derived from the decomposed granitic rocks of N.E. Minas, near Arassuahy. Here they are almost always water worn, being found in the river gravels. One (colourless) in the National Museum, Rio, weighs 4½ lb., but far larger ones have been recorded.

At Capão da Lana, and Bôa Vista (Ouro Preto),

the matrix occurs in a fracture parallel to the micaceous strata, bearing west 15° south. A small deposit exists in Rio Grande do Sul, and the stone is said to exist in the State of Rio.

THE OURO PRETO TOPAZ DISTRICT.
From Bauer's *Edelstein Kunde* (1909).

By the courtesy of Herr Chr. Herm Tauchnitz, Leipzic.

Reported from the river Tibagy, in Paraná, in the Diamantina district, here, as in *most* other localities, being colourless.

Topaz turns rose on heating. After being covered

with tinder, a brass wire is attached as a handle, the cotton burned off, all carbonic acid being absorbed.

Dr. Costa Sena says the deposits extend from Ouro Preto as far as Columnas, and Lagôa do Netto, considerably south of Miguel Burnier.

The trade price in the capital in 1800 was as follows:—

Yellow stones, per oitavo, 50 reis to 2½ $000.

Bluish stones, per oitavo, 50 to 200 reis.

White stones, per oitavo, 5 to 50 reis.

Krantz offered the following (1913): 1 golden yellow topaz in rock crystal with hematite (specular iron), 12 × 8½ × 6 centimetres, 90 marks. Another of dark orange yellow hue, 13½ long 3 wide (weighs 183 grammes), 450 marks.

Touchstone (Black and Blue Jasper)

On the upper Amazon at Ereré (Monte Alegre).

Tourmaline

Tourmalines were first brought to the coast by Fernandes Tourinho, 1522, and they were known as emeralds and sapphires (the blue variety) until the eighteenth century. The rubellite was recognized as a tourmaline in 1733, but even Mawe, the English mineralogist, imagined the indicolite was a sapphire. These stones were first worked in 1770, but it was not until the twentieth century that any systematic exportation took place. Formerly it was the fashion to present strangers in the district where they are principally found (north-east Minas) with a fine stone as a curiosity; but in 1905 the value of large clear gems had risen to £100 a kilo, and of smaller stones from £15 to £35 on the spot. The

districts of Porteiras, Larangeiras and Salinas are the headquarters of the trade, mostly in the hands of German agents. Those of Itambacury are found in cascalho in the forest, below 2 to 3 feet of earth. Green stones have been discovered weighing a pound, with rubellites (crimson, purple and pink) and indicolites (deep to clear blue) up to 3 inches long.

The Itambacury (Theophile Ottoni) gems are all green. One stone found in the Piauhy was 30 × 9 centimetres. The whole of the basin of the lower Arassuahy and the Jequitinhonha and upper Rio Doce is noted for these stones, and the matrix is usually decomposed quartz veins, running through pegmatites and gneiss. Some are found with red centres surrounded by green, others vice versa, some red at one end and green at the other, some brown (dravite), yellow, and colourless (see Achroite).

Dr. Nilo Pecanha, ex-President of the Republic, had a very rare gem presented to him, yellow with a green core.

Tourmalines are also common in the auriferous formation of Antonio Pereira (Ouro Preto). Schorl or massive tourmaline and large black isolated crystals are met with in many parts of Brazil. Value of rubellites on the spot, from 10s. to 15s. the gramme. Green stones, from 9d. to 1s. a gramme. Export tax (all colours) from Minas, 800 reis per gramme. Recent finds of rubellites, one 13 × 6 centimetres, one end rose violet, £37 10s.; one 9 × 3 centimetres, £12; one dark red 18½ × 10 centimetres, £30; one 17 × 8½ × 12 centimetres, £25; and one 14 × 8 centimetres, £25.

A crystal from Barra das Salinas, measuring 7½ centimetres long, a beautiful bright red in colour, was offered by Krantz for £6.

Tourmalines were found in the time of Eschwege, in feldspar at Campo de Santa Anna in the city of Rio Janeiro itself. Colour, grass to emerald green.

The five splendid series of crystal groups mentioned above occured on lepidolite (*Lithia mica*) with albite (feldspar) crystals.

Rubellites (dark violet red)

I.	22 × 18 × 10	C. (Group), 1,500 marks.
II.	16 × 11 × 8	C. (Group), 500 marks.
III.	13 × 11 × 7	C. (Group), 400 marks.
IV.	9 × 9 × 4	C. (Group), 300 marks.
IV.	13 × 11 × 9	centimetres.

Rubellite on rock crystal. Cat's eye rubellites, pale rose coloured, come from Ilha da Marambaia, N.E. Minas and S.W. Bahia, on the border of Minas.

Rubellites were first brought to London in 1733 when their true nature was discovered. They are generally more defective than the green variety, and both, like topaz, are found in rock crystal.

Indicolites (indigo blue tourmalines) were so named by de Andrade, the well-known Portuguese mineralogist, who became celebrated as a Brazilian statesman.

Green tourmalines have turned up in kaolin beds amongst the peat deposits of Bom Jardin, S. Minas, one crystal weighing 5 kilogrammes.

Gmelin gives the following analysis of this variety: Silica, 39·16 per cent.; Alumina, 40 per cent.; Lithia and Potassium, 3·59 per cent.; Magnetic Oxide of Iron, 5·96 per cent.; Manganese Oxide, 2·14 per cent.; Boric Acid, 4·59 per cent. Rubellites from Jacobina, Bahia, contain 38·30 per

cent. of Silica, 41·64 per cent. of Alumina, and those from Conquista in the same state, 37·99 per cent. and 38 per cent. respectively, and 5 per cent. of Iron Oxides.

The Marquis de Dree had a Dravite (velvety chestnut coloured variety from Ceylon), which was 10 by 9 mm.

Tremolite (near Nephrite)

At Ouro Preto.

Tripuhyte (Hussak and Prior)

A new mineral found with Cinnabar, Lewisite, and Derbylite, at Tripuhy, near Ouro Preto. Presumed to have originated in the mica schists. Specific gravity at 19° C. = 5·82.

Analysis: Silica, 66·88 per cent.; Ferric Oxide, 27·70 per cent.

Trydimite

Minas de Rio de Contas (Bahia).

Tungsten (see Wolfram)

Uranium (see Euxenite, etc.).

Vanadinite

Hardness 2·75-3. Specific gravity 6·66-7·10. At Sumidouro de Marianna in gold workings.

Wavellite

In acicular crystals near Carandahy, and at Itacolumy, containing 33 per cent. of phosphoric acid.

Wolframite

As in Cornwall, a few fathoms below the surface. At Encruzilhada, Rio Grande do Sul, in quartz veins from 12 to 20 inches thick. Proportion of acid,

40 per cent. Copper sulphides and monazite occur in connexion.

Also found at Ituassú, Bahia; analysis giving WO_3 75·02 per cent.; FeO 18·17 per cent.; and Mn, 6·50 per cent. Recently discovered near Marianna in Minas.

Xenotime (Yttrium Phosphate)

At Tripuhy, Ouro Preto, Datas, Diamantina, etc., in prismatic crystals up to 3 centimetres in length. Perfect clivage. Also at Pomba. See Euxenite.

Zinc (Oxide)

In the Serra de Caldas (see Brazilite). From 68·14 per cent. to 92·13 per cent. pure.

Zircon

At Tripuhy, Ouro Preto, and at Agua Suja, in yellowish prisms and cubes. Also with Brazilite near Caldas, Minas. Specific gravity 4·7. Hardness 8.

Zirkelite

At Jacupiranga, S. Paulo, with Perofskite. Hardness 5·5.

THERMAL SPRINGS

Pará. Near Serra Ereré, on the left bank of the Gurupatuba river, there are hot sulphur springs that have never been analysed or tapped.

Parahyba do Norte. At St. João do Rio do Peixe analysis has been taken of some waters lightly sulphurous, and with a temperature varying from 21·5 to 32·2 centigrade.

Ceará. Close to Tamboril there are acidified crystalline springs entirely unused. Another in the vicinity of Santa Quiteria has a temperature of 35° centigrade. The most important springs are at Caldas, 12½ kilometres from Barbalho.

Pernambuco. Mineral waters are found at Pajehú de Flores.

Bahia. Close to Itapicurú, 220 kilometres from the capital of the state, there are thermal springs, with a temperature of 39° centigrade. They contain chloride of sodium, lime and magnesia, sulphate of soda and bicarbonate of soda, carbonate of lime and magnesia. Four parts out of five are of the first-named. There are seven other hot springs of a similar nature in the vicinity of the above.

There are also thermal springs at Santa Luzia (Caetite), Morro do Chapeú, Jacobina and Abbadia.

Rio de Janeiro. In Parahyba do Sul there is a

mineral spring, classified between carbonates and feruginous effervescent types. It is a proto-thermal fountain, under the name of salutaris, and is prescribed by the local doctors for anæmia, dyspepsia, and female irregularities. In six years 49,307 boxes of 48 small bottles were sold in different parts of Brazil. In Santa Rita (Magé) there is a spring of water, very good indeed for affections of the liver and stomach. Of this, in the first three months of 1907, 43,930 bottles were sold.

Federal district (municipality, etc., of the capital of the Republic). Formerly there were many ferruginous springs (chalybeates in Cosme Velho, Santa Theresa, Tijuca and Boa Vista de Gavea), but the growth of the city has, so to speak, swallowed them up.

São Paulo. In Tatuhy a spring furnishes 3,000 quarts in 24 hours. It is largely impregnated with carbonic acid gas. In Santos there are several mineral springs, and in Campinas six of gaseous nature, as well as others in different parts of the state, as Leme, Rocinha, Mogy-Guassú, etc.

Paraná. The hot springs of Xapecó are of sulphurous nature, and are mostly used for affections of the skin.

Matto Grosso. From the granite, at a place called Frade, water gushes at 42° centigrade, of a ferro-magnesia nature, employed in cutaneous diseases.

Goyaz. In the Serra das Caldas there are three thermal springs, varying from 22° to 42° centigrade, of the same nature as the above. Experiments prove them to be minus acids or alkalies. Principally used by rheumatic patients, and those suffering from cutaneous diseases.

Minas Geraes

Caxambú is situated in the municipality of Baependy, 2,800 feet above sea level, 22° S. and 1°45′ W. of Rio Janeiro.

The midsummer temperature is: maximum, 26° centigrade; minimum, 18° centigrade. In 1911 there were 994 persons staying in the sanatorium, and 2,187 other persons taking the waters. The town has electric light and possesses several hotels, including the *Palace* and *Grande*. The local paper is *O Caxambuense*. Population, 3,000. Reached by Sapuchay Railway from Rio.

These mineral springs have been noted for a long time, and their reputation has increased so much that there is now quite a small town in the locality, with hotels, electric light, baths, etc. Nearly 100 persons are engaged in the bottling of water from five or six springs, others being used locally only, for medical purposes.

The use of these waters cures indigestion and constipation, diabetes, etc. Character of fountains D. Pedro and Viotti, gaseous acidulated waters like seltzer. Fountain D. Isabel more gaseous, and contains a large percentage of iron, tonical. Fonte D. Leopoldina, more alkaline and gaseous than the first two named. Fonte Intermittente, similar to D. Isabel, but more alkaline, and with less iron. Exportation, 1906, 20,917 boxes, of 48 bottles. Radio activity, 0·55 m/m. per minute.

S. Lourenço, 2,800 feet above sea level; nine hours from Rio by Minas-Rio Railway. Average temperature, 12° to 16° centigrade. Seven springs. Waters suitable for dyspepsia and stomach complaints.

Aguas de Fervedouro (Carangola). 2,000 feet

above sea level. 4 fountains (600,000 litres in 24 hours). Valuable for paralysis and skin diseases.

Aguas Santas (near Mattosinhos). Altitude, 2,700 feet. Cold springs, arsenical and sulphurous.

Aguas Virtuosas de Lambary, 3½ leagues from Campanha. There are three springs. The most important one is gaseous, of carbonic acid type. Its temperature is 19° centigrade. There are forty-three men employed at the place, which possesses a hydropathic establishment.

Latitude, 21°59′ S. West of Rio, 2°7′. Altitude, 2,900 feet. Has eight hotels, a casino, electric light markets, waterworks, park, etc. Press, *O Lambary*. On Sul Mineira Railway, 11½ hours from Rio. Population, 5,000.

Poçinhos do Rio Verde (Caldas). Waters suitable for liver and kidneys.

Aguas sulfurosas, alcalinas, do Araxá. (The title describes fully the type of these warm springs, 26° to 27° centigrade.) The waters are so strongly impregnated with alkaline properties that the rough loose skin of the hands peel off immediately on contact with the spring. The smell denotes their vicinity if out of sight. Araxá is delightfully situated, 2,800 feet above sea level, and the climate is perfection itself. Pulmonary diseases are absolutely unknown to the natives of the district.

The town is on the Oeste de Minas Railway, has a theatre, etc. Journal, *O Araxá*. Average temperature, 18·6° centigrade. Position, 19°30′ S. West of Rio, 4°2′.

The colour of the water is violet, turning to green. The seven springs yield 3,600 litres daily. Dyspepsias and ordinary derangements disappear as if by magic after a few days' use of these waters; equally suitable for internal or external use. Medical

research leads one to the opinion that these springs are superior to the famous ones at Carlsbad, Baden, etc.

1 litre contains 1·9272 gr. of carbonic acid and 0·2848 sulphuric acid.

Cambuquira. Sapucahy Railway, *via* Cruzeiro, or by electric tram from Tres Corações station. Altitude, 914 metres above sea level. Waters are ferro-gaseous, of the carbonic acid type. The town has a cinema, and every convenience.

Poços de Caldas. Mogyana Railway, *via* Campins, S. Paulo. There are two establishments. Two of the four springs are tapped at 42° centigrade; one has a temperature of 45°, and the other 36°.

Situation, 21°45′ S., 3°24′ W. Average temperature of the city, 17° centigrade.

These springs have been known and appreciated since 1786, so they are, in all probability, the oldest in Brazil. There is no export of the water worth mentioning, as it is principally used for bathing purposes.

The concern is a large one, a loan having been raised for the establishment, of over £100,000. The principal hotel has accommodation for hundreds of guests, and there is a casino, park and athletic grounds. The whole is subject to state control. Climate dry and temperate, the town being situated at nearly 4,000 feet above sea level. The waters have a soda base, with free sulphuret of hydrogen. They are superior in volume to those of Bagneres de Luchon, France (330,000 litres daily), that of Poços de Caldas being 416,372 litres, from 4 springs. Hotels Globe, Sul, etc.

Prata, etc. Chapadão fountains on the same branch line. Natural table waters. Bicarbonate of

soda, etc. Radio activity, 0·00174 micro-curies per litre. Two brands sold. Platina, 0·528 per cent., carbonate of soda, and Prata, 2·6124 grammes per litre.

Exportation of mineral waters (from Minas Geraes only) in 1917:—

Caxambú, 62,075 cases of 4 dozen half bottles; Lambary, 11,309; and Cambuquira, 11,551 cases. Average value per case, 32 $000.

Santa Catharina

Caldas do Sul. Near Santo Amaro, about 40 kils. from Estreito, opposite Florianopolis. They are also known as Caldas da Imperatriz. The first installation was in 1842, but long before this they were visited by the people of the surrounding district, who bathed in the hot pools of the stream itself, known as "Ribeirão das Aguas Claras." The springs appear at the base of a perpendicular rock, and the temperature varies from 35° to 37° centigrade, being constant, and not supposed to alter through atmospheric influences. These waters have an excellent effect on skin diseases, even those of a dangerous and contagious nature.

The building in which the baths are situated is a solidly constructed, but unpretentious wooden hut, the baths themselves being in marble. At present, 1918, there is no hotel accommodation, and only very poor lodgment for visitors.

Doubtless the waters are of a sulphurous nature, but no analysis is available.

Rio Grande do Sul

Mel. These hot springs are 55 kilometres from Palmeira, but the nearest railway station is at Santa Barbara. The temperature varies from 35·8° to

36·2° centigrade. They are crystalline, and have a sulphurous smell. Alkaline reaction per litre, 0·0013 grammes; chloruret of sodium, 0·388 gr.; sulphate of sodium, 0·465 gr. There is no bathing establishment, nor even a good road to the springs, but the state has the matter in hand, and proposes to render access easier in a year or so.

There are other springs near S. Gabriel, containing carbonates and iodurates of iron.

Mining Openings in Brazil

There are good openings in Brazil in the mining states for properly organized companies. Only a very small portion of the alluvium has been explored. Most of the river gravels (untouched at 20 to 50 feet below the surface of the water) contain enough gold to pay for dredging propositions.

One dredge, started in the Diamantina district, digs to a depth of 50 feet, and the buckets are able to cut into the bed-rock (a soft sandstone) to 4 or 5 feet. The expense of running is £6 daily, handling 1,000 yards of gravel. *Quoting from the statement of the operators*, the affair is a great success. With regard to the new law of Bahia, the proprietor of mineral lands is obliged to work them, or submit to Government arbitration with regard to their sale. No licence is required to prospect with movable plant, and concessions may be readily obtained on navigable rivers, in reaches up to 50 kilometres in length. All diamond mines being the property of the state, no question can arise as to ownership.

A licence for placer work costs a few milreis only. To quote the British Consul at Bahia, the new regulations are well calculated to encourage

exploitation of this, the richest zone in Brazil. The laws seem to have been based on the best features of those elsewhere. The taxes payable are from ½ to 10 per cent. In the case of monazitic sands they are very heavy, but the profits afford sufficient recompense for this impost. To sum up most of the abandoned properties were discarded for want of sufficient capital, or were failures through bad management. Legislation has been effected to protect prospectors, and to guarantee to them the result of their labour. The climate is excellent, and quite suited to northern Europeans. Registration and survey is obligatory, and no one can now pretend to ownership of a claim who is not possessed of properly stamped documents.

Summary of the Principal Clauses of the Mining Law of Minas Geraes (No. 574 of September 19, 1911)

CHAPTER I

Relating to Concessions

Art. 1.—Concessions for the exploration of mineral deposits may be given by decree in the following cases:—

I. On State lands which have been sold for agricultural purposes and with regard to which the State has reserved all mineral rights.

II. On all lands remaining the property of the State.

III. Along the course of navigable or other rivers, including each bank.

Art. 2.—For the regulation of such concessions; minerals will be divided into two classes:—

I. Diamonds and other precious stones on un-

explored lands, gold, silver, platina, copper, zinc and mercury and monazitic and other similar sands.

II. Iron and manganese ores and diamonds and other precious stones in lands already prospected and exploited.

Sole Paragraph

Regarding unspecified minerals, these will be classified into one or other of the two above divisions when the concession is given.

Art. 3.—Concessions will be made without recourse to public auction, and according to the present regulations.

Art. 4.—Demands for concessions must be through the Secretary of Agriculture, in a requisition, containing:—

I. A clear description of the locality and the extension of lands necessary to the exploitation or the length of the river, in case of fluvial workings.

II. Indication of the mineral or minerals which are sought.

Sole Paragraph

The request must be accompanied by samples of the minerals, and a report made by a competent mining engineer, or other professional, approved by the Government, and capable of submitting an accurate geological survey of the property.

Art. 5.—Within fifteen days from the date of the petition the Department of Agriculture will have posted in the district an invitation to any persons who may consider their rights infringed, to make a claim. These notices must remain sixty days, and on the expiration of this term in case no valid opposition is manifested the concession will be given in legal form. In the event of the lands being un-

disputed State property, the above formality will of course be dispensed with.

Art. 6.—In case of a concession given to work on land already used for agricultural purposes, the concessionaire must indemnify the owner for any damage and enter into an accord with him with regard to the use of the watercourses on the property.

I and II. Should no accord be possible, the lands will be expropriated and the proprietor indemnified. Should the concession be on State lands it may be bought outright at the price which is current at the epoch.

Art. 7.—At the time of registering the concession the expenses of measuring, etc., must be paid. This delimitation will be made by surveyors appointed by the Department of Agriculture.

Art. 9.—The annual taxes payable will be: for mines of the first class, 5 to 10 $ per hectare, and for those of the second category, 500 $ to 5 $ (paper).

Art. 11.—The maximum concession will be thirty years, but it may be renewed.

CHAPTER II

Art. 13.—Relating to prospecting: Authorization to prospect over lands not exceeding 100 hectares, or along streams not over 40 kilometres, may be given for one year on payment to the Department of Agriculture of 100 $. This authorization may be renewed for another period of one year on the same terms, provided proof of having commenced operations is afforded. One or more persons may obtain permission to prospect in different places on

the same terms, i.e. 100 $000 per 100 hectares or course of 40 kilometres of river bed and banks.

Demands for permission to prospect must be accompanied by samples of the mineral, or minerals, and petitioners must also produce a geological plan or survey of the locality, made by a mining engineer or other approved person.

Art. 31.—This regulation does not apply to the recognized diamond fields, as these are already under special control.

Prices of Coloured Gems in Rio

Given by SENHOR AUGUSTO BRILL, *Av. Central, Rio de Janeiro* (1911)

Aquamarines and tourmalines of *all* colours (except fine blues)—

Rough (per gramme).	*Cut* (per carat).
Good . . 1 $000 to 4 $000	From 8 milreis up to 35 $000.
Fine . . 5 $000 to 10 $000.	8 to 10 milreis for a parcel of mixed colours. Fine blues at top prices only.

Topaz (Ouro Preto district), ordinary yellow, 500 reis to 3 $000 a gramme; amber to wine-coloured and very pale rose, 4 to 12 milreis a gramme; fine rose (very rare), 10 to 20 or 25 milreis a gramme, rough.

White topazes have no sale; pale blue, cut, 30 to 40 milreis a carat, very rare.

Amethysts from Rio Grande or Minas, 100 to 500 reis a gramme, rough; from Bahia, 500 reis to 1 $000 a gramme. Cut stones, from 4 to 12 milreis a gramme.

Garnets, citrines, hematites and similar ornamental stones, 200 reis to 1 $000 a gramme.

Cut garnets, 4 to 8 milreis a gramme.

Chrysoberyls, rough, 1 $000 to 4 $000 a gramme; cut, 8 to 12 milreis a carat.

Euclase, rough, with terminal faces, 20 to 40 milreis a gramme (very rare).

Phenakites, andalusites, etc., etc., according to supply for mineralogists and collectors. No fixed value. Latter exceedingly rare.

TABLE OF SOME BRAZILIAN PRECIOUS STONES, WITH THEIR OPTICAL AND OTHER PROPERTIES

Gem Stone	Hardness	Specific Gravity	Refractive Index	Degree of Pleochroism	Relative Value	Chemical Constitution
Diamond	10	3·52-3·55	2·417-2·439	None	1-2	Carbon
Carbonates ...	—	—	None	—	—	—
Chrysoberyl ...	8½-8¾	3·5-3·8	1·742-60	Dichroic	3	Alumina
Cymophane ...	—	—	None	None	2-3	—
Yellow Topaz ...	8	3·40-3·60	1·607-37	Dichroic	4	Silicates
Rose ,, ...	—	—	—	—	3	
Blue ,, ...	—	—	—	Faint dichroism	3-4	
White ,, ...	—	—	—	None	6	
Phenacite	7½-8	2·966-301	1·620-68	None	4	—
Pink Phenacite...	—	—	—	Distinct dichroism	3-4	—
Euclase	7½	2·947-3·077	1·620-71	Trichroic	2	—
Blue Beryl ...	—	2·63-75	1·567-85	Strong dichroism	3-5	—
Green ,, ...	—	—	—	—	—	—
White ,, ...	—	—	—	None	4-6	—
Green Tourmaline	7	3·0-3·02	1·616-1·652	Strong dichroism	4-5	—
Rose or Purple Tourmaline	—	—	—	—	3-5	—
Blue Tourmaline	—	—	—	—	2-4	—
Achroite	—	—	—	None	4-6	—
Spodumene ...	6½-7	3·17-3·20	1·657-1·676	Distinct dichroism	5-6	—
Sphene	5½	3·35-3·45	1·888-979	Distinct dichroism	3-4	—
Epidote	6½	3·44	1·727-771	Strong dichroism	5-6	—
Spinel (rare) ...	8	3·58	1·716-730	None	2-3	Alumina
Balais Ruby ...	—	—	—	—	—	—
Andalusite... ...	7½	3·16-3.20	1·632-643	Dichroic to trichroic	3-5	—
Amethyst	7	2·50-2·80	1·543-1·554	Faint	5-6	Oxide
Citrine or Cairngorm	7	—	—	—	6	—
Garnet	6½-7½	3·15-4·3	1·740-1·815	None	5-6	Silicate

Recent discoveries of semi-precious stones in the State of Rio itself may encourage prospectors. It should be distinctly understood that apart from iron, or manganese, whatever minerals are dealt with in the following lists are enumerated without any idea of leading readers to gather that their exploitation would be necessarily a financial success. No responsibility can be accepted for failure, and before entering into arrangements to float concerns for any mineral enterprise in Brazil, it is taken for granted that capitalists will be pretty sure of their ground first.

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Dr. Orville Adalbert Derby wrote a great number of articles on the "Geology and Mineralogy of Brazil," from 1874 to 1912, and most of these are catalogued in :—

Bibliographical list of his Scientific publications. Typ., Leuzinger, Rio, 1908.

He was one of the companions of Hartt, in his geological survey, Director of the Geological section of the Rio Museum, after Director of the Geological survey of S. Paulo, working there with Drs. Hussak, Oliveira nd Gonzago de Campos, now Director of the National Geological Service, succeeding Dr. Derby in this post.

The School of Mines at Ouro Preto has turned out some first-class scientists, the present Director, Dr. Costa Sena, being co-disciple with two ex-Ministers, Antonio Olyntho and Calogeras, the latter at present one of the delegates to the Peace Conference.

Decrees relating to Mining, etc., are :—

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Interested inquirers should address themselves to the Serviço Geologico do Brasil, Ministerio da Agricultura, Rio de Janeiro (Praia Vermelha).

The author of these notes can accept no responsibility for mis-statements, as all the information is based on official data, or the works of reputed scientists.

CHAPTER XXVII

GAZETTEER

Brazil—The Voyage Out

Routes from most of the principal European ports converge at the Atlantic islands of Madeira, Las Palmas, etc., and proceed via Cape Verde Isles, or Dakar, to Pernambuco, Bahia and Rio.

North American services from New York make one of the Antilles, Barbados, Bermuda, etc., and then Pará, or Pernambuco.

As regards choice of steamer. There is but little difference nowadays, but one is naturally prejudiced in favour of a boat where one's mother-tongue is heard, or at least understood.

Book no passage before seeing the cabin plan, and accept no inside berths.

Promenade decks are dearer, and less tranquil than main decks.

Ladies possessed of any pretensions to good looks should never travel alone, as it is quite impossible to find a vessel where the objectionable man or woman is absent. One has, however, a right to expect that demi-mondaines should be kept within bounds, and not permitted to make themselves objectionable to respectable passengers.

On my voyage to Rio in 1917, I was heckled by the assistant purser for having written some scathing remarks on the conduct of junior officers in that

particular line, but what I have said I have said, and every word was Gospel truth.

After a few days on board one learns to sift out the fast set from the more sedate passengers, and a pleasant voyage may be anticipated as soon as the ship leaves Lisbon.

To avoid robbery. Keep your cabin locked and your port closed when in harbour, and do not put temptation in the way of men who are badly paid.

Passengers who wish to be in touch with the financial world should also ascertain whether the wireless department on board publishes a periodical bulletin.

It goes without saying that one chooses a ship where the cabins have no upper berths, and of course electric fans and port holes.

Don't expect too much from the ship's doctor, as he has some hundreds of people on his hands, and the dispensary is none too well furnished at times.

Treated with consideration, the stewards are very willing as a rule, and no one need go with unpolished shoes or dusty clothes. Most of the best ships have a laundry on board, as well as a store where fancy goods, clothing of all sorts and sweets may be bought. Some even carry shorthand-typists for the use of business men.

It is usual to dress for dinner after Lisbon is left, or up to that port if North bound.

English armour-plated shirts are decidely unsuitable for evening wear in the tropics, so it is better to buy soft-fronted pleated ones.

Be careful to have all your linen marked and washed, to avoid paying customs duty on necessary clothing, and above all, on arriving at a South American port, remember that *you* are a foreigner,

and should treat the authorities with respect and consideration. Courtesy costs nothing, and lofty airs of superiority are no proof of culture and higher grade civilization.

Meal hours are more or less elastic on board, a cup of tea and biscuits being usually available in the cabin after 6.30 a.m.; first breakfast, 8.30 to 9.30; broth or ices on deck, about 10 or 11; lunch from 12 to 1; tea, 3 or 4 o'clock; and dinner at 7 p.m.

Second cabin accommodation of to-day is more than equal to the first of twenty years ago, and steamers are at least two or three times the size, and, in some cases, much faster.

"Acre"

The Acre Territory is divided into three Prefectures, as follows:—

1st.—Juruá. Capital, Cruzeiro do Sul. Latitude, 72°33′42″ W. of Greenwich. Population, 5,000. To Manáos, 1,795 miles.

2nd.—Purús. Capital, Senna Madureira. 9°03′56″ S., 68°39′35″ W. Population, 4,000. To Manáos, 1,320 miles.

3rd.—Acre. Capital, Rio Branco. 9°58′30″ S., 67°52′51″ W. Population, 2,000. To Manáos, 1,351 miles.

This territory is bounded on the N. by Amazonas, W. by Peru, S. by Bolivia and Peru, and E. by Amazonas, S.E. by Matto Grosso.

It extends from 7° to 11° S. and from 23° to 31° W. (of Rio Janeiro).

The only noteworthy elevation is in the N.W., where the Serra de Catamana forms the frontier.

Principal Production—Native rubber (fine Pará).

Climate—Hot and damp.

Time taken by the journey from the coast—Two to three weeks.

Wages earned by the rubber gatherers vary from 100$ to 150$ per month, with rations, but the latter are very bad.

"Amazonas" (State of)

Bounded on the North by Guiana and Venezuela, East by Pará, South by Matto Grosso and Bolivia, W. by Peru and Ecuador and N.W. by Colombia. Mainly a great alluvial plain, or immense island of verdure, shut in on three sides by ranges of mountains, especially on the N., S. and W.

The only railway is that which extends from the Madeira to the Mamoré river.

Ocean going steamers can lie alongside the wharf at Porto Velho. Latitude, 8°45′33″ South, Longitude, 63°54′38″ West of Greenwich. Temperature, 28·5° Centigrade.

The line extends 364 kilometres and the trip to Guajará-Mirim takes eighteen hours, but as trains do not run at night, two days are occupied.

The State is administered by a Governor, elected for four years. There is no Senate, but a Chamber of twenty-four Deputies, who hold office for three years. There are three Senators and four Deputies representing this State in the Federal Government.

Seat of Government—Manáos, on the Rio Negro, a little above its union with the Amazon. Latitude, 3°06′05″ South; Longitude, 16°52′19″ West of Rio. Average temperature, 27·5°, Centigrade. Time 1 hr. 8 min. slower than Rio. 1,030 miles from the Ocean. Direct steamers from Liverpool, Havre, Hamburg, etc., in normal times. Duration of voyage, three weeks.

This city was only founded in 1848, but has a population (1916) of 81,000. It is a splendidly built and up to date Capital, with numerous cafés of a luxurious type a very large percentage of alien population, and a modicum of nocturnal gaiety exceptional in Brazil.

The Palace of Justice cost half a million sterling and the Theatre, £750,000.

The hotels include "Grande" and "Cassino," 15$ to 20$ daily. Principal newspapers are—*O Amazonas*, *A Noticia*, and *Correio do Norte*. Sanitary conditions are not bad, and every modern convenience is available except railways.

Exports include—Rubber, cocoa, nuts, tobacco, medicinal plants, tortoise-shell and oil, fish oil, dried fish, (pirarucú) and guaraná.

Other towns include:—

Barcellos.—240 miles from the Capital. Press *O Barcellense*. A small town with post office, church and schools.

Bôa Vista do *Rio Branco*.—Press, *Rio Branco*. Post office, etc.

Borba.—On the Madeira. 50 leagues from Manáos. Post, school, church, etc.

Itacoatiara.—110 miles from Manáos, on Amazon. Garrison town. School, post, telegraph. Press, *O Arauto*. Population of city, 5,000. Masonic Lodge.

Maués.—On river of same name. Seat of Guaraná industry.

Parintins.—1,500 inhabitants. 2°37′25″ South, 56°43′30″ West (of Greenwich). Temperature, 28° Centigrade. Post, telegraph, school. Press, *Parintins*. Meteorological station.

Silves.—Post, school, church, etc.

Teffe.—435 miles from Manáos. Post, school, etc. On the Solimões river.

Pará (State of)

Bounded on the North by Guiana, West by Amazonas, North and North-East by the Atlantic Ocean, and South-East by Maranhão, Goyaz and Matto Grosso. Administered by a Governor. The State Congress consists of a Senate with 11 members and a Chamber of Deputies of 26 members. The State sends 3 Senators and 7 Deputies to the Federal Parliament.

Capital—Belem do Pará

Travelling from Liverpool or Havre, etc., Pará, 21 days out (4,270 miles), is reached via Leixões (Oporto), Lisbon and Madeira. The steamers are small as transatlantic lines go nowadays, but the companies no doubt have sufficient reasons for not putting on larger vessels. The city being about 100 miles from the sea, and the river channel continually silting up, a pilot has to be taken. The new port is, however, well dredged, and lighted by acetylene gas buoys of 120 candle-power. The steamer goes alongside the quay, behind which is a fine new boulevard. Situated 1°26′59″ N. and 5°19′39″ W. (of Rio Janeiro), the climate is naturally very hot during the day, but a cool breeze springs up at nightfall. Average temperature, 26° Centigrade. It is well provided with open spaces, the principal being the Bosque Municipal, to all intents part of the forest behind the city. Public buildings include the Palace, Departments of Finance, Interior and Public Works, the Theatre da "Paz,"

Institute Bittencourt, Naval and Merchant Marine training schools, but the most interesting of all is the "Museu Goeldi," with exceedingly valuable, archæological and ethnographical collections, Zoo and Gardens. There are good services of electric trams, and cabs. Fares: horse, 10 $000 per hour, and motor, first hour 15 $000, per hour after 10 $000. The present population is 200,000, and it is rapidly increasing.

The trams are very convenient. There are first and second class, baggage and de Luxe, got up in great style with a table between each armchair. The principal hotels are: "America," "Commercio," "Universal," "Madrid," and "Paz," the latter the best. The best cafés are "Paz," "Madrid" and "Riche." The press comprises *Folha do Norte*, *A Provincia do Pará*, *O Journal*. The only railway in the State at present is that from Pará to Braganca, the whole of the enormous rubber exports finding their way to the capital by water. There are reckoned to be no fewer than 7,000,000 rubber trees and 2,160,000 cocoa trees in the State.

The population of the city is very mixed, English and Germans at the head of the big businesses, Portuguese holding a great part of the trade still, and Italians, Syrians, Jews and Spanish, etc., dominating in the smaller branches of trade. In spite of REPEATED requests I have failed to obtain a single publication from the State Government to enable me to do this city proper justice. In consequence it is not possible to enter into detail with regard to its internal economy. This is a common failing with provincial authorities everywhere; they are too indolent to make the most of their assets.

Cametá.—180 kilometres S.W. of Belem, on the

Tocantins. Population, 20,000. Latitude, 2°14′19″ S. Longitude, 802 W. Press, *A Ordem*. Post, telegraph, school.

Bragança.—233 kilometres from Belém, on Bragança Railway. Latitude, 1°1′3″ S. Longitude, 3°31′36″ W. Population, 8,000. Electric light. Press, *A Cidade*. Cinema. Population, 15,000. School, post, etc.

Vizeu.—250 kilometres from capital. At mouth of Gurupy River. Population, 1,500. School, church.

Breves.—On Marajó Island. S.W. side, 270 kilometres from Belem. *Souré*, E. side, and *Chaves*, N. side, are centres of the cattle trade of the island.

Santarem.—At the mouth of the Tapajoz. Population, 6,000. Gas lighting. Press, *O Commercio*. Post, telegraph, etc. 692 kilometres from Belem.

Monte Alegre.—615 kilometres W. Population, 1,500. Post and telegraph, school.

Obidos.—1,053 kilometres W. Population, 18,000. Latitude, 1°54′ S. Longitude, 12°21′ W. Garrison and fortified town. Post, telegraph, school. Centre of export trade of the Campos Geraes, or elevated plains N. of the Amazon. These extend as far as the Guiana frontier. Maximum elevation, 400 metres.

Macapá, 235 kilometres, and *Mazagão*, 251 kilometres, are on the N.W. side of the Amazon delta. Two remarkable natural features of the Amazon are the Poróróca, or bore, at the mouth of the river, where the contact with the ocean is often marked by a wall of water of great height, and the *Furos*, or canals which join many rivers, cutting them up into lengths, and greatly facilitating canoe navigation.

State of Matto Grosso

The great central state of Brazil. Extends from 8° to 24° S., and 6° to 22° W. Bounded on N. by Amazonas and Pará, W. by Bolivia and Peru, E. by Goyaz, Minas, S. Paulo, and S. by Paraguay. The middle and western parts of this state are high-lying and healthy, great rubber forests extending in an unbroken line right across the immense wilderness, and forming a belt of dense tropical verdure.

Maté grows freely over an area computed at 36,500 square kilometres, or from 11° to 12°5′ W. and 22° to 24° S., the yield at present being 6,000 tons per annum.

Legislation is exercised by a Chamber of Deputies of 24 members. The state is governed by a President, and sends 3 Senators and 4 Deputies to Rio. Capital, *Çuyabá*, on the river of that name, accessible by steamer or launch from Corumba, or by road South-West. District population, 30,000. Average temperature, 24° Centigrade. Press, *A Gazeta Official*, *O Pharol*. Latitude, 15°16′ South. Longitude, 12°15′ West. Post, etc., etc. Northwards there is communication with *Diamantino* by motor car. Altitude, 560 metres, and *Rosario*, 125 kilometres from Cuyabá. Population, 2,500. School, post, telegraph.

Caceres.—Population, 5,000. On left bank of Paraguay, 300 kilometres S.W. from Cuyabá.

Matto Grosso.—City, North-West of Caceres, on the Guaporé. Population, 5,000. Latitude, 15°03′ S. Longitude, 16°50′ W. Press, *O Germinal*. Normal school, hospital. 115 leagues from Cuyabá. Post, telegraph, church, etc.

Corumbá.—Commercial capital, and most impor-

tant city in the state. Population, 30,000. Situated on the Paraguay river. Has direct steam communication with Montevideo. 711 leagues. Sailings every two weeks. The city is divided into upper and lower districts, 120 and 175 metres above sea level. Hotel "International." Most of the commerce is in the hands of Syrian merchants. Press, *O Brasil*, *Correio do Estado*, etc. Post, telegraphs, Custom House. Fortified City (Coimbra). Arsenal. Steamer to Porto Esperança, 160 kilometres, thence by rail to *Miranda*, 20°14′ S., 58°31′16″ W. of Greenwich. North Western Railway. Population, 8,000. Post, church. Trains on Tuesdays to Aquidauna. Population, 2,500. Press, *Pioneer*. River navigation to Miranda and Corumbá. Trains arrive from S. Paulo on Sundays. Total distance from Corumbá to Rio Janeiro, 2,294 kilometres. Fare, 159 $300. Time to S. Paulo about 4 days. The Paraná river is crossed at present by ferry (950 metres). A bridge is under construction.

State of Maranhão

Bounded on N.W. by Pará, N. by the Atlantic, S.W. by Goyaz, and E. by Piauhy. Highest point 720 metres above sea level, in the Serra das Mangabeiras. Rainy season, January to June. Has a Governor, and Congress of 30 Deputies. Sends 3 Senators and 7 Deputies to Rio Janeiro.

Capital, *São Luiz*, on Maranhão island. Population, 58,000. Latitude, 2°29′ S. Longitude, 1°07′ W. Temperature, 27° Centigrade. This city has been termed the Brazilian Athens. Birthplace of the great lyric poet, Gonçalves Dias, Coelho Netto, Arthur Azevedo, Dunshee de Abranches,

Graça Aranha, etc. Has a theatre, school of music, state library, normal college, etc. Horse trams. Hotel "Central." Press, *Diario*, *Avanti*, *Revista*, etc. Frequent steamers to Rio and Pará.

Other towns include *Caxias*, on the Itapicurú, 429 kils. from its mouth. The railway from S. Luiz should have been concluded long since, and if the line is not finished in 1918, the Federal Government will rescind the contract.

