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Hunnicutt
Brazil world frontier

BRAZIL

WORLD FRONTIER

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Preface

Brazil is in many ways a World Frontier, not merely because of its more than a million square miles of entirely uninhabited area, but because it offers such exceptional opportunities for progress into the unknown: in science and sociology; in transportation and development of new territory; and also in health and sanitation.

There is so much to be accomplished that as fast as the "frontier" recedes a new one arises, just beyond the horizon. Enterprising and venturesome spirits are ever driving ahead, and that is as should be.

The increasing importance of Brazil in world development has been very evident in recent years. Its immense size, enormous natural resources, strategic location and democratic people all go to determine and enhance this importance.

The country suffers a number of decided handicaps in its large percentage of illiteracy, in the difficulties of transportation and in the lack of fertility of much of its territory. Agriculture and industry compete with each other for the available supply of labor. Large modern cities tend to empty rural districts far too fast, but in spite of these drawbacks, in the more than forty years that I have resided in Brazil much progress has been made and a close cooperation between the United States of America and the United States of Brazil can greatly hasten progress and offer many advantages to both countries.

An optimistic view point has been taken of the country as a whole, but every effort has been made not to exaggerate for or against, and as far as possible the information given is accurate.

Acknowledgments

My sincere gratitude to the Brazilian Government for its generous cooperation in the preparation of this book is hereby expressed. Without the help of the Brazilian Institute of Geography and Statistics this book could not have been written. I should mention especially Ambassador José Carlos de Macedo Soares, M. A. Teixeira de Freitas, Germano Jardim and Waldemar Lopes. Much work was done in the preparation of the manuscript by Miss Clarissa Rolfs which is hereby gratefully acknowledged. A great many friends, too numerous to be mentioned, cooperated in one way or another. To all of them I extend my sincere thanks.

Contents

Foreword

To write about a country, especially when it is not one's own country, is one of the most difficult spheres of literary effort.

Our generation, however, has been characterized by a voluminous output of this kind of writing which has been, for the most part, hasty and superficial. It has been more a writing business than the noble art of informing and of transmitting to others one's knowledge and experience.

Among this mass of publications the book BRAZIL: WORLD FRONTIER stands out as an exception. It is a book that comes from living and feeling. It has been written, observation by observation, by the knowledge that comes only from experience. It is a work that is realistic but, at the same time, lovingly sympathetic. It is a book by one who has come into intimate contact with Brazilians, and who has familiarized himself with things and facts Brazilian by study, understanding and faith. It is a sincere and noble work by one who has believed in the country and who has undertaken to work, and even to spend his life for it. It is by a man who has dedicated himself to educating, but who is convinced that the good educator tries to learn more and more in order to be better able to teach.

This is the reason why BRAZIL: WORLD FRONTIER is not just another book of superficial impressions or information, but a work of interpretation and understanding. Through it Brazilians themselves can, and should, learn to know Brazil better and to love her more. Mr. Benjamin H. Hunnicutt is a professor who has known no other activity except studying and teaching. He has laurels of esteem in molding the cultural life of several generations of Brazilians. His book is, therefore, essentially a great and profound lesson. Upon the pages of his book the physical and political aspects of Brazil are faithfully reflected. He captures the true Brazil for those who have a desire to know her.

This explains why he has described, almost photographically, various aspects of our geography, later making diagnoses, formulating conclusions, and even venturing upon making predictions. The title of the book expresses what he thinks—or rather, what he hopes. It might be called a prophesy. Before him, Theodore Roosevelt, after

traveling through our country, predicted in his book *Throughout the Brazilian Wilderness* that Brazil had it in her power, by virtue of her capacity to create a new civilization in the tropics, to broaden and extend the frontiers of world progress.

I know of no country whose geography, history, and general essence have been less widely known and more poorly interpreted than Brazil's. For this reason, the realistic and well-informed contribution of Prof. Benjamin H. Hunnicutt, set forth in written form, is of inestimable value. It fills a great void. I know of no better book about Brazil, in English. Furthermore, Brazil deserves books like this one. It is a vast and underpopulated country. It has every kind of climate, every kind of natural wealth, and every type of culture. In Brazil there live millions of people of every race, and there is room for many millions more.

It is, then, a land open to the world, where the old peoples will find new lands and—just as this book says—new frontiers. Also in like manner as those who, like B. H. Hunnicutt, have served and lived for Brazil, they will find new horizons and even new destinies.

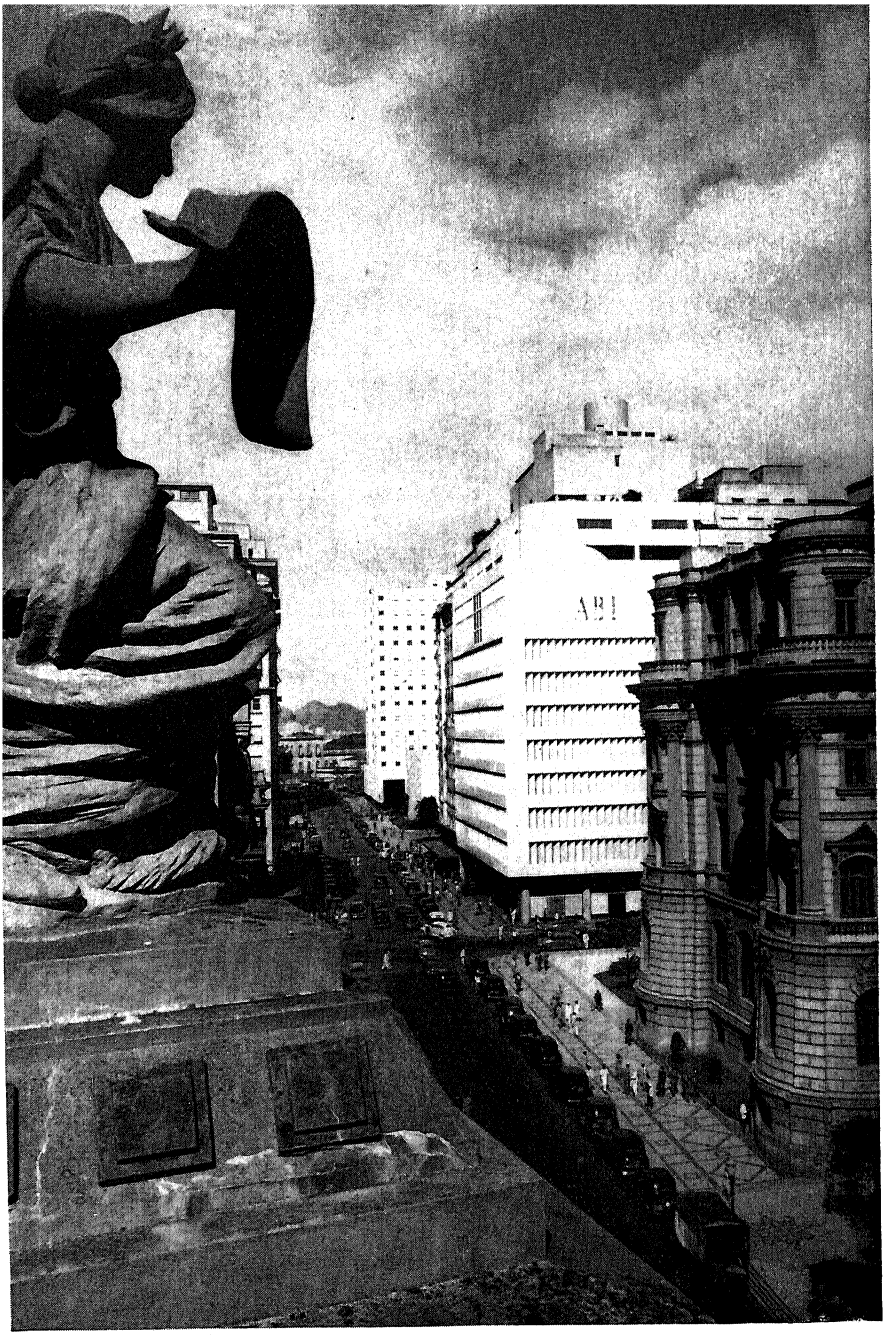
OSWALDO ARANHA

PHOTOGRAPHIC ILLUSTRATIONS

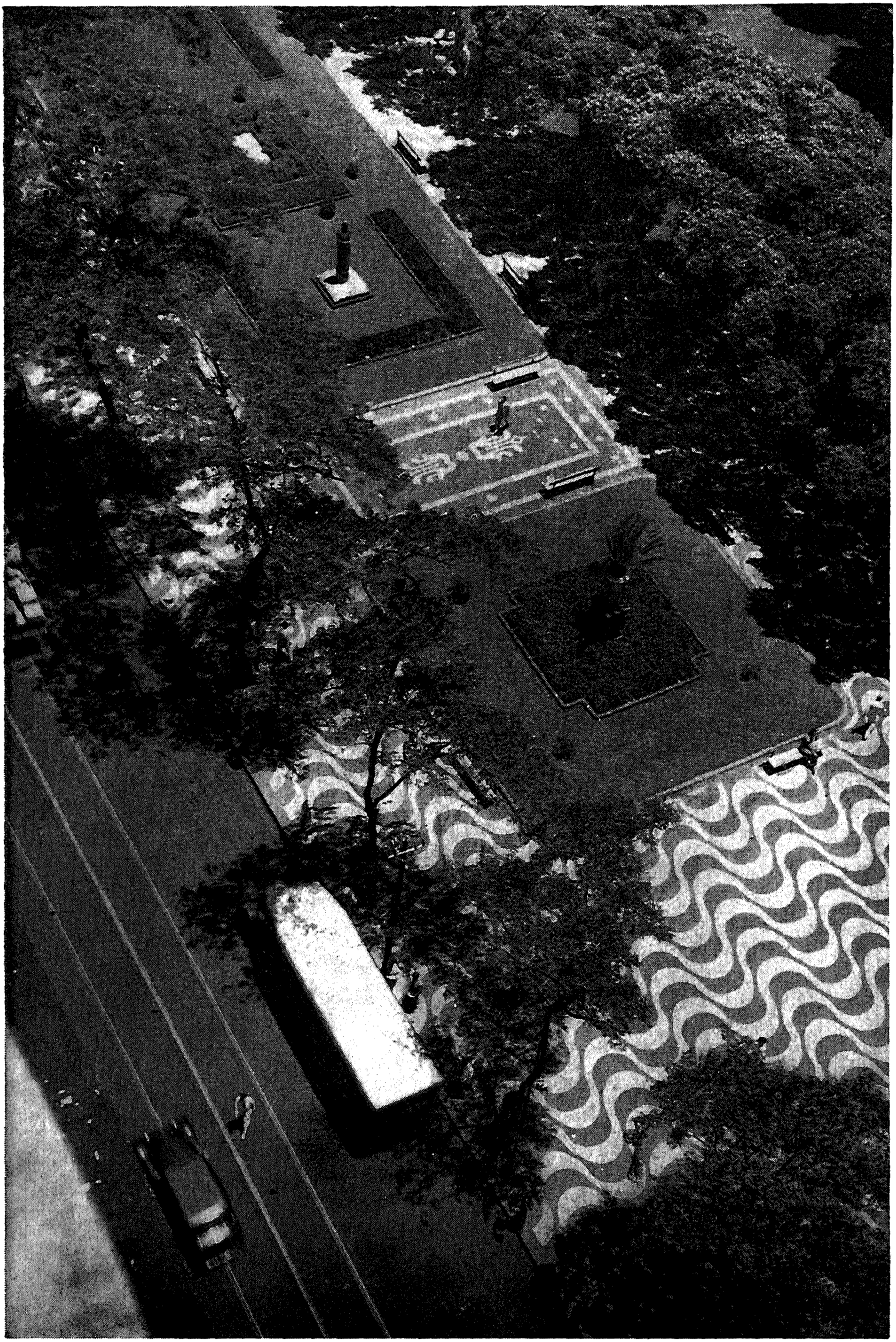
Brazil is a country of vast areas, large plantations, great wildernesses, beautiful cities, varied industries. To do justice to its variety and beauty would take many pages of pictures, impractical in a work intended as a general guide and reference book. In consequence the text has been illuminated by the drawings of Percy Lau, catching as no camera could the spirit of many phases of native Brazilian life, and in the section that follows are photographs of important or typical places and activities. Together it is hoped that they will give the reader some idea of the appearance of our great Southern neighbor.

Photographs from Brazilian Government Trade Bureau

Rio de Janeiro is Brazil's capital city and one of the most beautiful in the world. Its new architecture is typified by the buildings in Republic Square including (right) the Ministry of War.

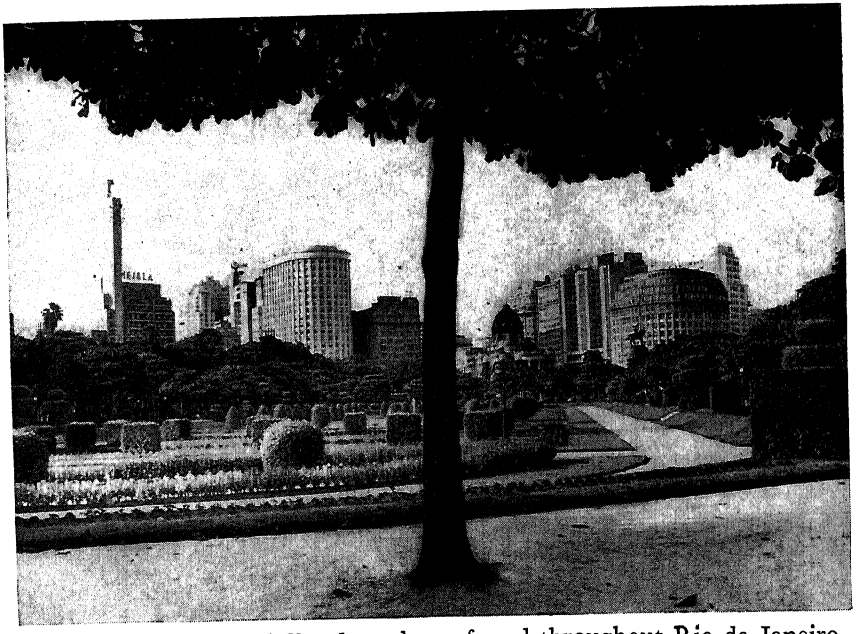


One of Rio de Janeiro's principal streets, Rua Araujo Porto Alegre, and the famous ABI building, designed by Le Corbusier.



Rio de Janeiro's tesselated pavements and sidewalks, like these in the Praca Floriano Peixoto, add to the charm of the city.

Copacabana Beach, a few minutes from the heart of Rio de Janeiro, lined for miles with apartment houses and famous hotels.



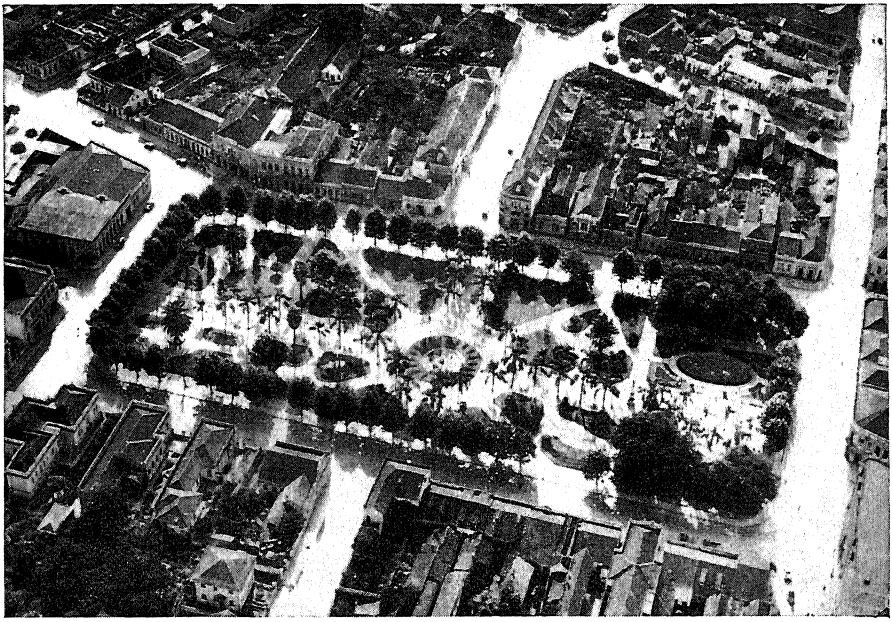
Great squares, beautifully planted, are found throughout Rio de Janeiro. This is the Praça Paris.

São Paulo is the greatest industrial city in Brazil, and is perhaps the most rapidly growing city in the world today. The Viaduto do Cha, shown here at night, is part of the city's magnificent road system.

The Ypiranga Museum in São Paulo, containing great Indian and other national collections.

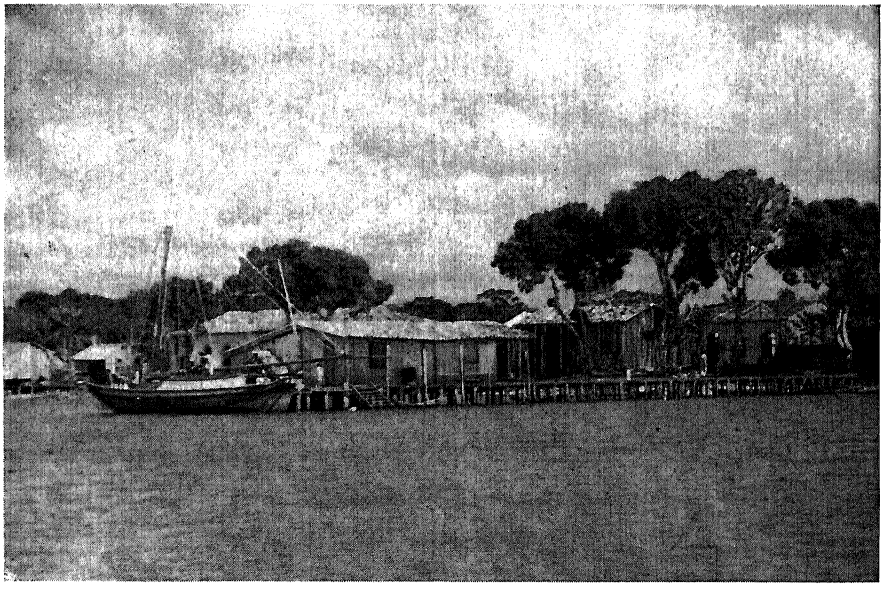
The main building of the School of Medicine of the University of São Paulo.

The ancient city of Santos, in the state of São Paulo, first settled in 1545 and now one of the great Brazilian ports.

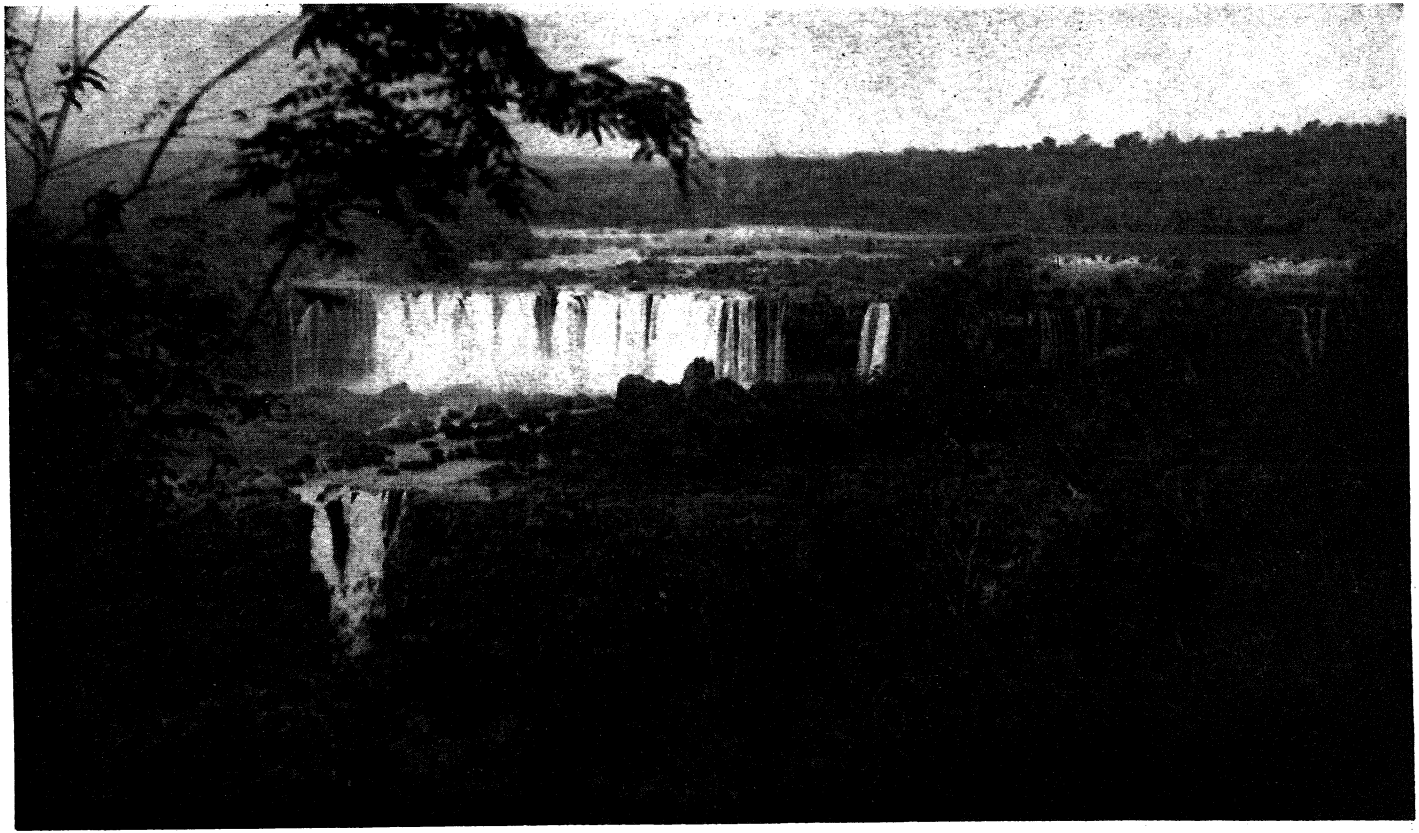


View from the air of Curitiba, in Paraná State, center of the mate, or Brazilian tea, industry.

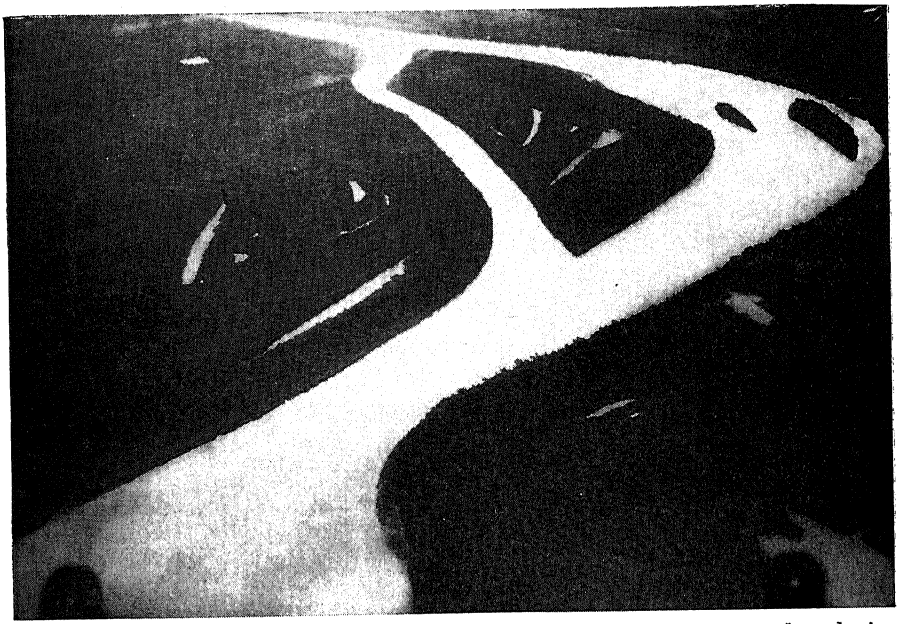
Early Portuguese settlers left their unmistakable mark on Brazilian buildings, as on this seventeenth century church in Recife, the principal city on the hump of Brazil and the site now of some of the hemisphere's most advanced business architecture.



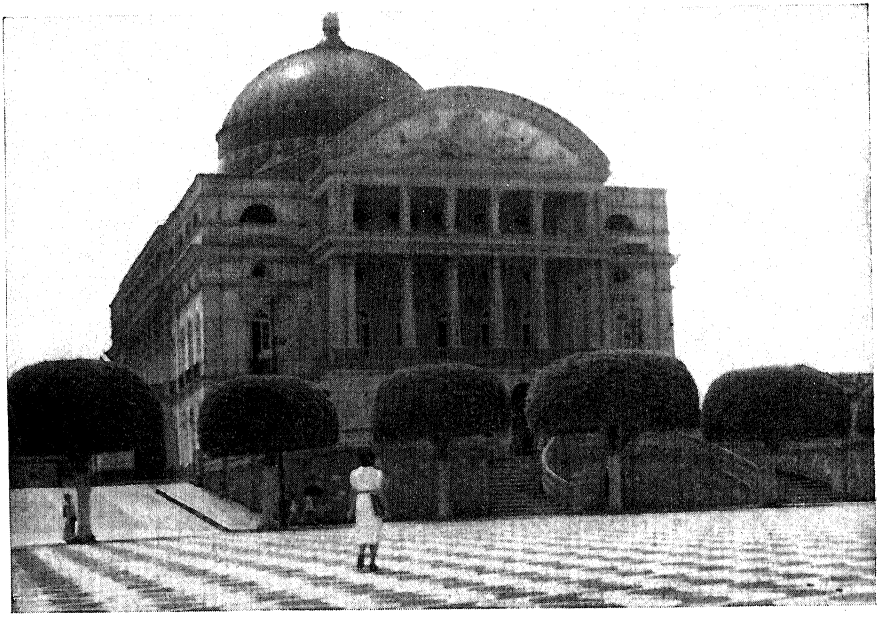
Old Brazil is also reflected in the little river villages that line the waterways. This is the town of Parintins in Amazonas province.



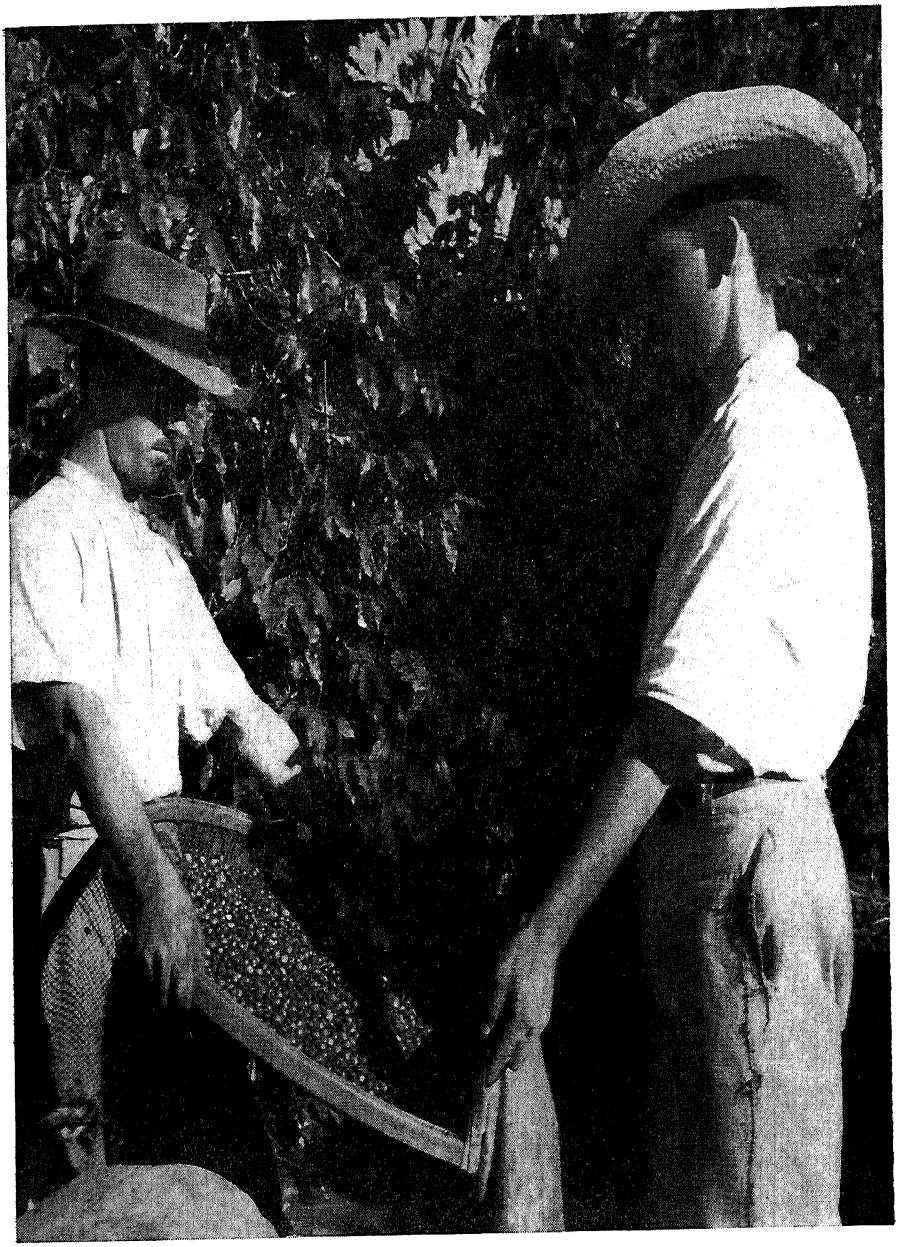
One of the world's greatest waterfalls is Iguaçú, in southern Paraná state, where the waters of the Iguaçú river drop over a serrated gorge nearly 250 feet high. The hydroelectric potential of the falls has been estimated at 800,000 kw.



The somber, rain-drenched Amazon valley, still largely unexplored, is difficult to photograph because of the climate. The Amazon basin is believed to cover nearly 3,000,000 square miles.

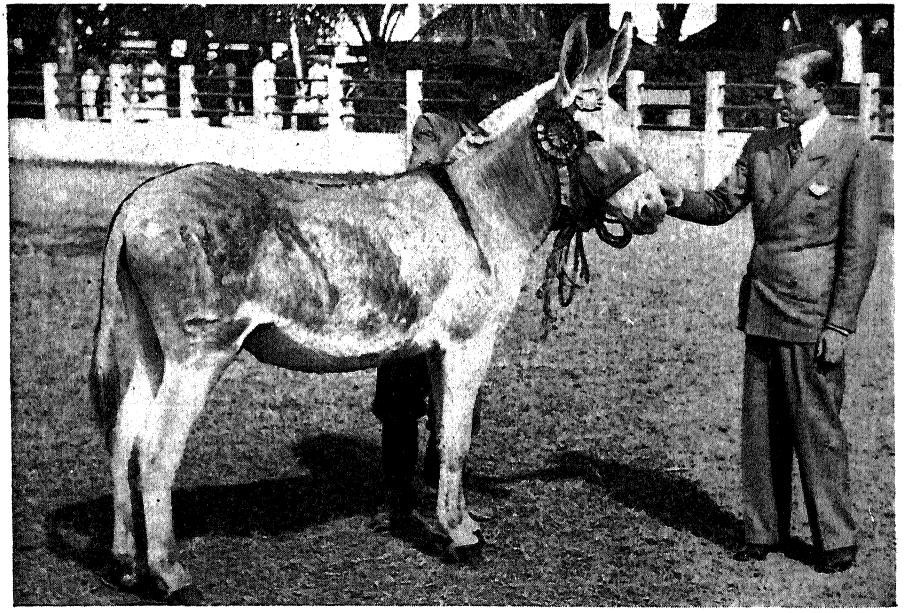


The opera house in Manaus, principal city of the inland Amazon area, was built when the city was a rich world rubber center.

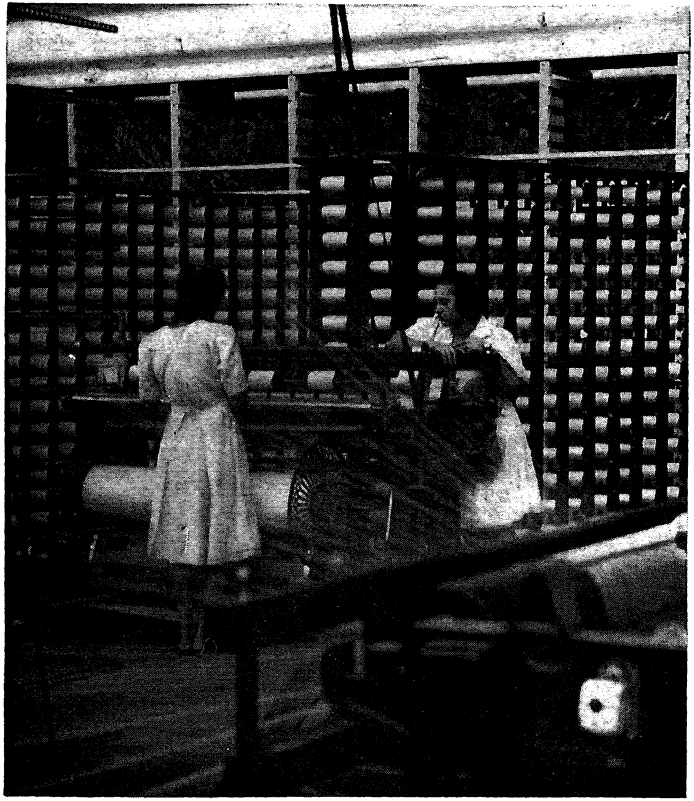


The natural products of Brazil cover a wide range. Most famous, and still one of Brazil's most profitable crops, is coffee, shown here being harvested at a São Paulo plantation.

A wild crop of great commercial importance is the Brazil nut, gathered in the state of Pará and stored for shipment in great warehouses at Belém and other Amazon basin ports.

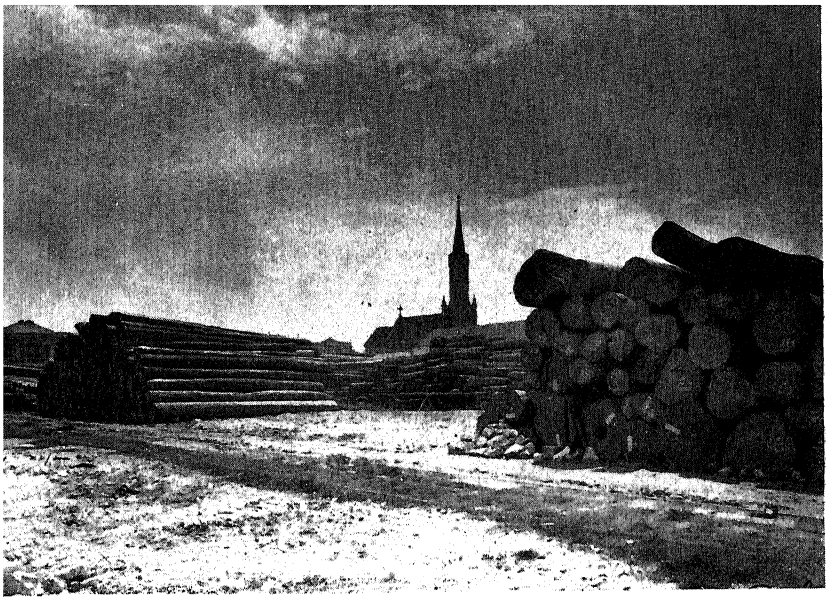


Cattle and livestock are important in the economy, and prize-winning animals, like this jackass at Rio de Janeiro's National Exposition of Animals, are raised extensively.

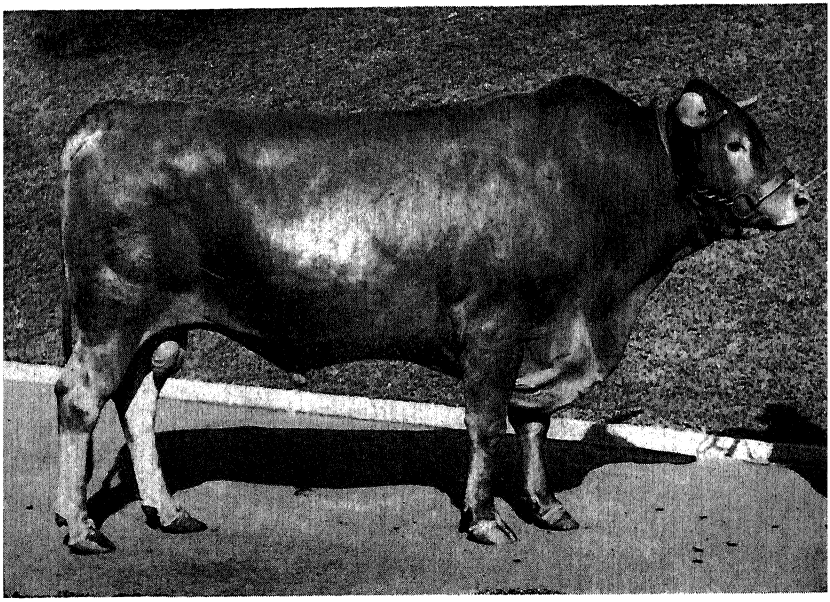


Local silk production competes favorably with Asiatic importations. The girls above are working in the spinning section of a São Paulo mill.

A great capital investment exists in cotton farm machinery and factories, and cotton is produced in modern plants at a price to compete in world markets.

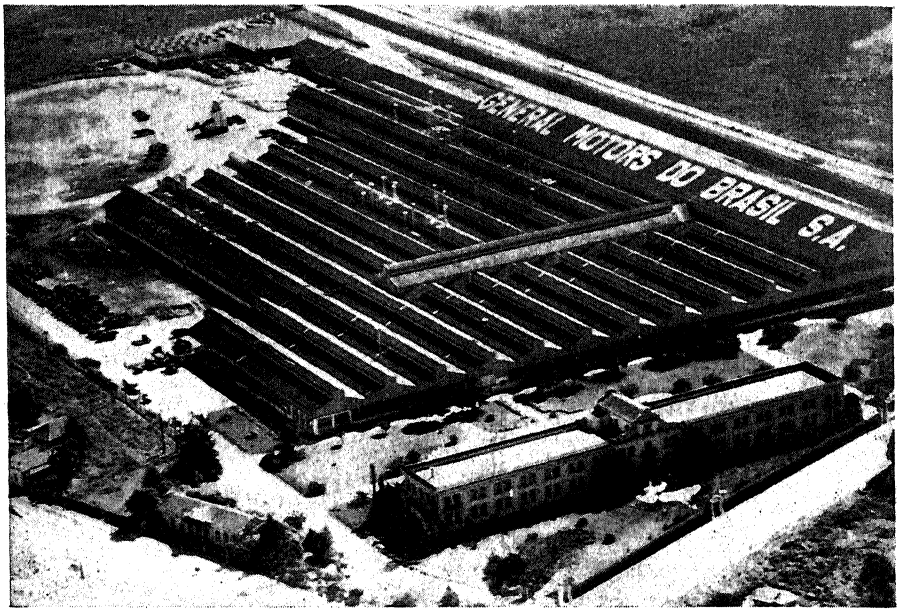


Another important crop is timber, existing in wide variety throughout the country. Fine woods are exported, in logs, to all parts of the world. The name of Brazil itself is derived from the brazilwood (caesalpinia).



A bull of the Caracú breed, grown at one of the government experimental farms as part of a program of livestock improvement.

Brazil's industrial development was given a great impetus by the war. This is the Volta Redonda steel plant of the National Mining Company, designed to produce 300,000 tons of steel annually from domestic ore and coal.



American interests participate in Brazil's industrial development. The General Motors plant near São Paulo is an example of the size of these enterprises.

Ford's rubber plantation at Belterra in the state of Pará. It is part of an experimental rubber development begun in 1927.

☆

PART I

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The People and the Land

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I

Brazilians

BRAZIL FACES Europe geographically and in the past looked to the Old World for its culture. Formerly very few people visited Brazil from the United States, and even fewer Brazilians came to the United States. In 1938 there were 375,000 citizens of the United States living in Europe, while there were not 5,000 in all Brazil. During 1937, more than 3,000 Chinese students were enrolled in the schools and colleges of the United States, but only thirty Brazilians. These figures indicate how few contacts we had with Brazilians and how little we influenced their life. When we thought of Brazil, we thought of savages inhabiting the Amazon Valley, where huge snakes crawl and monkeys chatter in forest jungles. Possibly we remembered that coffee is raised in the southern part of the country, that the capital is Rio de Janeiro, situated on a beautiful mountain-locked bay, and that Portuguese is the language of Brazil.

On the other hand, the average Brazilian's idea of our country was equally distorted. He thought of the United States as a land of skyscrapers, universal ownership of automobiles, and constant attendance at prize fights. He thought of our country as entirely centered in four large cities—New York, Hollywood, Miami, and Chicago. Brazilians learned about the United States principally through motion pictures, for our films, good and bad, were, and are, shown all over the country. Naturally, Brazilians acquired some queer ideas about the sort of people we are and the lives we live—queer because the vast majority of us have certainly never lived motion picture lives.

Fortunately for both countries, an ever-increasing mutual interest is manifesting itself. During World War II, Brazilians came to look to the United States for direction and aid in social and economic matters. In the majority of cases, the more the American sees of Brazil and Brazilians, the better he comes to like them. The same is true of most Brazilians in regard to the United States and our people. Thousands of well-educated Brazilians have come to the United States for advanced

study in their specialties. And thousands more plan to come—as students and as tourists. Brazilians seem to be more thoroughgoing as tourists than we are. They are willing to travel extensively in our country, whereas the usual tourist from the United States to Brazil is content to see only a few coastal cities.

The Typical Brazilian. Just as it is hard to describe a typical citizen of the United States, because of the diverse nationalities and races of those who have immigrated to the United States, so it is also difficult to describe a truly typical Brazilian. Types vary in different parts of the country, just as they do in various sections of the United States. The Brazilian from the northern parts of the country is usually small of stature, not much above five and a half feet in height, nearly always heavy set; he has black hair and a swarthy complexion. The typical person from the central part of the country is taller and heavier than the northerner, has dark hair and black eyes. Italian or German ancestry is often apparent in his features, and he looks more European. The farther south one goes in the country, the fewer Brazilians one finds with Negro or Indian blood. A great number of the people of southern Brazil show the blond hair and facial characteristics of German or Polish ancestry.

The Brazilian of the better class is well dressed, and he wears more or less the same cut of clothes that is worn in the United States. A person going to Brazil from warmer parts of our own country will wear the same type of clothes he has been wearing. As is nearly always true in the tropics, linen or cotton suits are customary, for they are cooler and more comfortable. The dress of the poorer class is quite different from ours. Warm weather permits, and poverty requires, that many of the poorer class go without shoes a great part of the year.

The Brazilian woman of means dresses in the same style as the women of the United States. She is likely to copy the Parisian fashions or to wear expensive Paris-made clothes. Usually she is a brunette, but she has a lighter complexion than the man. Her weight is not a subject for conversation; however, it varies as widely as it does with American women. The Brazilian woman is becoming more athletic as she gains greater social freedom. She attained social and political freedom later than did the women of the United States, and she still has her principal activity in the home.

The Brazilian woman's emancipation has paralleled surprisingly that of the women in our southern states. Even the period of time since the liberation of slaves corresponds more or less. One observes all over Brazil increasing difficulty in securing the good cheap house servants

of past generations. It is becoming increasingly necessary for Brazilian women to wait on themselves. They are proving themselves able to cope with changing conditions. And it must be remembered that they have done this without the aid of the educational advantages which have been available to girls in the United States and Canada.

Coeducation had its beginning at the Escola Americana founded by an American missionary, Rev. George Whitehill Chamberlain, in São Paulo in 1871. Nowadays practically all schools are open to women, but there is a lack of distinctly women's colleges. In high schools a recent decree has established a separation of sexes in the classrooms. Many women take a normal school course to prepare themselves for teaching; others are trained in business schools for work in offices in the cities.

Public offices are open to young women, who are as successful in the competitive civil service examinations as the young men. Brazilian boys and girls have much the same interests as young Americans: social life, education, and sports.

Composition of People. Brazil's mother country was Portugal. Thus the fourth largest country in the world had a small mother country in Europe, which recalls the case of England, a small island that was the mother country of the United States. The Brazilians speak Portuguese—and not, as so many Americans believe, Spanish.

The Portuguese colonists who came to Brazil in the early sixteenth century found the country inhabited by many independent Indian tribes. Those scattered along the coast were subdued and assimilated through marriage with the Portuguese immigrants. Some savage tribes are still scattered through the far interior. About three million slaves, according to some estimates, were imported to Brazil from Africa to work the farms and plantations.

More than four million Europeans immigrated to Brazil. The largest numbers came from Portugal, Spain, and Italy. A large number also came from Germany, and smaller numbers from Russia, Poland, and Syria. A total of 189,000 immigrants came from Japan.

We see that Brazil is very much like the United States: we, too, have the Indian and the Negro, as well as the many nationalities that have come from various parts of Europe. There is one distinct difference, however. The people of Portugal have little race prejudice, so intermarriage between races has taken place to a larger extent than in most other nations of the earth. A great intermixture resulted during the first century of Brazil's colonial history, because only men came out from Portugal at that time. They did not bring their families, as did many immigrants to the North American continent.

Early in the nineteenth century, when the Portuguese court fled to Brazil to escape from Napoleon's rule, the total population was estimated to be about four million. With the Prince Regent, and in following years, came wealthy and educated families. Then the simpler Portuguese villager began to come to Brazil in great numbers. At the time of Independence (1822) there were still less than five million people, but during the Empire, under Pedro I and Pedro II, the immigrant flow continued to increase. Migration records show that in the period from 1884, five years before the proclamation of the Republic, to 1943, 1,224,559 men, women, and children came to Brazil from Portugal alone.

It is evident to those who have known the Brazilians over a long period that they are much better physical and mental specimens now than they were thirty years ago. Better housing conditions and customs of dress, a wider use of milk, vegetables, and fruits in their diet, and better sanitary conditions which have resulted in the control of yellow fever, hookworm, and malaria—all these factors have made the Brazilians a finer and stronger people.

It has been only within the last few years that the Brazilian has learned to use the gifts of nature to their fullest extent. The development of bathing beaches and beautiful parks is doing much to make him an out-door man. On weekends when a national holiday adds an extra day or two, hundreds of thousands of people congest the highways and railroads that lead to the mountains or to the pleasure resorts. It may seem that holiday excursions are not important, but they are having a profound effect on the development of the Brazilian people who live near the seacoast. Brazil has a large number of fine beaches; also a large number of mountain resorts, one or two being a mile above sea level. Mineral spas, warm sulphur springs, and other health resorts are numerous. They are just beginning to be appreciated by Brazilians, who flock to them by the thousands, and to attract a large number of visitors from other countries, especially Uruguay and Argentina.

The modern youth of Brazil in the large cities enjoys greater social freedom than does the youth of any other Latin American country. "Brazilian girls enjoy a good deal more freedom than we expect to find in a Latin country, and this trend is growing. You understand why it is growing when you see these girls on the beach at Copacabana or at the golf club having a thoroughly good time and quite able to look out for themselves without the help of a chaperon." [1]

[1] Hugh Gibson, Rio (New York: Doubleday, Doran & Co., 1937), p. 23.

Individual Traits. The Brazilian is not so dynamic and aggressive as the American of the United States; but neither is he apathetic and indolent. What the Brazilians have done is to adapt their mode of life to the climate in which they live. They still maintain a great deal of the old European formalities in social intercourse. A Brazilian seems always to have time to chat with a friend or drink a cup of coffee, even on the busiest days. The modern tendency of life elsewhere has been to speed up everything until the world becomes one fast-moving merry-go-round. The Brazilian has never allowed himself to be made into a brusque, snappy, watch-your-step, or fast-living modernist.

Courtesy is the keynote of Brazilian life. Any barefoot boy that you meet on the road in the open country will greet you with "Good morning. How are you, sir?" In the great crowds of carnival time, when the streets are so congested one can hardly walk, there is always a good-natured courtesy and humor. People who have known the Brazil of the past and know the Brazil of the present hope that the time will never come when the Brazilians forget their fine manners in the race to keep up with the rest of the world.

National Traits. Brazilians are a notedly temperate people. Drunkenness is seldom seen in public places, though the use of strong alcoholic drinks has become more general than it was formerly. The common cheap cane rum is a menace to the poorer classes, but the government tax on low-class rum is high, which tends to moderate its use.

To do everything in your power for a friend or relative is the common attitude among Brazilians. Fortunate is he who wears a smile and is friendly toward others; his battle of life is half won. Some people think that this characteristic is exaggerated—that the Brazilian goes to the extreme of favoritism in aiding his friends and relatives.

Brazilians are more inclined to *adopt* than to *adapt* or develop things for themselves. Frequently this adoption produces happy results, as in the case of motor vehicles, radios, and electric refrigerators. In the case of social institutions and legislation, it has not proved so successful. Social institutions which function well in the enlightened environment in which they have been patiently evolved are likely to be costly failures where illiteracy is widespread and where inadequately trained assistants must often be advanced far too rapidly to positions of authority and responsibility. Lack of continuity of government support has been disastrous to many splendid projects and to institutions which have proved their worth elsewhere.

As Brazil continues her evolution toward becoming a world power, it is to be hoped that her people will retain their spirit of friendliness. The warm friendships that foreigners make with Brazilians are always highly cherished, and this to a great extent explains why many foreigners taking up residence in Brazil become so greatly attached to the country.

Family Ties. Brazilians have always maintained a close family life. Even after sons and daughters marry and establish homes of their own, it is common for them to return to their parents' home each week and have dinner together. The members of a family never let an opportunity pass for a reunion. The modern apartment, with its crowded living quarters, has come to many of the larger cities and is to some extent weakening family ties, but the old customs will not entirely disappear. The Brazilians persist in their efforts to prevent the disintegration of the family. Their law does not permit divorce. Brazil is one of the very few large nations that has no laws granting divorces.

Position of Women. In Brazil, at the beginning of the twentieth century, it was still considered improper for a lady to go out on the street or appear in public unaccompanied. Practically the only occupation of women outside the home was agricultural work in rural districts. Such conditions have changed greatly. Women now move about freely and even travel alone without fear of molestation. Most occupations and some professions are open, at least nominally, to women. They have suffrage, and they are required by law, if literate, to exercise this right.

More than a half million women are employed outside their home in the State of São Paulo alone. Many still engage in agricultural labor, but some 300,000 from the rural regions are employed in cities. Factory work accounts for about 135,000, and domestic service for some 75,000. Another 35,000 are in professional work, mostly as teachers. Thousands clerk in stores or work in private offices, as well as in government offices. In view of the fact that women can so easily obtain remunerative employment, it is no longer considered a disgrace for a woman to remain single.

Home life has been completely modified by a number of factors. Economic pressure has obliged thousands of women, even mothers of fairly large families, to supplement the family income. Factory work has so depleted the ranks of domestic servants that many large homes, which could be maintained only with the aid of numerous servants,

have been given up. It is not unusual for young married women to continue to work. Life in apartments, rather than in separate houses, has greatly altered family life for a large majority of city-dwelling women.

The greater freedom—economic, social, and political—which Brazilian women now enjoy has brought with it increased responsibilities, which as a rule are being met fairly adequately. The greatest lack is a type of education, in tune with the times, which would prepare the young woman not merely to earn a living but also to take her place in the home—for instance, domestic training for women employed in factories as well as special preparation for their specific jobs. Vocational training for rural girls is another lack. The middle class has perhaps the best opportunities at present for women's education.

Women are taking an increasingly active part in politics, and a few have been elected to Congress, or appointed mayors of cities. New avenues are constantly opening for Brazilian women. Education of women, their work, and their position in society are receiving more serious study and consideration than formerly.

Modern Health Measures and Social Legislation. A vigorous campaign for the protection of health, the prevention and cure of venereal diseases, the prevention of epidemics, the elimination of slums, and a gradual improvement of living standards, is having a profound effect on the make-up of Brazilian society. Improvements in facilities for outdoor life, which are available to the rich and poor, are making a happier country and a healthier people.

Brazilians are aware of the importance of sanitary measures in health. A real factor in the stimulation of their interest in health has been the cooperation of the Rockefeller Medical Foundation, which has given many scholarships for the training and advanced study of doctors and nurses, who, in turn, are bringing modern hospitalization within the grasp of many people. At the same time, the Federal Government is doing much to aid the health movement, by strict enforcement of sanitation laws.

Advanced social legislation in Brazil includes a minimum-wage scale, social security, shorter working hours in industry, a fifteen-day vacation for all employees, and many other programs for social betterment.

Present-Day Tendencies. For more than a century, upper-class Brazilians have suffered from an inferiority complex so far as their

country was concerned. The best of everything came from Europe, and very little was manufactured in Brazil. A cultural background and education could be gained only by traveling and studying in Europe. Within recent years a change has taken place, and Brazil is beginning to achieve her social and cultural emancipation. An intense nationalistic pride has spread over the country, and today the Brazilian is likely to feel that he is better than anyone else, sometimes with, sometimes without, reason. He has become self-reliant and is determined that his country shall be for the Brazilians—and for the Brazilians alone.

Attempts are being made to weld all of Brazil's foreign groups into one social unit. Rigid immigration restrictions have been enacted to prevent the domination of the country by foreigners. All foreign countries have been put on a quota basis; and while Portuguese, Spanish, and Italian immigrants are received in fairly large numbers, some other nations have seen their immigration greatly reduced. Japanese immigration is prohibited.

There is some interest in the United States in emigration to Brazil, especially among farmers.[2] Should they take up residence in Brazil, they would have to adapt themselves to a new language, a new climate, new tropical or subtropical crops, the customs of a Latin people, and a new economy. This adaptation is not an impossibility, but the problems connected with such a migratory movement require deep study.

A Peace-Loving People. The Brazilian has always loved peace and contentment more than anything else. No other nation as important as Brazil has a more honorable record for the amicable settlement of its problems. Freedom from dominance by Portugal, the settlement of boundary disputes, the emancipation of slaves, and the establishment of a republican form of government after nearly seventy years of monarchial rule—all these have been attained without war.

At the same time, the Brazilians have not overlooked the need of national defense. Their standing army is second in size to that of the United States in the Western Hemisphere. They feel it necessary to keep up a large army to maintain their national integrity and guarantee national security. Much is being done to modernize the whole military force, to introduce the manufacture of arms and munitions, and to improve air defense. Hundreds of airplanes for trainer flying have been donated by public-spirited citizens.

[2] In the year 1939 so many inquiries were received by the Brazilian Government from American farmers interested in settling in Brazil, that a special investigation was ordered to determine what the country had to offer in the way of opportunities.

The late Dr. L. S. Rowe, Director General of the Pan American Union, emphasized the peace-loving character of the Brazilians in the following statement:

> It must be a source of deep satisfaction and pride to every Brazilian citizen to realize that his country, from the earliest period of its existence as an independent nation, has maintained the highest standards of international dealing. The record is one quite unique in the history of modern nations. To every international question that has arisen, Brazil has brought not only an honest desire but a determination to effect a settlement by peaceful means. She has thereby given an example to the world of which every one of her citizens may well be proud.[3]

Friendliness to the United States. The record of Brazilian friendship for the United States is one of long standing. Brazil's official attitude has always been acceptable to us, as have personal dealings with individual Brazilians. The Brazilian Emperor, Pedro II, on his historic visit to the United States in 1876, gave many evidences of his high esteem for the American people. The late Dr. Mary W. Williams wrote an excellent biography of this outstanding Brazilian, *Dom Pedro, the Magnanimous,* which should be read by everyone interested in Brazil.

The Brazilians have always admired, and sometimes envied, our *Yankee* push and industrial and commercial aggressiveness. They have not feared the so-called *Yankee Imperialism* so much as have some other South Americans.

We are their best customers, and they buy a great deal from us. They grow many tropical products that we need and cannot produce ourselves. We are competitors in the world market in only two products: oranges and cotton. Brazil aspires to be the leading nation of South America, just as the United States is the leading power in North America. There is little doubt that Brazil will attain a much more important position as a world power than she occupies today. Brazil is a great nation, and will become greater.

Former Secretary of State Cordell Hull did much to further our Good Neighbor Policy. By this policy is meant that just as families in the same community should be good friends and neighbors, so should the nations on the two American continents have the same feeling of cordial friendship and mutual cooperation. Brazil is a firm believer in this policy. Modern improvements in communication and transportation have brought the United States and Brazil closer together.

[3] L. S. Rowe, *Message to Brazil.*

Each year the number of American travelers to Brazil, and Brazilian travelers to the United States, increases. The carrying out of the Good Neighbor Policy will draw the nations into closer relations, commercial and cultural, to mutual advantage. The Reciprocal Trade Agreements will also do much to improve inter-American trade and relations. There are recent trends toward a closer approximation of the cultures of the United States and Brazil. Cooperation between the two countries in hemispheric defense is also helping to promote interest and friendship between the two peoples.

A Summing Up. Educational circles in the United States have become profoundly interested in Brazil, and numerous scholarships are being offered Brazilian students. Interchange of students will become greater. Historians, economists, and just plain every-day citizens go "rolling down to Rio" and are taking a keen interest in the affairs of the country.

In an analysis of the national and racial amalgamation that is taking place in Brazil, the late Dr. Percy Alvin Martin of Stanford University gives us a good criterion by which to judge what is really taking place in the country. He says:

> In recent years we have heard the term "melting pot" applied to the assimilation of immigrants here in the United States. The term is even more applicable to Brazil, more applicable in fact than to any other country of America. For in a broad though very real sense Brazil is the ethnic and cultural heir to three continents—America, Europe, Africa. . . . A variety of factors, environment, ethnic, and cultural, will give the Brazilian a national physiognomy quite his own. In fact, the process is already clearly discernible. If the new world is ever destined to produce a *raza cósmica,* as was so insistently set forth by the Mexican philosopher José Vasconcelos, this race may well find its habitat in Brazil.[4]

[4] Percy Alvin Martin, "Portugal in America," *The Hispanic American Historical Review,* XVII, No. 2, May, 1937.

II

A Challenge to the Frontiersman

BRAZIL, the largest autonomous country in the tropics, has held together through four centuries under the same general dominance, first as a Portuguese colony for three centuries, and since 1822 as an independent country. Two efforts were made to wrest the land from its discoverers: one by the French, who landed at Rio de Janeiro in 1555, and one by the Dutch, who for twenty-four years (1630-54) occupied territory from Pernambuco to Maranhão. Both these efforts failed. The territorial limits of this vast nation have been established through peaceful means. The vastness of the country has had its advantages as well as its disadvantages during these past four centuries. Now a well articulated national unity is coming about rapidly, as transportation facilities make it possible for the various parts of the country to have access to one another.

Vast Unpopulated Areas. Enormous areas still have an average of less than two inhabitants per square mile. The reason is not that the climate is so bad that mankind cannot survive, but that large portions of this land have until recently been inaccessible for lack of transportation facilities. Brazilians have had so much land at their command that they neither have needed nor were able to use all of it. Much Brazilian territory has remained undeveloped because of slowness in adapting local production to the needs of international commerce. A more rapid use of the country's vast economic resources would have peopled these great areas of the interior. So much unoccupied land can constitute a danger in international relations. Some nations of the world have been so densely populated that it was difficult for them to supply a living for all their inhabitants. Raw materials run short, and food supplies become insufficient, so that governments look for territories to annex in order to offer land for settlement to their excess population. They also seek mines and forests to supply their needs in raw materials. When no territory can be obtained by peaceful means,

aggressive warfare is begun, and territory is taken from nations unable to defend themselves.

In World War II, Brazil became aware of this peril and prepared for her own defense by adopting military measures along with important plans for an effective peopling of her surplus lands, with adequate means of protection. The many commercial agreements signed with the United States will serve a double purpose: they will (1) stimulate production and (2) elicit helpful cooperation from the United States.

Periods of Development. Distinct epochs marked the days of colonial settlement. First, from 1500 to 1549, came the brazilwood trade. This was followed, at various points on the coast, by the dyewood exploitation and the cultivation of crops under the rule of *donatários*—lords with royal grants of land and powers. Then, for a century and a half, 1550 to 1700, the great sugar plantations along the coast were profitable sources of income. For their cultivation, and for mining in the State of Minas Gerais, 3,300,000 slaves, according to some estimates, were brought over from Africa during this period and in later years. Finally came the penetration of the highlands in the quest for gold and diamonds.

This movement attracted many settlers, with the "Bandeirantes Paulistas" from the State of São Paulo leading in the explorations, between the years 1700 and 1800. People from North Brazil and Portugal flowed in and established hundreds of settlements, which later grew into towns and cities. Precious metals and precious stones were carried to the port city of Rio de Janeiro on mule back, and on return trips supplies were carried by the same pack mules. Only occasionally was river transportation available for freight traffic, since the mineral wealth was all coming from the high mountainous plateaus, north and west of the coast.