From Rosario, the distance is 300 kilometres, and in January this year 252 kilometres of rail were laid. Caxias is in 4°52′ S. latitude, and 0°11″ W. longitude. Population, 15,000. Press, *Jornal*. The city may be reached from the coast by small craft. Distance by water to S. Luiz, 480 kilometres.

Rail from the mainland to *Senador Furtado*, 78 kilometres; fare, 7 $000. *Coroatá* is on the Itapicurú. Post, telegraph, etc. *Alcantara*, on the coast, 20 kilometres from S. Luiz. *Brejo*, near the left bank of the Paranahyba. Press, *O Anapuru* and *O Debate*. Post, telegraph. Lighted by acetylene gas. School. District population, 20,000.

Grajahú.—3°10′ W., 6° S. Post, telegraph, school.

Vianna.—6,000 population. Post, telegraph, school. *Carolina*, on right bank of Tocantins. Post, etc. Good river trade, as also *Imperatriz*, on the same stream.

State of Piauhy

Possesses only 85 kilometres of coast line, and one port, *Amarração*.

Is bounded on the E. by Ceará, and S. by Bahia. Hot, dry climate. *Governor*. Chamber of Deputies (24). Federal representatives: 3 Senators and 4

Deputies. Capital, *Therezina*, on the Paranahyba river. Population, 50,000. Average temperature, 26° C. Latitude, 5° S. Hotels "Castello Branco" and "Castro Silva." Press, *O Piauhy*, *Gazeta*, etc. Theatre, asylum, etc.

Amarração is only available to ships drawing less than 2½ metres. Population, 6,000. Post, telegraph, public and private schools.

Parnahyba.—18 kilometres from the sea. Population, 15,000. Latitude, 2°59′ S. Longitude, 1°26′ W. Hotel, "Miramar." Press, *O Nortista*, *O Municipio*. Post, schools, etc.

Amarante, on the Parnahyba. 7°5′ S. 3,500 population. Post and telegraph.

Oeiras.—22,000 district population, on the Caninde river.

State of Ceará

Lies between Piauhy and Rio Grande do Norte. Dry, hot climate in the interior, like that of all the N.Eastern states. Highest point, 1,020 metres (Serra de Ibiapaba). Governed by a President. The Chamber consists of 30 Deputies. Three Senators and 10 Deputies have seats in the Federal Congress. Capital, *Fortaleza*, a sea port. 3°46′ S. and 4°39′ E. Average temperature, 26° Centigrade Hotels "France" and "International." Press, *O Jornal*, *A Republica*. Population, 70,000. Birthplace of José de Alencar, the National romancist. Railway to *Baturité*, 101 kilometres. Temperature, 27·5° centigrade. District population, 15,000. (N. Eastern Ry.) Post, telegraph, etc., also public and private schools. Hotels, "Silveira" and "Cordeiro."

Quixada.—188 kilometres. Population, 6,000. Agricultural college, market, baths, prison, etc. Hotels, "Franco" and "Silveira."

Quixeramobim.—236 kilometres. Altitude, 200 metres. Temperature, 27·5° Centigrade. Hotel, "Popular." Post, church, etc.

Iguatú.—414 kilometres. 5,000 population. Altitude, 213 metres. Press, *Iguatú.* Present end of the line. Trains on Tuesdays, Thursdays, and Saturdays, fare 17 $3000. 17 hours' run. Return Monday, Thursday and Saturday. The line will be extended to:—

Crato.—Population, 20,000 (district). Press, *O Correio.* Hotels, "Lucas" and "Soledade." Latitude, 7°14′ S.

Camocim.—N.W. of Fortaleza. Latitude, 3°12′ S. Longitude, 2°28′ E., on the Sobral Railway. Population, 9,000. Press, *Rubi.* Hotel, "Perales." Port available to vessels drawing up to 17 feet (at highest tides). *Granja* is 25 kilometres. Press, *O Granjense.*

Sobral.—129 kilometres. Fare, 8 $700. Has horse trams. District population, 20,000. Latitude, 3°42′ S. The line extends to *Ipú*, 217 kilometres. Fare, 12 $500. Time, 10 hours. Population, 5,000. Post, telegraph, school, etc. Through trains thrice weekly, return alternate days. From here there is a line to *Cratheus*, 337 kilometres from Camocim. Population, 3,000. Trains on Tuesdays and Thursdays, return Wednesday and Friday. Through fare, 15 $700. Time from Ipú, 6½ hours' run.

State of Rio Grande do Norte

Has a Governor, and a Chamber of 25 Deputies. Federal representatives, 3 Senators and 4 Deputies. Most northern port, *Mossoró.* District population, 14,000. 60 leagues from the capital. Press, *Com-*

mercio. Rail, post, telegraph, public and private schools. "Hotel dos Viajantes."

Capital, *Natal.* One of the principal ports on the coast. Latitude, 5°46′ S. Longitude, 7°51′ E. Hotel, "Colombo." Press, *A Capital, A Republic, Diario.* Population, 30,000. Rail (Great Western), north to Ceará-mirim. Population, 5,000. 36 kilometres from Natal. Post, telegraph, school, etc.; and on to Lages, 145 kilometres. Fare, 12 $300. Time, 6 hours 45 minutes. Three times weekly. District population, 5,000.

Macau.—7,000 population. 50 leagues from Natal. Centre of the salt industry. Press, *A Noticia.* Theatre, etc., etc. Southwards, the line proceeds to Parahyba, 207 kilometres, and Cabedello. (See Parahyba do Norte.) Fare, 16 $700. *Flores,* 320 kilometres distant, has 2,000 population, market, cinema, etc. Press, *A Verdade.*

State of Parahyba do Norte

Governed by a President and an Assembly of 30 Deputies. Three Senators and 4 Deputies represent the state at Rio. Capital, *Parahyba.* Population, 50,000. Latitude, 7°6′40″ S. Longitude, 8°17′24″ E. Press, *O Estado, A União.* Birthplace of Pedro America, the famous artist. Great Western Railway. Hotels, "Globo," "Luso-Brasileiro," "Norte" and "Cione."

Cabedello, the port, is 30 minutes' run. Latitude, 6°57′50″ S. Distance, 18 kilometres. Population, 3,000. Cinema, post, etc. River communication also with the capital.

Cajazeiras.—3,000 population, in extreme W. of state. Post, telegraph, schools. Press, *A Brisa.* 100 leagues from the capital.

Itabayanna.—15 leagues distant from Parahyba. Post, etc. Hotels, "Moreira," "Mello." Press, *O Municipio.* Population, 5,000.

Pilar.—Great Western Railway. Near the former town. Post, school, etc.

Fernando do Noronha (Island)

75 leagues from Cape S. Roque, N. of Natal. Belongs to Pernambuco state. Latitude, 3°50′10″ S. Longitude, 10°45′09″ E. Wireless station. Length, 12 kilometres; breadth, 4. Temperature, 25·5° centigrade. Occasional steamers from Pernambuco.

Most liners take their bearings from the island.

A convict station.

State of Pernambuco

Govérnor. State Congress of 15 Senators and 30 Deputies. Sends 3 Senators and 17 Deputies to the Federal Congress.

Capital, *Recife* (Pernambuco). Latitude, 8°05′ S. Longitude, 8°19′12″ E.

It may be truly termed the ocean gateway to Brazil. Here the steamer has to lie outside, and the passengers embarked in, and disembarked from small boats by the aid of chairs. As there is usually a heavy swell on, this operation is more amusing to the onlooker than to the person swinging in mid-air. The usual tribe of bumboatmen crowd around the ship with pineapples (a revelation to the northerner) oranges, parrots, marmosets, curios and ocelot skins, until the warning siren drives them off in a hurry.

Return fare from ocean steamer to shore, 12s.

Small steamers and coasters can go inside the

reef and lie snugly within the narrow channel. The city consists of three distinct portions united by bridges. The port is Recife proper, the island section in the middle is called São Antonio. That on the mainland is Boa Vista. Pernambucanos entitle their city the Venice of America. Population, 220,000. If one's stay is short, a motor car is necessary in order to see the town (cost 19$000 per hour). A tram service is, however, available. Amongst the principal buildings are: The Opera House, seating 1,000, Law Academy, Engineering School, Academy of Commerce, School of Pharmacy and Public Library.

Pernambuco is quite a cultured city, perhaps partly due to the influence of its old Dutch masters, many of whose names are perpetuated in the best families of the State. Eminent natives include Nabuco and Oliveira Lima. Press, *Jornal*, *Correio*, *Diario*, etc.

Hotels, "de France," and "Von Landy." A new one, "Recife," is recommended.

Formerly a dirty smelly town, it is, however, thanks to its most energetic Government, undergoing a rapid transformation. Following the example of Rio, streets are being pulled down in all directions, but the great work in progress is undoubtedly the port. A breakwater, 1,147 metres long, is being built on a line of submerged reefs and the depth inside at lowest tide will be at least 30 feet. From the north the stone wall will advance into the sea for 798 metres, and terminate in another breakwater. There will be two quays, one 534 metres and the other 1,311, besides many other works of importance which will enable the largest vessels to lie inside the port, protected from

all winds, and in a position to discharge their cargoes directly on to the wharf. The whole will be equipped with electric cranes, and a network of railways will run all over the harbour works. This undertaking will cost 80 million francs.

This city has a great future before it. Three submarine cables leave the shore here. It will be the best and most convenient port in the whole of northern Brazil and the nearest to Europe. The railways are mostly in the hands of the Great Western, a British concern. The State produces an enormous amount of sugar, counting modern refineries alone, forty-six of which employ a capital varying from 250,000 to 2½ million francs. Besides these, 1,500 small factories are in operation. Pernambuco cotton, too, is famous for its quality. In short, in the near future the capital will profit exceedingly by the opening up of the interior, at present largely unexploited, and the improvements in course of execution in the city itself, and, more especially in its port, steamers of 12,000 tons being able to go alongside the quays. Average temperature, 26·5° centigrade. Rail to Itabayanna and Parahyba thrice weekly, at 6.55 a.m. Dining car. Arrive Parahyba (215 kilometres) 3.54 p.m. Fare, 13 $100, and Cabedello (233 kilometres) at 4.45 (14 $600). Return from Cabedello at 6.50 a.m., arrive Recife 5.5 p.m. Daily expresses at 4.30 p.m. (dining car) for *Limoeiro* (83 kilometres). Fare, 5 $000. Arrive, 8 p.m. Return, 4.55 p.m. daily except Sunday. Expresses run three times weekly to *Glycerio* (215 kilometres). Fare, 10 $100. Depart Recife (breakfast car) 5.55 a.m. Arrive 2.22 p.m. continue to *Garahuns* (271 kilometres). Fare, 10 $800. Arrive 4.35 p.m. Latitude 8°53′ S. Longitude

6°46″ E. Altitude, 845 metres. Temperature, 20° Centigrade. Press, *O Sertão*. District population, 25,000. Post, telegraph, school etc., etc.

From Glycerio, the line runs S. to União. 263 kilometres (from Recife). *Macéió* and Jaraguá, 348 and 351 kilometres, respectively. Time from Recipe to *Macéió*, 13 hrs. 25 min. Return at 5.45 a.m. (Dining car) three times weekly. Arrive Recife 7.40 p.m.

From Recife to *Pesqueira*.—229 kilometres. Fare 11 $200. Thrice weekly. Depart 6.50 a.m. Arrive 3.45 p.m. Return next morning, 7.5 or 8.30. Eleven or twelve hours run to the capital. *Pesqueira* lies 668 metres above sea level. Temperature 22.5° centigrade. Population, 16,000. Press, *Gazeta*. Hotels. "Pernambuco" and "Silva." Preserve factories. Post, schools, etc. The line continues to *Rio Branco*, 270 kilometres, and is under construction to *Triumpho*. Population, 2,600. Altitude, 1,027 metres; 100 leagues from Recife. Press, *Correio*. Theatre, cinema, post, etc., etc. Hotel, "Metropolitano." Excellent climate.

Goyanna.—65 kilometres from Recife. Population, 12,000. Press, *Voz, Diario*. Theatre, post, schools. Hotel, "Papagaio."

Olinda.—A suburb of Recife, 6 kilometres N. Tram available.

Pau d'Alho.—49 kilometres from Recife. Population, 5,000. Theatre, etc., etc.

Petrolina.—Population, 4,000. On S. Francisco River. Post, school, etc.

State of Alagôas

Governor. Three Federal Senators and six Deputies. Has a State Congress (two houses). Capital, *Maceió*. Population, 70,000. Latitude,

90°40′26″ S. Longitude, 7°27″ E. Hotels, "Commercial," "Universal." Press, *O Gutemberg*, *A Tribuna*, *Correio*, *Jornal*. Public Library, Lyceum, Private and Public schools. Masonic Lodge. Literary and Benefit Societies. Temperature, 26° Centigrade. Horse trams from the port (Jaraguá) two kilometres distant.

Alagôas City.—Population, 16,000. Seven leagues from Maceió is the old capital. Post, schools, hotels, etc.

Penedo.—50 miles from mouth of S. Francisco. Latitude, 10°18′ S. Longitude, 6°14″ E. Population, 15,000. Horse trams. Great local trade.

Pilar.—40 kilometres from Maceió, on lake of same name. Daily steamers. Population, 9,000. Theatre, schools, post. Hotel, "de Mello."

Piranhas.—On S. Francisco. Terminus of railway to Jatobá (Pernambuco), 8 hours run. Trains very infrequent. The line was built to convey goods between the upper and lower river, avoiding the falls. Post, telegraph, school.

Viçosa.—108 kilometres from Maceió by rail. Population, 11,000. Theatre, post, schools, etc. Hotel, "Pedrosa."

Paulo Affonso Falls

Alight at Pedra station on the Jatobá line, and take a horse to the falls, a couple of hours smart going. When close to the river it is, as a rule necessary to force a path through the forest to the edge of the immense cañon through which the waters pass.

Five branches unite here, four of them descending in a series of cascades and rapids, to form the great "Mai do Cachoeiro," or "Mother of the Falls." The view of this gigantic leap into space

is awe-inspiring, majestic and terrible at the same time. Below, the whole body of the river roars angrily, and swiftly through the narrow passage, and above, a thousand miles of interrupted navigation lead into the very heart of Brazil to Pirapóra, where the Central railway is struck, and the sinuous steel path conveys one straight to the Capital.

These falls, one of the world's wonders, are waiting to be of some use to man, instead of angrily fretting away their energy in the wilderness.

State of Sergipe

Has a President and Chamber of 24 Deputies, also 3 Senators and 4 Deputies in the Federal Congress. Capital, *Aracajú*. Population, 40,000. Latitude, 10°55′ S. Longitude, 6° E. Public Library. Theatre. Normal School. Agricultural College. Several private schools as well as public elementary ones. Press, *Correio*, *O Estado*, *Diario*. Hotels, "Brazil," "Internacional," etc. Historical and Geographical Institute, etc. Steamers frequently to Rio and Pernambuco, etc.

Estancia.—17 leagues from Aracajú has 13,000 population. Press, *A Razão*. Hospital, theatre, schools, post. Hotel, "Ribeiro."

Larangeiras.—Population, 10,000. Rail from capital (30 miles). Market, hospital, schools. Hotel, "Telles."

Propria.—On S. Francisco. Population, 5,000. Post, school, etc. The railway should be extended to this city shortly from the capital. Hotel, "Central."

Itabaiana.—In the centre of the State. Population, 8,000. 72 kilometres from Aracajú. Post, school, etc.

Maroim.—District population, 9,000. Post, etc. Press, *O Paladino.*

State of Bahia

Has a Governor and two Houses, the Senate consisting of 21 members, and the Chamber of Deputies of 42. This, already excessive number, may be augmented in the proportion of 1 Deputy per 50,000 inhabitants, and a Senator for each 100,000. There are three Federal Senators and 22 Deputies. Capital, S. Salvador, or Bahia, founded in 1549, on the bay of that name. Population, 320,000.

The distance from Pernambuco is 400 miles, taking thirty hours on the average. Founded in 1510, and the capital of Brazil for over 250 years, the city is the most typical of colonial life in the whole of Brazil.

The latitude is 12°58′16″ S. and the position east of Rio Janeiro is 4°39′08″. Temperature, 25·5° Centigrade.

All Saints' Bay is a fine deep harbour, second only to that of Rio itself. Ten years ago Bahia was a city of narrow streets and tall houses, where a teeming population lived and died as best they could, without (to quote the present government, *Jornal do Commercio, Rio*, June 29, 1913) the knowledge that such a thing as hygiene existed. Beams and rafters, that had served their turn for 300 years but were now as rotten as the rest of the habitations they were presumed to support, sewerless streets and bathless houses, dimly illuminated by miserable oil lamps. Street succeeded street, owing to the configuration of the city, seemingly piled one on top of another. Picturesque, of course,

but as truly a plague spot as London, Naples and their congeners. To-day order is being produced out of chaos, the elevators connecting the upper and lower town were the first step towards progress. Here the mulattress can be seen at her best, a veritable bronze figure with superbly moulded torso and arms, in a snowy turban. To-morrow she will disappear with the other relics of the ancient city.

The tinkling of the innumerable church bells is already drowned by the more strident note of the electric car, and with the completion of the new port works, the development of the railway system, and the consequent increased volume of trade, Bahia will be a great city. At present it is the centre of the tobacco and sugar and cocoa trade, and exports cocoa, rubber, piassava and many other kinds of tropical produce, besides almost all the carbonados (black diamonds) found in Brazil. The return trip to shore costs 5 $000 per head. The post and telegraph offices, markets, business houses, railway station and British and American Consulates are in the lower town, and in the upper (fare 100 reis) one finds most of the hotels. There are excellent electric trams from here to the Barra lighthouse, or inland to Rio Vermelho. The theatres include S. João and the Polytheama. There are three daily papers, i.e. *Diario de Noticias*, *A Bahia* and *Diario de Bahia*. A monument commemorating the independence of Brazil stands in the Largo Duque de Caixas, and represents the tutelar genius of the country, the Indian erect on the summit of a column of white marble. Some of the churches are well worth seeing, including that of São Francisco founded in 1587, at once one of

the most ancient and magnificent in the Republic. The present building, dating from 1713, is exceedingly decorative as far as the interior is concerned. Whoever visits Bahia must not forget to taste the best oranges in the world, the celebrated seedless navels, as well as the guavas, pineapples, etc.

Many improvements have taken place recently, especially as regards the salubrity of this city, and it is a pity one cannot say the same as regards the hotels, at least from one point of view. Neither of the principal ones are suitable for ladies, or for impressionable young men. The Belle Jardiniere Restaurant is the leading house of its kind. Dinner costs three to five milreis, and pension terms are 200 $000 monthly upwards.

Bahia is the birthplace of the Visconde do Rio Branco (father of the Great Baron), Ruy Barbosa, Castro Alves, and the Baron de Cotegipe. Amongst places of interest the Chapel of S. Bento Monastery is especially remarkable.

The new port works include two breakwaters, with 2,000 metres of quays along the lower fringe of the city, with a mean depth of 8½ metres, and an extension of eight or nine hundred metres, having a depth of 10 metres. The market and the beach near by needs a good deal of cleaning up, and the latter is still used as a sort of rubbish heap.

In Praça Riachuelo is a column in commemoration of the battle of the same name. If the visitor admires church architecture, there is ample choice, as it is impossible to miss at least half of the couple of hundred of sacred edifices in the city. Most of them, however, leave a good deal to be desired from the point of view of graceful outlines. That of S. Francisco, founded in 1587, is not only amongst

the most ancient but the present building, dating from 1713, is perhaps the most magnificent in the country, especially as regards the decoration of the interior. Most foreign countries have Consulates here. Amongst the public buildings the Government Palace, Praça Rio Branco, Conservatory of Music and School of Fine Arts, Rua 28 de Setembro, Polytechnic School, Largo S. Pedro and the Faculties of Medicine and Law, as well as the Technical College, Normal School and Gymnasium, are worth notice. The Public Library is in the Government Palace. Theatres, Cinemas, Masonic Lodge, Hospitals and Benefit Societies exist as in all large cities.

Steamboat communication with S. Felix and Cachoeira, six hours run across the bay. These cities are united by a bridge, and the joint population is 60,000. Distance about 80 kilometres from the Capital. Very large cigar factories.

Cachoeira.—Has two newspapers, *A Ordem* and *A Cachoeira*. Hotels, "Juvenal" and "Nações."

S. Felix.—Initial station of the Central Railway of Bahia. Hotel, "Dantas." Press, *O Industrial*, *O Propulsor*.

Castro Alves.—67 kilometres, by this line, fare 4$900, is a small town (II). Trains three times weekly at 6.50 a.m. Continue to *Machado Portella*, 259 kilometres; 18$500. Arrive here at 6.42 p.m. Return at 5.30 a.m. thrice weekly; arrive at S. Felix at 5.30 p.m. This line will continue from Bandeira de Mello, a little below the former station, to *S. João de Paraguassú*. Altitude, 1,200 metres. Centre of diamond district. Post, school, etc. Distance from B. de Mello, 102 kilometres. Projections are authorized to *Andarahy*, 90 kilometres from B. de Mello. Population, 7,000. Post, tele-

graph. Hotel, "Leão," and to Lençoes, 126 kilometres, and *Rio de Contas*, 174 kilometres S.W. *Morro do Chapéo* is another small city in the mining district, 100 leagues (600 kilometres) from the capital. Theatre, post, schools, etc.

Alagoinhas is a city on the northern line of rail. Population, 50,000. Latitude, 12°16′ S. Longitude, 4°52′ E. Press, *Correio* and *O Popular*. Post, schools, five small hotels. 124 kilometres from Bahia. S. Francisco, adjoining, is the junction for the Bahia—S. Francisco line. Continue from Alagoinhas to Aracajú (Sergipe), 307 kilometres from this station. The total journey takes up part of two days. Stop over at *Barracão*. On from S. Francisco to *Serrinha*, 233 kilometres from Bahia. Population, 3,000. Press, *A Tribuna*. Post, etc. Hotel, "Maciel." *Queimadas*, 350 kilometres; fare, 18 $200. Depart Bahia on Sunday at 7.30 a.m. arrive 8.40 p.m. Population, 3,000. Altitude, 275 metres. Proceed at 6.30 a.m. on Thursday or Sunday to *Bomfim*, 445 kilometres. Arrive 10.17 a.m. Fare from Bahia, 21 $400. Population, 10,000. Post, schools, etc. Hotel, "Lobo." Continue to the terminus at *Joazeiro;* arrive at 3.50 p.m. Population, 15,000. Latitude, 9°24′ S. Longitude, 2°53′ W. Altitude, 372 metres. Average temperature, 25° Centigrade. Hotel, "Paris." Press, *Correio*. Distance by water to Pirapóra by the *S. Francisco*, 1,369 kilometres. Trains return to Bahia twice weekly at 5.30 a.m.

Feira de Santa Anna is 45 kilometres from Cachoeira. Three trains daily, in 2 hours 20 minutes. Fare, 3 $400. District population, 25,000. Press, *Folha do Norte*. Post, schools, etc. A great cattle market.

Jacobina is 110 kilometres from Queimadas.

District population, 40,000. Latitude, 11°34′ S. Post, schools, etc. Temperature, 24° Centigrade.

Maragogibe.—12,000 population. 56 kilometres from Bahia. Press, *Nova Era.* Hotel, "União." Theatre, post, school.

Monte Alegre.—3,000 population. Theatre, and ascending the river S. Francisco from Joazeiro, *Remanso.* Altitude, 300 metres. Post, etc. Barra do Rio Grande, 760 kilometres from Bahia. Latitude, 11°05′51″ S. *Carinhanha*, post town. *Rio Branco*, 6,000 population.

Nazareth.—120 kilometres S. of the capital. Population, 10,000. (Rail to *Amargosa.*) Steamers on alternate days in 5 hours. Press, *O Conservador* and *O Regenerador.* Theatre, post, schools, etc. Four hotels. *Amargosa*, 99 kilometres, 6¼ hrs. run. Leave Nazareth at 7 a.m. The line continues to *Toca da Onça*, 196 kilometres.

Caetité is in the centre, 657 kilometres from Bahia, and 310 from Machado Portella. Altitude, 850 metres.

Southwards is *Ilhéos.* Population, 7,000. 117 miles from Bahia. 12 hours' run. Press, *Jornal* and *Diario.* Hospital, post, telegraph, telephone, schools. Two hotels. South Western Railway. Latitude, 14°47′40″ S. Longitude, 4°07′ E. Proceeding W. by the railway we find *Itabuna.* Population, 10,000. Press, *O Itabuense.* Post, telegraph, schools.

Conquista.—547 kilometres from Bahia is the present objective of the line. *Condeuba* is further W.

Jequié, on the Rio de Contas, is a small town. Press, *O Commercio.* Post, etc., etc.

Further S. is *Cannavierias*, another seaport. Dis-

trict population, 20,000. Latitude, 15°41′. Longitude, 5°. Press, *Monitor, A Democracia,* etc., etc. *Belmonte* is on the right bank of the Jequitinhonha, a little below Cannavieiras. Population, 6,000. Press, *A Evolução, O Arauto.* Several hotels.

Caravellas is 17°43′ S., 3°56′ E. Hotel, "Argentina." Bahia—Minas Railway to *Mayrink*, 192 kilometres, and Theophile Ottoni (see Minas Geraes), 378 kilometres. Fare, 33 $900. Six trains monthly each way.

Abrolhos Islands

Coral reefs in latitude 17°51′31″ S. Longitude, 4°28′33″ E.

State of Espirito Santo

Has a President and Congress of 18 Deputies. Sends 1 Senator and 4 Deputies to Rio Janeiro. The capital, Victoria, lies on an island, a few hundred metres from the mainland, on which the Leopoldina and Minas Railways are situated. A bridge is planned, and will be built as soon as the war is ended. Population of this city, 35,000. Latitude, 20°18′50″ S. Longitude, 2°50′35″ E. Hotels very indifferent; "Palace" the only one possible in 1916, when I visited the town. Press, *A Ordem, Diario,* etc. There is a pretty garden square and a brand new Government palace, with public library and a theatre (Melpomene). Amongst many improvements made lately, an electric tram service is not the least, and great sanitary works were put in hand by the last administration.

Trains leave for *Collatina,* 154 kilometres, every morning, continue to Natividade, 208 kilometres, *stop.* Run 9 hours (Minas boundary). Proceed next morning to Serra Escura (9¼ hours), total dis-

tance, 444 kilometres. The line will go on to Itabira in the iron ore district.

Towns in the North include *Conceição da Barra*, 2,000 population. Post, school, etc. *S. Mattheus*, 40 leagues from the capital. On river of same name. Population, 3,000. Post, telegraph, schools, etc.

Santa Cruz.—10 leagues from Victoria. Population, 2,000. Post, telegraph, school, etc.

South from Victoria

Expresses to Rio by the Leopoldina Railway, with dining and sleeping cars attached, depart on Sundays and Thursdays at 10.15 a.m., arriving at Mathilde, centre of the Italian and German colonies, 79 kilometres, at 1.18 p.m. Cachoeira de Itapemirim, 159 kilometres (buffet), is reached at 4.19. This is the second city in the state. Population, 10,000. Hotel, "Toledo." Press, *Correio*. There are several factories in the town, and it has electric light. Junction for Alegre, Devisa (state boundary) and Espera Feliz. Depart 6 a.m.; arrive 3.25 p.m. Fare, 9$500. Return three times weekly at 9.40 a.m. Arrive at Itapemirim 6 p.m. The Rio express continues to Murundú, reaching there at 8.15 p.m. Branch for Carangola, train at 3.15 p.m. Continue by through train to Campos, arrive at 9.30 p.m., Macahé 1.06 a.m., and Nictheroy 7.25 a.m. Total distance, 597 kilometres. Fare, 48$900. Berths in sleeping car, 10$ (upper), 15$ (lower). (See State of Rio.)

Trinidad Island

Latitude, 20°32′26″ S. Longitude, 13°50′46″ E. A wireless station. Length, 4½ kilometres; breadth, 1½ kilometres.

State of Rio Janeiro

Governed by a President. The Legislative Assembly consists of 46 Deputies. There are 3 Federal Senators and 17 Deputies.

Capital, *Nictheroy*, opposite Rio Janeiro. Latitude, 22°53′ S. Population, 88,000. Electric light and trams, and an excellent service of ferry boats to Rio. Fare, 300 reis. Steamers every half hour day and night. Hotel, "Soares." Journal, *A Capital*. Theatres, large colleges, and every convenience of a capital. To all intents, a suburb of Rio, being largely inhabited by workmen and others who are employed during the day in the former city. There is a large British and American colony. Trains to Victoria twice weekly at 9 p.m. Tram direct to the station from the landing stage.

Macahé.—181 kilometres. Latitude, 22°24′ S. Population, 8,000. Press, *Correio*, *Seculo*. Post, telegraph, etc. Three hotels. Branch line to *Glycerio* at foot of the "Frade," 1,750 metres altitude. Distance, 44 kilometres. *Araruama* is 116 kilometres from Nictheroy on Maricá line. Population, 1,000. Post, etc. *Cabo Frio*, on the coast, is a small fishing port. Theatre, post, telegraph. Two hotels, 6-8 hours by sea from Rio. *Santa Maria*, *Magdalena*. Altitude, 632 metres. Distance from Rio by Leopoldina Railway, 321 kilometres. Population, 2,000. Theatre, cinema, post, school. Hotel, etc. Lies on a branch line inland.

Proceed by main line to Campos, 275 kilometres.

On Parahyba do Sul. Population, 50,000. Latitude, 21°45′24″ S. Longitude, 1°50′21″ W. Average temperature, 25° Centigrade. Press, *Monitor*, *Gazeta*, *Folha*, *Rio Janeiro*, *Noticia*. Hotel,

"Flavia." Two theatres, cinema, hospital, colleges, and schools. Many improvements have taken place in recent years. Centre of sugar industry.

Atafona, a bathing place, with new hotel, is 43 kilometres. Trains daily at 3.30 p.m. Two hours run. Branch line of rail W. to *S. Fidelis*. Population, 4,000. Distance, 43 kilometres. Leave Campos 2.10 p.m. Hotel "Brandão." Press, *O S. Fidelis*. Continue to Padua, 114 kilometres. Paraokena, 124 kilometres, and Miracema, 138 kilometres, arrive 8.15 p.m. Return to Campos 5 a.m., or proceed to *Cysneiros* at 8.25 a.m., 19 kilometres, *Patrocinio*, 41 kilometres, returning through *Itaperuna*, 42 kilometres (depart Patrocinio 3.50 a.m.). Population, 3,000. Press, *O Popular*, *A Vedeta*, etc. Theatre, post, schools. Continue to Murundú, 121 kilometres; arrive 8.27, and Campos 10.55 a.m. Proceed by main line to Itapemirim (Esp. Santo) and Victoria (see Minas Geraes). From Santa Luzia (Minas Geraes) there are daily trains at 5.40 a.m. to Recreio, Mello Barreto, and *Novo Friburgo*. Population, 20,000. Altitude, 900 metres. Distance from Nictheroy, 109 kilometres. Fare, 11 $800. Three trains daily in 3 hours 35 minutes. Latitude, 22°17′. Longitude, 0°38′ E. "Grande" Hotel. *Jornal*, *O Friburgense*. This summer resort was founded by the Swiss Guards of Dom Pedro I when disbanded. Average temperature, 18° Centigrade. Continue W. to *Cantagallo*, 167 from Nictheroy. Fare, 16 $600. 6 hours 54 minutes. Population, 2,500. Press, *Correio*, *Tribuna*. Theatre, post, telegraph, schools. Average temperature, 25° Centigrade. Continue to *Portella*, 237 kilometres. 10 hours 20 minutes.

Petropolis

The best time to reach Brazil is in the winter, from June to September. Let us take our baggage and turn our attention towards the Queen of the Serras (Petropolis). Supposing we arrive by steamer at Rio in the early morning, and we are prudent enough not to be burdened with heavy luggage, we may get our goods and chattels cleared, and have done with customs' formalities before noon, if we elect to have late breakfast on board. I must go with you to be your guide, counsellor and friend, for, of course, you are ignorant of the romantic and expressive language of Camões. Call a carregador (porter) and have your luggage trundled to Praia Formosa Station. Trams marked Luiz Durão will convey one for 200 reis from Praça 15 de Novembro, and the station should be reached by 4 p.m. From Praça 11 de Junho, just above the Central Railway Station, the route follows the Canal do Mangue, bordered with a splendid palm avenue. This ancient open sewer is now cleansed and conducted along a channel 20 metres wide to the sea. The first section, measuring 1,200 metres, and a second (commencing close to the Leopoldina Railway Station) 1,400. Trains leave at 6, 8.20 and 10.30 a.m., and 3.50, 4.20, 5.40 and 8 p.m., making the journey in $1\frac{3}{4}$ hours.

The return fare for 2 days is 4 $000. Leaving at 4.20, the Jockey Club racecourse is passed, and a number of suburbs, until Penha is reached, with its twin-spired church perched on a huge rock. Here during the month of October, every Sunday, a sort of Kermesse is held, and the faithful crowd to the sacred fane in such numbers that trains have to be run every 5 minutes. A long dreary stretch of

swamp now faces the traveller, with the bulrush and papyrus (*Cyperus princeps*) growing everywhere. Estrella, an ancient decayed port, forms a sort of oasis in the morass, and at 5.25 the foot of the mountains is reached. Here a strange sort of monster comes behind to push us up the steep grade. The train is literally buried in the narrow cutting, and tremendous boulders overhang the line at every turn. Some wag has adorned one of perhaps 4 or 5 hundred tons with the invitation "Va com esta!"—*anglice* meaning, Take this with you.

Formerly the most frequented route was by water from Prainha to Mauá and thence by train, now the only way is by rail direct. In old times, as one passed the barrier at Prainha, one received a ticket with the number of one's seat in the train at Maná. Beware of sitting down at random in the carriage marked "Assignantes" (season ticket holders), as most seats are allotted to the "Diarios," as those travellers are called who hold the above tickets, and their names are seen on cards above the seats. This carriage is a variety of club where half a dozen nationalities are united in a species of freemasonry, and its members are brokers, merchants and Government employés as a rule, and often a couple of games of bridge are in progress at the same time, card tables being produced by the conductor as soon as the train is under way.

One finds the same four in the same place every day. Coming down from Petropolis at 7.35 a.m., and going up as a rule at 5.40 p.m.

Oblivious to everything but the cards, but sometimes relieving the tedium of the journey by politics or jokes. Sometimes a solemn Britisher, who con-

siders himself a cut above the crowd, "don't you know," takes up a corner, buried in the latest number of the *Times*. Most evenings one can hear the nasal drawl of a down-easter or two, unfortunately prejudicing sensitive people against them by their atrocious accent, when in reality they are often very good fellows. You can also stake your existence that your fellow travellers will comprise a sprinkling of Germans, and perhaps a diplomat or two, with the stupid stove pipe and frock coat of conventional style. Amongst the habitués of the "Diarios" car there is a spirit of "hail fellow well met" that permeates an olla podrida of several social ranks shut up daily together for three or four hours.

If we are going up in the summer, i.e., November to March, the vegetation is literally sodden with wet, reeking strata of mist being passed through at intervals. At 400 metres above sea level, Meio da Serra is reached, with a tumbledown hovel of a station, the chapel with a bandstand in front, and collection of small houses of the employés of a large cotton mill in the background. The train is usually divided into two or three sections, and a little above, passengers in the hindmost, look across the bend to the first part. The summit of the pass is reached at 2,600 feet, and the signs of civilization are once more visible in the form of electric light, rows of pretty villas, and electric trams. The engine is replaced by one of the usual type, and a very few minutes suffice to bring us to Petropolis itself, between 2 and 3 miles further on. The space in front of the station is crowded with carriages, and perhaps a dozen private motor cars, a motor bus and electric trams. There is no lack of hotels,

either the "Pensão Central," "Majestic," "Palace," "Modern," "Europa," "Rio de Janeiro," or "Bragança," and there are now two or three private pensions.

Agassiz speaks of the delicious climate of this mountain city, with its average summer temperature of 19° C. Its origin is due to Major Frederick Köeler, a German officer of Engineers in the employ of Dom Pedro II. It was formerly called Corrego Secco, and Dom Pedro I bought the whole of the domain as a sporting estate, and took possession of it in 1844. His palace was first in the Rua Marechal Deodoro, and this house became in turn the "Hotel MacDowell" and "Mills." It is now the "Pensão Macedo." The new palace (now College of St. Vincent de Paul) was built in 1845, but a coach road had already been built, and the same year Major Köeler obtained the Imperial estate for a rental of 1 conto yearly, and 200 Germans on their way to Australia were persuaded to leave the ship at Rio.

They were engaged on this road, and began to form the colony at the same time. A few months later 2,000 more arrived, and Petropolis became a city in 1854. First the summer residence of the Court and its parasites, it became capital of the State for a time, and has now developed into a busy industrial city, unspoiled, however. The public library has 15,000 works of reference, and the reading room is well supplied with European periodicals. The death-rate is 13 per thousand. Population, 35,000. There are two daily papers.

There are six colleges and many factories. The most important is that of the Companhia Petropolitana, at Cascatinha, employing 1,100 hands,

and turning out 7½ million metres of cotton yearly. The latitude of the city is 22°30′55″ S., longitude (east of Rio) 0°60′22″.

The public buildings include the Forum, Delegation of Police, Town Hall, etc.

Rentals vary from 80$ to 500$ monthly. Furnished houses may be obtained during the winter, May-October, at moderate rentals.

There are two cinemas in the main street and a theatre, and a new one is under construction.

Telephonic and telegraphic communications can be had with Rio Janeiro.

The Leopoldina Railway has three stations in the urban part of Petropolis, one at Alto da Serra, one at Petropolis and one at Cascatinha. The fastest trains in the day get here from Rio in ninety-five minutes. The population is extremely cosomopolitan, consisting of German, Italian, Spanish and Syrians, French, Austrian, Swiss, etc., besides Brazilians. In the summer one finds English and Americans, and most of the foreign diplomats. The city has become a very important industrial centre, and at the present time there are over eighty manufacturing concerns in the Municipality. The surrounding district, inland, produces 25,000 sacks of coffee yearly, as well as maize, beans, potatoes, fruit, etc., and dairy produce and vegetables.

The revenue of the city is estimated at 400 contos (1913) in taxes alone; and the total revenue should be at least 700 contos.

The journey up from Rio took 4 hours in 1865, but the tired traveller had at that time an English hotel to fall back on. At present there is none unfortunately. Car fares in the city are: per hour, four-wheel, 5 milreis; per hour after, 3 milreis; two-

wheel (seat only one passenger), 2 milreis; second hour, 1 milreis.

The trams are now running to Cascatinha, Alto da Serra and on a circular route in the city, and other lines are in course of construction. The system of transit is by the aerial contact, trolley arm.

Mr. Dent speaks of the absence of negroes in 1885. This can no longer be said, and in the summer, coloured mendicants flock in from all the surrounding districts. Brazilians are perhaps too charitable, and the irresponsible children of Ham abuse this virtue. The climate is magnificent from April to October, and although the summer is very wet the heat is greatly tempered, and the vegetation is glorious. Arums, roses, jasmine, heliotrope, etc., etc., are always in bloom. The principal orchids are Oncidium crispum, Cattleyas, Miltonias, Loelia, Sophronites, maxillaria, Stanhopea, Houlletia and Jonopsis.

Amongst other blossoms are Magnolia grandiflora, camellias, hydrangeas, cannas, anonaceas, gladioli, carnations, and every other kind of exotic flowers. A wild raspberry (Rosacea) fruits freely during most of the year, and many kinds of oranges, limes and lemons fill the gardens, with a score of varieties of bananas.

Trams are running all over the city, and daily milk and garden produce cars will bring in supplies from the suburbs. There are silk, cotton and woollen mills, breweries, nail, furniture and ice factories. Should we arrive in June, the change in temperature from Rio to the cool regions of the high serra is great, and a good overcoat should be donned the moment the train reaches a few hundred

feet above sea level. There are many delightful excursions, but the first thing to be seen is the view from Alto da Serra, just beyond the gap at the station. Before 8 a.m. the plain at the foot of the mountains is quite invisible, being hidden by the heavy cloak of white cloud that leaves only some of the loftier foot hills peeping above the snowy mass, like islands in the midst of an ocean. A breeze blowing from seawards opens up gaps in the *mer de nuages*, and the fleecy billows driven against the serried cliffs accentuate the illusion, breaking like huge waves in a stormy sea on a rocky shore. In an hour or two the freshening wind clears the whole of this away, with the aid of the sun, leaving only a dun-coloured cloud hovering above the city of Rio de Janeiro in the far distance; in the foreground the dark green-clad serra and the speckled plain, with the iron road driven straight across it, and in the middle distance the blue waters of the bay.