From 1850 to 1912 was the rubber era. Most of the world's supply of rubber came from the wild trees abundant in the Amazon Valley. Manaus, the rubber capital, abounded in easy money. Rubber reached the fantastic price of one dollar a pound. Then came the transfer of this production to the Far East, as will be told in the chapter on rubber.[1]

But before 1850 the coffee era had long been under way in the province of Rio de Janeiro. Later great forests were felled in São Paulo, Minas Gerais, and Espírito Santo to make way for coffee trees. The cheapness and ease with which coffee could be raised soon enabled Brazil to dominate the world coffee market. In 1928, owing to a tremendous overproduction (so many trees had been planted) and to

[1] See Chapter X.

the great amount of coffee other countries had begun to grow, it became less profitable. Cotton had been a bonanza crop during, and for a short period after, the Civil War in the United States. In recent years this crop was again suddenly developed in the State of São Paulo, which raised only 30,000 bales in 1930, but produced over 2,000,000 bales in 1941. Official estimates show that the value of the cotton crop of Brazil, including exportable by-products, is now higher than the value of the coffee crop.

Modern Frontiers. Sugar cane production, gold mining, rubber plantations, and coffee growing have at various times and in various places caused the Brazilian frontier to recede suddenly. Cattlemen have always penetrated the interior in advance of other settlers, because, even where there are no roads, cattle can still be driven to far-off markets. It has long been the custom to drive young cattle hundreds of miles to areas near the coast, where they can be rested and fattened in good pastures before going to market for slaughter. The cattle rancher follows the explorer and the miner, and only some years later does the farmer come to plant his crops.

Rapid shifts of population are taking place in Brazil at present. Old, fairly well populated regions yield up their most aggressive elements, who move to the new and hence more productive lands that are being opened up. Some students of Brazilian geography feel that the population is very unstable, since it moves easily from one district to another. They seem to forget that the same thing happened in the United States until recent times. Such resettling may be a sign of virility rather than of decay.[2]

Of course, criticism is justly made of those who fell virgin forests, burn off the timber, and plant the land only so long as it produces bumper crops, and then allow the land to leach and be impoverished by erosion, while they abandon it to move on to new areas of virgin soil.

The Paulista (inhabitant of the State of São Paulo) has frequently been accused of being forever on the lookout for quick riches, and of failing to take root. Yet how could a country have been settled had it not been for those venturesome spirits who left their homes and occupations to embark on a new life in new regions? One cannot expect Brazil to settle its land and establish its cities along European lines. On the old continent, land tenure is more permanent, because for ages there has been no frontier to be exploited.

[2] See "The Changing Patterns of Population in São Paulo State," by Preston James, *Geographical Review*, July, 1938.

Rapid Increase of Population. The population of Brazil is increasing at the rate of almost a million people a year. The official census of 1940 gave the country a population of 41,565,083; and a reliable estimate for December 31, 1943, a total of 44,400,000. At this rate of increase the population should triple in 95 years.

BRAZILIAN POPULATION

NUMBER OF INHABITANTS

STATES	CENSUS 1940	ESTIMATES 1942	1943	1944	1945
Guaporé (Territory)	.....	.....	.....	27,300	23,922
Acre (Territory)	81,326	85,100	86,900	88,700	90,395
Amazonas	453,233	474,300	484,100	463,900	478,896
Rio Branco (Territory)	.....	.....	.....	15,100	13,718
Pará	956,870	1,001,400	1,022,100	1,017,200	1,039,661
Amapá (Territory)	.....	.....	.....	25,600	23,909
Maranhão	1,242,721	1,300,600	1,327,500	1,354,300	1,381,297
Piauí	826,320	864,800	882,700	900,600	918,463
Ceará	2,101,325	2,199,100	2,244,600	2,290,100	2,335,644
Rio Grande do Norte	774,464	810,500	827,300	844,100	860,824
Paraíba	1,432,618	1,499,300	1,530,300	1,561,400	1,592,369
Pernambuco	2,694,616	2,820,100	2,878,500	2,935,600	2,993,903
Alagôas	957,628	1,002,200	1,022,900	1,043,600	1,064,413
Fernando de Noronha (Ter.)	.....	.....	.....	1,200	1,189
Sergipe	545,962	571,400	583,200	595,000	606,842
Bahia	3,938,909	4,122,300	4,207,600	4,292,900	4,378,136
Minas Gerais	6,798,647	7,161,900	7,310,000	7,458,400	7,556,763
*Serra dos Aimorés	67,103	.....	.....	.....	74,586
Espírito Santo	758,535	817,300	834,200	851,000	843,119
Rio de Janeiro	1,862,900	1,949,600	1,990,000	2,030,200	2,070,622
Distrito Federal	1,781,567	1,864,500	1,903,100	1,941,700	1,980,229
São Paulo	7,239,711	7,576,700	7,733,500	7,890,200	8,047,010
Paraná	1,248,536	1,306,700	1,333,700	1,316,100	1,328,804
Iguaçú (Territory)	.....	.....	.....	93,200	108,498
Santa Catarina	1,184,838	1,240,000	1,265,600	1,242,800	1,267,417
Rio Grande do Sul	3,350,120	3,506,100	3,578,600	3,651,100	3,723,692
Ponta Porã (Territory)	.....	.....	.....	94,800	101,517
Mato Grosso	434,265	454,500	463,900	366,100	368,410
Goiás	832,869	871,600	889,700	907,800	925,742
BRAZIL	41,565,083	43,500,000	44,400,000	45,300,000	46,200,000

* Area in dispute between the States of Minas Gerais and Espírito Santo.

NOTE: In 1946, the territories of Ponta Porã and Iguaçú were abolished; their areas and populations reverted to their respective original states: Mato Grosso, Paraná, and Santa Catarina.

Population and Land Settlement. Many large holdings have been purchased on the frontier to be broken up and sold in small lots, with

long terms for payment. Inheritance laws of Brazil require a division of property, so large holdings seldom hold together for more than one generation. Some of the railroads have promoted settlement along their lines, as was formerly done in the Far West of the United States. Brazil is studying land and settlement problems carefully so that rich natural resources will not be wasted by haphazard methods of pioneering.

Many new uses are being found for old, abandoned areas where coffee can no longer be produced profitably. Grapes are grown around Jundiaí and Campinas, orange plantations occupy large acreages at Limeira, and cotton and cassava are being planted in many parts of the State of São Paulo. Enormous areas formerly comprising coffee plantations are now perennial pastures, used principally for dairy cattle.

A better system of financing long-term farm loans is being sought. The legal rate of interest in Brazil on such loans is 10 per cent, and farmers find it difficult to pay this; hence they sometimes lose their farms when crops fail or when there is a depression. In recent years the Federal Government has come to the aid of farmers threatened with foreclosure, paying off half the mortgage, and making possible long-term payments of the other half.

Since large and small farms and estates exist in Brazil, anyone who has money can buy land. Farms are always on the market. Land ownership is also permitted to immigrants and to persons of any nationality residing in the country.

Immigration as Affecting Land Settlement. Up to 1934 immigration from all parts of the world was permitted. It was even subsidized for peoples of several European nationalities.

A new constitution was adopted in 1937 with a restricting immigration quota very similar to the one existing in the United States—only 2 per cent of the fifty years' previous average for each nationality being permitted to enter. These quotas, of course, greatly reduced the number of immigrants coming to Brazil. The following were the yearly quotas permitted a few nationalities:

Italians	27,074
Portuguese	22,966
Spaniards	11,536
Japanese	3,546
Germans	3,099
Russians	2,143
Poles	2,035
United States citizens	219

When a severe labor shortage occurred in the State of São Paulo, so much opposition developed to these quotas that it was modified in 1938 by a decree setting the minimum quota of any country at 3,000. Eighty per cent of immigrants wishing to become permanent residents of Brazil must be farmers or farm workers and must devote at least four years to this occupation after their arrival. No settlement can be composed wholly of foreigners of one nationality, but each must contain at least 30 per cent Brazilian-born and not more than 25 per cent of any one foreign nationality.

The reason may be asked for all these restrictions. During the last sixty years 1,412,763 Italians immigrated to Brazil, and most of them settled in the State of São Paulo. Of 172,253 German immigrants, almost all settled in the extreme southern part of Brazil. From 1908 to 1941 Brazil received 189,000 Japanese immigrants, the majority settling in São Paulo.[3]

Some of these colonists spoke only their mother tongue (the Germans, for example) after having been in Brazil several generations. The people of Brazil feel this sort of concentration of foreign culture to be a menace, hence the new regulations which permit immigrants to settle on the land, but not in colonies exclusively of one nationality. The Japanese planned to bring to Brazil 100,000 immigrants a year over a space of ten years. While only 172,000 Germans entered Brazil in the last sixty years as immigrants, the German-speaking population of Brazil is now estimated to be 600,000 people.

The Brazilians are fearful that large groups of people of alien race and nationality, having their own schools and using their mother tongue, will never become Brazilianized—that they will never become real citizens, even though born in Brazil. This has happened in southern Brazil, where whole cities and communities have remained entirely German. Many have never learned Portuguese.

A policy is being worked out, and new laws are being prepared by means of which foreign immigration will further the purposes of permanent land settlement without permitting foreign groups to become dangerous elements threatening national security.

Internal Migrations. An important phenomenon has been the internal migration of the Brazilians from one state to another. Owing to world conditions and the quota restrictions referred to, only 12,207 foreigners entered the State of São Paulo as immigrants during 1939. Of these, 7,000 were Portuguese and 2,800 Japanese, while the rest

[3] See "Present-Day Tendencies," Chapter 1.

came from other countries. But the same year 100,000 people came from other Brazilian states to São Paulo, more than 99,000 of them going to work on the farms upstate. The reason for this was partly the droughts in northern Brazilian states and partly the higher wages paid on the São Paulo farms. Just what the final results of this internal migration will be remains to be seen. It is an interesting social and economic development.

The Finest Unsettled Land. Those who have made a study of Brazilian lands, climates, and living conditions state that, of all unsettled inhabitable parts of the globe, southern Mato Grosso, western São Paulo, and northwestern Paraná offer the greatest possibility for people to earn an adequate living. New lines of communication by automobile roads, railroads, and air lines are rapidly providing access to these regions, with the result that settlement is taking place even in far away Mato Grosso.

During the past fifteen years great districts have been settled as railroads have penetrated them. The railroads have facilitated the transportation of passengers and of agricultural and commercial products. Cities of 20,000 people have grown up where all was forest. A typical example is the city of Marília, in the extreme western part of the State of São Paulo. The first person to be born in this new settlement was only seventeen years old in 1940. In a similar way many other towns have grown up overnight, as it were, in these newly settled regions.

Campo Grande, in the State of Mato Grosso, had only 1,500 inhabitants in 1910, but it has grown into an active commercial center, now with more than 50,000 people within the boundaries of the county. German and Japanese immigrants settled on lands in this new district, but the larger part of the newcomers are Brazilians who have moved in from old settled regions where they found farming no longer profitable. The recent increase in cotton growing, an increase that began in 1934, gave a tremendous impulse to the development of new lands. This was especially true when it became illegal as well as unprofitable to plant new coffee trees. If cotton becomes unprofitable, corn will be raised and hogs fattened. As a matter of fact, Brazil no longer puts all her eggs in one basket, as was done in the sugar cane era, and later with rubber and coffee. Many crops are now raised, and experiments are being conducted to determine how to make old crops more profitable and what new crops can be introduced to advantage.

The State of Goiás has much new land waiting for settlement. In fact, almost all the other states are sparsely settled, so that millions may be added to the population in coming years.

The Amazon Valley. For a hundred years scientists have been writing about the population problem of Brazil, dismissing the great Amazon Valley as a part of the world too unhealthy ever to attain large population. There is not the slightest doubt that malaria and other tropical diseases are prevalent in many parts of the Amazon Valley. On the other hand, with only 5 per cent of the total territory of some 3,000,000 square miles of Amazon region subject to flooding, there remains a whole empire of land at a reasonable altitude to be inhabited.

With modern medical and sanitary progress, these areas can easily be made habitable. Some day a great civilization will occupy them—the last great frontier awaiting mankind. As Dr. W. L. Schurz says: "The Amazonia (Amazon Basin) is neither a hell nor an earthly paradise. By far the greater part of it is entirely habitable by white men, though there are sections where nearly every circumstance of the environment militates against human existence." [4]

For more than two centuries the white man has penetrated the jungle either on a trip of exploration (sometimes lasting months and years) or as a permanent resident. All visitors to the city of Manaus notice the health of the English colony, whose members play tennis and in every way lead the active life to which they are accustomed.

The heat in the valley of the Amazon is not so severe as in most tropical regions. The average temperature of Belém, which is just a few miles inland on the Amazon River and about sixty miles south of the Equator, is below 80° F.

Two things that make life difficult for civilized people in the Amazon Valley are the prevalence of insect pests and the lack of fruits, vegetables, and fresh meat. An effort is being made to eliminate or control insects. And with modern refrigeration and the careful planting of vegetables and fruits that can be grown in the region, the proper food can be had.

One thing, however, must be remembered: tropical soils are subject to leaching and erosion to a much greater degree than soils of temperate zones, as has been clearly pointed out by Case and Bergsmark.[5]

Roy Nash, in his *Conquest of Brazil*,[6] states that the Amazon Valley will never be populated by people coming up the river. He believes that people must spill over into the relatively low lands of the Amazon region from the higher plateau regions to the south. In other words, he believes that only after all southern, central, and western Brazil

[4] *National Geographic Magazine*, April, 1926, p. 463.
[5] *Modern World Geography* (Philadelphia: Lippincott, 1938), pp. 638-48.
[6] Roy Nash, *Conquest of Brazil* (New York: Harcourt, Brace & Co., 1926).

has been settled, will the surplus population occupy the great Amazon Valley—a population coming from south to north, and not west from the Atlantic coast line.

Another point of view is that set forth by Roland Sharp: "Whether the Amazon basin is finally to be colonized from the Atlantic side, or across the Andes, will depend largely upon the vigor manifested by Brazil and Peru. At present, both nations display interest and advance slowly inward from the fringes of their Amazonian hinterland." [7]

In *Journey to Manaos,* Earl Parker Hanson has the following to say: "The average man can hardly realize how widespread is the idea, even in the United States, that the settling of South America's interior would give another breathing spell to our civilized world. But, being interested, I found myself confronted at every turn by the romantic argument that the conquest of South America's wilderness would do for the Western Hemisphere what the conquest of the West did for the United States at a critical time.

"The question of why Amazon and Goiana have never achieved stability is not academic and not important to Venezuela alone. It is important to you and me, to our children and grandchildren." [8]

There is great truth in these observations. It matters a great deal to the United States what destiny befalls the great Amazon region, and the importance of this has been greatly enhanced by the turn of affairs in World War II. The financing by the United States Government of vast sanitation projects in the Amazon Valley is very significant and is producing results that will profoundly modify the whole development of this incredibly rich region. Careful investigations have given evidence that the soils of the Amazon Valley are not of extreme fertility, yet the area has rich possibilities in providing not only rubber, but all tropical plant products. It is not necessary for all such products to be native to Brazil, for many can be brought in from Asia and other parts of the Far East. It will be interesting to watch developments in the settlement of this region, and to see what modern engineering and agricultural technique can do. The opening of this region was speeded up by a half century through the close cooperation of the Brazilian and United States Governments in World War II—not only in sanitation but in the production of rubber and other tropical plants and in the marketing of the products of these plants.

Central Brazil Foundation. The past few years have seen a decided increase of government activities toward making the people of Brazil

[7] *Inter-American Quarterly,* II, No. 2, April, 1940.
[8] Earl Hanson, *Journey to Manaos* (New York: Reynal & Hitchcock, 1938).

conscious of the great interior. "Go West, Young Man!" has become a slogan, widely distributed by means of posters, proclaimed over the radio, and given much publicity in the newspapers. The most concrete and definite step for the opening up of Central Brazil was taken when the whole development project came under the control of the Central Brazil Foundation in October, 1943. Minister João Alberto Lins de Barros, one-time Economic Coordinator of Brazil, was the active head of the Foundation. It was created to make accessible the great western region of the State of Goiás and the northeastern section of the State of Mato Grosso. Work was started from Uberlandia near the border of the State of Minas Gerais.

Hundreds of miles of dirt automobile roads are being built. Advanced surveying parties often have their supplies parachuted down to them from airplanes, as they proceed through dense forests. Savage Indians, the Chavantes, offer opposition. But the roads are pushed ahead, and vast regions are opened for colonization. The river gravels of this region contain diamonds and gold. Cattle raising is carried on along the eastern border. Towns and villages are sure to spring up, and trade and industry will come into being as rapidly as transportation is made available. Several hundreds of miles of preliminary roads have been opened, and hundreds of men are employed in improving them. Several hundred trucks carry in machinery and supplies of manufactured goods and bring out rice and beans.

Altogether this is the most positive effort yet made by the Brazilian Government to bring about a cross-continent line of communications through the heart of Brazil. The Government is no doubt looking to the diminishing of the danger of empty spaces.

During normal times venturesome frontiersmen with trucks and gasoline will swarm in to take advantage of cheap land. No doubt settlement will have to be made almost entirely by Brazilians, many of whom will be replaced on the farms in the more densely inhabited regions by immigrants from Europe.

As adequate medical and sanitary services are set up at government expense and educational facilities become available, population growth should be rapid and satisfactory.

Public Works and Agriculture in the "Sertão." A relatively small area of northeastern Brazil is almost a desert. Frequent long droughts, sometimes lasting three and four years, drive the population to migrate, and cause great suffering. Yet this region, in spite of the privations, is relatively well populated, and its people leave only when conditions

become impossible. Many remain until their health is undermined through malnutrition, and sometimes deaths occur from famine.

Some forty years ago, English spinners discovered that the long staple cotton produced in the *sertão* was admirably adapted to the manufacture of sewing thread. This discovery largely accounts for the occasional periods of prosperity in the *sertão.*

To aid this region, the Federal Government has set up a special service with three principal divisions: road construction, water control by dam construction, and agricultural work including agricultural extension. Around the artificial lakes, areas under cultivation become cultivated oases in the semidesert region.

José Duque Guimarães, a graduate of the Presbyterian Agricultural College at Lavras, Minas, and a professor at the Minas State Agricultural College at Viçosa, has for many years been in charge of agricultural extension work. Overcoming almost insurmountable difficulties, he and his associates have carried on experimental work, disseminated spineless cacti, and bred, introduced, and acclimated many useful varieties of plants suited to cultivation in that almost equatorial semidesert. Thousands of fruit trees and other useful plants have been developed and distributed, as well as hundreds of tons of improved seed. Soil maps of the irrigation projects have been elaborated, soil analyses have been made, and the local residents have been afforded much direct assistance and instruction. It is intended that this work shall make it possible for the population to be at least self-maintaining during periods of severe and extended drought.

III

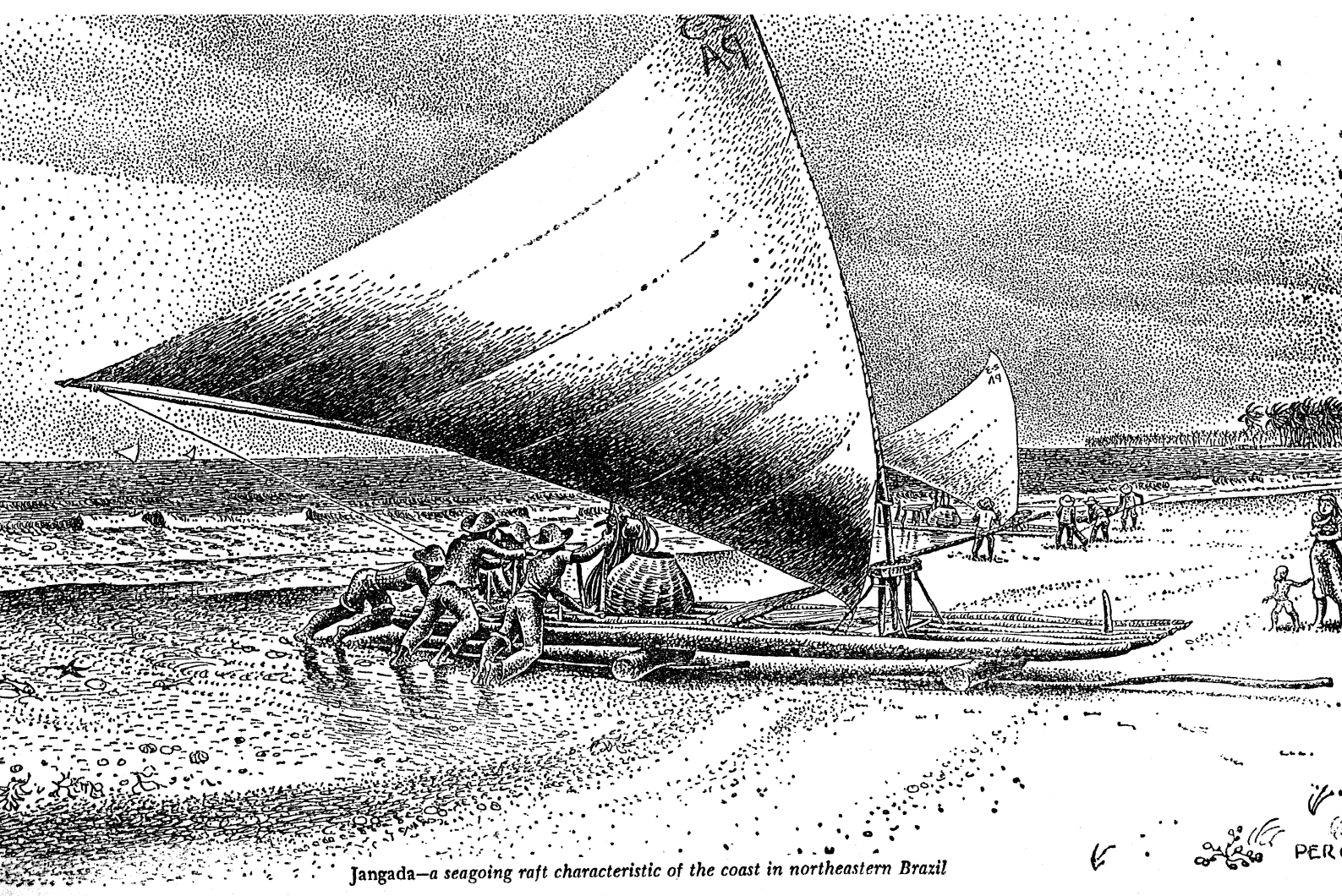
Geographically Speaking

BRAZIL, which comprises half the area of South America, is as large as the United States, with an extra Texas thrown in. The United States extends from ocean to ocean, and from Canada on the north to the Gulf of Mexico on the south. Brazil borders every one of the other South American countries except Chile and Ecuador. Brazil's distance north to south, and east to west, is about the same—approximately equal to the distance from New York to Los Angeles. The United States has the Great Lakes on its northern border; Brazil has no great lakes. The Mississippi-Missouri is the longest river in the world, but Brazil has the Amazon, which is the largest river in the world in the volume of water and area drained.

A study of the physical map of Brazil shows that nowhere does the country include the Andean system of mountains, except for a small stretch of the Serra do Divisor (erroneously called Contamana Range) on the frontier with Peru. All of Brazil's mountain ranges are situated along the east coast near the Atlantic Ocean. The Caparaó Range is the highest in the country, and contains the highest peak: Pico da Bandeira (Peak of the Flag), 9,482 feet. Pico do Calçado is the second highest peak on the Caparaó, 9,075 feet. Itatiaia, of the Mantiqueira Range, includes Pico das Agulhas Negras (Peak of the Black Needles), 9,144 feet. "Ita," a Guarany word meaning rock, is part of the name of many peaks in Brazil.

A large number of mountains in Brazil range from 6,000 to 9,000 feet above sea level; none of these is covered with snow, although snow occasionally falls on Itatiaia and Caparaó. In the coldest months snow falls on the highlands of the middle southern plateau from Paraná to Rio Grande do Sul. Very few Brazilian children have ever seen snow; however, many of them have seen the white frosts which are common in parts of the uplands.

The Importance of Mountains. Mountains and great elevations of land play an important part in the life and make-up of Brazil. Most



Jangada—*a seagoing raft characteristic of the coast in northeastern Brazil*

of the country's river systems have their origin in mountain ranges, but not all the rivers have the limits of their basins determined by them. Four great mountain ranges affect the rivers of Brazil, although two of them lie outside Brazilian territory:

1. The Andes and their subsidiary ranges, where many of the great tributaries of the Amazon have their sources.

2. The ranges that make the dividing line between Venezuela, the Guianas, and Brazil. These ranges separate the basins of the Orinoco, which flows north, and the Amazon tributaries, which flow south.

3. The great central plateau within Brazil which runs through the states of Maranhão, Piauí, and Pernambuco in the north, southward across much of the states of Bahia and Minas Gerais and São Paulo, and westward into Goiás and Mato Grosso. This plateau determines the watersheds of the São Francisco River, which flows north, and the Paraná, which flows south. The division of the headwaters of these two rivers is so unusual that small streams starting within a few feet of each other flow in opposite directions and into different rivers. One of these headwaters flows into the São Francisco River which empties into the Atlantic Ocean at latitude 10 degrees south; and the other flows into the Rio Grande, a tributary of the Paraná, which flows into the La Plata and eventually enters the Atlantic Ocean at the latitude of Montevideo and Buenos Aires.

4. The coastal range, called by Preston James the Great Escarpment. It is usually considered merely that part of the great plateau which lies near the sea. The plateau tilts slightly, so that the traveler coming from the interior has an impression of only a slight upward incline until he reaches the edge of the plateau and comes upon the coastal range. It is the incoming traveler arriving by sea who, in glimpsing the Great Escarpment, imagines he is seeing mountains on the coast of Brazil. The first real mountains are the Organ and Mantiqueira ranges.

Mountains and Climate. In addition to determining the origin of a river and the direction in which it flows, mountains determine the climate of a country. Altitude modifies temperature to such an extent that, even at the Equator, cool weather may be found on the plateaus and mountains. Although Rio de Janeiro and Santos sometimes have very hot weather during the summer (maximum 97.7° F.), it is cool and agreeable in the mountains a few miles away. Because of the enormous extent of the coastal range and the central plateaus, much of Brazil that lies in the tropics has a temperate climate. A more ideal climate than that of some parts of the interior of the state of Minas

Gerais can hardly be found anywhere else in the world. The temperature here ranges from 90 degrees F. in summer to as low as 20 degrees in winter, with an average of 60 degrees for the whole year. In the summer the heat is never unbearable. The winter is wholesome and invigorating.

The wonderful climate of Minas Gerais and São Paulo, and of the three southern states of Paraná, Santa Catarina, and Rio Grande do Sul is not only healthful but makes it possible for the farmer to grow a great variety of crops the year round and to maintain cattle in pastures throughout the year. Because of the good grazing lands available, and because of the fact that much of the mountainous region is unsuitable for cultivation, a large part of these southern and western states is devoted to cattle raising.

Mountains and Travel. Mountains may modify climate in a most beneficial way, but they may also be a great hindrance to the development of transportation. During the days when the first settlements were being made in Brazil, the mountain ranges along the southern coast offered almost insurmountable obstacles. The mountains had to be crossed on mule back. Paths had to be cut through dense forests, and it often took the settlers many years to find the gaps which later made possible the building of roads. Wagon roads leading into the interior of the country were gradually opened. In the second half of the nineteenth century, when railroads came to be built, many mountains had to be crossed. One company, whose line runs west from Rio de Janeiro, built a cog road. Later the government-owned Central Railroad wound its tracks around innumerable mountain curves and through seventeen tunnels in the first 130 miles of its line into the interior. In 1856 an English Company, the São Paulo Railway, in building a railroad from São Paulo to Santos, used cables for the steepest climb.

Almost immediately after the coast range had been scaled by the railroads, attempts were made to cross the great Central Highlands. These ranges lying farther inland offered a second series of obstacles, so that even today railroads often go great distances to reach a point only a few miles away. Many stretches are being relaid with easier grades and shortened routes, which save time and fuel.

Air travel in Brazil has also been hindered by mountain ranges. Because of the unevenness of the air above the mountainous terrain, and because of the scarcity of emergency landing fields, companies have been slow to open routes over the mountains. Now aviation companies have established regular air routes to all points of the country.

Modern planes can fly over enormous spaces where landing fields are infrequent. The trip from Rio de Janeiro to Belo Horizonte, which is seventeen hours by train, is cut to an hour and fifteen minutes by plane.

Mountains and Minerals. The mountains of Brazil have rich mineral deposits (see Chapters XX and XXI), some under exploitation, some explored, and many more awaiting man's necessity. Not all of Brazil's mineral wealth lies in its mountain ranges, but certainly the major part of it does.

Mountains and Tourists. Any country with beautiful mountains attracts tourists. Up to the present, most of the visitors who have come to Brazil have not seen the real mountain beauty of the country. Foreigners usually confine their sight-seeing to the large cities and seldom leave the coast for the beautiful interior.

American steamship lines usually make two stops in Brazil, at Rio de Janeiro and Santos, and sometimes include Recife and Bahia. The ambitious visitor will travel through the mountains, over paved roads, to the summer capital of Petrópolis, and on the way see some of the most beautiful scenery in Brazil. The most luxurious of all Brazilian hotels has been built in this mountainous city. Every tourist to Rio de Janeiro should ride on the swinging cable to the top of Sugar Loaf, the mountain which stands at the entrance to the harbor, and also go up Corcovado (Hunchback Mountain) on the cog railway. From these two peaks the whole city and harbor of Rio de Janeiro can be seen in all their majesty.

From Santos the tourist travels up the Serra do Mar (Range of the Sea) by train or automobile to the metropolis of São Paulo. Very few foreigners ever travel into the far interior to see points of interest along the vast rolling plains or through the mysterious wilderness on and beyond the central plateau, for they are reached by long and tiresome train rides, or by automobile over unpaved roads, or by river boat. Fortunately Brazil is becoming aware of its own scenic beauties, new areas are made accessible to the tourist each year, and better hotel accommodations are provided.

The rapid development of air lines is bringing the far interior into easy communication with the coast cities. For instance, civil airways connect the coast with the rich and almost unsettled regions of the Araguaia in Goiás; the famous Iguaçú waterfalls on the river which forms the Argentine border; the Sete Quedas (Seven Falls) on the Paraná River, on the frontier with Paraguay; and the old mineral

springs and the luxurious spas found in hilly uplands of the States of São Paulo and Minas Gerais, which are also served by motor roads and rail lines. Scenic trips to Iguaçú are offered by Rio de Janeiro and São Paulo tourist companies. A combination of trains and river steamers has been so arranged that one may visit the Seven Falls and proceed to Iguaçú and enjoy the splendid views of these cataracts on both the Brazilian and Argentine sides, where good hotels are found. The round trip from Rio requires about fifteen days, if made by train as far as the Paraná River. Other beautiful cataracts are the great Paulo Afonso Falls on the São Francisco River, on the boundary between the States of Alagoas and Bahia. These falls, in the northeastern part of the country, are reached by railroads and roads from Recife and Maceió.

The region of Campos do Jordão on the edge of the Mantiqueira Range, a couple of hundred kilometers toward Rio de Janeiro from the city of São Paulo, is attracting many tourists. The altitude of this plateau is from 4,000 to 5,500 feet, so its climate is quite different from that of any other region within hundreds of miles. Among the modern large hotels to be found here is one built by the State of São Paulo. There are also many fine summer homes. But it is an all-year-round resort rather than just a summer vacation region. Below-freezing temperatures are common; in fact, frost has been seen every month in the year. Many tubercular patients come here to seek the benefits of the invigorating atmosphere and the highly effective rays of the sun in the rarefied air. Fourteen sanatoriums have been built. The additional 2,500 feet altitude above the great central plateau makes possible a completely temperate climate zone north of the Tropic of Capricorn. Because the region is accessible to the city of São Paulo by automobile or train in four or five hours, it is destined to be one of Brazil's most popular resorts. A thoroughly modern city plan has been made for its development. Modern improvements are being installed and streets paved. Throngs visit Campos do Jordão every year.

The Organ Mountains, in sight of the city of Rio de Janeiro, and Itatiaia, with its famous peak, halfway between the cities of Rio de Janeiro and São Paulo, have been set aside as national parks. Roads and trails are being built and lodging quarters are becoming more and more numerous. It will not be long before other mountain ranges will be set aside. In time Brazilians and visitors to Brazil will begin to enjoy these scenic and climatic riches—so abundant yet so unknown except by the venturesome few.

Latitude. Brazil lies between 5° north and 34° south latitude—a wide range for a single country. Very little of the country lies north

of the Equator, and about 90 per cent lies between the Equator and the Tropic of Capricorn. On the northern boundary—just south of Venezuela and the Guianas—mountain ranges materially affect climatic conditions. But the greater part of the two largest states, Pará and Amazonas, is level and only slightly above sea level, and therefore the climate is tropical-equatorial. Along the coast, from the Equator (at the mouth of the Amazon River) south to Santos—a coast line of over 2,000 miles—the Atlantic Ocean moderates the climate. The coastal cities farther south have more extreme heat than those of the north, although the northern section of the country has a much higher mean average temperature.

The low-lying lands along the western borders of São Paulo and the eastern borders of Mato Grosso register even higher temperatures than the sea-level coastal cities of the same latitude. Higher temperatures are registered at Rio de Janeiro and at Santos than Recife. The following figures offer interesting comparisons:

Maximum temperatures in the middle of the year:

Pernambuco (Recife)	89°	Leipzig	91°
Colombo (Ceylão)	91°	Berlin	91.4°
Rio de Janeiro	97.7°	Timbuctoo	117°'

A second table shows the mean temperature of the hottest months:

Pernambuco (Recife)	80.8°	Leipzig	64.4°
Colombo	81.3°	Berlin	65.8°
Rio de Janeiro	79.9°	Timbuctoo	84.5°

But while in Leipzig and Berlin the temperature in the coldest months may fall to zero Fahr., in Pernambuco the mean temperature of the coldest month (July) is 75, and the minimum temperature of the year is 64.9. In Rio de Janeiro, the mean temperature of the coldest month is 70.1, whereas in eastern Germany the mean temperature is below the freezing point, and in western Germany only three or four degrees above freezing point. We see, then, that the essential difference does not consist in the higher temperature of the tropics, but in the fact that the tropics are distinguished by a *uniformly* high temperature. The variation in the course of the year averages less than 18, whereas in Europe it averages 86!

Consequently a table of mean annual temperatures reveals the real nature of the difference:

Rio de Janeiro	74.8°
Pernambuco (Recife)	78.2°
Berlin	48.3°

In the temperate zones we have a warm and a cold season in sharp contrast, whereas in the tropics it is summer all the year.[1]

Brazilian Climate. Brazil has three very distinct climates: (1) the tropical-equatorial; (2) the subtropical; (3) the temperate or mild. The first of these may be subdivided into superhumid, continental humid, and semihumid. The temperate climate is found in coastal, plateau, and highland areas.

The greater area of Brazil lies in the tropical zone, but about two-thirds of the population live either in the temperate zone or subtropical areas, where extreme heat is unknown. Under modern sanitary conditions, any part of Brazil can be made entirely habitable for white men. Of course, in the tropical zone, especially in the superhumid areas, the white man cannot exert energy to the same extent as in the temperate zone, but life can be comfortable. Vast regions are being drained to eliminate mosquitoes and the danger of malaria.

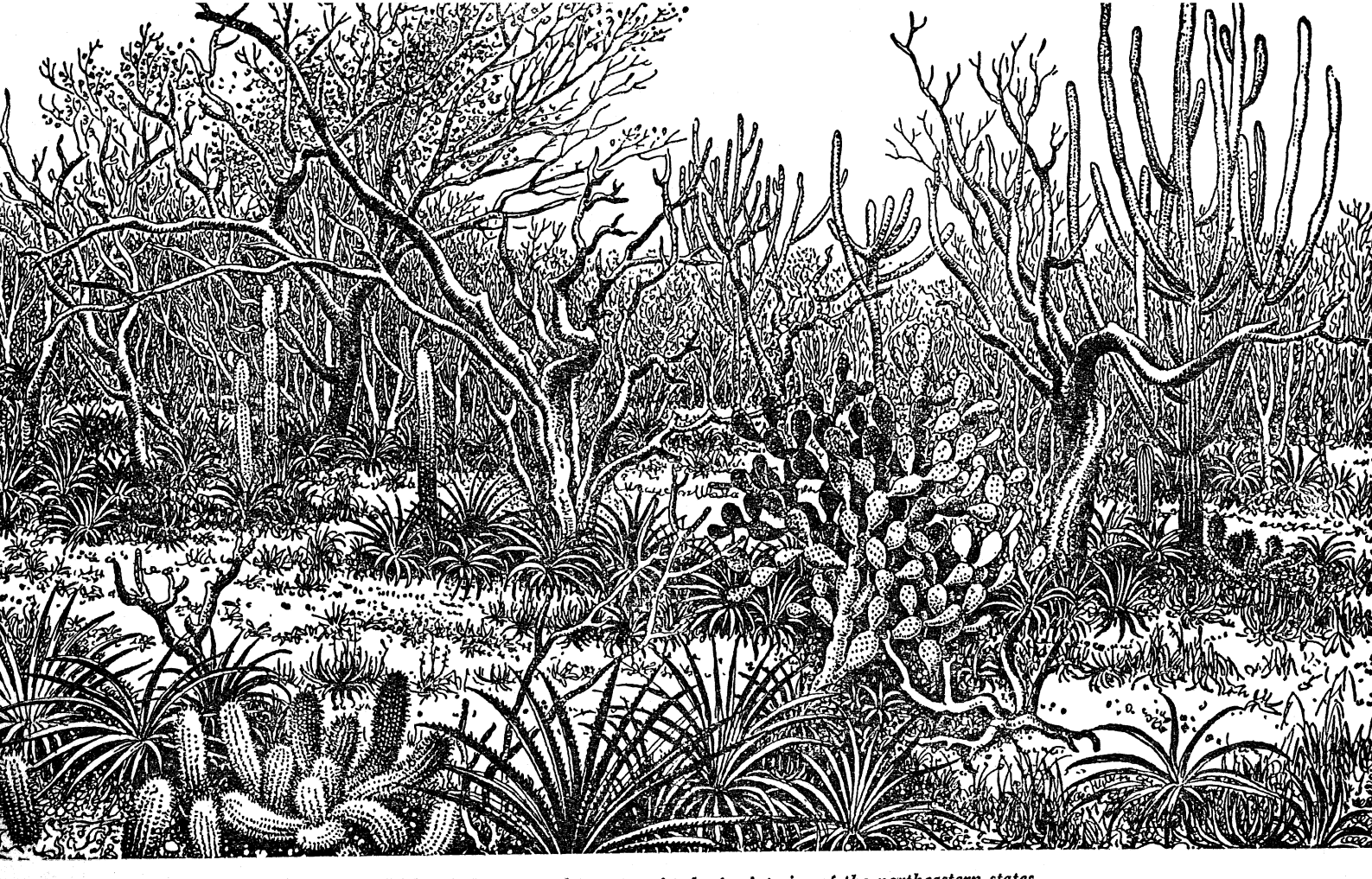
More and more people will move into this tropical-equatorial zone as the years go by and the more attractive southern areas become crowded.

Southwestern Brazil has not only a magnificent climate, but very fertile soil. Lands are being rapidly taken up as the "Go-West" movement gets more fully under way, and as means of transportation are improved. Central and southern Brazil offer no climatic obstacles for the residence of the white man except where conditions are not improved. The plateaus in northern Minas Gerais, Goiás, and Bahia are fertile plains, for the most part, with hilly lands in some parts and stretches of forest near the major streams. Most of these areas have an equable climate and may be found to be as healthy as areas in the southern coastal states, yet their conquest by man is far from accomplished.

Rainfall. Just as latitudes and altitude greatly affect climatic conditions, so does rainfall. The rainfall of a country is of the very greatest importance from two standpoints: (1) the total amount and (2) its distribution over the year. Generally speaking, Brazil is fortunate in regard to both the amount and distribution of its rainfall.

The four seasons of the temperate zone are not especially marked in Brazil, but there are two distinct seasons—a rainy and a dry one. Over about two-thirds of the total area, the rainy season coincides with the summer, or hot, season. In a very narrow coastal area along the

[1] Konrad Guenther, *A Naturalist in Brazil* (New York, 1931), p. 65.



Caatinga—*wild brush that covers large areas in the far interior of the northeastern states*

most eastern bulge the cooler months are rainy months. In the most southern part rains are well distributed throughout the year. The greater part of Brazil receives 50 per cent or more of its rainfall in the full summer months of December, January, and February. Rains begin in September and taper off in April and May. June, July, and August are almost entirely free of rains. These observations apply largely to the plateau and mountain regions. Rainfall along the coast generally differs from rainfall farther inland in both amount and distribution.

Heavy rains frequently fall—enormous amounts in twenty-four hours. The heaviest precipitations occur in central Brazil (southern part of Minas Gerais, State of Rio de Janeiro, eastern part of São Paulo, the coast of Santa Catarina, and northern part of Rio Grande do Sul). The city of Santos has had as high as sixteen inches of rainfall in one day. Long rainy spells, when rains prevail day after day, are very common during the rainy season proper. Disastrous floods occur but are rare and occur only in limited areas, except for the regular annual flooding of a large area of the Amazon Valley. On unpaved highways traffic becomes very difficult during the rainy season, and railroad traffic can be seriously handicapped if rains are excessive. Entire crop failures from lack of rain are unknown in a large part of the country. Irrigation is needed to supplement rainfall only in the semi-arid districts in northeastern Brazil and for rice production in central and southern Brazil.

Semiaridity is a feature of certain inland regions from Piauí down to northern Bahia. The dry areas are by no means contiguous. Deficient moisture determines the nature of the vegetation and accounts in great part for the peculiar way of life in the northeast, where droughts occur every five or seven years. The record for dryness—10 inches of rain in one year—belongs to Cabaceiras, in Paraíba. Over a treeless region in Ceará the average annual rainfall is about 18 inches. In an adjacent region it reaches 36 inches. In the larger part of Brazil it is between 60 and 78 inches, except in the extreme western section of the Amazon Valley, where it is 78 to 116 inches, and in the extreme northern section, bordering on the Guianas, where the average annual rainfall is 129 inches.

New Territories. Brazil was divided into twenty states, a federal district, and one territory until recently, when new territories were created.

The Island of Fernando Noronha was made a territory because of its strategic military value as the easternmost point of Brazilian terri-

tory. In September, 1943, five more territories were taken from the largest states of the nation—Amazonas, Pará, Mato Grosso, Paraná and Santa Catarina. The reasons for creating these new administrative divisions are predominantly military, but very real economic advantages have been obtained and much greater advantages are still to be had as soon as better transportation facilities are available. All the new territories are sparsely inhabited and contain no large cities, but an inrush of population is sure to follow the establishment of governing centers. All are located on the far-away frontiers, and all have rich mineral and agricultural resources that can be developed.

On the dividing line between Brazil and Dutch and French Guiana was created, from the State of Pará, the Territory of Amapá, with an area of 143,000 square kilometers. This region is near the Equator and has a hot and humid climate. In 1940 the population was 23,406. The principal products are lumber, Brazil nuts, skins of wild animals, fibers, and gold.

The Territory of Rio Branco was carved out of the State of Amazonas on the frontier of Venezuela and British Guiana. The region has a dry climate, and while the total area is 252,035 square kilometers, in 1940 its population was only 13,756. The chief products are gold, cattle, and timber.

Guaporé Territory, taken from the States of Amazonas and Mato Grosso on the border line with Bolivia, has practically the same area as Rio Branco, but a much larger population—24,918 inhabitants (1940). Rubber and gold are the principal products.

The Territory of Ponta Porã, along the border of Bolivia and Paraguay, was taken from the State of Mato Grosso with an area of just under 100,000 square kilometers. With 86,715 people in 1940 it almost reached the density of one person per square kilometer. The climate is tropical with two distinct seasons—the wet and the dry. The principal products are cattle and the quebracho tree, which yields tannin.

Iguaçú Territory was taken from the States of Paraná and Santa Catarina in the southern part of the country on the frontier of Paraguay and Argentina. The area is only 61,613 square kilometers, but the population was 85,000 in 1940. This territory has one of the healthiest climates of all Brazil, and due to the location of the Iguaçú Falls it has enormous tourist possibilities. There are large timber reserves, and much mate (Brazilian tea) is produced. This district has fine river navigation and is about to be reached by rail. With the recent abolition of the Territories of Ponta Porã and Iguaçú, their area reverted to their original States—Mato Grosso, Paraná and Santa Catarina.

Climatic Considerations for Tourists. North Americans should know that the seasons south of the Equator are the reverse of our seasons. Travelers leaving the United States in summer for Brazil should bring with them winter clothing; and if they leave in northern winter, they should bring summer clothing. A cold wintry day in São Paulo in June or July can be extremely uncomfortable for the unready, especially since no houses or hotels have central heating. All over the central plateau region of Brazil, nights are apt to be cool and chilly the whole year round.

Winter seasons have been known in Rio de Janeiro when for months a light overcoat was needed daily. Again, as in the year 1940, the whole winter may pass without cold weather—four to six months of uninterrupted Indian summer. In tropical Brazil there is no winter or summer. In the city of Bahia, for example, the difference between the average mean temperature of the two halves of the year, which should be winter and summer, is only two degrees Fahrenheit. In southern Brazil, the temperature may go up to 97° Fahr. at the highest, and down to 14° at the lowest extreme of cold.

The tourist, then, should bring both light tropical clothing and medium heavy clothes, with adequate wraps. Heavy fur coats are unnecessary in Brazil, as are sun helmets.

While in Brazil, just as anywhere else in the world, the climate varies from year to year, and from season to season, the country is not given to devastating floods, heat waves that cause sunstroke, cyclones, or land hurricanes. One living in central or southern Brazil can say with the Psalmist: "The lines are fallen unto me in pleasant places; yea, I have a goodly heritage."

IV

The Greatest River in the World

MANY AUTHORS writing of the Amazon River and its extensive basin refer to it as the "greatest river in the world." Is this justifiable? It is not so long as the Missouri-Mississippi, with its 6,000 miles of length, nor so long as the Nile, with its approximately 5,500 miles. But the Amazon, in its 4,500 miles of length (if the Ucayale be chosen as its upper course), contains four times the volume of water of the Mississippi. It drains a basin as large as all Europe and carries a volume of water larger than that of all the rivers of that continent combined. Thus it would seem that calling it the greatest of the world's rivers is not an exaggeration. Seven countries in South America, covering some 3,000,000 square miles, are partly drained in the Amazon River basin. Dr. W. L. Schurz, writing in the *National Geographic Magazine* (April, 1926), gives the area of the Amazon basin as approximately 2,300,000 square miles, but no accurate survey has ever been made.

The river varies in width from one to seven miles. Occasionally, for long distances, it divides into two main streams, with inland lateral channels all connected by a complicated system of natural canals cutting the low-lying lands. Ocean-going steamers go regularly up the river to the city of Manáus, which is 1,042 miles from the Atlantic Ocean. Some of them ascend the river as far as Iquitos, which is 2,300 miles from the sea, and smaller vessels may go 500 miles beyond that. The whole system of tributaries of the Amazon comprises 30,000 miles of rivers said to be navigable. That is, one could travel on the Amazon River and its tributaries a total distance greater than around the whole world. There are more than 1,000 tributaries to the system, some flowing south, some north. The main river flows east, almost directly along the Equator. Perhaps the best means to convey an idea of the size of the Amazon River is to mention that its waters are distinguishable from a distance of 150 to 180 miles at sea.

The story is told of the sailing vessel of former times that was cruising the Brazilian coast when the fresh water supply gave out, and it

seemed that the crew would die of thirst. No land was in sight, and they almost lost hope. One day another vessel was sighted, and at once they gave the signal for help, "We are out of water!" The other vessel signaled back, "Drop your buckets where you are!" The sailors hastened to do as told and were tremendously surprised to find that their buckets contained not salt sea water but fresh river water. This was because they were in the mouth of the Amazon River.

The width of the mouth of the river is usually given as 200 statute miles. That is the measurement from the mouth of Rio Pará to Cabo Norte and includes the ocean frontage of Marajó, an island about the size of Denmark lying in the mouth of the Amazon. This is the region of the *pororoca,* or *bore,* a tidal wall of water which rushes up river with a roaring noise. An interesting description, with photos, of the six phases of the *pororoca* is to be found in *Revista Brasileira de Geografia,* January-March, 1943. This official journal of the National Council of Geography has been published quarterly since 1939 and often contains material of historical and geographical value to the student of the Amazon Valley.

Origin of the Name "Amazon." In 1540 Gonzalo Pizarro and Francisco Orellana organized an expedition, in Quito, in search of gold, silver, and cinnamon. The expedition reached one of the northern tributaries of what is now called the Amazon River (it was called Paranaguassú, or "Great River," by the Indians). From there Orellana, with fifty men, was sent on for provisions. But instead of returning with provisions, he made the descent from the Andes to the sea—a voyage that took eight months. Thus he was the first white man to course the full length of the river. On his return to Spain, he told of many encounters along the river with savage Indians who had long hair. He thought they were all women. So the greatest of all rivers was named the "Amazon" River, after the nation of female warriors with whom, according to mythology, the Greeks repeatedly warred.

Source of the River. Just as it is difficult to say, "This is the mouth of the Amazon River" (look carefully at a good map of South America, for example the one by the *National Geographic Magazine* in its issue of December, 1937), so it is also difficult to determine the exact source of the river. The tributary rising farthest from the mouth of the river is in Peru. Oakenful says that the river originates in Lake Lauricocha, Peru, in the Andes—near the Pacific Ocean! The Amazon rises some 250 miles east of the Pacific and flows a total distance of 2,500 miles east to reach the Atlantic Ocean. Owing to the many

tributaries, some of them major rivers in themselves (the Madeira has ninety tributaries before it enters the Amazon; the Tapajós is 1,300 miles long; the Rio Negro is even longer, about 1,500 miles; and the Purus course reaches 2,190 miles), it becomes difficult to determine the exact source.

History. Ever since the discovery of the Amazon River, first visited by a European in 1541,[1] it has been literally the "threshold of the unknown." In 1615 the Portuguese, settling at Belém (Our Lady of Bethlehem), which is now the capital of the State of Pará, began to explore the great unknown. The first great ascent[2] of the river was made in 1637 by Pedro Teixeira, who organized an expedition. He took about 2,000 people with him. He went up the Amazon, reversing the route of Orellana, and reached Quito by way of the Napo River. Now, more than three hundred years later, much of the Amazon basin is still unsettled and still unknown.

The equatorial forest is as large as Europe in extent. It has always been inhabited by savage Indians. Lurking deadly germ diseases that have been so fatal to the white man in the impenetrable jungle forest held no terrors for the Indians, because they had built up an immunity to them. Magnificent physical specimens, both men and women, have been found among the savage Indian tribes. But, as they had never developed immunity to the white man's diseases—measles, smallpox, and others—they died in large numbers whenever the white man penetrated their territory.

One English mission established posts to preach the gospel to the Indians in the early 1900's. Sometimes the posts would be attacked by the savages before friendly relations could be established. The missionaries would protect themselves by simply making a barricade of corrugated iron around their little group of dwellings. The poisoned arrows of the Indians would rain on the galvanized sheets and fall harmlessly to the ground. After the attack was over, the missionaries would go out and collect the arrows, later selling them to museums in North America. In this way they obtained sufficient money for carrying on the missions for several years. Finally the work was abandoned, because, as soon as the so-called civilization of our present day penetrated the jungle, the Indians died off before the onslaught of the many new diseases brought in by the white man.

[1] It has been generally believed that in the year 1500 Vicente Yañez Pinson, in command of a Spanish expedition, approached only the mouth of the river and called it "Mar Dulce."

[2] The first descent was made by Orellana's expedition in 1540-41.

Missions of the Roman Catholic orders, principally the Jesuits, had been conducted for centuries among the Indians of Brazil. Their mission work was done from a settlement called a *redução,* commonly referred to by the Spanish word *reducción.* "Many of these disappeared, for example that of Guayrá, destroyed in 1627, remains of whose elaborate churches, hospitals, and storehouses are still to be found in the engulfing forest." [3]

For ages, civilized man has battled against nature, disease, and the savage inhabitants of this area, but much of its extent still remains unexplored.

Amazon River Floods. Every year a part of the river basin is flooded, owing to the heavy tropical rains. It is estimated that, of the total area, 5 per cent is subject to inundation. This means that some 150,000 square miles are flooded each year. These floods begin in December and recede in June. Many of the inhabitants along the banks of the river build their houses on high stilts because they know that each year the land will be flooded. They provide themselves liberally with canoes, because during the season of floods they can leave the houses only in canoes. The larger towns are erected on lands high enough to be free of floods. For example, Obidos, six hundred miles up the river, is on a little plateau on the northern bank of the river. At this point the Amazon is narrower than anywhere else along its course. Held in between two high banks for a short distance, the river reaches a depth of 350 feet. Manáus, a thousand miles up the river, is also on high soil, the docks along the river allowing for a rise and fall of sixty feet.

The highlands, which confine the floods, are at varying distances from the river. The floods do not kill the trees, because only those trees which can stand having their roots under water for several months at a time have survived. Monkeys, snakes, birds, and all the wild life that can do so, take to the trees during the months of inundation. Other animals must flee to the foothills.

Natural Resources. The Amazon Valley has long been a naturalist's paradise. Most of the 50,000 species of plants known to exist in Brazil can be found in this region. The English naturalist Henry Walter Bates found 8,000 new varieties of animal life along the river. Some of the 1,200 species of birds native to the valley have the most brilliant plumage of any birds in the world. Butterflies and moths of enormous size and gorgeous colors and patterns are common. Thousands

[3] Pierre Defontaines, "The Origin and Growth of the Brazilian Network of Towns," *Geographical Review,* July, 1938, p. 380.

of species of different plants have been classified by botanists, and no doubt many are yet to be found. Many useful plants—for example, rubber—are native to these jungle forests. The Brazil nut grows wild in various parts of the Amazon basin and brings in millions of dollars each year to gatherers and exporters. A fine medicinal plant known as *guaraná (Paullinia sorbilis)* grows wild in the forests and is also cultivated by the Indians and the Brazilians. The seeds are gathered from the small climbing plants in November, and after being dried in the sun they are slightly roasted and ground into a fine powder, or made into a paste by the addition of water. Small sausagelike slabs are made of the paste, and it is generally marketed in this shape after being hardened over a fire. The slabs are grated into water to make a soft drink. It is also used as the base for a carbonated drink popular in central and southern Brazil. The paste is worked into ornamental shapes by the Indians, such as alligators, snakes, birds, and even human forms and small scenes. These are sold in the curio shops in Manáus and Belém. It is estimated that one hundred tons of *guaraná* a year are harvested in the county of Maués, in the State of Amazonas. Plantations in other sections will soon offer *guaraná* for export.

With the exception of Fordlândia, described in Chapter X, few large-scale rubber plantations have been developed in the Amazon Valley. Small settlements have minor cultivations of rubber. Other settlements raise food crops. But the curse of the Amazon Valley has been twofold: (1) diseases, such as malaria and hookworm, and (2) economic imbalance, such as occurred in the collapse of the rubber boom, with the transfer of rubber production to the Far East. Japanese colonists in the region have supplied themselves with home-grown food and produced a surplus to sell to the Brazilians. The Indian has been made to work in the exploitation of natural resources, often to the point of losing his natural cunning in getting a living in his aboriginal way. The white man has thought himself too good to be a farmer in the ordinary sense of the word, but he has failed to furnish sufficient economic activity to sustain himself and the Indian with high-priced imported food. So wealth has come and gone, and all have suffered.

Fish and Reptiles. One of the greatest sources of food in the Amazon region is furnished by the rivers themselves, for they abound in fish. The Indian has always done his fishing with bow and arrow or spear. His poisoned arrows are shot into the fish, or he lands his catch with his spear. Hook and line were unknown to him in the savage state. The largest fresh-water fish in the world is found in the Amazon.

It is called the *pirarucú*. It sometimes attains a length of six feet and a weight of two hundred pounds. The manatee, sea cow, or *peixe-boi* as the Brazilians call it, is even larger, but it is a mammal and not a fish. The *pirarucú* is caught not only for immediate consumption but is dried, much as the codfish is prepared. It can thus be kept for a long time and shipped from place to place. Great swarms of turtles are found in the river. Fishermen catch them by shooting arrows into their necks. A cord is fastened to the arrow, and in this way the animal is drawn to the boat.

Turtle eggs are a favorite food, but in spite of the fact that they are collected by the thousands, turtles continue to abound. Alligators swarm in many of the rivers of the Amazon basin. They are hunted for their hides, which are sold to the United States and Europe for use in making belts, pocketbooks, and shoes. They are baited by raw meat attached to a soft piece of timber, which is floated along the surface of the river. The alligator snaps at the meat, his teeth sink into the soft wood, and he is easily killed before he can extricate himself.

Alligators are not generally dangerous, but the following story is told: "A native woman washing clothes on the beach of that part of the town (Manáus) known as São Raimundo, saw her child, who was bathing, in the jaws of an immense alligator. Rushing into the water, she thrust her fingers into the brute's eyes, and the little brown body was released."[4] Many tales are told of the dangers of life on the Amazon.

What most impresses the North Americans is the flesh-eating fish, the *piranha*. This is not a very large fish but a very vicious one and with an unbelievable biting power. It may grow to be more than a foot in length. If the blade of a knife is put between its jaws, it will close down on it so hard as to crush its own teeth. If a little blood is spilled in the water, these fish become extremely active. If they attack a man in the water, they can tear the flesh off his body in a few minutes. To catch them with line and hook, one must use a three-ply copper wire, since they will snap a lesser strand in two.[5]

Madeira-Mamoré Railway. Many of the tributaries of the Amazon have, somewhere along their course, rapids that make navigation dangerous or impossible. For small craft, however, a portage is possible.

[4] "Cowboys and Caymans of Marajó," *National Geographic Magazine*, November, 1938, LXXIV, No. 5.

[5] See the *National Geographic Magazine*, April, 1926, p. 412; also *Through the Brazilian Wilderness*, by Theodore Roosevelt, Scribner's, 1914, pp. 41-43.

The boat has to be taken out of the water and transported overland until it can be placed again in navigable water beyond the rapids. The longest of all the rapids in the Amazon Valley are those on the Madeira and Mamoré Rivers, over a course of some two hundred miles. The construction of a railway around these rapids was long dreamed of. Plans were made in 1870, but no work was started. In 1878 building was begun, but the mortality from fever was so high that work was abandoned. Construction was finally carried to completion in the years 1906 to 1913.

The line is 225 miles long, but just as it was completed (at a terrific cost in lives and money) the rubber boom collapsed. More than $30,000,000 was spent on the line, and it is commonly said that every cross-tie on the road represents a life lost. Now only one trip is made each week over the road. At one end—Pôrto Velho—the hospital constructed to take care of the sick while the road was being built is still in operation and does a great work for the relief of the inhabitants of those far-away regions. The railroad was constructed with the aid of literally tons of quinine. It is the only railroad on this great river system, and is operated at a loss by the Brazilian government.

Airways over the Amazon. What may yet really bring life to the whole Amazon region is the airplane. In 1924 the National Geographic Society sent out an expedition for exploring the Amazon Valley by hydroplane. This expedition was outfitted, equipped, and manned with the usual care with which this society makes scientific explorations. The results were published in the April, 1926, number of the *National Geographic Magazine*. Anyone interested in a study of Amazônia should read the story of this exploration.

What interests us most is the fact that the whole Amazon Valley is now traversed regularly by the planes of the Panair, Brazilian subsidiary of the Pan American Airways, and by those of the Cruzeiro do Sul. The first service was a weekly flight, made in a day, up as far as Manáus, from Belém. Now this has been extended to Pôrto Velho in the Territory of Acre, the most distant point of all Brazilian territory from the capital, Rio de Janeiro. The flight from Rio de Janeiro to Belém takes one day, from Belém to Manáus one day, from Manáus to Rio Branco one day—a total of three days. Formerly a month was the minimum of time in which the trip could be made. That was by steamer. The new rapid connection with the outside world makes a tremendous difference to the inhabitants of the valley.

Amazon Basin Explorations. While a sizable part of the Amazon Basin is as yet unknown, other parts have been well known for centuries. Some of the world's outstanding scientists have spent months, others years, in the Amazon region, and a number of books have been written on its many phases. Because some explorers have been fakes, a recent law very reasonably makes it necessary for an expedition to have authorization from the Brazilian Government before setting out. Brazilians want their country to be explored, but there have been too many false statements and descriptions by pseudo explorers. Some explorers have found traveling fairly easy and secure; some have met with tremendous difficulties; some have perished in their efforts. Among famous scientists who have made successful explorations are Humboldt (German), Castelman (French), Bates and Wallace (Englishmen), Agassiz, Orton, and Heath (Americans). Lieutenants Herndon and Gibbon of the United States Navy made a memorable exploration in the 1850's. The Oliveiras, Brazilian geologists, Barbosa Rodrigues, and the late Euclydes da Cunha were outstanding in various fields of Amazon exploration.

A former President of the United States, Theodore Roosevelt, made a complete crossing of Brazil in 1913-14, in company with General Rondon, a leading Brazilian explorer and an officer in the Brazilian Army. His full report of the experience is given in his book *Through the Brazilian Wilderness* (Scribner's, 1914).