Another time we can go by the Caminho dos Mineiros (the miner's road) to Caxambú, and leaving the dark depths of the reservoir away on our left, ascend by a mountain road to the summit of the pass (5,000 feet), and look down on the northern side of the bay, and at Magé, and Piedade beyond where starts the tiny line that creeps up the Serra to Thereosopolis, the coming rival to Petropolis. Look across yon awe-inspiring valley, there looms in front a tremendous mountain mass, with an assemblage of huge boulders at its highest point. From where we stand it is inaccessible, but we shall succeed in reaching it another day. There is also the Fazenda Ingleza, a famous picnic place, the Crémerie Buisson, the Presidencia, the Cortiço, the

top of that towering wall of rock, seen at Meio da Serra, and then there is Cascatinha (the little cascade), and Correias, further along the line towards the interior. In short, there are enough excursions for a month, but whatever is missed, Itaassú (or Pedra Assú, as it is called wrongly, with its bilingual name, half Portuguese, half Guarani) must be visited. We must leave our hotel well provided with blankets and creature comforts at 4 p.m., and take horse, or tramp to Pereira's, the last house, the veritable Ultima Thule. Here under the hospitable roof of this rosy, cheery old chap, we may sleep after our 2 to 2½ hours' journey, as the morn must see us under way as soon as daylight permits, at 6 to 6.30 anyhow. At Pereira's we are about 1,000 metres above the sea, or 300 higher than the station at Petropolis. From this, if we are wise, we shall not attempt more than 100 metres rise per half-hour, including halts, and so we shall come out at Isabeloca in about 4 hours, and here we can pause a while. In front, as soon as we leave the forest, appears a flattened basin, with its edges formed by low hills, the most elevated of which is crowned by a huge group of boulders of gneiss, forming the Castello of Itaassú, and the culminating point of the whole of the coastal ranges. In the winter the basin is dry, but the summer converts it into a lake of 2 or 3 miles in length if the season is a wet one, and it is not at all pleasant to make the journey after the spring rains have set in in October. In any event, a guide is useful, as the forest is almost impenetrable and no habitations are to be found after Pereira's is left behind, and one might wander a week without hearing a human voice or seeing a trace of human footsteps. Look down, where we

stand, and see a tiny white cluster of houses representing Petropolis, and nearer still the winding road leading from the city to the sombre way by which we have ascended.

Everything is different here. That great sheet of water with its countless isles that frames Rio de Janeiro, is diminished, as if we had been looking through the wrong end of the telescope. The ocean looms large before us. We stand where man is made to feel his littleness. Sea, sky, and mountains combine here to exert a dominating influence over the human soul. Consider now the herbage at our feet. We left in the town a hundred forms of familiar flowers, roses, dahlias, magnolias, camellias, heliotrope, jasmine, cannas, hortensias, and the flaming branches of the bougainvillea. Ere we reached Pereira's the last climbing fuchsias had been left behind, and the orchids, those mimics of the butterflies, have long since gone, or at any rate nearly all of them. In the dark depths of the forest we had hardly noticed the change, but now the ground is covered with a profusion of flowers we fail to find in the sub-tropical zone below.

There are bulbs scattered here and there, hardly attached to the soil, and besides the amaryllides, many sorts of plants of an alpine character, and which, alas, would not live even if we were successful in transplanting their seed or roots to Petropolis. Breakfast dispatched, we step out manfully, in Indian file, along a tiny path that has been worn by the tapirs on their way to the pool. Shortly we seem to be lost in a labyrinth of sword-grass tufts, reaching 6 or 7 feet in height, and so toiling for an hour, we cross the little stream trickling through the farther side of the swamp (a lake in February),

and climb up the other side to the shelter of those boulders that form the Castello, or the Itaassú (great stone) itself. Here we are 2,250 metres above Rio, or approximately 7,400 feet, and the height of the boulders may be 35 to 40 feet more. One I measured is 33 feet.

The altitude given is that taken by two compensated aneroid barometers, afterwards corrected by observations that had been taken simultaneously in Petropolis. If possible to climb up one of the higher boulders, the labour entailed will be well repaid, but one needs nerves and muscles of steel for such a task. I think a few persons have succeeded in getting up by aid of the sparse vegetation growing in the clefts of the rocks. I once managed this feat at considerable risk, and some damage to my clothes, but certainly I was in far better training than at present.

Probably there is no view so comprehensive in all Brazil, and certainly there cannot be any so glorious. Far as the eye can reach in the west, north, and south, rise serried masses of mountains fading away towards the setting sun in the distant valley of the Parahyba. The ranges take the most fantastic forms, seemingly due not to nature, but to the cyclopean architecture of some bygone race of demi-gods. Towers, spires, domes, minarets are scattered here and there in picturesque confusion. In the north there are isolated masses and peaks marking the site of Novo Friburgo, and the vicinity of Cantagallo, where the gold mines formerly existed. We cannot always catch a glimpse of Itatiaiá, for this monarch of all Brazilian mountains sometimes hides himself in the clouds. Here we must sleep, and the first thing to do is to collect

fuel, a very scanty thing indeed, and perhaps we shall find nothing but the feathery tops of the tacquaril, a small cane, hardly as long as a walking-stick. Then a pile of these same tops must go towards making our bed, and a wind screen of some sort thrown up, for the great boulders form a sort of funnel here. If we have completed our preparations to brave the elements, we may perhaps make a tour of our fortress, finding that it takes at least half an hour. Night comes on apace, and we boil our billy, and sit under the dark rock watching the moon rise, surely twice the size of the northern sphere, and as bright again. Now with the disappearance of the sun, rude Boreas comes sweeping and whistling through the crevices all around, blowing the ashes of our dying fire in every direction. Cover up well, and creep in close together as we may, one or other must need jump up now and then to replenish the blaze. Towards morning there is a thin film of ice over the pool which lies amidst the rocks. It is not, however, the temperature marked by the mercury that chills us. It is that bitter, piercing blast that comes sweeping across this exposed site all the way from the Antarctic regions.

Sunrise sees a pair of shivering pilgrims, struggling to get up their circulation, and to stimulate the flagging energies of the fire. Nine a.m. soon arrives, and the homeward march must be begun. We go down naturally much quicker than we came up, and arrive at Pereira's by 2 p.m., where we lunch and rest, and take horse back to Petropolis.

Unfortunately although the Piabanha River winds through the town of Petropolis, and the Itamarity joins it ere it reaches Cascatinha, there is no fishing. The dyes from the factories have poisoned all the

large fish that have not been destroyed by dynamite cartridges; so if we want any angling it will be necessary to travel some 3 or 4 leagues at least. There are, however, many rivers which contain abundance of finny life, and some, as the dourado and pirarucú, afford good sport. The seas swarm with a hundred different types of scaly monsters, and some amusement may be had, with rod and line, from the rocks near the Gavea (Rio de Janeiro).

We can take the train, when tired of Petropolis, to Itaipava, and from there amble gently into Theresopolis the same afternoon. Here there is less distraction. Only one hotel worth stopping at (*Hygino*), and hardly anything to do but amuse ourselves by excursions amongst the mountains and woods. From here we join the iron road again, and afterwards the boat to Rio de Janeiro. If limited in time, we can come out to Rio by the Royal Mail steamer, leave her on the Monday morning, or Sunday night, go straight up to Petropolis, visit Itaassú, etc., and leave for Theresopolis the following Monday, and remain there until Friday, arriving at Rio on that day. We have then 4½ days left to make the acquaintance of the capital, as the steamer leaves on the following Wednesday afternoon. Otherwise inclined, a journey to Ouro Preto and Morro Velho to see the gold mines, Bello Horizonte, and thence to São Paulo, and, if time permits, from Paranaguá to Curityba and back, may fill up our time. To do justice to Brazil, a month should be spent in Rio alone, adding at least from May to the beginning of October in the provinces, not forgetting the Iguassú Falls (Paraná).

No one need fear the want of the common neces-

sities of civilized life. As long as no attempt is made to travel away from the iron road, most European luxuries can be obtained. The American habit of living in hotels has caught on in Brazil, and in such places as Petropolis, Friburgo, Theresopolis, Poças de Caldas, etc., many families remain *en pension* for months together, to save the bother of a house and its attendant worries. Reference to the table of cost of living will convince the sceptic that prices are not out of proportion to those of Europe. I have in my mind a type of 10s. a day hotel, very common in the provinces in England, that certainly treats its guests far worse than one of the same class in Brazil. It is also interesting to compare the cost of living in certain resorts in France and in South Brazil. The Brazilian who has travelled in Europe is generally more exacting in the way of diet than the average British tourist, and he is not so disposed to phlegmatically put up with it as the latter; and, as he expressively puts it, frequently *passando uma decompostura no hoteleiro;* that is, giving him a good dressing down, in language more forcible than polite. The verb *to descompôr* is in common use in every-day life; indeed, and Anglo-Brazilians are adepts in its employment.

DISTANCES BY ROAD.

Petropolis to Cascatinha, 7·3 kilometres; Corrêas, 11·7 k.; Itaipava, 20·5 k. (road to Theresopolis); S. Antonio, 7 k.; Theresopolis, about 20 more.

Petropolis, Crêmerie Buisson, 5·7 k.; Fazenda do Campos, 7·8 k.; Petropolis, Alto de Serra, 3·5 k.

Petropolis, Isabeloca, 24 k.; Pedra Assú (Castello), 27¼.

Magé.—On Rio bay. Daily steam communi-

cation (line to Theresopolis). Post, telegraph, school. Hotel "Theresopolis." Population, 5,000. Altitude, 920 metres. Hotel, "Hygino." Day return tickets from Rio Janeiro (Caes Pharoux).

Towns near the Minas boundary include *Vassouras* (change at Barra Longa). Press, *O Municipio*. Altitude, 436 metres. Population, 2,500. Distance to Rio, 129 kilometres. Theatre, cinema, post, etc., 3 hotels. *Valença*, 185 kilometres, on an opposite branch line. Population, 4,000. Press, *Correio*, etc. Public library, post, schools. Hotels ("Central" and "Italia-Brasil"). Fare, 15 $. Run, 7½ hours.

Parahyba do Sul.—On line to Minas. 188 kilometres from Rio. Press, *Parahyba do Sul.* Hospital, theatre, cinema, post, schools, hotels. Fare, 15 $600. On the coast, S. of Rio, is *Angra dos Reis*. Latitude, 23°4′. Press, *Recreio*. District Population, 20,000, and *Paraty*, Press, *Razão*. Post, school, hotels, etc.

On the main line to S. Paulo is *Barra de Pirahy*, junction for Minas and S. Minas Railways. 108 kilometres from Rio. Several trains daily. "Station" Hotel. Press, *O Dever*, etc. Cinema, school, etc. *Barra Mansa*. Change for "*Este de Minas*" line, 153 kilometres. Press, *O Barra Mansa*. Hospital, post, schools. "Station" Hotel. District population, 26,000.

Rezende.—Altitude, 436 metres. 190 kilometres from Rio. Latitude, 22°58′ S. Average temperature, 24° Centigrade. Press, *O Regenerador*. Three hotels. Post, telegraph, telephone to Rio, schools. Junction to *Bocaina*, on slopes of Serra of this same, which rise to 1,500-1,700 metres at Barreiro, etc. Average temperature, 14-16° Centigrade.

Campo Bello.—193·· kilometres. Station for Itatiaiá. Train arrives from Rio at 11.39 a.m. Depart for Rio 2.18 a.m.

Itatiaiá

Thanks to the Ministry of Agriculture, it is now quite easy to visit this mountain. Starting from Rio de Janeiro, one may either alight at Campo Bello or Itatiaiá stations, on the São Paulo branch of the Central Railway, and those persons who are practically interested in colonization should make a point of visiting the Government nuclei at Visconde de Mauá and Itatiaiá, the latter extending from 800 to 2,500 metres above sea level.

The Casa da Invernada (Winter Lodge) is 17 miles from Itatiaiá station, and lies at an altitude of some 2,200 metres. The region from sea level up to 600 metres consists of tropical vegetation, and the forests extend up to the 1,700 metre level. Palms disappear at 1,400 metres, and a few hundred feet higher apples, pears and other European fruits thrive. In Santa Catharina palms cannot exist above 1,000 feet, but here, at a comparatively small difference of latitude, they flourish at thrice the altitude. In the high peak district they are well watered by the small lakes or tarns which exist at the top of the mountain. The auracaria, or graceful South American pine, rears its spreading and lofty head up to 2,000 metres, above which altitude the vegetation takes on another character.

Summer temperature at this level averages 57° Fahr., with a maximum of 72°. The winter minimum is well below freezing point, often reaching 6 degrees below zero (centigrade). Heavy snowfalls took place in June, 1911, and September, 1912.

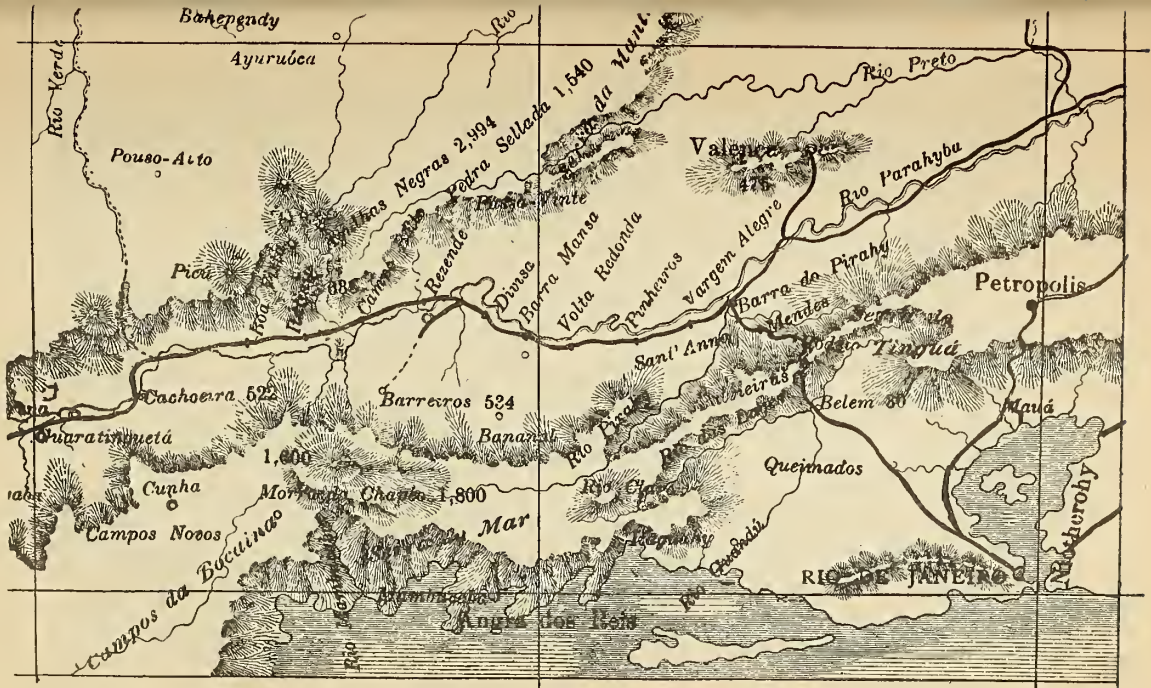
The weather is usually cold and dry from April to October. At 2,200 metres the streams are frozen in June and part of July, ice forming up to an inch thick. From the Retiro, or Casa da Invernada, a day is required to go to the top of the mountain and back. The Pyramids, a conical mass of rock, are passed after crossing the Ribeirão da Passagem, a small stream, and two other brooks and lakes skirted before the toothed crest of the Agulhas Negras is reached. Snow lies sometimes for a fortnight at this level, nearly 3,000 metres, and ice crystals attain a considerable thickness. The whole of the jagged series of rocks and boulders is comprised of Nephelene Syenite or Foyaite, as in Poços de Caldas, Tinguá and Cabo Frio, and the edges of the tarns are carpeted with Cryptograms (295 varieties) and 271 classes of Phanerogams. The highest peaks contain patches of Sphagnum and Harrisonia.

Some 300 varieties of flowers may be found on the plateau, or level at 2,200 metres, from which rises the curved spine of the Agulhas. The climate of the whole of the higher region of the mountain is excellent, and Dr. Richardson, of London, the food reformer, proposed in 1877 that a model city called Hygienopolis should be founded here.

Under favourable conditions, Itatiaiá is visible from the peak of Tijuca, behind Rio de Janeiro, as well as from Morro Assú, but the view from this huge mountain mass cannot be compared to that from the Assú.

Purity of water on Itatiaiá. At 823 metres = 0·4 per cent of solid matter per litre, and at 2,204 metres = 0·091 per cent. per metre.

Average temperature at Retiro (2,200 metres)—10° Centigrade for the whole year.



ITATIAIA.

Reduced from the Map of Barão Homen de Mello, 1876.

Visconde de Mauá colony, near by, at 1,030 metres, has a mean temperature of 17·5 Centigrade.

From Campo Bello station by road to the Agulhas Negras is 42 kilometres, but the distance as the crow flies is less than 30. Retiro may be reckoned as one league from the Agulhas (base), but several hours are necessary to get to the top, and very few persons have succeeded. The descent would take four or five hours at least.

Continue from Itatiaiá station (next to Campo Bello), by Queluz to S. Paulo. See return journey at end of Gazetteer.

The whole of the low-lying land in this state between the Serra do Mar and the sea is called the "Baixada," and behind the Federal capital it forms an immense plain or swamp, through which many rivers flow, or, rather, percolate on their way to the bay.

All of these rise in the Serra, and their first course is torrential, the fall being as much as 1,000 metres in a few miles, carrying with them, especially after the summer rains, an immense amount of detritus which has gradually obstructed their beds, and originated the costly drainage and canal construction work which was carried on for some years.

Several of these rivers, as, for instance, the Merity, Sarapuhy, Estrella, Iguassú and Macacú, etc., are now navigable for a considerable distance. The small village of Estrella, on the stream of that name, was formerly a port, from which passengers took coach to Petropolis.

The whole of the reclaimed land is, naturally, of the most fertile nature, and destined to produce immense crops of rice and sugar, besides vegetables and fruit of the finest types for the Rio markets.

CHAPTER XXVIII

RIO DE JANEIRO AND MINAS GERAES

Rio de Janeiro (Federal Capital)

Latitude, 22°54′23″ South. Longitude, 43°10′21″ West of Greenwich.

From Bahia to Rio de Janeiro Port is 742 miles, and wind and tide being favourable, Cabo Frio, the first light, should be abreast by tea-time; otherwise, and in case of delay at Bahia, speed is reduced, and it is 5 or 6 in the morning when the great cone of the sugar loaf, "Pão de Assucar," looms up 1,383 feet high on our port bow, and we wait the officer of health and the customs, and as a general rule, everybody is on shore by 8 o'clock, unless waiting on board for friends or going on to Santos the same afternoon.

It is an open question which is the best time of day to arrive at Rio, but I personally prefer sunset. At first the city is unseen, its dim outlines being in the shadow thrown by the gigantic figure of the sleeping titan, whose feet are composed by the sugar-loaf, and his head and body built up of the Tijuca and adjoining mountains. Away in the dim distance on the north side of the bay, dominating everything else, rise the slender pinnacles of the Organ Mountains with the "Dedo de Deus" (Finger of God) conspicuous in their midst, and

their higher and less ethereal summits attaining 7,000 feet. Nearer at hand, closing the head of the bay, the Serra de Estrella presents a more or less (at this distance) level outline. The ship is, we will imagine, steaming slowly in, leaving the fort of São João on the west, through a narrow and deep entrance into the most magnificent harbour in the world, some 18 miles long by 16 wide, containing nearly 100 islands, the largest being Governador (left) and Paqueta (right), both far in out of sight of the city.

Rio was founded in 1567 by Estacio de Sá, and a memorial stone exists on the Morro do Castello, near the Observatory.

Maximum altitude of the city 450 metres, in the Tijuca mountain. Exposition, N.E. It extends 9 miles from N. to S., and 10 from E to W. The area of the Federal District, or greater Rio, is 1,116½ square kilometres, with a population of only 3,928 to the kilometre. The Urban District covers an area double that of Paris, with hardly a quarter of the number of inhabitants.

Density of population of Vienna, 8,900; London, 14,500; Berlin, 28,000; and Paris, 34,000 per square kilometre. Number of inhabitants per house, 9·62. Houses in 1906, 82,396; in 1917, 117,000. Number of public gardens, 26. There were in 1906, 178 centenarians, seven of whom were over 130 years of age, and one almost 150.

The Federal District extends from the mouth of the Guandú to the Sugar Loaf mountain, 61 kilometres, and from Merity river to Guaratiba, 41½ kilometres.

When night has fallen, masses and crescents of light spring to life all round. The city glows and

radiates light. Paris has lost her claim to be called "La Ville Lumiere." It is, however, between sunrise and 8 or 9 a.m. that Rio is seen at its best, at least from a steamer's deck. It seems as if the best simile is that of a pearl, which gradually displays its orient to the beholder. Grey gives place to rose, and rose to green, white, vivid red and celestial blue. It is as if Almighty God had breathed on this favoured spot, and bidden it come forth endowed with more natural beauties than any other on earth. The city rises in terraces, not in huge masses of houses hiding the rock, as in Lisbon, but in fairy-like groups of habitations, half lost in the verdure of the tropical vegetation. On the sea level the greater part of Rio stretches in a vast crescent turned towards the north-east, broken here and there by spurs of the mountain range at the back, throwing out gently rounded foothills, covered to their tops with feathery palm tree ferns and bamboos, etc.

In the middle of the crescent, the suburbs stretch away inland for an immense distance, all served by excellent electric trams.

A writer in the Bulletin of the Pan-American Union strikes a new note in saying that Rio is not only the most beautiful, but by far the cleanest city in the world, the walls of the houses, as well as the streets, being washed every night. This I can vouch for myself, and I have never heard of a city where the Board of Health is so active and successful.

Natives of Rio are called "*Cariocas*," from the name of a spring (Casa da Agua) which rises in the Tijuca mountain, and forms a stream descending by Laranjeiras, and falling into the bay in Praia Flamengo.

Steamers come alongside the new quays at the far side of Praça Mauá extremity of the Avenida Rio Branco, close to the site of the wharf where one formerly embarked for Petropolis.

The great Avenida was planned in 1903 under the direction of Dr. Paulo Frontin, and in 5 months a passage was driven right across the city.

To use the words of Januzzi, the Italian architect most interested, his office building (the first erected) cost him 120 contos of reis (£6,000), and fetched 500 contos. First taken in hand on March 8, 1904, six months later the Avenida was opened to public traffic, 641 houses having to be demolished. It is 100 feet wide, and 2,100 yards in length, and its continuation, Avenida Beira Mar, $5\frac{1}{4}$ kilometres long. Extensions in hand will give an uninterrupted length of 12 kilometres of asphalted way.

At the Praça Mauá is the new building of the Railways, Ports, and Navigation Fiscalisation Department of the Ministry of Public Works, and in the centre a statue to Visconde de Mauá, founder of the first Brazilian railway, and, as we have said, the new quays commence here. They are $3\frac{1}{2}$ kilometres in length, and the mean depth alongside is 10 metres. The equipment cost over £5,000,000.

Passing up the Avenida we find, on the right, the Amortisation Bank, *Jornal do Brasil* and *Paiz* buildings, the Engineering Club, Lyceo de Artes e Officios, Naval Club, Central Tram station (Botanical Gardens line), and at the end the Municipal Theatre, a very ornate building, costing over a million sterling. Here Caruso with his own company and the Russian Ballet (Pavlova, Nijinsky, etc.) appeared in 1917. In 1918 as much as £200 was offered for a subscription to the stalls in the

grand opera season, with Rosa Raisa as the leading artiste. The theatre has a fine restaurant in Assyrian style, with truly tip-top prices for its *diner* concerts.

On the left side of the Avenida, commencing at Praça Mauá, is the *Jornal do Commercio* building, costing about £70,000, Western Telegraph, Equitative Insurance Company of Brazil, Jockey and Derby Clubs, and Escola de Bellas Artes.

This contains some pictures by masters of the Italian, Flemish and French schools, as well as the usual (bad) copies of classical statuary, and a noteworthy group by Bernadelli, a Brazilian sculptor (see Art). The annual Salon is usually inaugurated in August or September. The National Library, adjoining, was founded in 1810, with 60,000 volumes brought from Lisbon. It has at present nearly 350,000 works, besides half a million manuscripts, 29,000 coins, and 100,000 engravings. There is also a separate map section. The library possesses its own printing and bookbinding shops, a training school for the staff, motor van for transporting material from the post, and the most modern machinery for book distribution, cleaning, etc. The Supreme Tribunal is close at hand, and a small series of grass plots marks the end of the Avenida, here called Praça Floriano Peixoto, and marked by an allegorical group forming a monument to the Patria. At the extreme end of this small garden is a reproduction of the well-known "Mannekin Pis" of Brussels, on the right the Exhibition grounds, and further still the Chamber of Deputies, installed in the Munröe Palace, formerly Brazilian Pavilion at S. Luiz Exhibition, and rebuilt here in a few weeks.

On the left the sea wall, and (right) a public garden (Passeio Publico), with a small aquarium (sea fishes, etc.), open daily except Mondays. Again, on right is a monument to Teixeira de Freitas, a celebrated lawyer, and the Syllogeo Brasileiro, in which is housed the Instituto Historico, etc., etc. Proceeding by the "Avenida Beira Mar" we come to the Gloria gardens. Monument to Pedro Alvares Cabral, and a very artistic group in white marble (nude figures), forming a fountain, and presented to the city by a well-known firm of Oporto wine merchants. Beyond this is a football field, and then another monument, that to Almirante Barroso.

Continue along Praia Flamengo, past garden of President's Palace and private landing stage, "Select," "Splendid" and "Central" hotels, along a shady street to Praia de Botafogo with well laid out gardens, Papal Legation, American Embassy, etc., and on water front the Regatta Clubs' pavilion, and at end of promenade the Pavilhão Mouresco. Turn to right and follow tram lines to Praia Vermelha, Benjamin Constant Institute, Ministry of Agriculture, Faculty of Medicine (1918), and infantry barracks.

Station for the Sugar Loaf Aerial Railway.

Departure from Praia Vermelha, just beyond the Ministry of Agriculture; two sections. The first, 600 metres long to Morro da Urca, height 220 metres; the second 800 metres to the top of the Sugar Loaf, height 400 metres. The view is quite unique, and not to be missed.

Return tickets for each section, 2$000.

First car 7 a.m., then hourly until noon, and at 2, 3 and 6 p.m.

The Sugar Loaf Aerial Railway is built on such principles that confidence may be had in the entire safety of the trippers.

The cables are capable of supporting a weight of 150 tons each.

The terminal station on the top of the Sugar Loaf is nearly 400 metres above the sea, and from this coign of vantage the Ilha Raza, Copacabana, Leme, Nictheroy and the most beautiful parts of the Avenida Beira Mar and other scenes of interest may be taken in. At night a perfect collar of light is formed by the sinuous ways below.

The journey takes only ten minutes to the end of the line, and in the event of anything happening to the driver an automatic apparatus diminishes the current so that the cars may enter a station at a very reduced speed. The brakes and other parts of the machinery are of the very first quality.

Return to Praia de Botafogo, and take tram to Botanical Gardens *via* Largo dos Leões. Area about 500,000 square metres, with 3,000 species of plants. The great palm avenue is 740 metres in length, with 134 trees averaging 80 feet high, a transverse avenue being 540 metres long, and containing 140 palms, 70 feet high. The *mother* palm, from which all the others in Brazil have sprung, was planted in 1809. Its height is 114 feet, and greatest diameter 4 feet 3 inches.

Dom João VI, amongst other estimable actions (after planting the mother palm with his own hands), decreed that every seed should be carefully saved and burnt as soon as the avenue was completed, in order to conserve the monopoly of the Royal Palm. The slaves working in the garden hid some of the seeds and sold them, and in this manner

grew up the stately trees fôund in many gardens to-day.

Besides these incomparable wonders there are magnificent alleys of bamboos and mangueiras, and a multitude of other wonders of the vegetable kingdom, including splendid clove, nutmeg, cinnamon and other fragrant spice trees; and a very rich herbarium commenced by the late Emperor, Dom Pedro II.

Passing the gardens and Lagôa Rodrigo de Freitas (on the left) the road rises over a spur of the hill and reaches Praia de Gavea, available by motor car. From here one may proceed S. to Jacarépagua, or return by Avenida Niemeyer cliff drive, to Praia Leblon N. This beach extends by Praias Ipanema and Capacabana to Leme and Botafogo, electric trams being available from Leblon (*via* Botanical Gardens), or from Ipanema Anglo-American Country Club (golf links, etc.) to the city direct *via* Botafogo. The Botanical Gardens are 12 kilometres from Avenida Rio Branco ("Hotel Avenida") tram terminus. From the side of the gardens nearest the city a good road climbs up to Vista Chineza, and Alto de Bôa Vista, Tijuca, about 12 kilometres, maximum elevation over 400 metres. Another road, much longer, is available *via* Gavea to Tijuca.

Here, hardly an hour from the very centre of Rio, one is in the midst of nature's mysteries. There are the furnas (ovens), a great pile of eroded boulders as well as the grotto of Paul and Virginia, the Emperor's Table, the Solitude, etc. There is the distant flat-topped Gavea Mountains. Across yon blue bay, with its hundred wooded islands, chief of which is Governador, and lovely Paquetá,

a green fringe comes out to meet the water, and behind, the sombre cloud-capped ranges of the Estrella (left), and the Organs (right), north and north-east.

Electric train service from Bôa Vista to the city, 700 reis single; gradient, 10 per cent. (highest point on line 358 metres), *via* Muda de Tijuca. Conde de Bomfim and Central Railway station to Praça 15 de Novembro.

From Praia de Botafogo a train line runs to Praça José de Alencar. Statue to the romancist, and "Strangers" Hotel; and Largo de Machado (Praça Duque de Caxias).

Here is a monument to the Duke, and a public garden, with Gloria Church. Change for Laranjeiras, a street on the left, in which is the Maternity Hospital, Deaf and Dumb Asylum, Pasteur Institute, and, at Aguas Ferreas, the station for Corcovado electric railway. Extension of line $3\frac{8}{10}$ kilometres. Height at top, 711 metres above sea level.

At Paineiras is the aqueduct built by the Jesuits, and still in good repair. It is 6 kilometres in length to the Ponte do Inferno (Bridge of Hell), and it leads from thence to Tijuca.

From Paineiras, the rail mounts almost to the very top of the mountain. Here there is a gigantic bandstand or shelter, taking up almost all the apex. The whole of the city is spread out like a chessboard beneath us. With good glasses, an area of 100 kilometres can be swept, including the bay, and the surrounding mountains. At Paineiras is the hotel of the same name, and an aqueduct with a path leading to Tijuca.

Sylvestre lower down, connects with the Santa

Thereza electric train. Here is another aqueduct 9 kilometres long. Fare to Rio (Largo de Carioca) 1 $000 single, by França and Curvello.

Continue, from Largo Machado, by Rua de Cattete (Presidents' Palace on right), Gloria Gardens, Cardinals' Palace, on left. On the same side of the road is Rua Benjamin Constant, with the Positivist Temple (right). Proceed by Rua da Lapa to Largo da Lapa. Grande Hotel (left), and Convent of Dutch Carmelites with Church, on right. Here is the Passeio Publico gardens, with main entrance opposite the School of Music. Take Avenidá Mem de Sá, on same side as "Grande" Hotel, and pass under the Santa Thereza Viaduct. On right is Rua Menezes Vieira for Forum and Police Dept., and at end, Praça da Republica or Campo de Santa Anna, opened to the public in 1880. On the left is the Fire Brigade Station and on lower left hand corner of this side the Electro Technical section of the Polytechnic School. Follow round the square, past the Prefecture and Normal School, or back again past the Fire Brigade, Central Ambulance Station, Federal Senate and the Mint. The latter is well worth a visit. It employs 700 persons and produces all the stamps in current use, beside silver and other coinage.

In 1912 the value of stamps, etc., issued amounted to 268,308,975 $, and in gold, silver and bronze coin, no less than 6,939,100 $ was struck.

A battle of flowers is held in the Praça da Republica every September.

This great garden has an area of nearly 147,000 square metres, and contains 66,000 varieties of plants, besides many kinds of Brazilian animals and birds in a state of absolute freedom.

There is also an artificial grotto with a cascade,

and, on the S.E. side, a kindergarten school. On the N.W. there is a small museum of the fauna found in the Federal District, and there is also a statue to João Caetano, a celebrated Brazilian actor, 1808—1863.

Past the Mint is the "Flumineuse" Hotel, and at the corner on this side the Central Railway Station. Opposite this is the Ministry of War, and continuing in a direct line along Rua Floriano Peixoto (Vulgo Rua Larga) we find, on left, Ministry of War and Military Tribunal, Ministry of Foreign Affairs, Light and Power Co., and National Council of Education.

Where Rua Larga strikes the Avenida Rio Branco is the Amortisation Bank, and crossing the road, at the bottom, on left, the Naval Arsenal and Ministry of Marine, with a fine bridge of the new transporter type, connecting some dependencies in the Ilha das Cobras. Here is the Miners Quay, and on the right, a narrow street in which is the Custom House.

A little nearer the Avenida, and also parallel to it, is Rua Direita, or Primeiro do Março, as it is now called.

On the left is the Stock Exchange, the General Post Office, and the Conversion Bank, and, immediately beyond, Praça 15 de Novembro.

A Royal Palace formerly stood here, and a fountain which supplied water to the ships in harbour. Statue to General Osorio.

On N.E. side, a quay from which the steamer to Piedad departs, en route to Magé and Theresopolis.

On the right of the Caes Pharoux is the Ferry Station for Nictheroy, Paquetá and Governador Islands, etc.

Excursions from Rio.—To Paquetá Island from

Caes Pharoux, four times daily; fare, 500 reis single, on weekdays and holidays; Sundays, five times daily. First boat, 7 a.m.; last boat, 6 p.m. Returning up to 7.30 p.m.

Trips in the bay (3 hours) at 2 p.m. on Sundays, 1 $500 return.

To Governador Island. Week-days: four times daily; fare, 500 reis single. Sundays: first boat, 7 a.m.; others at 12.4 and 5.50; returning up to 5.10 p.m.

The Cathedral is at the top of the square, in Rua Primeiro do Marco, corner of Rua Sete de Setembro, and the Central Telegraph office on the left, opposite. Adjoining the Cathedral is the Commercial College and Museum. Behind the Telegraphs, the Ministry of Public Works lies hidden away, and the Observatory is on the Morro, nearby.

The new Central Markets are close to the Nictheroy ferry, and occupy a space of 22,500 square metres. Passing these, a narrow street leads to Praia Santa Luzia, where the Santa Casa, or Misericordia Hospital, is situated, and a road recently opened, connecting with the Avenida Beira Mar.

Retracing our steps via Rua Misericordia and Primeiro do Março, we see, on left, Rua do Ouvidor, so called from the Circuit Judge who lived here in 1770. This was formerly the principal shopping street in Rio, and still contains some of the best establishments. Crossing the Rua da Quitanda, the Avenida, Ruas Gonçalves Dias, and Uruguayana, we arrive at the Largo São Francisco, or Praça José Bonifacio, with a monument to the Patriarch of Independence, as de Andrade was

called. This great man was born in Santos the 13th of June, 1763. A scientist of note, he was educated in Portugal. Here is the Polytechnic School and close by the Portuguese Literary Society.

A little to the left is Praça Tiradentes, a garden square, with a fine equestrian statue to Pedro I., in the centre, surrounded by allegorical groups of Indians, representing the Amazon, Madeira, S. Francisco, and Paraná rivers. The design was by José M. Mafia, a Brazilian artist, and the work executed by Rochet.

On the W. side of the square is the Ministry of Justice and the Interior, housed in a dingy insignificant building. On the N., S. Pedro Theatre, and on the S. the Moulin Rouge Music Hall, etc., and S. José Theatre.

Proceed W. to Praça da Republica, or E. to Largo de Carioca. Here is the great fountain with 35 bronze taps, which formerly supplied the city with water from the Carioca river, brought in by the aqueduct, and now carrying the electric cars of the S. Thereza line. Station in the same square. Opposite is the Hotel "Avenida," and on the right, the Lyric Theatre, National Printing Press, and beyond, the new Conselho Municipal, and Exhibition Grounds.

Parallel with Rua do Ouvidor is Sete de Setembro, leading to Praça 15 de Novembro. From here we can get frequent cars to Jockey Club, S. Januario, etc., for the Quinta da Bôa Vista, in which park the National Museum is situated. There are lakes and a small aquarium, with fresh water fishes, and on the E. side the pond contains specimens of the Victoria Regia lily. The Museum,

formerly an Imperial Palace, was in 1890, the seat of the first National Assembly.

From the main gate of the park an avenue of Sapucacias leads up to the terrace garden and the building itself.

The most interesting sections are those devoted to ethnography and mineralogy, etc., and in the vestibule may be seen in the famous Bendigo Meteorite (vide Iron). A proposition was made by the late Director (Dr. Lacerda), to create a modern Zoological Gardens in the park. The one existing is at Villa Isabel, via Praça 15 de Novembro. Efforts have been made to popularize the small private collection there, and on alternate Sundays, in the season, the entrance fee of 1$000 comprises a match of 1st league football, the Villa Isabel Club having its ground inside the gardens.

Return to Praça da Bandeira, and change cars for the Military College (Rua General Canabarro), or for the suburb of Andarahy, at the foot of Tijuca mountain.

At the Jockey and Derby club race courses, near the Museum, meetings take place all the season, and crowds of as many as 15,000 spectators are to be seen when big events are on the tapis.

Another route leads from Praça da Bandeira, to Praça 11 de Junho, and the Central Station, by Avenida Gomes Friere, where one finds, on right, the Republica Theatre, and left, the new (1918) Orthodox Church, on through Avenida Mem de Sá to Largo da Lapa. Follow the tram lines across the Avenida, and turn down the Praia S. Luzia again, if wishful of visiting the great Misericordia Hospital. It has 57 doctors, 58

nursing sisters, 30 male nurses and nearly 200 other employees.

Those interested in bacteriology should endeavour to see the wonderful institute at Manguinhos. It is said to be the best equipped in the world. Known as the Oswaldo Crux Institute, from the name of its founder, the staff comprises most of the greatest specialists in the country, the present Director, Dr. Chagas, being well known as the discoverer of the microbe of the disease caused by the "Barbeiro" (see Insect Pests).

The Museum contains 190 species of mosquitos (19 new) and 150 species of ticks (9 new), including 40 classes of carrapatos.

Serums are prepared here for the cure of pest, diphtheria, tetanus, dysentery, typhus, etc., and vaccines against plague, carbuncle, etc. It does not confine its attention to man, dealing with animals of every possible kind. Founded in 1901, with a view to prepare the anti-pest serum, it has developed in such a manner that almost every kind of serum in use in the Republic bears the mark of the Institute.

The building (constructed especially for the purpose) contains laboratories, museum, library, operating and lecture rooms. There are also separate pavilions for the study of plague, animal houses, a hospital for human beings and one for animals, stables, aquarium (fresh and salt water), staff residences, crematorium, etc., etc. The Institute can be reached by rail or water in about 45 minutes from Rio de Janeiro. The publications of the Institute number nearly 100, and by exchange or purchase, no fewer than 421 periodicals are received, in every European language.

The library contains 22,000 volumes.

Amongst other well known institutions we may cite: —

The Children's Protection and Assistance Institute, Rio de Janeiro.—Statistical and Historical Notes furnished by Dr. Moncorvo, Junior, founder and director of the above Institution: The Institute was recognized as of public utility by a decree dated November 17, 1909. Silver medal awarded at St. Louis Exposition. Gold medal at the International Exhibition of Hygiene at Rio, 1909. Grand Prize at the National Exhibition at Rio, 1908. Gold medal at the South American Congres (S. Paulo), 1910. Grand Prize at the International Exhibition at Rome, 1912. The Institution was opened by Dr. Moncorvo on July 14, 1901, and the Central Dispensary annexed (now Dispensary Moncorvo) has done a great work in the medical and surgical treatment of children, as well as in the propagation of hygiene amongst the people. Like all the other departments of the Institute, this dispensary is in charge of specialists and comprises the following sections: Puericulture Intra-uterine: (i) Gynecology; (ii) Protection of poor women in a state of gravidity; (iii) Midwives and Accouchement (at the homes of the patients). Puericulture Extra-uterine: (i) Milk distribution (sterilized); (ii) Crêche; (iii) Hygiene of newly born infants; (iv) Examination of wet nurses; (v) Examination of mothers who demand a milk concession; (vi) Vaccination, medical assistance of every kind, massage, electro therapy, medicated baths. Also clinics for diseases of the Eye, Ear, Nose and Throat, and Dental Surgery. The Institute has the invaluable assistance of a number of the first ladies of the

Capital, who aid the work by means of an association founded with a view to devote its whole time to the work of the Institute. These devoted women give their money and labour freely. Factories and other buildings where children of tender age are employed are periodically inspected by the doctors of the Institute, as well as the public elementary schools. From July 14, 1901, to December 31, 1911, over 40,000 individuals were aided by the Institute, of whom 36,240 received medical assistance.

There are also the Polyclinic, treating 70,000 cases in 1912 alone, the Municipal Laboratory of Analyses, Rua Camerino (Rua Larga), British Hospital, Municipal Library, etc.

Ministry of Finance: Avenida Passos 17.
Senate: Rua do Areal.
Direction of Public Health: Rua Clapp 17.
Archives Public: P. Republica 12.
Head Fire Brigade: P. Republica 97.
Laboratory of Bacteriology: Rua Riachuelo 109.
Obras Contra as Seccas: Avenida Central 137. (Irrigation Commission.)
Department of Geology, etc., Ministry of Agriculture: Praia Vermelha.
Naval Hospital: Ilha das Cobras.
Naval Archives: Rua Conselheiro Saraiva.
Military Arsenal: Ponta do Cajú.
Caixa Economica: Rua D. Manoel.
Estatistica Commercial: Rua Primeiro do Março.
Emigrants' Home: Ilha da Flores.

The whole of the gas and electric lighting, the tram and electric power of the city is in the hands of a powerful Canadian syndicate, and the sewerage and sanitary arrangements are subject to the control

of the City Improvements Company, an Anglo-Brazilian concern.

The Postal Department has a pneumatic system installed, with ten public and three official stations, and messages can be delivered in 15 minutes anywhere in the centre.

Churches.—(Foreign) British, Rua Evaristo da Viega; German Lutheran in Rua Invalidos; American Methodist in Rua Conde de Baependy.

Press Agencies.—Havas, Avenida Central 145; Americana, Avenida Central 296.

British Consulate.—Royal Mail Building, Avenida R. Branco.

American Consulate.—Avenida 117.

PRINCIPAL TRAM SERVICES

	(From)		Entire Fare. Reis
Mattoso from	Praça 15 de Novembro ...	...	100
S. Luiz Durão to ...	Leopoldina Railway Station (Circular)	2 sections of 100 reis	200
Aldeia Campista ...	Caes Pharoux	2 ,,	200
Andarahy	,, ,, ...	3 ,,	300
Villa Isabel for Zoo and Engenho Novo ...	,, ,, ...	3 ,,	300
Engenho de Dentro ...	Praça 15 de Novembro ...	4 ,,	400
Cascadura	Largo de S. Francisco ...	3 ,,	400
Alto da Bôa Vista ...	Caes Pharoux	3 ,,	700
Jockey Club	,, ,, ...	...	200
Tijuca	,, ,, ...	2 sections	300
São Januario	,, ,, ...	2 ,,	200
Lapa—Marine Arsenal...	Lapa	...	100
Lapa—S. Francisco ...	S. Francisco	...	100
Silva Manoel	Caes	...	100
Praça 11 to Praça 15 de Novembro ...	Praça 15	...	100
Barcas	Praia Formoso Station ...	...100 to	200

Trams throughout the day and night on most of the lines.

Botanical Gardens Company

From Avenida Central (Rio Branco) (Hotel Avenida)	For	Fare. Reis
Aguas Ferreas ...	Corcovado Railway Station ...	300
Gavea	Botanical Gardens	400
Largo dos Leoes ...	... ...	300
Humaytá — Pont de Tabôas ...	... ...	300
Leme	Sea Beach...	400
Ipanema — Tunnel Nova	,, ...	400
Real Grandeza — Copacabana ...	,, ...	400
Leblon	,, ...	400
Praia Vermelha ...	Ministry of Agriculture and Sugar Loaf Aerial Railway	300

Car Fares

	6 a.m. to 1 a.m.	1 a.m. to 6 a.m.
Taxis (1 or 2 persons): the first hour	8$	9$
Per extra person	1$	2$
Per hour after	4$	5$
Taxis (1,600 metres): 1 or 2 persons	2$	
Per 400 metres after	200 reis	
From 1 to 6 a.m., 1,200 metres	1$400	
Per 300 metres after	200 reis	
4-Wheel horse carriages—		
2 persons, first hour	6$	7$
Each extra person	1$	2$
Per hour after	3$	4$
2 Wheelers (Tilburys), seat 1 person only	4$	5$
Per hour after	2$	3$

Some idea of the movement of trade in Rio may be afforded by the statement that during Carnival week, no less than £1,500,000 is expended in connexion with the festivities.

The suburban lines of the Central and Leopoldina Railways carry 30,000,000 passengers a year, and still the accommodation is not nearly sufficient, the trams serving the whole of the outlying area being crowded to excess every morning and afternoon.

Principal Hotels

"Strangers Hotel," Praça J. de Alençar; "Central," Praia Flamengo; "Avenida," Avenida R. Branco; "International," Sylvestre.

Others.—"Splendid," "Select," Flamengo; "France," Praça 15 Novembro; "Paineràs," Paineràs; "Metropole," Larangeiras; "America," Cattete; "Grande," Lapa; "Flumenense," Central Station; "Palace," Largo S. Francisco, etc. etc.

Restaurants

"Heim," Rua Assemblea; "Paris," Rua Uruguayana; "Madrid," Rua Gonçalves Dias; "Americana, Brahma," Av. Rio Branco.

Garages

Baptista, Berliet, Avenida, Fiat, etc.

If remaining in Rio baggage can be cleared in the warehouse adjoining the vessel, the passenger's name, steamer and class being given to a clerk and a slip received containing the number of packages to be examined.

With courtesy and patience the necessary formalities are soon fulfilled.

Banks

Banco do Brazil; New York City; London and Brazilian; River Plate; Française-Italienne in Rua da Alfandega; also the Banco Allemão Trans-

atlantico; Banco Hollandez in Rua da Candelaria; Credit Foncier, Avenida Rio Branco. Bancos Ultramarino de Lisbôa, and Brasilianishe für Deutschland are in Rua da Quitanda; British, Alliança do Porto, and Sudamerikanische, in Primeiro do Marco. There is also a new Portuguese bank and a branch of the Yokohama Specie Bank, and other minor companies in the city.

Rio Janeiro of to-day, compared with the small, dark and dirty town of a century ago, is truly a wonder city, and foreign critics, who expect too much, should remember the marvels created in a decade.

Here are a few interesting statistics:—

To supply the capital with light and power, the Canadian Company holding the present monopoly of such services, has constructed a dam at Ribeira das Lages, 51 miles out. This artificial lake is 15 miles long and 7½ wide, and the present H.P. developed by the dynamos at the central station is 100,000.

The city is illuminated by 9,000 arc lights, 350 incandescent and 22,500 ordinary gas lamps, and nearly 12,000,000 Kilowatt H.P. is consumed in public lighting, besides 10,000,000 for private lamps. About eight million cubic metres of gas are burned in the street lamps, and fifteen million in the houses.

The mortality in 1860 was equal to 71·5 per thousand, and in 1916 the average was only 19 per thousand.

There were 8,000 beggars in the city, 5,000 being adults, in the same year, but in December, 1917, radical measures were taken with the able-bodied, great numbers being arrested and deported to penal

colonies, or given land to cultivate on their own account. Many of these vagabonds became a charge on municipalities of the interior, and, naturally, the problem cannot be solved at a moment's notice.

The population able to read and write comprises 51 per cent. of the native element, 58 per cent. Portuguese, 60 per cent. Spanish, 88 per cent. German and English, 90 per cent. French, and 32 per cent. Turkish subjects, Syrians, etc.

There are 10 rowing clubs, a football league with 3 divisions, hockey, baseball, golf, tennis and other clubs, besides the inevitable (English) cricket club.

There are several smart social clubs (city, diarios and country), also others exclusively French, German, English, etc.

Like most Latin countries, there is a lottery, extractions of the winning numbers being daily, and prizes averaging £500, with, at times, special encouragement to the speculative, in the form of big lots of £5,000, or even £10,000.

A forbidden form of gambling is the "Jogo do Bicho." This was invented by Baron Drummond, the original proprietor of the local Zoo. To increase the revenue of this menagerie, he daily selected 25 animals, and apportioned 4 tickets, to each, the lucky holder of the number corresponding to the *bicho* shown at the entrance getting 25 $. Later, the prizes went to the numbers corresponding to the final of the lottery winner. As much as £400 has been won by a thousand to one chance.

In spite of posting a policeman at the door of every place where this game has been banked, it seems impossible to stamp out the vice. In 1914 a farmer sold his property for 160 contos of reis,

turned bicheiro, or banker, and by 1916, according to his own confession, had made 4,000 contos.

He then retired, and resolved to live on his *honest* earnings.

Several clubs make a good income from the shady side of their business. In the Rua Chile is the well-known Mozart Club. This spends on attractions, such as Cabaret singers, etc., £15 daily, or, rather, nightly, and the gambling section, a separate financial affair, laid out in 1916 over £50 an evening, employing two professional players, who were paid 15$ nightly, and ostensibly won huge sums from the administration.

The famous Carnival Club, "Tenientes do Diabo" (Devil's Lieutenants), spent £50 a night. The Palace Club and Club dos Politicos a similar amount.

Cinematographs have sprung up everywhere, the big houses in the smart centre giving a programme of only 35 to 50 minutes' duration for 1$000. In the Praça Tiradentes, etc., and especially the outlying districts, the public demand, and obtain, as much as 2 hours' amusement for the same price.

Programmes during 1917-1918 contained a very excessive amount of American drama or cowboy films.

School attendance in 1917 was on the basis of 1 in 20 of the entire population, night schools, hardly organized as yet, having an attendance of 1 person in 230.

Thirsty souls may like the information that each Carioca has 238 litres of water at his disposition for all purposes.

Criminal statistics are somewhat behind the times, but recent figures went to prove that the

unruly element of the population was comprised as follows: North American, 1 in 27 of the colony; Spanish, 1 in 63; Italian, 1 in 93; Portuguese, 1 in 114; Turkish subjects, 1 in 157; and native Brazilians, 1 in 164.

In 1907 there were 244 priests in the city, 150 being secular. Of these, 71 were Brazilians. There are still convents of the order of Carmo, S. Antonio, Capuchins, Jesuits, Little Fathers, etc. Of the monks, only 10 were Brazilians.

There is, of course, a British church, missions, a Greek Orthodox temple, and the inevitable Y.M.C.A., with evidence of great activity, less religious here than in many cities, and having special Syrian and other sections and many classes.

In 1917 there were 6,051 street hawkers, selling over 60 different kinds of goods.

Municipal taxes in 1918 were as follows:—

Racecourse, with Pari Mutuel, 30,305 $000. Insurance companies, 4,065 $. Banks, 2,565 $. Pawnshops, up to 2,410 $. Commercial agents, 1,563 $. Boarding house, 1st class, 503 $; 2nd class, 200 $ to 400 $; 1st class hotel, 1,324 $; 2nd idem, 883 $. Auctioneer, 1,003 $. Laundry (steam), 323 $. Manicure, 54 $. Palmists and other gentry (without any guarantee of police tolerance), 303 $. Fetichism, rampant in the poorer quarters, and rigorously repressed by the authorities, is a greater curse than the fortune teller. Every now and then a witch's den is brought to light.

One Candomblé, as it is called, raided in 1918, had a most awe-inspiring collection of charms, and to crown all, a life-sized figure of the Caboclo "Cubatão," a sort of god, black as coal, and surrounded by fearful weapons and attendant imps.

Huge clenched fists (figas) hung here and there, and a wooden Saint Onofre aided and abetted the fat, greasy mulatto who was the presiding genius of the establishment, and his better half, who helped to keep up the deafening din caused by huge drums.

The hovel was filled by a fervent crowd of faithful, howling and praying in chorus.

On the night of August 9 another rival concern was found, and the police captured 7 women and 10 men in the garb of Adam, dancing and posturing before the horrible images in the room. Preying on the superstitious fear of the lower orders, and promising them everything, from love potions, spells, etc., to the sickness and even death of their enemies, these exponents of the black art delude their victims with a strange mixture of African, Indian and Portuguese spells, reaping a golden harvest, until the authorities come down on them with a heavy hand.

It should be noted that all classes wear the clenched fist as a mascot, in gold, silver, ebony, jet or coral.

Amongst other curiosities of Rio, etc., may be noted the herbalists, who sell, in addition to more or less harmless simples, a hundred mysterious preparations derived from all the realms of nature, and from the four corners of the earth. Spiritualists flourish, and work a great deal of ill amongst the illiterate.

The junior male has improved, at least physically, out of all knowledge, playing football, even with a bundle of dirty rags at lunch time in the streets, at all times of the year; he rows or swims, and has joined the boy scout movement, also belong to health and strength clubs; has the systems of

Sandow, Müller, etc., to hand; *enfin* is right up to date as far as physical culture is concerned.

As in all large cities, there is a regular afternoon crowd of loungers, principally men of all ages, who contrive to spend time and money in the cafés, bars and tea rooms of the Avenida. Matinée (cinema) shows are the rule, half a dozen houses within a few hundred metres' range being usually packed with a well-dressed crowd. The ladies are charming, and display the latest fashions to excellent advantage.

The demi-monde is quite *en évidence*, and a rude person has stated that exports from France to S. America consist of modes, perfumes, pornographic books and frail women. The fact is, however, many of the bejewelled Magdalenes, as a rule with a fluffy "Lulu" at their heels, hail from *anywhere* but gay Parée, the only French thing about them being their garments and their language.

This, naturally, is a handicap on girls who really are French, but lead respectable lives, and society does its best to drag them down to the level of their less reputable sisters. The French Government is very largely to blame in this respect, as it exercises no fiscalization whatever on the emigration of women whose mode of existence is dubious, and who tend to give the race a bad name.

The lower depths are inhabited by Galician Jewesses, a few nondescripts, including even English and American, and a sprinkling of coloured women, and these are herded together in a few narrow streets, the whereabouts, I think, unnecessary to disclose. The unwary male, venturing by accident, or design, into the *zona*, as the local term has it, will find out for himself without the slightest difficulty, as a hundred shameless hussies

flaunt their faded charms in broad daylight before his eye without the slightest regard for the policeman at the corner. Here, then, is Rio at its best, and worst, a faithful picture, and, I hope, an impartial one.

Lord knows, one could write a book on any of the very varied phases of city life, beginning by the Italians, who absolutely monopolize the newspaper trade, and display the whole of Rio press on the ground, or in a doorway, with perhaps one or two shops only in the whole of the metropolis.

The Press

Dailies (1918): *Jornal do Commercio, O Paiz, Jornal do Brasil, Epoca* (Morning), *Imparcial, Gazeta de Noticias, Correio da Manha, A Razão, Il Corriere Italiano.* Afternoon: *A Noite, Rio Jornal, Noticia, Tribuna, Rua.* Bi-weekly: *A União.* Weekly: *Etoile du Sud, Revista da Semana, Fon Fon, Careta, Selecta, O Jockey, A Cidade, A Escola, Gazeta Suburbana, O Malho, Mar e Terra, Tico Tico, O Turf, A Politicà, A Actualidade, A.B.C., Wileman's Review, Braz Cubas, Don Quixote, Gazeta da Bolsa.* Fortnightly or Monthly: *Brazil Agricola, Monitor Mercantil, Revista de Industria e Commercio, Elegancias, Eu Sei Tudo, Aerophilo, Revista Veterinaria, A Lavoura, Revista Maritima, Brazil Ferro Carril,* etc., etc. The official press includes: *Diario Official and Diario do Congresso,* and most of the principal Government Departments issue periodical bulletins and reports.

Annual guide: "Almanack Laemmert" (4 vols.).

There are several agencies for foreign papers and reviews, and two Press Agencies, American and Havas.

State of Minas Geraes

Has a President, and a Congress of 23 Senators and 48 Deputies, and sends 3 Senators and 37 Deputies to Rio Janeiro. Towns in the zona da Matta, reached by the Leopoldina Railway, include, starting from Recreio junction, reached at 3.34 daily from Praia Formosa Station (Rio): *Leopoldina*. Arrive 5.15 p.m. 295 kilometres from Rio. Has a normal school, gymnasium, etc. Population, 3,000. Press, *Gazeta*. Post and telegraph. *Cataguazes*, arrive at 5.06 by another branch line. Altitude, 760 metres. Temperature, 24° Centigrade. Press, *O Cataguazes*. Hotel "Villas." Distance, 299 kilometres. Population, 5,500.

Ubá.—365 kilometres Arrive 7.50 p.m. Population, 10,000. Press, 2 *Folha do Povo*, *Gazeta*, Hospital, "Grande Hotel," and three others. Has a tramway service. Fare, 32 $100. Depart for Rio at 7 a.m., arrive 9.10 p.m. From Ubá the line continues to *Rio Branco*, a small town. Press, *O Rio Branco*, *O Mineiro*. Post, telegraph and school. Thence to *Viçosa*, altitude, 652 metres. Press, *Cidade*. Post, etc. Thence to *Ponte Nova*, 440 kilometres from Rio. Stop overnight. To B. Horizonte, road to Marianna, and thence by Central Railway (120 kilometres). Press, *O Piranga*, *Correio*, etc. Theatre, cinema, post, schools, and 3 hotels. Continue next morning to *Saúde*, 503 kilometres. Through fare, 42 $900. Return at 7.50 a.m. To Ubá, stop over, at 7.20 p.m. From Guarany there is a branch to *Pomba*, 288 kilometres from Rio; daily trains at 3.15 p.m. Arrive 4.30 p.m. Depart for Rio at 10.20 a.m. *Rio Novo*, junction for the Leopoldina line to Juiz de Fóra, has 4,000 population. Press, *Rio Novo*. Theatre,

cinema, schools, post, etc. Hotel "Rosas." Continue to *S. João de Nepumeceno*. Population, 4,500. Press, *Voz do Povo*. Hotel "Coelho." Change at *S Pedro* for *Mar de Hespanha*, 207 kilometres from Rio. Altitude, 475 metres. Press, *O Mar de Hespanha*. Population, 3,000. Hospital, cinema, post, 2 hotels, schools. Arrive at 4.5 p.m. Return to Rio at 10.45 a.m. Fare, 20 $400. Arrive *Petropolis* 7.15 p.m., Rio at 9.10 p.m. daily.

Alvinopolis.—12 kilometres from Saudé Station. Press, *O Alvinopolis*. 66 kilometres from Marianna.

Patrocinio (see State of Rio) is in the N.E., and the Leopoldina Railway continues to *Porciuncula* at 6.37 p.m., arrive 7.59 p.m., and *Santa Luzia*, arrive 9.40 p.m. Distance by direct line from Nictheroy, 409 kilometres. Trains run three times a week to *Espera Feliz*, in Minas Geraes, at 7 a.m., arrive 9.45 a.m. Stop over. Proceed next morning across the Espirito Santo boundary to *Itapemirim*, on main line to Victoria, or going on to the end of the line at *Manhuassú*. Population, 3,000. Altitude, 589 metres. Press, *O Manhuassú*. Post, schools, hotels, etc. Return thrice weekly at 11.10 a.m.; as far as Santa Luzia, stop over, return next day to Rio.

From *Recreio* there is a line to *Porto Novo da Cunha*. Arrive 2.13 p.m., and from thence, by changing, to *Entre Rios*, arrive 4.50 p.m. Junction for E. and W. lines, and for the Central Railway. Post, hospital, schools, etc. Station buffet, hotels. Continue to Petropolis and Rio Janeiro.

From this station proceed to *Juiz de Fóra*. Main line, Central Railway. Population, 35,000. Most industrial town in Minas Geraes, with a large Italian colony. Fare, *via* Petropolis, 29 $100.

Latitude, 21°45′36″ S. Longitude, 0°10′ W. Altitude, 675 metres. Temperature, 18·5° Centigrade. Has over 40 factories of every description. Two banks, several hotels, electric trams. Press, *O Pharol, Correio, Diario, Jornal, etc.* Theatres, cinemas, and large colleges, the principal being Granbery, and Academy of Commerce. Has hospitals, a forum, market, and town hall, with public library, also a park. Return to Petropolis by Leopoldina Railway at 8 a.m., or *via* Entre Rios, changing at the latter station.

Proceed to *Palmyra*. Great dairy centre. Latitude, 21°20′ S. Longitude, 0°31′28″ W. 325 kilometres from Rio. Fare, 25 $400. Altitude, 892 metres. Average temperature, 18·4° Centigrade. Population, 10,000, 4 newspapers, hospital, cinema, 3 hotels, Masonic lodge. *Sitio*, junction for Oeste de Minas Railway. 364 kilometres. Fare, 28 $300. *Barbacena*, 379 kilometres. 8 hours 35 minutes from Rio. Population, 10,000. Latitude, 21°14′43″S. Longitude, 0°35′ W. Altitude, 1,132 metres. "Grande Hotel," new in 1918. Press, *O Planalto, A Cidade*. Silk production, gymnasium, military college. Splendid climate. Town growing rapidly. Average temperature, 17·5° Centigrade.

Queluz.—Population, 10,000. Altitude, 969 metres. Press, *Correio, Flammula*. Hotels "Haya" and "Commercio." Colleges. Stations at *Lafayette* and *Buarque de Macedo*.

M. Burnier.—End of broad gauge. All passengers change here. 498 kilometres. 12 hours' run from Rio. Fare, 37 $900. *Sabará*, 583 kilometres. Very old city. Latitude, 19°47′ S. Altitude, 704 metres. Change here for *Santa Barbara*, 3 hours 52 minutes run. 660 from Rio. Fare,

46 $700. Latitude, 19°57′ S. Altitude, 756 metres. Press, *A Patria*. One train daily. If time permits, a stop may be made *en route* at *Caethé*, 20°01′ S., 1°06′ W. Altitude, 935 metres. Hospital, schools, theatre, cinema, post, etc., 3 small *pensions*. Continue by main line to *General Carneiro*. Change for main line, 590 kilometres from Rio. At *Honorio Bicalho* is an electric line to *Villa Nova de Lima* for Morro Velho gold mine. Population, 10,000. Latitude, 20° S. Longitude, 0·45° W. Altitude, 842 metres. Press, *O Ideal*. Hotels impossible. Necessary to return same day if no hospitable friend is available. The mining company practically run the town. Tram fare, 1 $00 each way. Cars to meet all the trains.

The train from Rio which leaves at 6 a.m. arrives at the State capital at 9.17 p.m., and the night express (at 7.15) reaches Bello Horizonte at 10 a.m. Return at 5.30 a.m. or 4.13 p.m. Through fares, 48 $700, or with special sleeping and parlour car accommodation, 67 $700 single. Breakfast and dinner cars are run on the narrow gauge from Burnier.

By the beginning of 1919 it should be possible to run through from Rio without changing, the 1m. 60c. gauge being continued by a new line from the junction.

Bello Horizonte

The capital of Minas Geraes is situated 920 metres above sea level (3,000 feet), in latitude 19°55′22″ S. and longitude west of Rio Janeiro 1°10′6″. Essentially a modern city, probably it has no rival from the point of view of situation, or construction. Well equipped with public buildings, all the machinery of State is, in every sense, up-to-date, especially

the hospital, official printing press, municipal theatre, public library, where one may read magazines and periodicals in English, French, German, etc. The educational establishments have been dealt with elsewhere. There is of course an electric tram service, lighting and power stations, besides gas for industrial purposes. Dust destructors, sewerage on up-to-date lines. Telephones and all other conveniences, including half a dozen cinemas and a Methodist temple. The city is served by two railways, one the Central from Rio Janeiro, and the other the Western of Minas, both using the same station at present. The Post Office is one of the finest in Brazil, and the Prefecture and various Ministries and the President's palace, handsome buildings. The press includes: *Minas Geraes*. (official), daily. Splendidly equipped and administered, and capable of any kind of colour work. The paper itself is printed on the latest type of Marinoni rotary machine, and several linotypes are in use, as well as many other labour-saving appliances. Other dailies are: *Estado de Minas*, *Diario de Minas*, *A Tarde*. There are also the *Illustração Mineira*, *União Popular*.

There are two banks as well as the National Savings Bank (Caixa Economica), etc., etc.

Amongst the hotels the most important are: "Avenida," close to station and well appointed, with a decent cook; daily, 6$ to 7$. The "Grande" (Rua da Bahia), 7$ to 8$ daily. "Commercio," 6$, "Globo," 6$, "Internacional," 6$. "União do Norte" and "Democrata"—the two first named being the best. There are also many private pensions. The best hotels are Italian.

The Tramway Company has in operation at

present (August, 1913) five different lines, and special cars are run for the transport of meat from the municipal slaughter house, for the watering of the streets and the removal of street refuse and for the goods service. The total extension of lines is 30 kilometres. Traffic has increased enormously since opening the service in 1903, the takings in 1912 being treble what they were in 1908, and 60 per cent. more than in 1911. The same company has control of the public and private illumination of the city, the tax for consumers being at the rate of 270 reis per kilowatt horse-power.

Power may be obtained at the rate of 100 to 150 reis for small installations, and from 50 to 100 reis for factories possessing concessions from the Municipality. For a city whose urban population does not exceed 12,000 (1912 census), 500 telephone subscribers is quite a gratifying number.

The water supply of the city is sufficient for 200,000 souls, although the total population is only 38,882, an increase, however, of 120 per cent. in six years.

The area of the city is 33,746,185 square metres, and it is laid out in the form of an irregular series of squares, the central part, however, being on the chessboard plan, with twenty public squares, a park and zoological gardens in embryo. The streets are named after Indian tribes and eminent Brazilians for the most part, as well as the different States.

The original name of the place was Curral d'El Rei, and it was only in March, 1894, that the Commission charged with building the new State capital began its operations. The number of habitations in the entire city area amounts to 2,894 (February, 1912). There is a model force of civil guards and

a small military force in garrison. Telegrams to Rio Janeiro cost 200 reis a word.

The population has a large foreign element in it, especially Italian and German.

The average annual temperature is 19·8° Centigrade; maximum 29° Centigrade and minimum 4° Centigrade. Prevailing winds are E.N.E. to E.S.E. Distance from Rio Janeiro, 604¾ kilometres. The city is situated in the midst of an undulating plain in the valley of the Parapeba river, with mountains bounding the horizon on all sides. The total net cost of the city, including construction of the branch line of rail from General Carneiro on the main line of the Central, amounted to 27,536,000 $000, or in round figures £1,300,000 at the then rate of exchange. By means of the Western of Minas Railway the city will serve as the great market for the agricultural and pastoral products of this zone, the suburbs are largely given up to fruit growing, and the mountains close at hand are certain to provide in the near future raw material for smelting and other works, as they contain enormous quantities of iron of very high grade. Eventually Bello Horizonte will be in direct communication by rail with Bahia Goyaz, Espirito Santo and São Paulo, besides the whole of the State of Minas Geraes. Amongst other inducements to invest in real estate, the municipality offers to persons expending not less than 800 contos in workmen's houses, to be sold on easy terms, exemption from local taxes, etc., on the following conditions: Three types of cottages to be built—(1) Costing 1½ contos; (2) 2 contos; (3) 2½ contos paper. To be constructed in accordance with plans approved by the Prefecture and to be paid for in

twelve years, interest not exceeding 9 per cent. per annum to be charged.

Concession will be given of land on which to build villas at a rental to be agreed upon, and exemption granted from house, water and sewer taxes for six years.

The firm obtaining such a concession will be obliged to build small houses for officials and other public employees, the monthly payments for such houses not to exceed a third of their income, nor the annual interest 9 per cent. To build each three months at least thirty-five workmen's cottages and twenty small villas.

Budget of Bello Horizonte, 1912: Expenditure and revenue alike, 1,190,751 $600.

Proceed from General Carneiro to *Seté Lagôas*, 685 kilometres from Rio. Fare, 48 $000. Latitude, 19°28′ S. Longitude, 1°2′ W. Population, 5,000. Altitude, 771 metres. Press, *O Reflexo*, *Republica*, *Binoculo*. Telephone, telegraph, post, schools, two hotels.

From Sabará the climate has gradually changed, and cotton has taken the place of minerals. *Curvello*, 798 kilometres. 54 $400. Altitude, 663 metres. Temperature, 21° Centigrade. Press, *O Porvir*, *Centro*. Population, 8,000. Four hotels. Electric light, schools, etc.

Curralinho.—853 kilometres. 10 hours 17 minutes run from General Carneiro.

Pirapóra.—1,006 kilometres from Rio. Present terminus. Fare, 65 $400. Latitude, 17°20′ S. Lies on the S. Francisco, a little below its confluence with the Rio das Velhas. Return to Curralinho, and change for *Diamantina*, 148 kilometres. Depart 8.40 a.m., arrive 3 p.m. Thrice weekly. Popula-

tion, 16,000. Latitude, 18°10′ S. Altitude, 1,132 metres. Average temperature, 21° Centigrade. Press, *Estrella Polar* and *Jequitinhonha*. Public library, hospital, schools and colleges. Centre of diamond cutting in the palmy days of this industry. Return by main line to Burnier, and change for *Ouro Preto*, the old capital of Minas, 2 hours 20 minutes run. 540 kilometres from Rio. Population, 10,000. Schools of Mines and Dentistry, colleges and normal school. Hotel "Grande." Rooms very bad. Temperature, 17·4° Centigrade. Latitude, 20°24′ S. Longitude, 0°16′ W. A perfect type of old colonial city. Has 18 churches, theatre, cinema, newspaper, etc. Motor cars unknown here. Proceed to *Passagem* for the gold mine, 548 kilometres. Population, 2,000. Fare, 40 $000 from Rio.

Marianna.—Ancient city. Bishopric. Seminary and 16 churches. 558 kilometres. Terminus of line, but now under construction towards *Ponte Nova*. No life in this small place with grass-covered streets. Hotel, cinema, and general store kept by an Armenian. Latitude, 20°23′ S. Longitude, 0°45′ W. Press, *O Germinal*.

Towns lying N. and N.E. and W. of the Central and Leopoldina Railways comprise:—

Arrasuahy.—Population 5,000. Latitude, 17° S. Longitude, 1°01′ E. Hospital, post, telegraph, schools. 144 kilometres to G. Mogul, 90 to Minas Novas and 120 to Salinas.

Araxa.—Famous mineral springs. 408 kilometres from B. Horizonte. Near Oeste de Minas line. Hospital, theatre, cinema, 4 hotels, schools, post, etc. Altitude, 1,000 metres. District population, 45,000. To Monte Carmello, 132 kilometres, Sacramento, 72, Bagagem, 156 kilometres.

Abacté.—Latitude, 19°09′ S. Longitude, 2°10′ W. Population, 10,000. 18 kilometres. Several stations on O. de Minas line, including Barra de Paraopeba, are near the city. Post, schools, etc.

Bomfim.—20°21′ S. 1°′ W. Population, 2,000. Altitude, 959 metres. Hotel "Dirnas." Theatre, school, post, etc. *Caratinga*, 150 kilometres from Santa Luz station of Leopoldina Railway. Press, *O Povo*. Hotel "Moura." Post, school, etc.

Conceição do Serro.—Altitude, 640 metres. From Diamantina, 210 kilometres; Serro, 60; Itabira do Mato Dentro, 90; Ferros, 60.

Grão Mogul.—From Rio Pardo, 144 kilometres; Minas Novas, 108; Montes Claros, 144; Salinas, 108 kilometres.

Itabira.—Press, *O Arauto*. Saude Station, 48 kilometres; Santa Barbara, 52; Conceição, 90; Santa Anna dos Ferros, 60 kilometres. Latitude, 19°40′ S. Altitude, 976 metres.

Januaria.—On S. Francisco, 1,055 kilometres from Joazeiro, and 314 from *Pirapóra*. Altitude, 450 metres. Population, 10,000. Latitude, 15°29′ S. Longitude, 1°10′ W. Temperature, 24° Centigrade. Press, *Gazeta*. Hospital, post, telegraph, telephone. Hotel "S. Salvador."

Minas Novas.—Latitude, 17°1′. Longitude, 0°35′ E. Altitude, 922 metres. Temperature, 21° Centigrade. Press, *A Noticia*. 180 kilometres to Theophile Ottoni. Bocayuva, 180. G. Mogol, 108.

Monte Alegre.—Latitude, 18°55′. Longitude, 5°31′ W. Press, *A Liberdade*. Post, telegraph, school, etc.

Montes Claros.—Population, 6,000. Latitude, 16°50′. Longitude, 6°3′ W. Press, *A Verdade*. Theatre, cinema, post, schools. Hotel, "S. Americano."

Pará.—14 leagues from B. Horizonte. Press, *Cidade.* Population, 10,000. Post, telegraph.

Paracatú.—Population, 6,000. 240 kilometres to Formosa; 240 to Catalão.

Peçanha. Population, 3,000. Altitude, 938 metres. Cinema, post, telegraph, etc. To Diamantina, 180 kilometres; Serro, 120; T. Ottoni, 180 kilometres; Conceição do Serro, 120 kilometres.

Piranga.—60 kilometres from O. Preto station. Population, 3,000. Press, *Cidade.* Post and schools.

Salinas.—N.E. of State. Altitude, 915 metres. Latitude, 16°23′. Longitude, 0°47″ E.

Santa Anna Dos Ferros.—Press, *Cidade.* Post, telegraph, school. The Central Ry. will shortly reach this city. 96 kilometres from Serra Escura station; Itabira, 60 kilometres; Guanhaes, 60; Conceicão, 60 kilometres.

Santa Rita de Cassia.—Population, 6,000. Press, *A Vanguarda.* Hospital, theatre, cinema. Seven leagues from Paraiso station of Mogyana Railway. Three Hotels. Schools, post, etc. To Franca (S Paulo) by automobile, 66 kilometres; Passos, 42 kilometres.

Santa Luzia.—(On Leopoldina Ry.) Population, 5,000. Press, *A Comarca.* Hospital, theatre, post, telegraph, schools.

S J. Baptista.—N. of State. Post, school. Press, *O Itamarandiba.*

Serro.—Latitude, 18°33′. Longitude, 0°3′ W. Press, *O Jornal.*

Theophilo Ottoni.—Latitude, 17°53′. Longitude, 1°47′ E. Altitude, 287 metres. Press, *O Mucury.* Rail from Caravellas (See Bahia). 376 kilometres from the sea. Post, telegraph, schools.

Towns on Oeste de Minas Ry., from Sitio

S. João Del Rey.—100 kilometres from Sitio. 3 hours 20 minutes. Population, 10,000. Latitude, 21°8′. Longitude, 4°20″ W. Altitude, 880 metres. Temperature, 18·5° Centigrade. Hotel "Oeste de Minas." Press, *O Reporter.* Eleven churches, theatre, cinema, public and private schools. *Bom Successo*, 216 kilometres. Fare, 16 $500. Latitude, 21°. Longitude, 2° W. Population, 2,000. Press, O Juvenil. Hospital, cinema, schools, 2 hotels. *Oliveira*, 271 kilometres. 20 $100. Population, 10,000. 11 hours 2 minutes run. Latitude, 21°46′. Longitude, 2°6′ W. Press, *Gazeta.* Post, telegraph, colleges and schools. *Divinopolis*, 356 kilometres. 25 $800. 14¾ hours run. Continue to B. Horizonte twice weekly. Sleeping car. 156 kilometres. Fare, inclusive, 21 $300.

Proceed by main line to *Parãopeba*, 602 kilometres from Sitio. Press, *A Folha.* Post, telegraph and schools. *Itapecicirica.* Population, 5,000. On a branch line. Press, *Correio.* Cinema, post, etc. *S. Antonio do Monte. Idem.* Cinema, post, schools, hotels, etc.

From Barra Mansa to *Arantes* by same railway. Leave Rio at 7 a.m., change at 10.31. Arrive at 3.37 p.m. 110 kilometres. *Turvo*, 135 kilometres, at 4.55. Population, 5,000. Altitude, 688 metres. Press, *A Farpa.* Cinema, post, schools, 3 hotels. Reached also from Bom Jardim.

Ribeirão Vermelho.—296 kilometres. Arrive 10.10 p.m. Return at 5.35 a.m. Arrive Rio 9 p.m., or continue from Arantes to *Bom Jardim* at noon, arrive 12.35 p.m.

Lavras.—Latitude, 21°10′ S. Longitude, 1°52′ W. Altitude, 868 metres. Press, *Folha.* Population, 20,000. Electric trams, hospital, municipal theatre,

cinema, post, telegraph, colleges and schools. Hotels "Central" and "Moreira." Has steam communication with R. Vermelho by the Rio Grande.

Towns on the Goyaz Railway

Formiga.—Latitude, 20°31′ S. Longitude, 2°40″ W. Hotel "Garcia." Press, *O Democrata.* Three trains weekly. Population, 7,000. Hospital, theatre, cinema, post, telegraph, schools. *Via* S. Paulo and Campinas (Mogyana Railway). Change at R. Preto for *Uberaba.* Population, 15,000. 715 kilometres from S. Paulo. Fare, 41 $300. Latitude, 19°45′ S. Longitude, 4°15′ W. Hotel "Carvalho." Press, *Gazeta, Lavoura.* Altitude, 762 metres. Theatre, cinemas, cafés, post, telegraph, colleges and schools. Temperature, 22° Centigrade.

Uberabinha.—Population, 6,000. Press, *O Progresso.* Hospital, theatre, cinema, telephone, telegraph, post. *Araguary*, 822 kilometres. Population, 8,000. Latitude, 18°25′. Longitude, 5° W. Six hours run from Uberaba.

Towns on Sul Mineira Railway from Cruzeiro

Leave Rio at 7 a.m. Change at Cruzeiro 12.40 p.m. Dining car to *Soledade* at 1 p.m., 90 kilometres; *Freitas*, 107 kilometres, 5.2 p.m. Change for *Campanha* at 5.8, reaching *Lambary* (see *Mineral Springs*) at 6.46, 150 kilometres; Cambuquira (*idem*), 7.53 (176 kilometres); Campanha, 193 kilometres, 8.30 p.m. Fare, 16 $600. Latitude, 21°41′ S. Longitude, 0°8′ W. Population, 4,000. Press, *Campanha.* Hospital, theatre, 3 hotels, college (Sion) and schools, post, etc. Or change at Soledade for Caxambú, 112 kilometres. Arrive 5.30 p.m. Fare, 10 $700. Latitude, 22°12′. Longitude,

0°7′ W. Altitude, 890 mètres. Temperature, 17·8° Centigrade. (See *Mineral Springs.*) On to *Baependy*, arrive 5.45. Population, 5,000. 11 $300 fare; 120 kilometres. Press, *Baependyense*. Theatre, cinema, post, etc., 2 hotels. Return from Campanha at 4.20 a.m., or Baependy at 6.45 a.m. Arrive Cruzeiro noon, or proceed at 10.15 a.m. to *Bueno Brandão*, 181 kilometres. 15 $700. Arrive 12.30. Return at 1 p.m. *via* Soledade (4 p.m.). Motor cars run from Baependy to Caxambú.

From Bueno Brandão one may travel to Barra de Pirahy *via Bom Jardim*, leaving at 8 a.m.; Barra, 5.52 p.m. Fare, 16 $600. Reverse journey from Barra at 9.35 a.m., arrive B. Brandão at 5.30 p.m. This route is shorter and cheaper. Proceed from *Freitas* at 5.7 p.m. to *Tres Coracões*, 170 kilometres. Arrive 6.55. Latitude, 21°42′ S. Longitude, 0°8′ W. Population, 7,000. "Stop." Great cattle fair. Press, *O Independente*. Altitude, 859 metres. Cinema, schools, post, etc.; 4 small hotels. Proceed to *Varginha*. Altitude, 894 metres. Press, *O Momento*. Theatre, cinema. Population, 1,000. Hotels, post, etc., etc. Proceed to *Gaspar Lopes*, 295 kilometres. Change for *Alfenas*, 302 kilometres. Arrive 5.5 p.m. Population, 10,000. Fare, 22 $600. Hotel "Grande." Press, *O Arado*. Latitude, 21°23′ S. Longitude, 1°05′ W. Return at 6.40 a.m. Continue from G. Lopes to *Tuyuty*, 361 kilometres. 24 $900. Arrive 7.30 p.m., return at 4.30 a.m., or continue to *Muzambinho* (Mogyana Railway), next station. Altitude, 1,040 metres. 2 hotels (very bad). Latitude, 21°18′ S. Temperature, 18·4° Centigrade. Gymnasium, schools, cinema, post and telegraph. Return *via* Tuyuty, arrive Cruzeiro 9.30 p.m., catching sleeping car to Rio 1.11 a.m. Arrive Rio 7 a.m., or *via Guaranesia*. Altitude, 800 metres.