Amazon Basin Development. Modern engineering, sanitation, air transportation, radio communication, and other developments make the future settlement of the Amazon River Basin possible. Brazil has already had a considerable measure of success in an experiment in the Valley of the Rio Doce, in the States of Minas Gerais and Espírito Santo. The purpose of this project is similar to that of the Tennessee Valley Authority. Plans have been discussed for another development, on a much larger scale, in the São Francisco Basin. Such developments bring great benefits to extensive areas and large population groups, because they foster transportation, power, communications, and many other economic goods under a coordinated plan. If such a project is undertaken in the Amazon River Basin on a scale commensurate with its area, it might become the most colossal feat of engineering and sanitation ever attempted, dwarfing the Grand Coulee Dam, the Tennessee Valley Authority, and even the Panama Canal.

Article 199 of the Brazilian Constitution provides that "In the execution of the plan to increase the economic worth of the Amazon

Valley, the Union shall invest, during at least twenty consecutive years, an amount not less than 3 per cent of its tax revenue." The Constitution does not specify how this money is to be expended. It seems certain that this great area, the world's largest river basin, will be developed.

Plans for a venture of international significance—to exploit the Amazon Valley for the benefit of mankind—were brought before a United Nations meeting in January, 1948. The moving spirit of the projected venture was Professor P. de Berredo Carneiro of Brazil.

V

Rio de Janeiro: The Marvelous City

BRAZIL became known to Europeans only eight years after Columbus made his epic discovery of the New World. The Portuguese of the fifteenth century were not only the most venturesome sailors of the time, but also the most powerful colonizers. They were the first to find a way to the Indies. A Portuguese mariner, Magellan, went around the world with a Spanish flag. In 1500 Pedro Alvares Cabral sailed his fleet along the coast of what is now Brazil. He believed it to be a large island, and, in the name of the King of Portugal, bestowed on it the name of Terra da Vera Cruz. No time was lost in taking possession of the new lands. Trading stations were established along the coast three years later, on the Bay of all Saints, and in 1549 the city known today as Bahia, or Salvador, was founded. That was seventy-one years before the Mayflower put in at Plymouth. Because Brazil has been slower in developing than the United States we often look on it as a new country, but the dates of early settlement contradict this impression.

Rio de Janeiro was started as a settlement in 1565, Santos in 1545, São Paulo in 1554. For four centuries, along the coast, over the mountains, and up the rivers, cities have been founded. They have grown from weak little settlements of a few families into modern cities with many thousands of inhabitants.

Since 1920 some Brazilian cities have been growing at a greater speed than ever before in their history. São Paulo had a population of 529,033 in 1920. By 1940 it had grown to more than 1,300,000, and by 1944 it had reached an estimated 1,450,000. Out beyond the great seacoast cities are thousands of small towns. Farther on are little villages surrounded by farms, Some farms contain entire villages within themselves, but large estates are the exception rather than the rule.

Brazilians call the far interior the *sertão.* No one can define exactly where the frontier, as we might translate *sertão,* begins or ends. It is ever receding, as highways and railways penetrate into the interior.

Frontiers have receded rapidly wherever gold or diamond deposits have attracted men.

It is not within the scope of this book to give an account of all the interesting cities of Brazil, but the two largest are described in the following pages.

"Cidade Maravilhosa." Slowly, in the deep silence of early morning, back in 1907, the little steamer *Tennyson* nosed her way into the harbor of Rio de Janeiro. Although it was not yet four o'clock, the passengers of the ship crowded on the decks to the rail to watch the first shafts of the morning sun strike the mountain peaks that fringe the harbor, slide swiftly down from the gray granite heights, and break over the sleeping city and still water in a sudden burst of gold. All the colors of the rainbow made patterns on the expanse of water in the bay. Skillfully the pilot guided the ship between Sugar Loaf on the south and the northern point of Guanabara Bay, Santa Cruz Fort. Scarcely a mile separates the two gates of Rio de Janeiro harbor. The water within was a mirror reflecting the intense and deep blue of a clear Brazilian sky. As we travelers looked intently toward the land, everyone was silent, for there are no words that can depict the scene. The visitor is awed when he catches a first glimpse of the "most beautiful harbor in the world." The city overflows the level land at the base of the towering mountains, which rise almost out of the sea, and extends far up the steep slopes.

All these kaleidoscopic pictures go to make up the glorious panorama which lies before the traveler who comes into Rio harbor. It is a sight that never ceases to be a marvel to the city's two million inhabitants. There is little wonder that the Brazilians call their beautiful metropolis in "A Cidade Maravilhosa"—the "marvelous city."

Of course, the bay is not always calm and the harbor a mirror of glass. Sometimes the waves beat high against the protecting seawall. Then buses and private cars, traveling to and from the city, may have to change their routes to avoid the swirling waters that come up across the harbor boulevards. Sometimes the sky is a dirty gray as heavy clouds hang low over the city and sudden tropical storms burst with sullen fury. Several times a year the cool sea winds cease and the sun beats down with cruel intensity. With the coming of night there is no relief. However, these periods of excessive heat last only for a few days and are not so oppressive as hot days in Chicago or New York. Very few deaths from sunstroke occur in Brazil.

The Founding of Rio de Janeiro. When three exploring ships from Cabral's fleet, under the command of André Gonçalves (or possibly Gaspar de Lemos, or Dom Nuno Manuel) first passed the narrow entrance into Guanabara Bay on January 1, 1502, just ten years after Columbus had discovered America, the explorers thought they had found the outlet of a great river. Since they entered the harbor in the first month of the year, they gave it the name of "Rio de Janeiro" or "River of January." One year later, Gonçalo Coelho, commanding a new expedition of six ships, approached the great bay. As soon as he had passed the towering mountain now called Sugar Loaf, his company landed on the nearest beach, and proceeded to put their supplies ashore in preparation for starting a settlement. The native Indians, who watched the white man's activities with interest, called his rude wood huts *cariocas.* To this day, anything pertaining to Rio de Janeiro or its inhabitants is called *carioca.* The word has been celebrated in recent years by a song and a dance called *A Carioca.*

The real birth of the city of Rio de Janeiro dates from the founding, in 1565, of a settlement by the Portuguese. They, however, first had to drive out the French, who had settled in the neighborhood in 1555 and claimed it in the name of their king. Some years later the village was moved farther in toward the head of the present harbor to *Morro do Castelo* (Castle Hill), because it offered greater security in case of attack and could be more easily fortified. Only a few years ago this hill was demolished and poured into the harbor to form new land, on which the city's modern airport was constructed. The area formerly occupied by the little hill is now the location of many of the skyscrapers in the business section of the city.

Rio became the capital city of the Portuguese colony in 1763 and has always remained the seat of government throughout all periods of Brazil's history—from the days of colonial empire to independence from Portugal following 1822 and the establishment of the Republic in 1889. As late as 1808, few foreign ships, except those of Portugal, were allowed to put in at the port. In that year the Regent of Portugal and his government, fleeing before Napoleon's invasion, removed his court from Lisbon to Rio. One of the first steps he took was to open the port to the trade of the world, ninety vessels being cleared by the customs office in that year. Currently more than two thousand ships stop at the port each year. Rio is the most important air transport center in South America.

Although there is a rather large area of flat land around the edge of the bay, access to the interior can be obtained only by scaling the very high escarpment thirty or forty miles back from the sea. Even so,

Rio is well located as the capital of Brazil, although it is no more the geographical center of Brazil than Washington, D. C., is the geographical center of the United States.

Other important dates in the history of the city were 1903, when work was first begun to make Rio a modern city under Mayor Pereira Passos, and 1907, when this huge task was successfully completed. Besides the modernization of the architecture and sanitation of the city, there was a rigid program for freeing the people of yellow fever and malaria, which was supervised by the late eminent Dr. Oswaldo Cruz. Since that time, Rio has taken on new life and has grown very rapidly. A 1930 estimate gave the population of the city as 1,505,595, making it about the same size as Detroit, Michigan. By 1940 its population had reached 1,800,000. In a short time the city may become one of the few in the world with more than two million inhabitants. The continued improvement of Rio, together with the fact that it has more outside contacts than any other South American city, makes it one of the most modern and up-to-date cities on the continent. A continual battle is waged against disease, and many problems, such as more rapid metropolitan transportation and better housing for the poor, are being solved. Some of the "favela" districts—tin-can dwellings, squatter shacks—have been cleared out, their occupants having been moved to simple but adequate houses built by the government.

The Beaches. Probably no city of the same size in the world has finer bathing beaches than Rio de Janeiro. Several small beaches inside the harbor, a few blocks from the city proper, are easily accessible to those who live in the heart of the city.

After traveling along a beautiful boulevard for nine miles, one comes to Copacabana Beach, with its open Atlantic surf bathing. A great many of the inhabitants live in this section of the city, and along the adjoining Ipanema Beach. On a warm Sunday morning it is not unusual for more than fifty thousand bathers to be on these two beaches. Many of the people who work in town take a swim before going to work in the morning and on their return home in the afternoon. In recent years hundreds of apartment houses, averaging ten stories in height, have been built along the beach and the narrow flat stretch of land lying between the beach and the mountains, which has brought a great increase of population to this area.

The municipal government maintains a very efficient lifeguard service all the year round, for there are only a few weeks of the year when it is too cool for comfortable bathing. Swimming is limited to the hours when the lifeguards are on duty. When the currents are strong

enough to make bathing dangerous, red flags are hoisted at the lifeguard stations, every few hundred yards, and swimming is prohibited by law. Contrary to common belief, there is no danger from man-eating sharks. In addition to the finest bathing in the world, the bay offers excellent opportunities for sailing. Powerboats, sailboats, and rowboats wind their way between the many islands. Sun bathing is even more popular than surf bathing.

The Crown of Mountains. Two peaks which lie within the city limits of Rio are visited by thousands of people each year. Pão de Açucar (Sugar Loaf), is probably the more famous, but Corcovado (the Hunchback) is the higher and more popular with tourists. Sugar Loaf is situated at the entrance of the harbor, and its summit is reached by an aerial cable car. Many people take the trip in the afternoon and stay until early evening to watch the lights come on in the city far below. Ships sail close to Sugar Loaf as they enter the harbor. There are few sights in the world that can compare with the view from the top of Sugar Loaf. One may look for miles out to the open sea, then back to the city, to the hills across the bay, or to the long line of mountains inland.

The top of the Hunchback may be reached on a cog road, or one can drive by auto almost to the summit and walk the rest of the way. As the Hunchback has a greater altitude than Sugar Loaf, it offers a more remarkable view. However, the trip should be made only on a clear day. Many of the beautiful photographs of the city and harbor were taken from this point. A-top the Hunchback there has been erected a huge statue of Christ the Redeemer. (This statue must not be confused with the Christ of the Andes on the Chile-Argentina frontier, more than a thousand miles to the southwest.) At night the statue is illuminated by floodlights. It is visible from all parts of the city both day and night, except when the summit of the Hunchback is hidden by clouds, which sometimes float over it in soft majesty.

Behind the Hunchback lies the Tijuca range. Two important peaks of these mountains, which fringe the Atlantic, are Pedra de Gávea and Dois Irmãos (Two Brothers). These peaks are so difficult to climb that tourists rarely scale them.

The Boulevards. The city of Rio has two drives which are unsurpassed anywhere in the world. One winds for fifteen miles along the beaches and around the edge of the harbor, and the other ascends into the Tijuca mountains. No visitor to Brazil should miss either of them. They are connected in such a way that one can drive over the moun-

tains and return by way of the coastal boulevards. But to enjoy the real beauties of the trip takes more than a day. Many vantage points are provided where the visitor may sit and look down over the city or out to the distant horizon of the Atlantic Ocean. The most famous point on the horizon is the *Mesa do Emperador* (the Emperor's Table), named for the last emperor of Brazil, Dom Pedro II, who had a great appreciation for the beauties of nature and built several roads over the mountains in order to visit them more easily. A famous traveler said, "There are three things I wish to do again before I die; one is to lie at my tent door in the moonlight in the Sahara; another is to sail again on the Inland Sea of Japan; and the last and the best is to once more take the drive around Tijuca." [1]

No visit would be complete without a trip over the forty miles of concrete drive winding through the mountains like a ribbon of silver in the bright sunlight to Petropolis. A little more than an hour after leaving Rio, one finds himself in this city, which has been the summer capital of Brazil since the days of the Empire. This suburb of Rio has within recent years become an important adjunct to Rio city life. It has thousands of new summer homes, many palatial, and the largest and finest summer resort hotel of all Brazil, Quitandinha. Rio, the seaside city, is fortunate in having a magnificent mountain resort within an hour's ride by car. It is the summer capital of the Federal Government and of the Government of the State of Rio de Janeiro.

Teresopólis, at the foot of the picturesque Organ Mountains (so named because at a distance they look like a gigantic pipe organ), is another beautiful summer resort, only a two-hour drive from Rio. It also has many beautiful summer homes. Teresopólis and Petropolis are in the State of Rio de Janeiro.

Two things stand out forever in the memory of the visitor to Rio: the patterned sidewalks in the downtown district and the beautiful trees that line the boulevards throughout the whole city. The Portuguese were accustomed to mosaic patterns in the sidewalks of Lisbon and introduced them in Rio de Janeiro. At first even the black and white stones used for making the patterns were brought from Europe, but later quarries were opened in Brazil. One watches with great interest as the workmen arrange the stones in the intricate patterns, the more so as one realizes that no cement is used to hold the stones in place. Very small stones are used, with flat sides, so that the sidewalks are pleasant to walk on.

Evergreen trees of many species line the boulevards and streets.

[1] Clayton Sedgewick Cooper, *The Brazilians and Their Country*, p. 281.

The most interesting tree used for this purpose is the "Brazil" tree, which lines the most important avenue in the city—the Avenida Rio Branco. Brazil took its name from this tree, which furnished a valuable dye and was the first important export from the American colony to the mother country, Portugal. Some of the trees used for street planting have small delicate leaves; others have large leaves, six inches or more in diameter. Many have gorgeous flowers—yellow gold, purple, or flaming red. In all the world there are no streets quite so grand as those of Rio lined with Royal Palms—such as Paisandú Street. One feels something near exaltation when walking between these stately pillars topped with green spreading fronds. It takes many years to form such an avenue, but the trees live for a century or more.

Along the great boulevard of the beaches, open spaces are often used for formal gardens. Plants are changed frequently, but since they are transplanted full of buds, they come into bloom in a riot of color almost overnight. These displays continue throughout the year. Add to the brilliance of flowers the gorgeous deep green of the stiffly pruned trees (*Ficus benjamini*), the rainbow colorings of the changing color fountain, and the shimmering tropical moonlight on a balmy evening—well, if there is romance anywhere, it is in Rio.

Two Famous Avenues. At the beginning of this century the city of Rio de Janeiro was remodeled, and its main business artery, extending from shore to shore on the promontory of São Sebastião, was opened. It was first called Central Avenue, but later changed to Rio Branco Avenue in just homage to Brazil's leading statesman, the Baron de Rio Branco.

Forty years later a new avenue of vast proportions, running at right angles to the first great avenue, was opened. It is about three miles long and has a total width, including mosaic sidewalks, of 94 meters (approximately one hundred yards).

Many square blocks of buildings were razed, including the City Hall, to make way for this imposing thoroughfare. Fortunately, the rich old architectural treasure, the Church of the Candelária, was not torn down, although several other very old churches were. The whole length of the new avenue will have buildings of uniform height and mosaic sidewalks. Building requirements are rigorous. All property adjacent to the new avenue, as well as that which was razed to make way for the thoroughfare, was condemned by the city on the basis of its value prior to the inception of the project. Then this adjacent property was sold at its enhanced value to defray the cost of the improve-

ment. The transformation is, however, so great that it will take some time for values to catch up.

A once congested city now has two very fine avenues through the business section.

What to do in Rio. Those who like to take short trips or go on picnics can take the ferry to the islands in the bay—Paquetá being especially rewarding. One can cross the bay to Niterói, the capital of the State of Rio de Janeiro. Or one can cruise and fish in the bay or along the coast. There are motorboats, sailboats, and rowboats that one can take. While fishing is a popular pastime for many in Rio, it is a means of livelihood for many others. Local markets are well supplied with many kinds of fish and with crustaceans, including shrimp, crabs, and oysters.

In addition to drives and the fine harbor, Rio has the world-famous Botanical Gardens, the great scientific institution at Manguinhos, the National Library in the heart of the city, the Municipal Opera House, and many public buildings. The building which was originally the residence of the emperors, *Quinta da Boa Vista,* has been restored and is today the National Museum. It contains an excellent collection of the artifacts of Brazilian Indians, exhibits of plant and animal life of the country, and many other things closely related to the historical development of Brazil.

Commerce and Public Services. Rio is one of the greatest trade centers of South America. Nearly all the companies that have business interests in Brazil maintain a general office and warehouse in Rio, though their factories or main offices may be elsewhere.

A great deal of manufacturing is carried on in Rio, especially of cotton and woolen goods. However, the principal industrial city of Brazil is São Paulo. In comparing these two cities with some in the United States, one might say that Rio is a combined New York and Washington, while São Paulo is the Detroit and Chicago of the country.

During the past decade Rio has experienced a great building boom. In recent years, more than five thousand houses and buildings have been constructed in the city each year. Many large apartment houses have been erected in the central parts of the city to accommodate the ever-increasing number of families who wish to live near their work and at the same time be near the beaches. The middle class has its homes farther back in the suburbs or on the plains extending back to the mountains. More than 150,000 commuters travel daily to and from Rio on the suburban electric lines of the Central Railway of Brazil.

The city has excellent streetcar and bus systems. Some of the middle-class businessmen use taxis, which are abundant and reasonable. Only the well-to-do can afford their own automobiles. When the city of Rio had 27,000 automobiles, the city of Indianapolis, for example, with one-fourth Rio's population, had 120,000.

New avenues and boulevards are being rapidly opened in Rio according to a well-laid plan for urban improvements. These will greatly facilitate traffic circulation to all parts of the city.

Rio de Janeiro is one of the best lighted cities in the world. Instead of single lights at great distances, the boulevards of the city have huge clusters of lights at frequent intervals, and even in the suburbs many of the streets are well illuminated.

Although most of the water consumed in the city is piped from the nearby mountains, with the growth of population it has been necessary to bring in an additional large supply from the Lages River, which also provides a hundred thousand electric horsepower for the industries of the city. The obtaining of an adequate water supply is one of the city's main problems.

The Markets. In addition to the large Municipal Market near the docks in the center of town, street markets are held once or twice a week in various parts of the city. These, however, are now being replaced by specially built "regional markets" under a plan developed by the Municipality for the Federal District. Six of them have already been installed in several wards of the city, and others will follow to complete a total of fourteen. Here and in the old street markets the housewife and the large buyer find all the principal fruits, vegetables, meats, and fish. In these markets the American will find nearly all the foods he is accustomed to eating at home as well as many kinds that are unknown to him, such as the *sapotí,* the *jaboticaba,* the *mamão* (papaya), and many other fruits he has never seen before. He is surprised to learn how inexpensive these are.

Education and Culture. The university, the public school system, the National School of Arts, the downtown trade school, the Lyceum, the National Library, and the Academy of Letters, the center of all Brazil's learned societies, are of great interest to foreign educators. For more than a century and a half, Rio has been a paradise for botanists, zoologists, and explorers. Hugh Gibson's book *Rio* describes vividly the great wealth of flora and fauna to be found in and around the capital of Brazil. The number of educational excursions made by

the professors and students of the United States to Brazil is constantly increasing.

The Spirit of the Cariocans. The Brazilian usually does his work without hurry, eats slowly, and lives in an easygoing manner. His life is spent close to great beauties of nature, in a warm and soothing climate. The rush of life is not felt so acutely in Brazil as in the United States. So often the great show places of the world may be enjoyed by only those few people who have much money. In Rio, however, as in few places in the world, beauty, nature, and the good life are available to most of the people, whether rich or poor. In normal times living costs are reasonable. Houses do not have to be heated, a minimum of clothing suffices, and basic foods are cheap. So we see that the spirit of the Cariocan is personified by the native Brazilian, a person who is lighthearted, patient, and courteous, who jokes when the North American would become angry. He is a person vitally alive within himself. He has respect for the rest of the world. He takes life easy. The people of the United States arouse his curiosity, and he doubts their sanity when he hears that they boil their tea to make it hot, then cool it with ice, add sugar to make it sweet, then squeeze in a piece of lemon to make it sour.

The great social event of the year looked forward to by all the Brazilians is Carnival. Since 1840, a huge celebration has been staged every year during the last four days before Lent. Carnival has grown to such size and importance that it has become a national holiday. Ships from many parts of the world arrange their itineraries so as to be in the port of Rio during Carnival. The nearest thing to the Rio Carnival in the United States is the Mardi Gras at New Orleans. However, the Rio celebration lasts not for a single day, as does the Mardi Gras, but is a continuous round of merrymaking for four days and nights. The streets become so crowded that all vehicular traffic is suspended, and it may take an hour for one to progress a few city blocks on foot. Everyone is out for a good time, half the population is dressed in fancy costumes, and all join in singing the popular Carnival songs, which change from year to year just as popular dance hits do. Brazilians who do not care for the crowds and amusements of the Carnival spend the vacation at their country homes or at one of the many summer resorts. "The real Rio has a very human variety of moods, and the whole appearance of the place alters with each change of humor." [2]

The Indescribable City. Because there is so much that must be felt,

[2] Hugh Gibson, *Rio*, p. 6.

as well as seen or heard, in Rio, foreigners who know the city intimately have reached this conclusion: the city must be visited to be appreciated.

"No one has yet been able to visualize Rio de Janeiro in words." [3]

"One thing that we learned then and there—that the bay and its setting cannot be described though many of the world's best writers have had a gallant fling at it. If you want to know what Rio is like you cannot learn it from a book. There is only one way—come and see for yourself." [4]

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[3] Clayton Sedgewick Cooper, *The Brazilians and Their Country*, p. 268.

[4] Hugh Gibson, *op. cit.*

VI

São Paulo: The Dynamic City

SAO PAULO is a city of anomalies. It is both the capital of the great agricultural state bearing the same name and the largest industrial city on the continent. Though on the Tropic of Capricorn, it is temperate in climate owing to its elevation of 2,700 feet. It has a large foreign population, yet all its residents have an intense pride in their city and state. It is a city of factories, yet it has a very small slum district. Though it is an inland city, it is only an hour's ride from the coast and has as much seagoing as overland commerce. Its ancient streets, nearly four hundred years old, stand in striking contrast to its modern avenues and boulevards. It is practical and prosaic, yet colorful, proud, exciting, and dynamic.

São Paulo is the nation's leading city in educational and cultural opportunities. A century ago São Paulo had about 15,000 inhabitants, and by 1890 it had grown to only 64,900. Ten years later it had a population of 240,000; in 1920, 579,000; and in 1940, about 1,500,000. An American geographer expressed the opinion that there seemed to be no adequate explanation for the city's phenomenal growth. Actually the reason for the growth is not hard to find. Imagine the palm of one's hand as a city and five fingers as railway systems radiating from it, penetrating vast interior regions where rich soil produces abundant crops of coffee, cotton, rice, and sugar cane, and where boundless tracts furnish pasture for millions of cattle—such an image is translated into reality in São Paulo. The city could no more help growing than Chicago or Detroit. Its invigorating climate attracted hundreds of thousands of European immigrants, who added initiative to the hardiness of the native element. This combination resulted in a great diversity of interests and pursuits. The development of agriculture, industry, commerce, and transportation was inevitable.

History and Development. São Paulo was founded in 1554 by Jesuit missionaries who came up the mountains from São Vicente, near San-

tos, and so can soon celebrate its 400th anniversary. The city now occupies an area of about four hundred square miles. It is divided into numerous boroughs, like New York City.. Some are residential, some commercial, some industrial, and some a mixture of all three.

Battles were fought with the Indians at the top of the mountain range, and the first settlement to be established was at Santo Andre, at present a suburb of São Paulo. But even in the sixteenth century the largest of the colonial settlements in the vicinity became definitely established at what is now São Paulo. The city lies on an extensive plateau, cut by two rivers and surrounded by low-lying mountains. Its proximity to the coastal range, which rises to a height of from 2,700 to 3,000 feet, made it of extremely difficult access in the early days, because trails up the mountain were difficult to negotiate and animal traction was slow. Even now this mountain range is a costly transportation barrier between the city and the sea, although the distance may be covered by train in about two hours and in one hour by automobile.

The obstacles overcome in establishing the colony of São Paulo—Saint Paul—seemed to temper its inhabitants, who have always been the most aggressive and progressive of the nation. In its first three centuries of existence, São Paulo was a small village, and its people led a pioneer life.

During the seventeenth and eighteenth centuries it was from São Paulo that the pioneers set out, penetrating the forests, following rivers upstream and finding passes through the mountain ranges. They settled much of the far interior. Generally they were looking for silver, gold, or diamonds, but frequently they settled down after their explorations were over. Today the Paulistas (as people from São Paulo are called) are still migrating to uninhabited parts of the vast inland regions of Brazil. They are a vigorous, restless, active, venturesome people, always ready to try something new and explore the unknown.

São Paulo is one of the few cities in the world having a population of more than 1,000,000 at an elevation of more than 2,500 feet above sea level. Because of its elevation, both transportation and water supply have been gigantic problems. At first there were only pack-horse trails from the coast. Later a road was built in the valley of the Paraíba River—from Rio de Janeiro to São Paulo and beyond into the interior. Still later, about 1867, the road was supplemented by a railroad. In the twentieth century great improvements were made in railways and highways. Now there is modern transportation by train, automobile, and airplane.

At first water from small rivers, taken up at their sources, was brought into the city by aqueduct. But with the rapid growth of the

city in the last forty years, it has been necessary to bring the water in over distances of from forty to fifty miles and install chlorinating plants. The Rio Claro aqueduct has an immense potential capacity, but as it is some sixty miles in length, the expense of its construction has delayed completion. Some two million people can be supplied from this source when necessity demands.

The industrial plants of the city frequently obtain their supply of water from artesian wells or from the River Tietê, which runs through the city. Owing to the elevation of certain sections of the city, the water supply has to be pumped into concrete tanks, from which it is easily distributed.

Part of the city is built on rather flat lands, where drainage is a problem, but more than half of the urban and suburban areas are spread over the many hills lying between the seacoast mountain range and the foothills of the Mantiqueira range.

Climate. The climate of the city is decidedly temperate, owing to its elevation.

The city has its heaviest rainfall in January. Records have been kept at the "Luz" Station of the São Paulo Railway for more than fifty years. The maximum annual rainfall during this half century was 78 inches, and the minimum was approximately 48 inches. Years of sparse rainfall and of unusually heavy precipitation have come in cycles of approximately twenty years. Floods on the Tietê River, which runs through the city, have also recurred in twenty year cycles. Much damage is done by these floods, and thousands of acres of land that could be utilized as building sites have been rendered useless. The city ordered an hydraulic dredge, electric-driven, from the United States and is draining the swampy area and straightening the curving river bed. Salvaged real estate will pay, many times over, the great cost of the whole project. The light and power company is doing the same for the Pinheiros River.

While buildings are not ordinarily heated, fireplaces are welcome additions in residences, since occasional heavy frosts and many cool nights call for some artificial heat. Owing to proximity to the coastal range, humidity is high, so the cold is felt much more than in a drier climate. Extreme heat is rarely experienced. A rapid rise or fall in the temperature occurs almost every day in the year, and this contributes to the vigor of the climate. These rapid changes are appreciated by some and lamented by others. The climate makes for general health conditions that are as good as in other Brazilian cities and better than in many.

The combination of temperate and tropical climates makes it possible to grow many plants of both zones. For example, common fruits include oranges, lemons, Japanese persimmons, loquats, avocados, and bananas; while mulberries, pears, peaches, strawberries, and grapes all do well. Even the American black walnut does well in São Paulo, and an occasional oak tree is found among the myriads of palms. Fine lettuce that heads beautifully grows in and around the city. Shipments of hard head lettuce are made daily to Rio by airplane and express train. Lettuce never does well in a strictly tropical climate. Cauliflower and celery grow alongside cassava and other tropical vegetables. Sweet peas, carnations, and dahlias are among the favorite flowers. Orchids grow outdoors.

The foreigners who immigrated in largest numbers to São Paulo were the Italians, Germans, Portuguese, Spanish, and Syrians. The English and North American colonies are small.

Industrial Center. The first four decades of this century saw a remarkable industrial development in the city of São Paulo, which is undoubtedly the largest industrial center in all Latin America. Many factors have contributed to making it so, such as abundance of power, nearness to the seaport of Santos, good transportation facilities to the interior of the state and to nearby states, abundance of credit and capital, and, above all, initiative and a progressive spirit. Textiles, sanitary supplies, building material, shoes, clothing, household articles, electrical supplies, machinery of all types, automobile tires, and rubber goods—in fact, practically every kind of manufactured goods produced in Brazil—are made in the city of São Paulo. The larger part of the great industrial output from more than two thousand factories is for domestic consumption, but some of it is shipped from Santos by coastwise steamers to points north and south, and a fair share is exported to other countries.

Some of the factories are Brazilian-owned, while some belong to foreign concerns operating in many countries. Among the latter are Armour and Wilson, meat packers; Goodyear, Firestone, and Pirelli, tire manufacturers; General Motors and Ford Motor Company automobile assembly plants; Lever Brothers, soapmakers; Johnson and Johnson, manufacturers of sanitary supplies; Corn Products Refining Company, producers of cornstarch and glucose. The Nitro-Quimica Company, the country's largest producer of nitro-cellulose products, bought a rayon plant at Hopewell, Virginia, and transported it to São Paulo. As a result of World War II, a great impetus was given to local

industries, especially to textile factories, steel sheet mills, and machinery specialty manufacturers.

Since transportation facilities to and from the city are being greatly improved and available electrical power is enormous, a still greater expansion of São Paulo's industries is to be expected. In various chapters of this book different phases of São Paulo's industries are discussed.

Commercial Center. São Paulo was a commercial center before it became the industrial center of Brazil. Where industry thrives, commerce keeps pace. Raw materials, especially coffee and cotton, pass through the city on their way to Santos, which has always been a typical port city. Imported goods for a large part of the Brazilian population come in through Santos on their way to the wholesalers and importers in São Paulo, who distribute them over four or five states. Banking and credit facilities, accessory to a large export trade, increase commercial activities and make São Paulo a strong financial center. Almost half of the nation's federal taxes come from São Paulo, which gives some idea of its relative importance.

Mappins, or the Anglo-Brasileira, as it is now called, an English department store in São Paulo, is Brazil's largest retail establishment. The largest number of traveling salesmen from any city in Brazil work out of São Paulo. Country trade flows in a constant outward tide, while food-products and raw materials for manufacturing and exportation flow inward. Though the city is more concerned with its industries than its commerce, one supplements the other. As transportation facilities improve, trade will expand. All the factors favoring this expansion occur in São Paulo. There seems to be little doubt that São Paulo will eventually surpass the national capital—Rio de Janeiro—in number of inhabitants, as it has already done in industrial and commercial importance.

City of Homes. São Paulo is noted for its homes. Though many apartment houses have been built, the middle and upper classes still favor home ownership. Only brick and concrete houses are built, and São Paulo is fortunate in having plenty of stone and gravel near by, as well as abundance of brick clay. There is a good supply of building timber in the forests along the railroads leading to the city, which tends to make building costs reasonable. Two of the largest cement mills in the country are near the city, and the supply greatly facilitates building operations.

More than ten thousand building permits were issued annually from 1935 to 1940, and a large portion of them were for homes. Enormous

subdivisions of real estate were in vogue a decade ago, and thousands of people became home owners on the installment plan. These widely scattered subdivisions created major problems, for the city had to furnish adequate water supply and street paving. Though the opening up of new subdivisions has been restricted, many new ones are still being developed.

War conditions enormously increased building costs, since the shortage of materials affected the market. The most serious bottleneck proved to be galvanized pipe for the water supply, since none was manufactured in Brazil. Construction of some of the taller buildings was held up on account of the difficulty of obtaining elevators. The falling off in building permits was not more than 25 percent, and the sale of lots was greater during the war than in the prewar period.

The city is divided into a large number of residential districts. In some the workmen's homes predominate, in others the middle class, and in still others the more well-to-do. As happens in all modern cities, growth and expansion cause a constant shift, as former residential areas become commercial areas. A goodly number of large apartment houses are being constructed near the center of the city, where lots become too valuable for single residences. Most people who work in the city lunch at home, so offices and stores give a two-hour lunch period. This accounts in part for the preference for homes nearer to town. Higienópolis, Jardim América, and Jardim Europa are centers for the homes of the more wealthy.

The Braz is an immense flat area studded with factories surrounded by small homes. Here were built the largest motion picture houses in the city, to serve the great population of the area. The more luxurious theaters are on the avenues in the center of the city. Some of the newer districts of workingmen's homes are still partly undeveloped, because the city has grown so fast that hundreds of streets are not yet paved.

The City Improvements Company, English-owned, has financed the development of a number of residential districts, notably Jardim América, Jardim Europa, and Pacaembú. The majority of the finer new homes are built in Jardim América. The real estate developments of this company are notable for the excellent street layout and the service improvements made before the lots are put on sale.

The foothills of the mountains near the city in the Cantareira district are now being "discovered" and are developing rapidly. One of the city's largest real estate developments is that of the Auto Estradas, called Interlagos, between the two great artificial lakes near Santo Amaro. Few great cities of the world can offer their residents such a choice for the location of their homes as does São Paulo—a choice

between a lake district and the foothills of a mountainous region with excellent climatic conditions.

As urban transportation facilities increase and as the vacant spaces between widely spread-out residential districts fill in, São Paulo will be able to accommodate a population several times greater than its present one.

City Planning. Like Topsy, São Paulo just grew—something like Atlanta, Georgia, with its Five Points. The old trails where the cows went out to pasture from the village became roads, then streets, and then main thoroughfares. The city proper grew up around a small triangle. As population became denser, transportation and even the handling of pedestrian traffic became a problem. Finally, streetcars were taken off many of the main streets, and an intelligent system of wide avenues was laid out from the center to the outskirts and around the center. A large Civic Center was planned, and then systematic demolition and new construction got under way. Thousands of houses were condemned and torn down to make way for improvements. Active work has gone on for five years, and at least ten years more (as of 1948) of uninterrupted work will be necessary for the realization of the program. So far expenses have been paid mostly out of the regular tax funds of the city, without the incurring of disastrous loans. The former mayor of the city, Dr. Francisco Prestes Maia, is an urbanist, or city-planning expert, and the program was planned and begun under his administration. Enough has been accomplished to demonstrate that a beautiful city will evolve.

São Paulo normally grows at the rate of about 60,000 inhabitants a year. Every year more than 12,000 building permits are issued, and hundreds of buildings, of ten or more stories, are erected. It is estimated that the city will have a population of approximately 3,000,000 by 1965, and another million by 1975. Present additions to the city water supply make immediate provision for 2,500,000 inhabitants, and improvements already contemplated will provide for a possible 4,000,000. The engineers in charge of supplying the city with its most essential element, safe water, have demonstrated the soundness of their belief in its growth and expansion.

The city is spreading over an ever-widening area, so that the problem of transportation is becoming increasingly complicated. Streetcar and bus lines are operated by a single company, which is controlled and half owned by the municipality. The fact that São Paulo has the lowest streetcar fare in the world probably only adds to the problem.

City of Culture. As a cultural center, with fine educational opportunities, São Paulo has much to offer. Public and private schools provide primary and secondary education. São Paulo has always been a leader in the development of primary education for Brazil. Several of the most noted scientific institutions of Brazil are in the city. "Mackenzie College, of North American origin and control, has also contributed liberally to Brazilian education." [1]

A municipal Department of Culture keeps a record of social documents of interest to the city; sees to it that historical data in regard to the city are gathered and properly recorded; and promotes art, drama, and music in the public interest. Prizes are offered each year to stimulate the production of original works in art, music, and literature. Concerts by a symphony orchestra, a string quartet, and a choral group, all maintained by the city, are given in the Municipal Opera House. At first they were free, but a nominal charge is now made. It is good to see the interest manifested year after year in these municipal concerts. The University of São Paulo is made up of a Law School, School of Medicine, Engineering, and other professional schools. It also has a Department of Philosophy, Science, and Letters.

All the component colleges of the State University are in São Paulo except the College of Agriculture, which is in Piracicaba. The Law School is in the heart of the city in a magnificent building of colonial style. The School of Medicine and School of Public Health are a short distance from the center in a beautiful building put up with a half-million-dollar grant from the Rockefeller Foundation, and a clinic hospital with 1,100 beds is also on the campus. Modern buildings have been planned for the Department of Humanities and the Engineering School.

Modern public school buildings are rapidly replacing rented buildings still being used for schools in many parts of the city.

The city library has moved into a twenty-two story skyscraper specially built to house it, and all modern library installations have been provided. It should become one of the best libraries on the continent. Dr. Sergio Milliet, the director, and Dona Adelpha Rodrigues Figueiredo, technical assistant, studied modern library practice in the United States.

The São Paulo Penitentiary. It may seem odd to include here, as one of the city's leading assets, its penitentiary, but no discussion of the city as a whole should omit it. There are individual cells for 1,400

[1] *São Paulo, the Heart of Coffee Land,* The American City Series, Pan American Union, Washington, D. C., 1934.

prisoners. So far no prisoner has escaped, and attempts to escape are rare. The work of rehabilitation through teaching of trades and the very good treatment given the inmates introduced a new method of handling prisoners in this part of the world. Men who have studied prisons the world over are unanimous in their praise of this penitentiary. So why shouldn't the city be proud of it?

Recreational Facilities. The city enjoys a number of advantages for sports and recreation. Several athletic clubs have extensive grounds with modern buildings and equipment, and always modern swimming pools. Memberships may run as high as five thousand or more. The clubs having soccer football teams are considered the most attractive. Some of the clubs are along the Tietê River, where excellent rowing facilities are available. The great Santo Amaro Lakes, which were built by the light and power company for reservoirs, are near the city and furnish a paradise for small boats as well as a shore line of several hundred miles for summer home sites.

The finest stadium on the continent has been built by the city at a cost of over a million dollars. It seats 60,000 in the main bowl, and is in almost constant use, and is so near the heart of the city as to be immediately accessible to the throngs attending the great soccer championship games and other athletic events. Two golf clubs and a number of fine tennis courts furnish ample opportunity for play. The leading Brazilian tennis players are from São Paulo.

Practically all sports are enjoyed in the city. The central training school of physical education is supplying teachers and coaches. The present generation of the city enjoys unusual privileges, and the improvement in general health and physique is a notable result of a more bountiful outdoor life of sports and recreation.

"Social Conscience." São Paulo is justly proud of its "social conscience." While there are overcrowded quarters and some slums, it is probable that in no other city of its size are there so few substandard dwellings. Though hospital accommodations are limited for so large a city, each year sees old hospitals enlarged and new ones built. The new 1,100-bed clinic of the Medical School is a great addition to present facilities. Free clinics, supported by popular subscription, are numerous. They supplement the work of the various dispensaries maintained by the State Department of Health.

An interesting manifestation of the "social conscience" at work under the best of auspices is found in the great Municipal Playgrounds

and children's parks. The department that supervises the playgrounds has achieved great results in child welfare and development.

The study of applied sociology has been undertaken in the University, and the Municipal Department of Culture is making a thorough investigation of the standard of living of the population. From these research studies, basic information is available which can be used to improve living conditions for the underprivileged through governmental action.

São Paulo is not a perfect city, but it is making an aggressive and intelligent effort to become a city of healthful and happy living.

Campinas and Santos

Campinas. Sixty-five miles inland from São Paulo is the city of Campinas, with a population of more than 100,000. It represents the best in inland cities of Brazil that are not state capitals. It has industrial establishments, is an active commercial center, has good educational facilities, and is the seat of the best Agricultural Experiment Station in all Latin America, known as the Instituto Agronômico. It was here that in 1868 the Presbyterian Church in the United States founded the old Colégio Internacional, the first American Protestant college in Latin America (now the Gammon Institute at Lavras, Minas Gerais).

Campinas was the birthplace of the greatest Brazilian composer, Carlos Gomes, who was born in 1836. He wrote "Il Guarany" and a number of other operas, much appreciated in South America and Europe, though little known in the United States.

The city is at a lower altitude than São Paulo, 2,230 feet, and, being farther from the seacoast mountain ranges, has a more stable climate. Campinas was formerly the center of the great coffee district, but the production of this crop has long since moved inland. Now cotton, grapes, and oranges are becoming the main crops of the surrounding country. Railroad connections are of the best, and the trip to São Paulo is made on excellent trains in less than two hours.

Tourists visiting the city of São Paulo generally visit Campinas and go out to some of the big coffee farms still under cultivation near the city. A visit to Campinas would not be complete without seeing the big Agricultural Experiment Station.

Santos. Three cities of the State of São Paulo are linked in many events of the early settlement days of colonial times, and in the present-day development of the country. They are São Paulo, Santos, and

São Vicente. The settlement of what is now Santos was begun in 1545, but the founding of the adjoining city, São Vicente, in 1532, makes the latter one of the oldest settlements in Brazil.

Santos lies 219 miles southwest of Rio de Janeiro and is the most important commercial port of Brazil, although Rio is a close rival. Most of the coffee, cotton, bananas, and frozen meat exported from Brazil is shipped from Santos, and great importations of machinery, wheat, and raw goods for manufacturing come in through this port. The exportation of coffee reaches a million bags a month, and it is not uncommon for ships to sail with a cargo of cotton, often more than 30,000 bales at a time. The annual exportation of bananas is about 12,000,000 stems.

Santos docks are protected from the open sea. Twenty enormous warehouses are used to receive incoming and outgoing merchandise. Railroad tracks run alongside, so that freight can be loaded on the docks for shipment. Most of the coffee exported is stored in special warehouses in the city and only is brought to the docks to be loaded in the outgoing steamers. There are sixteen automatic coffee-loading belts, with a total capacity of 12,000 bags of coffee an hour.

The city is connected with São Paulo by a railroad, the cars being pulled up the escarpment by cables. When the road was built a half century ago, it was considered an engineering marvel, but now it could no doubt be replaced by electrically drawn trains. Recently a new connection was made from the interior to the city of Santos on the state-owned Sorocabana Line. It uses ordinary trains, but, had it been electrified from the start, the route could have been shortened. It seems strange to see steam locomotives being used on both railroads when in sight of the railways is the largest hydroelectric development in all Brazil with a capacity of 700,000 horsepower. São Paulo, on the plateau, is so near Santos that the two cities are dependent one upon the other.

In earlier days the city of Santos, locked in by mountains, was hot and considered very unhealthful. Yellow fever took its heavy toll here forty and more years ago. Now the city has been thoroughly modernized. Boulevards along the ocean beaches make it very attractive.

Only forty miles from São Paulo, the city of Santos often has, on week ends and holidays, as many as a hundred thousand visitors who seek the beaches. Praia Grande is a thirty-mile beach lying a few miles south of the city. It now serves as a landing strip for airplanes, and it should be one of the finest resort beaches of the world when developed. The city has some excellent resort hotels, offering modern comforts.

Santos has been the birthplace of many notable Brazilians. The greatest was José Bonifácio de Andrada e Silva, a prominent Mason,

frequently called the Patriarch of Independence, because he was the outstanding statesman in bringing about the liberation of Brazil from Portugal.

Santos is a rapidly growing city, having increased from 50,000 people to nearly 200,000 in the last few years. Between Santos and São Paulo a four-lane concrete highway is nearing completion. Over it, automobiles will be able to cover the distance in about forty-five minutes, making Santos practically a suburb of São Paulo. There is bus-line service between the two cities, with buses running every seven minutes.

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PART II

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Brazilian Agriculture

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VII

Farming Under the Southern Cross

BRAZIL IS essentially an agricultural country. Vast mineral resources and an ever-growing home market have favored a large industrial development, but a large share of Brazil's wealth comes from the soil in the form of agricultural products. With so widespread an area and such varied conditions in altitude and climate, it is natural to expect a great diversity of plants. Just as Africa is the home of the most varied and abundant animal life, South America teems with different species of plant life, more than fifty thousand botanical species having been classified up to this time.

Brazil is principally associated in our minds with rubber and coffee, but the country raises many other agricultural products as well. The following chapters will devote much space to them, and to Brazilian agriculture in general, because it is necessary that this be done if one is to understand the present development of Brazil and its possible future importance in international economic affairs.

The great variety of farm products raised gives a picture of the many sources of income open to the Brazilian farmer. Some of the most important farm products are coffee, corn, cotton, sugar cane, rice, cacao beans, potatoes, mandioca or cassava, castor oil beans, and tobacco. Among the leading fruits produced are oranges, pineapples, bananas, coconuts, grapes, mangoes, papayas, and avocados; and some that are not exported, such as the sapodilla, jaboticaba, and caju (cashew).

There are nearly a hundred million head of livestock feeding on Brazilian ranches. Cattle, horses, mules, hogs, sheep, goats, and poultry are bred in all parts of the country and form an important industry for the landowner, owing not only to the demands of the home market but also to the large exportation of meat and meat products. Hides of both cattle and goats figure largely in the export volume of the country.

Brazil is different from some other South American countries in the fact that the owning of land is open to all classes. Anyone who has the money to pay for it may purchase land, and farms of all sizes, from

those of a few acres to great plantations, are constantly offered for sale. Large tracts of land are continually being broken up into small farms and offered for sale on easy payment plans. In this way it is possible for the less favored to buy small farms and to pay for them out of their annual earnings. There need be no land shortage in Brazil for a long time, since at present less than half its area has been settled. Every Brazilian has the opportunity of owning land if he has the capital and initiative to buy a piece of ground and farm it himself. In fact, in the far interior many squatters farm on land that they never come to own. As definite settlement takes place, and titles and deeds must be legalized, order comes out of chaos and better farming is done.

Many North American writers and students of South American economy find it difficult to believe that Brazil is not largely taken up by immense estates or farms. The 1920 census gave the country more than 640,000 farms. The 1940 census gave 1,903,843 farms, covering 197,550,840 hectares (a hectare is 2.5 acres). It is true that in some agricultural areas there are still many large estates, especially those that raise sugar cane, coffee, or cattle, but small landowning is becoming the rule, not the exception, in Brazil.

The Constitution of 1946 makes two provisions favoring the small landowner:

Article 156, Section 3, provides that "Everyone who, not being either a rural or an urban landowner, shall occupy for ten uninterrupted years, without opposition and without recognition of other ownership, a piece of land not exceeding the area of twenty-five hectares, and makes it productive by his work, and dwells thereon, shall acquire ownership, by declaratory sentence properly transcribed."

Article 18, Section 1, provides that small owner-operated farms be tax-exempt: "The land tax shall not fall upon sites which do not exceed twenty hectares in area when the owner who does not possess other real property cultivates them alone or with his family." [1]

Farms in the State of São Paulo. The number of farms in the State of São Paulo for 1938 was 235,960. There were more than 75,000 with less than 30 acres; 60,000 with from 30 to 60 acres; 55,000 with around 100 acres. There were only 4,000 farms with over 1,750 acres.

Thus it may be seen that more than half the farms of this state are of small acreage. Much of the coffee raised in Brazil is cultivated on small farms. In the same year, 1938, the following was the distri-

[1] T. Lynn Smith, *Brazil: People and Institutions* (Baton Rouge: Louisiana State University Press, 1946), Chapters XIII-XVIII.

bution of 75,099 coffee plantations in the State of São Paulo, according to the number of trees belonging to each farm unit or owner:

These figures show that there were less than five hundred farms with 500,000 trees or more, and that most of the coffee raised in Brazil comes from thousands of farms tended by small landowners. Because of the great activity in agriculture at the present time, thousands of new farms are being opened yearly. And the trend is constantly toward smaller coffee farms rather than toward larger ones. In 1942 the State of São Paulo had 68,818 coffee plantations and farms with a total of 1,177,596,891 trees.

Inheritance Laws. In Brazil, when the father or mother dies intestate, half of the property belongs to the surviving parent, and the other half passes into the hands of the children, automatically. In a will, a married person can dispose of only half of his property, in which case one-fourth goes to the surviving member and one-fourth is divided among the children. In view of the general provision of a half and half division in case no will is made, it is seldom that any one avails himself of the possible disposal of half of the property. In this way, large land holdings are being continually divided into smaller tracts in the settlement of estates. Even when the farms are not divided, they must be placed on sale for the settlement of estates, or a stock company must be formed with the members of the family as shareholders. The constant accumulation of large bodies of land, handed down from generation to generation in ever-increasing size, is hardly possible.

The large body of landowners, together with the merchants and small manufacturers, make up the growing middle class of the country. Some writers are not acquainted with the facts. They say that there is no middle class in Brazil. Although illiterate city and rural laborers compose a large percentage of the population, it would certainly be erroneous to say that there is no middle class.

Owing to the greater purchase value of Brazilian money within the country, in spite of its depreciation in foreign exchange values, a family can be considered to be of the middle class on a much smaller income or sum of possessions than would be the case in the United States. It is also true that the Brazilian middle-class family would not consider it necessary to possess nearly so many worldly goods for reasonable enjoyment and prosperity as would the American family.

The Small Farmer. Most farms of Brazil are smaller than those common in the United States. When we take into consideration that

almost all the work done on these small properties is hand labor, and that little farm machinery is used and little outside help hired, it will easily be seen that the amount of land held by one farmer must of necessity be smaller.

The cost of living is lower in Brazil than it is in the United States, and life is easier, slower, and simpler for the common people, although they lack many laborsaving devices. Houses do not require heating in most of the country. With a little careful planning, almost all the meat and other foods needed for the table can be raised by the farmer on his own land. Much less clothing is necessary. And a horse or a mule, which consumes grass, of which there is plenty (rather than an automobile, which consumes expensive gasoline), satisfies the transportation needs of the family.

The kind of crops grown on these small farms depends on their location. Rice thrives in low damp lands, irrigation sometimes being used. Coffee grows best in rich soil which is so situated that the trees are protected from the frost. Tobacco, oranges, and cotton are grown in various parts of the country, and nearly all the farms raise some corn. Although a small amount of wheat is grown in the three most southern states of Brazil, the annual production supplies but an insignificant part of national consumption, and most of the grain used in making bread is imported. Vineyards, orchards, and truck gardens are the chief sources of income for farmers whose land lies near enough to a big city to make marketing easy. Generally a small part of the farm is left in pasture land for the feeding of livestock, and another small part remains in timber to furnish firewood. It is seldom that the whole of a Brazilian farm is given over to the raising of a single crop.

The Brazilian house of the poorer farmer is built of adobe or native brick, the roof is covered with tile, the walls are whitewashed inside and out, and usually there are floors, although these may be nothing but packed earth. Because of the warm climate the rooms are sometimes left without a ceiling, which allows the air to circulate more freely and keeps the house cooler. In the northern section of the country most houses have no beds in the rooms, the people sleeping in hammocks. Along the coast and in the central part of Brazil, however, the houses are better and more comfortable, practically all being built of brick. Only in the three southern states are there any houses built of wood, such as are common in the United States.

The houses of the rural laborer are sometimes very primitive. They may be made of dried mud plastered over a woven twig framework with a roof covering a grass thatch. These houses have few windows,

and they are without glass. The main thing that is kept in mind in building them is to provide a shelter from the rain and a place in which to keep warm when the weather is cool. There is no provision for heating. When the nights are very cold, a brazier is placed in the middle of a room, and the family huddles around the heat of this little fire. Or the family gathers in the kitchen around the stove.

Roy Nash describes in the following way the mud house the backwoodsman from Ceará builds to withstand occasional rains: "He takes suitable clay from a pit, shapes it on a hollowed slab of wood, burns it in a simple kiln, and roofs his house with half round tiles. These, like the mud of the walls, are supported on a wickerwork of saplings or on stakes split from a palm stem. The roofs of rural Brazil are usually two-sided and but slightly pitched, although four-sided roofs are not uncommon." [2]

One or two horses or mules, several cows, a few pigs, and some poultry is usually the extent of a small farmer's livestock—in addition to some work oxen, for the draft animal of Brazil is the patient ox. Seldom are less than two yoke used, and frequently twelve to fourteen oxen pull the heavier loads over bad roads. Outside laborers are seldom hired. In most communities, if a farmer gets too far behind in his work, his neighbors will gather and in one day garner his crops. Later, of course, when they in turn are in need of help, he will join in and aid them in their work, just as Colonial Americans gathered to help one another at threshing, corn-husking bees, and barn-raisings.

Medium-sized Farms. Farms of from fifty to two hundred acres, unless made up entirely of grazing lands, present a very different picture from those of the poorer farmers. On the larger farms the owner has a much better house, several substantial outbuildings, and a number of small houses for laborers and their families. In some parts of Brazil the farmer has a small dairy herd, sells butterfat to some nearby creamery, and feeds the skim milk to his hogs and poultry. In strong contrast to the small farmer, he usually has some modern farm implements—a plow or two, a disk harrow, a one-row planter, one or two simple one-horse cultivators, and occasionally a tractor. A farm of this size may have a fairly large coffee planting or a large acreage of cotton or corn. There is usually an orchard from which the family table is supplied with fruit and the surplus sent to market.

It is common for these farms to have electric lights, barbed-wire fences to enclose their lands, and telephone connection with the outside

[2] Roy Nash, *Conquest of Brazil* (New York: Harcourt, Brace & Co., 1926).

world. Usually they have running water, which is used for the needs of the house. And usually a stream runs the gristmill and the electric generator that supplies current to operate the cream separator and to light the farm.

Many of these farms have, in addition to one or more ox teams of four yoke each (eight oxen), a truck and a passenger automobile. The government is linking the parts of the country together by a system of good, if not paved, roads; and the growing trucking system is becoming increasingly more important to the farmer every year. The scarcity of gasoline during wartime worked great hardships on the farmer.

Many of the homes on these medium-sized farms have modern conveniences. Radios, sewing machines, and pianos are common. The children are generally sent away to school. Many of them attend finishing schools and colleges and become professional men and women in the cities. Housework on these farms is usually done by servants from the laboring class.

One of the great problems of the Brazilian government today is to offer educational advantages to the children of farmers and farm laborers. Brazilians are very democratic. The children of the farm owner and laborer go to the same school and attend the same classes, and there is practically no feeling of ill will between the boys and girls of the middle class and those who come from the poorer class of laborers. Racial status and degrees of social standing play but a small part in the life of Brazilian children.

Large Plantations. Although the very large plantations are in the minority, a discussion of them should be included in this chapter. The reader, however, must remember that there are very few large farms and that this description does not apply to all the agricultural districts of Brazil.

Many of the large farms have names. A typical plantation is called Paradise Plantation. This beautiful farm lies about eleven hours by train from the city of São Paulo on the Paulista Railway. This railroad is one of the finest in Brazil, with hundreds of miles of electrified traction. The farmers who live along its lines and depend on it to transport their produce are fortunate, for the trains are fast and the rates are reasonable.

Paradise Plantation. Somewhat more than half of the 14,000 acres which comprise this plantation are covered by virgin forest, much of it valuable hardwood timber. The two principal crops here are coffee

and cotton. Nearly 400,000 coffee trees of the very finest producing variety are planted on 1,500 acres of land. An equal area is in pasture for feeding the plantation livestock. Some 2,000 acres are planted to cotton, and approximately equal areas to corn and other field crops.

The cotton produced (about 3,500 bales) is ginned on the plantation. The coffee-cleaning mill can take care of 200 sacks a day. Power to run the machinery and to light the buildings is brought to the farm by a high-tension power line. Laborers live in 120 houses, which are furnished with electric lights and running water. A large store supplies the economic needs of the 2,000 people living on the plantation, although the laborers are not forced to buy at the farm store. There is a school on the farm for the children.

More than sixty miles of private roads traverse the plantation. At night the gates of the plantation are closed to keep out the public. A large number of agricultural implements, and eighty mules, aid in farming the land. Trucks are used to haul the produce. A machine shop keeps farm equipment in repair, and a sawmill supplies lumber and firewood. As is often the case with these large plantations, the owner of Paradise Plantation lives in the city and hires a superintendent who directs the work on the farm. This plantation has a well-equipped office with a staff of several bookkeepers who act as time-keepers and keep a cost account for each crop and field.

São José Farm. On the farm just described very few cattle are raised, practically all the land under cultivation being given over to the growing of coffee and cotton. It is well to describe here another type of plantation, where livestock plays an important part. It would be hard to find a more interesting farm of this kind than the São José stud farm near Rio Claro (State of São Paulo), which has been in the same family for three generations and has celebrated a century of development. Rio Claro is only four hours distant from São Paulo by fast train, on the same railway system as Paradise Plantation.

The farm consists of 20,000 acres of *terra roxa,* the famous purple soil of the State of São Paulo that has proved so fertile and so productive when planted to coffee. This farm is no longer devoted largely to coffee production, but is maintained principally for the breeding of purebreds for racing. There are some two hundred purebreds on the farm and a fine crop of colts sired by stallions imported from England, France, Argentina, and the United States.

The breeding of race horses in tropical countries is very difficult because, owing to the lack of lime and phosphorus in the soil, the horses are easy victims to the dread disease called lumpy jaw. On the

São José farm this disease has been eliminated by proper rations being fed to the horses and the practice of impregnating their drinking water with lime. The pastures are so arranged that the horses, young and old, have access only to the treated water piped to stables and pastures. The young animals are fed a carefully prepared ration, two-thirds oats, one-third corn, and eight to twelve quarts of skim milk per head per day. Alfalfa hay is furnished from an 180-acre field giving ten cuttings a year. Because of heavy rains several months each year, all the hay is artificially cured under cover.

Some five hundred workmen take care of the crops, horses, and cattle. A fine race track (1,640 meters in length) provides exercise for the racers, and every possible provision is made for turning out winners. The farm has won more than five thousand races in Rio and São Paulo and holds most of the race track records of Brazil.

Other Large Plantations. Many other interesting plantations might be described, but it is only possible here to refer to them. On the São Paulo coast there is a fruit plantation with 1,500,000 banana trees and 50,000 citrus trees in full production. In some parts of the country there are farms devoted exclusively to the raising of corn, other farms where Brahman cattle (called Zebús) range the pastures by the hundreds of thousands, and still other farms where Holsteins are raised. In Rio do Sul, vast ranches stocked with Herefords are similar to such ranches in the western part of the United States. The variety of farms is unending.

Farm Wages and Land Ownership. It might be well to reiterate here that the big estate of a thousand or more acres is the exception and not the rule. This statement is repeated because of the general impression existing in the United States to the effect that in all Latin American countries the land is in the hands of a few and that the laborer has not the slightest possibility of becoming an owner. This is not true in Brazil.

Farm wages are much lower all over Brazil than even in the South of the United States. Some laborers earn as little as ten cruzeiros a day (a cruzeiro is worth five cents in United States money), but owing to the very great difference in living conditions already referred to, this is not a starvation wage. Living quarters are almost universally provided free on the farms, and it is also a general practice to allow the laborer to plant a small plot of ground for himself or on shares. Maximum farm labor wages can be said to be twenty cruzeiros (one dollar in United States money) per day. Minimum wages have been

decreed for all city laborers, and a study is being made with the same end in view for farm laborers. Wages have greatly improved in recent years. In some states, especially in São Paulo, farm wages compare favorably with city wages for unskilled labor.

On the coffee farms most of the work is done on a contract basis, so much being paid for a year per 1,000 trees cared for. As almost all the work can be done by the family as a whole, women and children helping, some capital can be accumulated by hard-working families. Thousands of landowners were formerly laborers or tenants, and their number is constantly increasing.

Here is a case in point. The father of a certain family was employed as foreman on the farm of a small agricultural college at a very modest wage. The whole family worked—the women in domestic occupations and the children on the farm, when not in school. Little by little, in spite of the small wage earned, capital was accumulated. Finally the day came when he was able to buy a good piece of land. A practically abandoned farm was up for sale. He gave up his work on the college farm and moved to his own land, putting into practice the improved methods that he had learned on the college farm. In a few years, with the help of two sons, another having remained on the faculty of the college, he developed an excellent property. In the home, electric lights, a radio, and other modern improvements were installed. The man was practically illiterate, but by hard work, economy, and good judgment, he rose from the farm labor class to being a landowner. Thousands have done the same in Brazil.

VIII

Corn, the Most Widely Grown Crop in Brazil

A GREAT number of the most important plants now used by man had their origin on the two American continents, but if a single plant had to be designated as most characteristically American there could be no hesitation in naming corn, or maize. It has been cultivated for so many centuries that no traces of its origin have been found.[1] It was being cultivated generally in both North and South America when the Europeans came on their voyages of exploration. These two continents still produce more than 90 per cent of the world's total crop of corn. New ways of cultivation, better varieties and, more recently, the use of hybrid seed have caused the production of corn to increase enormously, the total world harvest now amounting to some four billion bushels a year. As one of the world's most important food crops, its economic value is exceeded only by rice and wheat. We see so much corn grown around us that we are apt to consider it commonplace and not very important. That is a great mistake, because as a grain, as forage, and for conversion into silage it is one of the Americas' most important crops. In the United States it is called corn; in Europe, maize; in Brazil, milho.

Brazil is the third corn-producing country in the world. The United States is first and Argentina second. The United States produces fourteen times as much corn as Brazil. Argentina, one of the finest grain-growing countries in the world, produces only a small amount more than Brazil. In a not far distant future Brazil will become second in this crop because its production is greatly on the increase owing to a larger acreage, better methods of cultivation, wider uses in industry

[1] A group of botanists from Harvard University are making investigations to find the origin of corn.

and for fodder, instruction of farmers, and better seed.[2] Every one of Brazil's more than 1,629 counties produces corn.

Corn Cultivation in Brazil, Old Style. Much corn is still planted in Brazil according to the methods employed by the Indians before the Europeans came. The forest is felled, dried a short time, and then set on fire. Only the smaller timber and underbrush burn. Before the heavier timber is sawed into lumber or cut into firewood, corn is planted—in September or October in the southern part of the country, and January to March in northern Brazil.

A hill is formed with a hoe, and from ten to twelve grains of corn are put in each hill. A little soil is pushed over the seed with the foot. The soil is very rich, because it has been in forest and because the ashes of the burned vegetable matter have enriched it with potash. The corn springs out of the ground with the first rains and grows rapidly. There are so many stumps that the planting is irregular and cultivation is difficult. Since the fire has so recently burned all vegetable matter, very few weeds appear.

Corn grows tall in Brazil. Often a man on horseback cannot be seen in the field. Usually a stalk produces only one ear if it has not been selected for two-ear production, and a few stalks are often barren, because so many grains are left in each hill. When the corn is four months old, beans are planted in between the hills, and they climb the cornstalks. In this way the planter gets two crops a year from his land. The yield of the year depends largely on an adequate rainfall at the critical time, when the corn grains begin to form on the cob. Too much rain when the corn is forming the tassels reduces the yield.

When the time comes to gather the corn in late fall or early winter (May or June), the workmen go in to "break" the corn. We call it pulling corn in the United States, but in Brazil farmers really break corn, because the stalks have grown so tall they must be broken down so that the ears can be reached to be pulled off. The unshucked ears are heaped up in the field. Then they are either hauled at once to the crib or left in the field for some time, since there are few or no rains during the winter months. In case beans have been planted in the cornfield, the corn must be left on the stalk until the beans are harvested and "broken," with the shuck on, and in this state is stored in the crib. The shucks help, to some extent, in keeping out the weevils (little insects that eat corn grains, reducing them to a powder). This is also the reason why the Brazilian farmer plants mostly flint

[2] See Chapter XXXI for discussion of production of hybrid seed corn by the Rockefeller agricultural project.

varieties of corn. The softer dent corns, stored without the shucks, as is done in the United States, would in a very short time be destroyed by the weevils.

The Indians—and until recently the Brazilian farmers—planted corn only two, or at most three, years on the same plot of ground. Then a new tract of timber was cut, burned, and planted. Land and timber were plentiful, so why worry? Sometimes the farmers would plant grass seed in the corn instead of beans the third year and so form a new pasture, fence the land in for cattle, and again plant corn the fourth year in burned-over land. In most parts of the country this is no longer possible, because the timber has been cut over. In these older farming regions new processes of corn cultivation have been adopted.

Modern Cultivation. Having no more lands to be cleared, the farmer must give up raising corn or employ modern methods, i. e., prepare land with a plow and harrow, using a corn planter and cultivator, as is done in the United States. Very little of the farm land in Brazil is as level as that of our Middle West, so corn is not planted in checks (hills the same distance in all directions). It is planted in rows, some four feet apart, two grains to a hill, approximately two feet apart. This facilitates cultivation between rows with the hand hoe, the most widely used agricultural implement in Brazil. On many farms the ax, brush hook, and hoe are the only implements, but on a number of farms it is becoming the rule to use plows, harrows, and seeders.

All corn growers also have a sheller. Some few have modern ones that take the corn—husk and all—and deliver the winnowed grain completely cleaned. Most growers use the hand-powered shellers in which the shucked ear is placed, the cob being thrown out one way while the shelled grains fall on the floor to be cleaned and winnowed by hand.

Seed Corn. In all corn-growing countries the improvement of the seed is of the greatest importance. In the United States germination tests are made so that the farmer may be sure his seed will come up when planted. These tests are not necessary in Brazil, because corn seed commonly germinates 90 per cent or better.

During the decade beginning in 1920 and especially in the '30's, superior varieties of cotton were developed which pushed this commodity into a place second only to coffee among Brazil's exports. At the same time improvement of corn lagged behind. The very ease

with which corn germinates, grows and produces under the most primitive form of handling, made progressive scientific improvement seem unnecessary. In recent years, however, a number of experiment stations, particularly those of the states of São Paulo and Minas Gerais, where 45 per cent of Brazil's corn is produced, have given attention to corn breeding. Two well known plant breeders began looking toward production of hybrid corn seed almost simultaneously. At the Agricultural Institute of São Paulo, in Campinas, Dr. Arnaldo Krug, who had been trained in plant breeding at Cornell University, developed inbred pure lines and tested them in various combinations. At the same time, in Minas Gerais, Dr. Antonio Secundino de São José Araujo, who specialized in hybrid corn production at Iowa State College, began a similar work, at the State Agricultural College at Viçosa. The work of these men has been most successful. Already Secretaries of Agriculture of these and other states are making seed of hybrids, as well as of selected varieties, available to farmers. Two companies are actively engaged in producing hybrid seed on a commercial basis and others are contemplated. In this way the yield per acre is being greatly increased and at the same time the quality and uniformity of the crop are improved. Better seed, the spread of mechanized culture, and the shift to corn as old coffee plantations are plowed up, will all tend to make Brazil a corn exporting nation in the not far distant future. High transportation costs, however, will limit her sales abroad in periods of low world prices.

Use of Fertilizers for Corn. When corn was generally planted only on rich new soils, the use of fertilizers was unnecessary. Now, however, as these rich soils become exhausted, the question arises: Should corn be fertilized or not? It is largely an economic question. In some parts of the country the cheap price of corn makes the use of chemical fertilizers unprofitable. In other parts, where corn is not so abundant and freight hauls to market are short, it is very profitable to use them. Of course, the ideal way would be to maintain soil fertility of corn lands by a rotation of crops, the turning under of an occasional leguminous green cover crop, the prevention of erosion, and the application of as much manure as possible. Thus it would be possible to reduce to a minimum the use of chemical fertilizers. Experiment stations are endeavoring to determine what fertilizers are needed on each type of soil and what amounts produce the best results. As this information is not always available, the farmer often has to perform his own experiments. With small plots he can improve his seed and try

out various fertilizer formulas, then make use of this knowledge on a more extensive scale.

Uses of Corn for Livestock. At least half of the corn grown in Brazil is fed to livestock, especially hogs. Brazil is second in the world in swine production. Mostly lard types of hogs are raised, and practically all hogs are fattened with corn. It is generally estimated that one pound of pork represents six pounds of corn consumed by the hog. It can easily be seen that an enormous quantity of corn is consumed to produce the thousands of tons of pork and lard that are marketed in Brazil each year.

Horses and mules are fed corn, whether they are used for traction or for riding purposes, but to a lesser extent than in the United States, because pasture is available the year round. Oxen, the principal draft animals of Brazil, depend principally on pastures for their food, getting very little grain feed. Beef cattle are all pasture-fattened, being fed little corn. The use of corn silage for feeding dairy cattle is very greatly on the increase, and the Federal Government subsidizes the construction of silos. Very little grain corn is fed to dairy cattle.

Every Brazilian farm has a small flock of poultry, and there are some large poultry farms such as we have in the United States. Corn is the principal feed for poultry, and millions of bushels are used for this purpose every year. When there is a serious shortage in the year's corn crop, one of the first results is a scarcity of all poultry products and higher prices for them. The big producers depend on mixed feeds, but the farmer feeds only corn, the flock foraging for whatever other food can be picked up.

Corn as Human Food. Something like 40 per cent of the corn grown in Brazil is used as human food. Every farm has its gristmill for grinding corn into meal. The mill is usually run by water power. Water-ground meal is supposed to be better than meal ground by steam or electric-driven mills because the slower grinding of the gristmill does not develop heat in the grain.

The poorer people invariably add "couve" to their meager diet—a vegetable similar to the one called collards in the southern United States. The leaves are shredded, and slightly cooked in hot fat. This green vegetable seems adequate to prevent pellagra, that dread disease common to people who live on an almost exclusively corn meal diet. Corn bread made with eggs, common in the United States, is not known in Brazil. Grits are used to a limited extent, and samp, or coarse hominy, is used as a dessert. In all of the large cities mills pre-

pare corn meal and corn products for human food on an extensive scale, but little of this reaches the farm population, so each farm has its own mill, if possible. Some grinding is done on the toll basis, as used to be common in the rural districts of the United States. Breakfast foods of corn, corn flakes, and the like, are not known in Brazil except as imported and sold mostly to foreigners in the larger cities.

Industrial Uses of Corn. In the United States millions of bushels of corn are used annually for making starch, glucose, dextrose, oil, and sirup. Lately a great deal of corn has been used for these purposes in Brazil, so these products do not have to be imported. Corn growing has been put on a more solid basis because of this steadily increasing consumption, and because the big manufacturer contracts the growing of corn to insure an ample supply year by year. Corn Products Company, an American concern, has a large plant in São Paulo. Starch is in great demand for the cloth manufactured in the cotton mills. Glucose is the basis of modern candy, as it is cheaper than sugar and does not melt so easily. A number of the more complicated by-products of corn are now used in medicine, and these are being prepared in Brazil principally for local consumption.

Exportation and Importation of Corn. Brazil has never been a large exporter of corn. The only two countries doing much exporting of this grain are the United States and Argentina. The latter ordinarily produces eight to nine million tons of corn a year and exports an average of seven million tons, a large percentage of the total production. The United States produces two and a half billion bushels a year, about seventy million tons, but exports only about 2 per cent. The 1938 crop in Argentina was a failure, production being only half of normal; so the United States in 1939 was supplying the world markets with her surplus production, and Brazil was preparing to enter the export business by building granaries in the port of Santos and making arrangements with the railroads to ship corn in bulk. The banks now financed the corn crop for the first time in the history of the country. The total Brazilian production of corn was five and a half million tons in 1942.

Not much corn is exported from Brazil, but the thousands of tons of lard exported annually represent many times that amount of corn. Only when the corn harvest in Brazil is very large is any exported. When there is a shortage, corn is imported from Argentina. It will be interesting to see how much corn will be exported now that a definite effort is being made to increase production for the purpose of

export. All will depend on the selection of good seed and the use of improved methods of cultivation.

Modern Commerce in Corn. Brazil's handicap in supplying corn for the world's markets has been twofold—lack of uniformity and poor preparation of the grain for export. On the farm it makes little difference whether the corn is all red, or partially yellow and white, or mixed as to flint and soft grains. But when the product goes to market in the big cities where it will be used in industries, or when it is exported, this becomes a serious handicap. The great advantage Argentina has enjoyed for the exportation of corn has been the uniformity of the product, largely from a single variety. And because of natural low water content, the grain stood up well in spite of long periods en route. In 1938 Brazil exported 125,000 metric tons of corn, but in 1940 the amount fell to 28,000 tons. By 1943 the commodity almost disappeared from Brazil's foreign trade, only 392 tons being exported during the year.

Laws have been passed establishing rigorous grading standards and providing that no corn can be exported with a humidity content of over 15 per cent. But when it is remembered that most of the corn is raised by the illiterate small cropper, it can easily be seen how great is the task to carry back to him the necessary technical advice and furnish him with improved seed. In the State of São Paulo, experiment stations are advertising selected seed corn at nominal cost. The Extension Service of the State offers technical help, and if it continues its intensive campaign, it can bring about as great an improvement in corn as it has brought about in cotton. The state has been divided into fourteen zones, and locally grown corn seed, properly selected and fumigated, is furnished the farmers of each zone. Not only corn and cotton seed are offered, but also rice and castor bean seed. These are great steps forward to improve production. The installation in Rio de Janeiro of a fumigation and grading plant will make it possible to prepare and dry corn adequately for foreign shipment. With rigorous grading and drying it should be possible for Brazil to compete successfully in the corn markets of the world.

IX

Sugar Cane

It is impossible to overestimate the importance of sugar cane in the four centuries of Brazilian history. During the period when sugar was worth almost literally its weight in gold, the first exporter of this commodity to Europe, on a large scale, was Brazil. Sugar plantations, during the three centuries of its colonial status, were not only economic factors of primary importance, but great social units, of which the *casa grande*—the "big house"—and the slave quarters were components. Negro slaves were imported in large numbers from Africa.

So attractive was the wealth created that Holland attempted to wrest portions of this valuable territory from Portugal and succeeded in occupying parts of Brazil for a time. In 1630 the Dutch secured a foothold in Pernambuco, and for the next twenty-four years they produced sugar and greatly increased its exportation. But they never got very far inland, and finally the sugar plantation owners of the interior expelled the intruders after bitter fighting. Even so, a decided Dutch influence was left, and vestiges of it still persist.

For a detailed description of what might be called the Sugar Era in Brazil, see Gilberto Freyre's striking book *Casa Grande e Senzala,*[1] which has been translated into English.

Introduction of Sugar Cane. There appears to be considerable doubt as to the exact date and place of the first planting of sugar cane on Brazilian soil. Some historians assert that it was first planted in northeastern Brazil in 1502, the start having been made from stalks brought from Madeira. By 1526, Pernambuco was shipping sugar to Lisbon. A decade later plantations were made at São Vicente, near the present port of Santos. From there, cultivation gradually extended to Minas Gerais and Rio de Janeiro, and to other parts of the country which were then inhabited. São Vicente was founded by the Portu-

[1] Gilberto Freyre, *Masters and Slaves,* tr. Samuel Putnam (New York: Alfred A. Knopf, 1946).

guese, under Martim Afonso de Sousa, on January 20, 1532. This able leader soon developed a stable settlement, and introduced domestic animals and plants from Portugal. Records show that by 1538 six primitive sugar mills were in operation, giving employment to some six hundred colonists and a large number of slaves.

Extension of Plantings. The cultivation of sugar cane spread rapidly northward up the coastland, with relatively large plantations in Rio de Janeiro, Bahia, and the northeastern region. From the latter half of the sixteenth century until the beginning of the eighteenth century, Brazil was the principal source of sugar for all Europe. From then on the Caribbean colonies of Spain, England, and France took over as the main suppliers of Europe.

Sugar cane came originally from India, was brought to the Spanish and Portuguese colonies of the Canaries and Madeira, and from there was brought to Brazil. The original variety, called *crioula,* was later largely substituted by a variety called *caiana,* introduced during the nineteenth century.

Sugar Production in Northeastern Brazil. The great sugar estates, which created so much wealth in the early colonial days of Brazil, were nearly all in the region now included in the northeastern states—from the State of Ceará in the far northeast, to Bahia. A social and economic setup similar to that of the great cotton plantations of the slave-owning era in the South of the United States came into being. A sugar mill requires enormous amounts of cane, so large estates were developed for this industry. The money brought in by the exported product was sufficient for the mill owners to acquire enormous land holdings and extensive buildings, and to purchase many slaves. Their social and political positions were assured because of financial prowess. Owners of sugar plantations and mills were the wealthiest men in the nation for several centuries. Their families frequently went to Europe and enjoyed the best social, artistic, and cultural advantages not only of Brazil but of the entire world. The analogy between the slave-operated cotton plantations of the United States and the sugar-cane plantations of northeastern Brazil may be carried further: both types of economy and society succumbed with the liberation of the slaves.

Economic Importance of Sugar Cane. For the first three centuries of the Brazilian colony, sugar cane was the most important economic factor, considered from all standpoints. Sugar exportation reached as high as almost 70 per cent of Brazil's total exports. In 1827 sugar

was almost 50 per cent, followed by coffee, cotton, tobacco, cacao, and rubber. When the Republic was proclaimed in 1889, coffee had become the dominant product, with sugar demoted to third place.

In 1936 sugar represented less than 2 per cent of the exports of agricultural products, with coffee in the lead, followed by cotton, cacao, rubber, tobacco, mate, and sugar. This is not, however, an altogether fair method of appraising sugar's economic importance, because by 1936 the country had a population of something less than forty million, which meant a considerable quantity of sugar for domestic consumption. Since World War I, exports of sugar have been small, and most of it has gone to other South American countries.

Present Production. A total of more than a million acres of sugar cane is planted in Brazil, but the average production is only 41 tons to a hectare (2.5 acres). Of the 1939-40 crop, 298 mills ground 9,500,000 tons of cane, producing 14,400,000 sacks of sugar (a sack weighs 60 kilos, or 132 pounds). In addition to these large mills, many small mills produce sugar, and hard brown-sugar bricks are made on thousands of farms.

There is a definite rivalry between the northeastern sugar district and what is called the southern district, comprising the States of Minas Gerais, Rio de Janeiro, and São Paulo. The Sugar and Alcohol Institute, set up to control sugar production when there was an excess on the market, previous to World War II, restricted production severely in the South, to provide economic stability for the northeastern states. In 1945 the northeastern district produced 11,500,000 sacks as against 7,300,000 sacks for the southern district. São Paulo's production was fixed at a quota of approximately 5,000,000 sacks annually.

Formerly the Catende Mill in the State of Pernambuco was the largest in Brazil. The largest now is in the State of São Paulo, near Araraquara, and belongs to the Refinaria Paulista. Its annual production is over a million sacks of sugar and six million liters of alcohol.

Sugar production fell so far behind normal consumption that sugar was rationed for several years, until February, 1947. The amount allowed the individual, more than a pound a week, was ample, but this amount was not always available. The total production ceiling has been raised to 23,000,000 sacks, but much more could be produced. An increase in production could be effected by increasing the area planted to cane, or, better still, raising the average production per acre by better cultivation, better fertilization, and better varieties.

In 1941 the total number of mills in the country was 64,417. There were 327 large central mills with vacuum turbines. Rum-producing units numbered 8,611; and 37,216 farm units produced solid sugar-juice extract (*rapadura*), an extremely variable product, usually containing more impurities than standard "C" grade sugar. More than 1,500,000 persons were employed in the sugar and alcohol industries in 1945.

Sugar-Cane Diseases. Sugar-cane mosaic, a very destructive leaf disease, was first identified in 1923, in São Paulo, by Dr. José Vizioli. It was proving so great a menace to the industry that, as in other cane-producing countries, mosaic-resistant varieties were introduced from the Dutch East Indies, to be substituted for the susceptible varieties. The necessity of experimenting with many new varieties resulted in the establishment of an experiment station for sugar-cane research at Piracicaba, São Paulo. This institution has been able to divulgate much valuable information and instruction to cane planters. Many introductions of promising varieties have been made.

The effects of the mosaic disease on cane production, and the increase in production following widespread planting of the Javanese varieties in the State of São Paulo, may be seen by the comparative production figures since 1924-25, when the crop of this state was reduced to a record low of only 146,000 sacks.

CROP YEAR	BRAZIL	SÃO PAULO
1924-25	5,150,000	146,000
1926-27	6,378,360	650,000
1928-29	8,000,407	1,116,000
1930-31	8,256,153	1,108,510
1932-33	8,745,779	1,673,998
1934-35	11,136,010	1,844,497
1936-37	9,550,214	2,248,370
1938-39	12,702,719	2,198,510
1940-41	13,511,832	2,330,194
1942-43	14,759,017	2,926,968
1944-45	14,896,924	3,067,307
1946-47	17,200,000	4,100,000

Sugar-cane varieties with higher sucrose content are being introduced and disseminated, as well as disease-resistant varieties and strains. Better methods of cultivation are being employed, and the increased use of green manures and chemical fertilizers maintains production at

a fairly high level. If it were not for the limit of production imposed, the sugar industry of São Paulo would reach far greater proportions than at present.

The conditions over the country as a whole are fairly satisfactory, and sugar-cane and alcohol production have been greatly increased.

Cane Alcohol. Industrial alcohol and rum for use as a drink are by-products of the sugar industry. Following a serious overproduction of sugar in 1933, the Sugar and Alcohol Institute was established to create new industrial uses of sugar. Since its organization, sugar production has doubled, and the production of alcohol has increased from 10,000,000 gallons in 1931-32 to 40,000,000 gallons in 1943-44. A persistent effort has been made to induce automobile and truck drivers to use alcohol as a motor fuel, and frequently, for longer or shorter periods of time, governmental orders have made obligatory the use of a mixture of varying percentages of alcohol with gasoline. However, no mixture of alcohol and gasoline has proved as satisfactory as unadulterated gasoline. Alcohol has an enormous industrial consumption in Brazil but is not important as an export product.

Cane Planting. On large sugar-cane plantations, the system of cultivation of sugar cane is very much the same as that followed in other parts of the world where sugar is produced. The land is plowed with tractors, large furrows are opened some five feet apart, and the cane is sown either entire or cut into short lengths. On small farms, holes are made in the hillsides with a hoe, and the top twelve or fifteen inches of a stalk used for planting. The rest of the stalk goes to the mill. Up-to-date plantations practice rotation of crops. Green manures and commercial fertilizers are used. Well-cared-for plantings on good soil continue production of paying crops for many years. Only level valley land is used on the better plantations, although hillsides may be planted, to some extent, where soil and climate are favorable. A hot, humid climate is the most favorable, but sugar cane is grown to some extent in every state in Brazil. Most of the cultivation is done by hand, with an ordinary farm hoe. In the northeastern part of the country, irrigation of cane is becoming the accepted practice.

On the average, cane produces three crops in four years. On poor, hilly upland, it may be necessary to replant after each harvest; but on rich bottomlands, fields may continue to produce profitable harvests for twenty years. In São Paulo the average is to replant after some four or five years.

In Brazil, cane is cut by hand with a long knife. The stalks are stripped of leaves and hauled to the mill either by oxcart or truck. In some cases a miniature railroad is owned by the plantation or by the central mill.

Sugar Manufacture. Grinding is done in small farm mills, small central mills, or in the huge industrial establishments capable of producing thousands of sacks of sugar each harvest season. Where there are distinct rainy and dry seasons, grinding begins with the advent of the dry season and continues for several months. During the rainy season, attention is given to cane planting and cultivation. The mill undergoes general repairs and a thorough overhauling during the off season.

In modern establishments, as soon as the cane is crushed the juice is reduced in vacuum boilers, and then the concentrated sirup is passed through several centrifugal sieves rotating at high rates of speed. Various grades of sugar are extracted, and when no more can be extracted profitably, the remaining molasses is utilized for the production of rum or alcohol.

Much of the sugar is sacked in standard sixty-kilo bags, which go to the central refineries, in large cities, before finally reaching the consumer.

Domestic Consumption. Being inveterate coffee drinkers, Brazilians consume enormous amounts of sugar per capita. They are also devoted to very sweet desserts—in fact, to sweets of every kind. At the average family table, no meal is considered complete without a sweet dessert. Since sugar rates high as a food and is undoubtedly one of the most palatable of foods, adding zest as well to innumerable otherwise unpalatable dishes, one can understand why its use in Brazil should reach such a high per capita average. But addiction to it is harmful. Excessive consumption of sugar, coupled with lack of milk, may possibly account for the fact that one sees many Brazilians with defective teeth.

Brazil is fortunate in being able to produce sugar for its own use. It could, to great advantage, export a considerable amount. A more advanced system of cultivation, with more extensive use of up-to-date milling processes, would increase sugar production without necessitating an increase in the areas at present planted to sugar cane.

Sugar Exportation. The nations which purchase the largest amounts of sugar from Brazil are its close neighbors, Uruguay and Argentina. The quantities exported vary each year, as the following table indicates:

PURCHASER	VOLUME IN KILOGRAMS	
	1945	1946
Argentina	3,000,000	6,000,000
France	21,537,820	5,003,050
Bolivia	886,572	217,631
Peru	6,600	.....
Spain	.....	6,510,000

It is impossible to predict what trends may develop in the exportation of sugar. The mainstay of the economy of the industry is the home market, but a well-developed export trade would contribute to a favorable balance of trade and help stabilize the Brazilian economy.

X

Rubber

OUR MOST versatile vegetable product was once known only as a plaything. Explorers in South America saw the Indians playing with balls that bounced, and learned that they were made from the milky juice of certain trees. When the explorers took some of this substance back to Europe, it was discovered that pencil marks could be rubbed out with it. Having been used by the Indians, it came to be known as "India rubber." In 1823 waterproof shoes were first manufactured. Because they had a coating of rubber, they were called "rubbers." Soon afterward coats were treated in a similar manner. A waterproofed coat was called a mackintosh in honor of the man who patented the process of applying rubber to cloth.

Each year more than one million tons of rubber are produced in various parts of the world, and its production is not fully developed by any means. Three kinds of rubber—native, plantation, and synthetic—are now on the market. Most native rubber is gathered from the wild trees of the Amazon Valley, while plantation rubber comes from cultivated trees grown in the Orient. About 97 per cent of the world's supply is plantation rubber. Most of the plantation rubber has been grown in British Malaya, the Dutch East Indies, Ceylon, Borneo, and French Indo-China.

Wild Rubber from the Amazon Valley. There are many plants which yield a raw material called latex. It is extracted from the trees by making a cut in the bark which allows the liquid to drain down into tin or clay cups hung at the bottom of the cut. The process is similar to that used gathering resin from pine trees in our South, or maple sap from maple trees in our northeastern states. Several rubber-bearing plants are native to Brazil. The most important is Pará rubber (*Hevea brasiliensis*), or *seringueira* as it is called in Brazil. There are numerous commercial grades; among the best is Acre fine.

Tapping rubber-producing trees in the Amazon forests

During the nineteenth century and the first twelve years of the present century, rubber was one of the principal Brazilian exports. It brought fabulous prices, reaching as high as a dollar a pound. The rubber barons of the Amazon region amassed huge fortunes, and the only factor that limited production was the great difficulty of getting workmen to gather the latex.

Some millions of wild forest trees scattered over an area of 2,000,000 square miles were available to the rubber gatherers. However, rubber extraction in the Amazon Valley was expensive, even though the trees grew wild.

The *seringueiro,* as the rubber gatherer is called, is furnished supplies by a landowner or an extracting company. He then spends several months in the deep forests making a daily round of his trees, usually about two hundred in number. He gathers the latex, carries it to his thatched hut or lean-to, and coagulates it over a slow-burning fire. To harden it he first dips a pole into the milk-like liquid and rolls it slowly over the smoking fire, repeating the dipping and the smoking. As the mass grows, he forms it into a ball by pouring more and more latex on the turning stick, which quickly hardens over the fire and forms a black solid ball. These balls range in weight from 60 to 130 pounds. The *seringueiro* sells them to the person or company staking him for his travel up the river and supplies. When the season for gathering rubber is over, the worker returns to his own home. Some workers have no homes, and they live in their boats all year round on the Tapajóz River.

Living conditions in the dense damp forests, where the best rubber is found, are injurious to the gatherers' health. Much of the Amazon Valley is subject to an annual overflow from the river, so the houses usually have to be built on stilts. At times it is necessary for the rubber gatherer to make his rounds in a canoe. Most of the rubber is gathered from May to September. This method of gathering rubber has been followed for more than a century and a half. On the plantations, rubber trees are tapped from January to June, during the rainy season, the most advantageous time of year. In the jungles, rubber cannot be harvested during the rainy season.

Although many tales are told of labor exploitation and the semi-slavery of Indians and immigrant workmen, their lot was not too hard. Only with the fall in the price of rubber did they suffer privation. When the price of rubber is high, they are well paid for their work, and everyone in the industry makes a profit, but at other times only companies with plenty of capital can make a profit.

Under the system of intensified production of rubber in the Amazon basin promoted by an agreement between the United States Government and Brazil, a vast program of health protection and sanitation has been launched. Hospitals and health centers have been built, and medical service is available to all in this vast region. Preventive health measures include the supplying to all of antimalaria doses and all sorts of antifever inoculations. Sanitary engineers have made a study of the more urgent needs of the cities in the Amazon region and of the colonies, or concentration points, where rubber workers live. An effort is also being made to improve the health of the rubber gatherers by supplying them with more abundant and nutritious food.

Heyday of Wild Rubber Production. More rubber was exported from Brazil in 1912 (42,410 tons) than in any previous year.[1] Money flowed freely in all the Amazon Valley. The rush of people to the city of Manáus was comparable to the California or Pike's Peak gold rush. Manáus lay in the center of the rubber-producing area, and rubber barons made it their headquarters. With the easy flow money and much leisure time, there came an interest in and desire for the cultural advantages of the outside world. At great expense the people of the town erected a magnificent opera house, and outstanding operatic companies were brought over from Italy to entertain the wealthy inhabitants of the area. Huge mansions were erected along the river, often of stone imported from Europe. Rubber hunters swarmed along the little-known and unexplored regions of the Amazon and its tributaries. Theodore Roosevelt said of them: "Rubber dazzled them, as gold and diamonds have dazzled other men and driven them forth to wander through the waste spaces of the world. Searching for rubber, they made highways of rivers whose very existence was unknown to the government authorities, or to map makers. Whether they succeeded or failed, they everywhere left behind them settlers, who toiled, married, and brought up children. Settlement began; the conquest of the wilderness entered on its first stage." [2]

A Change of Great Economic Importance. It was not until the introduction of the pneumatic automobile tire that the production of

[1] In 1940 Brazilian rubber production was 18,000 tons, and in 1942, 22,000 tons. In 1945, 30,593 tons, in 1946, 30,073 tons, and in 1947, 32,930 tons. In 1945, 18,887 tons were exported, in 1946, 18,159 tons, and in 1947, 14,510 tons.

[2] Theodore Roosevelt, *Through the Brazilian Wilderness* (New York: Charles Scribner's Sons), p. 325.

rubber became of enormous commercial value. With the development of the automobile came an apparently unlimited demand for rubber, so that the value of the crude product rose to one dollar a pound in 1911 and 1912. Some years later the Brazilians found the demand for their rubber had decreased, and the price had fallen to a few cents a pound.

There is as much rubber in Brazil today as there was when the country supplied the world's market. But in recent years it has supplied only slightly more than fifteen thousand of the million tons produced in the world annually. Because the Brazilians had no thought of outside competition, they overlooked the fact that an increasing demand for rubber, with large fortunes to be made in its production, would stimulate cultivation in other tropical countries. Earl P. Hanson, in his book *Journey to Manáos,* says: "The whole big rubber industry is reduced to a mere shadow because the British and Dutch *planted* rubber trees while the South Americans looked for the wild stuff in the jungles. . . . People tear the jungles apart *searching* for wealth instead of laboring to make the country produce their wealth for them. It is so now and it always was so." [3]

"Agriculture's Costliest Migration." The transplanting of rubber production from Brazil to the Orient is referred to by J. R. Hildebrand as "agriculture's costliest migration." The fall of the Brazilian rubber monopoly began when an Englishman named Wickersham sailed up the Amazon in 1876, shipped 70,000 seeds, carefully packed in special cases, to Ceylon, where they were planted in cultivated gardens.[4] Six years later some of the first trees were tapped for latex. Although as late as 1900 only four tons of rubber from the Orient appeared in international trade, the pioneering British and Dutch planters finally wrested from Brazil practically all of its rubber trade. Before World War II, 98 per cent of the world supply was produced by the cultivated trees of the plantations in the Orient. Brazil received wealth-producing coffee from Africa, and gave wealth-producing rubber to Asia and Africa.

Fordlândia. In 1927 the Ford Motor Company received from the State of Pará a concession of 5,000 square miles of land situated on the Tapajóz River, one of the tributaries of the Amazon. This con-

[3] Earl Parker Hanson, *Journey to Manáos* (New York: Reynal & Hitchcock, 1938), p. 309.

[4] H. J. Bruman, "Genetic Aspect of Plant Introduction," *Scientific Monthly,* XLVI, February, 1938, pp. 120-31.

cession was 112 miles from the city of Santarém and was called Fordlândia. Later, however, two new pieces of land were granted to replace the old concession, although the total acreage was not increased. The new grant was some thirty miles from Santarém and was called Belterra.

A great deal of experimental work was carried on here with seventy varieties of the *Hevea brasiliensis* to determine the best rubber-producing strains. Important experiments were carried on with other species of rubber-producing trees. For these experiments the land must first be cleared of the forest growth to make way for the planting of cultivated trees. While wild trees produce from 2.2 to 3.5 pounds of rubber each, the best strains of cultivated budded stock produce from five to eight times as much. By 1937 about forty square miles of land had been planted with 3,000,000 trees. The best yield that may be expected is one ton per acre.

The lot of the *seringueiro* buried in the primitive jungle six months a year and subject to varied dangers and diseases has been mentioned. Compare his life with that of the thousands of people who lived and worked on the Ford concessions (4,500 at Belterra and 1,800 at Fordlândia). Whereas the workers here did not receive as much money as the more adventurous *seringueiro* gambled on getting for his work, good wages were paid. About five hundred modern houses were built by the company, and these, together with pure running water and electric lights, were furnished without cost to the workmen and their families. The men were employed the year round and were certain of a steady income. In contrast, the *seringueiro* could expect no more than six months' work a year at the most, and the rest of the time he was left to earn his living as best he could in some other way.

Every village in Fordlândia was equipped with a modern hospital, with competent doctors in charge. The service of these hospitals was available to all workers without cost. The medical corps inspected the sources and distribution of water. Instead of drinking the polluted waters of the rivers and springs in the jungle, in one village the water supply was derived from an artesian well and in another the water was filtered. Abundant food supplies were on sale, under supervision of the company officials and doctors, at reasonable prices to the workmen. The Ford experiment demonstrated that excellent health can prevail on rubber plantations even when they are on the Equator in the heart of the jungle of the Amazon Valley. The officials of the company did not overlook the cultural and educational needs of the workmen and their families. Good schools were available to the chil-

dren of employees, and the radio and motion pictures kept this isolated experimental plantation in contact with the outside world.

The Ford Motor Company spent millions annually on its Amazon concession and demonstrated adequately that satisfactory living conditions can be guaranteed to workers in the Brazilian tropics and that rubber can be produced here as well as in any other part of the world.

Although the wild-tree rubber of Brazil is of a much finer quality than that raised on the plantations of the Far East, its scarcity and high cost prevent its more general use.

The Ford concession was voluntarily turned back to the Brazilian government for a nominal sum.

A New Phase of Brazilian Rubber Utilization. The establishment in Brazil of automobile tire factories, one under national management, with American processes, and two branch factories of American companies—Goodyear and Firestone—and still another under American technical direction, Pirelli, using only nationally produced rubber, introduces a new angle into the complicated Brazilian rubber situation. These factories produce tires for the 300,000 automobiles used in Brazil and for the automobiles of other South American countries. Brazil has a fairly large consumption of other rubber products in addition to tires, and local factories are beginning to supply them. This is true of rubber-soled canvas shoes, which were formerly imported and very expensive. They are now more reasonable in price, hence widely used. In the way of foreign trade, exports of rubber tires and inner tubes alone, valued at less than one million cruzeiros in 1941, rose to 54 million in 1942 and to 187 million in 1943.

The Importance of Rubber. The United States is the greatest purchaser of raw rubber. It alone consumes more than half of the world's supply. Akron, Ohio, is the greatest rubber manufacturing city in the world. The vastness of this industry cannot easily be imagined. A production valued at about $1,250,000,000 comes from this one industry during a normal year.

The diversity of uses for rubber is almost unbelievable. The ordinary automobile has around three hundred rubber parts, and a two-motored airplane engine may have as high as four hundred rubber parts. One factory in the United States lists more than 30,000 different rubber products, taking into account all the sizes, styles, and colors. More than 40,000 uses of rubber are known to exist.

Rubber is made to withstand heat and cold, often both in the same object—for example, in an electric refrigerator. It is prepared

to withstand abrasion, humidity, and extreme dryness. It can be accurately molded into the fittings required for successful operation of an automobile piston. It can be woven into cloth and may be made into automobile seats or even into mattresses. Finally, a process has been discovered whereby it can be vulcanized to metal.

Synthetic Rubber. During recent years synthetic rubber has been produced from various raw materials, but up to now the products obtained are more expensive than the natural rubber.

Unless new uses for the natural product are found, the whole matter of its demand and utilization will undergo great changes. Large American manufacturers such as Goodyear, Firestone, and the United States Rubber Company have succeeded in producing synthetic rubber of a quality as good as the natural product, though it is more expensive.

In the intensive war and postwar effort to perfect the synthetic product and to cheapen its production, great strides have been made, most seriously affecting the economy of those countries in which natural rubber is grown. The annual production of synthetic rubber, 740,000 tons in 1946, materially improved the whole rubber situation as far as the United States was concerned and a still larger amount can be produced each succeeding year.

Many new uses of rubber are being perfected, so rapidly that it is entirely possible that for years to come all available supplies of both natural and synthetic rubber will be needed. As new roads come into use in many countries which have heretofore been without automobile traffic more tires will be needed, increasing the demand for raw rubber.

Rubber in World War II. When the Dutch and British colonies of the Far East came under Japanese control early in 1942, an industrial crisis of the first magnitude threatened the world in general and the United States in particular. One of industry's most important raw materials is rubber. Practically the whole supply had been coming from the area which was now conquered. Suddenly the supply was cut off. Large stocks of raw rubber were on hand, but as war itself is a prodigious consumer of rubber, the shortage became many times more acute. Automobile tires suddenly became unavailable, and millions of cars passed out of circulation. The effort to meet the crisis took the natural turn to be expected—priority for war needs of available stock, curtailment of all non-essential uses of rubber, salvage of all old rubber that could in any way be used again, tech-

nical improvements in use and manufacture, intensive expansion of the manufacture of synthetic rubber, new processes, new factories financed by the government, scouring of the Western Hemisphere for any possible sources of rubber. A semiarid-region wild plant—guayule, from which rubber had been extracted for a long time in a small way—was planted as the only possible source worth while within the United States proper.

A special service was formed for expanding rubber production in Central and South America under the Office of Inter-American Affairs. Sixteen technicians were sent out in all haste to help set up rapid measures for immediate and long-time increases in rubber production. Seven technicians were sent to Brazil. The United States Rubber Development Company (government-controlled) established a very considerable fund both for raw rubber development in Brazil and for the purchase of her total output, with the exception of the ever-growing amount needed by Brazilian manufacturers.

Extensive experiments carried on for years by Ford have already been described. The Agronomic Institute of the North, located at Belém, Pará, carried on intensive experiments with plantation rubber, and better-budding stock was brought to this station by airplane from the Far East late in 1940. Plantation rubber will, without a doubt, be produced in the Amazon Valley or even farther south—where much rubber-producing land is found and where soil and climate are favorable. An effort will also be made to encourage small landholders to introduce the simple processes of producing sheet rubber, which is much preferred by factories to the common wild rubber balls prepared by the smoking process. Attractive prices and a ready outlet will stimulate the production of wild rubber. The average exports of rubber from Brazil, for the years 1935-40, were 12,000 tons annually. In 1943, 14,575 tons; in 1944, 21,192 tons; and in 1945, 18,278 tons.

XI

The World's Coffee Cup

PLANTS, like people, migrate. It can almost be said that most plants cultivated by man have reached their greatest development in some part of the earth far from their points of origin. Brazil has given to the world many plants of great value—the rubber tree, peanuts, cotton, cassava (mandioca), and the Brazil nut, to mention only a few—but its greatest profits from agriculture have been from two plants not native to its soil, namely, sugar cane and coffee. One of the great epics of modern agriculture began with the introduction of coffee to Brazil from Africa, by way of French Guiana, just as another great epic began when rubber migrated from Brazil to the Orient.

In colonial days, gold and precious stones were abundant in the State of Minas Gerais (very appropriately named "General Mines"). Hardy pioneering bands frequently sallied forth from the State of São Paulo, seeking the precious metals and stones. These groups were the famed "Bandeirantes Paulistas." They correspond more or less to the bands of pioneers who explored and developed our own Far West. Just as many pioneers settled along what became our midwestern farm belt, the richest agricultural section of the United States, so many inhabitants of São Paulo settled along the rich agricultural lands of the State of Minas Gerais. Coffee proved to be one of the richest products of this state.

Dense forests, wide and frequent rivers, high mountains, and seemingly endless ranges were hostile forces of nature in those early days when transportation was by pack horse, oxcart, or canoe. So every step of advance into the interior was won after a hard-fought battle against natural difficulties and unfriendly Indians who were in possession of the land. Gradually the coastal population penetrated farther into the interior. At first, only small areas were cleared. Much later, about the middle of the nineteenth century, large farms began to be developed. In the following decades, when the railroads reached out in every direction, the coffee boom absorbed the energies of the

people of the State of São Paulo. Villages became towns; towns, cities. And the capital of the state, São Paulo—in 1890 a small city of 70,000—became a thriving metropolis. This rapid progress and development of wealth were primarily based on the coffee-growing activities of the state. Although it is no longer true that coffee is the only crop of the State of São Paulo, the wealth of the people has come largely from the production and exportation of coffee.

Origin of the Coffee Plant. When one thinks about coffee, one can hardly fail to think about Brazil, for that is the country which produces most of the coffee consumed in the United States. Coffee was introduced into South America from Ethiopia in Africa, where it still grows wild. Arabians first discovered what a good drink could be made from the dried beans, and they domesticated the wild trees. The name coffee comes from the word *Kaffa,* a town in Ethiopia. The botanical name of coffee is *Coffea arabica.*

In 1727, more than two hundred years ago, a few plants were introduced into the State of Pará, Brazil, by Francisco de Melo Palheta, who brought them in from French Guiana. The number of plants gradually increased, and the cultivation of coffee spread from one part of the country to another. In the latter part of the eighteenth century and in the early nineteenth century many coffee plantations were developed in the Province of Rio de Janeiro, giving origin to a rural aristocracy, which took a prominent place in the affairs of the Empire. Later it was discovered that the soil of the State of São Paulo offered special advantages for coffee production, and today this state alone has about one and a quarter billion coffee trees, producing annually some 10,000,000 bags of coffee. The remaining coffee-producing states have about the same number of trees, but their production of coffee is only about half as much. Brazil alone produces about half of the world's average annual crop.

The Coffee Plant. Jasmine shrubs, with their dark green leaves, common either in greenhouses or in yards of homes in the South, are very similar to the coffee plant. The size of coffee trees is about that of certain cherry trees grown in the United States, the average height being six to eight feet, the maximum height reaching twelve to fourteen feet. In the Pan American Union Building, Washington, D. C., in the main lobby, there are a number of tropical plants, among them several coffee trees. There, many Americans who have never had an opportunity of visiting a tropical country have been able to see the coffee tree in flower and fruit.

The trees look very much like the cherry trees in a Colorado or California orchard, but they are not deciduous. When the trees are in bloom, the flowers give the appearance of soft snow fallen over the green trees. The bean develops in a berry, which is like the cranberry in size and shape. The individual bean is flat on one side and round on the other because two beans generally grow in each berry. Since coffee trees cannot stand more than a light freeze, they can be cultivated only in tropical or subtropical climates, and since they cannot stand great heat, they grow best in the uplands of tropical countries where it is neither too hot nor too cold. If the sun is very warm, trees that grow higher than the coffee tree must be left standing when the land is cleared for coffee cultivation, or be set out when the coffee is planted, to furnish shade.

Experiments are being made with various types of trees for shading coffee plantations. It has even been found that the Pará rubber tree, *seringueira,* grows rapidly, and produces excellent shade; and its natural product, rubber latex, is of good quality. Should this combination become general, another source of agricultural wealth will have been discovered.

Brazil's Special Advantages for Coffee Production. The great interior plateau of Brazil provides ideal conditions for the cultivation of coffee. The heat is not sufficient to make it necessary to use other trees for the purpose of shade, although it has been proved that a better quality of coffee can be produced where shade is provided. By planting on the tops of the hills, rather than in the valleys, the grower insures sufficient circulation of air to avoid heavy frosts that injure, or even kill, the coffee trees.

Coffee demands a rich soil if a maximum of productiveness is to be obtained. The soils of the State of São Paulo, called *terra roxa,* or purple land, are very deep rich soils with a high iron and potash content. If proper care is given to prevent erosion, the coffee trees may produce as long as thirty years in these soils. As only the rolling lands are used for coffee, the greatest danger is from erosion, which carries off the rich top soil. Unfortunately, erosion is greatly increased by the old system of planting coffee in rows up and down the hills, rather than on contour lines.

Another great advantage that this part of Brazil enjoys is the fact that the climate is most favorable to the production of coffee. Most of the rains fall in the summer, when the plants need a great deal of moisture for the growing crop. There is very little rain during

the winter, when the berries must be spread on the ground for open-air drying.

Let us go over these advantages again, for it is interesting to know why a single, relatively small area (the State of São Paulo has 100,000 square miles of territory) can produce more than half of the world's supply of a commodity. The soil is rich and deep, has plenty of potash and nitrogen, and also contains iron, which gives it a purple color. The high elevation and rolling formation of the land permits good air drainage, making loss from frost infrequent. This high altitude, combined with a latitude relatively near the Equator, allows coffee to grow without the use of plants to provide artificial shade. The rains are so distributed that most of the precipitation (four to six feet a year) occurs during the growing season, and during harvest time there is little rain to interfere with the gathering of the berries or the process of drying them in the open air.

Planting and Cultivation. Newly cleared ground is used. First the forest is cut, and as soon as the trees and undergrowth are sufficiently dry, the smaller branches and leaves are burned. Among the stumps and fallen logs, holes are dug in which coffee berries are to be planted. These holes are a foot and a half square and a foot and a half deep. In each hole are placed from twenty to twenty-five coffee berries, which have been selected for seed. The hole is then covered over with pieces of wood in the form of a pyramid. This is done to protect the young plants from the strong rays of the sun. After the seeds germinate, the planter comes and pulls out all but four of the little plants, leaving one in each corner of the hole. Less frequently the coffee is germinated in seed beds, and the young trees are transplanted to the fields when they are strong enough to withstand the heat of the sun.

The first year of the little plant's life is spent in a dark hole; but during the second year it begins to push its way up through the pyramid of pieces of wood over the hole. Before the wood is finally removed at the end of the second year, the young plants must be protected against being covered over with soil or drowned out with water during the heavy rains. This is done by digging a small outlet for the water around each little pile of wood. These holes, or hills, are placed from eight to fourteen feet apart in accurately measured rows. The owners take pride in the neatness of their plantations, so great care is taken at the time of planting.

During the third year the trees have their first blooms and may produce a few berries. However, a regular crop cannot be expected before the fifth year. By that time the trees have attained enough

height and growth to make it possible for them to bear on almost every branch. The principal item in the cultivation of coffee is to keep the land clear of weeds and the soil broken up. Some coffee planters prune their trees from the very start, but usually pruning is done only after the mature trees begin to fall off in production. The soil must be cultivated four or five times a year. This may be done with modern farm machinery or entirely with the hoe. The space between the young trees is so great that during the five years it is customary to plant corn and beans between the trees. As soon as these crops begin to interfere with the coffee trees, interplanting is discontinued.

Fruit Harvest. After the third year, the young trees bloom every year during the spring months, September to October. Because the coffee tree may bloom three times during the spring, depending on favorable weather conditions, it has reasonable possibilities of setting fruit.[1] When the bloom falls off, it leaves small berries about the size of a large pencil point in clusters, which are about six inches apart, grow all summer until the berries, green in color, are the size of large peas. When they begin to ripen they turn to a rich red or golden color, depending on the variety of coffee. When completely ripe, the berry is black.

Harvest time begins in May and may extend through the months of June and July, and occasionally into August. These are the winter months in Brazil, and are almost free from rain. Although the berries are never all ripe at the same time, they are stripped off the trees together. It is now deemed imperative that only the ripe cherries be picked and that no damage be occasioned to the green berries and blossoms. A cloth is spread on the ground under each tree, and the berries are stripped from the branches by hand, dropping into this cloth. Care must be taken to remove only the berries from the trees. However, some leaves and bits of broken branches always fall with the berries, so as soon as the tree is stripped, the cloth is held up by the corners and its contents are then put through a winnowing process. The berries, now free of trash, are piled up at the end of the coffee row by each picker or group of pickers. Usually a whole family—the father, mother, and children—works as a group. Toward night, big oxcarts or automobile trucks drive through the plantation and haul away the harvest of the day. The berries are measured in baskets sim-

[1] Many flowers do not result in the production of fruit. Some small berries fall off if weather conditions are unfavorable. By the setting of fruit is meant the production of a fruit or berry that stays on the plant until it eventually ripens.

ilar to our bushel baskets, and the picker is paid according to the contract price agreed to with the planter at the beginning of the harvest. This price varies greatly according to the locality, for prevailing wages are much higher in some places than in others. This may be because of a scarcity of laborers, or because of higher and more profitable production. Coffee trees bear ordinarily on a three-year cycle—a heavy crop followed by a very light one, and this in turn by a medium crop. The scale of pay per unit for harvesting has to be such that earnings are not greatly lower in off-crop years than in the bumper-crop year. As the whole family works, several dollars a day (United States money value) can be earned. Almost the highest earnings possible for an agricultural laborer in Brazil are to be made picking coffee.

Coffee picking on the large plantations is a tremendous job, and rarely if ever are there enough workers on the farm. Many city people go to the plantations in the harvest season to work. Often families travel for hundreds of miles to take part in the harvest, returning home as soon as the season is over. This is not unlike the custom in many parts of the United States where harvest hands and vegetable and fruit pickers move with the ripening grain, vegetables, or fruits. Whole families will trek cross-country hundreds of miles, from the interior of the State of Bahia into the States of Minas Gerais and São Paulo, where they earn enough money in six months to support the family during the remaining six months of the year after returning home. Recently employment agencies have provided large groups of farm laborers and harvesters on contract. The agency transports them from one section of the country to another on the railroads. Many migratory workers are transported to their jobs by truck. The farms receiving these laborers usually provide residences of a fairly good quality although sometimes workers live under simple thatched shelters in the orchards.

Trucks or oxcarts, as the case may be, haul the day's harvest and dump their loads on the edge of the drying ground. These drying grounds, which are generally near the residence of the owner, are a very important part of every coffee plantation. The size of the drying grounds varies according to the amount of coffee to be harvested. They are almost level, with just enough incline to drain off the water when it rains. The surface may be hard-packed clay, bricks, or a tar composition such as is used to surface roads in the United States. On most up-to-date farms these drying grounds are well lighted by electricity.

The berries are spread out in a thin layer over the surface. Every few hours workmen go over the ground with an implement similar to a rake and stir the berries in order to dry them more quickly and more evenly. When the berries are completely dried, which usually takes from a few days to two weeks, they are stored in great bins in a storehouse built for this purpose. The coffee berry, when completely dry, can be kept indefinitely before being cleaned and marketed. The common practice is to clean it as soon as possible after it has been harvested.

By another curing process, the berries are not allowed to dry. As soon as they are brought in from the field, the ripe berries are thoroughly washed to free them of all dirt and foreign particles. They are hulled while the pulp is still wet and then dried very carefully, for a rapid change in humidity while they are in the drying process is harmful.

In both these processes, the treatment of the beans is important, for the care with which they are handled from the time they are picked until finally ready for market has a great deal to do with the quality of the coffee produced. Coffee is graded for market like cotton, corn, or any other agricultural commodity, the price depending on the quality.

Cleaning Coffee. Large plantations usually have their own cleaning plant. Smaller producers, however, send their coffee to a mill in a nearby town, paying so much per sack to have it cleaned for market. The dried berries are usually carried to the mill from adjoining bins by a conveyor such as is used in grain elevators for carrying wheat. In the mill, a special machine first thoroughly removes all extraneous material, even dust. Then the outer hull is cracked off and separated from the beans. Each bean is still enclosed in a thin parchment covering, which looks like cellophane and is more difficult to remove than the thick outer hull. The machine rubs the beans together in such a way that this thin covering is completely removed. The beans are then separated into five or more sizes. If the coffee is of high quality, about 80 per cent of the beans will fall into one size and grade.

A few berries on the ends of the branches have only one bean, which is round and not flat like ordinary coffee. This type of bean formerly brought a premium price, but is really the same coffee, coming off the same trees as the rest.

Marketing Coffee. The standard and only legal weight of coffee, as sacked in Brazil, is sixty kilos, or 132 pounds, per sack. The berries coming from the cleaning mill are sacked in exactly this weight. As all coffee is produced at some distance from the coast, there is the problem of getting it to the seaport for market and shipment abroad.

There are three principal ports for the shipment of coffee in Brazil: Santos in the State of São Paulo, Rio de Janeiro, and Vitória in the State of Espírito Santo. Some coffee is marketed from other ports. But most of the coffee that is exported is shipped from Santos, which is known as the "Coffee Port."

The farmer either sells his coffee locally or ships it to a commission merchant in a port city, who will sell it to an exporter when the owner so instructs him.

A serious overproduction of coffee in the 1890's brought about a crisis. To aid the coffee interests, the Brazilian Government made several attempts at valorization—governmental control of price—between the years 1906 and 1921. These attempts failed to serve their purpose. Then, in 1930, owing to the shrinkage in markets caused by the world depression, the Brazilian Government instituted new action to solve the problems of the coffee growers. Legislation resulted in the government's purchase of unsalable stocks of coffee in order that they might be removed from the market, thus creating a more normal export. The principle behind this action was that a balance must be maintained between production and exportation. In November, 1937, valorization, which had not worked to the advantage of the coffee grower, was discontinued by presidential decree.

The government bought the excess of coffee stocks through a tax levied on exportable coffee and stored it in large warehouses throughout the coffee belt. The poorer grades were burned in huge fires in the open. For several years a million bags were burned every month. A total of seventy-seven million bags was destroyed between 1930 and the end of 1942. But Brazil did not know how else to dispose of such a surplus as had been produced.

Efforts are being made to find industrial and chemical uses for surplus coffee. Recently a plastic made from the coffee bean has been developed, and possibly its manufacture, together with the production of various other by-products of coffee, may become sources of revenue.

The better grades of coffee are shipped to the port cities, either by train or by truck, and there the coffee is again stored in great warehouses until it is sold for exportation. When sold, it must be recleaned and resacked. This time the sack has a green and yellow band stamped on or woven into it, to show that it originated in Brazil. It is against the law to export any coffee from Brazil without this official mark.

Coffee Exportation. Coffee for exportation is carried to the docks in trucks and dumped on the sidewalk. In the port of Santos, modern

machinery is used for loading the bags onto the ships. The bags are dropped from the sidewalk through holes that are similar to the manholes common in our city streets. Then they fall on an endless belt beneath. The belt conveys the bags to the dock's edge, elevates them to a height above the deck of the ship, and finally into the hold. Thousands of bags can be loaded in one day. Some of the largest ships load a hundred thousand bags for a single voyage. In former days, coffee was carried to the edge of the ship on men's backs, and it was a common sight to see a man carry three sacks of coffee at a time—396 pounds! Each man carried all he could, since he was paid so much a sack.

Coffee from Brazil goes to many ports, but the larger part of it goes to three ports in the United States—New York, New Orleans, and San Francisco. There are regular lines of steamers to each of these ports which transport most of the coffee. In the rush season, tramp steamers are also used.

After the coffee producer has shipped his coffee to the port city, let us say Santos, to be sold by a commission merchant, it is bought by an exporter. This exporter in turn sells it to an American coffee buyer, or he ships it to New York to be sold there on the Coffee Exchange. In New York, New Orleans, and San Francisco large dealers buy the coffee and ship it all over the United States. It is roasted and ground and offered for sale through local merchants, or is distributed from centrally located roasting plants. It is called green coffee until it is roasted. Very little coffee is home-roasted nowadays.

At least one large American distributor, the A & P Food Stores, operates in Brazil, buying on local markets under the name of the American Coffee Corporation. This distributor is the largest buyer of Brazilian coffee.

The World's Coffee Crop. In 1942, the total number of coffee trees was approximately four billion eight hundred million. About half of these were in Brazil, distributed among the various states as follows:

São Paulo	1,262,444,518
Minas Gerais	537,275,866
Espírito Santo	172,838,428
Rio de Janeiro	137,419,923
Bahia	134,431,900
Paraná	61,707,076
Pernambuco	50,157,200
Goiás	6,126,725
Santa Catarina	4,077,586
All other states	21,207,586

Colombia and Venezuela have over 500,000,000 trees. Salvador and Mexico have over 100,000,000 each. Four-fifths of the world's coffee plantations are in Latin America.

In 1937 the total production of coffee in the world was 37,000,000 bags. Of this amount Brazil produced 26,103,000 bags. In this same year Brazil shipped 6,590,000 bags to the United States and 4,589,000 bags to Europe. The United States imported 6,220,000 bags from other countries. However, the amount of coffee furnished the United States annually by Brazil varies: it is usually from 60 to 70 per cent of the total United States consumption. In 1942 the total world production was 31,000,000 bags. The Brazilian crop for 1943 was above 15,000,000 bags, just about equal to the production of the rest of the world. In 1944, Brazil produced 13,737,100 bags.

Brazilian production is not on the increase. Until the beginning of 1943 it was unlawful to plant new trees, but the prohibition has since been lifted. Many of the old trees, having a very low production, have been rooted up to make way for more profitable crops. Because Brazil no longer fixes an artificial price on its exports and can produce coffee in greater abundance and at a lower price than any other nation, competing countries will naturally find it difficult to cope with Brazilian coffee in the world markets.

The number of coffee trees in the state of São Paulo has decreased significantly in the last few years. In 1942, there were 1,262,444,518; in 1943, 1,268,278,462; in 1944, 1,218,422,942; in 1945, 1,124,487,926; in 1946, 1,027,983,911; and in 1947 only 1,035,322,019. The Brazilian total in 1946 was 2,146,004,144 trees.

Coffee drinkers in the United States average probably three cups a day. Their total consumption is equivalent to an average of two cups a day for all the inhabitants of the country. It is easy to see that it takes many million bags of coffee a year to satisfy this demand.

A Healthful Stimulant. Now we will ask an important question: Why do coffee drinkers insist on having their coffee each day? Coffee is more of a stimulant than a food, so a person gets into the habit of desiring its effect daily. But if it is a stimulant, is it not harmful? To most people, no. It is a safe and healthful stimulant except to a few people who are supersensitive to caffeine. Brazilians drink a great deal of coffee. Some take more than a dozen cups a day.

Every Brazilian city has its *Cafés,* or coffee shops. In São Paulo the larger ones have no tables or seats. The customer stands by the counter, drinks his cup of freshly made coffee, and moves on. In Rio preference was formerly given to shops where small tables and chairs are

provided, but there are now magnificent coffee shops with standing room only.

Coffee Quota Agreement. While Brazil continued to eliminate inferior grades by burning excess coffee, the closing of European markets in World War II created a bad economic situation. In 1938 Brazil had exported nine million bags to the United States and eight million to other countries. The loss of European markets after 1939 meant hardships not only to Brazil but also to all other coffee-producing countries.

The Pan American Coffee Bureau, created in 1936, had been attempting to promote cooperation between the coffee-producing countries and to stimulate consumption in the United States. But something more than a simple gentleman's agreement was needed. In 1938 a Trade Agreement for Coffee Importation was agreed upon in Washington. It was signed by fifteen countries, came into force in October, 1938, and remained in force until October, 1943. By this agreement quotas were established for the purchase of coffee by the United States from all producing countries as well as quotas for exportations to all other countries from these same producers. Of a total to be purchased by the United States, some 15,545,000 bags annually, Brazil was to furnish 9,300,000. Of a grand total of 11,612,000 bags to be exported to all other countries, Brazil was to furnish 7,813,000. A new agreement will be made before the close of each five-year period.

These facts are clearly shown in the following table:

3-YEAR MOVING AVERAGE	QUANTITIES IN BAGS OF 60 KILOS (132.276 POUNDS)				PERCENTAGE OF DESTINATIONS IN TOTAL EXPORTS			
	United States	Europe	All Others	Total	United States	Europe	All Others	Total
1932-34.....	7,479,739	5,444,605	922,800	13,847,144	54.0	39.3	6.7	100.0
1934-36.....	8,102,220	5,514,189	937,316	14,553,725	55.7	37.9	6.4	100.0
1936-38.....	7,927,008	5,558,276	1,015,388	13,500,672	54.7	38.3	7.0	100.0
1938-40.....	9,084,553	4,994,671	1,271,447	15,300,671	59.4	32.3	8.3	100.0
1940-42.....	8,293,502	857,789	977,950	10,129,241	81.9	8.5	9.6	100.0

Brazilian production was affected by two climatic disasters—drought in 1939-40 and heavy frosts in 1942. The reduced production was on the whole an advantage, since it meant that a lesser quantity of coffee had to be burned. The determination on the part of the United States

to favor Brazilian economy in the mutual hemisphere defense program of World War II also worked out in favor of Brazil in the marketing of its principal export product.

The peak year of exports to the United States in any of the 3-year periods shown in the table was 1941, with a total of 9,804,811 bags, while the shipments to Europe in the same year dropped to 340,267 bags. The peak in the above table was surpassed, however, in the years 1944 and 1945, during which the United States imported, respectively, 11,611,440 and 11,690,554 bags. Shipments to Europe also increased to 858,453 and 1,528,404 bags in the same years.

XII

Cotton

A FLURRY was created in the cotton-producing areas of the United States a few years ago by the rumor that this country was holding an umbrella over the Brazilian cotton grower through artificially boosted prices and that Brazil was making the most of it. It was further alleged that all the vast area of Brazil, larger than the United States, was a perfect cotton belt, and that Brazil would soon be producing more cotton annually than the whole world needed. Like so many general statements this one, though erroneous, was not without basis of truth. We must admit that it was startling to see the State of São Paulo's annual production leap from 30,000 bales to 1,500,000 bales in less than ten years' time.