Population, 10,000. Press, *Monitor*. Cinema, post, schools. (See S. Paulo for continuation of this route.) Arrive Campinas and São Paulo, 402 kilometres, the same night. *Passos* lies W. of Muzambinho. Latitude, 20°45′ S. Longitude, 3°35′ W. Population, 6,000.

Pocos de Caldas.—From *Cascavel* (see S. Paulo). Mogyana Railway. 310 kilometres. 24 $600. To S. Paulo, 9¼ hours. Dining car from main line.

From *Soledade* to *Itajuba*, 174 kilometres. Depart 9.40 a.m., arrive 1.33 p.m. 15 $200. Population, 5,000. Latitude, 22°36′ S. Longitude, 2°16′ W. Theatre, electro-technic college, etc.

Pouso Alegre.—Arrive 4.36 p.m. 254 kilometres. Fare, 20 $200. Population, 6,000. Latitude, 22°1′ S. Longtude, 2°47′ W. Altitude, 814 metres. Temperature, 20° Centigrade. Press, *A Cidade*. Hotel "Abreu."

Ouro Fino.—314 kilometres. 23 $100. Population, 4,000. Latitude, 22°42′ S. Longitude, 2°6′ W. Arrive 7 p.m. *Stop*. Continue to Sapucahy next day, 359 kilometres. Fare, 24 $800. Return at 2.50 p.m. Sleep at Pouso Alegre. 7.30 p.m. Proceed at 7.46 a.m., or from Ouro Fino at 5 a.m. Arrive Soledade 2.32 p.m. At *Porto Sapucahy*, 236 kilometres from Soledade, there are river steamers to *Cubatão*. Arrive 3.46; 160 kilometres. Depart 8.30 a.m. This journey takes up part of 2 days. Return fare, 11 $600. Boats twice weekly.

State of Goyaz

Has a *President* and Assembly of 12 Senators and 21 Deputies. Sends 3 Senators and 4 Deputies to Rio. Capital, *Goyaz*. Population, 20,000. Altitude, 486 metres. Latitude, 15°55′ S. Longitude, 6°57″ W. Post, telegraph, hospital, theatre, cinemas, Lyceum

and normal school, 2 colleges. Press, *Goyaz, Imprensa, Estado, Correio*, etc. Hotels.

Bomfim, altitude, 842 metres, is 240 kilometres from Goyaz. Population, 2,000. Post, school, etc., 54 kilometres from Campo Formosa and 146 kilometres from *Catalão*. *Campo Formoso*. Population, 2,000, 50 leagues from Goyaz. Post, school, etc. *Catalão*. Rail from Araguary. Depart 6 a.m. arrive 12.10 noon. 116 kilometres. Fare, 11 $900. Trains twice weekly. Continue to Roncador, 211 kilometres. Arrive 2.50 p.m., return 6 a.m. Bomfim will be reached shortly.

Catalão.—Population, 8,000. Altitude, 826 metres. 219½ kilometres from Uberaba by road. Post, telegraph, schools, 2 hotels. *Formosa*. Latitude, 15°32′7″ S. Longitude, 4°8′ W. 572 kilometres to Uberaba, 312 to Goyaz. Altitude, 900 metres; 240 kilometres to Pyrenopolis. Population, 1,500. Post, school, etc. *Morrinhos*. Population, 1,000. School. Between Catalão and Goyaz. *Porto Nacional*, 10°30′ S., on Tocantins river. Population, 1,500. Altitude, 330 metres. Press, *Norte de Goyaz*. Post, school, cinema. Average temperature, 24° Centigrade. *Pyrenopolis*. Site for Federal Capital. Altitude, 740 metres; 333 kilometres from Catalão, 152 from Formosa, 153 from Goyaz. Population, 5,000. Latitude, 15°51′45″ S. 5°47′ W. Hospital, theatre, schools, etc.

Rio Verde.—Population, 2,000, 70 leagues from Uberabinha, and 55 from Goyaz. Cinema, post, schools. *Santa Luiza*. Population, 2,000, 300 kilometres below Formosa. Press, *O Planalto*. Post, school, etc. Bananal, *island* in Araguaya river. Latitude, 12°30′ S. Average altitude of the Goyaz plateau, 1,000 metres. Temperature (15° to 19° S. latitude) averages 20° Centigrade

CHAPTER XXIX

STATE OF S. PAULO

The State is governed by a President, with Secretaries of the Interior, Justice, Finance, Agriculture and Public Works. The Congress consists of 18 Senators and 49 Deputies, 2 Senators and 22 Deputies going to the Federal Congress.

Steamers leave Rio for Santos at frequent intervals, and the trip takes from 15 to 20 hours. Departure by Brazilian Lloyd or Costeira boat before noon, the narrow canal leading to the great port being entered in the small hours of the morning, and the vessel getting alongside the quays at 7 or 8 o'clock. The railway station is near at hand, but electric trams are available, lines No. 10 and 12 passing the terminus every few minutes.

In the Praça da Republica is a statue to "Braz Cubas," the founder of this city. At the end of the square there is another, Praça Rio Branco, and from here begins Rua 15 de Novembro, the principal street, where the banks, cafés, hotels, etc., are situated. The Banco do Brasil is, however, in Rua 11 de Junho.

Principal theatres include Guarany (Praça Andradas), Colyseu (Praça José Bonifacio), and there are also several cinemas.

Amongst the most important public buildings are

(1902.) (Minas Geraes.) Branch from here to *Biguatinga*, 288 kilometres, and line under construction to Jacuhy. From Guaxupé to *Muzambinho*. Change for Sul Mineira Railway to Tres Corações, Cruzeiro, etc. Ten hours run from Campinas to Tuyuty. From Guaxupé a line runs to *Monte Santo* and *S. Sebastião do Paraizo*, 356 kilometres, being under construction from the latter station to *Pratinha*. (Branch to *Sta. Rita de Cassia*) and *Passos*. (See Minas Geraes.) Continue from *Casa Branca* to *Baldeação*. (Joint Paulista-Mogyana station). 189 kilometres. Return from here by Paulista line to Campinas. On to Santos Dumont, 236 kilometres. (*Cajura* branch, 295 kilometres) and *S. Simão*, 259 kilometres. Population, 5,000. Hospital, theatre, etc. Hotel, "dos Viajantes." Press, *O Trabalho*. Line open 16-8-1882. Two routes from here to *Ribeirão Preto*. Contract 8th June, 1880. Station opened November, 1883. One line passes through *Cravinhos*, 291 kilometres. (Branches to *Serrana*, 319 kilometres and Arantes, 312 kilometres), to Ribeirão Preto, 317 kilometres, the other by *Monteiros*, 320 kilometres (Paulista Railway), and Silveira, 370 kilometres, running through a zone of intensive coffee culture, of which Ribeirão Preto is the great market. This city lies only 550 metres above sea level. Latitude, 21°10′20″ S. Longitude 4°38′51″ W. Hotels, "Fonseca," "Simões," etc. $11\frac{1}{4}$ hours run from S. Paulo. Population, 20,000. Theatre, 6 cinemas. Press, *A Cidade*, *Diario*, *La Voce Italiane*, etc. Public gardens, gymnasium, zootechnic post, forum, cathedral, market. From here run two trunk lines, Westward, one to

Batataes, 365 kilometres. Altitude, 800 metres. Press, *Tribuna, Cidade.* Population, 10,000. Telephone, etc. *Franca*, 422 kilometres. Altitude, 995 metres. Hospital, public gardens, telephone. *Jaguará*, 508 kilometres. Here the Rio Grande is crossed. *Uberaba*, 610 kilometres. (See Minas Geraes.) Line opened April, 1889. Alternative route from Ribeirão Preto to *Jardinopolis S. Joaquim*, 407 kilometres. Ituverava, 437 kilometres. Igarapava, 493 kilometres. Altitude, 663 metres. Across the Rio Grande to Calafate, 510 kilometres, to Uberaba. This line is much the shorter of the two. Another branch from Ribeirão Preto (Barração), 319 kilometres, to *Sertãozinho* and Pontal, 358 kilometres. (Paulista Railway.) Return route through *Guatapava*, 332 kilometres. (Mogyana Railway.) *S. Carlos*, etc., to Campinas. Main line proceeds from Uberaba to *Uberabinha*, 744 kilometres. Araguary, 789 kilometres to Goyaz. Total extension of the Mogyana Railway, 1,891 kilometres, including the line to Catalão (Goyaz). Branch lines to conclude 31-12-1918. Biguatinga-Jacuhy, 23 kilometres. S. Sebastião-Passos, 82 kilometres. Santa Rita de Cassia branch, 18 kilometres. Passos, in direction of the Rio Grande, 24½ kilometres.

It should be noted that the company has opened up a very extensive zone of W. and N.W. S. Paulo, S. Minas Geraes, rendered possible through connection with the Central Railway of Brazil, thus linking 4 states together, greatly developed a backward region, automatically colonizing a vast extension of territory, and bringing the most varied products to the markets of S. Paulo and Rio Janeiro.

Board of Control, 1918

President: Coronel Manoel de Mattos. *Directors:* Guilherme d'Andrade Villares, José Egydio de Queiroz Aranha, Francisco de Paula Ramos de Alevedo, Luiz Tavares Alves Pereira, Amadeu Gomez de Sanza.

This railway, provincial in origin and still having its head office in Campinas (see plate), is a striking example of Brazilian energy and capacity, possessing a record of which far more ambitious concerns might well be proud.

Paulista Railway Company

S. Paulo (Luz Station) to Jundiahy, 60 kilometres.

Limeira.—167 kilometres. Altitude, 542 metres. 3 hours 9 minutes. 14 $300. Population, 10,000. Press, *Commercio*, etc. Hospital, theatre, cinema, post, telegraph, telephone, 3 hotels, public and private schools. Junction for *Araras*, 195 kilometres from S. Paulo. Population, 8,000. Press, *Tribuna*. Cinemas, hotels, schools, etc. *Pirassununga*, 217 kilometres. Altitude, 637 metres. Press, *Jornal*. Hospital, schools, etc.

Palmeiras.—300 kilometres. Population, 4,000. Press, *A Cidade*. Hospital, theatre, cinema, schools, hotels, post, telegraph, etc. *Santa Rita*, 280 kilometres. Press, *Cidade*. School, post, etc. Continue by main line from Cordeiro to *Rio Claro*, 194 kilometres. 16 $000. 3 hours 48 minutes from S. Paulo. Population, 15,000. Press, *Alpha*, *Diario*, etc. Hospital, cinema, colleges, 4 small hotels, *Ityrapina*, 252 kilometres. 18 $400. Change for *Brotas*, 247 kilometres from S. Paulo. Altitude, 647 metres. Population, 2,000. Press, *O Muni-*

cipio. Post, telephone, telegraph, cinema, schools, 2 hotels. *Dous Corregos*, 367 kilometres. Altitude, 687 metres. 9 hours 10 minutes to S. Paulo. Population, 3,000. Press, *A Comarca*. Post, schools, 3 hotels, hospital, cinema. *Jahú*, 364 kilometres. Altitude, 544 metres. Latitude, 22°16′ S. Fare, 23 $900. Hotel "Toscano." Press, *Imparcial*, *Commercio*, etc. Population, 20,000. A cathedral city. Hospital, 2 theatres, several colleges and schools. *Agudos*, altitude, 650 metres. Population, 10,000. Press, *S. Paulo*. Two lines of rail, theatre, hospital, etc., post, telephone, telegraph, schools, 3 hotels.

Baurú.—Altitude, 499 metres. 433 kilometres from S. Paulo. 13¼ hours run. Population, 7,000. Press, *O Baurú*, *O Tempo*, etc. Hospital, theatre, cinema, schools, several indifferent hotels. Accessible also from S. Paulo by Soracabana Railway, en route to Matto Grosso. Continue by main line to *S. Carlos*, 267 kilometres. 20 $200. 5 hours 22 minutes. Altitude, 828 metres. Hotels "Tassoni," etc. Population, 12,000. Press, *A Tarde*, *Correio*. Post, schools, cathedral. Change for *Ribeirão Bonito*, 311 kilometres from S. Paulo. Press, *Noticia*. Post, schools, etc. Continue from S. Carlos to *Araraquara*, 349 kilometres. 22 $300. 7 hours run. Hotel "Oeste." 7 $000 daily. Population, 12,000. Press, *Popular*, etc. Cinema, etc., schools. Several hotels. Change for Araraquara Railway to Mattão, population, 2,000. Press, *O Clarim*. Hotels, schools, post. Taquaritinga, population, 3,000. Press, *Cidade*. Hotels, school, etc.

Rio Preto.—End of line. District population, 14,000. Press, *A Cidade*. 546 kilometres to S. Paulo. 36 $700. Journey 13¾ hours. Cinema,

schools, post. Cities lying W. of this line include *Ibitinga*. Population, 2,000. On *Dourado* line. 421 kilometres from S. Paulo. Post, telegraph, telephone, theatre, schools, 3 hotels.

Itapolis.—Population, 6,000. Altitude, 540 metres. Press, *O Progresso*. Post, telephone, schools. Continue by main line of rail from *Araraquara* to *Rincão* and *Jaboticabal*, 413 kilometres. 9½ hours. Fare, 25 $300. Population, 5,000. Press, *O Combate*, etc. Hospital, theatres, post, telegraph, schools. Several hotels. Change for *Jaboticabal* local railway, or continue to *Bebedouro*, 466 kilometres. 26 $900. 11¼ hours. Hotel "Commercio." Population, 5,000. Latitude, 20°10. S. Longitude, 6°50′ W. Press, *Jornal*. Post, schools, etc., etc.

Barretos.—Terminus. 523 kilometres. 28 $600. 12¾ hours run. Hotel "Central." Press, *Correio*. Post, telegraph, schools. From Bebedouro the *Goyaz* Railways runs to *Villa Olympia*, 537 kilometres from S. Paulo, 13 hours 43 minutes. 32 $600. *Pitangueiras* is reached from Rincão station. Population, 4,000. Press, *O Trabalho*. Cinema, post, telegraph, telephone, schools, 3 hotels.

Soracabana Railway

The terminus adjoins the Luz Station in S. Paulo. Expresses at 3.40 or 7.16 p.m. to *S. Roque*, 67 kilometres. Altitude, 830 metres. Press, *O. S. Roquense*. Hospital, post, telegraph, schools, 2 hotels. Time of run, 1 hour 50 minutes. Mayrink. Change for *Ytú*, 127 kilometres. 11 $, 4 hours 11 minutes. Altitude, 566. Latitude, 23°28′. Great seminary, colleges, schools. Press, *Republica*, *Cidade*, etc. District population, 20,000. Post, telegraph, 4 hotels. *Salto de Ytú*, on the Tieté

river. Great waterfall. Population, 3,000. Press, *Correio*. 135 kilometres from S. Paulo. Continue by this line to Campinas. On by main line from Mayrink to *Soracabá*, 110 kilometres. Altitude, 542 metres. Hotel "Victoria." Press, *Cruzeiro*, *Diario*. Population, 18,000. Public library, hospitals, colleges, post, telegraph, etc. Large cotton mills. *Piedade* is near by, 102 kilometres. District population. 10,000. On to *Boituvá* junction, 162 kilometres. 14$300. Buffet. 4 hours 10 minutes run.

Capivary, 123 kilometres, by another line *via Jundiahy* or *Ytú*, has 9,000 district population. Press, *Gazeta*. Post, telegraph, schools.

Piraçicaba, 241 kilometres. Altitude, 527 metres. District population, 45,000. A beautiful town on the river of same name. Press, *Gazeta*, *Jornal*. Cinema, post, telegraph, agricultural and other colleges and schools. Great waterfall. Fare, 16$000. Run, 6 hours 38 minutes. Various hotels. From Boiturvá to *Botucatú*, 309 kilometres. Altitude, 778 metres. Fare, 21$100. 9 hours 42 minutes. Latitude, 22°55′ Longitude, 4°16″45′ W. Press, *Diario*, etc. Hotel "Vilela." Population, 20,000 (district). Hospitals, theatre, cinema, post, telephone, telegraph, colleges. *São Manoel*, 344 kilometres. Altitude, 675 metres. Latitude, 22°40′33″. Longitude, 5°25′38″ W. Press, *O Movimento*. District population, 35,000. Hospital, theatre, cinema, post, telephone, etc. 3 hotels.

Lenções, 385 kilometres, 535 metres altitude, 2 hotels. Post, telegraph, etc. *Tieté*, on a short branch line. Population, 4,500. Press, *O Tiete*. Hospital, theatre, cinema, post, telephone, telegraph, schools, hotels. *Agudos*, 600 metres alti-

tude. Dstrict population, 19,000. Press, *O S. Paulo*. Hospital, theatre, post, telephone, telegraph. 455 kilometres to S. Paulo by Paulista Railway, the shortest route. *Baurú*, 439 kilometres. 13¾ hours run (see Paulista Railway). Continue by N.W. Railway to *Itapura*. Depart 6.30 a.m. Araçatuba is 281 kilometres. Arrive 5.27 p.m. Fare, 21 $400. Altitude, 386 metres. *Stop*. Proceed at 5 a.m. to Itapura, arrive 11.44 a.m., 437 kilometres. Altitude, 277 metres. Fare, 27 $700. Continue to Porto Esperança and Corumbá (see Matto Grosso).

From S. Paûlo to *Botucatû*, *Itatinga*, 360 kilometres. Post, telephone, schools, hotels. District population, 17,000. *Avaré*, 386 kilometres. Altitude, 572 metres. Latitude, 23°7′. Longitude, 5°11′ W. Press, *Tribuna*. Population, 6,000. Post, telegraph, schools, 2 hotels.

Pirajú, 468 kilometres. Altitude, 591 metres. District population, 18,000. Electric trams. Post, telegraph, schools, 2 hotels, etc.

Santa Cruz (Rio Pardo), 489 kilometres. Altitude, 471 metres. Population, 4,000. Press, *Cidade*, etc. Theatre, cinema, post, telegraph, 4 hotels. *Salto Grande*, 535 kilometres. Great falls on the Paranápanema. Fare, 27 $700. Altitude, 368 metres. Population, 3,000. Press, *Noticia*. Cinema, post, schools. Several small hotels. The line is now open as far as *Indiana*, 773 kilometres. Fare, 32 $500. (15 hours run from S. Paulo.)

CHAPTER XXX

SOUTH BRAZIL

Sleeping and dining cars run from S. Paulo at 7.15 p.m. on Wednesdays for Porto Alegre, and on Sundays for Curityba, direct (Soracabana Railway), Boituvá Junction, 162 kilometres. Tatuhy, 182 kilometres. Altitude, 590 metres. Population, 10,000. Press, *Cidade*. Hospital, cinema, etc. Hotels. Itapetininga, 226 kilometres. Altitude, 644 metres. Press, *Tribuna*, *Democrata*, etc. Normal school. Population, 5,000. Faxina, 364 kilometres. Altitude, 638 metres. Population, 7,000. Post, telephone, etc. Press, *O Tempo*. Theatre, cinema. Hotels, "Europe," "Italia." Itararé, 434 kilometres. Altitude, 715 metres. Population, 3,000. Press, *Itararé*. Hospital, cinema. Fare from S. Paulo 25 $100, 1st class single. 15 hours run. Last station in S. Paulo State. Cross the Itararé river to Paraná.

State of Paraná

Has a President and an Assembly of 30 Deputies. Sends 3 Senators and 4 Deputies to Rio. The financial situation is not very good, but guarantees on the loans outstanding, and a new one of £870,000, are afforded by water and sewer rates and new taxes (1918).

From the S. Paulo boundary, Auracarias begin

to make their appearance, at first as outposts of the forests further south. These tall, straight trunks, with umbrella-like tops, are very conspicuous in the landscape. At *Jaguaryahva*, the first town in this State, some Indian boys may be seen, and usually two or three are to be found at the station. They are good looking enough, and at first glance resemble in their colouring the Andalusian Gypsies. Population of the town, 1,500. Altitude, 870 metres. Theatre, cinema, post, schools and two hotels. Distance from *Itararé*, 98 kilometres. The line will be continued to the Tibajy river (see Coal). Cattle now become more numerous, and with increasing altitude, the temperature drops rapidly as we proceed southwards. Geological features present marked differences, sandstone outcrops showing here and there. Flowers of a new and attractive kind make their appearance, bedecking the *campos* with the most brilliant blues, violets, scarlets and oranges, the latter predominating, as in most countries. Great tufts of long, silky, rose-tipped grasses waving to and fro in the breeze, alternate with the bright blossoms. Population is very sparse and no other town is met until *Castro*, 196 kilometres. Arrive, 5.40 p.m. Altitude, 957 metres. Population, 5,000. Post, telegraph, schools and two small hotels. Average temperature, 16·5° centigrade. On to *Ponta Grossa*, 252 kilometres from Itararé. Altitude, 957 metres. Arrive, 7.23 p.m., if on time. Population, 10,000, including many Poles and Germans.

Rio Janeiro is now quite 1,000 kilometres off, and we are in quite another climate. Average temperature, 16·2° centigrade. There is a Buffet at the station, kept by the proprietor of "Hotel

Palermo," where I stayed, the accommodation being most reasonable and not at all bad. There are other hostelries, one or two close to the station. Ponta Grossa is a sort of metropolis, and has, no doubt a great future before it. At the end of any of the quiet streets, the rolling campos are before one, stretching away west without a break, to the infinite almost. The place boasts of some industries, including breweries, and the first malt house in Brazil, the barley being grown in the vicinity, and hops in another municipality of the State. Change for the line to *Curityba*. *Tibagy*, lies at right angles to this branch, almost due S.W. of P. Grossa. Latitude, 21°42′30″ S. Longitude, 7°31′20″ W. Altitude, 730 metres. Is 70 kilometres from Castro, and about the same distance from P. Grossa. It lies on the river of the same name, and has post, school, etc., etc. The train to Curityba came in 70 minutes late, a common occurrence, and we reached *Palmeira* over an hour behind. Post, telegraph, school, 3 hotels. District population, 15,000. *Serrinha*, junction, is 111 kilometres from P. Grossa, and at Portão, 6 miles from the State capital, electric trams make their appearance, and the train is invaded by half a dozen hotel porters. *Curityba*, 183 kilometres. I chose the "Tassi," through the kind recommendation of a fellow passenger, and handed my bags to a fair haired youth whom I took to be a German, but found was a Pole, like most of the hotel servants, the waiter being a Viennese. Other hotels include, "Moderno," "Roma," etc. Altitude, 908 metres. Average temperature, 16·4° centigrade. This growing city has every convenience, and most of the attractions which make

life pleasant, in addition, it is the healthiest capital in Brazil. The population is over 40,000, and there is ample space for development, building going on in every direction. There are three daily papers, *Commercio*, *Republica* and *Diario de Tarde* (afternoon), besides two Polish journals, a weekly review, and, previous to November, 1917, a German Catholic organ, *Der Kompass*, issued by the Franciscan Fathers. A museum exists that is only open on Sundays, and the most violent hammering on its portals failed to bring the guardian to see what I wanted. The Cathedral is a handsome modern building, and the Paço Municipal, or town hall, is a fine and really elegant structure. There are several public gardens, one, Rio Branco, having a statue of the late Chancellor. As in so many Brazilian towns, the principal street is called Avenida 15 de Novembro, some of the shops, the Louvre especially, having a good appearance. Many of the most important business houses, wholesale and retail, are in the hands of the Teuton, but he seems to be distinctly in the minority, as far as the town and country population are concerned.

One trip is not to be missed, and that is the run down to Paranaguá and back. The total distance to the sea is 110 kilometres, and the one train daily, starting at 7.30 a.m., takes 3 hrs. 40 min. The most interesting, to my mind, is the return journey, but going down, one has a greater sense of the splendid piece of engineering, and the great labour entailed by the construction, leaving, from a spectacular point of view, at least, the Rio-Petropolis, and Santos-S. Paulo, mountain railway sections quite in the shade.

Morretes, 69 kilometres, is called a city, like hundreds of other one-horse towns in Brazil, but the urban population is certainly not 2,000. Post, telegraph, schools, etc. Change for *Antonina*. Population, 4,000. 86 kilometres from Curityba. Post, telegraph, schools, town hall, several indifferent hotels. Steamers direct to N. and S. ports.

Continue from Morretes to *Paranaguá* at the entrance to Antonina Bay. There are over 3½ hrs. of waiting at Paranaguá before the train returns, and it is all too long, for there is nothing to see in this dreary spot. After devoting as long as possible to breakfast (Hotel "Wing"), and enjoying a dish of splendid prawns, I took a stroll across the flats to the port which lies, a kilometre or so, nearer the mouth of Antonina Bay. A mule-drawn tramcar conveys passengers who have less time to spare. Paranaguá consists of a couple of streets and a small garden square, and the only important features are the warehouses and store of the exporters and steamship agents. The heat is unsupportable in summer, and mosquitoes make life not worth living.

At 2.15 a corner seat was chosen in the waiting train, and at half past we left a gaping crowd of idlers, congregated on the platform, behind, and, gathering speed, soon got back to a more healthy and interesting zone. The slopes of the foothills are covered with banana plantations, and most of the crop finds its way to the River Plate. Failing shipment, huge quantities of Maté are piled up at several of the stations, spoiling through the saline atmosphere of the baixada, or low levels. This plant being very delicate, loses its original aroma soon.

After Morretes the line begins to curve upwards, forming spirals, and vainly endeavouring to tie itself into knots, as it climbs the Serra in daring *voltas*. By and bye, the rails seem to disappear into the depths of the mountain itself, two high walls of gneiss closing the path. Still an outlet is found, now running on the verge of a frowning precipice, presently tunnelling its way through the bowels of the earth, climbing ever higher and higher, and anon into the dark depths of a cañon, down which rushes a foaming torrent escaping from its rocky prison, and hurrying on to the sea In a while, the walls of the gorge appear to fal apart, and as they incline more and more to the horizontal, daylight appears again, but only for a short time, as we are still in winter, according to the almanack, and, being now 6 o'clock, sunset hour is at hand.

Once more on the level, the short semi-tropical twilight draws near, and before Curityba is reached, the afterglow lights up the mystic west, and the city comes in view, set in a glorious frame of ruddy gold.

At half-past six, punctually, the train draws alongside the platform, and, being Sunday evening, it is difficult to get out of the station through the crowd of loungers, and step across to one's hotel.

Failing definite interest to occupy one's time, it is unnecessary to remain here for longer than two or three days, and the necessity is felt to get underway once more.

Rio Branco is 43 kilometres N. of the capital, on a branch. Population, 1,000. Altitude, 890 metres. Latitude, 25°07′. Longitude, 5°53′ W. Post, telegraph, school, etc. *Serro Azul.* Popu-

lation, 1,500. Has no rail connexion. It lies N. near the S. Paulo boundary. Press, *O Serro Azulense*. Post, school, etc.

Retracing our steps to Curityba, there is an express on Tuesdays, Thursdays and Saturdays, via Serrinha, to the south. The first town is *Lapa*, 102 kilometres. Latitude, 25°46′10″ S. Longitude, 6°36′ W. Altitude, about 960 metres. Press, *O Tempo*. Population, 1,500. Theatre, cinema, post, telegraph, school, hotels. Continue to *Rio Negro*, 161 kilometres. Population, 3,000. Post, schools, factories. Press, *O Imparcial*. Two Hotels. This town lies in Paraná and Santa Catharina, and the S. side of the river has its own railway station, called *Mafra*. Here is the new junction, with the S. Francisco branch, the W. section, having a train every afternoon as far as Canoinhas, 113 kilometres, 5¼ hrs. run. Stop. Continue thrice weekly to the N.-S. main line at Porto do União, or União da Victoria. Proceed E. or S.E. to *S. Bento*, 74 kilometres further on. Arrive 1.17 p.m from Rio Negro. The line is now with a decided down gradient, following the valley of the river. S. Bento boasts of an hotel, "Wagner," and a newspaper, *O Catherinense*. Post, telegraph, schools, both public and private. Population of this municipality, 10,000. On to *Hansa*, another 43 kilometres, and, like S. Bento, an old German colony. Arrive, 3.35 p.m. Post, telegraph, schools and modest inns. *Joinville* is 55 kilometres further on, or 333 kilometres from Curityba. The largest and most industrial town in the whole of German Brazil, as many are pleased to call it, is sadly disappointing at first sight. Reaching the town in darkness, and having to drive

more than a mile along a muddy road, catching glimpses of small houses bordering the way, hungry and train sick (no restaurant cars this route), I was brought up suddenly at the door of what seemed more like a large cottage than anything else. Foolishly, I had ignored the fact that motor cabs were available, and so sundry specimens of the genus bagman ("cometa," as the phrase is here) had forestalled me and appropriated the best rooms in the hotel, "Müller." Electric light of course, but only the strongest remonstrances enabled me to get a chamber illuminated with something better than a candle. There is a better hotel building, for the same proprietor. The food was good, and the place clean, however, and that was the main thing. Strolling down town to the creek, in the morning, I found a couple of small vessels alongside, and more signs of life than in the streets. In the vicinity are chemical, lace, soap and candle, nail and other factories, and it is proposed to construct new quays, 10 kilometres lower down, to which ocean going steamers may come alongside. There is a tug which conveys passengers to S. Francisco, or one may go by rail, the distance, 41 kilometres, taking 71 minutes by the latter means of conveyance. In the course of conversation with several shopkeepers, of German origin, I found a general feeling of discontent, due, partly to want of sufficient trade, and partly to indifferent health. The place is well kept and the inhabitants, as a rule, are more or less hygienic in their habits, but the situation of the town is bad, and it is very little above sea level. Ill chosen, as a site for N. European colonization, at the head of an estuary, in a clearing made in the forest, subject

to inundation, and naturally plagued with the Anopheles mosquito, it takes a good deal of care to avoid attacks of malaria and other similar complaints. There is no great future before the town, at least not as things look now, and many of the retail merchants find it a hard struggle to put a trifle by. There is only one train a day each way.

S. Francisco.—Terminus of the line, on an island, is one of the finest ports in Brazil, and available for transatlantic steamers. A small town, not at all worthy of its site. Post, telegraph, schools and some small industries. Communication with Joinville by steam launch, two or three times a week. Return from the latter town to *Jaraguá*, 37 kilometres. Arrive at noon. Small inns, one of which, kept by a German-Pole, is the post house. Fare from here to *Blumenau*, 40 $000-50 $000, according to the state of the road. This happened to be very bad in October, 1917, when I last travelled that way. Leaving at 1 p.m., behind 4 horses, a trot degenerated into a walk, especially when the Serra de Jaraguá had to be negotiated. At first there was plenty of local traffic, and for this reason the wheels were often covered in mud as far as the axles. The soil is of a heavy, clinging nature, the valley well watered and evidently very fertile and cultivated almost the whole distance, houses being in sight continually. All the products of this colonial region have to be transported in wagons to either of the two centres. The patient, plodding peasant, hereabouts, mainly of Pomeranian stock, has worked miracles, owes nothing, and has, up to now, educated his children at his own expense. I soon found out the reason why the Polish element in Paraná has assimilated better

with the native than his Teuton rival, and also the reason why there is little sympathy between the Luso-Brasileiros and the men who are the real backbone of this State. These latter arrived in the country when it was a wilderness, improved it out of all knowledge, paid for almost everything out of their own pockets, and, leaving a land where the conditions of social life and the habits and customs of the people were undoubtedly superior to those in Brazil in the first decades of the 19th Century, it is small wonder that the Germanic peoples retained their language, and stuck together to the possible *political* detriment of S. Brazil.

The Pole, on the other hand, both from temperament, which more resembles the Latin, and from the fact of arriving half a century later, when conditions had vastly changed, and finding life both easier and more agreeable than in his native country, fell, if not into a bed of roses, at least amongst a people who have managed to absorb him to a far greater extent than is possible with the *dour* and cold Teuton. Certainly, at the beginning, there was considerable trouble, owing to the want of selection of the functionaries engaged in dealings with the colonists, and their ignorance of the laws of *meum* and *tuum*, as regards the female section of the new comers, who, *inter alia*, are often more seductive than their blonde sisters. So, many of the Germans became homesick, and are so still, and as we shall see, in an appendix, had good reason to complain.

Pommeroda, 45 kilometres from Jaragua, was reached in the darkness, after passing two villages, Rego and Testo, each with its post office and *gast* house, besides the inevitable church. The inn at

the first was of a composite type, and as usual in the whole of this part of the State, possessed a great hall, which served as a dancing saloon, or for the audience, on nights when a (local) dramatic company gave representations, or a cinema performance was on, a regular stage with footlights (electric) being available. Spotless cleanliness everywhere, and a truly surprising supper, quite impromptu, including home cured ham, sausage, cheese, butter, honey and bread, besides mustard, prepared on the spot, and other delicacies. Across the river Testo is a fine covered bridge, with an arched roof, similar to the famous ones at Lucerne. This idea is quite a common one in Santa Catharina. My bill was exceedingly reasonable, and the cordial hospitality touching, a great contrast to the sulky, suspicious attitude of mine host at Joinville. Next morning there were but 33 kilometres to cover to Blumenau.

I had noticed the wonderful profusion of passiflora by the roadside, on the previous afternoon, and, in all its glory of purple, blue, rose or white blossoms, this truly decorative flower bedecked the hedges, not only here, but in many other parts of Santa Catharina. Most of the houses are built of brick and wood, the black angularly placed timbers giving them an appearance not unlike those of the Tudor period in England. The bricks are picked out in white, and the buildings usually elevated half a metre, or so, above the ground, and possessing overhanging eaves, to protect them from the weather.

All have well kept gardens, many, laid out most tastefully, and quite a happy family of pigs, ducks, turkeys and other feathered creatures mixes itself up with, at times, a dozen children.

Northwards, as we have seen, the soil is heavy, but the rest of the journey is over a sandy road, the going being far easier.

Everything is done by the peasants, road repairing, ditch making for drainage, hedges, and the less pretentious bridges.

Nature is extremely bountiful, potatoes yielding four crops yearly.

The people pay for their own schools and teachers, and we shall see, later, what this has led to.

Round each house, duly protected against the wintry winds, there is a small coffee plantation, sufficient for the necessities of the family only. I found one thing to take exception to, and that was the excessive labour of the women and girls, not only household, but field, and there is nothing truer than the saying, "All work and no play makes Jack (and Jill) dull." The female sex, perhaps for this reason, have not the physical attractiveness of the, on the other hand, far too idle middle-class young women of the cities.

Starting at 7.30 a.m., we reached the river Itajahy at 10, having to cross it on a ferry just above the cataracts of Salto Weissbach.

A few minutes later we crossed the Blumenau-Hansa Railway line, and were within the suburban area of the former town at Itoupava Secca.

Suddenly I saw a figure striding down the road which appeared familiar, and recognized a savant whose name is known everywhere in the scientific world. He had been retired from his post in S. Paulo for some reason or another, and was rusticating here for the time being, so I resolved to put up at the same hotel ("Franke"), now close

at hand. We were only three kilometres from Blumenau, the road being first rate, and an omnibus available several times a day. Houses straggle along the whole of this distance, the place has more the air of an overgrown village than Joinville, and the population is less in any case.

The "Annuaire du Brésil Economique" (Rio and Paris, 1912) gives it as 25,000, but these figures refer to the entire municipality, the largest in Santa Catharina, and are out of date. Blumenau is prettier than Joinville, and perhaps more Teutonic in aspect. There are but few industries; but naturally a brewery is not lacking, and of course dairy products are largely exported.

I had carefully kept the S. Paulo and Curityba newspapers up to the 9th of October, and as we were only the 12th, they were gladly accepted by my friend the professor. Those on the hotel table were at least eight days old.

There existed, at that time, two tiny journals in German, the *Zeitung* and *Uhrwaldsbote*, both bi-weekly, one issuing a nightly sheet of cables, which found its way all over the district.

Both were suppressed in November, and, I think, now appear in the vernacular.

Telephonic communication exists here, somewhat more extensive than in Joinville, where the line is not permitted to be connected with S. Francisco. I see no reason, but presume it is for military purposes.

Itoupava possesses a cinema, and I passed two hours away, at a cost of 500 reis, half the price in more ambitious centres.

Here the good folk demand full value for money, and small blame to them. There is no school in

Blumenau up to the standard of that in Joinville, considered the best in all the south, at least from the German point of view. I saw there the notorious maps which are supposed to indicate the German parts of Brazil.

Examining them carefully, I found the indication, "Colonies *inhabited* by German settlers," the word "WOHNUNG" not being capable of other signification.

Living is much cheaper in Santa Catharina than up north, and wages are in proportion. Butter, at 2$500 the kilo, was half Rio Janeiro prices.

The small restaurants and hotels, especially in the country, place a great variety of home-cured sausages and other delicatessen before one.

At Pomeroda, I had paid for my dinner, bed and breakfast only 4$500, with everything *ad lib.* My conveyance to Blumenau would have cost me but 25$000 for the *return* journey of 78 kilometres had I been able to utilize it.

Some statistics with regard to the Blumenau Municipality may not be out of place. It extends to the west of Hansa, the terminus of the Estrada de Ferro de Santa Catharina, 70 kilometres distant.

Referring to official data on page 13 of the *Relatorio do Superintendente do Municipio, para* 1916, we find: In accordance with the statistics compiled by Drs. Blumenau and Paula Ramos, the Imperial Government spent on this Colony up to the date of its emancipation no less than 1,423 contos of reis, and from 1882 to September, 1911, 2,000 contos were laid out in addition. This sum included all improvements in the way of roads and bridges, and from the latter date until the end of 1916, almost all the money spent was on work of a permanent nature.

The highways are stated to be the best in all Brazil, and I have no doubt they are, when the nature of the subsoil is taken into consideration.

Many parts of the district are hardly above high water level, or, in some cases, actually below the flood limit.

Total expenses from 1850 to date (January, 1917) amount to 5,000 contos, and, up to 1912, only 26,000 immigrants entered the colony, the population being 10,791 in 1877, 45,089 in 1907, and now totalling 62,000.

Of the grand total in 1907, 36,354 were born in Brazil, and at present there are less than 3 per cent. of strangers.

The area of this municipality is 946,000 hectares, of which 395,000 are either occupied or allotted. I have mentioned the large families, and this is, undoubtedly, a great asset to the state, when there is ample room for their settlement. The total sum spent on this colony has been repaid to the Government in one form or another.

Death-rate from 1913 to 1916, inclusive, was less than *seven* per 1,000 annually. The whole of the N.E. part of Santa Catharina is fairly well populated, and expansion must take a great impulse when transit facilities are improved. There is a pressing need for north-south lines of rail, connecting Curityba with the capitals of Santa Catharina and Rio Grande do Sul.

The Santa Catharina Railway was taken over by the Federal Government in March (1918), and should have reached Itajahy long since had it not been for the war. An important maritime station was projected there and other branches and extensions are shown on the map, 40 kilometres of line being already surveyed. From Hansa it would

have proceeded by Itajahy do Sul and the valley of Canoas river to Marcellino Ramos, where the boundary of the Rio Grande do Sul is struck, on the trunk line.

This route is the longest one, but the only possible, owing to formidable obstacles presented by the topography.

Otherwise the most natural way would have been through Curitybanos to Herval, so, as we have seen, communications are as yet very inadequate.

Three parts of Brazil know only through the telegraph what the rest is doing. Hard work and little reward is the lot of the colonists down here. Recently epidemics of epizootia have decimated their stock, many small farmers selling what remained of their swine in order to avoid complete loss. On top of these disasters, typhoid, brought in goodness knows how, caused ravages, especially in the parts where Italians were in the majority.

Exports showed a goodly bulk of production in 1916, in spite of all troubles, nearly 9½ tons of beeswax, 21¾ of cheese, 19,700 sacks of sugar, 180 pipes of aguardiente, 598¾ tons of tobacco in leaf, and 18¼ in plug, besides large quantities of honey, rice, maize, starch, orange wine, hams, sausages, etc., maté, potatoes, etc., leaving the valleys.