In 1885 John C. Branner, later President of Stanford University, wrote a report for the United States Government, *Cotton in the Empire of Brazil,* in which he made the statement: "Cotton in Brazil grows on its native soil and, it is to be presumed, under climatic and other conditions best adapted to its highest development. But though Brazil began to export cotton more than a hundred years before the United States, her annual production today is only about one-eighth as much as our own." On another page he said: "The territory in Brazil capable of yielding cotton is co-extensive with the empire itself. I have myself seen cotton growing in almost every one of the provinces, and in regard to the others there exists no doubt whatever."

So, if the potential cotton-growing capacity of Brazil was proclaimed fifty years earlier, why so much excitement in 1935 over the Brazilian cotton menace? Because Brazil actively entered world markets that year. Naturally, we began to look around to see why this should be true. To our surprise, we found that Brazil had suddenly greatly increased her cotton production, and still more surprising, we found that the quality of this cotton was better than the general run of upland cotton from our own South.

Investigators, private and official, rushed to Brazil to see what it was all about. Their report, on the one hand, was rather sensational: "Brazil will take away the whole American market." On the other hand, one official investigator reported: "Periodically Brazil flares into the world market when coffee prices drop below a profitable basis, and at such times as world cotton prices are raised by war scares. As soon as coffee comes back, or war prices slump, as they always do, Brazilians will immediately abandon cotton production on a large scale." Therefore, all that was necessary was to wait a year or two and things would follow their normal course.

Apparently both conclusions were wrong. In the first place, more than half of Brazil is underpopulated. Of the fairly well-populated half of the country, we can safely say that nearly 50 per cent is not good agricultural land—some because it is too mountainous, some because it lacks fertility, some because it needs draining. One half of the remaining good agricultural land is devoted to the growing of coffee, sugar cane, rice, corn, and oranges, to say nothing of the millions of acres in pasture lands. So by a simple process of elimination, we have left a comparatively small area of a few million acres that can actually be planted in cotton. The same logic may be applied to the labor question. The State of São Paulo alone has a shortage of 300,000 agricultural laborers, and, with a very restricted immigration quota in effect in Brazil, this shortage will not easily be made up. These two factors alone are deterrents to any fantastic cotton expansion program.

The first mention of cotton in Brazilian annals was in May, 1500. Cotton was first exported from Brazil to Europe in 1749, and the utilization of cotton in Brazil was begun a year later. The year of the greatest Brazilian exportation of cotton was in 1871-72, when 181,608,949 pounds were shipped out of the country. From that year, exports of cotton declined until the period of World War I. After that period of great export activity, another decline came that lasted until 1935. These historical facts should be borne in mind when present conditions are under discussion.

Out of the One-Crop Rut. The return of cotton cultivation in central Brazil, in the early 1930's, came as a godsend to the State of São Paulo, just when the returns from coffee were at their lowest. The income from cotton meant much to the state and nation. Because of this increased income through the exportation of cotton, as the Brazilians themselves said, "we were able to buy big quantities of agricultural machinery, tractors, trucks, gins, and presses from North America, thus strengthening our ties of friendship and of commercial cooperation

with the great nation of the North, traditionally a friend of our country."

By way of contrast, coffee growing is not an easy undertaking. To start a plantation requires a huge outlay of capital. The trees bear over a period of thirty years or more, and cannot be eliminated by plowing them under or simply abandoning them whenever prices are not high enough to allow the grower to make a profit. What cotton did was to furnish a cash crop for the coffee grower who had a little extra land on which to plant cotton, and for the state as a whole it added millions of dollars to the income of the farmers who were not coffee growers.

A few long-time marginal coffee producers dug up their trees to make way for cotton or for orange groves. However, this land constitutes but a small part of the total cotton-producing acreage. In the coffee-growing State of São Paulo single-crop farming has shifted to diversified agriculture. Large plantings are made of cotton, orange trees, corn, rice, and many other agricultural products. The farmers seem determined never to fall back into the one-crop rut.

World-wide Confidence Gained. Formerly Brazilian cotton had four serious defects: poor and unequal fibers of short length; lack of standardization; poor ginning, resulting in broken fibers; improper grading. The British spinner showed the Brazilian cotton grower that unless these defects were overcome no permanent expansion in cotton growing could ever be realized. The Brazilian took to heart the British criticisms.

In the 1920's the Brazilian Government gave scholarships to outstanding agricultural students for study in the United States. Two of these students have been almost entirely responsible for the magnificent progress which Brazil has made in cotton production and exportation in recent years.

José Garibaldi Dantas, a graduate of the Lavras Agricultural College in the State of Minas Gerais, went to the United States on a government scholarship to study cotton growing. He took a special course in cotton grading at the University of Georgia. After his return to Brazil, he became chief of the Federal Cotton Grading Commission in the State of São Paulo. Through his conscientious and efficient work as head of this official organization, which classifies all the cotton of the state, world-wide confidence has been established in the grading of São Paulo cotton. He personally reviews samples graded each day during the ginning season. At the same time he has trained classifiers, or graders, who become qualified to do the general grading work. This

commission is the keystone to the cotton export trade of southern Brazil.

Raymundo Cruz Martins studied cotton growing in various institutions of the South, and he became Chief Agronomist of the São Paulo State Experiment Station in the city of Campinas in 1924. On finding that the varieties of cotton grown at the station were poor in quality and in crop yield, he instituted a "variety test" and soon eliminated most of the station's varieties as undesirable, selecting two upland types from Texas—Express and Texas Big Boll—as best for São Paulo.

After a few years of intensive selection and improvement, a system was evolved by which the best seed selected by the main experiment station was sent out for propagation each year, and four years later distributed to the farmer for crop use.

Although two varieties of cotton are grown, they are so similar that the average layman cannot tell them apart, so that the State of São Paulo, producing over a million bales of cotton a year, may be considered a one-variety state. Other varieties are being tried out constantly, and five hundred have been brought to the experiment station from all over the world for breeding and selection. Fifteen years of continuous selection have greatly modified the appearance and structure of the two Texas varieties as originally introduced into Brazil.

Other useful technical data have been worked out at the Experiment Station in Campinas—such as the best time to plant, the best distance between rows and hills, the best time to chop or thin the cotton, when and how to spray and combat diseases and insect pests, how to fertilize the various types of soil of the state, and many other points relative to cotton growing.

Cotton began to be grown on a large scale in the State of São Paulo in 1933-34, as a result of the technical work and the careful selection of seed ten years earlier. The painstaking work of Dantas in the field of better grading and Martins in the field of plant improvement was, without doubt, the foundation for the rapid expansion of cotton growing.

Good grading does not, of course, improve the quality of the cotton. Good grading simply attests, to the satisfaction of both the seller and the buyer, the quality of the cotton being marketed. But good selection does improve quality, and the need for better quality is shown by the results of the grading of each crop. Every season carefully prepared statistics are given out showing the percentage of the crop of the year that was classified in each grade, and it is astounding how rapidly the lower grade groups have diminished and the better grade groups have increased.

From a fiber length of less than ¾ of an inch a few years ago, the fiber length of the whole crop of the state has been raised to 1 to 1⅛ inches. Eventually, the average length of upland cotton marketed in the State of São Paulo may average 1¼ inches. A million and a half bales of cotton of a uniform staple length and quality, produced within the area of a single state in Brazil, where chaos existed a few years ago in cotton production, represent an achievement in agricultural practice seldom equaled anywhere in the world.

A reliable grading service has been provided, and the crop of the whole state has been standardized in quality and fiber length. But the grading system determines only quality; it does not specify staple length or ginning preparation. The many old-fashioned gins in Brazil did a poor job. British spinners were entirely correct in demanding a properly ginned product as well as a fiber of good quality. The transformation was effected in two years. In that period 350 gins, mostly of American make, were installed. In general, the cotton ginned in São Paulo now presents such an attractive appearance that some exporters advertise their cotton under a trade-mark, much as oranges and pears are advertised in the United States.

Financing the Crop. Most of the cotton of the State of São Paulo is marketed through the Merchandise Exchange in the City of São Paulo. Approximately 2,000,000 bales of cotton are produced annually in Brazil. More than half of this is grown in the State of São Paulo; most of the remainder in the northern states. Between 600,000 and 700,000 bales are used by the Brazilian textile mills. Wartime demands for textile goods increased the annual home consumption to over 1,000,000 bales. Nearly 800,000 bales are exported from the port of Santos. Formerly this city was noted only for its coffee exportations, but now it has become a famous cotton port also. Most of the cotton is exported in mixed cargoes, but previous to World War II ships bound for Germany and Japan were sometimes loaded exclusively with cotton, taking 30,000 and more bales at a trip. In 1941 large shipments were made to Canada, and in 1942 the principal importer of Brazilian cotton was Spain.

The large grower finances his own crop, or gets a loan from the bank. The small farmer generally depends on the owner of the local gin for his financing, while the ginner in turn is financed through the bank. The largest single factor in cotton financing is the Bank of Brazil, the Federal Government's official bank. Anderson & Clayton, the largest cotton merchants in the world, established a banking firm to handle their loans. As owners of a large number of gins, four or

more cottonseed oil mills, and a big compress, the largest in the world, they are very active in the cotton market, although they export chiefly through Brazilian firms. The Federal Government facilitates cotton financing through the many branches of the Bank of Brazil, and at present does so on a very liberal basis.

Cotton-Minded People. The head of the Cotton Grading Commission, J. G. Dantas, is also a journalist, and just as he did splendidly in bringing order out of chaos in the matter of cotton grading, he also did well in making the people of this state cotton-minded. As a member of the editorial staff of one of the leading daily newspapers, *O Estado de São Paulo,* he wrote daily editorials on economic subjects, producing at least three hundred editorials a year on the subject of cotton. Day by day the reading public was furnished with the latest news about cotton and the best possible analysis of world market trends. The influence of this persistent presentation, year after year, did much to formulate the modern policies of the cotton industry of Brazil. The Federal Government has a cotton service and experiment stations in several states.

There are several international features in the Brazilian cotton industry. The nations most involved were Great Britain, Germany, Japan, and the United States. Great Britain has always wanted a good source of supply for raw cotton from some country competing with the United States, and spent much time and money in an effort to find it, with little success, until, finally, the idea of helping the Brazilian grower produce the quality of cotton required by British spinners was hit upon.

Meeting British Needs. The secretary of the British Spinner Association, Arno Pearse, headed a commission of British experts who were sent to Brazil on an extensive trip. On his return he wrote two books, one on growing cotton in southern Brazil, and one on growing cotton in northern Brazil. These two sections of the country are distinctly different. Southern Brazil approximates conditions in the South of the United States, whereas northern Brazil is tropical, with conditions more like those of Egypt and India. The important outcome of the publication of these two books is that Brazil heeded the advice given by the Pearse commission and undertook to provide the cotton the spinners of Europe wanted, especially those of Great Britain.

Trade with Germany. Germany was the largest importer of Brazilian cotton for some years. It strongly entrenched itself in Brazilian

commerce and trade through its barter system of exchange, and bought heavily of raw materials, especially cotton, giving in payment barter marks, which could be used only as payment for goods manufactured in Germany.

Germany went even further, giving extra trade discounts of 25 to 40 per cent on all barter trade, and making it advantageous for the Brazilian merchant to make use of this barter arrangement. In need of markets for its largely increased cotton production, Brazil traded its cotton for manufacturing machinery, railroad supplies, and whatever Germany was prepared to furnish under these trade agreements. In the end, relations with Germany became strained in diplomatic circles because of German efforts to control the German-speaking population in Brazil.

More than either Great Britain or Germany, the foreign country to profit most by the sudden expansion of Brazilian cotton production was Japan. Entire shiploads of cotton were exported from Santos to Japanese ports. It will probably surprise most Americans to know that a great deal of the cotton formerly grown in the State of São Paulo was produced each year by Japanese immigrants, farm owners, sharecroppers, or renters. Japanese exporters to some extent handled the details of this trade with Japan, thus pocketing the profits of production and exportation.

The Stake of the United States in Brazil. What does the United States have at stake in the matter of Brazilian cotton production? What have we gained, if anything, or what do we stand to lose? The entire Brazilian cotton production exceeds 2,000,000 bales a year, and about 1,200,000 bales enter export trade, coming, of course, into direct competition with American cotton. This accounts for some of the decrease in exports from the United States, and has helped to increase our surplus.

Reliable estimates put the largest probable production of Brazil at from two and a half to three million bales a year. The production in 1941 was 2,216,000 bales. Any sudden slump in world prices might curtail this crop, as might also unfavorable weather or insect pests. Unprofitable world prices of cotton, immediately following the Civil War, caused a great reduction in Brazilian cotton production at that time.

The large capital investment made in gins and farm machinery indicates that Brazil will not fade from the cotton market as it did in the past. That cotton production fastens itself on a people in a drastic and lasting way is evidenced in the South of the United States. Every-

thing points to the fact that Brazil is in the business of cotton production and exportation to stay.

A new variety of cotton especially adapted to conditions in central Brazil, designated as "Campinas 817," has been developed under the technical direction of Dr. Ismar Ramos, at the Agronomic Institute of the State of São Paulo, located at Campinas. Its principal characteristics are as follows: average length of fiber, 30 mms; average height of plants, 79 cms; average weight of fiber in boll, 6.4 gms; per cent weight in first crop, 73. It is an early ripening variety, of high fiber production and economical to pick. Its widespread use will increase the cotton production in Brazil, both in quality and quantity.

Production of cotton in Brazil in recent years has been as follows: 496,444 tons in 1943, 589,586 tons in 1944, 355,674 tons in 1945, 285,000 tons in 1946, and 291,000 tons in 1947. For the State of São Paulo, production has been as follows: 375,084 in 1943, 463,193 in 1944, 232,674 in 1945, 174,063 tons in 1946, and 175,255 tons in 1947. (Each ton is approximately five bales.)

Exportation of cotton for the past three years has been as follows: 164,456 tons in 1945, 352,752 tons in 1946, 285,473 tons in 1947.

Distribution of exportation, by countries of destination, for the year 1946, was as follows:

	Tons		*Tons*
Union of South Africa	450	Canada	3,716
United States	2,133	Guatemala	149
Chile	899	Columbia	6,537
Uruguay	622	China	51,079
English India	947	Denmark	3,428
Spain	35,438	Finland	1,668
France	9,751	England	94,080
Greece	1,233	Holland	12,882
Ireland	142	Italy	65,649
Yugoslavia	2,095	Norway	682
Polonia	500	Portugal	861
Sweden	11,466	Switzerland	6,091
Union of Belgium-Luxemburg	30,963		

L. A. Wheeler, Director of the Department of Foreign Agricultural Relations, stated that in normal times Brazilian cotton can compete with American cotton. According to his report, in 1940 and 1941 São Paulo cotton was sold in Canada at seven to eight cents a pound, which is cheaper than prices for American cotton of the same quality in New

Orleans. He added that investigations have shown that, because of cheap labor and fertile soils, cotton can be grown in São Paulo for five cents and less a pound.

A Lesson for the United States. It has been said that if the Brazilians cleared good profits on only their cottonseed oil and by-products of cotton, they could afford to plant the crop even though the fiber itself yielded no profit. This may or may not be true. It is a fact that Anderson & Clayton, Swift International, and Matarazzo (a Brazilian firm), all have made tremendous investments, believing that cotton production and trade have come to stay.

Brazilian cotton, grade for grade, should bring as much on the world's market as cotton produced in the United States. If Brazil continues to produce better cotton of a more uniform staple than that produced in the United States, Brazilian cotton will eventually command a premium.

What the United States needs to do is to take a few leaves out of Brazil's book of experience and stress quality before quantity. Still another thing the United States must do is to standardize. Instead of one-variety communities, there should be one-variety states or, better yet, one-variety regions. If this is not feasible, at least the number of varieties, which is legion, should be reduced to a minimum. The Brazilians have done all this to their profit.

Pest Control. What about diseases and insect pests? The boll weevil does not as yet exist in Brazil. The pink bollworm and the Alabama army worm are the worst pests to date. Strange to say, the pink bollworm, which has been prevalent in Brazil many years, has never been so destructive to the crop as might be supposed. Some years it does little damage; again, when weather conditions are favorable, much damage is done. The same is true of the army worm. When heavy rain falls throughout the growing season, the army worm is very destructive.

Pink bollworm is fought principally through the effort to have the farm provided with disinfected seed, and by the farmer's burning all trash after the harvest. The state law requires every cotton grower to pull up cotton stalks by the roots and burn them as soon as the harvest is completed, in part to combat the pink bollworm, and in part to combat the root borer.

Recently wilt has appeared in some fields. This means that the station plant breeders will have their hands full establishing wilt-resistant strains of the two varieties of cotton now grown extensively. Much research work is being carried on in an effort to keep diseases and pests

under control. An interesting thing that the São Paulo planter has learned is that he must let nearly two months of the growing season go by before he plants, as otherwise the root borer will destroy his entire crop. With a growing season of from nine to ten months there is still ample time for the full development of cotton.

On what size farms do Brazilians grow cotton? In the State of São Paulo, according to a census made in 1938, the total number of all kinds of farms is given as 235,960 and 80 per cent ranged in area from 30 to 150 acres.

The fourth largest cotton farm in São Paulo produces three thousand bales a year. Few farms produce a thousand bales a year. Eighty per cent of the cotton is grown in small fields operated by the individual farmer with little outside labor. It can be seen from these figures that big estates do not predominate in Brazil.

Brazilian Cotton in World War II. In 1941, for the first time, Brazilian cotton production passed the two-million-bale mark, just when greatly disturbed world conditions disrupted normal trade. Where to sell so much cotton was a real problem, since Brazilian mills consume only half of the national production of cotton. In the short space of eight years the production of cotton was increased five times, and for three years Brazil occupied fourth place in world production, having displaced China and Egypt. In 1940 Canada was the principal importer of Brazilian cotton, but the United States began to supply the Canadians under the Lend Lease Act. So new markets had to be found. In 1942 Spain and Sweden took about one-third of the Brazilian crop. In 1943, of the total cotton export, valued at 414 million cruzeiros, 89.5% was sold in Europe (Great Britain 48%, Spain 30.5%, Sweden 18%, and Portugal 3.5%) and 10.5% in South America (Colombia 94%, Bolivia 3%, and Ecuador 3%). This was the lowest year, according to the export records, during the war period.

Just as the war was interfering greatly with regular trade channels, causing Brazilian cotton mills to slow down for lack of markets, other South American countries, notably Argentina, began to buy heavily. An enormous volume of business was done in the exportation of manufactured cotton goods, and the mills of Brazil had difficulty in supplying the demand. How much of this continental trade Brazil can hold in the face of international competition remains to be seen, but this trade in manufactured products proved a real windfall. Fortunately Brazil has a wide range of textile manufacture which largely supplies her home consumption and made it possible to take care of this sudden export demand.

The short fibers left on the seed when the longer fibers are removed in ginning are called linters. Brazilian production amounts to 40,000 metric tons a year. This product has many uses in peace-time industry and is also a strategic war material in the production of explosives of all kinds. The United States has agreed to take all of this product which is not sold to the other United Nations. Cottonseed oil and cottonseed meal, valuable by-products, greatly increased in value during the war. So much oil was exported in 1941 that a home shortage developed in 1942. The government finally prohibited exportation, but even so, prices on the local market more than doubled. Cottonseed meal was formerly exported in large quantities, until Brazilian railroads began using it as fuel.

In the State of São Paulo alone the total value of the cotton crop reached two billion cruzeiros in 1943, and over three billion in 1944. Great care in classification is being continued, and every effort is being maintained to improve the strains of cotton planted. The seed furnished to farmers and the large producers by the State Experiment Station improves in quality year by year, so the production of the state has in its favor two notable characteristics—quality and uniformity.

Friendly Competition. Between Brazil and the United States, great countries both, each occupying half of its continent, there is competition in only two agricultural products—cotton and oranges. Because the two countries rather supplement each other than compete, they can work out mutually helpful programs that will promote mutual respect and cooperation.

XIII

The Little C's and Other Crops

THE BIG C's of Brazilian agriculture are Corn, Cane, Coffee, Cotton, and Cattle. The little C's are cacao, cassava (*mandioca*), castor bean, carnaúba, and caroá. Naturally, it is not possible to include all the crops of the country in an alliteration. Rice, beans, tobacco, and other crops are also important. These are all of enough economic value to demand a brief discussion in this chapter.

Brazil has, at various times, given almost all its attention to one specific crop: first sugar cane, then rubber, then coffee, and finally, in 1939, cotton. But Brazil is no longer a one-crop nation, and everything indicates that it never will be again. With its varied conditions of soil, climate, and humidity, practically all tropical plants and nearly all temperate plants and fruits can be grown. The tropical plants can be grown on such a scale that surpluses can be produced for exportation—once sufficient care has been taken to carry out the technical demands of the crop and to heed its market requirements. But it does not necessarily follow that all tropical plants will be produced on a large enough scale for export or even to meet domestic needs.

World War II increased the variety of plants put under cultivation. The vast research resources of the United States Department of Agriculture were put at the service of the Brazilian Government, resulting in the cooperation of the scientists of the two nations. There is now plenty of evidence that Brazil will be able to cultivate many tropical and temperate zone crops not formerly grown.

Cacao. Most of us take chocolate and cocoa so much for granted that we never stop to find out from what they are made. Chocolate is the cacao bean ground to a paste, and cocoa is chocolate deprived of a portion of its fat and pulverized. After sugar has been added to these products of the cacao bean, we consume it in drinks, ice cream, confections, and many other foods. Most people like it on first trial without the necessity of cultivating a taste for it, which fact would justify Lin-

naeus in having given the plant its scientific name—*Theobroma* ("food for the gods").

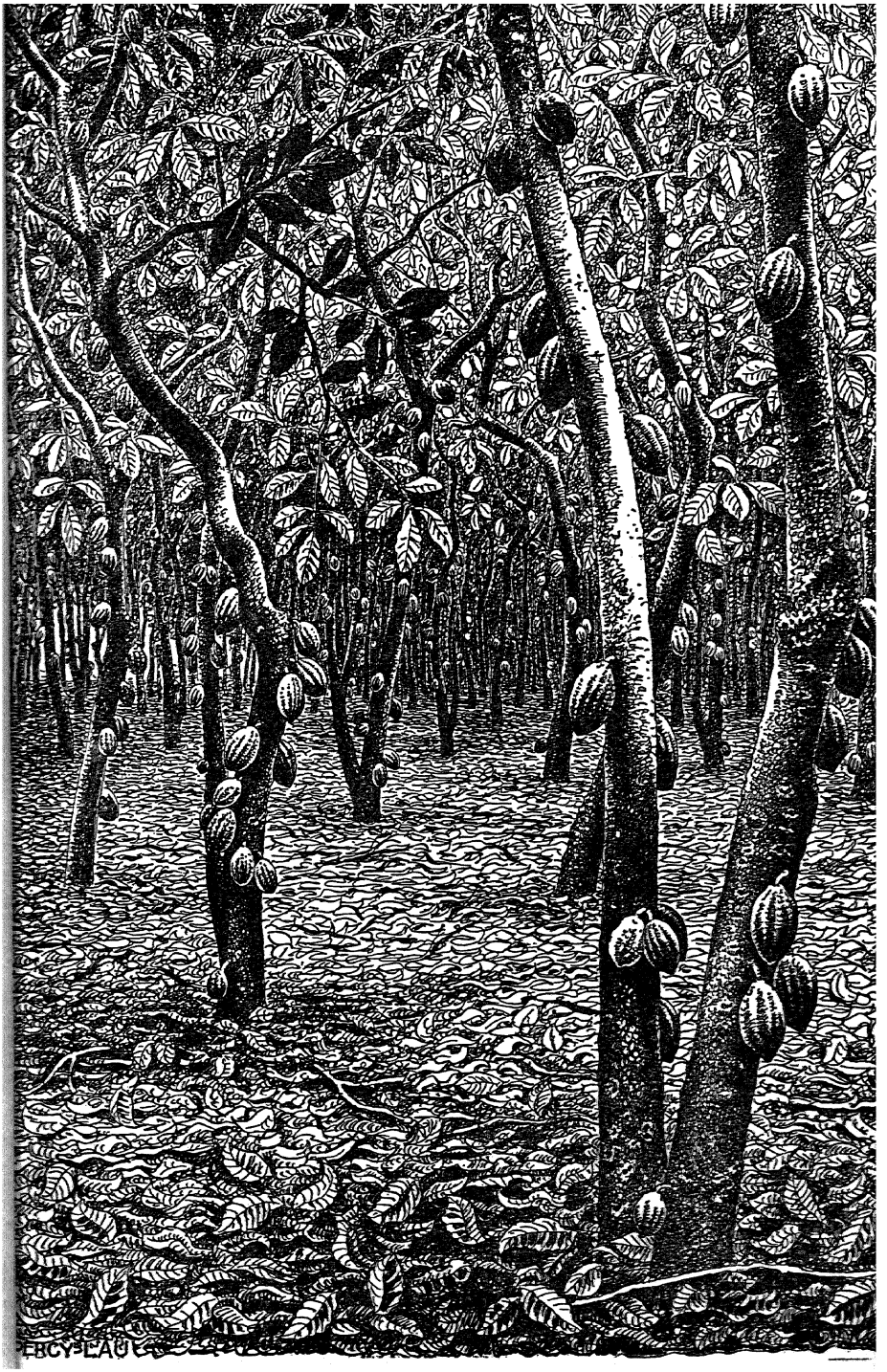
The plant originated in the tropical zone of Central and South America, perhaps in the Amazon Valley or the Orinoco Valley of Venezuela. It was cultivated in Mexico and Peru by the Indians long before the discovery of America by Columbus. It was cultivated in Brazil as a regular plantation crop as early as 1746, but only in the nineteenth century did it become an important crop. Now Brazil is second in its production, the Gold Coast (Africa) being the largest producer, although the planting of cacao was begun there in only the latter part of the nineteenth century.

Brazil produces about 250,000,000 pounds a year, a large part of the crop being exported. Ninety-eight per cent of this total is grown in the State of Bahia. Before the war the United States took about 80 per cent of the Brazilian exportation, the remainder going to Italy, Germany, Argentina, and Holland.

Since the cacao market is a highly speculative one, and the isolated grower finds himself unable to cope with the violent oscillations of foreign markets, an organ of defense and control was greatly needed. In June, 1931, a cooperative society with limited responsibility, called the Cacao Institute, was organized in Bahia for the purpose of establishing a system of marketing that would benefit all the members of the cooperative. Daily minimum prices are established, and growers are able to know how much their product is worth. The Institute handles cacao as buyer and exporter, regulates exportations to avoid glutting the markets, and distributes selling quotas among its members in such a way as to avoid excessive advantages to the larger producers. In March, 1941, the Government of the State of Bahia declared the Institute to be an independent organization.

Cacao grows in large pods, each containing from thirty to forty beans, on low, spreading trees. A rich soil and humid climate are needed for its growth. The trees are planted close together and entirely shade the ground, so that little or no growth of other plants takes place. The ripe pods are gathered and cut open. The beans are cured and dried, then stored for shipment to distant markets or for local manufacture. The curing process varies in different countries. It is an important part of the preparation of the bean for market.

The largest consumers of cacao are the United States, Germany, England, France, Holland, and Switzerland. The United States alone consumes about five million sacks a year. The consumption of cacao in Brazil itself is being greatly stimulated by the manufacture of better confections and by the use of drinks made of chocolate or cocoa and


PERCY LAU

milk. These drinks are used as lunches for school children, especially in the State of São Paulo.

The 1943 exportation of cacao (115,000 tons) amounted to 342 million cruzeiros, a value higher by about 60 per cent than in 1942.

Cassava. Like cacao, cassava is native to Brazil. It constitutes an important source of carbohydrate food throughout much of the country. Its many species are roughly divided into two classifications: *mandioca* and *aipim*. These plants are similar, but the tuberous, starchy storage roots of the former contain deadly hydrocyanic acid, whereas the latter are innocuous. The harmful principle of the poisonous kinds is readily volatilized by submitting the powdered roots to a hot fire, or by soaking them for several days in water.

In the United States, cassava is grown in a small way in the extreme southeastern part of the country, even in parts of Alabama. In Brazil it is cultivated everywhere.

The *aipim* variety is used as a stock food and as human food in its fresh stage. Flour and a dried meal are derived from the roots. The flour is used in the preparation of many dishes. Also, an almost pure starch product is obtained by thoroughly washing the grated roots. When prepared in flakes, it is like breakfast foods and can be eaten with milk and sugar. As a rough powder it is used as a substitute for bread at meal times. The starch is used in preparing foods for invalids and for some dessert dishes, and industrially as a sizer for cotton cloth.

The production of cassava in Brazil was greatly stimulated by a law by which all wheat flour used for bread had to contain 10 to 20 per cent of mandioca flour or starch. This was done to reduce the amount of wheat imported. The law has been repealed, so new markets are being sought for the exportation of mandioca starches to take the place of this large home consumption now lost.

Equal interest is being manifested in the production of industrial alcohol from cassava. Since the rootstocks yield an abundant supply of starch, its conversion into alcohol is merely a matter of fermentation and distillation. Large distilleries are being set up.

For the preparation of the starches, flour, and meal, many farms have crude, old-fashioned mills. But the tendency is toward large central mills equipped with modern machinery. These large mills produce better products.

The United States formerly imported a great deal of cassava flour and starch from the Dutch East Indies. During World War II, considerable importations were made from Brazil. Although Brazil is the largest producer of cassava in the world, it exports less than 10 per cent

of the flour and tapioca (a preparation of cassava starch) that go into international trade. As the methods of processing these products for exportation improve, there seems to be no reason why Brazil cannot export them in thousands of tons. In 1940 Brazil exported 11,000 tons of mandioca flour, most of it going to Great Britain. However, successive reductions in this trade with foreign countries have been recorded since that year. In 1943 only 2,243 tons were exported, 90 per cent of which went to Uruguay, the United States, and Argentina.

The plant is reproduced in this way: the branches are cut into small pieces, a bud being left on each piece. When planted, this sprouts quickly, and a new plant is formed in short order. The plants are low bushes. They are sometimes cut back to cause greater root expansion, since it is the starchy root that is harvested. All the cultivation that is necessary is to keep the planting free from weeds. The harvest is usually eighteen months after planting. The best soil for the cassava plant is a sandy loam of mediocre fertility. Very fertile land produces too much stalk growth, curtailing root growth. Mandioca was once a small field growth. Formerly, only enough was planted for home consumption, but within the past few years it has become a major crop and plantings of hundreds of acres have been made. As the plant is not subject to any serious disease, a harvest is almost certain, although yields vary enormously.

Castor Bean. Brazil is the largest exporter of castor beans in the world. From 1930 to 1939, exportation increased 455 per cent, reaching a total in 1939 of 125,000 tons, out of a total production of more than 170,000 tons. Only a slightly smaller amount was exported in 1940. In 1943 the exportation (156,000 tons) was valued at 208 million cruzeiros, showing an increase of 31,000 tons and of 112 million cruzeiros as compared with 1939.

Castor oil has many industrial and medicinal uses, but its principal importance is for the lubrication of airplane motors. No crop is easier to cultivate than the castor bean. It may come up spontaneously in any field in Brazil, but when cultivated it is planted in rows and handled as a crop. The common varieties, which are like weeds all over the country, have two serious defects: the beans are too small and the bushes grow so tall that it is difficult to harvest. Many growers prefer the dwarf varieties, which grow about half as high as the common varieties. Breeding experiments are being conducted on the dwarf varieties to obtain strains with higher oil content, with pods that can easily be opened when ripe. Ease in opening the pods is important, because some varieties are almost impossible to shell. The State of São

Paulo furnishes selected seed to its farmers at a reasonable price. This has greatly stimulated production. The tendency has been to crush more of the beans in Brazil and to export more of the oil.

The State of Bahia produces one-fourth of the castor beans exported from Brazil. Minas Gerais, Pernambuco, Ceará, and São Paulo are also large exporters. The crop is grown all over northern Brazil, and only recently has the acreage planted in central Brazil been greatly increased. During wartime the value of the oil increases immensely, and the rise in price causes growers to increase their acreage quickly. While the plant is a perennial, the crop is handled as an annual.

When hostilities broke out in Europe in 1939, a coordinated effort was being made in Brazil to develop the castor oil market. From 583 tons shipped abroad in 1939, the exportation of this oil reached 4,506 tons in 1941, declined to 2,600 tons in 1942, and jumped to 12,600 tons, valued at 47 million cruzeiros, in 1943.

Carnaúba Palm. The Carnaúba palm tree grows abundantly in a wild state throughout northeastern Brazil. In recent years cultivation has been started in that region, notably in the States of Ceará and Piauí. In one area of Piauí more than two million trees were planted. Producing trees, wild and cultivated, now number about 80,000,000, and it is estimated that there will be 100,000,000 before long. O. H. Barnett gives a realistic account of this curious source of wealth:

"Much has been written on Carnaúba, the wax extracted from the palm tree that is so abundant in Brazil. Little is known, however, about this amazing natural product of the tropics, outside of the trade circles engaged in the importation of Carnaúba in the industrial centers the world over.

"The Carnaúba palm tree (*Copernicia cerifera*) was named by Humboldt, the famous naturalist, "the Tree of Life," when he learned of the many purposes which Carnaúba serves. The natives of Brazil have found extraordinary qualities in the roots of Carnaúba as a nutritious food and as a tonic and medicine. The trunk of the palm tree is commonly used in the building of huts. The Carnaúba leaves, besides producing the valuable wax, are extensively used in the making of straw hats, baskets, mats, sacks, and in thatching roofs and sides of the houses in the country. The cultivation of this valuable palm in other parts of the world, principally in Ceylon, has met with little success. The Carnaúba produces the wax powder for which it is known in the foreign trade of Brazil. It seems that in this region, where rains are infrequent, nature provides the Carnaúba palm leaves with a coating of wax with which the plant retains the necessary humidity under the tropical sun.

Entirely different from all other palm trees, the Carnaúba attains a height of from fifty to sixty feet and is easily distinguished by its fanlike leaves and by the stubs left in a spiral design around the trunk. Although most of the Carnaúba wax exported from Brazil comes from the wild palms found scattered all over the Northeastern states, the production from cultivated areas is already considerable.

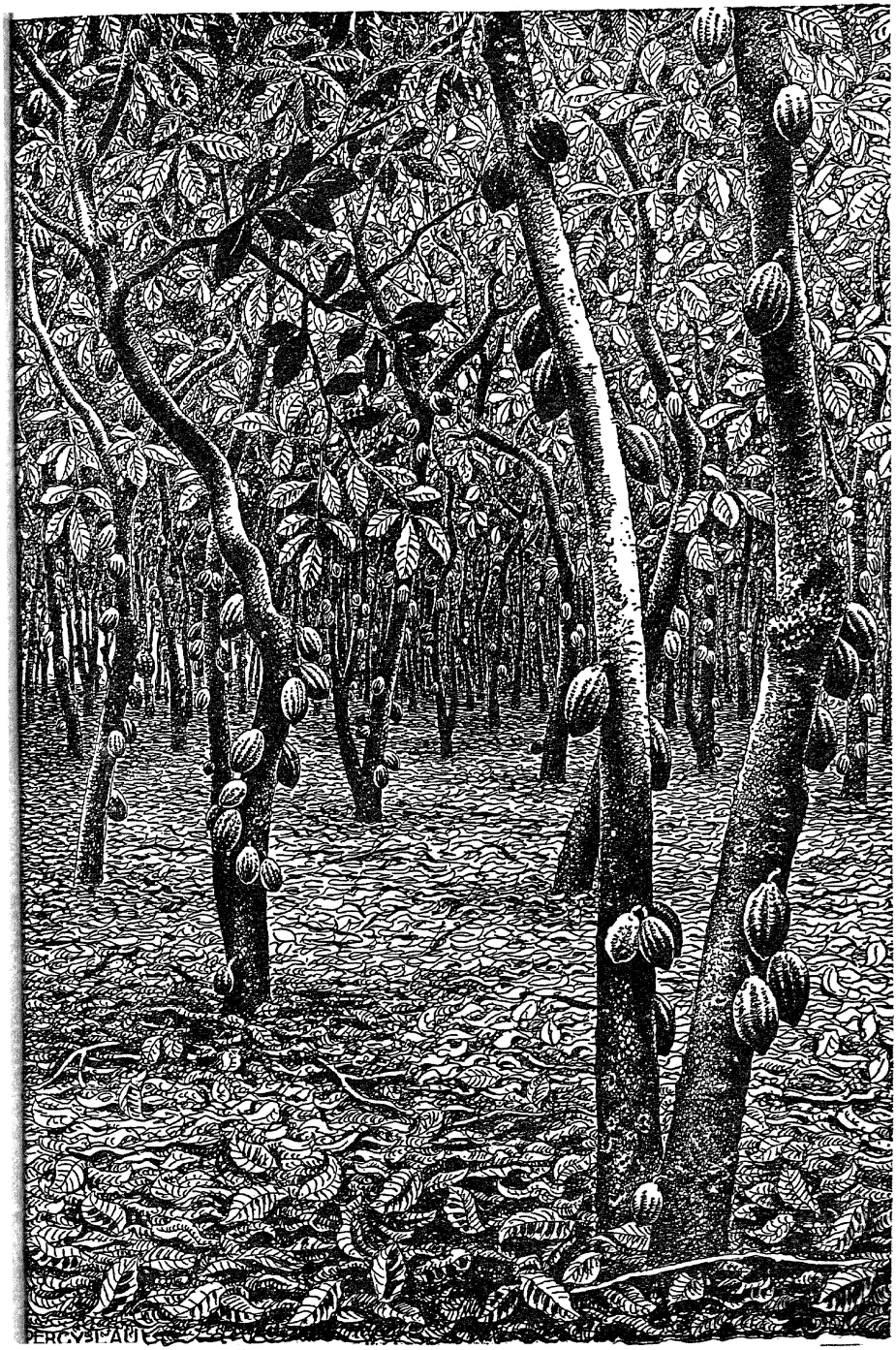
"The palm trees begin to produce wax after eight or ten years. The leaves are cut off by means of a pruning knife attached to a bamboo pole. This is usually done three or four months after the rainy season ends. The leaves are gathered in small bunches and tied over the back of a mule, and thus transported to fields or yards where they are left to dry during three or four days. At this stage, the fuzz of wax on the surface of the leaves begins to loosen. The leaves are stacked in piles and taken into small rooms where they are whipped or combed by means of special apparatus, until most of the powder is extracted from their folds. This powder is put into large kettles and melted down into wax. It is then poured into containers to cool, after which the cakes are broken into small pieces and shipped in bags.

"There are two principal grades: the Yellow, which is produced from the leaves that are cut before they have completely unfolded and been exposed to the sun. This is the first and best quality. Then there is the grade that is made from the leaves which have unfolded and have been exposed to the rays of the sun. This is a darker grade: it is called the Fatty or North Country No. 3. The powder of these two grades is melted over a direct fire and contains no moisture. There are other grades made by different processes, the principal one of which is the Chalky grade, produced by using the same powder that produces the Fatty grade, but is melted by mixing with water and boiled to a point until it becomes a solid. This accounts for the large percentage of moisture found in this latter quality." [1]

A number of other palms yield waxes useful in industry, but the Carnaúba is the only one reaching a fairly large value in trade channels. Nearly ten million dollars' worth is exported annually to the United States. It is used in flour, furniture, and shoe polishes, in electrical insulators, the surfacing of phonograph records, and in various other manufactures.

Carnaúba wax has been exported from Brazil for more than a hundred years and has reached a position of real importance, ranking fourth in the country's exports. The trade, mostly with the United States and Great Britain, in 1941 totaled 11,776 tons, valued at 288

[1] *Brazil Today*, I, No. 1, Sept., 1940.



Orchard of cacao trees in the State of Bahia

million cruzeiros. During periods of war its value greatly increases because of its use in the manufacture of munitions. The Johnson Wax Company of Racine, Wisconsin, has the largest industrial plant in Brazil for extracting the wax. Two or three different types of threshing machines have been developed and are being tried by small wax producers. A better mechanical process that will yield a pure product is sought. Almost all wax products manufactured in Brazil are made in São Paulo, more than a thousand miles from the regions where the wax is extracted. The great danger to the whole Carnaúba wax trade is the possibility of the discovery of a synthetic product that might replace the natural product. A few years ago it was discovered that a Brazilian pollen produces a wax comparable to Carnaúba wax. It is called licuri, and exports of this new product, starting with a small quantity in 1937, reached 193 tons in 1939 and jumped to 2,200 tons, valued at 34,000,000 cruzeiros, in 1941.

Caroá (*Neoglaziovia variegata*). Caroá is an uncultivated fibrous plant—one of the many wild fibers which may be destined for wide use. It is known only in Brazil, where it grows in profusion throughout the northeast. It is used as a substitute for jute and hemp. Extensive experiments are being made to find additional uses for this fiber. Because Brazil imports enough jute and hemp to make 200,000,000 sacks a year, a tremendous sum of money is lost to the country. Some native fiber plant will surely be developed to take care of Brazil's needs for jute and hemp—and it may well be caroá. Jute is not cultivated profitably in Brazil at the present time.

Caroá grows in very dry climates of considerable heat, and at present is being produced on a commercial scale only in the State of Pernambuco. The fiber is three times as strong as jute, and sacks made from it have only half the weight of jute sacks. These qualities, in addition to the fact that it grows on soils not adapted to other economic plants, combine to make it of potential value.

The industrialization of the caroá fiber is largely due to the tenacious work of a single family, or rather one firm, José de Vasconcellos and Company of Pernambuco. Convinced that this wild plant fiber, which was being used in a crude way for rope manufacture, held possibilities as a substitute for jute, one member of the firm went to England to study the textile processes, another made a series of investigations with the help of English textile experts, another studied agriculture in preparation for handling the field production work, a fourth studied law, and a fifth took a business course. When they had finally made the necessary investigations and finished preparing themselves

for the various activities of a large industrial concern, a plant was established at Caruará, a little town more than two hundred miles from the coast. A half million dollars was invested in the industrial plant for preparing the fiber, and for providing living quarters for the workmen. Later this capital was doubled and operations were greatly extended, even to the point of building automobile roads for bringing in the raw material.

As soon as the practical use of the caroá fiber was demonstrated, it was decreed that it be mixed in all jute cloth for sacks and in all rope manufacture. An acceptable cloth for tropical suits is being made of this fiber, and its use has been greatly increased since linen became scarce. In 1943 the manufacturing industry of sacks consumed 28,809 tons of various species of fibers (including imported jute and hemp). Of this total 64 per cent was of native plants; caroá contributed 20 per cent.

A Varied Agriculture. The big C's and the little C's cover the greater part of Brazil's agricultural production, but a number of important and interesting crops do not fall under the alliteration. Some of these are typically tropical and others temperate zone crops. Brazil is fortunate in having three states entirely in the temperate zone—Paraná, Santa Catarina, and Rio Grande do Sul. These states have received large numbers of European immigrants, who, being familiar with the cultivation of wheat in their native countries, could cultivate the grain crops in Brazil.

One of Brazil's most rewarding efforts will be the successful allocation of the country's widely differing crops to regions in which they will give the best yields. Many experiments by local farmers and by government agencies are always necessary to discover the best crops for each region. Once the best crops have been determined, it becomes necessary to improve them by plant selection and good processes of cultivation. Extension work among the farmers can stimulate production. And proper trade channels have to be established to guarantee outlets for the crops harvested.

Rice Production. A crop well illustrative of these steps is rice. Rice and beans are the most important staple foods in Brazil. Rice grows wild in the deep tropics, but the cultivated varieties were brought in from Portugal by the early colonizers. Rice was cultivated in some of the Brazilian settlements as early as the sixteenth century. It is now grown in every state. Even with soil and climatic conditions in its favor, much rice was imported until 1914. In 1905 almost 60,000 tons

were imported. About this time a young agricultural college graduate from the State of São Paulo was sent to the United States to study rice irrigation. He was Emilio Castello, and upon his return to Brazil modern rice irrigation processes began to be adopted. By the time of World War I, rice importation had fallen to about 8,000 tons, and the first exportation had been made, though it was only 51 tons. In 1917, 35 tons were imported and 44,000 tons were exported. Since then practically no rice has been imported, and in recent years the average exportation has been 50,000 tons a year.

With the introduction of modern methods of irrigation and the use of farm machinery, the State of São Paulo took the leadership and now produces 30 per cent of the nation's rice crop. Minas Gerais and Rio Grande do Sul account for 27 and 22 per cent respectively, so that these three states produce 79 per cent of the whole. Similarly, in corn and a number of other crops, at least three-fourths of the national production comes from these three states. The total production of rice averaged 1,500,000 tons up to 1941. In 1942 it was 1,902,638 tons, and the exportation 82,603 tons. The highest record in rice exportation was reached in 1943, with 84,582 tons shipped to the following destinations: Great Britain (65%), South African Union (10%), Switzerland (9.7%), Sweden (7.4%), Spain (2.1%), French Guiana (1.5%), and other foreign countries (4.3%).

Methods of Cultivation. There are two distinct types of rice and of methods of production:

1. Lowland irrigated rice, called *padi* (paddy) in Asia, is grown principally in the States of São Paulo and Rio Grande do Sul. Whole regions in which low-lying alluvial river basins permit easy irrigation are given over to rice. Japanese immigration gave a great stimulus to the production of irrigated rice, and through the example of the Japanese the transplantation of rice has been successfully made. Seed beds are prepared in advance of the planting season, so that half-grown plants are ready for transplanting when ordinary seeding begins. This is done in water-covered terraces by workers standing all day in ten inches of water. The rice matures a full two months earlier and comes on the market when prices are at their best. The water having been drained, the rice is gathered, the land is plowed and harrowed, and rice is again transplanted. Thus two full crops are harvested each season. Because of the large amount of hand labor involved, this method is used by relatively few planters. Irrigated rice is a sure crop, because water is provided in abundance.

2. The cultivation of upland rice is dependent upon ordinary rainfall. It is almost as productive as irrigated rice if the rains fall abundantly and with the proper distribution. This does not always happen of course, so production is variable, and occasionally the crop fails entirely. Even so, at least half, and probably an even larger part, of the total crop in Brazil is grown without irrigation, much of it on small acreages.

Rice must be threshed as soon as harvested, because the grains fall as they become dry. The threshing is done either by hand or by machinery. The grain must be spread on drying grounds before it can be cleaned. There are rice-cleaning mills in all rice-producing regions, and very little of the grain in the hull is shipped. All cleaned rice is sacked to weigh 60 kilos, or 132 pounds. Some farmers clean their rice at home in primitive mills, and the product is much more nutritious than highly polished rice, which has lost much of its nutritional value by the removal of the bran.

Rice as a Food. Rice and beans are staple foods of practically universal use. To prepare rice for the table, the Brazilian cook puts garlic, onions, and tomatoes in hot lard, then adds the rice and stirs it until it is well coated but not browned. Over this is poured one cup of boiling water to each cup of rice, and salt is added to taste. The rice continues cooking until the water is dried out. A staining plant called *urucum* may also be added, making the rice a deep red color. Brazilians eat two full meals a day—lunch (at ten in the morning in the country and at midday in the cities) and dinner (late afternoon in the country and at night in the cities). Coffee and milk with bread and butter constitute the universal breakfast. At both main meals, rice and beans are present on practically all Brazilian tables. It is interesting to note that while many foreigners do not care for this diet, or these dishes, their Brazilian-born children almost always insist on having rice and beans twice daily.

Beans. What potatoes are to the diet of the European, beans are to the diet of the Brazilian. Beans are eaten every day the year round at each of the two meals, and are even more certain to be part of the diet than rice. If the very poor cannot afford rice, which cannot be grown in all districts, corn-meal dishes make a good substitute to be eaten with the beans. Beans are prepared with little difference for the table of the poor or the well-to-do. They require long hours of cooking, and are usually cooked over charcoal fires, even by city housewives who have gas stoves. It has been suggested that central cooking arrange-

ments be made through beaneries, like bakeries, with a daily distribution. Should such a scheme be put into practice—and all the necessary dietetic studies have been made by the Institute of Hygiene in São Paulo, under the direction of Dr. Geraldo Paula Souza—it would greatly simplify domestic problems, especially in large cities, where servants are hard to obtain. One of Brazil's most characteristic dishes is *feijoada,* prepared with jerked beef, sausage, and salt pork, and served with *pinga* (cane rum). It is almost universal in restaurants on Saturday.

Many varieties of beans are grown in the country, the two principal ones being a solid black bean and a sulphur-colored bean called *mulatinho.* All colors are represented among the varieties—pure white, solid black, brilliant red, purple, and all the possible variations and mixtures. At a recent state show of cereals and leguminous plants held in Niteroi, capital of the State of Rio de Janeiro, more than thirty varieties of beans were on exhibit and more than a hundred samples of the more common varieties. At this particular show the champion lot was of the white navy bean, so common in the United States, but little known in Brazil.

National Production. Up to World War I, seven or eight thousand tons of beans were exported annually, but the war gave such a stimulus to production that as many as 93,000 tons were exported in a single year (1917). After the war, exportation practically ceased until 1938, when 1,000 metric tons were exported. The corresponding figures for the first five years of World War II (1939-43) were also irregular: 4,208, 1,568, 187, 11,213, and 5,758 tons. Of the total for 1943, Spain imported 44 per cent, Sweden 21 per cent, Uruguay 25 per cent and a few other foreign markets 10 per cent in all. Brazil's total crop of beans produced in twenty-one states increased from a total of 809,000 tons in 1941 to 896,000 tons in 1942. The large number of varieties of beans grown and the lack of large quantities of standard graded qualities keep Brazil from figuring steadily in the world markets. Should half the effort be put on improvement of bean-growing that has been lavished on cotton, for example, Brazil could easily dominate the foreign trade of the world in beans.

Two very simple cultivation processes are used. About half the beans harvested in Brazil are planted in the cornfields after the corn is fully grown. The other half is grown as a single crop. Beans mature very rapidly—in from two to four months. There are two planting seasons each year, one at the beginning of the rainy season and one in

the middle. The first crop ripens during the rainy season and may be difficult to harvest. Beans are harvested by pulling up the stalk before the pods are thoroughly ripe, and the plants are extended on the ground until thoroughly dry. Then the beans are beaten with a hand flail. Modern threshers are rarely used. Beans are grown all over the country, but the three states that grow most of the rice and corn also grow most of the beans. Minas Gerais takes first place, São Paulo second place, and Rio Grande do Sul third place in bean production.

Wheat. The only agricultural product imported in large amount is wheat. About a million tons are imported each year, either in grain or as flour, which represents an annual expense of almost a half billion cruzeiros, which at five cents to the cruzeiro is $25,000,000 in United States currency. Brazil produces 180,000 tons, on an average, which represents from 13 to 14 per cent of its total consumption. A hundred years ago wheat was a relatively important crop, but an invasion of rust disease almost wiped it out. It is estimated that the three temperate zone states in the extreme southern part of the country could produce enough wheat to supply national demand, but they are not settled densely enough to raise that much wheat. In recent years large sums of money have been expended by the Federal Government and by the State of Rio Grande do Sul for experimental purposes and extension work to increase the quantity and quality of wheat. A grower can get selected seed and instructions for growing the crop.

Wheat is grown in the southern states and as far north as Minas Gerais. One great mistake is being made in trying to force production in certain areas improper for the growing of wheat, such as in the State of São Paulo. Wheat has one climatic requirement essential to its productive growth—a wet, cold winter and a hot, dry maturing season. In the States of São Paulo and Minas Gerais, opposite conditions prevail —rainy hot seasons and dry cold or cooler seasons. Wheat of many varieties grows in Brazil, and no doubt a little wheat can be grown anywhere in the country, but profitable harvests are hardly to be expected where decidedly unfavorable climatic conditions prevail.

The persistent efforts of the government to increase wheat production have yielded results. Importation has gradually declined, but since wheat prices have gone higher and higher, the annual expenditures for imported wheat have gone up. In August, 1942, a single shipment of wheat from the State of Rio Grande do Sul was received in Rio de Janeiro amounting to 1,280 tons. No such domestic shipment had been received before.

In respect to flour, the obligatory mixture of starch from corn, rice, and mandioca (cassava) was finally abandoned after two years' experience, so that pure wheat flour is now available and a much better bread is baked. Brazilian per capita wheat consumption is very low, 24 kilos, as against 170 in the United States and 243 in Argentina. Much of the wheat imported comes from Argentina, but some is imported from the United States. The rice and bean diet makes wheat bread a dispensable article at lunch and dinner.

Potatoes. Potatoes are a staple food in Brazil and are usually on the tables of the better class at each meal, although they do not form such an important item of food as in Europe and the United States. Up to 1930, 30,000 tons were imported annually, but since 1935 the average importation has not reached 2,000 tons. The annual Brazilian production has greatly increased and is now a half million tons a year. Japanese immigrants raise potatoes as one of their principal crops, and because they are liberal in their use of fertilizers and cultivate intensively, they have boosted the total production. Climatic and soil conditions are not so favorable as they might be, but in a few years the country will produce enough potatoes for its own consumption and have a surplus for export. The State of Rio Grande do Sul produces almost 40 per cent of the total production; São Paulo follows with 30 per cent, and Paraná with 13 per cent. Seed potatoes of reliable strains were formerly imported from Holland and Chile. Government experiment farms have recently been established for the exclusive purpose of producing seed potatoes of especially desirable strains. As selection must be continuous, these single-purpose farms will make it unnecessary to import so large a tonnage of seed as formerly. At present the potatoes generally seen on the market are smaller and inferior to those grown in the United States.

Sweet potatoes grow abundantly all over Brazil and have the advantage of year-round harvesting since freezes and frost are generally not heavy enough to harm the potatoes in the ground. It is estimated that the annual production is more than 250,000 tons, but only a small part of the harvest is shipped. The major part of the crop is consumed on the farm or marketed locally. A few large plantations are found near cities like São Paulo, where the potatoes are marketed along with other truck crops and vegetables. The sweet, juicy yams common in the United States have been introduced by the agricultural college experiment farms, but their cultivation has not become general. No industrial application is made of the sweet potatoes, although some are fed to livestock.

Tobacco. Brazilians are fairly heavy smokers, and tobacco is grown in many parts of the country. Excellent qualities are produced in the States of Bahia, Minas Gerais, São Paulo, and Rio Grande do Sul. Forty per cent comes from Bahia, 28 per cent from Rio Grande do Sul, and 11 per cent from Minas Gerais. The total production is around 100,000 tons a year, and of this an average of 40,000 tons is exported. A small quantity, amounting to a few hundred tons, is brought in for special mixtures. In 1818 Brazil exported to Lisbon 2,700 tons of tobacco, and the amount exported has been constantly increasing. The finest cigars are made in the State of Bahia, one factory alone employing 3,000 people. Light leaf tobacco is mostly produced in Rio Grande do Sul, but experimental stations and the extension service are also teaching the technique of curing leaf tobacco in various sections of the State of Minas Gerais.

An effort is being made to improve the quality of the leaf as well as the yield. Much of the tobacco produced is of an inferior grade, not being acceptable for exportation. It is used locally as "rope" or "cord" tobacco, similar to the Louisiana perique.

The home-rolled cigarette is still in vogue with many Brazilians, more especially in the interior and in the northern states, but is rapidly yielding ground to the machine-made article.

The cigarette industry, counting in its ranks several large organizations, is one of the most important in Brazil. Its contribution to government revenue (in United States currency, $50,000,000) is approximately 8½ per cent of the national budget per annum.

Machinery and equipment of the most modern type are used by the cigarette manufacturers, whose products, both in quality and appearance, compare favorably with the best of those found in other countries.

The total consumption of machine-made cigarettes is calculated to be in the region of twenty-five billions per annum, and is on the increase.

The American form of packing, introduced in recent years by the largest manufacturer, is proving increasingly popular with the Brazilian smoking public. It is probably only a question of time and substitution of machinery before this packing entirely supersedes the flap type of packet and other types which were formerly in general use.

As regards imported cigarettes, heavy excise stamp duty increases their cost to a point where they become inaccessible to the great majority of smokers, and consumption is, consequently, insignificant.

The tobacco crop, as well as most of the other crops described in this chapter, can be greatly increased once economic conditions warrant it and prices furnish the necessary stimulus.

Alfalfa. The cultivation of alfalfa on a large scale has been hard to get under way in Brazil. For years, what was used in the country was imported from Argentina. Brazil has only limited areas of good soils of a sufficient depth to make good alfalfa crops, but not even these are planted as they might be. In Argentina alfalfa not only grows luxuriantly, but becomes in some sections a veritable weed, difficult to eradicate. Just the contrary happens in Brazil: alfalfa is not a dominant plant, and the eradication of weeds becomes a tedious and expensive task. Without irrigation, six or more cuttings of alfalfa can be made on fertile soils, which to some extent makes up for the difficulty of cultivation. There is a ready market for all the baled alfalfa produced, and an annual production of some 150,000 tons has been reached, mostly coming from the States of São Paulo and Rio Grande do Sul.

Mate, or Brazilian Tea. One of the typical customs in southern Brazil, Argentina, and Paraguay is the drinking of mate, sometimes called Brazilian tea. The dried leaves are placed in a silver-trimmed gourd, boiling water is poured in, and the tea is sucked through a silver tube (*bombilla*). The gourd is passed from one person to another in a gathering, just as the pipe of peace was passed from hand to hand by our American Indians.

Mate is taken very widely as common tea, and large factories, principally in the city of Curitiba, State of Paraná, prepare the finished product in attractive tins or cellophane packages, shipping it to all parts of the country. When served in a cup, brewed like regular tea, it is usually taken with sugar, and sometimes with milk or lemon. Iced mate has been advertised in the United States, where, though efforts have been made since 1927 to introduce the drink, its use has increased rather slowly. The principal recommendation for Brazilian tea is that it soothes rather than excites the nervous system. As a healthful drink it compares favorably with coffee and tea.

Until a few years ago the entire Brazilian exportation of mate went to Argentina. A maximum of 85,000 tons was reached in 1929, but there was a gradual falling off until, in 1940, only 50,000 tons were exported—chiefly because Argentina increased its own production. The annual average of Brazilian exportation of mate is now placed at 48,000 tons.

The tea is made from the leaves of a medium-sized tree, *Ilex paraguayensis,* which grows wild in the forests all over southern Brazil, parts of Paraguay, and northern Argentina. The seed germinates with extreme difficulty, and it was only after years of experimentation that the

Argentinians discovered a process of soaking the seed in warm water a certain number of hours, thus obtaining a fairly good germination. The process of gathering the crop is rather crude. Limbs are cut off the trees and hauled to a drying shed and tied in bundles. The leaves are dried over a slow fire, then beaten or stripped off the branches. A primitive wooden toothed wheel is rotated over the leaves until they are crushed. Then the product is sacked and hauled to markets in wagons exactly like the old prairie schooners of the United States—drawn by eight horses, four abreast. In the markets the leaves are again crushed, cleaned and processed. Recently carbonated mate has been bottled and placed on the market. A fairly good beverage has been produced, but it remains to be seen whether it will become popular.

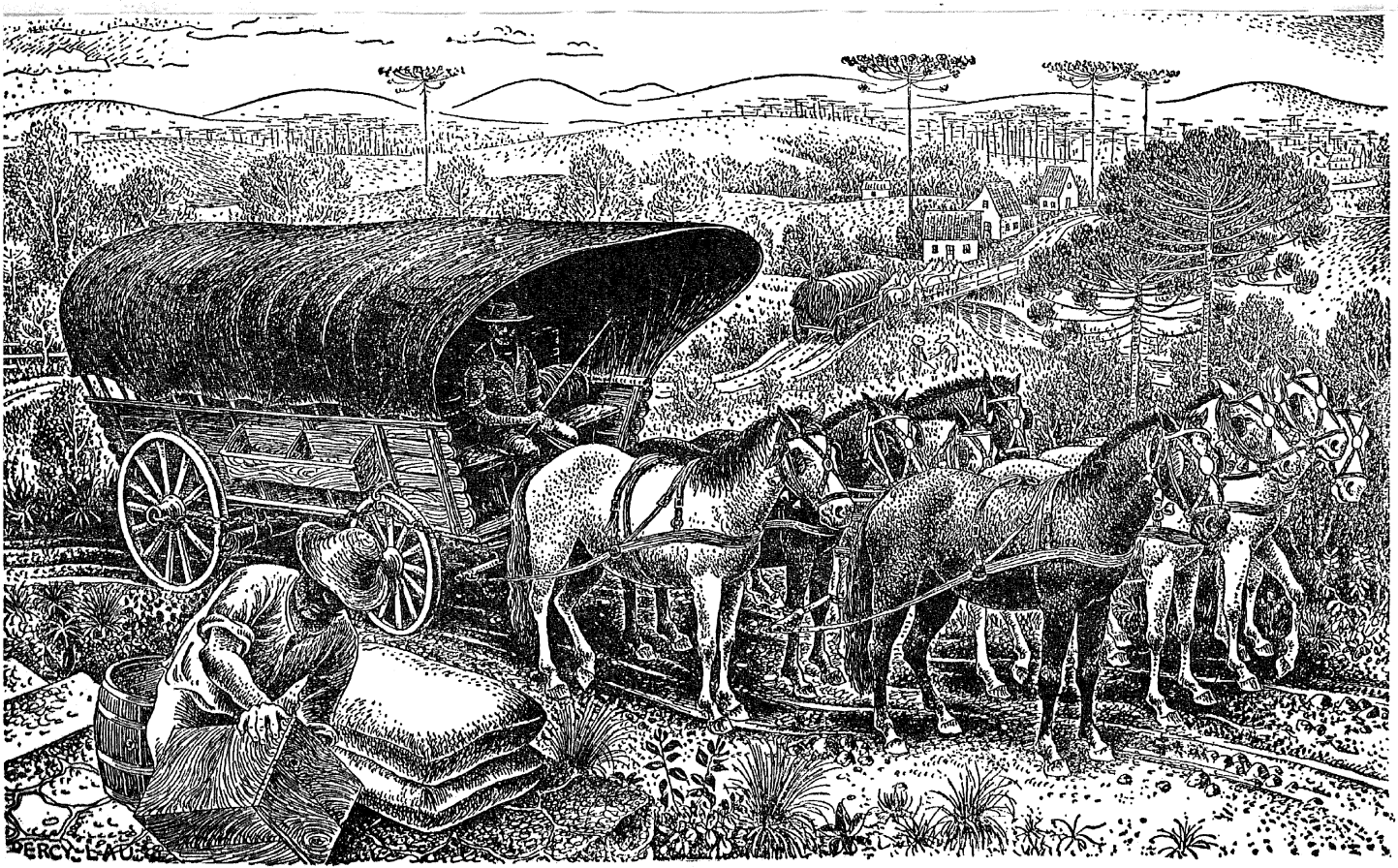
As the crop grows wild, demand determines the size of the crop. When prices are not attractive, the trees are not sheared. The same tree is sheared only once in four years. In Brazil, plantations have not been developed, since the wild trees easily supply market demands for mate.

Tea. Before World War I, Brazil imported 360 tons of tea a year. But its production had so increased by 1940 that 91 tons were exported and only 80 tons were imported. In colonial days tea was cultivated in Brazil principally in the State of Minas Gerais, but production gradually dropped until almost the total consumed in the country was imported. Japanese immigration gave a new impulse to tea growing in the State of São Paulo, but Minas Gerais continues to be the principal producer. The tea-growing district of largest size is around the historic former capital of Minas Gerais—Ouro Preto. In this district alone there are more than 3,500,000 trees in full production.

It is possible that the finer teas can be raised in Brazil, but only with thoroughly improved selection of plants and techniques of preparation can a product equal to the best coming from India or China be produced.

Medicinal Plants. Brazilian flora is rich in its variety. More than 50,000 different plants have been classified, and, as would naturally be expected, many of them have medicinal value. The most important are native to the forests of the State of Mato Grosso.

Evea ipecacuanha produces ipecac, used as medicine and recently, in industry. In 1939 only 77 tons were exported; in 1941, 158 tons. This creeping plant grows wild in Brazil and is found chiefly in the States of Mato Grosso, Minas Gerais, and Espírito Santo.



Hauling mate in the southern states

Carpotroche brasiliensis, commonly called *sapucainha,* produces the same oil as does the Asiatic chaulmoogra tree. This oil, like chaulmoogra oil, is useful in the treatment of leprosy.

The United States has been much interested in opening extensive quinine-producing plantations in South America. Seedlings of the *Cinchona ledgeriana* were furnished the Brazilian Government, and efforts are being made to increase production. Other countries, notably Guatemala, are making the same efforts. Timbo, a plant common in the Amazon Valley, is one of the highest producers of rotenone, a very valuable ingredient of an insecticide used in the United States. It will be rapidly brought under cultivation, and by proper selection and improvement it can be produced in even greater quantities. The annual exports of the powder average over 500 tons.

Dozens of other plants of a medicinal nature are known to exist in the country and await an intelligent and persistent exploitation.

Other Plants. Rye, oats, barley, and many other plants are grown on a small scale. The possibility of the development in Brazil of old well-known crops, and the introduction of new ones is almost unlimited, since the right soil and climate exist somewhere in Brazil for almost every kind of cultivated plant.

XIV

Oranges and Bananas

WHEN FOREIGN markets were largely cut off during World War II, oranges and bananas, which are abundant all over Brazil, reached new highs in home consumption. A campaign carried on by the Public Health Department of the Federal Government increased the use of fruit in the national diet. It seems likely that the habit of eating more fruit has been acquired and that, as the years go by, the use of fruit will make a definite contribution to the improvement of the health of the population. Oranges and bananas in Brazil are both cheap and of excellent quality.

The antiscorbutic value of citrus fruits was known to early navigators, who carried a supply on long voyages. When a vessel dumped refuse in a harbor, seeds drifted ashore, germinated, and grew. In regions free of severe freezes, these accidentally introduced plants became a part of the local flora. The rough lemon, popular in Florida as a bud stock, has become scattered over Brazil and is found growing wild from the banks of the Amazon, near the Equator, to the Federal District, which is crossed by the Tropic of Capricorn. On the Amazon, trails cut through the undergrowth, for the gatherer of rubber latex, pass through nests of rough lemon bushes. In Florida, its natural distribution is limited to the east shore of Lake Okeechobee. The sour orange, which is the rootstock for 75 per cent of the cultivated orange trees of the world, is found growing wild on the banks of the Paraná River, which marks the boundary between Brazil and Paraguay. The sweet Persian (Tahiti) lime grows wild in the forests of the State of Rio de Janeiro. The Rangpur lime, which, by the way, is not a lime at all, grows wild around old worked-out gold mines in Minas Gerais. When Brazil was a colony, all of its gold belonged to the Portuguese Crown. Only those with official permits could pan it. The law required the miners to leave half of their gold with the agents of the Crown. But some of the miners did not abide by the law. They struck out through the trackless woods, avoiding the established highways,

which were policed. They carried with them citrus fruits to prevent scurvy, and thus more citrus seeds were distributed. They were the Johnny Appleseeds of Brazil. It is no surprise to the scientist to find citrus growing wild in every tropical and subtropical region of the country.

Increase in Production of Oranges. In 1923 Felisberto Camargo, a Brazilian agricultural college graduate who had had postgraduate studies in the United States, constructed the first three standard orange boxes ever made in Brazil. In 1923 he accompanied a shipment of two hundred crates to the New York market, at the height of the North American season. The two hundred crates were sold at auction and brought such a high price that North American citrus growers became apprehensive. California and Florida cooperated to close the New York market against oranges coming from regions that might be infested with the Mediterranean fruit fly!

Previous to this, Brazil had produced barely enough oranges to supply the home market. They were marketed locally, not more than a few miles from where they were grown. Modern packing houses were unknown. Oranges were overabundant for a few weeks during the ripening season, and scarce the remainder of the year. The municipal market in Rio always had a few. No oranges were exported except those grown in Bahia, which went to Argentina. Then came an interest in the exportation of oranges to Europe. Large commercial orchards were planted around Rio de Janeiro and in the State of São Paulo. Modern machinery was installed, so that properly packed fruit could be exported. From 1927 to 1932 shipments rose from 359,000 boxes to 739,000 boxes. By 1936 the shipments reached 1,300,000 boxes and by 1939 more than 5,000,000 boxes.

The Story of the Washington Navel Orange. The most important contribution Brazil has made to foreign fruit growers is the navel, or seedless, orange. The orange is not a native of Brazil, but the navel orange, one of its finest varieties, developed there. It originated in the State of Bahia in the early part of the nineteenth century and was introduced into the United States in 1870. This introduction gave a great impulse to citrus production in California and may be properly credited with being the origin of all modern citrus developments, although by no means all the oranges of the United States are of the navel variety. Some of the trees were sent to Washington in 1870 by a Presbyterian missionary, the Reverend F. J. C. Schneider, who then lived in Bahia. He had advised William Saunders, the Superintendent of Grounds and

Buildings of the Department of Agriculture in Washington, of the splendidly flavored large-sized oranges commonly grown in Bahia, that possessed a unique characteristic—they were seedless. The Commissioner wrote asking that some trees be sent to him. The first lot died. He then sent detailed instructions on how the trees should be packed. Mr. Schneider followed instructions, and a second shipment was made. How many of these trees survived is not known, but shortly afterward two were shipped to California. One of the trees was taken to Riverside, California, and is still a popular sight for tourists. Beside it is a bronze plaque, on which the inscription reads: "To honor Mrs. Eliza Tibbetts and to commend her good work in planting at Riverside, in 1873, the first Washington Navel orange trees in California. Native to Bahia, Brazil, it proved the most valuable fruit introduction yet made by the United States Department of Agriculture."

However, no special credit has ever been given the person responsible for the introduction of the seedless navel orange from Brazil into the United States. Mr. Schneider moved from Bahia to São Paulo, where he died in 1910. During the latter years of his life he was a highly esteemed member of the Geographic and Geologic Commission of the State of São Paulo. The navel orange is one of the many extremely valuable plant introductions into the United States made by missionaries, to whom not enough credit has been given.

In 1907 the annual production of this orange in California was valued at $10,000; in 1917, at $30,000,000. By 1938 it had increased to $57,000,000.

Another introduction into the United States from Bahia was made in 1914 by Dr. A. D. Shamel of the Department of Agriculture. He introduced a variety of orange that has been given the common name of the Texas navel, for it seems best adapted to the climate and soil of Texas and produces the finest orange grown in that area. Dr. Shamel also propagated fifteen useful varieties originating from the Washington navel. It is easy to see the importance of the introduction of the Brazilian orange into the United States, where each year the fruit grower realizes some $60,000,000 from this citrus crop.

In Bahia, the birthplace of the navel orange, this fruit grows to a diameter of six inches. That means that it grows to be as large as a small grapefruit. In fact, its large size makes it unsuitable for export. The large, unwieldy oranges are cut in slices and eaten as one would eat a piece of cantaloupe. The meat of the orange is a light yellow color and not the deep orange of the fruit produced in California. In recent years a strain has been developed called the Bahianinha, or "Little

Bahia," which has a wonderful flavor and quality and is of a desirable size for export.

In the State of Bahia the following interesting legend is told about the origin of the navel orange. (See Bulletin 244 of the United States Department of Agriculture.) A Bahian slave owner had one of his female servants chastised. It made her revengeful. Later he sent her out to plant orange seed. She, having the power to bewitch, threw a spell on the seed and proclaimed that it would never have any children —hence a seedless orange.

The Bahia, or Washington, navel has a well marked identification, the navel, and is the progenitor of scores of varieties in many different lands. In Brazil commercial varieties range in size from that of a tennis ball (252 oranges to the box) to a medium-sized grapefruit (54 to the box). The larger sizes are rarely seen in commercial channels, but many are sold from house to house. The thick rinds protect them during rough handling. Almost every community has its favorite navel and considers that of its neighbor inferior.

More than twenty-five years ago, Bahia had a considerable export trade of oranges to Argentina. The undertaking was precarious. The fruit varied in size, quality, and quantity. No cooling plants existed either at the docks or on shipboard. Voyages were of varying lengths. When the groves in Argentina began to produce in quantity, they crowded the Bahia fruit off the market.

From what has been said it should not be inferred that naveling is a quality peculiar to the Washington navel orange. This modification has been observed in nearly all citrus species. In 1901 tangerines at Mandeville, Jamaica, produced fruit with a huge navel, about one-fourth the size of the fruit proper, and this navel had an edible pulp. Inside the main navel grew a secondary navel. Some forty years ago a nurseryman in Florida offered nursery trees of naveled grapefruit for sale. The variety had no other quality to commend it, so it was never planted extensively.

Other Varieties of Oranges. The *Selecta* orange is doubtless the progenitor of the Washington navel. It looks so much like the Bahian orange that it is often necessary to cut the fruit open to see whether it has seed or not. This variety produces all sorts of mutants (sports), both seed and bud mutants. Dozens have been propagated by bud grafts. Each one has some distinctive and desirable quality. The *Selecta* orange is one of the finest-flavored oranges known. After the Washington navel, the *Laranja Cipó* (vine orange) is probably the most distinctive and picturesque. When the bud grafts are inserted at

the normal distance above the soil, the vines grow and sprawl all over the ground. The fruits are produced singly in the axils of the leaves.

The most ornamental use of the vine orange is to bud it high, six to ten feet from the ground. The buds grow outward, droop, and produce long vines bearing half a dozen or more delicious oranges. A most artistic natural arbor results. The fruits retain their excellent quality for an unusually long time. The late Dr. Caire, pomologist during the early 1920's in the Ministry of Agriculture, is authority for the statement that the vine orange was found as a bud mutant in a nursery of *Selecta* oranges. This variety would be very much appreciated in the United States for its decorative possibilities, but it is doubtful if it can ever be introduced.

The *Laranja Serra d'Agua,* also called *Laranja lima,* is characterized by the almost complete absence of citric acid. It belongs to the same group as the Florida Parson Brown. Another variety, the Valência, was recently introduced from the United States and is maintaining its reputation. This type is late in maturing, as is a popular Brazilian orange, called the *Pera,* from its oblong shape, which might prove objectionable in the United States. Subvarieties are numerous. This variety can remain on the tree several months without deterioration, and can be marketed over a long period and at a time when no other oranges are available. It supplies the home market from October until January.

The foregoing varieties, except the *Cipo,* are the ones most frequently exported. The quality has been greatly improved since the enlargement of the export trade. Immense quantities of these varieties are sold on the local markets.

Tangerines grow well and are very productive but are usually marketed locally. A few of those grown in their optimum climatic area are shipped. They are thin-skinned and of excellent flavor. For the most part they have been planted in a navel orange climatic area.

In 1939, just before the war interfered, 170,000 boxes of grapefruit were exported to England.

A number of varieties of lemons such as the Eureka, Genova, and Villa Franca, do well but are little planted and never cured for export trade. Sweet lemons are planted on almost every homestead for medicinal purposes. The production of lemons is estimated at more than a million and a half boxes, one-third being grown in the State of São Paulo. A small quantity of lemons is exported chiefly to England, Canada, and Argentina.

Both sweet and sour Persian limes grow wild in many parts of the country. The Mexican lime has also been planted in many regions.

Almost every family has a few lime or lemon trees in the back yard, where the fruit can be picked as needed.

Oranges for Export. It has only been within the last few years that the Brazilian orange has appeared in the European markets. A phenomenal growth in the annual exportation from 359,000 boxes in 1927 to more than 5,000,000 boxes in 1939, shows how rapidly this industry has developed. In selling oranges to Europe, the grower has to compete with the cheaper grade of African oranges. This made exportation almost impossible until the development of the Little Bahia. Today the Brazilian has less trouble meeting his competitors. For many years scientists have been trying to find a process by which orange juice could be canned without losing flavor or vitamin content. A large canning factory is being erected near the city of São Paulo. This will be a great aid to the Brazilian orange grower in disposing of his surplus or unexportable crop.

The principal regions for growing oranges are the districts around the cities in the States of Bahia, Minas Gerais, Rio de Janeiro, and São Paulo. Most of the crop is exported through Rio de Janeiro and Santos. The season of harvest in Brazil is from May to December, while in the United States oranges are gathered from October to May. Thus there is little overlapping of the two producing seasons.

There are about 20,000,000 orange trees in Brazil, which are distributed as follows:

Area	*Number*
State of Sáo Paulo	8,985,000
State of Rio de Janeiro and Federal District	6,500,000
State of Minas Gerais	2,465,000
State of Bahia	400,000
All other states	1,650,000

With an annual production from these 20,000,000 trees of more than 35,000,000 boxes of fruit, and an export business of about 5,000,000 boxes annually, the importance of orange production is easily seen. When exportation to Europe—England has always been the principal importer of Brazilian oranges—became impossible during the war, larger shipments were made to Argentina. As late as 1940 almost three million boxes were exported. The Brazilian Government has always maintained strict regulations and inspections for the exportation of oranges. Recently quotas have been established so that an equitable distribution of business can be made between growers and exporters.

Packing houses, both along the coast and in the interior, are well equipped for properly handling a large volume of export fruit. At least one railway system—the Paulista—has an adequate supply of refrigerated cars for hauling the fruit to the port of Santos. Special trainloads of oranges leave the principal producing centers daily during the export season, and prompt loadings are made to the steamers leaving for foreign ports. Some storage facilities are provided both in Rio and Santos, but not enough to make the export season as long as it might be.

For the 1948 citrus exportation from Brazil, estimates are as follows: Europe, approximately 700,000 boxes; England, 1,000,000; Canada, 100,000, and Argentina, 2,000,000 boxes.

Orange Oil. With the export trade reduced to half the normal amount by the war, the Brazilian orange grower had little outlet for his product. A few growers abandoned the care of their orchards. Some dug large holes and buried their crops. The Government of the State of São Paulo conducted an intensive campaign to increase local consumption. Trucks were provided free to haul oranges over the city of São Paulo so that everybody had a chance to buy oranges at a very low price. This was done for two years, and a fairly large part of the crop was disposed of at a nominal price.

The United States consumes a large amount of orange oil, extracted from the rinds. As the Spanish and Palestine markets were practically cut off by war conditions, a great demand was created for this product from Brazil. A large quantity was exported in 1941, and a still larger amount in 1942. By 1948, world production and transportation of orange oil had caused such a drastic reduction in its price, that it could no longer be produced profitably in Brazil. A small amount originated as a by-product in factories producing jelly, concentrated juice, and wine, but this was not exported in any appreciable amount. In 1943 about 250 tons were exported. The oil was extracted in a large number of small plants, and the product was decidedly uneven in quality. The Federal Government adopted standards on qualities to be exported, and the Bank of Brazil financed producers so that better market conditions could be maintained.

"Tristeza." Just as the orange export business was reaching commercial importance, World War II brought it to a practical standstill. Shipping space was no longer available for fruit. A sinister obstacle now looms before the Brazilian orange grower in the nature of a blight that has killed millions of trees. Its presence was first detected in 1937 near the city of Taubaté, between the cities of Rio de Janeiro and São Paulo.

Since then, its ravages have been felt in widely scattered sections of the State of São Paulo, and in some other sections of Brazil. The same disease, or a similar one, was described in Africa in 1910, in Java in 1928, and in Argentina in 1931.

The cause of the disease is unknown. Trees affected die out. First the leaves become a sickly yellow, then they begin to fall, and the root system deteriorates simultaneously. Sometimes the trees die quickly, sometimes they linger two or three years. Groves may die out entirely. At least 60 per cent of the trees are certain to die if on rootstock subject to the disease.

Any citrus budded on sour orange stock seems to be easily susceptible. Citrus budded on sweet orange stock seems to be immune. So far the only procedure recommended is a complete substitution of trees budded on sour orange stock. Many growers have found this uneconomical and have abandoned orange production. Apparently the orange-growing region of the State of Rio de Janeiro has been less affected so far than the State of São Paulo. Only lucrative prices for oranges will cause the industry to flourish again.

Prices of citrus fruits of all kinds have increased on the domestic market, so that the grower does not have to depend upon foreign markets as the only profitable outlet for his fruit. Lemons, tangerines, and, to a limited extent, grapefruit, find a fairly satisfactory home market.

Government research agencies are doing everything possible to discover the cause of *tristeza* and a remedy. This disease and some similar diseases have spread over most of South America where citrus fruit is produced. It may be the same as "orange quick-decline disease," as described in California, now generally conceded to be a virus disease.

Brazilian Bananas. Next to the orange, the most important fruit crop of the country is the banana. It is grown almost everywhere except in the most southern section of Brazil and in the high altitudes subject to light freezes. The banana is a tropical plant and is severely injured by freezing weather, although it may produce fruit where there are occasional frosts. The plant sends up new shoots from the base when the top has been killed by frosts.

The banana plant, which has a most beautiful foliage, varies in height from four to fourteen feet. There are many varieties of the fruit, some being about the size of one's finger, and others more than a foot long and several inches in diameter. The tiny Gold Banana (known as Lady Finger in Cuba and the Antillean region of extreme south Florida) is a rich golden color, has fruit two or three inches long, and looks as though it were a miniature reproduction of the real fruit. The

silver variety is white, almost colorless, and very popular as a table fruit, but it is not exported. The apple banana has a slight apple flavor, and the fig and quince varieties get their names from these fruits because of real or fancied similarity of flavor. There is an endless and fascinating variety.

Bananas are propagated by planting shoots from the underground rootstock. (One variety produces viable seeds.) After the stalk has produced a bunch, it is cut down, and a young shoot from the rootstock produces the next bunch. The best plantations are in the low flat fields along the coast, the most important of these being near the cities of Rio de Janeiro and Santos. The country around Santos alone has more than 5,000,000 of these plants growing.

The variety usually grown for exportation is the low-growing Chinese banana—*nanica* (dwarf banana), as it is called in Brazil. The plant is dwarfed in size, but neither the fruit nor the bunch is dwarfed. The fruit is slightly larger than that commonly found on the market in the United States. When the bunch is developed, it hangs nearly to the ground. The quality of the fruit is much superior to the flavorless Gros Michel variety found on sale in the United States.

Bananas are generally harvested and allowed to ripen under artificial conditions. This is the case with some varieties even when grown for family use. They ripen best in a dark room, and many of the banana export ships have cooled holds in which the fruit can ripen en route.

Argentina is the best customer for Brazilian bananas, buying about 10,000,000 bunches a year. Some 2,000,000 bunches of *nanica* are exported to Great Britain annually, and 60,000,000 bunches are sold in shops in Brazil itself. A large quantity is purchased every year by jam and fruit-preserving factories. A single bunch of excellent bananas can be bought in Brazil for one-twelfth the price the same number of fruits of inferior quality cost in the United States, so it can easily be seen why the banana is such a popular food. Home consumption defies calculation. Bananas are an everyday article of diet for millions of people in Brazil. All bananas imported into the United States are raised in Central America and the Caribbean Islands and adjoining mainland. None are imported from Brazil.

In Brazil, most varieties of bananas are served raw, but some are eaten only when cooked. Different kinds have special uses. They may be fried, baked, or boiled. Many kinds of jams and marmalades are made from the banana. Some bananas are dried. Banana flour and flakes are found on sale in the city markets. In Santos there is a modern plant for drying and preparing various fruits and vegetables, and this plant manufactures the flour and flakes of the banana and also banana

malt, a prepared food for invalids. By a process used in this factory, the fresh banana is completely dehydrated in from six to ten seconds, so rapidly that the vitamin content of the fruit is not affected. Not only is the dried product a palatable invalid food and, better still, a food for children, but it can be used in candies and ice creams. There are great possibilities for these manufactured products, not only for home consumption, but for exportation. The manufacture of banana products in large industrial plants would offer a sure outlet for surplus bananas that could not be exported as fruits, thus stabilizing the market and bringing to the nation an increased income.

Banana Plantations. Along the coast, southwest of Rio de Janeiro, plantations thousands of acres in extent have been established. The low-lying flats above tidewater, covered with rain forests, are especially productive. Drainage canals provide waterways for barges to carry the crop to shipside. But for export, the cutting has to be so calculated that the bananas will remain firm and not ripen before reaching the market. Wherever the *nanica* is obtainable, the Caribbean banana is not popular.

The establishing of a *nanica* plantation is an art. After the area of virgin forest—often a hundred acres, a thousand acres, or even more in extent—has been determined on, and drainage provided, the grower is ready to begin. Surveyors lay out the rows, axmen fell the trees and clear paths through the underbrush, and spademen bury the banana rootstalks at intervals of fifteen feet. In this rainy, humid climate, the limbs and most of the trunks of the felled trees will have rotted in two years, when the first crop ripens. The successful grower must be an astute gardener, capable of tending a garden on a gigantic scale.

Importance of Bananas to Brazil. An American in Brazil, after having traveled extensively on the railroads to the interior, remarked, "Banana plants are as common along the railroad lines as burdocks are along the railways in the United States." Banana plants are so ubiquitous that they sometimes appear to be a weed rather than a cultivated plant. In fact, all over Brazil, at almost every railway station where the train stops long enough for sales to be made, bananas are offered in little baskets woven of split bamboo.

It is estimated that a hundred million bunches of bananas are produced in Brazil each year, and undoubtedly the country ranks as one of the leaders in the work production of this fruit. An English company has almost two million plants on a single plantation and exports bananas to England in its own ships.

XV

Other Fruits

A GREATLY varying climate, a long coast line, and high mountainous regions with nearby plateaus give Brazil extraordinary ranges of soil and climate for fruit production. But it is only recently that fruit culture has passed out of the home orchard phase into commercial production. This has come about because of the possibility of exporting fruit and of supplying the demands of large industrial plants that prepare fruit products.

A century or two ago, plant scientists considered the orange an essentially tropical fruit. When Florida, California and Japan became exporters of citrus fruits, the orange became known as subtropical fruit, although Japan is closer to the Arctic Circle than to the Equator. Bahia, the birthplace of the Washington navel orange, is midway between the Equator and the Tropic of Capricorn.

Not all lands lying between the Tropic of Cancer and the Tropic of Capricorn have a tropical climate. At high altitudes, even near the Equator, the climate is temperate. Where fairly high altitudes are found within the tropics, fruits of both tropical and temperate zones can be seen growing in the same seasonal orchard.

Brazilians are fortunate in having a succession of fruits—along with fruits like the banana, the avocado, and the papaya, which ripen practically the year round. Nature is so lavish that man has only to plant and harvest. This is even true of many fruits domesticated on other continents, which have been successfully grown in Brazil. There are very few tropical or temperate zone plants that cannot find a congenial home somewhere in the vastness of Brazil. The dry *sertão* (semi-desert) and the extensive *caatinga* (a brush and scrub forest vegetation similar to *chaparral*) have not yet been exploited. They present a challenge to the plant research scientist.

In many cases native fruits in Brazil are so cheap that it is not worth while to preserve them by refrigeration. The reverse is true in the temperate zones, where fruit harvests fall into a shorter period,

and where but few fruits—apples, for example—can be kept for long periods, in home cellars.

It is not surprising that only slight attempts have been made to cultivate native fruits, since they are to be had for the picking by anyone who is alert enough to beat the insects, birds, and four-footed animals to them. As to deciduous fruits, all that Brazil could consume might be grown on its extensive plateaus that have an altitude of from two to four thousand feet.

In recent years Brazil has exported annually between five and six million boxes of oranges, and more than 16,000 tons of other fruits. At the same time more than 20,000 tons of fruits have been imported each year. Grapes, apples, and plums come from North America. Grapes, pears, apples, peaches, and plums come from Argentina, and, during other seasons of the year, from Chile, South Africa, and New Zealand. With this interchange it is possible for the cities and larger towns to have an adequate supply of high-priced fresh fruits all the year round from foreign countries. The rate of consumption of fruits per capita, among all classes, is definitely on the increase. There is also increasing consciousness, on the part of Brazilian fruit producers, of the enormous home market.

Pineapples. The third fruit of importance in Brazil is the pineapple, *abacaxi.* Some 85,000,000 pineapples are exported to various parts of the world annually, a very small part of the total production consumed locally. The pineapples sold in the United States come mostly from Cuba and other Antillean regions. A few are produced in Florida and the canned product comes from Hawaii.

The best of the Brazilian varieties are grown in the northern part of the country—in Pernambuco and nearby states. Argentina is the best customer for this fruit, with Great Britain and Uruguay tied for second place. If the Brazilian applied as much scientific knowledge to the growth of the pineapple as is applied in Hawaii, it is probable that in a short time the pineapple would rank as one of the major fruit crops in the export trade of the country. Pineapples canned in Pernambuco and in Rio de Janeiro are on the shelves of the retailers in even the smaller interior towns, and a small export trade has been developed. The product, though generally good, is variable, and, as is the case with other canned goods in Brazil, too expensive for universal consumption. With more attention paid to selecting the best fruits for canning, the export trade should grow.

Pineapples are reproduced through the planting of suckers, slips, or crown slips. The sucker arises in the axils of the leaves while the

fruit is developing and ripening. The slips develop at the base of the fruit, and crown slips develop at the base of the crown of the fruit. The crown itself is rarely used for planting. Suckers, slips, and crown slips are equally good, provided they have attained the size of suckers. Seeds, although plentifully produced in some pineapples, could not, practically, be employed for fruit production. It takes anywhere from three to five years to produce a ripe pineapple from a seed. Scientists employ seed for originating new varieties. At least a hundred varieties are known. No variety is superior to those grown in northern Brazil, in the States of Pernambuco and Paraíba.

A deep, sandy loam is preferable for a pineapple planting. Where the science of fertilizing is well understood, a soil ranging up to 95 per cent of sand and insoluble matter will produce delicious pineapples of excellent keeping quality. The wild ancestors of several species of pineapples still exist in the hinterlands of Brazil, where the plant originated. Brazil has progressed less than some other countries in the culture and canning of this delicious fruit, although it is the birthplace of a number of species.

Avocados. One of the most nutritious and delightful fruits recently introduced into international use is the avocado, called *abacate* in Brazil. It grows easily and produces well in the Brazilian climate and has been used for many years as a dessert fruit. Only in the past three decades, however, has it been propagated by modern horticultural methods. Today commercial plantings use only budded trees. More than one hundred thousand budded trees have been planted in the State of São Paulo. Agents of the United States Department of Agriculture collected many varieties from tropical countries, and introduced some of the more promising ones into Brazil. In consequence it is possible for the grower to supply the market with avocados throughout the year. This fact should make it possible for home consumption to be enormously increased and for the grower to export the fruit to Argentina and Europe.

In the United States the avocado is used almost entirely as a salad fruit. However, it is also a delicious dessert fruit. The favorite mode of preparation in Brazil is to remove the skin, pass the pulp through a sieve, and flavor the paste with sugar and lemon. This is served in individual dessert molds. Avocado cut into small cubes adds much to any fruit salad. The pulp is as nutritious, pound for pound, as loin steak. There is no doubt that it will become a more popular food as it becomes more widely known and lower-priced.

No other country in the world has so large an area capable of producing this nutritious fruit as Brazil. Nowhere else in the world is there so large a population already familiar with the avocado and fond of it. The introduction of the Guatemalan and Mexican varieties and hybrids by the Agricultural College of the State of Minas Gerais in 1925 opened a new era in avocado culture. One São Paulo firm alone, in 1939, shipped over two and a half million avocados to the State of Rio Grande do Sul. The same firm has also exported excellent avocados to Europe. It will require several decades of expansion for the production to equal the demand.

Papayas. The scientific name of the tree that bears papayas is *Carica papaya.* The fruit is called *mamão* in Portuguese. The papaya is a native fruit of tropical America and very popular in Brazil. Although it grows on a tree, it is very much like a cantaloupe or melon in appearance. It is delicious, healthful, and rich in pepsin. It is one of the cheapest fruits on the Brazilian market. But it does not ship well, for the papaya must be eaten soon after it has been picked. The book *Foods America Gave the World* [1] gives the following interesting description of the fruit: "The papaya is striking in appearance, growing very straight, with a crown of broad palmate leaves at the summit only. Old specimens may attain a height of thirty or forty feet, and may have several branches; but as a rule there is a single stalk from seven to twelve feet in height. The blossoms appear and the fruits are borne by the trunk, and the fruiting papaya tree with its leafless trunk covered with squash-like fruits is a remarkable sight." The fruits vary in size and shape. Many weigh up to twenty-five pounds. They are usually allowed to turn a golden color on the trees, and then, though not ready to use, they are picked and allowed to ripen fully. When they are ripe, the pulp is a rich golden color. It may be eaten just as one eats a cantaloupe; but the fruit is so large that it is usually sliced. It is served with sugar and lime juice. The interior surface of the papaya is lined more or less thickly with black seeds which have a peppery taste. Some people like to chew a few seeds along with the pulp. Papaya, besides being delicious, is said to be one of the most easily digested of all fruits.

Papain, a proteolytic enzyme, is contained in the juice of the papaya. The grower scarifies the surface of well developed, green fruits still on the tree, which makes the juice exude copiously. This is allowed to

[1] A. Hyatt Verril and Otis W. Barrett, *Foods America Gave the World* (Boston: L. C. Page & Co., 1937), p. 219.

dry on the surface of the fruit, and then collected. Papain is marketed in the drug trade. It is used as a digestant.

Mangoes. Although the mango is not native to America but comes from India, it grows in all of tropical America. When the fruit is of good quality, it is most delicious. However, the inferior grades have a typical "hawser waste dipped in turpentine" taste. Mangoes generally are not an easy fruit to eat gracefully at the table unless they have been peeled and sliced before being served. The finer kinds are eaten from the half shell, with a spoon, like the cantaloupe.

Seedling mango trees of the turpentine family grow to be very large and reach a very old age. The trees are beautiful in form and are sometimes used as shade or ornamental trees. Especially is this true in the "rain forest" zone. The earlier importations produced a worthless fruit but a magnificent tree, such as one sees in street plantings in Belém, capital of the State of Pará. It is impossible to harvest the fruit (which is poor anyway) from such trees.

In commercial orchards, propagation is carried on by budding and grafting. Scientific experimentation is improving the varieties. Seedling trees are extremely variable in the quality and quantity of fruits produced. One of the most popular Brazilian varieties is the Rosa, which has the rich color of a full-blown red rose. It is one of the most decorative fruits for a dinner table. The Itamaracá variety produces a much more delicious fruit than the Rosa but lacks decorative qualities. The fruit may be cut in half and eaten with a teaspoon—tidily. Mangoes of the Espada variety are nearly all seedlings and contain some distinct individuals. The fruits are usually very large and less fibrous than the Rosa, but they ripen with a green color and are therefore less decorative. The pulp from three fair-sized fruits will fill a quart container. The preserved Espadas put out by a cannery in Minas are excellent. A delicious ice cream is made from the fruit, and several dishes of sweets, a jam, and a paste.

Varieties of mangoes are legion. Almost every region has one or more varieties of outstanding qualities which are highly lauded locally. The Rosa is the most beautiful, though generally inferior in other qualities to some dozen other varieties. In certain mango varieties there occurs the following interesting phenomenon: Of a number of shoots originating from a single seed, only one (frequently of weaker growth and hence subject to early suppression) is the result of sexual reproduction. The others originate from adventitious buds within the seed covering and thus reproduce fruit true to the mother tree. The very finest varieties of mangoes are grown in Florida, but these have

apparently never been successfully introduced into Brazil, although numerous attempts have been made.

The mango can be shipped fairly well when crated by an expert. It is becoming more and more popular every year with the fruit epicures of the United States.

Guavas. Dessert Number One all over Brazil is guava paste, called *goiabada,* served with cheese. Guava jam and jelly are less well known products of this fruit. The fresh fruit has little or no market value as such but thousands of tons are used by canneries. The trees grow wild all over Brazil, but commercial use of the fruit is limited principally to the States of Rio de Janeiro and Pernambuco. In the County of Campos, State of Rio de Janeiro, more than a thousand tons of guava paste are prepared every year. Many of the guava products are made in small establishments, but there are two large industrial companies that make a specialty of guava and quince paste—the two sweets having the largest sale throughout Brazil.

Jaboticabas. There are so many kinds of fruit grown in Brazil that are known only locally that it is possible to describe only a few of the most interesting. One of the most characteristic fruits, and one most loved by the Brazilian, is the *jaboticaba* (*Myrciaria cauliflora*). The fruit is like a large, purple muscadine, but it grows on trees. The limbs and trunk of the trees are covered with flowers during the first spring rains in September, and the fruit generally ripens before the end of November. The individual fruits range in size from more than an inch in diameter to a small marble. They are delicious but the pulp is not usually swallowed. The number that a small boy can eat is proverbial. A strictly Brazilian fruit, it grows in regions where freezes do not occur, from south of the Tropic of Capricorn northward. Before the advent of the Europeans, native Indians had planted this luscious fruit throughout the region.

The seeds lose their power of germination in a short time. Fresh fruit, sent from Rio by steamship, had lost its germinating power by the time it reached Washington. Of two hundred and fifty grafted trees consigned to New York in perfect condition, not one reached the consignee alive. A few trees from seeds are producing in southern Florida.

In the higher altitudes of Brazil the tree grows natively in humid hollows abundantly supplied with organic matter. When it is planted in orchards, irrigation and fertilization are usually needed. The rain forest region, whose soil is abundantly supplied with humus, produces

the finest and most luscious jaboticabas.[2] Jam and jelly are easily made from the jaboticaba, but they are manufactured on a very small scale.

Grapes. Table grapes and wine grapes are produced most extensively in the southernmost state, Rio Grande do Sul. The best grape growers from Europe happened to settle there, and the weather is favorable. Where rainfall is heavy or likely to be heavy, the cost of spraying grapes may be greater than the value of the crop. On the plateau near the city of Caxias is a vineyard of Isabella grapes brought from the United States and planted in 1881.

The State of São Paulo, crossed by the Tropic of Capricorn, hence latitudinally in both temperate and tropical zones, has produced and marketed unusually fine table grapes—for instance, the Niagara, a luscious grape. The same variety has been grown and marketed in the State of Ceará, near its capital, Fortaleza, only a few degrees south of the Equator.

The principal wine-producing states are Rio Grande do Sul, the southernmost state, and Minas Gerais, one of the middle states and well within the tropics. In Minas, wine from the Niagara has the characteristic delicate Niagara aroma. Innumerable varieties of wines are produced, and a great effort is made to equal European qualities. Unfermented grape juice, which is sold all over Brazil, is bottled principally in São Paulo and Rio Grande do Sul. The grape juice put up by the Seventh Day Adventist College, at Santo Amaro, São Paulo, rivals the best North American brand in quality. A cooperative association in Garibaldi, Rio Grande do Sul, owns a model winery and in 1943 had thirteen wine stations in the interior. More than 70 per cent of the viticulturists in the region joined this association, which now ships fifteen million cruzeiros worth of wine to Rio and the northern markets of Brazil.

In the State of São Paulo, Niagara and other early grapes are shipped in quantities in January (midsummer). Southward from São Paulo, the distinct seasons of the temperate zone prevail. From Rio northward, there are no distinct seasons, only dry and wet periods. The periods of rains, following the trade winds, move gradually northward, reaching the State of Ceará by mid-October. Their retarded advent retards the ripening of grapes. Thus Brazil gives the Niagara and other table grapes about ten months in which to ripen. The production of both table

[2] Additional material on the jaboticaba may be found in the United States Department of Agriculture Bulletin No. 445, *The Brazilian Navel Oranges of Bahia, With Notes on Some Little-known Brazilian Fruits.*

and wine grapes is greatly on the increase, and in São Paulo during the grape season enormous quantities of grapes are crated and marketed.

Brazilian grapes are cultivated only in the plateau region, but not throughout it. Some parts of it are too wet. Rains and fog are the great enemies of grape production.

Apples. Imported apples are for sale everywhere—in the markets of cities, small towns, and resort places. They are commonly designated as "from California" no matter whether from the State of Washington, New Zealand, or South Africa. The Brazilian is "apple-minded" and will pay a good price for a beautiful specimen.

There are many small areas in Brazil suitable for apple production—sufficient to supply the whole population—but orchards on a large scale have not been developed, although much progress has been made.

Quince. Half a dozen varieties of quince are grown in Brazil—some from the Orient, some of European origin. It is grown principally in the mountainous regions of the State of Minas Gerais, which has a decidedly temperate climate and at the same time a rich soil. The quince is used extensively for homemade jellies and marmalades, and the fruit is generally sold not by the bushel or by weight but by the hundred. Just why this method of sale should prevail no one knows.

In 1932 a terrible leaf disease, *Entomosporium maculatum,* began to attack quince orchards. In a few years the disease had so devastated the trees that it became necessary to import the fruits from Argentina to keep the factories going which had been set up especially for preparing quince marmalade. Through the work of two brothers, Josué and Isaias Deslandes, phytopathologists of the Federal Ministry of Agriculture, an effective method of combating the disease was found. A spraying of a sulphur-calcium mixture is made during the dry winter season when the trees are leafless. After the leaves sprout, further sprayings are made with Bordeaux mixture. With this treatment the trees not only have been restored to a healthy condition but are far more productive than before. As quince orchards were mostly owned and cared for by small landowners, it was a brilliant piece of extension work to convert them to the use of these mixtures. In the one County of Delfim Moreira, State of Minas Gerais, more than a million quince trees are treated each year.

Peaches. Excellent varieties of peaches are numerous in Brazil. Most of them are Oriental strains, which have arrived by way of the

southern part of the United States—for example, Waldo, Elberta, Jewell, and Hall's Yellow. Some of the Persian group have almost become wild.

The great difficulty in growing peaches in Brazil is to protect them from the fruit fly. Some Japanese orchardists go to the trouble of wrapping each individual peach in a paper bag, which is tedious and expensive. Now that spraying processes are coming into more common use and better adapted varieties of peaches are being offered by nurserymen, the production of peaches will probably increase. In the State of Rio Grande do Sul, production is already on a sufficiently large scale to supply the canners with enough peaches for the home market. A number of hardy, productive varieties of peaches have been developed in São Paulo.

Figs. Fresh figs have attained a size, quantity, and quality unknown in the United States. This has come about because of the immigration from Portugal and Italy of highly trained and indefatigable orchardists. Figs with twice the diameter of ping-pong balls are sold by the dozen in the Rio and São Paulo markets. These figs are as tender as strawberries and as delicious as peaches. They are grown principally in the State of São Paulo. Curiously enough, Brazilian varieties are almost identical with those grown in the southern United States—Brunswick, Brown, Turkey, Lemon, and White Portugal. The regions in which fig growing has been carried on extensively are too humid for drying figs.

Miscellaneous Fruits. Large, luscious strawberries are marketed in the cities. The principal varieties grown in Brazil originated in Europe. Laxton's Noble, the favorite, is planted in April or May and ripens a crop about a year later. The quantity produced has been greatly increased in the last ten years, coincident with a greatly improved product and better packing methods.

The Japanese persimmon, or Kaki, is widely distributed in Brazil and is occasionally found on the markets. It is grafted on the native Brazilian persimmon, which has a smaller tree trunk, more willowy branches, and more pointed and smaller fruit than the wild North American persimmon.

Japanese plums are among the fruits that have been imported. Among those grown most commonly are the Kelsey, Wickson, Shiro, and Wildgoose. These are not grown in sufficient quantity for marketing through commercial channels.

Vitamin-conscious readers will be interested to learn that among the fruits commonly grown in Brazil there are some which have proved exceptionally rich in vitamins. Mangoes and papayas, especially those with orange-colored flesh, have a very high content of Vitamin A. Some guava seedlings are exceptionally high in Vitamin C (ascorbic acid), and can be used commercially in the preparation of a concentrate of this vitamin.

Sapodillas, various anonas, jakfruit, ambarella (or Otaheite apple), passion fruit, Surinam cherry, and tamarinds are other characteristic fruits cultivated in Brazil.

XVI

Nuts of Brazil

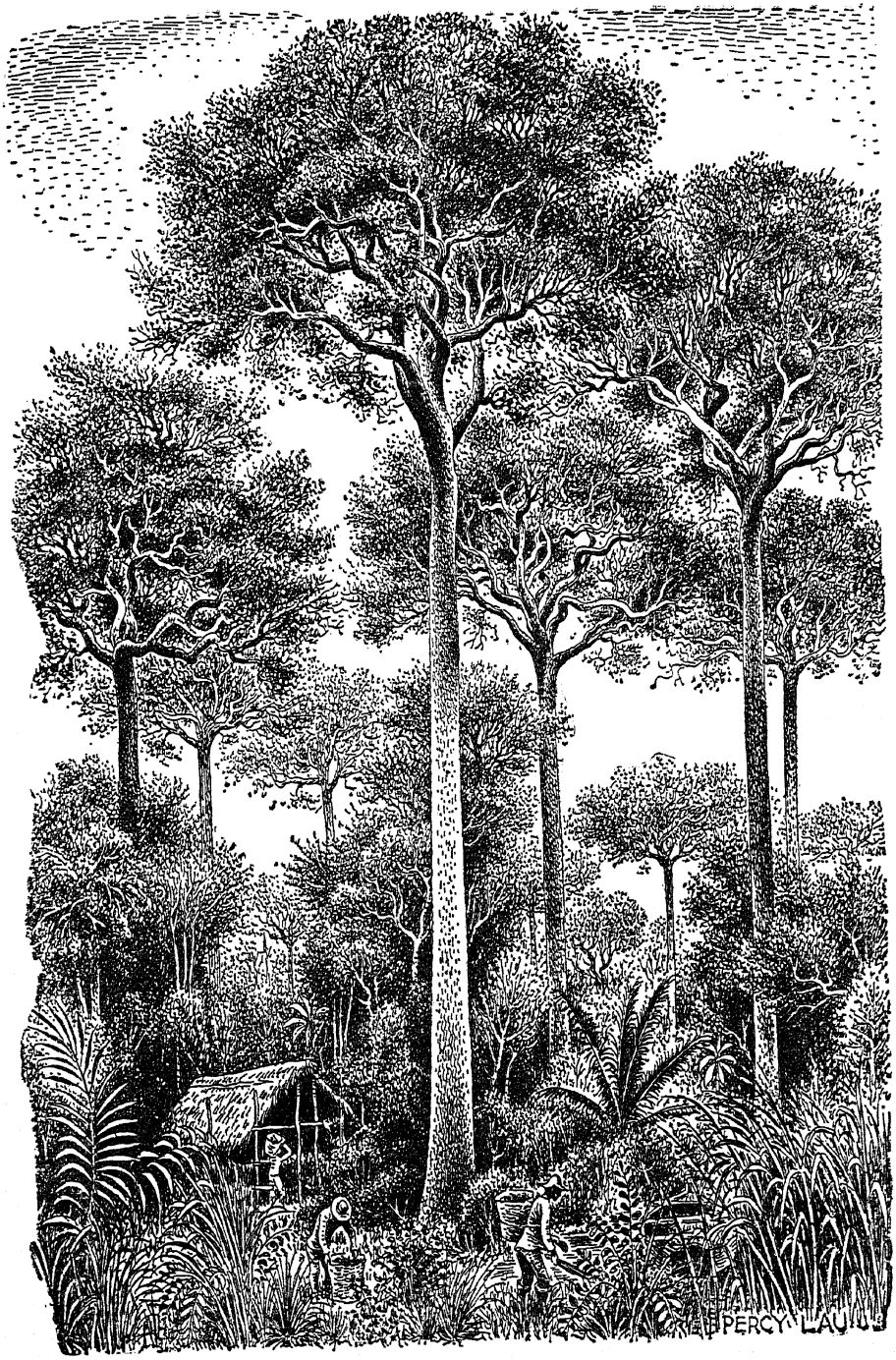
BRAZIL undoubtedly has areas with soils and climatic conditions suitable for growing many types of nuts, edible and oil-producing, of both the tropical and temperate zones, but so far only the wild uncultivated nuts have been gathered on a large scale. Some plantings have been made, however, and in a few years there may be an increase in the production of the so-called European and American nuts—walnuts, pecans, hazelnuts, chestnuts.

Brazil Nuts. The only product of the country that is always sold in the United States under the name "Brazil" is the Brazil nut. It is the seed of trees which grow wild in the forests of the Amazon Valley. It is hard to imagine the size to which these trees grow. The average height is from 75 to 100 feet. The diameter is from 4 to 6 feet at fifty feet above the ground. The scientific name is *Betholletia excelsa.* The nut is commonly called *Castanha do Pará,* or Pará chestnut, in Brazil.

The nut grows in a shell, called *ouriço,* about the size of a husked coconut, which contains from fifteen to twenty nuts. This outer shell is so hard that a loaded wagon could run over one and not crack it.

In the Amazon forests where the trees abound, there are no railroads or automobile roads. The State of Amazonas, which is more than twice the size of Texas, has only 250 miles of automobile roads but more than 20,000 miles of navigable rivers. The nuts are loaded on canoes in small streams and taken to the tributaries of the Amazon. When large shipments are piled up, motor boats take them downstream to the Amazon. Then ocean-going vessels carry them some two thousand miles to the great export city of Belém, sixty miles up the river from the coast.

The annual harvest begins in January as the rainy season comes on. The heavy shells, falling as they ripen from the enormously high trees,



The majestic Brazil nut tree

are dangerous to men on the ground below. It is necessary to avoid days of high winds for this work. Each shell weighs from 2 to 4 pounds and in falling reaches a speed of from 800 to 1,000 feet a second. The shells are broken open where they are found, with a heavy knife called a *terçado*. Thus the heavy shells are left in the forest, and only the seeds (nuts) are carried to shipping points. This is necessary in order to reduce both weight and volume.

The native gatherers live along the river, either in permanent homes or in temporary huts. They go to the big trees of a certain area during the harvest season. Their first job is to cut trails through the dense forest and keep them open. An active worker can gather from 700 to 800 *ouriços* a day. When he has a supply on hand he will take them by canoe down the river, to the nearest trading center. He exchanges the nuts for supplies, but seldom receives actual cash.

How many Brazil nut trees exist in the vast Amazon basin is not known, but it is estimated that nuts are gathered from 100,000 trees, which is a small fraction of the total number of trees. The amount of the annual crop depends on their barter value. When the supplies offered these jungle men as payment are not satisfactory, they simply abandon the nuts in the forest. In a few months the humidity causes these nuts to spoil or sprout.

Within the last few years it has been the practice to ship about half the nuts exported as shelled meats. The meats are packed in boxes weighing sixty-six pounds each. This shelling has been made possible by the use of a simple hand-operated machine, similar to a home bottle-capper. The nuts are first soaked for 24 hours, then placed in boiling water for from 3 to 5 minutes. There are fifteen shelling plants in Brazil, eight of them in Belém, Pará. The Brazil nut is one of the richest and most nutritious nuts used by mankind. Two Brazil nuts are said to have food value equal in number of calories to one egg. Each 14 grams (about half an ounce) of nuts furnish 100 calories. The following is the chemical content of the nut:

	Per Cent
Digestible protein	17
Fat	67
Hydrocarbonates	7
Mineral salts	4
Water	5

The nut has a very high albumin content. It contains a specific albumin called excelsin—a food of high nutritional value, especially for growing children.

Some years the nut crop of Brazil is a failure, and the large number of people who make their living by gathering the nuts for shipment are reduced to poverty.

There are only two small plantations of Brazil nut trees in the Amazon Valley, and since it takes fifteen years for the trees to come into bearing, it is not possible to calculate their economic value. For twenty years unsuccessful attempts have been made to domesticate these trees in Far Eastern tropical countries.

Most of the crop was exported to Europe before World War II, but now it goes to the United States. In 1910, 10,000 tons with a value of $1,500,000 were exported from Brazil, while in 1940 a total of 20,000 tons of nuts and 7,000 tons of shelled meats, valued at $2,800,000, and in 1945, 30,000 tons of shelled nuts were exported. From these figures we can see that, while the number of tons of nuts exported increased more than twofold in thirty years the money they brought in 1940 was less than twice as much as it was in 1910. Because of the decreased value of Brazilian money, it has often been true that although the quantity of an article exported has been increased, the amount paid for it in pounds sterling or American dollars has remained much the same. In 1910 the American dollar was worth three Brazilian milréis (the standard coin of exchange, now cruzeiro). In 1940 the dollar was worth nineteen milréis, which means that a person received six times as much Brazilian money for an American dollar as he did in 1910. The purchasing power of the milréis in Brazil has decreased since 1910 to much the same extent. But the dollar changed too during this period.

The export trade in Brazil nuts has passed into the hands of Brazilian firms, and an effort is being made to reduce the wide gap between the local market price and the selling price on foreign markets. The fact that the crop is bought in Brazil in the first months of the year, whereas the principal retail consumption comes at the end of the year at the Christmas holiday season, forces a long hold-over period. A drive for increasing consumption was sponsored by the Brazil Nut Advertising Fund in the United States.

In the southern states of Brazil these nuts were almost unknown a few years ago. Now they are on sale everywhere, and "Brazil Nut Week" is observed during the month of August in Rio de Janeiro and São Paulo—a campaign put on to increase consumption which has had marked success.

Peanuts (*Arachis hypogaea*). The peanut is also a native of Brazil.[1] As recently as 1936 it was found growing wild in the State of Mato Grosso. In that year an agricultural explorer of the United States Department of Agriculture found uncultivated plants in the interior of central Brazil. There are twelve different species of the peanut, and all are supposed to have originated in Brazil. It is grown by farmers in all parts of the country and is used very much as we use it in the United States: roasted and in candy. One of the most popular native candies of Brazil is the *pé de moleque,* which is made from brown sugar and peanuts. The name of the candy translated into English means "foot of the street urchin." Just why it should have been given that name no one knows; in any case it not only is eaten by street urchins but is a very popular confection. Peanut brittle is not known, and peanut butter is manufactured only on a limited scale.

Mills for extracting peanut oil are not so common as in the South of the United States, but the cottonseed oil mills have equipment to crush peanuts. The peanut has an oil content of 16 per cent; this has recently been put on the Brazilian market, and a number of plants offer to contract the entire crop of farms in advance of planting. They also offer selected seed and are doing all in their power to increase production in the State of São Paulo. The Brazilian exportation of the peanut is irregular. Some years as many as a hundred tons are shipped to Europe. However, in Brazil the peanut has never become so important a crop as it is in California and the South of the United States. It is used very little, if at all, as hog food.

Babassú (*Orbignya speciosa*). The nut of the babassú tree, a tall, handsome palm, is a source of great natural wealth to Brazil. Millions of these trees are to be found in homogeneous forest formations in the northeastern states of the country. Because the shell is difficult to remove, it has been only within the last few years, after machines were invented to do the work, that this nut has become an important commercial crop. Brazil exported 30,000 tons of babassú nuts in 1936; 22,000 tons in 1937; 40,000 tons in 1940; and 44,000 tons in 1945. However, the value of the nut suddenly increased to such an extent that the 1937 exportation of 8,000 tons less than the shipment of the previous year brought almost as much money. About 98 per cent of the nuts exported are shipped to the United States, where they are made into soap, lubricants, edible fats such as margarine, and medicinal products. Every part of the babassú palm is useful. The leaves are

[1] For further information see *The Amazon Basin Brazil Nut Industry,* by Walter R. Schreiber. Foreign Agriculture Report No. 4, U. S. Department of Agriculture.

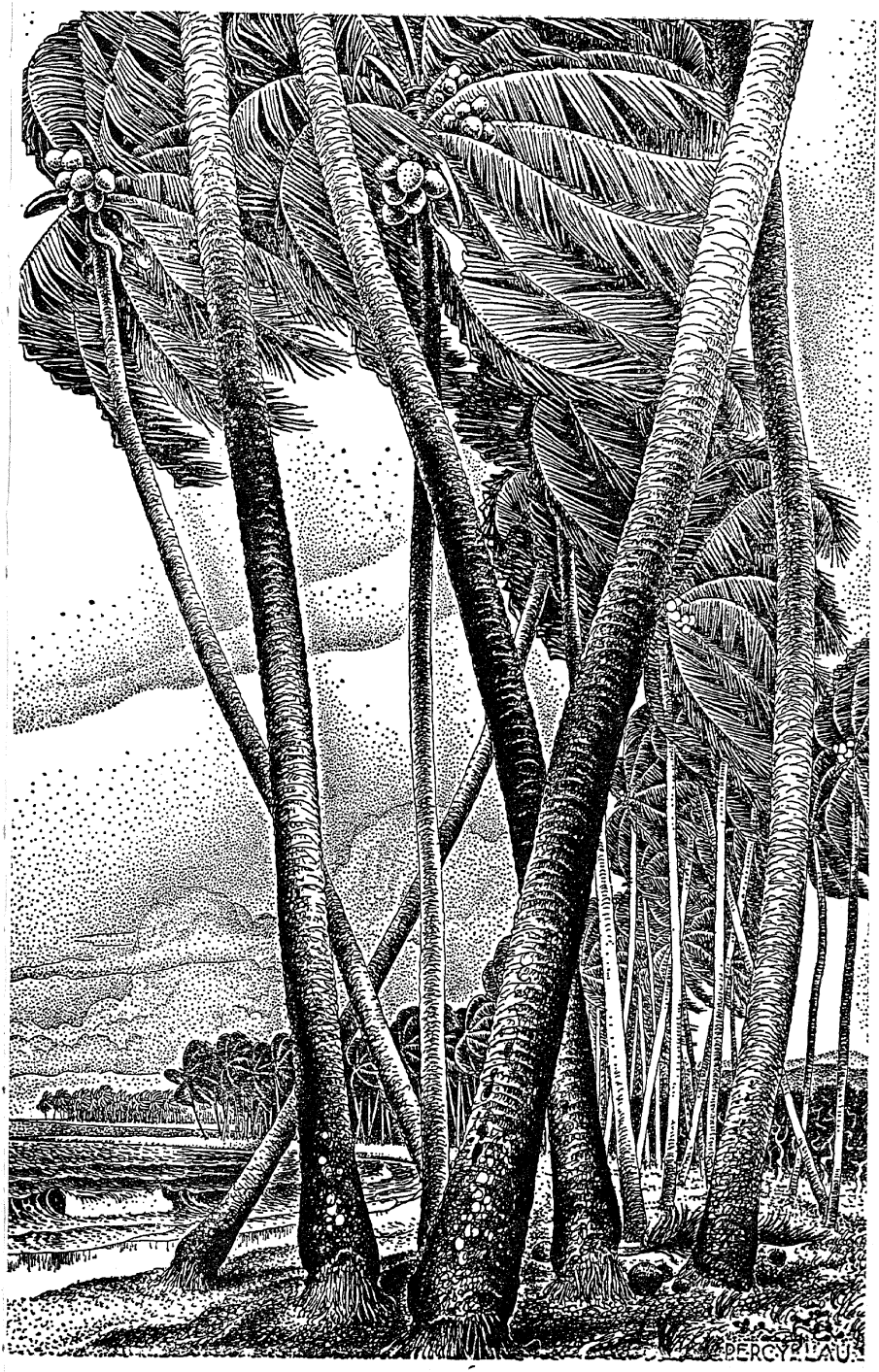
used in the manufacture of straw hats, mats, sieves, and baskets. The nuts are burned as fuel in the preparation of rubber latex for shipment. The trunks of the trees are used as building material. Various parts of the nut itself are useful, but the oil extracted from the kernel is the most valuable product, and the oil content averages around 65 per cent. A variety of products, such as calcium, acetate, methyl alcohol, acetic acid, dyes, rosins, and fuel, is derived from the nutshells.

When we remember that there are literally millions of these trees scattered over a wide area and that a single tree may produce as many as a thousand nuts a year, we realize that the babassú is an important commercial product. It may some day bring much wealth to the country. A small part of the crop is used in Brazil for oil extraction but the larger part is exported as harvested. The largest babassú area in the northeast is in Maranhão, where the total production for a five-year period (1938-42) exceeded 220,000 tons valued at 200 million cruzeiros. Piauí is second to Maranhão in both production and exportation.

The Coconut (*Cocos nucifera*). The coconut palm is not native to the Americas, but it grows in all of the tropical coastal area of Brazil. It takes one year for the coconut to germinate, and six years for a tree to bear. Forty trees are planted to an acre. A tree may continue to produce nuts until it is sixty years old.

Oil, butter, and fiber are all valuable products of the coconut palm. The oil is used extensively for the manufacture of soap, candles, and lubricants. The Brazilian coconut contains an average of 191 grams of meat to a nut, as compared with 161 grams in nuts from other countries, or 19 per cent more. The Brazilian nut also has a higher oil content. However, because there are so many other plants in Brazil that produce oil, and because these other plants grow wild, the coconut industry has never become important. Because the cost of labor is higher in Brazil than it is in coastal areas of the East Indies, Philippine Islands, and in southeastern Asia, where 90 per cent of the world's coconut groves are to be found, prospective growers could not meet the competition of the East. Brazil exports a little more than two hundred tons of coconut, mostly to Argentina.

Formerly only the nuts from trees growing along the coast were harvested, in a casual and careless way. Today, there are a number of coconut plantations, systematically and efficiently run. Probably the total number of coconut palms in Brazil is more than five million. In the State of Bahia alone, three times that many could be planted.



Graceful coconut palms, found along the coast from Rio de Janeiro northward

Most of the world's coconut supply is made into copra, or dried coconut meat. The meat is dried in the sun or in special kilns. The copra is of better quality when it is dried in a kiln. However, the additional expense involved prevents this process from being more generally used.

In the United States coconuts are for the most part sold shelled and partly desiccated, in cans or in packages. In Brazil, however, they are generally sold green. The milk, about a half pint per coconut, is popular as a beverage and is also used in cooking. The soft pulp is eaten from the shell with a spoon. Piles of green coconuts are kept on display in the cafés, and when a customer orders one, it is opened by the waiter with a big knife called a *machete*. Coconut candy is also popular with the Brazilians and on sale everywhere. Our coconut pie is not known to the Brazilians, but they have many sweets made of coconut that are not known in the United States.

The Cashew (*Anacardium occidentale*). It has been only within the last few years that the cashew, or *caju* as it is called in Portuguese, has been used as a nut in Brazil. In the past only the fruit of the tree was used, mainly in making a drink similar to our lemonade. This is one of the queerest fruits in the world, for the seed, or nut, appears to grow on the outside of the fruit, which is in reality the greatly enlarged fleshy stem of the nut.

The authors of *Foods America Gave the World,* in describing the *caju,* said: "The so-called fruits vary from pale whitish-yellow to rich crimson in color and are the shape of reversed pears, with highly polished skins, the nut being borne at the broad tip. Long before the fruit itself appears, the nuts may be seen, the fruit forming back of the seed. The fruits vary in quality, some being quite sweet while others are too 'puckery' or astringent to be edible. They are very juicy, and even the very puckery varieties have a most remarkable thirst-quenching and refreshing effect. They make excellent conserves, jellies, and pies. When raw, the shells of the nut contain a highly corrosive, poisonous juice. This is eliminated by roasting." [2] The trees grow to an enormous size and have a very wide spread.