The municipality is go-ahead, but needs money, the toy railway having been run at a loss for some time. First class fare to the terminus at Hansa is 6 $900, and there is but one small passenger coach, with a partial division between the two classes carried.

One train daily, and another on Wednesdays and Sundays.

Stops are made at every station, and there appears

to be no hurry to get going again, the journey taking nearly 3¾ hours.

The line follows all the curves of the river Itajahy quite close to its bank, and the valley is pretty well settled, although there are only a few houses round each station as a rule.

At Hansa there is even less, but a 4-wheeler or so meets the train to convey infrequent passengers to the headquarters of the Colonization Company at Hammonia across the river, 4 kilometres away.

There are actually 3 hotels at the latter place, but how they all manage to make a living goodness only knows. The "Hansa," where I put up, leaves nothing to be desired, and, to my surprise, I found a fair number of guests from as far away as Rio de Janeiro itself.

Next afternoon, in company with the Director of the Indian post at the mouth of the Plate river, up stream, I set off in a springless cart, and reached the last village in the colony, Nova Bremen, 15 kilometres further west, at tea time, and found the general shop and inn, serving the purpose of chapel, in what, the night before, *was* the dancing saloon, and which would be, in all probability, devoted to the same purpose, or to a cinema performance that very evening. As it was, the most irreligious conversation of sundry wine bibbers at the bar certainly penetrated to the hall.

God and the devil come to close quarters at times in this part of the world. Beyond the village the quality of the few and far between houses gradually deteriorated, poverty-stricken hovels now making their appearance, Italian elements succeeding Teutonic, and presently the poor, neglected Caboclo (native peasant) taking his place, until the

last pretences of civilization were left right behind. We camped in a dirty hut, and tried in vain to sleep, a legion of monstrous fleas finding a harvest, so daylight was welcome, and with the aid of plenty of cold water one managed to refresh, and then swallow coffee, of a sort, and mandioca fritters.

A little beyond the Sharlach stream banned our path.

Against the advice of the boatmen a leaky canoe was hauled out from under the bank, and five of us, with bags and other impedimenta, were stowed in it somehow, and an attempt made to proceed up river.

Following a number of excessively rainy days, there was a strong current and a great depth of water, and it was courting disaster to start in any such type of embarkation. We managed, however, to pass several cataracts, but after a couple of hours' paddling in a difficult passage the canoe broached to, filled, and I found myself in some 4 metres of water. Sticking tight to the craft, she presently drifted near the bank, and, like a drowned rat, I crawled ashore.

My belongings had made the best of their way down stream, but the valises were recovered, whatever was loose in the canoe being gone for ever. I specially lamented the loss of an extra large umbrella, made to order for the rainy climate of Petropolis, and, in addition, several other things of value had disappeared. Fortunately, a hut was not far distant, and after wringing a few quarts of water out of my clothes, what was saved was left behind to dry, and I swallowed a great draught of brandy and a litre or so of coffee, and was ready to set off again, but not by the river.

One of our boatmen had showed the white feather, and turned tail back to the hut where we had slept the night before.

I think he was wise, for there were 25 kilometres of forest path between us and the Indian post, and it was up and down the whole way, with the worst of going.

My watch refused to tell the truth any longer, and as there were no clocks hereabouts we had to reckon the time by the sun, making it something like 2 p.m. when a move was made.

On the map a well-defined mule track exists all the way, but in many places it needed a pathfinder in order to make it out. We were three, not counting a small boy, and the "Camarada," or labourer, who led the way, carried a small bag with some items I could not well leave behind. Here and there one had to literally force one's way through the undergrowth by sheer weight, and at every step the twining, clinging lianas or creepers, some as thick as a man's leg, did their best to trip one up. My boots were especially stout London-made waterproofs, but by the time I got through, the uppers were scarred all over by countless thorns.

After wading the Lacisz and Wiegand tributaries up to the middle in icy water we came to an enclosure, shutting off the Indian reserve from the rest of the forest. To make matters worse, just when our clothes were getting dry, by reason of the breakneck speed we had been keeping up, it came on to rain again, and only a great effort enabled us to reach the post before darkness (6.30). The road would have been opened right up to the post before this, but sundry rocks intervening, and dynamite not available (forbidden to be imported

into the state during the war), things remained at a standstill for the present.

So, in times of flood, the score of whites and 250 Botucudo Indians had to live on the scanty resources of the post, eked out by what birds and beasts they could manage to slay.

The settlement lies on the west side of the Plate river, and the only means of access to the huts is by water, or across a slippery tree trunk which serves the purpose of a bridge.

I have dealt with the Indian question elsewhere, and have only to say here that difficulties are in store for the Federal and State Governments if measures are not taken to improve the situation of these savages, at present encamped on lands belonging to the Hansa Colonization Company. They are on the wrong side of the forest, and complain of a lack of game and the slow, but inevitable approach of the white man.

After two days rest we returned to the base, this time by water all the way, in spite of my disinclination to risk another bath.

The river had, however, in the meantime, fallen to something like a normal level, and with a couple of portages we got through without any mishap, reaching Hammonia the same night.

I wanted to explore the upper reaches and attempt to reach Canoinhas, where the Hercilio, or Itajahy do Norte, rises near the sources of the Iguassú and Rio Negro, from whence it descends with great rapidity through gorges, and over precipices, cataracts and falls, causing impassable obstacles to any sort of craft.

Thus, it is impossible to travel more than a few leagues up stream, or to the first step in the series

of terraces leading to the plateau. There are (on paper, at least) several tracks or paths which enable one to reach Rio Negro, Canoinhas, Curitybanos, etc., in 2 or 3 days from the Plate post, but as the Indians are wandering all over the forest region in groups, and their civilization is still very doubtful, it is better not to take risks. One route climbs up to the top of the Serra do Mirador, and follows its summit S.E. towards Hansa, or N.W. to Passo de Canoinhas, through the wilderness some 80-90 kilometres, and about the same distance further on to R. Negro, with only a few groups of houses intervening. Canoinhas itself may be a little less through Rodeio Grande or Curitybanos, about 100 kilometres S.W., the telegraph line being struck at Santa Cecilia, a little over halfway.

Canoinhas, population 700, altitude 800 metres, Hotel "Knitzer," is several kilometres from the railway station, is 113 kilometres from Rio Negro. Depart 7.24 a.m., arrive at R. Negro 12.40 p.m. From Canoinhas to Porto do União is 135 kilometres, depart at 8 a.m. three times weekly, arrive 1.56. No Sunday trains on this section either way. North-bound expresses leave P. do União at 7.44 p.m., and southwards at 5.52 a.m. on Mondays, Wednesdays and Fridays, if punctual.

Previous distances are only approximate when across country, being measured to scale, on the latest state map, issued October, 1917.

The Itajahy river is divided into three branches: Hercilio, or North, following the southern slopes of the Serra do Roncador, and South, the latter rising in the plateau close to the Florianopolis-Lages road, about 115 kilometres from the sea.

Below Hansa there is but one stream, the Itajahy-

Assú, and near its mouth the Mirim, or little Itajahy, joins it, with a ferry on the road from Blumenau to Itajahy town, on the outskirts of the latter place.

The "Holetz." Hotel in Blumenau is old and the rooms are bad, and so I was glad to leave it, failing the steamer, by road, to—

Gaspar, 15 kilometres, a large village with a mixed population, the only other place passed being *Ilhota*. *Itajahy*, 54 kilometres, is 6-9 hours drive, according to the state of the road, which follows the windings of the river nearly all the way. This stream, rising like most of its tributaries, on the high plateau, presents some curious features. First, as we have noted, it descends to the alluvial plain by means of a succession of falls, and, in its middle course, wide, deep and placid reaches are interrupted by shelves of rock, or lages, where its bed is compressed, and forms a series of cataracts. Lower down the immense amount of *débris* brought down in the rainy season has formed islands which develop with astonishing rapidity, and present a very difficult problem.

One, opposite the "Hansa" Hotel at Hammonia, has doubled in size within the last 25 years. The consequence is, the lower reaches are subject to frequent inundations, the river reaching first floor windows in the main street of Blumenau in 1908, and 2 metres above high water level at Ilhota, some 40 kilometres down stream.

Geological features are interesting, and the clay slate and schistose ledges or terraces of the upper river give place to flat beds of gneiss, with huge masses of pink orthoclase in the Hansa district. At its mouth the cliffs are largely composed of mica

schists. Productions vary with the altitude, banana crops planted above Hansa failing in 1917 owing to severe frosts. Down stream sugar and rice afford splendid opportunities, and as the river is navigable by small steamers up to Blumenau bridge, the crops can be put right on board.

Civilization, centring in Blumenau and district (up to Hansa) declines gradually up or down stream, and in the zone intervening between Gaspar and Itajahy it has reached a low ebb. Life is cheaper in this part of Brazil than further N. My car fare cost 35 $000, and the two horses had to be stabled and fed overnight, and driven back the 57 kilometres to Itoupava Secca next day without a passenger.

Itajahy is almost invisible until one comes right down on it, one-storied houses being the rule, the town lying hidden amongst the reeds at the river's mouth. It has electric light, sewerage, some factories, a market, public garden, town hall, cinema, schools, post, etc., a newspaper, *Novidades*, and 3 or 4 hotels ("*Burckhardt*," etc.) A port of call for three lines of steamers, there is always a certain amount of movement in the town, and it will go ahead like steam when the railway reaches it. Population, 5,000. Thirty miles in direct line to Florianopolis, State capital. Governor, Dr. Hercilio Luz. Congress consists of 19 Deputies. Federal representation, 3 Senators and 4 Deputies. The town is on the west side of Santa Catharina island. Brazilian Lloyd steamers have their own wharf, as also the Hoepke line, but the Companhia Costeira anchors its boats a few hundred metres from the shore.

Santa Catharina is one of the smallest states in the Union, yet it has 8 Public Libraries, and 81

newspapers, taking first place in this connexion, Espirito Santo being second, and Paraná, third.

In criminality it is behind Minas Geraes, which state is the most virtuous. That possessing fewest illegitimate children is S. Paulo, Santa Catharina again second, Paraná third and Rio Grande do Sul fourth.

Quoting from the "Annuaire du Brésil Economique," 1913, page 755.—The financial situation of Santa Catharina is good, budgets leaving, as a rule, a balance on the right side.

In 1916, receipts were 2,457 contos, and expenditure 2,360 contos. Its foreign debt is only £203,167, and the total internal, 3,547 contos, all obligations being met when due.

The area of this state is greater than that of Holland, Belgium or Switzerland, but its population of half a million is not to be compared to these.

Santa Catharina spends over 20·5 per cent. of its revenue on public instruction, as compared with 5 per cent. by the Federal Government, vide "Relatorio da Directoria Geral de Estatistica," for 1916. The amount spent per capita amounts to a little over 1 $000, annually (page 131). And "Of late, many immigrants have come from Russia, a country where 99 out of every 125 inhabitants are quite illiterate."

In 1917, exports were valued at 20,128 contos of reis. Receipts, 6,000 contos, exceeded expenditure by nearly 10 per cent.

Like all cities with a background of sufficiently lofty hills, and white houses showing up sharply in the clear atmosphere, Florianopolis, or Desterro (place of exile), as it was formerly called, is

picturesque, when seen from the sea. The city lies 27°35′37″ S. and 5°34′45″ W.

The highest point in the island is Ribeirão, 600 metres above sea level. Once on shore, the illusion is lost, and apart from the Government Palace, Hospital, Normal and Technical schools, there is little in the way of architecture to arrest the eye. By the quay side there is a covered market, and the town has, naturally, electric light, but in most else is quite unworthy of a southern capital, with at least 35,000 inhabitants.

The trams, miserably equipped, and very infrequent, are mule drawn, and, as Major Vieira da Rosa says in his "Chorographia" (page 179), "In the Figueira quarter the tiny, filthy and ugly wooden huts, falling to pieces, are an eyesore." Praça 15 de Novembro, in the centre of the city, is a well kept square, with the post office on one side, and the telegraphs on the opposite. There is another garden a little higher up, with the theatre at a corner. A small museum exists in the technical school.

Amongst the local industries are cotton and lace mills, ice, nail and general iron works, ship repairing yards and breweries.

Newspapers include *O Dia*, *O Estado*, *A Epoca*, and *Opinião* (evening).

Hotels, "Macedo," "Metropole" and "Taranto."

There is insufficient water in the anchorage for anything but small coasting steamers, and I understand that the rocky bottom would render deepening a very expensive process. No rail facilities exist, and communication with the main land is by means of a launch every half hour during the day.

When the stormy breezes blow, as I found to my

cost, the passage is anything but pleasant. Roads on the island are good enough for motor traffic, and I had a run across to the East side, or, rather to the ridge from which one can look down on the coast and to a vast lagoon which fringes it.

This is a famous fishing place, and huge hauls are made.

Florianopolis is one of the cheapest cities in Brazil, the market being well supplied, especially with fish, this form of diet being so much in vogue, that the Catherinenses are rudely termed "green bellies" (barriga verde). To my delight, I found a tiny flower on the hill side, above the town, which recalled many happy memories, the scarlet pimpernel. It is also frequent further south, but I had never seen it before in Brazil.

A great speciality of the island is floral ornaments, made in the most artistic and dainty fashion from feathers, shells, fish scales, and other most unlikely material.

Once across the strait, there is as a rule no lack of cars to choose from, and a well kept road stretches north and south.

Taking the latter route, S. José, a long straggling township, is reached in less than an hour (8 kilometres). The place shows signs of former prosperity, and there are several churches (Protestant and Catholic), a small theatre, and a town hall. Still on a level with the sea, 5 kilometres further on, Palhoça is reached. This boasts of a newspaper, *A Comarca*, and a tiny port, from which, like S. Jose, a great deal of produce is shipped in sailing boats of the barge type, to Florianopolis. Lying, like its neighbour, on the mud flats, a good deal of drainage is necessary, if developments are to take place, as a sort of dismal

swamp encroaches almost on the main street. Still, it shows signs of vitality, no fewer than 8 inns being mentioned in the Almanack Laemmert, the Brazilian "Bottin."

Sto. Amaro (28th-29th kilometre) is a large village lying higher and drier, and the road begins to rise sharply just above, and, crossing the river Cubatão, on the left, there is a by-road, of a sort, to some hot springs a couple of miles away.

The main road climbs up steadily to the table land, but we will travel that way later.

The return journey to the waters (see Thermal Springs) cost me 40$000, the distance being over 74 kilometres, the small, but wiry horses finishing this long and tiring run without having had a mid-day meal of anything but grass, the heartless driver pulling up at the landing stage in the hope of securing another passenger when the launch came in at 6 p.m.

Northwards the coast road proceeds to *Biguassú*, 15 kilometres. District population, 17,000. Post, telegraph, school, etc. On to S. Miguel and Tijuquinhas, to Tijucas, or by a shorter, but less populated route, of 52 kilometres. The latter place has an excellent position at the head of a proposed railway to Porto Bello, 15 kilometres, and the river Tijucas has sufficient depth for small craft, all the way up to *Nova Trento*, the Italian colony, 30 kilometres distant. The town of Tijucas boasts of a small print, and the alluvials of the river are said to carry gold in payable quantities. *Nova Trento*. Population, 5,000. Has silk mills, brick and other works. Post, telegraph, schools, 2 small hotels, and a newspaper.

From here there is a road which runs almost

direct N., through Alliança to Brusque, about 20 kilometres. This latter is a mixed colony, Teuto-Italian. The town has 1,200 inhabitants, possesses spinning and weaving mills, and cheese factories. Latitude, 27°5′ S. Longitude, 5°45′ W. Hotel, "Schaefer."

Routes branch off from here to Itajahy (30 kilometres), and Blumenau, and a railway has been surveyed to the latter town. There is communication by water between Brusque and Itajahy, down the Itajahy Mirim river. Steam launches are to be hired at either town.

Returning south, to Florianopolis, and retracing our route to Palhoça, the road skirts the sea by Enseada, Garopaba, etc., to *Imbituba*, rail head of the Thereza Christina line, a distance of something like 90 kilometres. Fare thence to *Laguna* is 2$600, but there are trains twice weekly only, steamers calling at the former port once or twice a week, on their way to Rio Grande, or at Laguna periodically, one service of the Brazilian Lloyd making this port its terminus, conveying prisoners from Rio to a Correctional Colony there. Time from Florianopolis 10 to 12 hours. Laguna has a district population of 20,000. There is a market, hospital, and a weekly journal, *O Albor*. The town lies at the head of the lake from which it derives its name, and is celebrated as being the birth-place of Annita Garibaldi, wife of the Italian hero. At one time, this municipality produced more wheat than any other in Brazil. The situation is healthy, and living cheap and good. Tubarão, 53 kilometres, has a daily train from Laguna (Sundays excepted), fare 2$100. Situation 28°30′ S., 5°50″ W. District population, 30,000. Hotel, "Italia."

Press, *Gazeta do Sul*. Below this latitude, malarial fever may be said to be non-existant. The whole of the southern part of the state is healthy, and will produce cereals of almost every kind, besides affording excellent pasturage. King Coal, however, is likely to make the fortunes of many people (see Mineralogy). The river Tubarão (shark) is navigable up to the city, and by canoes, 13 kilometres beyond, to Guarda, and the rail follows its banks on to Orleans. There are sulphur springs at Guarda.

Orleans is 96 kilometres from Laguna, fare 5 $800, run 4 hrs. 20 min. Lauro Müller, present terminus of the line, is 111 kilometres, and the journey takes over 5 hrs., costing 7 $000. The coal measures commence N. of here. At Pedras Grandes (78 kilometres) there is a road S., to the workings at Urussangá, and on to Cocal and Cresciuma, another centre of the coal mining.

A line is in course of construction towards Araranguá, 35-40 kilometres further S. From Lauro Müller routes run due south to the colonies of Belvedere, Nova Treviso, Nova Belluno, and Nova Venezia. Italian settlements predominate all along this part of the south.

Rail communication is sadly needed with Rio Grande do Sul.

From Araranguá some sort of road continues to the latter state, but there is a great distance to the nearest station, "Taquará."

From Orleans mule tracks lead W. to Bom Jardim (32-34 kilometres), and from thence, 45-50 more to S. Joaquim. This municipality, with that of Lages, Curitybanos, Campos Novos, etc., forms the real wonderland of S. Brazil, as far as climate

and suitability for European settlers is concerned. Here (S. Joaquim) 12 degrees of frost have been registered, and the severe cold continues sometimes until January. Altitudes vary from 1,000 to 1,900 metres. The small town itself is perched on a hill, or cochilla, as it is termed down here, and the houses are mostly built of wood. The situation is one of the most isolated in the state. It is 1,000 metres above sea level. Hotel, "Furtadi." Journal, *O Labor*.

From here northwards is *Lages* (60 kilometres), the telegraph lines following the road. Both these towns are on the roof of the (Brazilian) world, but the latter place is 85 metres lower, although its newspaper boasts of the title *Sineta do Céo* (The Bell of Heaven). There are two hotels, "Lenze" and "Walbroel," and a photographer. Latitude, 27°50′. Population, 5,000. Temperature, 13·8° centigrade. Centre of a great pastoral zone. Hops produced twice yearly in this favoured spot, and apples, pears, plums, and all other northern European fruits grow splendidly. Average *mid-summer* temperature 15 to 18 degrees centigrade. There is a regular motor car service to this town from Florianopolis, or, rather, from the ferry station, opposite, proceeding through Palhoça, Santo Amaro, Vargem Grande, Rancho Queimado, Rio Bonito, Taguaras (81 kilometres), Barração (115½ kilometres), Lomba Alta (120 kilometres), 1,000 metres above the sea, Ponta Alta (141 kilometres), etc., etc., to Lages (271 kilometres), stone posts marking each kilometre, all the way.

From Lages there are tracks leading N. and S., the latter going through Campo Bello, 45 kilometres, and Annita Garibaldi, 82 kilometres, to

Campos Novos, 120 kilometres; hotel, "Souza;" population, 500; altitude, 930 metres. From here Herval village is about 35 kilometres, and the railway station, 40. Up trains at 8.39 a.m., Tuesday, Thursday and Saturday. Thirty-five hours to S. Paulo. Down trains at 5 p.m. on Monday, Wednesday and Friday. Forty and a half hours to Porto Alegre.

Curitybanos lies 7°20′ W., Longitude, and Latitude, 27°18′ S. Altitude, 930 metres; 340 kilometres from Florianopolis, and 75 kilometres from Lages, through Bom Jesus. Population, 4,000. Hotel, "Nunes." From here one may ride to Campos Novos, the distance by direct road being about 70 kilometres, but there is not a single village the whole way. Tracks lead also to Rio Bonito and Rio das Pedras stations, but the routes are desolate in the extreme.

A somewhat more fraquented road runs to Pouso Redondo, 75 kilometres, and Itajahy do Sul, 105 kilometres, and from thence to Hansa (131 kilometres) station, on the Blumenau line. Southwards, from Lages to the Rio Grande boundary, is something like 50 kilometres, and the road and telegraph line continue to *Vaccaria* in that state. West of the S. Paulo-Rio Grande railway the region of high campos extends over 2½ degrees N. to S., and 4 degrees E. to W., including the zone lying between the Uruguay and Chapeco rivers, which has been handed over to Santa Catharina by the recent accord. This formed the southern half of what was known as the "Contestada," i.e., the territory in litigation between Paraná and the former state. The towns of Palmas and Clevelandia remain in the latter. In the extreme N.E.

corner of Santa Catharina, we find *Campo Alegre*, population, 1,000. Press, *O Serrano*. It is accessible from S. Bento, 21 kilometres from this station (S. Francisco line).

We left Florianopolis, south-bound, on the Brazilian Lloyd steamer of the same name, starting in the small hours of the morning. My cabin companion kept to his berth, and I to the deck, enjoying the cool breezes, yet inclined to curse the ship and all on her, when she began to roll and pitch in the choppy seas. Bad weather failed to impair my appetite, however, and the run to Rio Grande was made in 36 hours, rather slow going for only 349 nautical miles. It took us some time to tie up at the quays, but there was sufficient daylight left to see something of the town, besides the fine new quays and warehouses.

There are 40,000 inhabitants in this city, and it has most modern improvements, sewerage being installed since the end of 1917.

Hotels, "Paris" and "Grande." Newspaper, *Echo do Sul*. Electric trams, etc. Built on a sandy flat at the entrance to Lagôa dos Patos; the centre is a kilometre from the port, and a league from the sea.

A loop line runs down to the beach at Beira Mar (25 kilometres), 1 hour's journey, where one finds a Casino and bathing establishment. 5 trains daily.

This port of Rio Grande is the only deep water one in the far south, and the depôt for all the exports of Rio Grande, including chilled and salted beef, coal, wine and fruit.

Here Porto Alegre passengers tranship to the *Mercedes*, which leaves every Monday morning, the steamer from Rio being due at Rio Grande Sunday

afternoon. The Costeira steamers, drawing less water, are able to proceed up the lagoon.

Certainly the change was a most welcome one, the lake steamer being luxurious, and built on purpose for warm climates. Rio Grande was left at 9 a.m., and the 27 miles to *Pelotas* took three hours. This is a busy town of 40,000 population. Situated at the entrance to the S. Gonçalo canal, leading to Lagôa Mirim, for Santa Victoria and Jaguarão, and the inlet to Lagôa dos Patos, there is always a good deal of life and movement in the port. There are 5 trains daily from *Rio Grande*, 52 kilometres. Latitude of Pelotas, 31°46′53″ S. Longitude, 9°14′29″ W. Hotels "Alliança" and "Brazil." Press, *Diario* and *Correio*. Electric trams, the only double deckers I know of in Brazil. Public library, hospitals, theatres and cinemas, post, telephone, telegraph, various colleges and schools, 6 banks, etc., etc. Change steamer for *Arroio Grande*, Population, 4,000. Press, *Correio*. Post, telegraph, schools, 2 hotels. On to *Jaguarão*, 45 kilometres. Latitude, 32°33′55″ S. Longitude, 10°11′22″ W. Population, 10,000. Press, *A Situação*, *A União*. Theatre, post, telegraph, barracks. Hotels "Francez," "Central," etc. Lies a little way up the river Jaguarão.

Herval.—Inland. 32° S. latitude. 52 kilometres from *Arroio Grande* and 70 from *Jaguarão*. Population, 1,000. Hotel "Neves." Post and telegraph. *Santa Victoria*. Population, 5,000. Latitude, 33°31′ S. Longitude, 10°15′ W. 610 kilometres from P. Alegre. Press, *Echo*. Post, telegraph, schools, 2 hotels. Steamer *Rio Grande* from Rio Grande and Pelotas on Mondays.

Proceeding from Pelotas, owing to bad coal,

time was lost, and at 11 p.m., the pilot having left a sailor at the wheel, the latter put the ship off her course, and ran her nose hard and fast on a sand-bank near Christovão Pereira light, about halfway to Porto Alegre. Here we stuck, a few metres from the shore, but fortunately on a level keel. S.O.S. messages were sent out promptly, and we resigned ourselves to wait patiently for help. Sundry Gaúchos or cowboys rode down to reconnoitre us, and vastly amused the foreigners aboard with their traditional poncho, wideawake hat, and bumbachas, or sort of loose trousers, etc. At 8 o'clock the next night the Costeira steamer passed us, and signalled her readiness to take off such of our passengers who would venture to row a couple of miles in the ship's boat. Nobody volunteered, and shortly before midnight three tugs came up from Rio Grande, and, after most tremendous efforts, dragged us off into deep water at 6 a.m.

We had, however, damaged the propeller, and, like a lame duck, were towed up the lake, and crawled ingloriously into port at night, 36 hours behind time, having eaten and drunk everything on board.

Rio Grande do Sul has a President, and an Assembly of 48 members, 3 Senators, and 16 Deputies representing the state in the Federal Capital.

There are Secretaries of Public Works, Finance, and Instruction.

Population in 1918 about two millions.

Wealth, per capita, 2,480 $000. The rateable value of the capital is 985,250 $000. Total wealth of state, 4,963,804 $000, of which about 25 per cent. is in live stock.

Individual property has doubled in value since 1908.

There is no foreign debt, and the internal loan absorbs only 3 per cent. of the revenue, and, as the Report of the Secretary of Finance for 1916 states, "In spite of progressive reduction in taxation, the sum obtained from this source constitutes a record."

As far as agricultural development is concerned, this state is right in the front rank, as the following figures will show, its pastoral resources being shown elsewhere.

The Italian colonies produced in 1916-1917 84,000 tons of wine, worth 16,800 contos. For the next harvests, estimates give:—

Wheat, 100,000 tons; barley, 13,850 tons; one hectare yielding 1,200 litres of grain, and to every 100 kilos of wheat there are 150 to 200 of straw. The future crop of potatoes should be 108,000 tons, that of maize 1,600,000 tons, more than all the rest of Brazil put together, S. Paulo, next on the list, reckoning 699,564 tons; but, as far as beans are concerned, leading Rio Grande, with 177,411 tons, against 65,000, Minas third, 31,777 tons. Rio Grande will harvest 125,000 tons of Mandioca meal.

As regards sugar, naturally none of the southern states can show any figures as high as Rio Janeiro (60,000 tons), S. Paulo calculating its crop at 32,310 tons, and Santa Catharina 10,500.

Total exports of Rio Grande do Sul amounted to 20,000 contos in 1916, as compared with 15,805 the previous year.

Rice is a new crop which presents very encouraging figures, S. Paulo expecting 157,680 tons of grain this year, and Rio Grande do Sul 120,000.

This state, with excellent transport facilities and

great markets close at hand (Buenos Aires and Montevideo), should be not more than 3 days' steam or rail from Rio Janeiro, given anything like reasonably fast services. Its river system is exceedingly valuable for the purpose of shipping colonial products, and money is well spent that is now being devoted to deepening of channels, harbour and buoying works.

Altogether, it cannot be doubted that there is a very great future before the whole of the south, favoured as it is by climate, natural riches, and all else that goes to make prosperity.

Porto Alegre struck me as being more in a state of transition than S. Paulo even, and vast changes are under way.

The entire population of the Municipality amounted to 150,525 persons of Brazilian birth, 9,136 Italians, 5,020 Germans, 4,020 Portuguese, and 3,121 Spaniards when the census was taken in 1916.

There were, at that time, 139 factories in the city, besides 88 workshops and 435 wholesale houses.

In Porto Alegre the elementary (public) school attendance in 1916 was 2,553, the colonial proportions being very much higher. Entire population of Germanic settlements, 79,000; scholars, 4,615. Italian colonies, 53,000; school-attendance, 3,397.

Taking the whole of the Federal Colonies into consideration, 18 per cent. of the children have scholastic facilities.

In Rio Grande do Sul, amongst the section of the population afflicted with insanity, Italians equal 49 per cent.; Poles, 11·90 per cent.; Germans, 10·20 per cent.; and Spaniards, 6·80 per cent. All other strangers, 22·10 per cent.

Taking the total number of Journals and Reviews, *without* regard to the number of inhabitants, we find: S. Paulo, 511; Minas Geraes, 395; The Federal District (Rio), 238; Rio State, 178; Bahia, 121; Rio Grande do Sul, 120; Santa Catharina, 81 (7th place); and Paraná (8th place) with 50.

The new Post and Telegraph office is a fine building, and several others are in course of construction, including the Customs House, which has, surmounting it, a huge figure of Atlas, and the inevitable globe.

The principal business street is Rua das Andradas, and, in its continuation, Rua da Independencia, most of the residences of the rich are to be found. Amongst the newspapers are *A Federação*, *Diario* and *Correio do Povo*. Hotels "Grande," "Moderne," "Lagache," "Metropole," "Familiar," "Schmidt."

In Praça Marechal Deodoro is the theatre and a fine monument to Julio de Castilhos, with new Government buildings, as yet unfinished, and behind, on the right, is the small but interesting State Museum.

Two other public squares, laid out with gardens, are Praça da Alfandega and Praça 15 de Novembro.

The city is rather badly lighted, and the paving leaves much to be desired, but, as I have said, everything is in course of improvement.

Behind, the suburbs stretch away for a long distance, and encroach on the lower slopes of the granite hills. This rock is so plentiful here that the fencing posts are mostly made of it, costing only 2$000 apiece.

Locusts had made their appearance in the city itself, and when I was there the sky was darkened

by them. They fell on our steamer in heaps whilst we were steaming up the lagoon, and immense damage was done all round this part of the country by the plague.

To add to the distress of the farmers and graziers the winter had been excessively dry, and most of the pasture was burned up or destroyed by the frosts.

Porto Alegre is going ahead with great strides, and a direct line of steamers is now running to Buenos Aires. Small vessels leave every day for one or other of a dozen thriving cities on the rivers near the capital. Amongst these are S. Sebastião do Cahy, 112 kilometres, a rising place. Population, 3,000. Hotel "Fett." Press, *Voz de Cahy*. Large conserve factory.

S. José do Norte.—Population, 1,000. On ocean side of Rio Grande Canal.

Mostardas, halfway to P. Alegre, and *Palmares*, further W., on the lake, are small places. *Torres*, a bathing place, 216 kilometres N. of P. Alegre, may come into prominence when the canal is opened, which will afford direct communication with the sea, and save many hours' journey *en route* to the state capital.

Rail from Rio Grande to Porto Alegre

Through trains run to *Bagé* on Monday, Wednesday and Friday nights at 4.30 p.m. Sleeping car attached. *Pelotas*, arrive 5.58 a.m.. *Candiota* for *Cacimbinhas* (60 kilometres from *Herval*). Press, *Novidades*. Population, 2,000. Post, telegraph, schools, hotels. *Piratiny*, 33 kilometres further on, 31°26′ S., 9°55′ W. Population, 1,500. Post, telegraph, etc. 165 kilometres to Caçapava.

Continue from Candiota to *Cerro Chato*, 10.35 p.m. Arrive Bagé 4.30 a.m. *Change*. Population, 20,000. Distance from Rio Grande, 280 kilometres. Fare, 30$000. Latitude, 31°20′ S., 11° W. Altitude, 207 metres. Temperature, 18·1° Centigrade. Hotels "Paris," "Brazil," etc. Press, *O Dever* and *Correio*. Hospital, theatre, cinemas, post, telegraph, colleges and schools. Continue to *S. Sebastião* station for *Pedrito*, 75 kilometres from Bagé and *Santa Anna do Livramento*, 235 kilometres across country, or N. to *Lavras* (17 kilometres to Bagé). Population, 2,000. Post, school, hotels, and *Caçapava*, 60 kilometres (across country). Latitude, 30°28′15″ S. Longitude, 11°53′49″ W. Press, *O Municipio*. Post, telegraph, schools. Population, 5,000. *S. Gabriel* (60 kilometres from Lavras by road). Arrive by rail at 6 p.m. Population, 10,000. Latitude, 30°17′ S. Press, *Diario*. Hotels "Grande," "Prado." Theatre, post, telegraph, colleges and schools.

Bagé, 131 kilometres. Average temperature, 18° Centigrade. Trains from Santa Maria (South bound) arrive at *S. Gabriel* 4.22 p.m., and Bagé 8.50 p.m. Continue from Bagé to *Rio Grande* 9.45 p.m., arrive (*Rio Grande*) 9.58 a.m. Continue N. to *Cacequy* junction, 113 kilometres to Santa Maria. Change for *Rosario*, 172 kilometres. Population, 5,000. 704 kilometres to *P. Alegre*. Latitude, 30°. Altitude, 126 metres. Press, *Rosairense*. Theatre, cinema, telephone, etc., etc., 2 hotels. On to *Livramento* (frontier station), 280 kilometres from Santa Maria. 11½ hours run. Altitude, 210 metres. Average temperature, 17·7° Centigrade. Press, *Debate*, *A Tarde*. Hotels "Brazil" and "Central." Garrison town. Telephone, theatre.

Population, 10,000. Adjoins *Rivera* (in Uruguay). Expresses to Montevideo 3 times weekly. Return at 6.30 a.m., or by through train (Sundays only) at 6 p.m., arriving at *Santa Maria* by this at 5.10 a.m. Monday. Change at *Cacequy* for *Alegrete*, 119 kilometres. 4 hours run. 5 $900. Population, 10,000. Press, *Gazeta*. Hotels "Central" and "Europa." Theatre, hospital, schools, etc.

Line under construction to *Quarahy*, 99 kilometres. Population, 5,000. Post, school, etc., etc. Continue from Alegrete to *Uruguayana* (frontier) on river Uruguay, 261 kilometres. Fare, 13 $. Hotels "Grande," "Moderno." Latitude, 29°45′18″ S. Longitude, 13°50′36″ W. Hospital, theatre, Custom House, telephone, post, telegraph, colleges and schools. Press, *A Nação*, *A Fronteira*. Population, 13,000. Fine public garden. Steamer service up and down stream. Rail south to *Quarahim*, 76 kilometres. Population, 4,000. Press, *Incentivo*. Hotel "Central." 3 hours run; and north to *Itaquy*, 100 kilometres. 11 $. Population, 6,000. Press, *A Ordem*. Hotel "do Commercio." The line ends at *Santa Borja*, 124 kilometres. Population, 5,000. Proceed to *Porto Alegre* from *Santa Maria*, 389 kilometres. (See reverse journey.) Arrive at the capital on 9.30 a.m. express from S. Paulo. The terminus is (1918) quite unworthy of the town, being tiny and dirty, inside and out, and situated in the most smelly part of the city.

Trains leave for the colonial centres of S. Leopoldo and Taquará several times daily, and the S. Paulo express on Tuesdays, Thursdays and Sundays at 4 p.m. The first stop of importance is *S. Leopoldo*, the capital of the older German colonies. Population, 10,000. Hotel "Kock." Press, *O*

Correio. Distance from P. Alegre, 34 kilometres. Fare, 2$800.

There is steamboat communication also with this town by the Rio dos Sinos. The branch line continues to *Taquará*, 89 kilometres. Fare, 8$. Time, 4¼ hours. Population, 3,500. Hotel "Lehn." Press, *Mundo Novo*. The same river is navigable to near the town. From here there is a road over the Serra do Mar to the state boundary.

Continuing by main line, we reach *Montenegro*, 76 kilometres, in 2 hours 43 minutes. Journal, *O Progresso*. Population, 1,000. There is a branch line from here to *Carlos Barboza*, 74 kilometres from the junction, 3 hours 40 minutes, and *Caxias*, 118 kilometres, 5 hours 50 minutes. Hotels "Globo," "Firenze," etc. Journal, *O Brasil*. Population, 5,000. This is the largest town in the Italian colonies, and has a great trade in wine, produced all over the district. One train daily from P. Alegre. Return at 7.25 a.m., arrive at the capital 5.15 p.m.

Bento Gonçalves lies to the W., a new line being finished from the station of *S. Salvador*. Population, 2,000. Two newspapers, *Correio d'Italia* and *O Estado*. This railway will run to Alfredo Chaves, and perhaps further north-west.

Vaccaria, already mentioned, lies 215 kilometres from P. Alegre.

There are steamboat services from the capital to *Triumpho*, 72 kilometres up the Jacuhy river, and to *S. Jeronymo* (coal mines) on the opposite right bank. Population, 2,000. A local line runs from the wharf to the town. From Triumpho small steamers ascend the *Taquary* to the town of this name, 119 kilometres, also up to *Estrella* (Hotel "Boelter").

Venancio Ayres, opposite the latter place, is 132 kilometres from the capital. Population, 1,000. Hotel "Myllus." A road extends from here to *Soledada*, 376 kilometres, and an electric railway was supposed to have been in operation to this town years ago, but only exists on paper.

This isolated place boasts of a newspaper, *O Butucary*. Hotel "Serrano." There is an Indian reserve near by. Continue by main line to *Couto*, 204 kilometres; 7 hrs. 22 min. Change for *Santa Cruz*. Depart from Couto, 2.40 p.m. Arrive 4 p.m., 218 kilometres. Population, 4,000. Hotel "Wegner." Leave for P. Alegre at 10 a.m. Arrive 7.30 p.m. Main line to *Rio Pardo*, 208 kilometres. Hotel, "Viajantes." *Cachoeira*, 274 kilometres. Arrive 1.52 a.m. Population, 8,000. Hotel, "Allianca." Press, *Commercio*. Hospital, theatre, schools, post and telegraph. *Santa Maria Da Bocca Do Monte*, 389 kilometres. Population, 16,000. Great railway centre. Press, *Correio*. Hotels, "Hambourgo," "Müller," etc. Hospital, theatre, fine square, colleges, schools, etc. Altitude, 114 metres. Temperature, 20° centigrade. Arrive from P. Alegre, 6 a.m.; S. Paulo, 7.15 p.m. Fare to P. Alegre, 14 $500; to *Marcellino Ramos*, end of Rio Grande railways, 36 $800, 536 kilometres. The northern express leaves Santa Maria at 6.30 a.m. (Mondays) and has sleeping and restaurant cars attached, and sleeping car only on Wednesday.

Towns lying off the railway include *Dores de Camaquam*, S.W. of P. Alegre, 105 kilometres. Population, 2,000. Post, telegraph, school, hotels. *Encruzilhada*, 314 kilometres from the capital. Population, 3,500. Latitude, 31°34′8″ S.

Press, *A Encruzilhada*. Post, telephone, telegraph, hotel, "Mandelski," schools, bank, etc. West from Alegrete, rail projected, is *S. Thiago*, population, 2,000. Press, *Farrapo*. To Cruz Alta, 171 kilometres. Post, telegraph, schools, cinema, etc. *S. Luiz Gonzaga*. Latitude, 28°25′26″ S. Longitude, 14°46′25″ W. Population, 5,000. Press, *A Verdade*. Hotels, "Langsch" and "Brizolla." Post, telegraph, etc.; 99 kilometres to S. Thiago.