Once only the fruit was eaten, but today the nuts are offered for sale throughout the world in small cellophane bags. In some of the large cities of the United States, there are stores devoted to the exclusive sale of cashew nuts; and candy and confectionery shops always sell them. Little attention has been paid to the production of the cashew nut in Brazil, but even so 460 tons were exported in 1939.

[2] Hyatt Verril and Otis W. Barrett, *op. cit.,* p. 209.

The Pine Nut. The Brazilian pine tree, *Araucaria angustifolia,* produces a bur about the size of a pineapple, and the seeds contained in it are a little larger than our papershell pecans. They have a thin hull. The nuts are eaten boiled or roasted. Brazilians are very fond of them, but we would not regard them as very tasty, for they are almost pure starch. Not many of these nuts are found on the market, but in season they are on sale in the stores of southern Brazil. In Paraná and Santa Catarina, where the pine grows wild in the forests, great herds of swine are turned loose in the groves for fattening when the nuts are ripe.

North American and European Nuts. After many attempts had been made to introduce the pecan into Brazil, a seedling was found, not many years ago, at Piracicaba, São Paulo, which bears a good quality of nut, and bears it heavily enough to make commercial production possible. Many grafts are being made from this tree, and it is possible that the pecan will be widely planted in São Paulo in the future. Budded pecan trees of the finest varieties are on sale by at least one nurseryman.

The so-called English walnut bears in Brazil, but has never been cultivated on a large scale. Shipments are being made from Rio Grande do Sul to the São Paulo and Rio de Janeiro markets. The American black walnut also bears well in Brazil, especially in the State of São Paulo, and if planted in good soil, it produces excellent timber in addition to nuts. Although chestnuts bear in Brazil, they are not commonly cultivated. And the American hickory nut is unknown. Each year thousands of sacks of English walnuts, filberts, almonds, and European chestnuts are imported into Brazil for the Christmas trade.

Nuts are being used in ever increasing quantities in Brazil for food and for oil production. In 1905 the United States imported a few million pounds of tropical oils, and by 1935 this amount had increased to more than a billion pounds. Brazil can produce, in great quantities, nearly all varieties of tropical oil nuts, whether native or not. As Brazil becomes more densely populated, the tendency is to enlarge the planting of these food and oil-bearing crops.

XVII

Green Oceans

DURING the sixteenth and seventeenth centuries brazilwood (*Caesalpinia*) was greatly sought after by European traders because it produced a rich red dye. Brazilwood was found growing wild in the region now known as Brazil, and traders began to call this land "The Brazils," after the tree.

Along the main avenues of the beautiful city of Rio de Janeiro thousands of brazilwood trees have been planted, and the streets have the appearance of beautiful shaded aisles. It is seldom that the visitor or tourist realizes the significance of this tree in the history of Brazil, or the part that the tree itself has played in the story of world commerce.

From its earliest known history, timber and forests have played an important role in the development of Brazil. One of the great economic periods of the country was the timber period. Soon after the discovery of Brazil, the exportation of woods from the new land became a monopoly of the Portuguese crown. Rights to ship out woods and timber were let by contract. Brazilwood, which furnished a valuable dye material, became the first important export article. During the sixteenth and seventeenth centuries great fortunes were amassed in Brazil, Portugal, and France, through this lucrative dyewood trade. Up to the present, foreign trade in both rare woods and the most common types of lumber pines has been carried on from northern and southern ports. Much has been written about the forests of Brazil, and more will be written, since many thousands of square miles of timberland are still unexplored.

Vast Unknown Regions. Before the advent of the airplane, it was almost impossible for civilized man to enter the vast regions of the equatorial forests of the Amazon Valley. Nature's open roads—the rivers—had been the only means of penetrating into these deep jungles, and few men dared venture beyond the riverbanks because of hostile

Indian tribes. Scientific explorers and venturesome rubber-gatherers have been the only ones to penetrate the vast jungles of the Amazon region. Through many centuries the upper Amazon Valley remained almost a blank spot on our maps of Brazil.

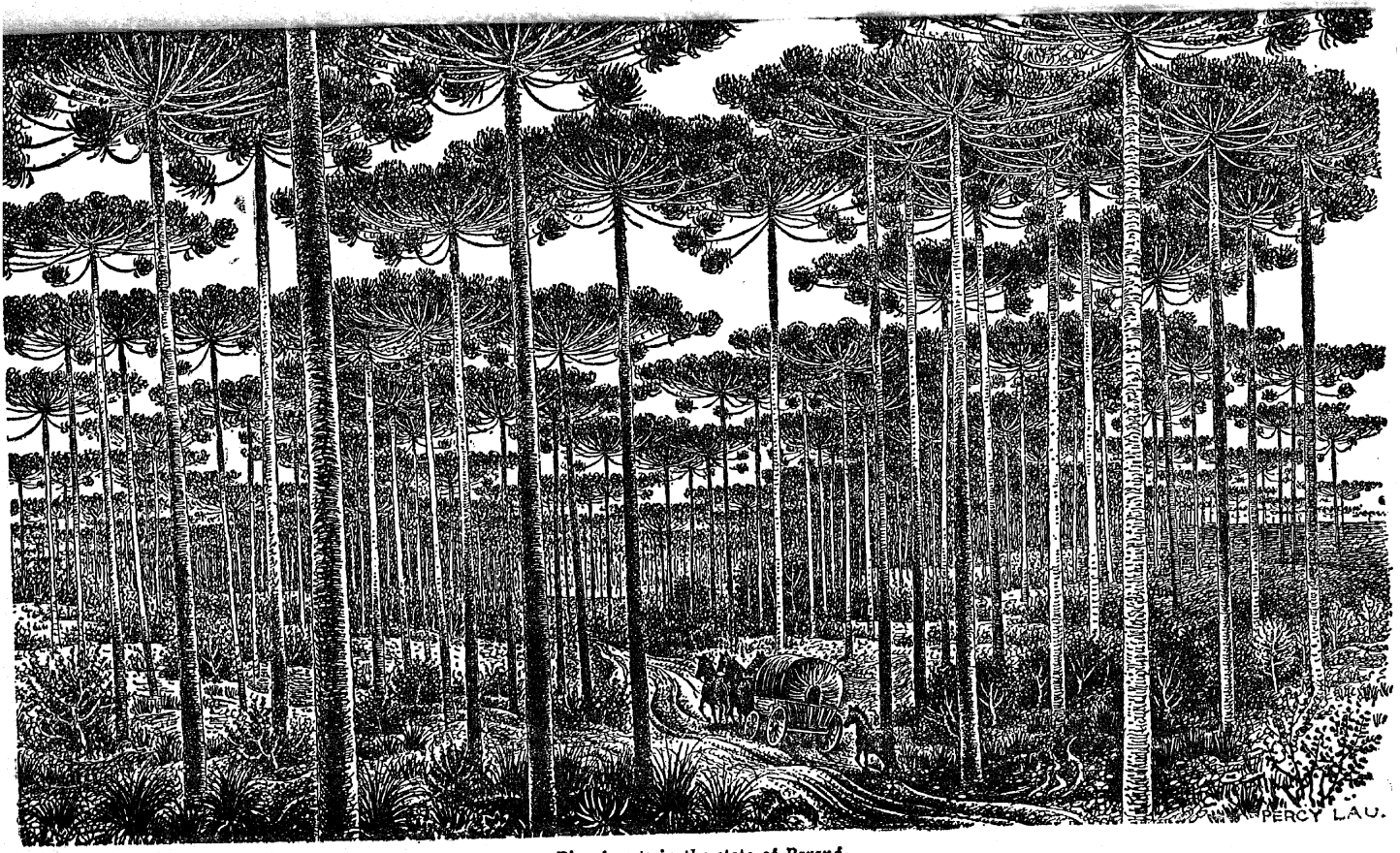
Now the airplane covers this vast unknown in a few days. The airplane made it possible to map the mysterious jungle lands still little known by the white man. The jungle of closely woven trees appears from the air to be an almost endless sea of green waves. Because of the many climbing vines that twine themselves like a woven mat at the top of the jungle growth, this green sea is only here and there dotted by abrupt irregularities, a few of the highest trees rising like lone crags above the green waves. Air-view photographs give only a faint idea of the appearance of the forests from above.

Konrad Guenther, a German naturalist, thus described the interior of a Brazilian forest: "The uniform illumination of the tropical forest enables plants to spring up everywhere, and this gives the interior of the forest a richness and variety unknown to Europe. The charm of a northern forest is on the whole divided between the roof of leafage, the colonnades of the tree trunks, and the weeds and flowers that more or less cover the ground. In the tropical forest, the plants and flowers are found sometimes on the ground, sometimes on the branches of the trees, now far overhead, now almost within reach, here growing upwards, and there sprouting forth sideways; and the result is a picture full of enchanting variety, and a mass of minute detail which would mock the efforts of a modern painter with his few broad brush-strokes." [1]

Forests and Lumber. The equatorial forests of the Amazon Valley, the mixed hardwood forests of São Paulo and Minas Gerais, and the pine forests of Paraná and Santa Catarina undoubtedly put the timber resources of Brazil among the greatest in the world. A large part of Brazil's three million square miles of territory is still covered by forests. There is a considerable semidesert area in the northeastern part of the country, and an extensive section of grasslands, called *campos,* corresponding to prairies and plains of the United States, in the central and southern part. Some authorities have estimated that 80 per cent of Brazil was originally covered by timber of various kinds and that more than 50 per cent is still in forests. But only a small part of the forests of this vast area supplies commercial timber.

With the exception of the pine forests in southern Brazil there are almost no timberlands composed of a single variety, such as we have

[1] Konrad Guenther, *A Naturalist in Brazil* (New York, 1931).



Pine forests in the state of Paraná

in the United States in our pine forests. It is not unusual to find forty or more different kinds of trees within a twenty-acre tract of land. However, wherever fairly good timber trees are predominant, lumber exportation becomes the principal business of that region if transportation is available. The vast forest lands are valuable to Brazil for building purposes, for manufacturing furniture, and for firewood. The determining factor in the use of the timber reserves of the country is transportation, for often getting the lumber to market costs more than the lumber is worth. Germany has thirty-six native trees, Ceylon has 1,500, but Brazil has many times more than Ceylon.

Reforestation. In countries which have been settled for hundreds of years, forests become extremely valuable because of the scarcity of wood. In Europe, the Black Forest of Germany offers an example. Every effort was made by European governments not only to conserve natural forests but to increase the number of trees by a program of reforestation. But in a newly settled and sparsely inhabited country like Brazil, the clearing of timber to make the land available for settlement is the pressing problem. Half of Brazil is still almost unpopulated. Only the lands along the coast are thickly inhabited.

The problem of cutting the forests for farming always faces the colonial settler. Unfortunately there is no market for the timber which is cut to clear the land, for all the people in the new community have timber enough of their own. Because newly settled parts have inadequate transportation facilities, there is no way to send excess timber to the thickly populated parts of the world. Consequently much of the timber must be left to rot where it was cut, or burned to make way for the planting of crops.

For centuries a ruthless warfare has been waged in Brazil against the forests. Because of this careless, wasteful destruction, the price of lumber is much higher than it would have been had reasonable precautions been observed. In the long-settled sections of the country, there is an acute need for good lumber, which has resulted in making forest conservation and reforestation one of the most widely discussed problems in the country. Reforestation projects initiated only ten or twelve years ago are bringing rich harvests to owners.

While timber exists in great abundance in the remote parts of the country, it is necessary to reforest the old inhabited regions. If this were not done, some sections of Brazil would find it necessary and cheaper to import lumber from other parts of the world.

In 1904 the Paulista Railroad began experimenting with eucalyptus trees on a small piece of ground, along its main line near the city of

São Paulo, under the direction of the late Edmundo Navarro de Andrade. Seeds were imported from Australia, where this species originated. Sixty-five varieties of the tree were tried in the experiment, and the five that were found to be best adapted for growth in the State of São Paulo were planted by the millions. The company's plantations now total 30,000,000 eucalyptus trees on seventeen properties. Some 3,000,000 eucalyptus are set out annually by this railroad. A total of 70,000,000 trees has been planted in the State of São Paulo. Up to 1941 the company had used from its plantations 2,000,000 cubic meters of firewood and 1,297,000 linear meters of timber.

Every year an additional 6,500,000 eucalyptus trees are planted by farmers and large companies, and 4,500,000 seedlings are distributed by the Forestry Department of the State of São Paulo. This is a splendid record. But when we remember that the annual consumption of timber in this state alone reaches 25,000,000 cubic meters, or the equivalent of 75,000,000 trees, we see there is still a big deficit.

But replanting is not limited to the eucalyptus tree, though more than 80 per cent of the trees being planted belong to this family. The Paraná pine, a fast-growing tree that produces not only excellent timber but also cellulose for paper fiber, is being planted—though in only a few instances has this been done on a large scale.

Paraná pines are planted a yard apart, and in six years become large enough to be used for the manufacture of paper pulp. The reforestation program has not included hardwood trees, for they grow very slowly. However, if some of the hardwoods were planted now, they would probably mature about the time the present forests are exhausted.

The Forestry Code. Brazil has not established great national forests and preserves, as the United States has done. But now Brazilians have become conscious of the value of their natural forests, and vast areas are being taken over by the government. Provisions have been made in the Forestry Code for scientific cutting and reforestation. If the provisions of this code are carried out, the country need never know the lack of wood.

This basic law, passed by the Brazilian Government in 1942, prohibits exploitation of forests and provides for reforestation of old lands. The difficulty has been to find men trained in forestry to see that the law is observed. Although Brazilian agricultural schools teach some forestry, it will probably be necessary for the government to establish a special school of forestry to train the great number of men needed to carry out this project.

The Forestry Code was prepared by the State of São Paulo, where large tracts of land had already been reforested. A State Forest Board had been functioning for several years, studying the problems of forestry conservation and reforestation in the state. Technical help will be provided to those desiring to reforest their lands, but economic results can be realized only a decade or more from now. The Federal Government has given new emphasis to forestry needs, but has been slow to establish properly guarded forest reserves on a scale commensurate with the needs of the country.

Uses of Wood and Timber. Very few houses in Brazil are built of wood, except in the extreme southern part of the country. In the city of São Paulo, with a population of 1,500,000, scarcely any houses are built of lumber. Most Brazilian houses are built of brick or adobe. (In São Paulo one sees an occasional stone house.) But wood is used for doors, window frames, ceilings, and roof supports. Walls are of brick or adobe. Brick houses are stuccoed. Roofs are of tile.

Brick and adobe houses are practically fireproof. Seldom is there a fire in any of the cities of Brazil. The fire record for the city of São Paulo for the past few years is as follows: fires of total loss, 15 in 1938; 24 in 1939; 22 in 1940; and only 10 in 1941. Fires of partial loss are almost as rare: 11 in 1938; 31 in 1939; 37 in 1940; and only 12 in 1941. These figures show that São Paulo, with a million and a half people, had the extremely small number of 22 fires in 1941.

Modern structures of more than two stories generally have walls of concrete reinforced with steel. The steel framework so common in the United States is less frequently used in Brazil. For small houses, concrete is occasionally used. These types of construction greatly decrease the demand for lumber, although a great deal is still needed because of the extensive building program going on. In the city of São Paulo, more than 10,000 building permits are issued yearly, about half of these for buildings of two or more stories. This means that about thirty buildings are completed each working day throughout the year; and with an eight-hour working day, four houses are completed each hour. Although fewer permits to build are issued in Rio de Janeiro, the total cost of construction here is about equal to that of São Paulo. In recent years several hundred apartment houses, some more than ten stories in height, and several office buildings twenty stories high, have been constructed in the cities of Rio de Janeiro and São Paulo. War conditions slowed operations considerably, because of lack of building materials, transportation difficulties, and higher costs.

Wood for Furniture. Many Brazilian woods are used in the manufacture of furniture. Among the most popular are Brazilian cedar, sandalwood, violet wood, imbuia, canela, jacarandá. There are many large furniture factories in Brazil, but approximately half of the furniture used in the homes is made by local designers and artisans. In the homes of poor people, furniture is extremely simple. In middle-class homes, it is ornate. The furniture in wealthy homes is usually magnificent, both in design and material. Some pieces are exquisitely carved and beautifully inlaid. Almost all Brazilian furniture is made of hardwoods, for only these will resist destruction by termites.

Within the past few years apartment hotels have introduced modernistic furniture into Brazil, and this has created a demand for this type of furnishing among small-home owners. Many factories are now making the less expensive veneer furniture.

Timber and Wood for Railroads. Although hardwood railroad ties will last for as long as ten years, the twenty thousand miles of Brazilian railways require a million ties a year for replacement. If one adds to that the wood required for firing of locomotives, one can see that railroads require huge amounts of timber annually. Because of the high cost of coal, most of the railroads use wood for fuel. Sometimes a wood-burning locomotive can be seen hauling coal! In southern Brazil a low grade of bituminous coal is mined, but the demand greatly exceeds the supply. Despite the wide use of wood for the firing of locomotives, the greater part of the 2,000,000 tons of coal imported from Europe in 1937 was used by the railroads.

When railroads first penetrate a new region, wood is found in abundance. However, in a few years the available timber is burned, and the railroads find it difficult and expensive to provide fuel. Today some of the more progressive railroads have begun to electrify their lines, and to engage in reforestation. Hydroelectric power is abundant and cheap.

Previous to World War II large shipments of railroad ties were exported to Europe, because the hardwood supplies of that continent were depleted. At the same time Brazilian railroads were expanding and being improved, so the home market for ties was enormous. Wood for railroad fuel was consumed during the war period as never before in the history of the country. Even so, the main railroad of the country, the government-owned Central Railroad, had to take off many of its passenger trains because of the shortage of fuel.

Methods of Lumbering. Lumbering in Brazil is carried on in several different ways. One method is that used in the Amazon Valley.

The city of Belém, Pará, is the center of the hardwood industry in this section of the country. Magnificent giant trees are felled in the jungle, dragged by ox teams or tractors to the river's edge, and shipped by boat to Belém. Because these hardwoods are too heavy to float, they must be transported. They can not be made into rafts and floated down the rivers as are the softwoods in the United States lumbering districts. In Belém, the logs are squared and shipped, without further preparation, to southern Brazil or Europe. They are usually sold by the cubic meter; in the last few years, however, the English measure of board feet has been rather generally accepted as the standard in Brazil.

In the other regions of Brazil, except the extreme southern part, lumbering for hardwoods is carried on by the complete cutting of timber stands. The softwoods, or timber not suitable for finishing, are cut into short lengths for fuel if there is a railroad near enough to facilitate marketing. Otherwise the trees are burned on the ground where cut. As soon as a region of this kind becomes settled, this type of lumbering comes to an end, because by that time the timber stands are almost completely gone.

Still another method is carried on by the individual farmer. As he clears his lands for planting additional crops, he fells and saws up all the timber which will make good lumber and sells it to his neighbors or sends it to a nearby market. The waste wood left after sawing he keeps for use as fuel. Often it happens that very little of this wood can be sold, for much of the natural second growth on cleared agricultural land does not produce marketable lumber.

Lumbering in the Pine Forests. The States of Paraná, Santa Catarina, and Rio Grande do Sul are the principal places where great lumber companies operate powerful sawmills and ship thousands of cars of finished lumber a year. Formerly hundreds of thousands of acres were covered with pure stands of the Paraná pine (*Araucaria angustifolia*), and it is estimated that these three states had nearly two hundred million of these trees. Now each year thousands of these trees are cut. One company has cut the timber from more than 300,000 acres of land. This company has been taken over by the national government. The lumber of the Paraná pine is of an excellent quality and is used in building in most of the country. Three-fourths of the timber exported in 1940 was Paraná pine.

The National Pine Institute (Instituto Nacional do Pinho) was created in 1941, but has considerably expanded its activities since 1943. About 50 per cent of its revenue is for forestation purposes. Experiment stations maintained by the Institute in the States of Paraná, Santa

Catarina, and São Paulo supply expert advice and encourage tree planting by private enterprises.

Exportation of Brazilian pine, especially to Plata River markets, is becoming increasingly important. There are more than 5,000,000 sawmills in the southern states. In 1944 their authorized sawn pine production was, in cubic meters: Paraná 866,238; Santa Catarina 560,137; Rio Grande do Sul 522,654; and São Paulo 39,096.

Wherever the Paraná pine grows in the States of Paraná and Santa Catarina will be found *Ilex paraguayensis* or the mate plant.

The Timber Market. Brazil exported 2,900 tons of unfinished lumber in 1892. By 1911 the export trade had grown to 8,900 tons, and by 1936 to 190,000 tons. The following year, 1937, exports jumped to 260,000 tons. In 1938 it was 300,000; in 1939, 400,000 tons. Although Brazil has more timber than any other country in the world, much of it is inaccessible at the present time. High cost of transportation keeps valuable lumber out of the market. Most of the lumber produced in Brazil in recent years has been consumed in the country's own building boom.

Because Brazil has neglected to develop its papermaking industry, it has been necessary to import more than 100,000 tons of wood pulp each year. This would not be necessary if scientific methods of forestry development and experimentation were carried on. Just as a process has been discovered for making an acceptable paper pulp from the fast-growing slash pine of the southern United States, it should be possible to discover a way of making paper pulp from some fast-growing Brazilian tree such as the eucalyptus or the Paraná pine.

Reforestation, forest conservation, exploitation of standing timber, and soil conservation in the mountainous regions—these and many related problems are being studied by Brazilians, who are beginning to recognize the importance of conservation and wise utilization of the natural resources of their country.

Palms. Palms grow so abundantly in some parts of Brazil as to constitute true forests. They embellish, in a marvelous way, many thousands of square miles of the country and provide many valuable products.

Palms vary all the way from the stately Royals, that overtop the surrounding forest trees, to the scrub palm of Florida, whose trunk crawls along the ground. In the dense jungles of Brazil, one finds vine

palms twining up trees and shrubs for support, the slender rattans growing two or three times the height of a man, with a trunk no greater in diameter than one's thumb. Some dwarfed specimens of rattans are exhibited in palm conservatories in the United States.

Palms are the most graceful and decorative of all plants, but they also have great economic value. The coconut ranks above all other palms in this respect. Copra, the dried meat of the coconut, is one of the world's great export articles. About a million tons enter world trade channels annually, rivaling the world's trade in animal fats. Brazil does not yet supply its home market. The United States imports about 25 per cent of the world's copra production. Artificially dried copra contains 66% oil; sun-dried, 50% to 60%. The oil is extracted in industrial centers leaving a meal which contains 11% fat, 18% protein, and 47% carbohydrate. This copra meal is a highly concentrated food, especially useful as food for dairy cattle. The husk of the nuts produces fibers for cordage and matting. Alagoas, the next to the smallest state in Brazil, produces some forty million coconuts annually. These yield six to seven tons of copra per thousand trees.

The Piassava palm (*Attalea funifera*) produces a fiber almost universally employed for making brushes. The midrib of the leaves yields fibrovascular bundles often fifteen feet long. Many tons are exported. Nearly every ship that touches the Bahian coast carries some away. Practically everybody has used brushes made of palm fiber, usually without knowing that they are the product of the Piassava palm.

The Babassú (*Attalea speciosa*)[2] is noted for its thick, very hard pericarp. It produces a kernel with a high oil content. The pericarp produces a charcoal of superior quality for use in the arts and industries.

The Carnaúba (*Copernicia cerifera*),[3] the characteristically lofty fan palm, covers extensive areas in northeastern Brazil and produces the world-famous carnaúba wax.

More than a hundred native species of palms have been described, and many are left to be described. Any young botanist who wishes to immortalize himself by describing a new species of palm need only hasten to Brazil. More than a hundred species from other continents are also growing here.

Dendé (*Elais guineensis*), an African palm, whose seeds were imported with the slaves, is known for its rich palatable oil. It now serves the table for rich and poor in the States of Bahia and Pernambuco. Some authorities affirm that this is a native of Brazil.

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2 See discussion of Babassú in Chapter XVI.

3 See discussion of Carnaúba wax in Chapter XIII.

The date palm (*Phoenix dactylifera*), when grown in the humid regions, does about as well as in Florida. In the few plantings at the experiment stations in semiarid regions, they do as well as in the southwestern regions of the United States.

In the Rio Grande do Sul, fresh palm leaves are fed to dairy cattle and work oxen during the dry season when forage is scarce. The tall trunks are scaled and the lower leaves cut off.

The palms are a wonderful family. They supply materials for building and thatching houses, and wax and oils for industry. At the same time they produce nutritious and delicious food for man, and feed for dairy cattle.

XVIII

On a Thousand Hillsides

PORTUGUESE SETTLERS of the sixteenth century brought cattle to Brazil. The first known to have been imported were brought to São Vicente in 1530. All forms of livestock thrive in Brazil, but it is difficult to develop the high quality of animals common in the United States and Argentina because of the prevalence of pests and diseases, which, however, are now being overcome. The total number of kinds of livestock in the country is more than ninety-five million head. This total gives Brazil third place in number, India being first and the United States second. But when it comes to economic importance, the livestock of Argentina is more valuable than that of Brazil. In Argentina the quality of the animals and the volume of livestock products in international trade are higher.

Countries with enormous herds of cattle become more important economically as the years go by. Brazil ranks high in importance not only because of its present wealth of cattle but because of potential production of all kinds of livestock. Vast areas already set aside for grazing and for the formation of pastures, natural grasses of good quality, abundance of water, fairly good climatic conditions—these indicate that Brazil will increase its animal industry. The surplus of meat products available for export is large, but it could be made much larger through research and improved techniques in breeding and feeding.

Native Grazing. A comparatively small part of Brazil is now covered by virgin forests. Most of the eastern part of the country is mountainous or hilly, and much of the land is covered with native grasses. A typical Brazilian scene is a herd of cattle roaming over a hillside pasture. The native range grass is somewhat similar to that of our own western ranges. Cattle are raised on these vast ranges with no supplementary feeding. As the range grass gets tough during the dry winter months, cattle men usually burn it off just before spring comes on. Then, with the first rains, fresh new grass springs up, and the cattle get

fat and sleek. It takes from five to six acres of this type of pasturage to maintain each head of cattle.

The common draft animal of Brazil has been, through the centuries, the patient ox. Cattle have been bred for long horns and strong bodies. By the time the age of two and a half years is reached, oxen are broken to work in the yoke. They continue working until ten or twelve years old. From eight to sixteen oxen are used to pull the two-wheeled carts. When no longer able to work, they are fattened and used as beef. On the open range, cows are not milked but the calves run with the herd, getting what milk their mothers produce. On the open ranges little or no care was taken in former days with the selection of breeding animals, and the cattle were undersized and not prolific. During the latter half of the nineteenth century good beef and dairy cattle began to be in demand, so an effort was made to improve range cattle.

Improvement of Cattle. Three things are necessary to improve cattle: better blood (better breeds); better pastures; and control of pests and diseases. Introduction of better cattle from Europe and the United States has been made, but many of the imported cattle died of tick fever shortly after reaching Brazil. Later it was found that the cattle from India, called zebú in Brazil and Brahman cattle in the United States, were hardier than European cattle and resisted tick fever. Shiploads were brought from India in the early part of this century. Now, the greater part of Brazilian cattle have the long ears and hump, showing that they have some Brahman blood. This cross made the cattle more productive and larger in size. Recently a process has been perfected by which cattle brought from outside the country can be treated immediately upon arrival in Brazil, to immunize them against tick fever. This has proved to be a boon to cattle breeders, who now import cattle from Europe each year, also from Argentina, and a few head from the United States. All degrees of mixture of blood are to be found in native range cattle: Brahman breeds from India, and strains of what are called the European breeds, namely, Hereford, Shorthorn, and various dairy breeds.

Brahman Cattle. For fifty years zebú, or Brahman, cattle have been raised in Brazil on an increasing scale. The simple fact that they thrived where European breeds could be raised only with difficulty caused the Brazilian breeder to turn his attention to them as the most available source of improvements of his herds. It has only recently been discovered that these cattle of Indian origin do not sweat as do the European

breeds, and therefore not only are able to stand greater degrees of heat, but do not lose flesh in hot, damp climates. This caused Texas and Florida breeders to use these breeds extensively for crossing on common cattle. While the Brazilian breeder did not know the reason, he did know that the Indian breeds stood up under his climatic and pasture conditions.

Never having been well nourished in their native habitat, the Brahman cattle grew and developed in the rich pastures and bracing climate of Brazil (compared to the lowlands of India) as they never did in Asia. For a long time many animal husbandrymen of Brazil, bent on introducing European breeds at any cost, ridiculed the whole question of the zebú. Certain stock shows even went so far as to prohibit their exhibition. A complete change came about as the zebú won out in competition. At the national stock show held in São Paulo in 1924, 420 zebús were exhibited as against 348 of all other breeds. Seventy-two head of the Indian breeds sold during the show brought an average of more than $1,000 a head, with a maximum price of $7,500. One lot of ten young breeding cows brought $1,000 each. Ninety-four head of cattle of the European breeds brought an average of only a little more than $250 each. This was a tremendous change from a few years earlier.[1]

The different breeds of zebú cattle brought from India have been the Guzerat, Gir, and Nellore. Brazilians have originated sub-breeds which they call Indúbrasil or Indú-Uberabas. The Gir is the smallest of the Indian cattle but is by far the best for milking, and so has the preference of the dairymen. It has no fixed color. It may be red and white, black and white, or any combination of the three. The Guzerat is a much larger breed, has long legs and horns, and is chiefly used as a beef and draft animal. It is solid gray or bay in color. The largest of the Brahman cattle is the Nellore, which is generally a solid gray in color, light or dark. But white and solid bay are also fairly common.

The Indúbrasil is shorter-legged than either of the other three zebú breeds and is extremely large. The finest examples are of a solid color: white, gray, red, or cream.

It being necessary to improve the pastures, many of the more fertile soils have been allowed to seed naturally or have been planted to good native pasture grasses. About 90 per cent of these pastures have been planted to molasses grass (*capim gordura* in Portuguese; *Melinis minutiflora scientifically*). It can be crushed in one's hand and used to shine shoes. It is excellent for dairy cows and for fattening cattle. There

[1] See "Zebú Cattle in Brazil," *Journal of Heredity*, VI, No. 5, May, 1915, article by the author.

are some other good native grasses, and many have been introduced from other countries. Among them is Rhodes grass. Alfalfa is difficult to raise in Brazil, although it grows as rankly as a weed in Argentina.

Great strides have been made in the control of cattle diseases. It is now the general practice to vaccinate young calves against blackleg, and almost all the larger cattle farms and ranches have vats for dipping cattle to rid them of ticks. The government has manufactured and sells, for less than cost, serums and vaccines for the prevention and cure of diseases.

Cattle born on farms infested with ticks do not need artificial immunization. Only those imported need treatment. The Brazilian breeder must be always vigilant and constantly treating his cattle against epidemics, the worst of which is the foot-and-mouth disease. The United States and Great Britain have been able to keep this dread disease out. It is endemic in parts of Brazil. Some day a vaccine treatment against it will doubtless be found, but in the meantime it causes great losses to breeders all over Brazil.

Exportation of Meat. With its 40,000,000 head of cattle, Brazil's annual exportation of meat is only 42,000 tons. Argentina has 32,000,000 head of cattle and exports from 450,000 to 800,000 tons of beef a year. There are more than forty million people to be fed in Brazil, as against only thirteen million in Argentina. A large percentage of the cattle in Brazil are draft oxen, and several million are dairy cattle. By further improving the breeds, Brazilians could export a much greater quantity of meat. There are five large packing houses in Brazil which export beef and also supply the local markets to some extent. They kill annually two million head of cattle and a million and a half hogs. Before the days of packing houses, or *frigorificos* as they are called in South America, cattle were killed at local slaughterhouses, and the meat was consumed within twenty-four hours, since there was no refrigeration. Where fresh meat could not be obtained, jerked beef was used. Jerked beef is made immediately after the cattle are killed. The meat is cut in great slabs and put on poles to dry in the sun. The slabs of dried meat are put in piles and thoroughly salted. When completely cured, this meat keeps indefinitely and can be shipped into the interior. Now that modern refrigeration makes chilled beef available in many places, jerked beef is chiefly sold and used in country districts. The fresh meats used in Brazil have a very different flavor from the frozen meats consumed in the United States and are more palatable.

Three states have half the cattle of the country. Rio Grande do Sul has 10,000,000 head; Minas Gerais, 9,000,000; and Goiás, 4,000,000.

The cattle raised in Goiás are driven on the hoof to the State of São Paulo or Minas Gerais and fattened on molasses-grass pastures, then sold to slaughterhouses or packing houses. Some of the best beef herds are found in Rio Grande do Sul, where the predominant strains are Hereford, Shorthorn, and Aberdeen Angus. The State of São Paulo has a native pedigreed breed called *caracú,* which is being carefully developed as a dual-purpose breed. It has not spread widely over the country, although it fattens nicely and furnishes a good quality of beef. The Brahman strain is predominant in Goiás and Minas Gerais, the states which supply most of the meat for export. More than a million head of cattle are to be found on Marajó Island in the State of Pará and the upper Rio Branco. Brazil's annual average export of hides and skins ranges from 55,000 to 60,000 tons.

Dairy Cattle. Fifty years ago it was a common thing in Brazil to buy butter from France and Denmark packed in kilo tins (2 1/5 pounds). The annual importation was 3,000 tons. Gradually a few cream separators came into use, and a little butter began to be manufactured around 1900. Now there are creameries all over the country, and in the State of Minas Gerais millions of pounds of butter and cheese are made and shipped to other states. Fresh milk is on sale in the cities and towns of Brazil. It is shipped, pasteurized, bottled, and delivered to homes, as in the United States. Per capita consumption is relatively small. Much of the milk is deficient in calcium content, but in a few cities high grade milk is available at fancy prices.

Few dairy cows receive other food than what they graze. This and the fact that the general custom on the farms is to milk once a day results in small yields of milk. The most popular of milk breeds is the Holstein, followed by the Brown Swiss, Jersey, and Guernsey. Some of the breeds common in Europe and the United States are little known in Brazil.

There are some modern dairies where the cows are fed and stabled as in the United States. When the cattle are not stabled, the calf is tied to a front leg of the cow while she is being milked. If this is not done the cow will give no milk. The annual production of milk in Brazil has reached forty million hectoliters. From this, 42,000 metric tons of cheese and 38,000 metric tons of butter are manufactured. So far little cheese and butter have been exported, although the quality of both would make them acceptable on many foreign markets. Only a little more than twenty tons of butter were exported to five South American countries in 1940, and even less cheese. Condensed milk is manufactured in fairly large quantities, and small quantities are exported. The

annual production is more than 6,000 metric tons. The production of milk powder is increasing and will soon be sufficient for national consumption. Rigorous inspection laws exist for controlling not only fresh milk but also milk products. Technical assistance is furnished by the government to both dairymen and creameries, so that the tendency is for a constant increase in quantity and quality.

Swine. Brazil ranks second among the nations of the world in hog production, with twenty-five million head. But, just as with cattle, better breeds, better methods of feeding, and drastic measures to keep down disease are necessary to improve quality. Hog cholera is not prevalent, and in the mild form in which it appears it can be held in check with vaccines.

Most hogs are raised with little care or feeding. When one year old, the rather undergrown and poorly developed pig is put in the fattening pen and has nothing to do for the rest of his life but to eat, sleep, and get fat. When fed corn meal with plenty of skim milk for three months he will weigh three hundred pounds and be ready for market. Almost all fattened hogs in Brazil are of the lard type and are made to weigh as much as possible. Ham and bacon are produced by the big packing houses and rival the quality of the same types from the United States, but they are luxury foods and not in common use. Roast pork is a popular dish, but of late years the extremely high cost of all pork puts it out of reach of any but the well-to-do. Most fat hogs are marketed locally. Every Saturday many hogs are killed, and they are put on sale in the local grocery stores of the small towns. The meat is sold fresh at once, while the fat sides are salted and then sold during a period of several days. Some Brazilian housewives buy this fat and render their own lard, or use the fat itself as shortening. It should be noted here that, because of the great increase in cotton production, fats from cottonseed oil are becoming serious competitors of lard.

There are a number of native breeds of hogs, but none with careful selections or pedigrees. Some of the popular breeds introduced from the United States are the Duroc Jerseys, Poland Chinas, and Hampshires. Of the English breeds the Berkshires, Yorkshires, and Large Blacks are the most popular. Some German breeds are to be found in small herds.

The only state having enough hogs to be able to export any large amount of meat or lard is Rio Grande do Sul. An average of 8,000 tons of lard has been exported each year for the past five years, and a new packing house has been built for handling hogs exclusively. Small lard factories are to be found in almost every state of Brazil, manufac-

turing a few thousand tons a year, usually for consumption in the same state or nearby regions. The total production of refined lard for the years 1942-45 was as follows: 1942, 50,376 metric tons; 1943, 52,069 tons; 1944, 72,108 tons and in 1945, 61,930 tons. The average production of salt bacon for this period was about one hundred thousand tons a year.

In São Paulo, the large meat-packing houses kill all the fat hogs they can buy, but the supply is never adequate. Brazil could easily double its swine production and reach a total of fifty instead of twenty-five million head. Hogs are numerous where corn is abundant and where dairy cattle are to be found. There are several pests, especially intestinal worms, which check the development of the hog industry, but methods of control are known and can be put into practice.

Mules and Horses. Brazilians love a good horse and ride well. Before the day of the automobile, horses were in great demand. They still are used to a great extent for traveling short distances. Every farmer keeps a few saddle horses. He appreciates gaited horses and will not ride the trotter (except where it is fashionable to do so). Oxen are used for heavy hauling; the mule for light traction and pulling farm machinery; the horses chiefly for the saddle. Several good native breeds have been developed, and English racing breeds and Arabian horses are imported to cross with the native mares. The heavy breeds, like the Percherons and Belgians, do not do well in Brazil, possibly because it is too warm for them.

According to the latest figures available, there are more than six million horses and three million mules in the country. Some Spanish and Italian jacks have been imported to improve the size and quality of the mules. A few Mammoth Kentucky jacks were imported from the United States with indifferent success, for they did not acclimate well.

With the development of highways, the automobile and truck took the place of other forms of traction, and the breeding of horses and mules is not so important as it was formerly, but they are still important as work animals. Tractors are expensive to buy and to maintain and are not profitable on small farms with unskilled farm labor. During World War II the gasoline shortage brought animal traction back into fashion, and consequently mules and horses for draft purposes became valuable. Many queer and forgotten turn-outs appeared in city streets and along country highways.

Sheep. Brazil cannot be called a sheep country, because it has only fourteen million head. More than eight million—63 per cent of the

total—are in the State of Rio Grande do Sul. Some fine sheep are raised in this pastoral state in the extreme south. The sheep found in the other states are of no particular breed, nor are they very productive of either wool or mutton, which are sold only to local markets. There are two principal reasons for so few sheep being raised: (1) climatic conditions are not favorable and (2) sheep suffer from the maggot worm, which causes heavy losses.

About the same amount of raw wool is exported and imported each year. Almost all the woolens used in domestic trade for men's clothing are now woven in Brazil, although some are imported, principally from Great Britain.

Goats. There are estimated to be about six million goats in Brazil. They are raised mostly for meat and hides, and only a few for milking. The greater number are in northern Brazil, Bahia leading with 1,800,000, with Pernambuco and Ceará in second and third places. These goats are not purebred, nor are they raised in large herds. They thrive on dry lands when pasture is scarce—even when the thrifty upland cattle survive with difficulty. An effort is being made to improve quality. In some of the big cities, goat milk is much sought after. In São Paulo, six or seven milk goats, tied together, are driven from door to door, and the purchaser receives the freshly milked product. After customers are supplied, the herd is driven back to pasture until the next morning's delivery of milk. It is a novelty to see this ancient custom, in so modern a city, and hear the tinkling bells of the milk goats as they move nonchalantly among the hurrying automobiles of modern traffic. The annual export of 2,500 tons of goat hides goes principally to the United States.

Poultry. Every Brazilian farm, large or small, has some poultry. Eggs and chickens are common articles of diet and, on festive occasions, a good fat turkey is just as acceptable on a Brazilian table as in the United States. Until about thirty years ago, only nondescript farm poultry was raised, but since that time great interest has been manifested in better poultry. There are many fine poultry farms in the Federal District (Rio de Janeiro) and the States of São Paulo, Rio de Janeiro, Pernambuco and Rio Grande do Sul. There is beginning to be a surplus of eggs, which is exported to England. Some day, fat poultry may be available for exportation. The White Leghorns are the most popular breed. Rhode Island Reds, Plymouth Rocks, White and Barred Orpingtons, Giant Black Jerseys, Wyandottes, and most other breeds common in the United States and Great Britain, are raised. Day-old chicks are offered for sale by a number of breeders, but this process

of raising bought chicks is not as general as in the United States. The use of incubators and brooders is becoming more common, and they are being manufactured on a fairly large scale in Brazil. Poultry shows are well attended, and fair prices are paid for good eggs and birds for breeding purposes. It is interesting to note how ubiquitous the loud-cackling hen is. Even in the most exclusive residential sections of the large cities it can be heard in the early morning hours, along with the crowing rooster.

Other Stock. Rabbit raising and, more lately, fish breeding are not uncommon. Beekeeping is also being developed, and silkworms are raised on many farms. Sometimes these are merely hobbies, but frequently they are attractive sources of income.

An increased interest in raising silkworms was brought about by World War II. For many years a small silk-producing industry has existed in Brazil and a federal experiment station in Barbacena, State of Minas Gerais, has carried on experiments, furnished technical instruction, and sold silkworms, from eggs to larvae, to the small producers. Since 1941 the Government of the State of São Paulo has done much to expand silk culture in that State. Mulberry leaves are the basis of silkworm growth, since silkworms feed on them, so a campaign has been carried on to increase the plantings of mulberry trees. In less than one year about twelve million trees were set out, and in one single month five million cuttings were distributed for planting. To follow up this campaign, a Silk Culture Service was organized in the State Department of Agriculture. It is charged with giving all possible help to the silkworm growers. Not only is technical help provided, but experiments are carried on and a study is made of pests that attack either the mulberry trees or silkworms. Strict inspections are made of establishments selling either eggs or mulberry cuttings and of textile plants that use the word "silk" on their products. In many counties plantings are made on public lands, where leaves for feeding silkworms are furnished free of charge to the poorer families that wish to raise silkworms but do not have land for planting mulberry trees. At a recent National Livestock Show almost a whole building was given over to silkworm culture, and the exhibits were closely examined by many interested farmers. The large colonies from two silk-producing countries—Japan and Italy—give of their skill to the silk production industry of Brazil.

Government Aid to Livestock Growers. Through the Bureau of Animal Production of the Federal Ministry of Agriculture and the State Secretaries of Agriculture, a great deal is done to aid the breeder in the improvement of various breeds, the care of imported stock, and the

development of better feeds. Information is given out to farmers at cattle shows, through published bulletins and by demonstrations, as is done in the United States. Not only do these stations import foreign breeds, but some of them work along the line of selecting and establishing native breeds. Surplus stock is sold to farmers at auction each year. The government imports animals of various breeds, and these are sold to farmers at cost, the government bearing the cost of transportation from abroad and of immunization in the case of cattle against tick fever.

A national cattle show is held annually under the auspices of the Ministry of Agriculture—successively in the cities of Rio de Janeiro, São Paulo, and Belo Horizonte. This national show is an important gauge of the development of breeds grown in the country. Some of the states and communities hold shows of interest to local breeders, such as the Brahman cattle shows in northwest Minas.

In combating and controlling diseases and pests, the state governments do a great deal, constantly experimenting to find better methods of prevention and cure and furnishing vaccines and serums to the breeders at less than cost. Many more veterinarians could be employed if they were available.

The construction of silos and dipping vats is subsidized by the Federal Government, which also furnishes free transportation for purebred stock within the country.

The government maintains an inspection service at each packing house, certifying to the quality of the frozen and chilled meat that is exported and condemning carcasses of diseased animals. This is a necessary protection to the consumer, and stimulates breeders to combat diseases with more energy.

Particulars on the meat industry are given in the following table, which covers all slaughtering and meat production in municipal abattoirs and private industrial establishments and packing houses throughout the country.

	DESCRIPTION	1941	1942
Animals slaughtered (Number)	Cattle (cows and calves included)	4,751,105	4,920,374
	Hogs	4,253,022	4,019,352
	Sheep, lambs, and goats	1,832,392	1,548,860
Meat Production (Tons)	Beef and veal	781,635	795,026
	Pork	210,050	205,488
	Sheep, lambs, and goats	24,383	18,092
Value of Production (Million cruzeiros)	Beef and veal	1,803	2,179
	Pork	564	675
	Sheep, lambs, and goats	48	39

Livestock Problems. The livestock breeder in Brazil, as in any other country, is faced with many problems. A program of benefit to the whole livestock industry of Brazil would include greater availability of purebred stock, until only purebred sires are used in breeding; experimentation to discover the best use of the various breeds, from the point of view of both purpose and locality; improvement of pastures and supplementary feeds; greater use of silage, cottonseed meal, and other feeds to carry the cattle through the winter season when pastures are poor; veterinary aid to combat epidemics and diseases; careful recording of pedigrees, so that purebred stock can be guaranteed as such; more rapid development of fattened animals, so that quality will be improved and cost of production lowered; standardization of meat products, especially those exported; more cattle shows, so that the breeder can have a better understanding of the improvements obtained in the breeds.

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PART III

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Mineral and Water Resources

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XIX

Economic Evolution

BRAZIL'S VAST area and sparseness of population have necessarily influenced the trend of its economic development. A number of periods of prosperity has produced immense wealth for the country. Successively, brazilwood, sugar, gold, diamonds, rubber, coffee, and cotton have predominated in the total exports. These exports have had a much greater influence on the national economy than the total production for home consumption.

Many factors have influenced the national economy and determined the standard of living of the people of Brazil. These factors will be briefly discussed in a general way here before being taken up in separate chapters. Because of its large size, Brazil has had difficulty in planning and directing its economic development, and this has resulted in several financial crises, which have perhaps retarded the country's industrial development by many decades.

Mining in Colonial Brazil. From the time of discovery until 1822, Brazil was a Portuguese colony. Economic and administrative life was directed from, and for the benefit of Portugal. Initially Brazil was overshadowed by the lucrative trade between Portugal and India. Colonization was slow and difficult, and Portugal had a monopoly of Brazilian trade, which was profitable to the Portuguese.

Discovery of Gold and Diamonds. In 1695, two centuries after the establishment of the colony, the first important gold washings were discovered, although gold had been first exported in 1690. Pioneering bands of prospectors, called *bandeirantes,* swarmed from São Paulo in search of new gold-producing localities, and they were rewarded by discovery of gold near what is now the city of Taubaté. The *bandeirantes* penetrated farther to discover rich washings in what is now the State of Minas Gerais. This name comes from the abundance of mining centers discovered in that region.

As has always been the case, the discovery of gold caused a stampede of population. Thousands of people came from Portugal. In a short time the *capitania* of Minas Gerais (detached from São Paulo in 1720) became the most populous region in Brazil. (It continued so until about 1940, when the population of the State of São Paulo exceeded that of Minas for the first time.)

The discovery of diamonds in 1721 made its contribution to the value of mining products exported to Europe. The discoveries of gold and diamonds were made at an opportune time, for sugar exports had reached their maximum about 1650, and a rapid decline was suffered until the end of the century. But with the discovery of gold, new commercial importance, and with it new life, came to the colony. Even so, the value of sugar exported during the whole of the colonial period was more than double the value of all other exports, gold included.

Colonial Industry. Because Portugal was avid for raw imports from Brazil and desirous of a market for its own manufactured articles, all industrial progress in the colony was discouraged. The little that succeeded in flourishing was of a simple handicraft nature. A goodly part of Brazil's cotton was taken to Europe to be spun and made into cloth, to be returned to the colony. Fascinating remnants of primitive handicrafts may be discovered today by the assiduous searcher—homespuns of cotton, wool, and even of linen; ceilings (for rooms) woven of bamboo, hammocks and saddle pads. These are, almost without exception, articles of homely necessity, which were not used in other countries and hence not thrown on the international markets.

On large estates, during the colonial period, whatever could be produced at home or by local or slave artisans was so made. Imported articles were largely in the luxury class. Furniture of a rude sort, saddles, harness, nails, and some simple tools were made on the estates.

Shipbuilders and gold- and silversmiths prospered in the eighteenth century. In 1785 manufacturing in Brazil was prohibited by Portugal. This served to stimulate growing discontent, which early in the nineteenth century resulted in the country's declaration of independence.

Colonial Trade. Portugal never adopted a liberal commercial policy toward its great colony. Portugal was determined to extract all the wealth possible from Brazil, without regard for its liberty of action or its growth. All shipping to and from Brazil had to be done in Portuguese bottoms. All exports and imports had to come or go through Portugal. Not until 1808 was Brazil permitted to open its seaports. Such trade restrictions by the mother country were only natural, but

as long as they existed they greatly hampered development of Brazil's foreign trade and commerce. In addition, Brazil's trade was hurt by the French, Dutch, and English whose ships constantly attacked Portuguese vessels. Often a whole year was consumed by the round trip between Portugal and Brazil, sometimes an even longer period.

Though Brazil is a richly watered country and has some navigable rivers, trade with the hinterland during colonial days had to be mostly by pack train. Hence only very valuable cargoes could be transported, and most of the population had to settle near the coast. Very few of the rivers are navigable (with the exception of the Amazon, whose valley is still largely unpopulated) for any great distance into the interior, because of rapids and waterfalls.

The system of taxation of colonial products, never less than a tithe, also militated against commercial development. Another factor that retarded trade was that slaves had no purchasing power whatever, and free colonial laborers had very little.

International complications with the French and Dutch, who tried to establish themselves on Brazilian territory, and preferential trade agreements with England also affected Brazilian colonial commerce, usually adversely. Among the products exported were gold, diamonds, tobacco, hides, skins, and cotton.[1]

Nineteenth-Century Developments. Brazil became an independent monarchy in 1822, not long after Portugal had adopted a somewhat more liberal policy toward the colony. This had been initiated by Dom João VI, during his stay in Rio de Janeiro (1808-21). Domestic industry, trade, and commerce immediately took on importance.

Brazil had free trade until 1844, when tariffs were placed on imports to aid home industry. During the second half of the century, coffee became the principal export; and during the last quarter of the century, European immigration began to help the development of the country, especially of the State of São Paulo. In 1850 there were fewer than fifty industrial establishments in Brazil, including two cotton mills and five metallurgical plants. By 1866 there were nine textile mills, employing more than eight hundred workers. At this time there were approximately a thousand cotton mills in the United States. By 1881 the number of cotton mills in Brazil had increased to forty-four, with five thousand mill hands.

The first industrial spurt came in the decade of 1880 to 1890, just at the end of the monarchy (1889). At this time there were 636 industrial units in the country, with a capital of approximately £25,000,000

[1] Diffie, *Latin American Civilization,* pp. 674-92.

employing more than 54,000 workers. During the years 1890-95, about 452 factories were established.

Twentieth-Century Growth. Brazil's industry, mining, and commerce have had a remarkable growth in the twentieth century. Many factors have contributed to this, chief among them being the two world wars. During both war periods the country was practically cut off from foreign imports, so production was intensified. During World War I, Brazil manufactured goods for its own needs and exported food and raw mineral products. During World War II Brazil's industrial evolution was so great that its manufactured goods were exported on a considerable scale and steps were taken, with the financial cooperation of the United States, to put iron and steel production on an adequate and permanent basis.

Industrial Ascendancy. Agricultural production is of primary importance to Brazil's growth and its international interests, but during the years 1940-48, for the first time in the history of the country, industrial and mining production exceeded in value the sum total of agricultural production. There were some exaggerations in this rapid industrial rise. Farm districts have been so reduced in population by urban growth that an insufficient food supply has resulted. Although nothing like famine conditions have prevailed, there have been serious shortages of sugar, meat, and cooking fats. These products were rationed during World War II and for some time thereafter. Just how far an agricultural country should go in becoming industrialized is always a serious problem. The following table[2] gives a clear picture of the recent industrial and agricultural expansion of Brazil:

	INDUSTRIAL EXPANSION (United States Dollars)		AGRICULTURAL EXPANSION (Tons)	
		Product	1920	1945
1939	$ 750,000,000	Cotton	99,701	468,695
1942	1,378,400,000	Oranges	77,000	1,206,000
1945	2,820,850,000	Pineapples	18,000	138,678
		Bananas	540,000	1,833,334
		Coffee	788,488	1,001,813
		Cacao	68,883	128,616
		Sugar cane	13,986,000	21,474,591
		Potatoes	145,985	464,662
		Brazil nuts	6,588	68,162

2 A. P. Peck, "Brazil, A Coming Industrial Empire," *Scientific American*, March, 1947.

Brazil now faces problems brought on by rapid industrialization. Though the larger cities point with pride to their increasing populations (São Paulo justly prides herself on being the largest industrial center in Latin America), the fact that an ever-increasing number of people must be fed, clothed, and housed has led to food shortages of a serious nature.

Brazil is a country of such vast territory, such rich natural resources, and such immense possibilities of water power, that its growth and development seem almost inevitable. But rapid development presents problems of such magnitude that it challenges every power of the nation.

An interesting study of planning for the industrial growth of Brazil has been prepared by Glycon de Paiva [3] and published by the Ministry of Agriculture. In this work the author suggests that the industries of the nation ought to be located strategically in the great river basins, where vast hydraulic power can be developed. The Brazilian Government has already undertaken the development of the Rio Doce Valley, in the States of Minas Gerais and Espírito Santo. If this valley can be developed successfully, commensurate with its mineral, agricultural, industrial, and hydraulic resources, a pattern will be established for future efforts.

What Brazil needs for an orderly economic development is first-class planning, covering long-time periods. It needs to escape from its century-old habit of opportunism in everything related to industry, trade, and commerce. This planning ought to take into consideration the best interests of the largest number of the population, over the most extensive area of the national territory possible, and for the longest possible period of years. This involves economic foresight, constructive and not merely restrictive government participation, and proper coordination of government, capital, and labor.

Brazil has a great deal that the "have nots" need. It must use its resources wisely and prevent infringements on its vast empty spaces in the event of future wars. The Federal Government recognizes this, and in the new Constitution has taken definite steps to cope with these problems.

[3] Glycon de Paiva, *Planificação dos Espaços de Ocupação Industrial no Brazil* (Rio de Janeiro, 1945).

XX

Precious Metals and Stones

WHAT MADE the new lands of the Americas an El Dorado? A German scientist, Werner Sombart, went so far as to say that had it not been for the discovery of precious metals in Brazil, the very existence of modern capitalism would have been impossible.

As a matter of fact, the large supplies of gold exported from Brazil to the mother country, Portugal, in the eighteenth century, made possible the first accumulation of stocks of this precious metal in modern times. According to the late Roberto Simonsen, the production of gold in Brazil during the first seventy years of that century was equal to the total gold production of all the Americas between 1493 and 1850—a period of 363 years. Brazil's production was 50 per cent of the world's production during the three centuries mentioned. A Brazilian writer made the following statement: "Pandía Calógeras estimated the Brazilian gold production, up to 1930, as 1,400 tons, to the value of £190,000,000. As regards diamonds and other precious stones, the total production in Brazil, from colonial times up to the present, has been officially estimated at 4,000 kilograms." [1]

Gold Production. Gold was found soon after the penetration of central Brazil, and some two centuries after the discovery of the continent. It is estimated that prior to 1903 Brazil had produced more than 1,000 tons of refined metal. The search for new fields and the exploitation of the old ones still go on.

Some primitive placer mining is still carried on—a process in which the miner washes the gold-bearing sand in a pan in order to separate the gold from the gravel. Some miners run the sands through sluice boxes—a method that was used in the California gold rush and later in Alaska. Some of the streams are worked with modern dredges, and some of the metal is extracted from mines by modern mining processes.

[1] Josias Leão, *Mines and Minerals in Brazil* (Rio de Janeiro: Centro de Estudos Econômicos).

Deep in the Earth. One of the richest and most productive gold mines in the world is in the mountains of Brazil a few miles from the city of Belo Horizonte. It is the Morro Velho Mine owned by an English company. It was first opened in 1725 and has been operating continuously since 1830. The opening of the shaft is at an altitude of 2,768 feet above sea level. The depth of the mine in 1913 was 5,596 feet below the ground level, or 2,828 feet below sea level, making it the deepest mine in the Western Hemisphere and one of the deepest in the world.

The gold-producing ore is brought to the surface, where it enters the mill and the complete refining process is effected. In addition to gold, silver and arsenic are extracted. Electric power is used throughout the mine and mill, and the various levels are connected by telephone. Nearly the entire population of the town of Vila Nova de Lima depends on the mine and its subsidiary activities for a living. It employs some 7,200 workmen. Because of the careful working of the mine, in which an effort is made to realize a fair profit on the annual output rather than to extract a large amount of gold as quickly as possible, it is estimated that the mine will be working several generations hence.

The total ore-bearing rock removed from the mine amounts to 840 tons a day and yields from 13 to 14 grams of gold per ton. The company operates on a capital of 200,000,000 cruzeiros, and its annual production is equal to 50 per cent of its capital. In 1939 the production of this mine was 4,067 kilos of gold.

Many visitors to Brazil are taken on a special trip to the mine, over the good automobile road from Belo Horizonte. The mine is open to visitors every Wednesday. Before going down, they must put on overalls. As in so many other mining areas throughout the world, neither women nor priests are permitted to descend, for there is a strong superstition among the workmen that accidents follow their visits. They may, however, visit the surface works. The intense heat of the lower levels is reduced by a modern air conditioning system.

The Passagem Mine, situated near Ouro Preto, is another of the important mines of Brazil. First worked in 1800, it is still a heavy producer. The shaft has been sunk to the 3,000-foot level, and eighty crushers break the ore so the gold can be extracted by water. Eight thousand gallons of water are pumped out of the mine every hour, most of which is used in the mill. Nearly a thousand men are employed in the mine and on its claims.

Several rich deposits of gold were found in 1913 on the banks of the Rio das Garças in the State of Goiás. This discovery led to a

mining boom. The value of the washings has been greatly enhanced by the presence of diamonds.

For a number of years the law has required that all gold mined in the country must be sold to the Bank of Brazil. No gold coins have been in circulation in the country for many decades, but a gold reserve is being set up as fast as production permits. In 1938 the Bank purchased 6,738 kilos of gold; in 1939, 9,020 kilos; in 1940, 9,918 kilos; in 1941, 17,084 kilos; in 1942, 39,942 kilos; and in 1943, 123,618 kilos. Much gold goes clandestinely into trade channels because of individual placer miners whose production is difficult to control. The only two large gold mines working deep rock-bearing veins account for some 90 per cent of the total production of the country. There is no doubt whatever that much gold-bearing rock still exists that could be mined profitably by modern methods with the prevailing high price of gold, but owing to a lack of men technically prepared for prospecting and for directing mining operations, these resources are undeveloped. Most of the easily mined gold comes from washings in open streams.

At present Brazil occupies an insignificant place among gold-producing nations. The Union of South Africa produces more than 30 per cent of the annual world output, which exceeds 1,200,000 kilos. Russia, Canada, and the United States run around 12 to 13 per cent each, and Australia is also a large producer. It is interesting to note that the annual value of iron production in Brazil is already three times that of the annual gold production.

Silver and Nickel. In the colonial days, the *bandeirantes* were organized in the Province of São Paulo to look for precious metals in the wild and dangerous interior of the States of Minas Gerais, Goiás, and Mato Grosso. What they did was to explore the country and make a real contribution toward future settlements. They went out to find silver but they and their successors—the settlers following in their wake—found not silver but gold. Brazil's silver production so far has been negligible. As a matter of fact, a much larger amount of silver is imported each year than is mined. Some silver is produced as a by-product in gold and lead mining. The popularity of solid silver flatware has been greatly stimulated by its manufacture in Brazil, and has increased the demand for silver.

Platinum is found in Brazil, but nearly all of the small amount used in jewelry and dentistry is imported.

Nickel is not a precious metal, but we might mention in passing that nickel-bearing ores are being mined in the States of Minas Gerais and Goiás. Considerable nickel is imported for use in the making of coins

and in metal-working industries—this because production does not yet equal home consumption.

Diamond Fields. Fabulous wealth in diamonds has been taken from the Brazilian mountain streams. These precious stones are not found in concentrated and easily mined deposits, such as the diamond mines of South Africa, but are scattered over large areas, usually in the beds of running streams. The Brazilian diamond is of good quality. About 400,000 carats were mined in 1940 (about 3 per cent of the world's production), and 254,000 carats were exported at a valuation of more than four million dollars.

Three large Brazilian diamonds discovered in the State of Minas Gerais weighed respectively 726, 460, and 328 carats. It is needless to say that such stones are worth fortunes. Another famous diamond found in Brazil was the Estrêla do Sul (Southern Star), which weighed 125 carats after lapidation and sold for $500,000. Still another was the Dresden, which weighed 76½ carats as a cut stone and brought its finders $250,000.

Brazil's most important diamond district is in the State of Minas Gerais. Diamantina, a small city eight hundred miles north of Rio de Janeiro, is the center of the country's diamond market.

The first Brazilian diamonds were found in the State of Minas Gerais in 1721, and by 1732 there were more than 40,000 people working in the diamond mines of the state. Between 1732 and 1771, Brazil exported 1,666,569 carats of diamonds. By 1850, 5,844,000 carats had been exported under the legal tax restrictions. It is probable that half again as many were exported clandestinely.