Proceed from Santa Maria, the line rising in beautiful curves, to *Julio da Castilhos*, 73 kilometres, 3 hrs. 6 min.; 42 kilometres to P. Alegre. *Cruz Alta*, 162 kilometres; 6 hrs. 10 min. Population, 6,000. Altitude, 450 metres. 528 kilometres to the capital. Latitude, 28°36′30° S. Longitude, 10°26′7″ W. Press, "Cruz Alta." Theatre, post, telegraph, schools, 4 hotels. Change for *Ijuhy*, population, 2,000. Post, telegraph, etc. *Rio Branco*, 76 kilometres. Population, 1,000. One train each way 3 times weekly. *Carasinha*, buffet (on paper only in 1917), by main line from Cruz Alta, arrive 6 p.m. Returning from the south, by the first express, after a great strike, and having no restaurant car on the train, we were overcharged in the most outrageous fashion by the colonists. *Passo Fundo*, population 4,000. Altitude, 700 metres. Average temperature, 18 centigrade. Hotel, "Familiar." Press, *O Gaucho*. Latitude, 28°13′. Longitude, 9°26″ W. Fare from Santa Maria 21 $200. Distance, 365 kilometres. Continue to *Erechim* and *Erebango*, stations for the Colonial centres; buffet at the latter; arrive at 11.40 p.m. *Marcellino Ramos*, last station in the state, 536 kilometres; 36 $800 from Santa Maria. The whole

of the line from the capital was in the most disgraceful condition, no stone ballasting, and no fewer than three derailments occurring within 24 hours. Add to these, I hope, abnormal happenings, the constant clouds of red-brown dust, and the pyrotechnic displays from the engine chimney, rendered it almost impossible to open doors or windows, the floor of our sleeping car being an inch deep in slime, after a rain storm en route. I carry a permanent reminder of this journey, in the form of a scar, where a blazing fragment of wood, penetrating by some means into the carriage, fell on my arm and burned coat, shirt and undervest. Arrive *M. Ramos* at 4.40 a.m. Depart for S. Paulo, 5 a.m. Arrive from S. Paulo at 8.30 p.m. on Monday, Wednesday and Friday. Buffet at the station, like all the others, badly provided and dear. Once more in the State of Santa Catharina, and a marked difference in the condition of the line and rate of travel, in spite of the rapid rise. Here the River Uruguay is crossed, and, near by, the stream, 400 metres wide, suddenly narrows to an S-shaped funnel, not over 3 metres in width, and down which the whole volume of the water rushes with incredible swiftness. First station, *Rio Uruguay*, 6 kilometres. The permanent way is now splendidly ballasted with basalt, which crops out all along the valley of the Rio do Peixe, by which the line makes its way N.E. (see Mineralogy). From *Herval*, 101 kilometres, the ascent is rapid to *Calmon*, 290 kilometres, and *S. João*, 316 kilometres. Altitude, 1,201 metres. Down gradients are met with from here. *Nova Galicia*, 340 kilometres, is 1,083 metres, and we arrive at the N. boundary of the state at *União da Victoria*, 369 kilometres, on the

Iguassu river. The whole of this long stretch has hardly any population, although many small colonial centres are found dotted along the line, and wooden houses springing up in the clearings round the stations. The splendid Araucarias form veritable forests, and the 15 hours run from M. Ramos is through groves of these majestic trees. Taking in parts of the two states N. and S. of S. Catharina, one may say that there is a good 1,000 kilometres of line without a single town worthy of the name.

Depart from U. da Victoria, at 7.44 p.m., Tuesday, Thursday and Saturday, for S. Paulo. Arrive from S. Paulo at 5.35 a.m. on alternate days.

Iraty, the first stop of any note in Paraná, Arrive at 2 a.m. Population, 1,500. Cinema, post, telegraph, Colonial schools, saw mills. Hotel "Schmidt." The whole of this region is occupied by the Araucaria and Maté (Ilex Paraguayensis). M. Ramos, 525 kilometres. On to *Ponta Grossa*, 633 kilometres. Arrive, 6.39 a.m. Depart for S. Paulo, 6.59 a.m. *Carambehy*, 666 kilometres, 8.04 a.m. Celebrated for its cheese. *Castro*, 689 kilometres, 8.57 a.m., and *Itarare* (S. Paulo state), 3.45 p.m. Depart, 4 p.m. 885 kilometres from M. Ramos.

From *Miguel Calmon* station, tracks lead W. to Palmas, a couple of days' ride on horseback. Latitude, 26°17′ S. Longitude, 8°49′ W. Average temperature, 15° centigrade. Altitude, 1,160 metres. Press, *O Palmense*. Theatre, post, telegraph, public and private schools, 2 hotels. *Clevelandia* is still further in the wilds. Population 1,000. Post, telegraph, schools. *Guarapuava*, population, 5,000. Altitude, 1,365 metres. Temp-

erature, 16° centigrade. Post, telegraph, cinema, schools. Hotel, "Cordeiro," 300 kilometres W. of Curityba. A line of rail is projected from Ponta Grossa, and another down the Iguassú Valley, from U. da Victoria to the Paraná River, when the famous falls of Santa Maria, and the cataracts, will be accessible in 3 or 4 days from Rio Janeiro.

The Iguassú Falls

This world's wonder, the mightiest demonstration of hydraulic possibilities in creation, may be visited from Uruguayana. Train from the Uruguay side to *Posadas*, on the Paraná, opposite the Paraguayan town of *Encarnación*. Steamers run in connexion, about twice a month, the round trip taking 8 to 10 days.

From *Villa Iguassú* (hotel with electric light, etc.), on the Upper Paraná, there is a good road for motor cars to the falls.

The train journey costs 19½ pesos, and the return steamer fare, 54. There are small hotels at the falls themselves, on the Argentine and Brazilian sides.

Here, the Iguassú rushes through a narrow neck or canõn, termed, appropriately, "Garganta (throat) do Diabo," precipitating itself from a great height over the Santa Maria, Union, and other splendid falls. Before reaching here the river is wide, and at the chute itself forms a horse-shoe bend, Brazil occupying the inner space on the N., S.-E. and W. being in Argentina. Below the falls the stream is greatly narrowed, and runs on to join the Paraná, by a continual series of cataracts (see Waterfalls).

Continue by rail from Itararé, main line northwards towards S. Paulo.

The express arrives at Faxina at 7 p.m. Itapetininga, 11.55 p.m.; Boituva, 2.33 a.m. and S. Paulo at 7.30 a.m. Dining car on day express from Luz station, to Rio, at 7. a.m., or sleeping cars with buffet on night express, leaving S. Paulo, at 7.30, or on train *de luxe*, at 9.05 p.m.

Arrive Mogy Das Cruzes, 51 kilometres, 1 hr. 17 min. Altitude, 737 metres. Jacarehy, 92 kilometres, 2 hrs. 4 min. Altitude, 562 metres. *S. José dos Campos*, 108 kilometres; 2 hrs. 31 min. Altitude, 594 metres. *Taubaté*, 154 kilometres in 3½ hrs. Altitude, 585 metres. Latitude, 22°54′ S. Population, 10,000. Hotel, "Pereira." Press, *Jornal. Pindamonhangaba*, 173 kilometres. Altitude, 552 metres. Latitude, 22°58′. Longitude, 2°19 W. Population, 10,000. Four hrs. run. Fare, 16 $. Agricultural College. Press, *Folha do Norte*. Hotels. Electric railway to *Campos de Jordão* (Villa Jaguaribe). Altitude, 1,600 metres. English Pension. 164 cloudless days in the year. Average temperature (lowest in Brazil) 13.1 centigrade. Telephone to Pindamonhangaba. Continue by Central railway to *Guaratinguetá*, 203 kilometres. Altitude, 527 metres. Four hrs. 43 min. Population, 9,000. Press, *Correio Popular*, *Norte de S. Paulo*. Hospital, theatre, cinema, post, telephone, telegraph, colleges and schools. Hotels, "Freire," "Norte," etc. *Lorena*, 218 kilometres, Altitude, 537 metres. Population, 8,000. Hotel, "Paiva." Press, *Gazeta*, *Semana*. Theatre, cinema, schools, etc. *Cachoeira*, 233 kilometres. Altitude, 520 metres. Five hrs. 17 min. run. *Cruzeiro Junction*, 246 kilometres, 21 $800. Arrive by day express at 12.37 p.m., (see Sul Mineira railway). Population, 3,000. Press; *Correio*. Post,

etc. *Queluz*, 271 kilometres, 1.14 p.m. Population, 5,000. Press, *A Palavra*, *O Lyric*. Hospital theatre, cinema, post, telegraph, schools. Hotel, "Central."

Itatiaia, State of Rio, 288 kilometres. *Campo Bello*, 305 kilometres. Arrive, 1.40 p.m. Visit the mountain and return to Rio or S. Paulo next day. Continue to Rio at 1.45 p.m. or 2.18 a.m. Fare from S. Paulo, 25 $500; from Rio, about 15 $. Continue to *Rezende*, 308 kilometres, and *Barra Mansa*, 345 kilometres. Fare from S. Paulo, 29 $100. *Barra do Pirahy*, 390 kilometres, 32 $300. *Belem*, 437 kilometres, 35 $700. Arrive, 5.05 p.m. *Cascadura*, first suburban station, with electric cars to Rio, 483 kilometres. Arrive, 6.04 p.m. *Rio Janeiro*, 498 kilometres. Arrive, 6.22 p.m. Fare, 40 $100.

Telephone communication is now available with nearly the whole of S. Paulo State. Capital to capital, initial fee, 8 $000.

APPENDIX I

Wages and Cost of Living

Day Wages, Rio Janeiro, 1913

Daily

Smith, 6 to 10 milreis.
Millhand, 5 to 10 milreis.
Leather worker, up to 10 milreis.
Scalemaker, 9 milreis.
Glass blower, up to 20 milreis.
Brick and tile maker, 8 milreis.
Baker, 8 milreis.
Brewer, 12 milreis.
Hatter, 8 milreis.
Shoemaker, 8 milreis.
Cabinet maker, 10 milreis.
Founder, 10 milreis.
Painter, 6 to 15 milreis.
Tram conductor, 6 to 8 milreis.
Day labourers, 2½ to 3 milreis.
Gardeners, 3 to 5 milreis.
Turners, 6 to 8 milreis.
Tailors, 4 to 8 milreis.
Printers, 6 to 10 milreis.
Masons, etc., 5 to 10 milreis.
Carpenters, 4$ to 7$.
Litho printers, 10$ to 15$.
Mechanics, 8$ to 15$.
Plumbers, 5$ to 12$.
Saddlers, 5$ to 6$.
Glaziers, 6$ to 8$.
Sawyers, 7$ to 10$.
Stone Cutters, 7$ to 10$
Patters, 5$ to 7$.
Watchmakers, 10$ to 20$.
Brickmakers, 3$ to 7$.
Coopers, 7$ to 10$.

MONTHLY

Clerk, junior, 100 to 200 milreis.
Bookkeper or cashier, 200 to 600 milreis.
Shop assistant, 60 to 500 milreis (without lodging) with board.
Civil guard, 150 to 250 milreis.
Nurse girl, 15 to 40 milreis.
Foreign nurse, 60 to 120 milreis.
Wet nurse, 50 to 150 milreis.
Postman, 100 to 300 milreis.
Baker, 150 $.
Police, 120 to 200 milreis.
Seamen, 80 to 100 milreis.
Ship's Steward, 40 to 60 milreis.
Man servant, 50 to 120 milreis.
Male cook, 50 to 200 milreis.
Female cook, 30 to 100 milreis.
General servant, 15 to 50 milreis.
Butcher, 100 with board and lodging.
Motor bus drivers, 100 $ to 200 $.
Electricians, 150 $ to 400 $.
Jewellers, 300 $ to 400 $.
Gardeners, (board and lodging, 100 $ to 300 $.
Hairdressers, 90 $ to 150 $.
Brewers, 100 $ to 150 $.
Tailors' cutters, 200 $ to 800 $.

(2) SÃO PAULO (1913)

SALARIES

	From	To
Tanners	5 $	6 $ daily
Hatters	5 $	,,
Sculptors	10 $	15 $,,
Founders	5 $	6 $,,
Blacksmiths	6 $	8 $,,
French polishers	3 $	4 $,,

	From	To
Lithographers	5 $	6 $ daily
Chauffeurs	5 $	6 $,,
Engine drivers	7 $	10 $,,
Watchmakers	5 $	6 $,,
Painters	6 $	7 $,,
Masons	6 $	8 $,,
Other trades (average)	5 $	8 $,,
Foremen	200 $	400 $ monthly
Tailors (*idem*)	150 $	200 $,,
Electricians	200 $	250 $,,
Chauffeurs	*idem*	*idem*

Women's Wages, Rio (1916)

Shop assistant (outdoors), 70 $—100 $ monthly.
Modiste, 200 $ to 300 $.
Manageress, 400 $ to 800 $.
Typist, 200 $; telephone operator, 80 $ (6 hours daily).
Junior teacher, 100 $; senior, to 250 $.
Postmistress, 250 $.
Piece work: 1 doz. shirts, 4 $—8 $.
,, 1 ,, pants, 3 $600.
1 sack (canvas), 300 reis.

Wages in Curityba and Porto Alegre are somewhat higher in the case of skilled labour, and the cost of living considerably less, at least as far as prime necessities go.

Day wages in the small towns usually less than in Rio or S. Paulo.

Cost of Living (1913)

In the Alto Juruá in 1901, a kilo of beef cost 3 $000; a chicken, 20 $000; eggs, from 500 reis to

1$000 each. Probably prices are less to-day, but in any case they are still very high.

In Manáos beef costs up to 2$500 a kilo; sugar (ordinary), 800 reis upwards; butter, 2$500 the half kilo; beer from Pará, 45$000 the two dozen bottles; potatoes (Portuguese), 10$000 for 30 kilos; rice, 8$000 the 30 kilos; salt (English), 4$000 for 50 kilos; coffee (ordinary), 1$000 the kilo; Pirarucú flesh, 800 reis to 1$000 a kilo; chickens, 10$000 to 15$000 each; port, brandy, etc., 10$000 to 12$000 a bottle; alcohol, the litre, 800 reis; wine (Rio Grande do Sul), 800 reis a litre.

In Pará prices are somewhat less.

Maranhão (S. Luiz).—Beef, 1$000; pork, 1$100; mutton, 1$600; rice (common), 200 reis; tapioca, 200 reis; maize, 100 reis; beans, 250 reis a kilo; small chickens, 600 reis; large chickens, 1$600 each; ducks, 1$000; turkeys, 4$500 each; spirits up to 22 per cent., 300 reis a litre; sugar (first quality), 450 reis a kilo; lard, 1$000 a kilo; coffee, 1$000 a kilo; and bread, 500 reis a kilo. (December, 1912.)

In Maceió: Beef, 1$000; pork, 1$000, and mutton, 1$600 a kilo; lard is 1$200; fresh fish, 1$400; eggs, three for 200 reis; large folws (?), 2$000 each; first quality sugar, 4$000 the 15 kilos; rice, 4$300 the 10 litres; beans, 3$600 the 10 litres. (April, 1913.)

In July (1913) prices in Bello Horizonte (Minas Geraes) ruled as follows: Ordinary cane spirit, 80 litres, 21$000; sugar, 15 kilos, 4$500; cooking oil, 500 reis a litre; English potatoes (15 kilos), 5$500; sweet potatoes, 1$500; coffee, 7$000; dried beef, 9$500; mandioca meal (50 litres), 4$500; beans, 13$000; chickens, a dozen, 14$000; fowls, 16$000 a dozen; sucking pigs, 10$000 each; 50 litres

of maize, 4 $800; butter, (10 kilos), 28 $000; eggs, 900 reis a dozen.

In Porto Alegre in 1913 lard was 1 $000 to 1 $250 a kilo; butter, 1 $800 a kilo; eggs, 600 reis a dozen; and potatoes, 5 $000 a sack of 60 kilos.

In São Paulo milk cost from 250 to 300 reis a litre; butter, 2 $500 to 3 $500; beef, 500 to 800 reis; mutton, 1 $000; and pork, 1 $000 a kilo; whilst eggs were 1 $000 a dozen.

Hotel prices, 6 to 15 milreis daily, according to class.

Pension rates (with room), 150 $ to 300 $000 monthly.

Average increase from 1887 to 1912: Food, 671 per cent.; clothes, 537 per cent.; household goods, 611 per cent.; medicines, 1,940 per cent. All-round average, 940 per cent.

PRICES IN RIO DE JANEIRO[1]

	1889.	1912.
Rice, per sack	7 $500-15 $000	17 $000-32 $000
Bacalhão (stock fish) per case	15 $000-24 $000	36 $000-50 $000
Charque (Salt and dried beef) per kilo	190-300 reis	600-940 reis
Black beans, per sack	8 $000-10 $000	9 $500-33 $000
Mandioca meal, per sack	4 $500-11 $000	6 $500-9 $500
Sugar, per kilo	170-360 reis	330-730 reis
Lard, per kilo	1 $000-1 $200	1 $150-1 $250
Flour, per sack or barrel	11 $500-15 $500	22 $000-24 $000
Maize, per sack or barrel	6 $500-8 $000	10 $500-15 $200

Prices in Rio de Janeiro

Price per 100 kilos

(Rio Janeiro) *Maximum*	1913	1914	1915	1916
Mandioca .	22 $200	17 $800	13 $300	32 $900
Beans . .	36 $700	41 $700	51 $700	41 $700
Maize . .	11 $300	15 $300	14 $200	21 $000
Rice . .	50 $000	43 $300	58 $300	68 $300

Decimal Proportions.

	1890	1915	1916
Rice . .	7·542	22·805	11·446
Sugar . .	·222	·217	·287
Maize . .	3·436	4·189	3·200
Beans . .	6·704	12·566	9·335

Percentage Dearer in 1916 (*over* 1911)

Rice, 89 per cent.; potatoes, 35 per cent.; mandioca, 52 per cent.; beans, 74 per cent.; maize, 63 per cent.; wheat flour, 18 per cent.; stock fish (bacalhão), 98 per cent.; lard, 14 per cent.; charque, 76 per cent.; butter, 6 per cent. Average increase, 50 per cent.

Decimal Prices Increase

From 1917 (*January*) *to* 1918 (*January*)

Rice, 15 to 46; sugar, 30 to 58; lard, 48 to 126; potatoes, 12 to 20; beans, 12 to 32; butter, 16 to 35; and salt meat, 940 to 1,500.

Refined sugar is now 24 cents gold the kilo, or almost London prices, bread (cheapest) is 16 cents. the kilo; beefsteak, 30 cents; and butter, 130 cents.

Coffee is 10 per cent. dearer; tea over 50 per cent. Petroleum nearly double 1914 prices.

A kilo of beans, costing 340 reis in Porto Alegre, fetches 700 reis in Rio; rice costs 560 and 900 reis, and Mandioca 350 and 600 reis, respectively.

The contrast is, however, flagrant, if one compares Rio Janeiro and the Acre Territory. In 1916, the difference was as follows *for wholesale rates*:—Beans, 500 and 2 $500 per kilo; petroleum (case of two tins), 10 $000—100 $000; rice, per sack, 35 $ and 180 $000; salt (30 kilos), 3 $—30 $000; charque, 1 $000 and 4 $000.

Wholesale Rates 1918 (*Rio*)

Beans (60 kilos), 30 $ to 35 $; butter (kilo), 3 $800; fat bacon (kilo), 1 $280; rice (average) (60 kilos), 36 $000; onions (100 kilos), 5 $000; potatoes (kilo), 340 reis; mandioca (45 kilos), 19 $ to 27 $000.

Bahia Prices (*December* 1917)

Alcohol (litre), 700 reis; rice, 32 $000 per sack; sugar (kilo), 660 reis; pea nuts (litre) 280 reis; potatoes (kilo), 500 reis; bacalhão, 1 $700; lard, 1 $600; cocoa (10 kilos) 9 $200; coffee, idem, 8 $000; dried meat, 1 $600 kilo; beans (sack), 24 $000; mandicoa, 18 $000; tobacco, in roll (kilo), 1 $200; maize (sack), 10 $000; salt (litre), 140 reis.

Colonists in S. Paulo and Minas have profited immensely by the rise in prices, many having made £1,000 to £1,500 out of their small crops, in addition to their wages in the coffee zone of the former state. Wages have not, however, risen to any extent.

Petroleum was in July, 1914, 180 reis a bottle; in 1918, 700 reis.

S. Paulo (end of 1918) Decimal Percentage

	Cost to Produce	Sold Retail
Maize	087 kilo	137 kilo
Beans	156 "	450 "
Rice	324 "	700 "
Potatoes	162 "	300 "
Mandioca	123 "	500 "

S. Paulo. Cost of Food to Government

(For Immigrants' Hostel)

	1914	1918
Oil (Olive)	2 $600 Litre	10 $000
Rice, 1915, 500 reis, kilo, 1918 (3rd quarter)		600 reis
Sugar	470 reis	900 reis
Lard	1 $300 "	2 $000 "
Beef	460 "	750 "
Macaroni	420 "	900 "
Butter	3 $200 "	4 $500 "
Bread	380 "	700 "
Coffee	600 "	700 "
Potatoes	280 "	350 "

Average increase on articles of prime necessity, 85 per cent. On hospital stores, 66 per cent.

Official Maximum Prices, Rio (January, 1919)

Fat chickens, 1 $800; hens up to 3 $000; eggs, dozen, 1 $100; lemons, 50 to 100 reis each; pirarucú, (dried) fish, 2 $100 kilo; fresh fish, finest in cuts (clean), 4 $000; 2nd quality, 2 $500; *large* prawns (*monsters*), 5 $000 kilo; small, 2 $500.

Prices of all common remedies, at the drug stores, especially those for grippe, etc., were (temporarily) fixed by law (October-December, 1918).

January, 1919.—The Food Commissioner with his staff has been transferred to the Agricultural Department, having from June to December, 1918, possessed independent powers, conferred by the President. Congress having suppressed this department the Vice-President, Dr. Delfim Moreira, vetoed the resolution, in January, 1919.

Prices of Clothing (1918)

Men's Garments, Etc.

Lounge suits, all wool, from 140 to 220 milreis; morning coat suits, 180 to 280 milreis; dinner jacket suits, 200 to 300 milreis; evening dress, 300 to 400 milreis; overcoats (Cheviot), 100 to 150 milreis; waterproofs, 60 to 150 milreis; cheaper suits, in mixtures, from 80 milreis; in drills, etc., from 35 milreis; dressing gowns, all wool, from 90 to 180 milreis; straw hats, 6 to 18 milreis; felt hats, 15 to 30 milreis; Panamas, from 45 to 500 milreis; bowlers, from 20 to 30 milreis; silk hats and crush hats, from 40 to 60 milreis; shirts, 5$ to 25$; undervests, 3$ to 20$; pants, 4$ to 20$; socks, 1$500 to 6$000; ties, 2$ to 6$; collars, 1$ to 2$; cuffs, 1$500 to 2$500; braces, 2$ to 5$; gloves, up to 10$; suspenders, 1$500 to 4$; scarves, 5$ to 10$; umbrellas, 10$ to 60$; walking sticks, 10$ to 50$; handkerchiefs, $500 to 5$000; boots and shoes, 15$ to 45$000, children's much dearer in proportion to European prices.

Ladies' Garments

From the (June, 1918) catalogue of the largest store in Rio:—Costumes, 75$, 105$ and 220$; hats, 25$, 55$, 85$; mantles, 48$ to 75$; capes,

Gymnasium, Academy of Commerce and Lyceum, and there are several other colleges.

Football and regatta clubs and a skating rink appeal to the athletic visitor. *A Tribuna* is the leading journal.

Santos is the birthplace of the first aeronautist, Father Bartholomeu de Gusmão. Most of the foreign steamship companies have agencies in the town.

In Praça Rosario is the post office, the cathedral and tramway terminus. From here starts Rua S. Antonio, leading to the railway station. Cabs cost 4 $000 per hour, motors and taxis 10 $ to 15 $. Porters (*carregadors*) charge for hand baggage from quay to São Paulo railway station, 1 $ to 2 $. For several packages on a handcart, 3 $ to 5 $. Express messengers for letters and small parcels charge, per packet in the city, 400 reis; shoe blacks, 200 reis. Hotels include: "Sportsman" (Rua 15 de Novembro), 10 $ to 12 $; "Bristol" Rua S. Antonio), 10 $; "Washington" (Praça da Republica), and "America" (Rua 15 de Novembro), from 8 $ daily.

The "Palace Hotel" is situated somewhat out of the town, on the beach at José Menino, by tram 300 reis. Sea baths available here and at the "Grande Hotel Internacional." Rates from 10 $ to 20 $ daily.

The great resort is at Guarajú, hourly service (tram and boat) most of the year. Return, 2 $. The "Grand Hotel" (opened 1912) has 220 rooms. Rate, 12 $. There is also casino, etc., in connexion.

The principal restaurants in the city are: "Sportsman" and "Nieto Condé" (Praça da Republica).

The Western Telegraph Company is in Praça 11 de Junho. National Telegraphic Station, Rua 24 de Maio. American Consulate, Rua 15 de Novembro. British Consulate, Rua Frei Gaspar, No. 1011. French Consulate, Praça 11 de Junho, No. 3.

Santos lies in 23°58′ S. latitude, and has an average annual temperature of 21·5° Centigrade. Its population is now about 80,000.

Before the war, total entries of shipping amounted to nearly 4,500,000 tons in a single year.

The Southern Railway runs to Juquiá, 150 kilometres, in the rice producing district. A little south of the present terminus is Séte Barras, on the Ribeira do Iguapé, and below this the town of Xiririca, on the same river, with steamers every week to the sea, at Iguapé, 116 kilometres by water, or 86 by road. The rail head at Juquia may be reached by boat in 12 hours (6 p.m.) Population of Xiririca, 4,000. Has post, telegraph, school, and some small hotels.

At *Yporanga*, 66 kilometres up stream by canoe, population 2,000, there are some famous limestone caverns, with remarkable stalagmites and stalagtites, especially in the Monjolinho and Santo Antonio caves, gypsum formations exhibiting the most wonderful and beautiful forms. According to a naturalist, Richard Krone, one monstrous stalagtite in the former cavern weighs 54 tons, and its age is reckoned at 25,000 years. 41 of these caves were examined by Senhor Krone in 1908, and the state has resolved to consider them a national asset.

Further south is *Apiahy*. Latitude, 24°23′26″ S. 40 kilometres from Xiririca. Post, school, etc.

Cananéa.—Population, 3,000. 25° S. Post, tele-

graph, schools. *Serro Azul* lies inland, near the Paraná boundary. *Iguapé* has 3,000 population. Latitude, 24°35′ S. 320 kilometres from S. Paulo. Press, *Tribuna*. Cinema, hospital, post, telegraph, schools. Hotels "Commercio" and "S. Paulo."

Trains leave Santos for S. Paulo many times during the day, the journey taking something over two hours. Distance, 79 kilometres. Single fare, 5 $700. The line is double the whole way, and the rolling stock and track kept in the most perfect order. Owing to dividends being limited by the State, the S. Paulo Railway Company expends its surplus profits on the maintenance of a general level of excellence unknown elsewhere in Brazil.

There are 13 tunnels on the way to the capital.

One arrives at a terminus of which any city might be proud, and undoubtedly the finest in the country; there are, perhaps, none equalling it in any other S. American Republic. It covers an area of 7,520 square metres.

S. Paulo time is 13 minutes behind that of Rio Janeiro. Latitude, 23°34′ S. Longitude, 3°28′30″ W. of Rio.

The State has three distinct climates. First, the hot coastal zone, extends the whole length of the littoral; then the cooler, but damp Serra do Mar, forming a narrow fringe, parallel with the coast; and lastly, the high lands of the interior, drier, and perhaps hotter in summer, but with a well-defined winter.

Dr. Paulo Rangel Pestana, "O Estado de S. Paulo e seu progresso, 1917," says: The density of population in 1890 was 5·47 per square kilometre;

it is now 13·21. In 1891 there were 2,894 kilometres of railway, and in 1915, 6,277 kilometres.

The area cultivated in 1894 amounted to 561,855 hectares, and in 1915 nearly 2,000,000. Total value of produce in 1910-1911 was 338,244 contos of reis, and in 1915-1916, 569,609 contos. Manufactures in 1900 were worth 69,752 contos, and in 1915, 274,147. Foreign commerce in 1900 equalled £12,000,000, and in 1915 double this sum.

The balance for 1917, presented to the President the 29th of April (1918), is worthy of careful attention.

Exports from Santos and by the Central Railway (to Rio), etc., reached record figures, amounting to 746,316,533 $000. Of this sum (*equal to £38,000,000*), coffee accounted for 274,770,622 $000, and cotton, 158,463,312 $000.

Foreign trade (exports) reached 422,334,512, $000, more than a third of that of all Brazil.

Receipts were 82,556,094 $000 (another record), 18,798,997, $000 being spent on public instruction.

Rural property in S. Paulo is mostly divided between the following different nationalities, as far as foreigners are concerned:—

	Number of properties	Area	Value in contos of reis
British	25	29,791 hectares	12,921
German	675	60,776 ,,	29,791
Portuguese	1,607	130,787 ,,	32,814
Italian	5,197	192,021 ,,	48,395

As far as urban interests are concerned, Italians are easily first now, although only second (as the following table shows) in 1913, immense development having taken place, especially in industries.

Italians	own 23,520	lots, of a value of	113,234	contos	
Portuguese	„ 12,834	„	„ 118,005	„	
Germans	„ 3,498	„	„ 41,926	„	
Spaniards	„ 1,488	„	„ 8,628	„	
Syrian	„ 619	„	„ 3,728	„	
French	„ 464	„	„ 7,246	„	
British	„ 80	„	„ 4,723	„	
Other nationalities	„ 1,327	„	„ 14,158	„	
Total,	43,830 proprietors,		Value, 318,648	contos	

One German-born farmer, Colonel Schmidt, is known as the Coffee King. He owns 32 estates, containing 8 million trees, yielding 300,000 tons yearly, and employs 10,000 persons in different enterprises. His net income from interest on capital alone is presumed to amount to £250,000 yearly.

S. Paulo city takes its name from the fact that the first mass was celebrated on the site, the anniversary of the conversion of St. Paul.

Founded on that day (25th of January, 1554), it became capital of the province in 1815 only.

The population of this city is now over 500,000, and it is increasing at the rate of at least 40,000 annually.

The architecture of this city is largely Italian, and the language of Dante is heard everywhere, in accents which belong in most cases to the Neapolitan, Calabrese and Sicilian.

It is a city in the making, rather than in being, and, with its European climate and cosmopolitan activity, will doubtless outstrip Rio Janeiro some day. There are three railways running through it, and a fine service of electric tramcars. Prominent amongst the public buildings is the Opera House, inaugurated in September, 1911, by a company under the leadership of the celebrated baritone,

"Titto Ruffo," whilst Caruso, the Russian ballet (with Nijinski), etc., appeared in 1917, and Pavlova will give a series of representations this year.

S. José Theatre is in front of the Opera House, and others worth visiting include Santa Anna (Rua Bôa Vista) and the Polytheama (Rua S. João), prices varying from 1 $500 to 5 $000 per seat. When first-rate foreign stars are at the Opera House, GALLERY rates as high as 10 $000.

The Opera House belongs to the Municipality, and occupies a fine site in the triangle formed just below the junction of Ruas Direita, 15 de Novembro and S Bento. The orchestra is invisible to the audience, and numbers 120, when at full strength.

Ypiranga Museum.—This splendid building is situated on the site where the Regent (Dom Pedro I) proclaimed the independence of Brazil, on his return from Santos, where he had received orders from the mother country, which would, if carried out, have proved a death blow to the aspirations of the colony. The edifice is about half an hour from town (Line No. 4). It was finished in 1890, and cost a huge sum. Length over 400 feet. Taking second rank amongst Brazilian museums, it is, however, quite on a par with that of Rio Janeiro, from a scientific point of view.

In the conference chamber is a picture by Pedro America, representing the historical scene mentioned, with the cry of the Regent, "Independencia ou Morte," for title. This event took place on September the 7th, 1822.

This museum has a special value, in being purely Brazilian, and its collection of national fauna, nearly everything in duplicate, is especially valuable. The arrangement of groups of wild animals is

admirable, and the late Director and his assistants deserve great credit for the work.

I shall always remember the kind welcome I received there in 1913. No trouble was too much, and Senhor Von Ihering and son both laid themselves out to satisfy my enquiries. The library contains 10,000 books, including many first editions. There is a small restaurant in the garden.

A trial ground is attached, where many exotic plants are successfully cultivated.

The Museum is opened on Thursdays and Sundays to the general public, and it is in the vicinity that the centre of the great Centenary celebrations will take place in 1922.

The Experimental Station of the Forestry Service is on the Cantareira tram line, and another exists at Alto da Serra, on the way to Santos.

The Institute Pasteur in Avenida Paulista, the Santa Casa (Misericordia Hospital), in Rua Cesario Motta, Alms House, Lunatic Asylum, Schools of Pharmacy, Dentistry and Commerce, the Polytechnic, the Lyceum of the Sacred Heart, Jockey Club, Faculty of Law, Normal School and various government offices. The Anglo-Brazilian College has 300 pupils, and the Mackenzie College (American) 900. The latter gives a very complete education on secular lines if desired.

Elementary education is carried out on really scientific lines in São Paulo, and the health and hygiene of the pupils is attended to carefully, medical examination being carried out by four doctors specially devoted to this work in the city free schools. Weights and heights and condition of organs are taken regularly. Gymnastics are permitted only according to the physical powers of

the child. Everything is subject to medical sanction; regulations even defining the size of the type and distance between the lines in the school books, the height, inclination and position of the desks, the lighting of the schoolrooms, the water supply, the playgrounds—in short, everything.

The Art Gallery (Pinacotheca) is in a wing of the Technical School, on one side of the Jardim da Luz, just across the bridge from the railway station. It is small, but possesses some good modern pictures, prominent amongst which is "La Faiseuse d'Anges," by Pedro Weingartner, a Brazilian artist. The gallery is open from 11 a.m. to 5 p.m. daily, except Tuesdays.

Butantan (Serumpathic Institute) is worth a visit, but it is some distance out of the city (at Pinheiros) by tram and trap. Antidotes are prepared here for the bites of rattlesnakes and other serpents, diphtheria, etc. (see Reptiles). Open Sundays and Thursdays.

The Trachoma Commission is in Rua Ypiranga, the Geographical Commission is in Rua Visconde do Ria Branco, and the Departments of Justice, Finance, Agriculture and Public Works are in the Government Palace (Largo do Palacio).

Police organization is excellent (as in Rio Janeiro), metal boxes being found in nearly every street, responsible citizens having a numbered key, which they use to open the call box and summon assistance. The key cannot be withdrawn until a policeman comes along, when it is restored to its owner as soon as the bona fide nature of the call is ascertained. The insertion of the second key, automatically calls up a police motor ambulance, with a doctor and an ambulance man, etc. The

policeman using the second key before inserting it turns a pointer to the words, Accident, crime, resistance to the police, etc., gets in contact by telephone at once with the nearest police station without delay. There are 160 such alarms in the city. The State military force comprises 6,529 men and 189 officers.

The City Fire Brigade has three motor engines, besides many others, and 413 men.

São Paulo has facilities for all kinds of sports, including lawn tennis, hockey (with a league), football, played so well that crack European teams can hardly hold their own, the Mackenzie College beating a representative Portuguese team badly, and the famous Corinthians taking out a great side in 1913 could only draw their first match.

Rowing has its votaries (on the Tieité river). and there is a racecourse just outside the city. Aviation is not unknown, a Brazilian (Ed. Chaves) having flown from Santos to S. Paulo in 55 minutes and S. Paulo to Rio Janeiro

There are 10 daily papers, *O Estado de S. Paulo* (circulation, 60,000; the greatest in Brazil), *O Correio Paulistano*, and *A Platea*, being the principal. The foreign press includes *Le Messager de St. Paul*, *Fanfulla*, *Diario Español*, *Al Alkar*, etc.

In 1912 there were 31,000 houses in the city with an average value of over £700 each. Of these, 7,462 were occupied by Italians, 1,515 by Germans, and 318 by French. In January, 1914, the number had increased to 43,940, and there are over 500 industrial establishments, with a working capital of nearly £5,000,000.

In 1914, 1,365 taxi cabs were plying for hire in the city. First hour cost, 10 $000; and per hour after,

8$000. These rates may be higher now, owing to greatly increased cost of petrol.

One-horse cabs are, per course, 2$ to 4$, 2 horses, per hour, 6$000, or with taximeter 1$ per 1,000 metres.

Banks

London and Brazilian, London and River Plate, Franco-Italiano, Banco de Napoli, and Brasilianische Bank für Deutschland, are all in Rua 15 de Novembro. The British Bank and Banco de S. Paulo are in Rua S. Bento, and the Banco Español in Rua Alvares Penteado. There is also the Banco Allemão Transatlantico, but, like the Brasilianische, its operations were under Government control during the war, and naturally, Allied subjects cannot have dealings with it.

All the steamship companies have agencies here, mostly in Rua S. Bento.

Trams

Line No. 2. From Largo do Sé to Norte Station (for Rio Janeiro).

Line No. 16. To Zootechnic Station.

Line No. 5. To Public Library.

Line No. 11. To Velodrome (football ground) and Luz and Soracabana Stations.

Line No. 13. To Normal School, Praça da Republica and Municipal, S. José, Polytheama and Bijou Theatres.

Line No. 23. To Railway Stations, School of Pharmacy, Polytechnic, Gymnasium, etc.

Line No. 27. To Normal school, Gardens and principal theatres.

Line No. 29. To Velodrome.

Line No. 35. To Gardens, Normal School and Parc Antarctica.

The hotels include:—	Tariff.
"Sportsman," Rua S. Bento . .	15$—30$
"Grande" and "Majestic," same street	7$—10$
"Oeste," in Largo de S. Bento . .	7$— 8$
"Royal," in Largo de S. Bento . . .	7$
"Albion," in Rua Brigadeiro Tobias . .	7$
"Paris," in Rua Brigadeiro Tobias .	7$—10$

Most of course making a reduction for a long stay.

The best restaurants are: "Sportsman" (Rua S. Bento), "Progredior" (15 de Novembro), "Pinoni" (S. Bento).

Confectioners.—"Brasserie Paulista" and "Castellões" (Praça Antonio Prado), also "Fasoli" (Rua Direita).

The main business streets are already much too narrow for the traffic and perhaps, at no distant date, the shops will need to migrate. Large tracts of the city are being rebuilt, and a little way out tree bordered *avenidas* are lined with splendid mansions.

Before proceeding southwards, we must visit a few of the principal towns in the interior, commencing by the Paulista and Mogyana lines, starting from the Leiz station.

Mogyana Railway and Navigation Company

Organized at Campinas in 1872, with a capital of 3,000 contos, interest at 7 per cent. being guaranteed. This amount was realized by 1875, when the first section, Mogy-Mirim, was opened. In 1879 the amount was raised to 5,000 contos, in 1888 to 11,225 contos, in 1893 to 41,000 contos, in 1897 to 50,000 contos with a reserve fund of 1,383

COMPANHIA MOGYANA

PLANTA GERAL DAS LINHAS

ESCALA 1:2.000.000

• 1918 •

LEGENDA

Linhas da Cia. Mogyana, em trafego ——————

Linhas da Cia. Mogyana, em constr.º - - - - - -

Linhas de outras Companhias..... ——·——·——


PRATINHA
S. SEBASTIÃO DO PARAISO K.356
JARDINOPOLIS
SERTÃOSINHO
RIB. PRETO K.317
MONTE SANTO
GUAXUPÉ K.258
GUARANESIA
MOCOCA
MONTEBELLO
MUZAMBINHO
S. JOSÉ DO RIO PARDO
S. SIMÃO K.259
CASA BRANCA K.177
S. CARLOS
S. JOÃO DA BOA VISTA
ESPIRITO SANTO DO PINHAL K.121
MOGY-MIRIM
ITAPIRA
SOCCORRO
AMPARO K.65
CAMPINAS
ITATIBA
JUNDIAHY
Rio Mogy-Guassú
Rio Piracicaba
E. F. S. Paulo e Minas
E. F. F. B. R. V. Sul Mineira
Companhia Paulista de Estradas de Ferro
Poços de Caldas K.204

contos; in 1901 to 60,000 contos, reserves reaching 3,000 contos; in 1910 to 80,000 contos, and 6,294 respectively; in 1918, the same capital, about £5,000,000, at present exchange, with a reserve fund of about £500,000.

In 1875 the Company realized a net profit of something over £1,000, receipts being 190 contos, and expenses 169 contos, the credit balance ten years later reaching £60,000, expenditure being less than half the receipts. At the end of 1895 a quarter of a million sterling profit was made on the year's workings, record figures of £600,000 standing to the Company's credit in 1915, and but little less in 1916-17.

In 1909, 1,619,061 passengers, 371,049 tons of coffee, and 407,021 tons of other goods were transported; the figures for 1918 being, 2,146,607 passengers and 1,120,354 tons of merchandise.

In 1909 the Company had 130 locomotives, 177 carriages and 2,000 goods trucks, and in 1918, 176 engines, 284 passenger cars and 2,618 goods wagons.

The staff comprises (1919):—Inspection and Finance, 176; Traffic, 2,068; Locomotion, 1,367; Permanent Way, etc., 1,234 persons; a total of 4,845 employees.

Chief Inspector, Dr. Carlos Stevenson; Traffic Manager, Dr. Coriolano Gomes de Mattos; Locomotion Director, Dr. Horacio A. Costa; Chief of Permanent Way Department, Dr. Prospero Ariani; Office Manager, Dr. Alfredo Monteiro.

The Company has undertaken a long series of contracts with the Provincial, Imperial and Federal Governments, beginning on the 19th of June, 1873, with its lines to Mogy-Mirim and Amparo.

Initial Station—Campinas, from S. Paulo Luz station. First stop of Paulista Railway Express. Jundiahy, terminus of the S. Paulo Railway, 60 kilometres. Altitude, 706 metres. Run, 1 hr. 4 min. Average temperature, 19° centigrade. Press, *A Folha*. Latitude, 23° S. Hotels, "Stadt Hamburgo," "Carlos," etc. Population, 15,000. Hospital, theatre, cinemas, colleges. On to joint station of Paulista-Mogyana Railway at Campinas. 105 kilometres. Fare from S. Paulo, 1st class, 9$400. Princess of the West, birthplace of Carlos Gomes, composer of the well known opera "O Guarany." Altitude, 693 metres. Latitude 22°54′ S. Longitude, 3°84′ W. of Rio Janeiro. Average temperature, 19·5° centigrade. Hotels, "Brazil," "Paulista," "Pinheiro," etc. Press, (daily), *Commercio*, *Cidade*, *Diario*. Time of run from S. Paulo, 1 hr. 56 min. Seven expresses daily. Electric trams. City population, 35,000. Many industries. Telephones, market, colleges, schools, theatre, public gardens, cathedral. Main line of rail and principal branches are one-metre gauge. The Mogyana Railway works here have turned out locomotives of the highest grade. Luncheon, Dining and Sleeping cars from here. First important stop *Jaguary* (35 kilometres), 140 kilometres from S. Paulo. Junction for *Pedreira* and *Amparo* (65 kilometres), 169 kilometres from S. Paulo. Population, 10,000. Press, *Diario*. Hotel, "Grande. Junction for (A) *Serra Negra*, 251 kilometres. Population, 2,500. Latitude, 22°58′ S. Altitude, 916 metres. Theatre. cinema. Hotel, "Leone." Narrow gauge line (60 centimetres). Open in 1892. Contracts of 4-2-1890. From Amparo to (B) Monte Alegre and *Soccorro*.

Altitude, 734 metres. Press, *A Cidade*. Telephone. Proceed by main line from Jaquary to *Mogy-Mirim*, 76 kilometres. Population, 10,000. Latitude, 22°20′. Longitude, 3°48″ W. Press, *A Comarca*. Change for Itapira. Population, 6,000. Altitude, 628 metres. Press, *A Cidade*. Theatre, cinema. Hotels, "Brasil" and "Sapucahy." 126 kilometres. Change here for the Sul Mineira Railway to *Ouro Fino*, *Pouso Alegre*, *Itajubá*, etc.

Contracts for the main line extension from Mogy-Mirim, 14-4-75, and for the Sapucahy branch, 9-11-1880. Line to Mogy-Mirim opened August, 1875.

On from Mogy-Mirim to Mogy-Guassú, 84 kilometres. Hotel, "Mello." Press, *O Municipio*. Branch to Espirito Santo do Pinhal, 121 kilometres. Population, 5,000. Two hotels. Altitude, 839 metres. Press, *O Pinhalense*. Contract dated 1-3-1888. Line opened 1889. Proceed by main line to *Cascavel*, 128 kilometres. Change for *S. João da Bôa Vista*, Prata (see Thermal Springs), and Poços de Caldas (204 kilometres) (Minas Geraes). On from Cascavel to Lagôa (short branch to Vargem Grande) (173 kilometres) and *Casa Branca*, 172 kilometres. Line opened 1878. Altitude, 715 metres. Normal school. Hotel, "Grande." Population, 5,000. Change for *S. José do Rio Pardo*, 207 kilometres. Population, 8,000. Altitude, 718 metres. Theatre, cinema, telephone. Hotel, "Scazzola." *Ribeirão do Valle*. Branch to Mococa, 237 kilometres. Telephone. Hotel, "Terraço" and Canôas, 246 kilometres. (Contracts of 1888.) Opened 1890. On from R. do Valle to Guaxupé, 258 kilometres.

25 $; furs (rabbit skin), 78 $ to 98 $; no high-class furs listed; hat trimmings, 2 $ to 15 $; skirts, 35 $ to 155 $; blouses, 10 $ to 75 $ (crêpe de chine); dressing jackets, 16 $ to 68 $; dressing gowns, 20 $ to 78 $ (voile bengaline); handkerchiefs, $500 to 7 $500; chemises, 6 $ to 14 $500; nightgowns, 8 $ to 15 $; combinations (plain), 20 $; petticoats, 9 $ to 18 $; corsets, 13 $500 up to 80 $; pinafores, 3 $ to 32 $; cache corsets, 3 $ to 20 $; flannel vests, 12 $ to 22 $; stockings (cotton), 4 $, wool, 5 $500 to 12 $; porte monnaies (bags), 10 $ to 35 $; umbrellas, 12 $ to 36 $; perfumes, 2 $, 4 $, 5 $ to 10 $.

Carmine for the lips, pencils for the eyes, rouge and all sorts of creams and powders are offered for sale without shame, as they are bought openly by highly respectable women.

A great campaign in the press, in the pulpit and through the doctors, etc., is needed to put an end to these habits, but the first step is in the schools and at the home.

The above prices represent average rates. Many small shops, mostly Syrian, sell cheaper things, and, in the Avenida Rio Branco, one may pay almost anything.

Referring back to prices of provisions:—

Fruit is sold in the smart stores at prices three or four times as high as in the little shops in the poorer quarters, and the most fabulous profits are easily made.

I have seen a cheese offered for sale at 8 $000 a kilo which was of local production, and not up to the standard of a good English Cheddar.

Sweets, wrapped in paper, costing 1 $500 to produce, at most, fetch 4 $000, and hand-made candies, marzipan, etc., 10 $000 the kilo.

The Labor Question

As a faithful chronicler I must take hold of this thorny problem, and note the flagrant contrasts which are only too evident, between the existence of the partially organized workers and their masters. At a fancy dress ball given by the American Colony of S. Paulo, to Admiral Caperton, on the 22nd of February, this year, a local lady paid £400 for her dress. Jewelry is much more lavish and expensive than conditions of life warrant, and for the sake of display furs are worn when the temperature is not below 15 or 16 degrees centigrade.

A Labour code was under discussion in Congress, in August, 1918, and not one single *Labour* member there to back it up. It was defended by two Rio lawyers and as the Rio "A. B. C.," of August 24th, stated, the views of a typical cosmopolitan Jew adventurer and financier, that 8 hours labour was insufficient, were accepted, he being called by the House Committee as an authority. In a southern city, which I will not mention, a strike was settled by the simple means of driving the men out of their houses and to work at the bayonet's point, under instructions from the State Governor, a Positivist. Social and political unrest is rife in every State, and I only hope that Congress will, this year, take radical measures to put the working man on a living wage and at reasonable hours, and that the question of his housing will be carefully looked into as well. A step was taken at the close of 1918, by the institution of compulsory compensation in the event of an accident whilst at work.

Let us hope reforms will come about by the co-operation of capital and labor, not by violence.

There is already a Bolsheviki section of the Rio-S. Paulo proletariat, and the foreign element is largely responsible. I will offer no opinion as to its rights or wrongs.

Brazil has been honoured by a seat on the Council of the Society of Nations, and it is to the lasting credit of the great Republic that it has always stood out for liberty and right, and, in all probability, taken less advantage of its being at war with Germany than any of the other Allies.

APPENDIX II

SPORTS

Football

This sport has flourished for a number of years, and some of the best amateur and professional clubs from England have played a series of matches in Rio and S. Paulo.

A Portuguese team came out a few years ago and got rather the worst of the contests played.

In 1915 all the responsible clubs were organized under the "Federação Brasileira de Sports," and in 1916 the "Liga Metropolitana" came into being, occupying itself with football and water polo only.

Championship meetings were held in 1916-18 in Rio, for the first, second and third division clubs, the premier section consisting of ten. The Fluminense with H. Welfare (ex-trainer and English International) (professional), and French, another Britisher, took the lead, 1917-19. Twenty-two Inter-state matches with São Paulo resulted as follows:—13 lost; 4 won; and, 5 drawn; goals—68 against; 28 for.

South American championships were held in Montevideo and Buenos Aires, between Argentina, Brazil, Chili and Uruguay, 1916-17, the latter winning in each case. No matches took place for this event in 1918, but the championships will be held in Rio this October or November.

A split has occurred between Rio and S. Paulo owing to charges of veiled professionalism.

The Flumenense Football Club has made great preparations for the 1919 matches, building a Stadium with accommodation for 30,000 spectators, and a splendid swimming bath for the water polo matches. The league consists of most of the first class rowing clubs, etc. This club has also tennis and gymnastic sections.

I much regret to say that *repeated* application to the secretary of the Metropolitan League for further information met with no success, in spite of giving him ample time to reply, and being promised full details. I would have been glad to publish one or two photos. A letter to H. Welfare, the footballer mentioned, also remained unanswered.

Swimming

No records available.

Plunging

A. Azámbuja, C. Regatas, S. Christovão, 1918, 3 minutes under water.

Gymnastics

The Club Gymnastico Portuguesa, instituted in 1868, is installed since 1911, in a fine building, costing £17,000. All the four weight lifting championships, 1914-17, are held by the club, which has now 800 members. The champions have been Brazilians every year, and the record lift is 424½ kilos, by J. Martins Fereira, age 26, weight about 73 kilos (a light middle weight).

Gymnastic championships fell to a Swiss in 1909,

and to Germans, four firsts and three seconds, no meetings being held since December, 1913. I am indebted to the club secretary for these details.

Rowing

The first boat races were held in Botafogo Bay, Rio de Janeiro, in 1862, but this sport was not taken up seriously until 1885, when a grand regatta took place in the presence of the Emperor and Empress.

Amongst the sixteen events were: Six-oared races between Brazilian and British sailors, and 16-oared contests with local men-of-war crews and those from two American cruisers in harbour. Results are not forthcoming with regard to these races.

About this time outriggers were imported, and various local French crews gave excellent accounts of themselves.

Rio Grande do Sul and Santos soon organized rowing clubs, the brothers Wright and Navarro de Andrade being prominent amongst the promoters.

In 1895 the first yacht race took place, 6 cutters sailing, the May-be coming in first.

In 1900 a ladies' club was organized but its existence was very short lived.

1897.—First regatta held under control of the União de Regatas, and in 1898 the championship of Rio began (4-oared whale boats). Pará, Pernambuco, Bahiá., S. Paulo, etc., took up rowing, and clubs multiplied in Rio, etc. At Icarahy (Nictheroy) the brothers Naylor formed part of the first committee.

1905.—The Pari Mutuel, flourishing like an ill weed, was finally abolished, and in 1908 the

Federação das Sociedades de Remo was finally "un fait accompli."

Some Records

	Min.	Sec.
1906—2,000 Metres, 8 oars, straight course,	6	30
1910—2,000 Metres, 4 oars,	7	47
Won by "Salamina," Botafogo Club.		
1916—1,000 Metres, 2 oars,	4	13¾
"Ibis," Vasco de Gama Club.		
1916—Single sculls, 1,000 Metres,	4	09
C. Martins da Rocha, Guanabara Club.		

The boats used in Brazil have almost always been Italian built (Gallinari), and the type has remained the same for a number of years.

In 1918, Rio Grande do Sul sent two crews, with two reserve men, to Rio Janeiro, and won the 4-oared (Prova Classica) race; time, well over 8 minutes. Rio rowing men attributed this unexpected beating to the disorganization owing to the Grippe.

I am indebted for these rowing notes to "Historia do Sport Nautico no Brasil," 8vo, 414 pp., Ill. by A de Mendonca. Edited by the "Federação Brasileiro de Remo," Rio Janeiro.

APPENDIX III

GLOSSARY

Abaeté. (T.) Ugly folk.
Agata. Agate.
Aguas Mineraes. Mineral waters.
Alavança. Bar of iron for breaking rocks.
Alcatrão. Tar.
Amianto. Asbestos.
Araponga (T.). Screamer, parrot or blacksmith bird.
Araxá (T.). Sunrise view, highest point in a plateau.
Ardosias. Slates and slatey clays.
Areia. Sand.
Areias monaziticas. Monazitic sands.
Arenito. Sandstone.
Arenoso. Sandy.
Argilla. Clay.
Baependy (T.). Opening in the forest.
Banhado. Savannah, or meadow.
Batea. Bowl of hard wood used for washing diamond-bearing gravels.
Berilio. Beryl.
Boart. Amorphous carbon. Hard as a diamond.
Brejo (or Pantano). Swamp or bog.
Breu. Pitch.
Cabóclo (T.) One from the forest.
Caçimba. Cauldron or shallow well.
Caco (T). Disintegrated quartz in angular fragments,

Caethé (T.). Virgin forest.
Cal. Lime.
Calcareos. Limestone rocks.
Caldeirões. Potholes.
Camada. Layer.
Cambalaxo. Spodumene.
Canga (*Tapanhoa-canga*) (T.) Breccia, or spongy iron ore, with mica or clay slate, and quartz.
Cangica (T.). Soft grain-boiled maize.
Canhado. Low land between hills.
Canõas. Inclined planes in river beds.
Capa. Covering of mineral lode.
Capanema (T.). Evil-smelling foliage.
Capão. Thicket.
Capivara (T.). Grass eater.
Capoeira. Second growth of forest.
Carioca (T.). Half-breed. (See also Rio.)
Carimbé (A.). Wooden bowl used in carrying gravel to the washing place. (See Diamonds.)
Carrasco. Low, poor undergrowth, stunted trees.
Carvão de Pedra. Coal.
Cascalho. Diamond-bearing gravel.
Catinga (T.). Scrub or undergrowth. White wood. Also typical smell of negroes.
Cativos. Minerals accompanying diamonds.
Cavador. One who knows how to arrange his affairs.
Cavar. Excavate.
Chapada. Tableland.
Chumbo. Lead.
Cinnabrio. Cinnabar.
Cipó (T.). Liane or creeper.
Cobre. Copper.
Congonhas (T.). Maté.
Copalina. Fossil gum.

Corrego. Water course.
Cristal da Rocha. Rock crystal.
Cupim (T.). White ants.
Dobras or Dobradas. Folds or undulations.
eisenglimmer. (Specular iron.)
Enxofre. Sulphur.
Esmeril. Emery.
Estrada. Road.
Estrellada. Starred. Coloured clays with white fragments (diamond formation).
Faiscador. Gold or diamond seeker in river beds.
Falha. Fault.
Fatia. Slice.
Favas. Rolled pebbles of various minerals.
Feijões. Rolled black tourmalines.
Feitor. Foreman.
Fenda. Crack.
Ferro. Iron.
Flor da terra. Surface of the earth.
Folhelo. Shale.
Fosfato de calcio. Guano.
Formação. Association of minerals amongst which diamonds are found.
Foz. Mouth of river.
Furo. Bore or passage between two rivers. (Pará.)
Gabiroba (T.). Bitter fruit. Found in Minas Geraes.
Gaiolas. Small passenger steamers (P.) on the Amazon, etc., (literally *cages*).
Gamella. Pan larger than the Bateá.
Garimpeiro. One who works a garimpo or placer. Formerly an illicit miner.
Genipapo (T.). Fruit for cleaning or painting.
Girão. Garret, upper floor, or elevated road.
Giz. Chalk.

Gres. Sandstone.
Granadas. Garnets.
Gravatá (T.). Strong, tough or hard.
Grupiaras. Gravel patches on hillsides, in diamond workings.
Guará (T.). Sacred Ibis.
Guaraná (T.). (See Botany.)
Guarani (Guarany) (T.). Warrior or struggler.
Gorgulho. Dry diamond workings. River bar.
Gypso. Gypsum.
Hulha. Coal.
Igapó (T.). Flooded forest.
Igarapé (T.). Small stream navigable for canoes.
Inhaúma (T.). Blackbird.
Ipanema (T.). Bad water.
Ita (T.). Stone.
Itaberaba (T.). Crystal. Bright stone.
Itabira (T.). Pinnacle or peak.
Itabirites. Iron ores.
Itabirite (T.). Bright stone.
Itacolumite (T.). Whitish sandstone.
Itacolumi (T.). Stone child, or stone mother and child.
Itaipara (T.). Ford, flat rock bed of river.
Itajuba (T.). Yellow metal (gold).
Itamarandiba (T.). Signal stone.
Itamaraty (T.). White stone.
Itapuan (T.). Round stone.
Itaruna (T.). Black stone.
Itatiáia (T.). Toothed ridge.
Itauna (T.). Black stone.
Itinga (T.). White river.
Ivahy (T.). Tormented waters.
Jacaré (T.). Sinuous, curved (alligator).
Jacarécangá (T.). Alligator's head.

Jacinthio. Andalusite. (Falsely so-called.)
Jacutinga (T.). Micaceous glance, with quartz manganese, etc. Also the White Penelope.
Jacú (T.). Penelope.
Jaguár (T.). The devourer or tearer (jaguar).
Jatahy (T.). Resin (*Hymenæa courbaril*). Tree of the hard fruit.
Jatobá (T.). Resin. That which has a hard bark.
Jequitinhonha (T.). Submerged cavern or grave.
Kaolino. China clay.
Lage. Flat sand bank or bar.
Lapa. Foot wall in mine.
Lavra. Gold or diamond workings.
Lavrito. Boart.
Leito. Bed of river, etc., etc.
Lençol. Sheet. Underground lake.
Malacacheta. Mica.
Maleitas. Malaria.
Maloca (T.). Indian hut or huts.
Mantiqueira (T.). Vertente or watershed.
Maranhão (T.). Sea-like river.
Marmore. Marble.
Minhocas (T.). Worms. Things which are pulled out or extracted.
Miracema (T.). Departure of the people.
Mogy-guassú (T.). Great snake river.
Morro. Mount or hill.
Muriahe (T.). Cloud of mosquitoes or small flies.
Nafta. Petroleum.
Nascente. Spring fountain head.
Ninho (bucho). A rich pocket in a mine; a nest.
Nivel. Level.
Oiro (Ouro). Gold.
Oligisto. Hematite.
Paca (T.). Agile or quick.

Pará (T.). Mother, or gatherer of waters.
Paracatú (T.). Placid stream, pleasant waters.
Parahyba (T.). Innavigable river.
Parahybuna (T.). Dark river.
Paramirim (T.). Little river.
Paranáhyba (Parnahyba (T.). Great river full of cataracts.
Paraná (T.). Great as the sea.
Paraopeba (T.). River of smooth waters.
Paraúna (T.). Black river.
Pederneira. Flint.
Pedra-pomes. Pumice stone.
Pedra-hume. Alum.
Pedra-sabão. Soap stone.
Pedra de móer. Grindstone.
Pedra de toque. Touchstone.
Pernambuco (T.). (Recife) Reef.
Phosphoro. Illicit voter. One using false papers.
Picada. Path.
Piçarra. Slate.
Pico. Peak.
Pindahyba (T.). Fishing rod.
Pirapóra (T.). Fish leap.
Pitanguy (T.). Red river.
Poço. Well.
Poeira. Dust.
Poente. West.
Polvora. Powder.
Poróroca (T.). Tidal waves (bore at mouth of Amazon).
Praia. Beach.
Roça. Plantation.
Roçar. To clean the ground.
Rocha. Rock.
Sabará (T.). Bright stone.

Sacco. Sack. Hollow pass. Narrow bay. Inlet.
Sal. Salt.
Salitre. Saltpetre.
Salto. Waterfall, jump.
Sapucaia (T.). A clamour. To cry out. See also Nuts.
Schistos. Schists.
Secundina. Clay schists. Second layer in diamond formation.
Sertão (Desertão). Great desert. Wilderness. Hinterland.
Serviços. Lavras, or open workings.
Sitio. Country estate, site.
Soldo. Wages.
Soltar. To let go.
Sondar. To sound.
Sublocação. Subletting.
Suçuarana (T.). *Felis concolor* (Puma).
Sumidouro. Disappearance of gold in river.
Sumiu. Disappeared. Absconded.
Tabatinga (T.). White clay, village.
Taboleiro. Tableland.
Talho aberto. Open workings.
Tamanduá (T.). Ant-eater.
Tapera (T.). Deserted village; ruins.
Taquará (T.). Bamboo. Pierced stem of anything.
Tatú (T.). Thick skinned (armadillo).
Taúbas (T.). Yellow stone or metal.
Tembé (T.). Lip.
Tembetá (T.). Labret or lip stone.
Termo. Term or limit.
Terra-roxa. Red earth common all along the coast and in São Paulo, Rio, Minas, etc.
Terraço. Terrace.
Tesó. Escarpment. Stiff.

Testado. Ridge or boundary.
Thermas. Hot springs.
Tijuco or Tejuco (T.). Mud, or rotten water, etc.
Timbó (T.). Fish killing plant.
Tincal. Borax.
Titulo. Title or deeds.
Toca. Hall mark; stamped on bars of gold or silver, percentage in carats.
Tripuhy (T.). Slender mount or peak.
Tucano (T.). Great beak. Toucan.
Tupy (T.). The Creator, God. The Sublime, the Father of all.
Turfa. Peat.
Turvo. Muddy or discoloured.
Turma. Gang of men.
Ubá (T.). Arrow; bark canoe.
Uberaba (T.). Shining water.
Una (T.). Black river.
Urubú (T.). Black fowl.
Urucú (T.). The red producer (*Bixa orellana*).
Usar. To make use of.
Varar. To gauge or measure.
Varzea. Meadow or savannah subject to floods.
Vasa. Ooze or mud.
Veia. Vein or lode.
Vertente. Watershed.
Via-ferrea. Railway.
Vieiro. Vein or lode.
Viga. Beam.

(A.). African origin.
(T.). Tupy (aboriginal) words. Mostly taken from the lists given by Dr. Alfredo de Carvalho in the *Annuario de Minas Geraes* of Dr. Nelson de Senna. Bello Horizonte, 1906-1913.

APPENDIX IV

THE PRESS, BIBLIOGRAPHY, SCIENCE, ART AND LITERATURE

A BROCHURE in Dutch was issued clandestinely at Pernambuco in 1647. It contained 28 pages of Gothic text, and single copies fetched £50. Thirty-two different were sold for 400 $000. There is a specimen in the Bibliotheca Fluminense, Rio Janeiro.

The first press was set up at Recife in 1705, but a year later it was broken up by order of the Crown.

Up to the end of the 18th Century all Brazilian works had to be printed in Portugal, and before the type was set up licence must be granted by the Holy Office (Inquisition) and the Ultramarine Council.

João V issued an edict, on July the 6th, 1747, that books could not be printed in Brazil, as their cost was too great.

On June 1st, 1808, the *Correio Brazilicnse*, first of Brazilian newspapers, came out in London, under the direction of Hyppolito da Costa, and on the 10th of September, the same year, *A Gazeta do Rio Janeiro* saw the light, and about the same time the *Impressão Regia* began operations in the Capital. The *Diario do Rio Janeiro followed*.

In 1821, José Bonifacio decreed the liberty of the press.

Bahia set up a newspaper in 1811 (The *Idade do*

Ouro) "Golden Age" (something ironical about that title, it seems to me).

Pernambuco started in 1820 with the "*Aurora*" (surely a more appropriate name at this period), and Maranhão the same year.

Pará followed suit in 1822, and São Paulo in 1827 with *O Pharol* (The Lighthouse).

The doyen of Brazilian papers, the *Jornal do Commercio*, appeared in 1824, under very modest guise, its size being $27\frac{1}{2} \times 17$ centimetres. Contrast this with the Christmas number of 1912, weighing *one kilo*, and containing 84 pages, measuring 67×54 centimetres, and costing 500 reis for postage.

In 1833, a review, *O Auxiliadora de Industria Nacional*, was first published, appearing at intervals until 1898.

The *Almanack Laemmert* (Directory) has been issued annually since 1844, and now comprises 4 volumes.

The Press Association was started in 1916, and has a Rifle Corps affiliated.

Some of the principal scientific publications include:—Annaes and Revistas of the Institutes at Fortaleza, Maceio, Pernambuco, Curityba, Florianopolis, Bello Horizonte (Archivo), Pará and the Museums, etc., of Rio and S. Paulo.

The Rio press exercises little influence outside the capital, and in most of the towns off the great trunk routes (or on for that matter) it is very difficult to purchase any papers published outside their area. One usually finds, however, that the public libraries in large cities file the *Jornal do Commercio* and two or three other Rio papers.

Rio Janeiro publishers comprise:—Garnier, a French firm, long established in Rua do Ouvidor; Briquet, Rua Sachet and Alves, Ouvidor. This is the oldest and most important Brazilian house, and was founded by Nicolau A. Alves (Portuguese), in 1854, his nephew and successor, Francesco Alves, taking over the firm in 1881. The latter, a naturalized Brazilian, took in Dr. Manoel Pacheco Leão as partner, in 1897, but on the death of Sr. Alves, in 1913, the property was left in its entirety to the Brazilian Academy of Letters. It is still in litigation, through law suits instituted by his family. In 1895 a branch was opened in S. Paulo, and another at Bello Horizonte in 1910.

Other Rio firms include Jacintho Ribeiro dos Santos, and, a new comer, Leite Ribeiro e Co., opposite the central tram terminus. In S. Paulo, an enterprising firm in Weisflog Irmãos, this latter undertaking work usually outside the publishing business, making a speciality in school books and maps.

1912. Newspapers and Reviews.—S. Paulo (State), 511; Minas, 395; Federal District, 238; Rio State, 178; Bahia, 121; R. G. do Sul, 120; Santa Catharina, 81; Paraná, 50.

Public Libraries (1914).—S. Paulo, 72; Federal District, 45; Minas, 36.

Literature (Chronology) Part I

Poets, Novelists, etc.

1663-1738.—Gregorio de Matos (Bahia). Greatest satirical poet. Virulent attacks on the Mulatto element of the people.

1717.—Frei José, Santa Rita Durão (Minas). First noteworthy epic poet. Caramurú, etc., etc.

1729-1789.—Claudio da Costa. First lyric poet.

1749-1814.—M. da Silva Alvarenga (Minas). Lyrist.

1765-1838.—José Bonifacio. Essayist, etc. (See Mineralogy.)

1806-1879.—Porto Alegre (R. G. do Sul). Epics, Colombo, etc.

1820-—J. M. de Macedo. Father of the romance in Brazil. A Morenenha.

1823-1864.—Gonçalves Dias. Greatest lyric poet. Canção do Exilio, etc. Dramas—Cénci, Boabdil, etc., etc. Born at Caxias, Maranhão.

1829-1877.—José de Alencar. National romancist par excellence. O Guarany, Iracema, and many other Indian romances.

1834-1910.—Luiz Delfino. Novelist. (Santa Catharina).

1837-1860.—Casimero de Abreu. First lyric poet of his day.

1837-1898.—Couto de Magalhães. General. Many literary works. Folklore.

1839-1908.—Machado de Assis (Rio). Greatest writer in Brazil. Critic, essayist and novelist. Best known work "Braz Cubas."

1839.—Tavares Bastos.—Essayist. Through his efforts the Amazon was opened to international commerce.

1839.—Tobias Barreto. Poet. Died 1889.

1841-1875.—Fagundes Varela.—Poet of the first rank.

1843-1899.—R. de Escragnole Taunay. Romance and history.

1845-1912.—Barão do Rio Branco. Statesman,

essayist, geographer. Facile princeps amongst Brazilian intellectuals. Diplomat and foreign minister for many years.

1847-1871.—Castro Alves. Romantic poet. Epics and lyrics.

1849-1910.—Joaquim Nabuco. Fit to rank with Rio Branco. One of the same school. Very varied work.

1851-1905.—José de Patrocinio (Campos). Abolitionist, orator, etc. Leading journalist of his day.

1858-1913.—Aluzio de Azevedo. Principal exponent of Zolaism.

Amongst more modern romance writers we may note:—Coelho Netto, Affonso Arinhos, Graça Aranha, Afranio Peixoto (a distinguished physician), and Julia Lopes de Almeida.

Poets of the first rank include:—Olavo Bilac (Died 1918), Luiz Guimaraes Filho, Alberto de Oliveira, Fontoura Xavier, Luiz Edmundo, Felix Pacheco, etc. Critics, José Verissimo and Sylvio Romero, both responsible for literary anthologies, the former being the most complete and classical (Livraria Alves, Rio, etc.).

João Ribeiro.—The greatest all-round literary giant. Leading critic.

Successful lawyers and orators include:—Ruy Barbosa (Delegate of Brazil at the Hague Peace Conference); Oliveira Lima, ex-diplomat, jurist and historian; Affonso Celso, Count of the Holy Roman Empire; Amaro Cavalcanti; Medeiros e Albuquerque, best known as a journalist, head of his profession.

The greatest playright was Arthur Azevedo, author of over 40 pieces, mainly comedies.

Geographers include:—Barão Homen de Mello, 1837-1917; Euclydes da Cunha, 1868-1909, his masterpiece, "Os Sertões" (The Hinterland); Arthur Orlando (Recife), died 1915.

Doyen of Brazilian Journalists.—José Carlos Rodrigues.

Character Studies:—Gustavo Barroso, "Terra do Sol" (Northern Customs); Mario Guedes, "Os Seringaes" (The Rubber Gatherers); Jackson de Figueredo is a young Northerner with marked critical capacity; Rocha Pomba, the best known living historian.

Other founts of knowledge to be recommended are:—Anthologia de E. Werneck, several editions; Petropolis, excellent for school use; and for French scholars, Anthologie d'Ecrivains Brésiliens, Victor Orban, Paris, 1910.

A new female poet of note is Gilka Machado, Rio. In the twenties only.

See also: A. Mulher na Poesia Brasileira; Leal de Santos; Liv. Jacintho Ribeiro dos Santos; Rua S. José, Rio, 1918; Catullo da Paixao Cearense, this poet is the chronicler of the patois of his beloved north. Has had considerable vogue amongst the literary inclined of the capital, etc.

Musicians

The first Conservatoire in Brazil was opened by the Jesuits, and destined to the musical education of the negroes, a fine orchestra being formed. The National School of Music was founded in 1847, Carlos Gomes being a pupil. It was reformed by Leopoldo Miguez in 1870. He was the composer of the National Anthem, for which he was voted 20

contos of reis, but decided that the money should be spent in purchasing a grand organ. Amongst the compositions of Miguez may be mentioned, Prometheus, Parisina, etc. Carlos Gomes, besides his opus magnus, "O Guarany," wrote "Lo Schiavo," produced in Rio, in 1917, by an Italian Opera Co. The National Institute of Music was finished in 1896.

Amongst modern composers Alberto Nepomuceno takes first place, his principal work being "Artemis." Henrique Oswaldo composed "Il Neige." Francisco Braga is the author of the well-known *morceau* "La Serenata." Delgado de Carvalho, Meneleu Campos, Carlos de Mesquita and Abdon Milanez, present Director of the National School of Music, are well-known composers.

Pianists include Arthur Napoleão, who gave concerts at 9, Guiomar Novaes; Mdme. Rudge Miller, etc., and a child prodigy of 8, Maria Antonia, who gave a recital recently at the Municipal Theatre, playing 18 of the most difficult pieces of Bach, Beethoven, Chopin, etc., from memory.

Maria Tagliaferro is a gifted young violinist.

Singers include Nicia Silva, Mdme. Kendall, Beatrice Sherrard, Marietta Campello, Carlos de Carvalho, and Mario Pinheiro, *Basso Cantante*, a very fine artist, with a powerful organ.

The best known orchestra, or rather band, brass, and wind instruments, is that of the "Corpo dos Bombeiros" or Fire Brigade, but it has fallen off in late years, the Naval Brigade Orchestra, under the direction of Francisco Braga, playing, when at full strength 120 figures, probably being the best in Brazil at the present time.

Art

The Academy of Fine Arts dates back to 1826, and, amongst other foreign painters, Le Breton, Debret and Taunay were engaged in teaching here, as well as the famous engraver Girardet.

The first Brazilian sculptor of any note was a native of Ouro Preto, surnamed "O Aleijadinho" (The Little Lame One), born in 1730. He was a mestiço of very little education, and his real name, Antonio Francisco. A bust in bronze exists in the Passeio Publico, Rio, and examples of his labour, including a great deal of artistic iron work, are to be found all over Minas.

Rodolpho Bernadelli is the leading living sculptor. He is now engaged on a great monument to Campos Salles, for the city of S. Paulo. Correa Lima, a pupil of his, has produced some fine work, including "Mater Dolorosa." João Baptista da Costa, Director of the National Gallery and School of Fine Arts, is a landscape artist, of whom Brazil may well be proud. Aurelio de Figueredo, "Paulo e Francesca"; Rudolpho Amoedo, "O Ultimo Tamoyo" and "A Narração de Philetas"; Antonio de Parreiras, "A Derubada" and "Calme du Soir"; Rodolpho Chambelland, with "A Sahida do Baile"; Georgina de Albuquerque, "Supremo Amor"; Lucilio de Albuquerque, "A Expedição de Laguna"; Henrique Bernadelli, "Os Bandeirantes," etc., are amongst the painters of the first rank.

Included in a list of foreign artists domiciled in Brazil, Aurelio Zimmerman, born in Germany in 1854, is the master *par excellence* of all pertaining to rural scenes in the south, hunting pictures. etc.

Several gifted Italians have made their home in the country.

Classical painters are headed by: Pedro America (Paralyba, 1843), author of "Judith," "David," and the well-known "Proclamação de Indepen-dencia" in S. Paulo Museum. Other historical painters include Victor Merielles, "A batalha de Guararapes," "A batalha de Riachuelo (1878)," "A Primeira Missa no Brasil," etc.

Science

Oswaldo Cruz, Dr. Founder and Director of Manguinhos Institute, perhaps the finest biological laboratory, etc., in existence. Was responsible for the successful campaign against the mosquito in Rio, and other cities. Died 1917. Prefect of Petropolis.

Chagas, Dr. Professor of the Institute. Discoverer of the disease which bears his name.

Santos Dumont. Needs no introduction. Born in 1873, in Minas. Was driving engines at 12 years of age, on the well-known Dumont Coffee estates, in S. Paulo.

Huet Bacellar, Admiral. Improvements in torpedos.

Landell de Moura, Father. First inventor of the wireless telephone.

Barbosa Rodrigues. Celebrated Anthropologist and Botanist.

Radler de Aquino, Lieut. Many engineering inventions.

Mello Marques. A new submarine.

Chapot Prevost. A great surgeon.

Costa Senna, Dr. Director of the School of Mines. First authority on Brazilian mineralogy.

Gonzaga de Campos. Director of Geological De partment. A distinguished geologist.

Amongst foreign scientists who have devoted their talents to Brazil, Drs. Orville Derby, who deserves a chapter to himself, Hartt, Branner, and Agassiz, all Americans, lead the way in Geology and Mineralogy.

Dr. Derby spent over 40 years in Brazil and left 115 different articles on natural science. He discovered that Tinguá was a volcano, and defined an ancient eruptive zone of considerable extension.

Lund the Dane, D'Ursel, St. Hilaire (see Bibliography), Fritz Muller, Hensel, Rath, Langsdorff, Natterer, Ehrenreich, Tschudi, Wappæus, Katzer, Peckholt, Koch Grunberg, Von den Steinen, Von Ihering, Florence, Burmeister, Goeldi, Huber, Bates, Burton, Wallace, and many others, form a galaxy of names which scintillate in the annals of science in Brazil, and amongst the staff of the museum in Rio, S. Paulo, etc., there are men with first-rate records.

Religion in Brazil

There are nearly five thousand Roman Catholic churches and chapels in the Republic, the principal centres being Bahia, 389, of which more than 100 are in the State Capital itself. The diocese of Marianna, in Minas, possesses 514, but it is very large. Olinda (Pernambuco) has 401; Fortaleza, 305; Parahyba, 336; and, Nictheroy, 297. In the South the number of edifices and clergy is far less than in the above mentioned districts.

Brazil has a Cardinal Archbishop, Cavalcanti e Albuquerque, and the Santa Se naturally maintains a Nuncio in Rio, the Brazilian Government, illegally, perhaps, but wisely, elevating its repre-

sentative at the Vatican to the rank of ambassador (1919).

Brazilians are essentially a sentimental people, and, as such, devout Catholics. Nonconforming creeds are well represented, Baptists having 119 chapels, Evangelists 94, Presbyterians 99, Methodists (American) 45, Jews 8, Episcopalians 14, Anglicans 6, the Greek Orthodox Church 1, and other religious bodies 55. There are no mosques or temples to any other Oriental faith. Most of the numerous body of Syrians in Brazil belong to the Maronites, or else to one or other of the Methodist and other Churches founded in Palestine by the Americans, in connexion with some excellent schools, which would do even better work if they left the people to their own religions. Sad to say, as most travellers have noted, the renegade is often of a sly false disposition, especially when his conversion results from practical motives, and I have found the Moslem a better man than the Christian as a general rule.

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Von Tschudi ("Reisen."), etc., etc.

It is not my business to give long quotations from any of the works mentioned, but to let impartial readers form their own judgment.

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For sundry other mistakes not noted and errors of punctuation I must beg the reader's kind indulgence.

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(1) British Isles

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Financial Review of Reviews: "An authority, who has made long and careful study of Brazil."
Financial Standard: "Will be found invaluable."
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Investors' Review: "Nothing clearer."
Irish Times: "Profound."
Journal Royal Geographical Society: "Especially useful."
Journal of the Royal Society of Arts: "Excellent and valuable."
Lancet: "A great guide-book."
Leicester Post: "Admirably written."
Magazine of Commerce: "To the point; excellent."
Manchester Courier: "A monumental work."
Mining World: "A model book."

Nature (London): "An excellent work; tactful and valuable. Carried out well."
Newcastle Chronicle: "A modern, comprehensive and accurate guide."
Northern Whig: (Belfast): "Encyclopædic, vivid, admirable, of immense value. Wide purview, authoritative and very instructive.
Nottingham Guardian: "Straightforward, clear, admirable and invaluable."
Page's Weekly (London): "A marvel. Extremely valuable."
Referee (London): "All difficulties overcome admirably."
Rubber (London): "Most instructive. Nothing omitted."
Scotsman (Edinburgh): "Handy and valuable."
South America: "Simply amazing. Thorough, exceedingly useful."
South American Journal: "A very concise and valuable work."
Sussex Daily News: "Graphic, lucid, accurate."
Times: "A very valuable and comprehensive book."
Tropical Life: "Really valuable, correct and explicit."
Western Mercury: "Marvellously got together."

(2) United States and Canada, etc.

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American Club Woman: "Especially valuable."
Book News (Pa.): "Of rare commercial value."
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Eagle (Brooklyn): "Contains mines of information."

Hawk Eye (Burlington): "Most interesting and valuable."

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San Francisco Chronicle: "Instructive, attractive and interesting."

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Toronto Mail: "Everything about Brazil."

Washington Daily News: "Useful and dependable."

Washington Times: "An admirable text-book."

(3) Brazil

Correio da Manha (Rio Janeiro): "Brazil, de Oakenfull. Um vasto repertorio. Rarissima excepção em obras de propaganda."

Etoile du Sud: "Excellent vademecum. Concis, au style clair et élegant. Un tableau très fidèle."

Gazeta de Noticias: "Complete. Of real merit."

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The London and River Plate Bank, Limited.

Established 1862.

CAPITAL

Authorised . . .	£4,000,000
Subscribed . . .	£3,000,000
Paid up	£1,800,000
Reserve Fund . .	£2,100,000

29, Rua da Alfandega and 112, Rua da Quitanda, Rio de Janeiro;

And at London, Manchester, Paris, Antwerp, Lisbon, New York, Santos, São Paulo, Pernambuco, Pará, Manáos, Bahia, Curityba, Victoria, Porto Alegre, Buenos Aires, Rosario, Mendoza, Concordia, Bahia-Blanca, Barracas, Cordoba, Paraná, Tucuman, Once, Boca, Montevideo, Paysandú, Salto, Valparaiso and Santiago.

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Correspondents in all other chief towns of Brazil.

Bills of Exchange issued and purchased at the following places: London, and all the principal towns of the United Kingdom; Paris, and all the principal towns of France, and of the Argentine Republic, Uruguay, Chili, United States, Canada and Japan.

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