Several interesting stories have grown up around the life of the diamond fields. There is the story of the poor cart man whose cart ran over a hard stone. After examination, the stone was found to be a diamond. Needless to say, the cart was put away. In 1906 a stone of 600 carats was discovered in the Veríssimo River. The stone was practically destroyed by being tested on an anvil with a sledge hammer. When cut, the largest fragment made an eight-carat gem.

The largest single stone found in recent years was named for President Getúlio Vargas. It weighed 726.60 carats, and was sold for $120,000 in the rough. As a cut stone it is worth millions of dollars. After weeks of calculation for its cutting in New York, it was decided to divide it into four parts. It was a dramatic moment when the cutter made the first blows to obtain the desired cleavage. A second effort with heavier blows was necessary, but the operation was successful. This stone ranks fourth in size among the white diamonds of the world.

The Cullinan weighs 3,025.75 carats; the Excelsior, 995.2 carats; the Grand Mogul, 787 carats.

In 1943 a diamond weighing 328 carats in the rough was found in Brazil. It was promptly christened "Victory." It was cut into one large stone weighing 30.9 carats for a ring, and forty-three beautifully matched round stones of graduated sizes for a necklace.

Much jewelry is manufactured in Brazil. Stones used in the national trade are set by local artisans. The Portuguese were the ones who brought the lapidary's art to Brazil.

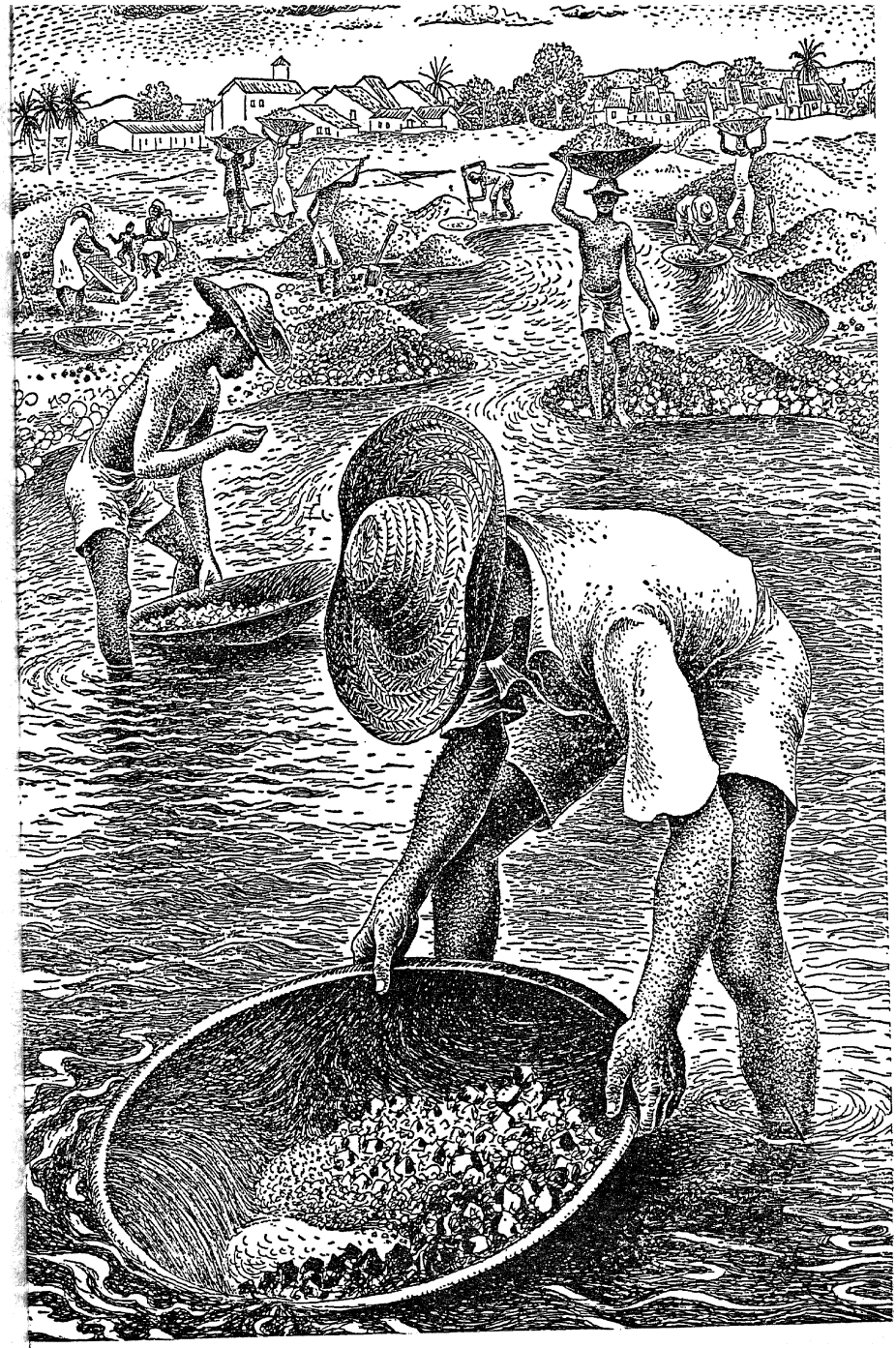
Prices of diamonds are much lower, quality for quality, in Brazil than in either the United States or Europe, even though prices advanced greatly during World War II. Formerly few diamonds were lapidated in Brazil, and the forms used were not those most appreciated by North American buyers. Nearly all large stones were exported in the rough. An influx of refugee Dutch diamond merchants and diamond cutters gave considerable impetus to the industry. A school for cutters was established under the direction of expert Dutch technicians, and a much higher grade of work has appeared on the Brazilian market.

Brazilian diamonds range through many color variations, from white to black. The latter are not made into jewelry, but have many uses in industry. Within the last few years phonograph needles have been tipped with these black stones, and as many as 10,000 records have been played with a single diamond-point needle. War conditions greatly increased the demand for industrial diamonds. The United States was the largest buyer, and in a single year purchased about two million dollars' worth. The story is told of an airplane loaded with industrial diamonds which took off from Brazil for Europe in the early stages of the war but never reached its destination.

Emeralds and sapphires are found in Brazil. The price of emeralds varies greatly according to quality, the very best being worth more per carat than diamonds.

Semiprecious Stones. Brazil is noted for semiprecious stones such as amethysts, tourmalines, aquamarines, garnets, topazes, beryls, and many others (about 40 kinds altogether).[2] The principal markets for these semiprecious gems are Bahia and Rio de Janeiro. Amethysts are found in nearly all the Brazilian states. A stone weighing 334 carats is in the collection of the British Museum. Many amethysts of gigantic size have been found.

[2] See the frontispiece of *Brazil* (1913), by J. C. Oakenfull, for a full-color picture of some of the Brazilian stones in the collection of the British Museum of Natural History.



Washing for diamonds

Aquamarines are usually considered the most beautiful of the semiprecious stones. The colors run from bright blue and green to almost colorless. The largest of these stones ever discovered was found by a Syrian in Brazil in 1910, in an abandoned mine. It was so large that it had to be carried on horseback to the nearest railroad. It was sent to Germany, where it was valued at $250,000. The Natural History Museum at South Kensington, London, has a Brazilian aquamarine weighing 875 carats, and other stones have been found weighing as much as fifteen pounds in the rough.

Blue aquamarines are considered the best and bring the highest prices, sometimes as high as twenty dollars a carat. These stones are becoming very popular in the United States, and in 1940 our importations from Brazil amounted to more than a half million dollars. Aquamarines are mined only in the State of Minas Gerais, and are usually cut either in Diamantina or Belo Horizonte. They are sometimes used in rings, but more commonly in pendants, brooches, and bracelets.

Opals are found in several Brazilian states, but not in a sufficient number to make their mining and exportation profitable. There are great quantities of garnets, most of them being very small, the largest weighing only a few carats. Yellow, orange, and brown topazes have been found in several states, most of the stones coming from the old center of gold production near Ouro Preto. A white Brazilian topaz in the Royal Crown of Portugal weighs 1,680 carats.

Tourmalines were first discovered in Brazil in 1700, but they were not recognized as such until 1733. Before that time they had been classified as sapphires. During the colonial period they were not considered of any special value, but during the past few years they have been much sought after and bring a very good price. They range in color from a dark violet-red to a beautiful rose, with a few green and blue stones. Unfortunately semiprecious stones have been very well imitated, so that today when a person buys these gems it is difficult to tell the synthetic from the genuine.

Crystal Quartz. Crystal quartz has been used for many years in cheap jewelry, and is not usually classified as a semiprecious stone. In modern industry and technological warfare, it has become so strategically important that it merits discussion.

During World War II crystal quartz, so essential in the construction of precision instruments, radio oscillators, etc., came principally from Brazil. Large deposits are found in various parts of the State of Bahia, but the largest active mines are in the State of Goiás.

Three crystals found in the State of Bahia weighed respectively 882, 1,033, and 1,200 kilos each. The largest crystal ever found came from the State of Minas Gerais near the Bahia border and weighed almost 4,700 kilos. It is on exhibit in Belo Horizonte, the state capital. Until war conditions changed the whole situation, Japan, Great Britain, and the United States were the principal purchasers. From 1931 to 1940 the exports of this mineral doubled from a half million to more than a million kilos. The purchases of the United States from 1941 to 1943—six million kilos—were equal to the total exports from Brazil up to 1940. The Western Electric Company, which was the principal purchaser of the best grade crystals, established a purchasing office in Brazil.

The Brazilian Government required that all crystal for export be classified by the Federal Mining Service, and that a minimum price be set for each class. This was done to stabilize the market and to protect those producers who did not know the value of their product.

XXI

Other Mineral Wealth

MINERALS have played an important part in the history of Brazil, especially since the beginning of the eighteenth century. Although tons of gold have been transferred from Brazil to Europe and thousands of carats of precious and semiprecious stones have been taken from the Brazilian mountain streams, untold mineral wealth still lies untouched. Notwithstanding the quantities of ore that are being exported annually, the amount is insignificant compared to the untouched mineral wealth. Most of the mining done up to the present date has been surface mining. The rich subsoil is practically undisturbed.

Importance of Brazilian Mineral Production. From 1700 to 1822, during the occupation of Brazil by Europeans, gold and precious stones were the only minerals that entered international trade. The heavy minerals were left intact because of lack of means of transportation for export purposes and because of the nonexistence of Brazilian industries using these raw materials. World War I caused an active spurt in both mining and manufacturing. Some exportation got under way, and because of the importing difficulties over the four-year period of the war, a small iron and steel industry came into being. Following the war, exports declined, but the national production and consumption continued with a gradual and healthy increase. World War II gave a renewed stimulus to mining and exportation. Not only the more common ores, like manganese, but a variety of minerals, some fifteen in all, entered international trade. A still greater impulse came with the home consumption of minerals in industry. Manufactures and many mining operations formerly of a precarious nature are now firmly established. Great progress has been made in both iron and steel production and in coal mining.

Half of Brazil's total mineral production comes from the State of Minas Gerais (General Mines), the States of São Paulo and Rio Grande do Sul following in second and third place respectively. Between 1930 and 1940 mineral exports quadrupled. From 1938 to 1943 iron and

steel production increased about 100 per cent and all industries employing minerals as raw materials underwent similar increases.

Heavy Minerals. Gold and precious and semiprecious stones are always a spectacular form of mineral wealth, this being especially true when a gold rush takes place or when gems of extraordinary size are found. A more prosaic mineral wealth is made up of heavy minerals, four of which will be discussed in this chapter, namely, iron, manganese, coal, and oil. Cement, which is a mineral composite, will be taken into consideration, because of its importance.

For a country to be prosperous, heavy minerals must be abundant for purposes of modern construction and manufacture. Fuel minerals must be present to supply motive power to drive factories and to transport raw materials to manufacturing centers and from these centers on to consumers.

According to Professor F. S. Warner, of the University of Pennsylvania, Brazil has about 13,000,000,000 tons of the total known world iron deposits, which amount to 63,800,000,000 tons. Brazil thus ranks among the most important potential sources of iron, with almost 22 per cent of the total known deposits of iron ore in the world. These deposits are located in three regions: Minas Gerais, Territory of Amapá, and Mató Grosso. They are in highly inaccessible regions, remote from the deposits of mediocre coal which have been found in the southern part of the country.

What about oil? Venezuela and other South American countries have oil in abundance. Within Brazil's vast territory it may also exist in great quantities. So far, oil has been found only in the small area around the Bay of All Saints (Todos os Santos), State of Bahia. This area is only now beginning to be put into production.

The following table gives a comparison of Brazilian imports of heavy minerals and products of allied industries for a decade ago, with those of 1946 and 1947.

IMPORTS OF BRAZIL	1936		1937	1946		1947
Iron and steel	(Tons)	106,113	141,831	(Tons)	149,400	163,383
Iron products	(Tons)	229,033	304,792	(Tons)	288,078	333,739
Machinery	(Tons)	58,945	83,228	(Tons)	96,076	164,398
Coal (including fuel briquets and coke)	(Tons)	1,431,175	1,707,852	(Tons)	1,060,986	1,572,731
Gasoline	(Tons)	325,175	357,109	(Tons)	623,849	932,916
Automobiles	(Units)	18,971	25,605	(Units)	28,603	66,098

Of Brazil's importations of coal alone in 1937, 711,033 tons came from Germany, 602,635 tons from Great Britain, 141,309 tons from the United States, and 34,656 tons from European Turkey. At present, importation of coal is exclusively from the United States. The *value* of the coal imported that year was one-fourth the value of the machinery imported, but the *amount* of coal imported was twenty times the tonnage of the machinery imported. In 1940 and 1941, when prices of coal were much higher than in 1937, the coal purchases dropped to an average of 1,100,000 tons per year. In 1942 the importation fell to about half of this average, but the cost per ton had nearly doubled.

It is an anomaly to see a country like Brazil, which is estimated to have enough iron ore deposits to supply the world's needs for five hundred years (according to Dr. Charles Van Hise, one-time President of the University of Wisconsin), importing annually almost a half million tons of iron, steel, and products of iron and steel.

Iron. The following table shows the development of the iron industry in Brazil. The figures are for iron and steel in tons:

YEAR	Pig Iron	Sheet Iron	Steel
1925	30,046	283	7,559
1930	33,305	25,896	20,985
1933	46,774	42,362	57,567
1934	58,559	48,699	61,675
1935	64,082	52,358	64,231
1936	78,418	62,942	73,667
1937	98,101	71,419	76,430
1938	122,352	85,666	92,420
1939	160,016	100,996	114,095
1940	185,570	135,293	141,076
1941	208,795	149,928	155,057
1942	213,619	153,154	159,614
1943	247,680	155,058	184,325

The total for 1943 gives Brazil a production of steel and iron of 580,000 tons, as against the United States average annual production of nearly 1,000,000,000 tons a year.

It is in the State of Minas Gerais, which produces most of the gold and diamonds of Brazil, that much of the iron ore lies. Here, too, most of the present-day mills producing iron and steel are to be found. Twenty-five iron deposits are listed in Minas Gerais, with an estimated supply of 11,027,101,000 tons of ore. Much of this ore is of the highest

grade known in the world, and in many places the high-grade ore crops out above the ground. The most famous of these iron mountains, literally composed of high-grade iron ore, is Itabira Peak.

In 1912 the Brazilian Iron and Steel Company received special concessions from the government for the building of a railroad from the location of the rich iron ore deposits in and around the Itabira Peak. The company was an international organization, which was to ship ore to the coast on its own railroad and to Europe and North America in its own ships. These ships were to return laden with coke, and enough iron and steel were to be smelted by the company to supply all Brazilian needs, with a surplus for exportation to other South American countries. A great protest was raised, because it was thought that the favors conceded in the contract were too generous. Objections were made to any ore being exported as such, the contention being that all should be smelted within the country. World War I came on, and negotiations were suspended. In 1920 a new contract was made, leaving out the objectionable features contained in the first one.

This contract was finally approved in 1928, but the smaller companies operating in Brazil joined to fight a contract which involved so comprehensive an undertaking. As those opposed to the exporting of any ore whatever joined in with them, years dragged on, and the largest mineral exploitation project ever planned in Brazil was blocked.

The Brazilian iron industry has developed slowly, and little exportation of ore took place between 1920 and 1930. During 1938 and 1939, more than 375,000 tons of ore were exported annually. In 1939 the contract was rescinded. Brazilians realize that the development of the vast deposits of iron ore is of utmost importance for economic progress and for national defense.

National Mining Company. A new phase in the iron and steel industry came into being with the organization of the National Mining Company and the signing of a contract with the Export-Import Bank of Washington for a loan of $25,000,000. A capital of $25,000,000 was subscribed in Brazil. A war-time loan from the United States was used for the purchase of machinery. A plant for large-scale production of iron and steel products, with sufficient capacity to supply Brazilian needs, was established at Volta Redonda, in the State of Rio de Janeiro, a hundred miles from the city of Rio. A large flat area between the mountain ranges in that region offered the necessary space for an immense industrial development at a minimum of expense. Ore is brought down from the State of Minas Gerais on several railroads, and the finished product is carried to the principal markets over the gov-

ernment-owned Central of Brazil Railroad. The lines of this road will be electrified to Rio de Janeiro, and both the lines hauling ore and those hauling the finished product will be improved, to take care of an immense increase in production.

The company is entirely Brazilian, and only Brazilians can own stock in it. Senhor Guilherme Guinle is its president, and he has been responsible for its successful organization. Technical help in installation and operation was available from the United States. This company is the largest single industrial plant in Brazil. Its successful operation will mean the solution of one of the country's most important economic problems. A large hotel and hundreds of houses for workmen have been erected; in fact, a whole city has been built to take care of the great industrial plant.

The plant was designed to produce annually 90,000 tons of rails and accessories, 25,000 tons of structural steel, 50,000 tons of round bars, 60,000 tons of sheet iron, 50,000 tons of tin sheets, 280,000 tons of pig iron. In 1947, production was 175,000 tons of pig iron and 146,000 tons of steel. Raw material is needed on a large scale—750,000 tons of iron ore, and 600,000 tons of limestone. The iron ore and manganese come from the State of Minas Gerais, and the calcareous ingredients come from that state and also from the States of São Paulo and Rio de Janeiro. Coal is brought from southern Brazil, principally from the State of Santa Catarina. Ports are being prepared to facilitate the shipment of enormous quantities of coal for use in the Volta Redonda plant, since a total of 2,000,000 tons a year will be necessary. The State of Santa Catarina has coal reserves of 500,000,000 tons. This coal, when specially treated, is of sufficiently good quality to permit its use in the production of coke, which is essential in the manufacture of steel and high-grade iron products.

Rio Doce Valley Ore Project. Another large concern has been organized solely for the purpose of exportation of ores. It is called the Rio Doce Valley Company, because the ore is shipped down the valley of the Rio Doce (Sweet River) to the port of Vitória in the State of Espírito Santo. A modern port with installations for rapid loading of ore has been built. The railroad from the port to the mountainous region of the State of Minas Gerais, where the ore deposits exist in such great abundance, is being entirely rebuilt and equipped with rolling stock specially designed for ore transportation. During World War II the company received a grant of $14,000,000 from the Office of Lend-Lease Administration, and an equal amount was subscribed in Brazil. A small amount of ore is being shipped out from Vitória,

which has a good natural harbor, but immense amounts can be shipped from there as soon as adequate transportation facilities are provided. The Rio Doce Valley Company complements the National Mining Company's activities in making available to Brazil and the world immense deposits of the highest grade of iron ore.

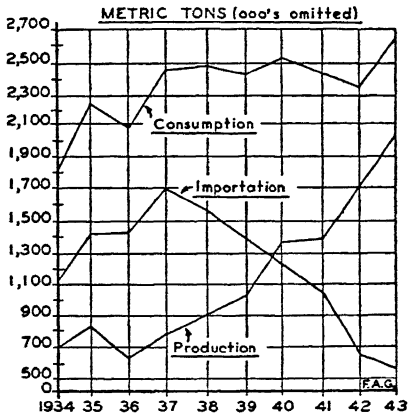
Iron and Steel Consumption. In these days, sometimes called the steel age, the advancement of civilization is often measured in terms of iron or steel—according to the per capita consumption. The United States uses about two thousand pounds of steel per capita per year, whereas Brazil uses a little less than twenty pounds. From 1925 to 1934 the average annual mineral production was $37 per capita for the United States, while for the remainder of the world it was $4 per capita. In India it was only 30 cents per capita.

Manganese. Manganese is an essential product in the preparation of certain alloys and high grades of steel. Brazil has enormous deposits of manganese ore of high content—millions of tons—and ranks third in world production, after Russia and the Gold Coast. In 1937, 250,000 tons of ore were exported from Brazil: 150,000 tons to the United States and 100,000 to Europe, most of it going to Germany. This represented a great increase from 2,300 tons in 1934 and 60,000 tons in 1935. Exportations decreased in 1938 as compared with the preceding year, but reached 222,000 tons in 1940 and 437,000 tons in 1941. Then efforts were made to export larger quantities to the United States. Iron ore and manganese are a war-time necessity, but they also have wonderful peacetime applications. When belligerently inclined nations become overactive in the purchase of these ores, suspicion is always aroused.

Coal. Lack of coal of a high grade has been the greatest drawback to the modern development of Brazil, because it has made fuel costs excessive for transportation purposes and for the smelting of ores for iron and steel production. Houses and other buildings do not have to be heated in most of Brazil. If it were otherwise, the country would be almost uninhabitable because of lack of coal. Coal is used almost exclusively for the firing of locomotives and the driving of industrial machinery, but it is frequently necessary to mix national coal with the imported product to get good results. These coal-producing regions have been mined in a desultory way since 1880, but only during recent years has any large amount of coal been extracted. In 1945, São Paulo produced 18,770 metric tons, Paraná, 107,208 m. t., Santa Catarina, 692,856 m. t., and Rio Grande do Sul, 1,140,075 m. t.

The extraction of Brazilian coal has increased more than five times in the past twenty years—from 329,122 tons in 1923 to 1,958,909 tons

in 1945. The increase in extraction and the corresponding decrease in importations for the years 1934-43 can be seen in the following chart:



There are twenty-five companies in Brazil engaged in mining coal, but 95 per cent of the coal is mined by only five of them. Rio Grande do Sul and Santa Catarina are the only states which produce coal in sufficient quantities for local use and shipment to other states.

The first coal-mining concession was granted in 1866 to James Johnson, a competent English coal mine operator, who formed a partnership with Ignácio Ferreira. Shortly afterward they formed a company in England with a capital of 100,000 pounds sterling. They sold their concession to a company called Imperial Brazilian Colleries Co., Ltd. This company built a railroad to the mines at São Jerônimo and bought the necessary mining machinery. A few years later they sold out to Holtzweissig & Cia., which further developed the mines. This company in turn sold the mines to a Brazilian company, and finally in 1889 the properties passed into the hands of the Companhia Estrada de Ferro de Minas de São Jerônimo, which is to the present day the largest coal producer in Brazil.

National coal production by states, for the years 1940-43, is shown, in tons, in the following table:

STATES	1940	1941	1942	1943
Rio Grande do Sul	1,065,488	1,067,371	1,314,801	1,346,269
Santa Catarina	265,638	334,962	432,594	678,451
Paraná	2,773	1,775	5,459	5,884
São Paulo	2,402	3,971	4,167	3,707

These figures show that in 1943 coal production had increased 52 per cent over the 1940 production.

In 1929 coal importation amounted to 336,753 tons, but by 1937 the total had reached 1,707,852 tons. As national production increases, importation decreases, so much so that in 1940 importations were down to 1,209,000 tons, which was 127,000 tons less than the total of national production. The expansion of Brazilian mines during World War II, and restrictions on the shipping of coal from Europe and the United States, increased the national output to more than 2,000,000 tons and reduced importation to 587,000 tons in 1943.

Electricity rather than coal is used in Brazil for motive power. This includes the almost exclusive use of electric power for industrial motive power and the electrification of several of the more important railroads. The more rapidly the railroads can be electrified the better, even if national coal is mined on an ever-increasing scale.

Oil. Oil fields have been developed in many of the South American countries, but so far all soundings have been comparatively negative in Brazil. Recently oil has been found in several localities near the City of São Salvador, Bahia, and if production can be developed on a large scale, it will be of great economic importance to the country.

Recent laws have made all the subsoil of Brazil national property so that, should any wells be found, they will belong to the Federal Government, which, according to this law, may exploit the oil directly or by contract with national or foreign companies. A National Petroleum Council has been established. It is made up exclusively of native-born Brazilians, and no oil fields may be exploited and no crude oil refined except by companies entirely owned and operated by Brazilians.

The tremendous shortage of both gasoline and fuel oil during the latter half of 1942 and throughout 1943 and 1944 put private cars into storage, unless they were converted to charcoal burners. It also caused a great shortage in taxis, trucks, and buses. From 1920 to 1940 the importation of fuel oil tripled (694,000 tons in 1940). The shortage created by the war seriously handicapped many industries, especially in the State of São Paulo.

Cement. Though cement is not a mineral, it is made of several minerals. Its use has come to be a major factor in the development of any modern civilization. For many years all the cement used in Brazil was imported, but it began to be manufactured in 1926. The total production was only 87,000 tons in 1930, but now more than 750,000

tons are produced annually—an increase of from 10 to 30 per cent each year. Importation fell from 385,000 tons in 1930 to 22,800 tons in 1940 and 10,000 tons in 1941. In 1946, 350,000 tons were imported. Because of shortages of fuel affecting production in 1942, the output of cement decreased 20,000 tons as compared with the previous year, and so 69,000 tons were imported. Production remained about the same in 1943, but importation fell to 13,000 tons. In 1946, 826,500 tons of cement were produced, and in 1947, 913,525 tons were produced.

There are three large cement factories—one just within the city of São Paulo; one at Sorocaba, about a hundred miles from São Paulo; and one in the State of Rio de Janeiro, near the city of Rio. Altogether seven cement companies operate in six different states, but 80 per cent of the total amount produced comes from the three large factories. They manufacture a high grade of cement, and since the country has begun to pave the highways with concrete, an annual production of even a million tons will be inadequate. Nearly all main highways are now graded and graveled. It is planned to pave the highway from Rio to São Paulo, which is about 350 miles long. The São Paulo-Santos highway and the Rio de Janeiro-Petrópolis road are already paved.

The largest consumption of cement is in the building trades. Factories are constantly being constructed, and though national production continues to develop rapidly, a real shortage of cement continues.

Phosphates. One of the minerals most important to the economy of any country is phosphate for use as fertilizer. Phosphates are used to some extent in the industries, and they are indispensable to agriculture. Large amounts are imported, but this should not be necessary since extensive deposits are known to exist within the country.

The largest known phosphate deposit in Brazil is of aluminous phosphate. It is found on Tramira Island, in the State of Maranhão, some two hundred miles east of the city of Belém (State of Pará). This little island is a level plateau, approximately 1,300 by 2,400 feet, and is estimated to contain from six to ten million tons of aluminous phosphate, which is ideal for the production of superphosphate fertilizer. There is another large deposit at Alagôa do Monteiro, near Campina Grande, in the State of Paraiba, and there are several deposits in the State of Bahia. The only deposits now being worked are in the State of São Paulo, at Jacupiranga, near Cananéa. The Ipanema deposits are playing out. Extensive deposits exist in the State of Minas, near Araxá, but freight rates from here to the agricultural centers are prohibitively high.

Concerted efforts are being made to discover new deposits, for they would be a great contribution to Brazilian agricultural economy.

Other Minerals. Lead, nickel, mica, asbestos, and many less used minerals have been found and mined to some extent. Lead is now mined on a large scale. Nickel deposits have also been found and are beginning to be mined. Large deposits of bauxite have been found, and some mining has been done. In one locality, Pocos de Caldas, Minas Gerais, deposits are estimated at 120,000,000 tons. Some bauxite was exported—18,000 tons in 1939—but lack of shipping space brought this movement to a standstill. Aluminum factories in Brazil thus far have been unable to compete in the foreign markets.

Many other minerals of lesser value are being mined and exported. In 1940, 1,500 tons of beryllium were shipped out of the country going principally to Germany. In 1941 the shipments totaled 1,700, but the United States was the only importer of consequence. Beryllium is used as a steel alloy. Future extractions will depend on foreign demand. Ten tons of tungsten were exported in 1940. Rutile, from which titanium is produced, was exported in the amount of some 500 tons a year, but shipments greatly increased during 1941 and later years. Titanium is used as an alloy in special steel products. The export of zirconium was 1,521 tons in 1940, practically all going to the United States, but in 1941 it was 4,375 tons. This product is used in ceramic industries.

From 1940 to 1943 operations in the mining industry showed a great expansion in the nation as a whole. A total of 3,232 mining survey licenses were issued, and 206 new mines were opened to industrial exploitation. Total Brazilian exports of metallic minerals in general, including iron, manganese, chromium, rutile, bauxite, wolframite and sheelite, tantalite, zirconium, columbite, and others, reached three million metric tons in the same period of four years.

The profitable exploitation of much of Brazil's natural resources has been retarded by the lack of trained geologists. Formerly this training was to be had at only one small but famous institution, the Escola de Minas (College of Mining) at Ouro Preto, State of Minas Gerais. Geology is only now gaining recognition as a profession distinct from mining engineering.

Vast mineral wealth doubtless still awaits discovery. With the increase of industrial requirements, technical knowledge, and transportation facilities, the mineral resources of Brazil will come to play an increasingly important role in the economy of the country.

XXII

White Coal

MODERN civilization would be nonexistent were it not for the use of electric power. A nation rich in natural sources of electric power has a firm economic foundation. Electricity is supplied ordinarily from two sources: water and heat. Electricity that is produced by means of water falling to a lower level is called hydroelectricity. Electricity that is produced by means of heat is called thermoelectricity. The resultant electricity is the same, the cost of installation per unit of power is of the same order, but the cost of maintenance and operation is substantially in favor of hydroelectric plants. At first natural waterfalls were utilized to furnish electric power. Later simple reservoirs were made by single dams, but in recent years more complicated processes of canalization of streams have changed the whole problem of generating electricity through the use of water.

Brazil was among the early nations to avail itself of electricity generated by both processes. Vast power expansion will continue, because the growth of the nation demands readily available power—and electrical power is one of the essentials of Brazilian economic life and industry. Brazil ranks sixth in the nations of the world in estimated potential power from natural falls. Those ranking higher are Belgian Congo, the Soviet Union, French Congo, India, and the United States. The highest horsepower potentialities with and without special provision for water storage given in recent publications are as follows: the Soviet Union, 58,000,000; the United States, 25,000,000; China, 20,000,000; Canada, 19,000,000; Brazil, 14,500,000 horsepower. A. W. K. Billings, the leading electrical engineer in Brazil, says: "Estimates of the potential water power of Brazil range from 15,000,000 to 60,000,000 horsepower. However, the visible waterfalls thus catalogued are secondary in economic importance to the invisible water powers obtainable by diversion. Nearly all the great waterfalls are relatively inaccessible and suffer serious disadvantages of very high backwater

in flood season, and it seems certain that they will have a negligible part in the economic future of the country." [1]

If the natural sources offer so many millions of available horsepower, even though part of it lies in the inaccessible interior, it staggers one's imagination to calculate the power possibilities of a country so well watered as is approximately 85 per cent of Brazil.

Electrical Development. Brazil was among the earliest users of electricity. The first thermal generating plant was installed in Campos in 1883 with only 52 kilowatts. The first hydroelectric plant was set up in the city of Juiz de Fóra, in the State of Minas Gerais, in 1889, and it generated 478 kilowatts. By 1900 eleven plants were in operation. From 1901 to 1911 the number of thermoelectric and hydroelectric plants rose to eighty-eight, with a total combined generating capacity of 152,162 kilowatts. By 1920 a marked advance had been made. Data from the Economic Census taken at that time supply the following figures by five-year periods, starting with the first power installations: [2]

PERIODS	NUMBER OF PLANTS	HORSE-POWER	PER CENT
Up to 1890	2	10.350	2.2
1891-1895	2	3.705	0.8
1896-1900	6	3.386	0.7
1901-1905	17	43.337	9.1
1906-1910	60	143.123	30.1
1911-1915	104	192.679	40.5
1916-1920	152	79.072	16.6
Total	343	475.652	100.0

Of these 343 plants, 209 use waterpower, generating more than 70 per cent of the total electric energy. The growth of installations has been on a steady increase ever since, with a relatively large growth in hydroelectric power. In 1939, from a total of 1,044,723 kilowatts, 884,570 kilowatts, or 84.7 per cent, came from waterpower. In 1940, the number of power plants for generating electricity had reached 1,131, with a combined capacity estimated at 1,186,882 kilowatts. Data for 1946 show that there were 1,602 power companies possessing 1,873 generating plants (871 thermoelectric, 910 hydroelectric, and 28 mixed

[1] A. W. K. Billings, "Water Power in Brazil," *Civil Engineer,* August, 1938, p. 520.

[2] "Estatísticas Complementares do Censo Econômico," *Recenseamento do Brazil,* V, Part 3, September 1, 1920.

plants) with a total capacity of 1,295,614 kilowatts. It is interesting to note in this connection that one plant alone, near the city of São Paulo, when completely installed, will have a production capacity of well over 1,000,000 kilowatts.

The tendency in future installations will be in favor of hydroelectric plants, because of the high cost of operation of thermal plants whether they consume imported or national coal. If at any future time abundant petroleum supplies are discovered in the country, the picture will be materially changed.

The largest thermoelectric plant is that of Recife, State of Pernambuco, with a capacity of 22,500 kilowatts, the second largest being in Pôrto Alegre. The largest hydroelectric plant is at Cubatão, between Santos and São Paulo, with effective capacity of 340,000 kilowatts. This plant will be fully described later in this chapter. The second is the Ribeirão das Lages near the city of Rio de Janeiro, with 175,000 kilowatts, and the third in size is the Ilha dos Pombos, in the State of Rio de Janeiro, with 117,040 kilowatts.

Power Companies. The ownership of the companies supplying power to the cities and industries varies considerably. Some plants are municipally owned. Many are in the hands of small companies operating in a single city. A few Brazilian-owned power companies operate over regions taking in several counties. A number of the large industrial companies, principally cotton mills, own power plants, nearly all with hydroelectric generators. Two foreign concerns supply about 70 per cent of the total power consumed in the entire country. The Brazilian Traction, Light and Power Company, commonly known as the "Light," furnished, in 1945, 3,041,530,000 kilowatt hours, and in the same year the Electric Bond and Share, commonly known as "Empresas," furnished 286,729,800 in the State of São Paulo.

The first of these companies is Canadian and has plants in several states of Brazil. The second is American, with headquarters in New York. The "Light" has about 54 per cent of the Brazilian productive capacity of electricity, and the *Empresas* 14 per cent. Annual consumption did not decline during the war. It has been increasing on an average of about 8 per cent annually.

The lack of uniformity in electrical energy supplied in some towns has been a handicap to those using electricity. Some twelve and a half million inhabitants have alternating current, 120 volts, while two million are supplied with direct current. Some few cities are supplied with 220 volts, but these represent a small minority. Standardization is progressing, and no doubt eventually the voltage will be AC 110

for the whole country. As the cities of Rio de Janeiro and São Paulo and the cities in the intervening country are supplied by sister companies, the power lines of the two companies have been interconnected. In this way a peak load in one company's system beyond its capacity can be carried by the other company's system.

Application of Energy. Electric power has all the normal uses in Brazil: public utilities (city lighting, street-car traction, etc.); home consumption (in the large cities practically every home is wired for electric lights, radios, electric irons, and refrigerators); in industries (wherever electric power is available it is preferred because it is cheaper); for railroad traction (four railroads are operating part of their lines electrically). Almost every city and many villages of Brazil have electric lights, and the larger cities are exceptionally well lighted. Thousands of farm homes have their own electric plants for lighting and often for supplying power for farm machinery and home industries. Some farms are connected with power lines of the larger companies, not only for lighting but for farm industry uses as well. The use of electric power in industry is well nigh universal. São Paulo's enormous industrial growth has as its principal factor the existence of an abundant supply of reasonably priced electric power. Rio de Janeiro and many other cities have adequate electric power, but some cities have had their growth retarded because of inadequate power supply. Railway electrification is increasing and should be increased even more if the country is to have anything like the transportation service essential to its progress and development.

Brazilians have been quick to adopt modern electric home appliances, as far as their economic status would permit. Often a radio is heard from a rude mud hut, where the radio cost more than the house. Some humble homes have an electric refrigerator, which in such circumstances cannot be considered anything but a luxury. Sales on the installment plan make the purchase of these modern home appliances available for many who would otherwise be unable to own them. As the standard of living rises, one of the first results is the purchase of labor-saving and comfort-giving appliances. Power companies are often hard pressed to supply the demand. Many electrical appliances are either manufactured or assembled in Brazil, which places them within the buying range of a fair percentage of the middle-class population.

The warm climate of most of the country does away with the necessity of artificially heated homes and buildings, and this economy makes available funds for electric refrigerators and for fans and other appli-

ances. The fact that electric equipment and appliances are within reach of even some of the poorer classes is a great contribution to the social welfare and evolution of the nation.

Railway Electrification. Railways in Brazil use wood, coal, and oil as fuel, in the order named. Many roads use wood almost exclusively, and those whose lines are penetrating new regions usually find an abundant supply. Some of the railways, notably the Companhia Paulista, have carried on extensive work in reforestation along their lines, preparing for the day when natural forests will have been exhausted. Others, especially the Central do Brazil and the São Paulo Railway, have relied largely on imported coal. Railroads have used some wood and some crude oil, and more recently an increasing amount of national coal. The use of either coal or wood in locomotives is an anomaly in a country where electricity can be generated so easily and so cheaply.

The foremost example of railway electrification is that of the Companhia Paulista. Its first electrified train went into service in 1922, and now 250 miles of line have been electrified. The use of heavy rails, a magnificent roadbed (one of the finest in the world), and the best of modern equipment make it possible for the company to maintain fast service, both for passengers and freight. A frequent traveler on the Twentieth Century Limited was heard to remark that he only wished that the New York Central had a roadbed as good as that of the Paulista.

The change from wood- and coal-burning locomotives to electric traction meant an economy to the company of 80 per cent in hauling costs. The use of electricity to such a large extent resulted in an economy of millions of cubic meters of wood. This means that the company's annual harvest of 100,000 cubic meters of wood from its eucalyptus plantations is available for other purposes.

The Oeste de Minas, now part of the Viação Mineira, was the next railroad to begin electrification. It has a line from Angra dos Reis to Lavras, from the seacoast up through the mountains, with a heavy freight but almost no passenger traffic. Grades were steep and wood-burning locomotives could pull only six to eight loaded freight cars. In 1927 a part of the most mountainous section was electrified, on a contract with the Electrical Export Co., Ltd., whereby the electrification would be paid for from the economies of its use. Since then the electrified section has been tripled in extent, and eventually some five hundred miles will be so equipped.

The suburban traffic out of Rio de Janeiro is intense. On the Central do Brasil Railroad, with the system under steam traction, 250

trains a day (125 in each direction) seemed to be the upper limit, a train every fifteen minutes. As the suburbs became more densely populated, service became wholly inadequate. It was a common sight to see every inch of a train taken up by passengers, on the tender, on the roof of the baggage car, on the platforms, and on the steps. Accidents occurred with appalling frequency. In 1920 money was borrowed in the United States for electrification, but the road was not electrified till 1938. The work was done by Metropolitan Vickers. Trains have been speeded up, departures made at five-minute intervals, and safety regulations tightened. An unprofitable business was brought to a paying basis. This single improvement was the greatest advance in this century in Brazilian railroad operations.

Plans call for the immediate extension of the electrification of the Central to Barra Mansa, to supply traffic needs of the big steel plant at Volta Redonda. Eventually this type of operation will be extended to São Paulo, since the Rio-São Paulo lines have the heaviest traffic in Brazil.

The Sorocabana Railroad also now has electric traction. This state-owned road has a total extension within the State of São Paulo of 2,200 kilometers and is next to the Central do Brasil with respect to total income. Electrification has been carried on by a combine between the General Electric and Westinghouse—a magnificent feat of American industry and commerce. Initial electrification covered the double track from São Paulo to Santo Antonio, a total distance of 92 miles. As in the case of all the other electrified railroads, an initial section of heavy traffic is first converted; then, as rapidly as economic conditions permit, extensions are made.

The electrification of Brazilian railroads is going on. It will greatly enhance travel and promote transportation progress, and contribute to the economic welfare of the country. Transportation is Brazil's main problem, and electrification of its railroads represents the greatest progress possible, along with a cheapening of cost that means everything to the country's prosperity. In these days of industrialization it might well be recommended that the government determine on the compulsory electrification of all railroads of any sizable traffic. The São Paulo Railway has been required to electrify a part of its system.

Rivers That Run Backward. The most interesting engineering development in Brazil is the electrical power project between São Paulo and Santos called the Serra plant. Twenty miles from the coast the Cubatão range rises abruptly to an elevation of 2,445 feet. A few miles from this high level arise two rivers, the Rio Grande and Pin-

heiros, which in short distances from their sources join the Tietê. The natural flow of all three is due west, then south, then east. With sources less than fifty miles distant from the Atlantic Ocean, they eventually reach the ocean through Uruguay, after having bordered both Paraguay and Argentina, 2,500 miles away! A study of the region was made, and the result was that these rivers were dammed and great reservoirs established close to the summit so that the waters plunge down a drop of 2,380 feet to approximately sea level—with a generating capacity of more than a million horsepower. The direction of the water toward the sea then became due east, as against a natural flow due west.

For detailed technical description of this engineering feat, the reader is referred to the article by A. W. K. Billings already cited in this chapter. As this project was developed and is being carried out under his magnificent engineering skill, no one else could better describe it.

Even to a layman a few salient features of this power development should be interesting. Along the divide where the water is impounded, rainfall is heavy, so that, while the rivers involved are small, large amounts of water are available. Along the hot coast the normal rainfall is from 72 to 96 inches annually, and further inland it decreases to about 48 to 60 inches, but on the divide it is from 180 to 240 inches. Where this power project is located, the average rainfall is 190 inches per year, with a record of 270 inches! As much as 52 inches may fall in a month, and a precipitation of 7½ inches in eighty minutes has been registered.

So much water is needed to guarantee against occasional decreases, when a minimum rainfall may prevail for three years in succession, that it has been necessary to raise the water from two lower levels to lakes high up—a total lift of from 40 to 100 feet. Water from one river is elevated 15 feet into the Pinheiros Canal, and then elevated a second time in lifts varying from 25 to 85 feet to the main lake, known as the Rio Grande Lake. This consecutive lifting from river to lake and from lake to lake is calculated to take care of the electric power capacity needs of São Paulo for the coming twenty to thirty years. Already $50,000,000 has been spent on the project. To give an idea of the cost involved, each generator of 90,000 horsepower cost more than $3,000,000, including its pipe-line feeder and other accessory construction costs.

So vast is the lake near the city, with its 600-mile shore line and it approach to the city through connecting canals and dredged rivers, that it would be feasible to transport freight in barges from Santos

to the foot of the mountain, lift them the 2,400 feet by ropeway or barge incline, then bring them to the city of São Paulo through the lakes and canals. This plan may never be carried out, but it would give São Paulo cheap inland transportation for the enormous amount of imported and exported goods that constantly flow in and out of the city.

One of the complementary benefits furnished the city of São Paulo through this provision for the storing of water and its control has been the regulation of floods. This, together with the straightening of the River Tietê, as it winds its way through the city, will provide protection to low-lying sections which until recently were subject to disastrous flooding. These storage lakes may possibly have some influence on the São Paulo climate, and as recreational lakes they are most attractive. Sailing clubs abound, and anyone can obtain a license to place a sailing vessel on the waters. Hundreds of country homes surround the lakes, and as soon as roads are paved in the surrounding area, larger crowds will avail themselves of the water and beaches.

Nothing could be more fortunate for a fast-growing city like São Paulo than to have such an adequate power supply within thirty miles. It is also fortunate that this power is handled by so capable a company as the "Light," which has the necessary capital, engineering skill, and commercial initiative to see to it that this vast interesting power project keeps pace with the needs of the city.

Future Developments. Dozens of other projects have been studied by the government authorities and only await the application of capital and development to provide the electric power so much needed by a growing nation. Legislation has been passed to safeguard the Brazilian interest, but the cooperation of foreign capital and engineering skill will be needed for many years.

☆

PART IV

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Industry and Commerce

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XXIII

Industrial Development

FOR THE past fifty years an industrial evolution has been going on in Brazil, until at the present time the annual value of industrial products is double that of agricultural products.[1] One thesis of this book is that as a producer of raw materials, especially agricultural, Brazil holds out greater promise than any other nation on the globe (with the possible exception of the Soviet Union). But this does not mean that Brazil has not experienced a tremendous industrial expansion.

Historically Speaking. The beginning of the industrial development of Brazil dates from the last quarter of the nineteenth century. During colonial times Portugal made a decided effort to prohibit any industrial development. Its attitude was typically mercantilistic—i.e., all raw materials as well as all gold and precious stones should be shipped to the mother country, and such manufactured articles as were necessary should go to Brazil from Portugal. The few manufactured articles produced in the colony were usually hand-forged or hand-woven by the slaves on the great agricultural estates. The only important industrial production in the colonial era was carried on in sugar mills (*engenhos*) built entirely of wood.

Typical legislative acts of Portugal definitely prohibiting manufacturing activities in Brazil can be cited. For instance, the goldsmith's trade was made illegal in 1766, and from 1783 to 1808 the manufacture of any cloth, except a coarse cotton cloth used for the garments of slaves, was against the law. The manufacture of iron products, which had begun in a small way in 1590, was also forbidden until 1800, when it was allowed to be resumed. Even sugar production was curtailed, in

[1] *Brazil, 1940-41,* p. ix. In 1938 industrial production was valued at 20 million contos and agricultural production at 12½ million contos. Since 1938 both totals have greatly increased, but industrial production much faster than agricultural. (Conto=one thousand cruzeiros=U. S. $50.)

order that more cotton might be planted and sent to the mills of Portugal. Saltpeter production was prohibited, because it was feared that gunpowder would be manufactured. In addition to desiring to suppress all types of manufacture in the colony of Brazil so that more labor could be used in the mining of gold, Portugal wished to develop its own trade with the Orient.[2]

When the Portuguese exile, the Prince Regent who later became Dom João VI, came to Brazil in 1807, he liberalized the laws somewhat, but British imperialism barred the road. A "most-favored nation" commercial treaty with Great Britain blocked for a time any stimulus to industrial development in Brazil. The influence of British trade and commercial agreements continued a handicap throughout the first half of the century. The lack of capital, as well as of industrial and manufacturing experience, were grave handicaps. After thirty years of independence, only fifty industrial establishments were in operation in the Empire. In 1860 nine cotton factories were in operation with a total of less than a thousand mill hands. By 1881 the number of mills had grown to forty-four, and five thousand workmen were employed. The first significant industrial rise took place between the years 1880 and 1890. More than a thousand factories sprang up in this decade, and the number of workmen exceeded 50,000. This sudden growth came about at the close of the Empire as capital increased, manufacturing machinery began to be imported, and transportation facilities were improved.

From 1890 to 1914 there was a steady growth of industry. With the restrictions on international trade caused by World War I, manufactured goods were extremely difficult to obtain, and prices of some imported goods were prohibitive. From 1914 to 1920, 5,936 new manufacturing plants were put into operation. Many of these enterprises were not firmly established and succumbed as soon as international trade began to assume something like normal proportions after the war. But two definite results were evident: large-scale industry had come to stay, and São Paulo had replaced Rio de Janeiro as the industrial center. São Paulo's rapid industrial development was due to its favorable climate, cheap power, abundant supply of labor (including a liberal proportion of European immigrants), good transportation facilities (both inland and by sea through Santos), and subsidiary and complementary establishments. The State of São Paulo has abundant rich agricultural lands which furnish raw materials for industry and a ready market for manufactured products among the agricultural popu-

[2] *Brazil, 1939-40,* p. 427.

lation. Progress has been greatest in this state. It must also be said that the large foreign population contributed materially to this rapid rise of industry in the state. Some of the German and Italian immigrants became industrial barons, often in one generation. There is a tendency for these national groups to enter into industry in Brazil.

In the future it is expected that other parts of Brazil will increase their contributions to the country's industrial life. Iron and steel in Minas Gerais, rubber in Pará, and lumber mills in Paraná will swell the national total of industrial production.

The United States, Japan, and Brazil were undoubtedly the three nations which received the greatest industrial stimulus from World War I. While Brazil did not compare with the other two countries in volume or value of industrial production, its industries in the postwar period were of vital importance in the economic life of the nation. From 1911 to 1919 the total products of Brazilian industry tripled in value. The greatest total increase was in textiles.

By 1942 there were in operation in Brazil more than 70,000 registered factories, a majority of them small. About 10,000 are of economic significance: they have a total annual production of 12,000,000,000 cruzeiros and employ, in round numbers, about 1,500,000 working men and women (the total number employed in industry in 1940 being 1,412,434). More than 40 per cent of this industrial production is carried on in the State of São Paulo.

Influence of World War II. World War I started Brazilian industry on its way, and World War II further advanced it. The number of industries has greatly increased, and much progress has been made not only in the variety of manufactured products, but also in their quality. The volume of goods has more than quadrupled, which accounts for the fact that a significant part of Brazilian exports is now made up of manufactured goods. The value of the industrial production, which amounted to 8,000 million cruzeiros, in 1937, exceeded 27,000 million in 1943.

One phase of industrial development that needs strengthening is the manufacture of supplies for national defense such as arms and munitions. A foundation for these industries has been laid, but active production on a large scale has not been achieved. That the United States is interested in the development of Brazilian industry is shown by its collaboration in the development of the steel industry.

The most economical production and application of strategic raw materials is of importance. The former Economic Coordinator of Brazil, Sr. João Alberto Lins de Barros, endeavored to direct national

industries along the most productive war effort lines, and to bring about a general alignment of industries for more efficient production during the coming years.

Migration of Industry from Other Countries. A significant phase of the industrial development of Brazil, and other South American countries as well, has been the establishment of branch factories by many foreign concerns. A fairly large percentage of the present industrial production of Brazil is accounted for by branch factories of foreign-owned and -controlled companies. This movement, which began more than thirty years ago, has recently been greatly accelerated by the exigencies of the world's economic and political structure. Most American branch factories in Brazil are about ten years old. D. M. Phelps has gone fully into this subject in his book *Migration of Industry to South America.*[3]

Recently the Goodyear and Firestone companies established branch automobile tire factories in São Paulo. Practically no imported material will be necessary. This effects an economy for these producers and enables them to pass goods on to the consumer at reduced prices.

A Typical Example of American Industry in Brazil. Johnson & Johnson have long supplied a part of the Brazilian market with their pharmaceutical goods. With the recent rapid progress in public health sanitation and the enormous increase in hospital equipment and facilities, there has been opened up an increasing demand for hospital supplies. In 1934 a branch factory of this company was set up in the city of São Paulo. By 1940 its capacity had risen to two and a half times the original. Ninety-nine per cent of all the products of the company sold in Brazil is manufactured there. Forty-one major products are being made, and new items are constantly added. From 1934 to 1939, there was an increase of 350 per cent. This firm is now supplying goods to 4,000 drugstores throughout the country and to about 1,500 hospitals.

The company consumes as much nationally produced raw material as is practicable. In making absorbent cotton alone, about a thousand tons of raw material each year are used. Investigations and research are being carried on with the purpose of replacing high-priced imported products. Many of these may soon be produced from national raw materials, and thus be priced within the reach of the masses. Some of the company's manufactured goods are exported from Brazil to other countries of South America and even to South Africa.

[3] D. M. Phelps, *Migration of Industry to South America* (New York: McGraw-Hill Book Co., 1936).

Corn Products Refining Company. Another type of migrated industry is that of the Corn Products Refining Company, operating as a Brazilian company subsidiary to the parent company in New York. This company began operations in Brazil in 1930, although since 1928 it had been running a branch factory in Argentina. Corn is practically the only raw material used. Cornstarch and glucose are rather low-priced bulky products, which do not lend themselves to importation, especially if there is a protective tariff. Brazil is a large producer of corn, but until this company installed its plants in São Paulo it was not considered an industrial product. It was raised largely for home consumption, and only a small part of the annual crop entered into commerce. The company has always been able to obtain enough corn on the local market, or has made contracts with the growers in the interior. Three thousand tons of corn are used each month, and practically all the products of the parent company's plants in the United States are now produced and marketed in Brazil. Few of the manufactured products are exported, however. This company produces large quantities of industrial starches and other products for home use, which are marketed over the whole country. The introduction of the use of glucose in the confectionery trade has contributed largely to the extraordinary increase in the manufacture and sale of candies of many kinds. With the high protective tariffs now existing, very limited quantities of these products would be available on the local market were they imported.

An Unusual Case of Migration. The coming to Brazil of an entire American industrial plant, purchased by Brazilian capital, is rather unusual. After World War I, and owing to continuous labor troubles at Hopewell, Virginia, the rayon plant of the Tubize Chatillon Company became idle and was closed down. It was purchased by a group of Brazilian capitalists. The machinery was dismantled, shipped to São Paulo, and set up in an entirely new factory a few miles out of the city. An abundance of water from a nearby river, of the quality needed in the manufacture of nitrocellulose, was available. The plant was near enough to the city to obtain the necessary supply of labor. American technicians set up the plant, which is now being run almost entirely with Brazilian supervision and labor. This plant gives employment to four thousand people.

Grouping of Industries. D. M. Phelps classifies the activities of the American companies into four groups, and it might be well to use this same division for all Brazilian industry:

1. Activities primarily related to the extraction and processing of mineral products and other raw materials.
2. Processing products of agricultural or pastoral origin.
3. Furnishing services (public utilities).
4. General manufacturing.

The first group is of great importance to Brazil, because home consumption of products in this group has been increasing rapidly. The new steel plants in Volta Redonda will greatly contribute to the progress of the country.

At present Brazil produces only 1 per cent of the world's supply of cement. A continually increasing amount is essential to the development of Brazil. Bridges, paved roads, and buildings are among the country's greatest needs, and cement is essential to their construction. If Brazil succeeds in obtaining cheap and abundant steel for railroad equipment and cement for road paving, it can go forward by leaps and bounds. Without these, other industrial developments are necessarily retarded.

The largest single industrial organization in Brazil belongs to the Matarazzo family. Francisco Matarazzo came to Brazil as an Italian immigrant from a fairly well-to-do family. Beginning at scratch in 1881, he gradually developed an industrial group entirely under his control. He died in 1939, and the company continues under his son, who bears the same name. The largest textile factory in Brazil is but one of the many activities of the United Matarazzo Industries. The company's products include wheat flour, textiles, cellophane, starch, sugar, salt, rice, granulated caustic soda, alcohol, brandies, liqueurs, lard, glycerine, cottonseed oil, linseed oil, medicinal and industrial castor oil, vegetable oils and seedcake, edible and industrial coconut oil, common and toilet soaps, perfumery, insecticides, cardboard, gypsum, nails, artificial silk textiles, crockery, and tin and sheet metal articles. It is the largest single industrial concern in South America, employing 20,000 workers. The power needed to run the factories amounts to 30,000 horsepower, and the monthly consumption of electricity runs from 8 to 10 million kilowatts. Besides manufacturing, the firm does a large import, export, and banking business. In addition to its manufacturing industries in the State of São Paulo, it has concerns in other Brazilian states under its control, and it carries on a large number of commercial operations.

Factors Unfavorable to Industrial Development. Certainly the lack of an easily available and abundant supply of coal and oil can be con-

sidered as a major drawback. The country has whole mountains of iron ore, but there is a shortage of coal, and the supply comes from a state far south of those having the iron ore. Power is largely supplied by the use of electricity, but in the years gone by the lack of coal has been a tremendous handicap to industrial development.

Insufficiency of capital for investment has been another grave drawback. The first great Brazilian industrialist, Mauá, failed because of lack of capital. Much foreign capital has been poured into the country from Great Britain, the United States, and some of the European countries, but the lack of nationally owned and controlled capital and the corresponding credit that goes with it has slowed down industrial growth.

Trained labor and technical supervisors have also been lacking. There is not a sufficient supply of untrained labor, and trained workers are almost always at a premium. Technically trained men may be available for directing an industry, but foremen and skilled workers are usually foreigners. Now that the laws on immigration are stringent, the problem becomes more acute.

The constant want ads in the São Paulo newspapers prove both shortages, because not only is unskilled labor called for but almost daily numerous offers are made for men with technical training. The great industrial expansion of 1940-42 caused a crisis in the labor market. Such an insistent demand for trained men was made that the Federal Government finally elaborated a most ambitious educational scheme for training both skilled workers and technical men. A small monthly tax of twenty cents per employee is levied on industrial concerns. This tax is to be spent exclusively in professional training in all branches of industry and in more elaborate technical courses. The State Federation of Industries in São Paulo is in charge of this work in that state. It is operating trade schools for skilled workers under the direction of Professor Robert Mange, a Swiss engineer. At Mackenzie College, four-year courses for chemists and electricians have been given since 1937. The entrance requirement has been a high school diploma.

Under a new law the entrance requirements are nine years' schooling, including the primary course. There are fifteen courses, which cover nearly all modern industrial needs. Each requires three years, except chemistry, which is a four-year course. Private schools are allowed to offer these courses, but in each large center a Federal Technical School is being established. The one in Rio de Janeiro is already functioning, and professors have been brought from Switzerland and the United States to initiate its activities. In a few years, intense devel-

opment of professional training and technical courses will have a marked result in national industry.[4]

Lack of abundant and cheap transportation facilities has been a great handicap to an expanding industrial development. Most towns and villages are now accessible by train or truck, but some are still reached only by slow river navigation or pack mule. Hard-surface roads are essential to any process of more rapid industrial developments. It is interesting to note that Brazil has completely skipped the four-wheel horse-drawn vehicle stage of developement, going from the two-wheeled oxcart to the automobile and truck, and, in some instances, directly to the airplane.

Factors Favorable to Industrial Development. Ever since its inception in the time of the Empire, Brazilian industry has had the advantage of a high protective tariff. At present, duties protect practically all nationally manufactured products and are so set up that they become operative for any newly manufactured item as soon as the industry applies for protection. Some imported articles are on sale, at almost prohibitive prices. Protection has driven others completely from the market. Shoes are an example of the latter. Practically no foreign-made shoes are now offered on the Brazilian market. Some English woolen goods are still imported and sold at a much higher price than the Brazilian product, but almost all men's suits are now made of nationally woven goods.

Roberto Simonsen had this to say in *Brazil's Industrial Evolution:* "Much more than any protective tariff, the gradual depreciation of our currency in terms of foreign currencies, and the rapid increase of a population continually more educated, influence our industrial growth." [5]

The rapid increase of population, and the fairly rapid rise in the standard of living and purchasing power of the population, would form, without any doubt, one of the strongest aids to the industrial growth of Brazil. A population that doubles itself every few decades has a tremendously expanding power of consumption. But even if the rate of increase in population should decline, it seems reasonable to believe that the purchasing power of the total population will increase sufficiently to offset any of the effects of a drop in population.

The decline of the value of Brazilian currency in comparison with the dollar, for example, has greatly enhanced the value of home indus-

[4] See Chapter XXXI.

[5] Roberto C. Simonsen, *Brazil's Industrial Evolution* (São Paulo: Escola Livre de Sociologia e Política, 1939).

tries. An item may be cited to prove this—absorbent cotton used in hospitals and for sanitary purposes costs just three times as much in cruzeiros when it is imported. Many products of the United States, when manufactured in Brazil, with Brazilian labor and raw materials, can, despite taxes, be sold at retail in Brazil for less than the same article can be sold on the home market when manufactured in the United States.

Brazilian Leadership. Outstanding among Brazilian industrial leaders was the late Roberto Simonsen. From the time of his graduation from the State Polytechnic Institute he was active in industrial development. His first administrative positions were in the city of Santos, where he was born. In 1924 he organized the Santos Construction Company. He continued at the head of this company until his death in 1948, but since 1925 he was active as the head of a number of industrial organizations in the city of São Paulo, such as the São Caetano Ceramics, one of the largest concerns in that line in Brazil. As president of the São Paulo Industrial Federation he was actively engaged in efficient leadership at a time when the greatest expansion in the industrial history of Brazil was taking place.

In spite of his many enterprises he found time to study the economic history of Brazil and wrote a two-volume work. His *História Econômica do Brasil* is a most informative and complete work for study and reference. Altogether he published some eighteen books, all on economic or engineering subjects. He was president of the State Engineering Institute and a member of the São Paulo Academy of Letters and of the Brazilian Academy of Letters. He was the leading influence in the founding of the São Paulo School of Sociology and Political Science, giving liberally of his time as a professor and of his means for maintenance. This privately owned institution is the only one of its kind in Brazil, and although not officially a part of the University it is making an enormous contribution to the study and teaching of sociology and politics, both administrative and economic. This institution is one of the few Brazilian colleges being helped by American foundations. It would never have existed but for the strong backing given by Roberto Simonsen.

One of the best-informed industrial leaders in Brazil, he collaborated with the Federal Government in establishing technical education and training for both laborers and skilled technicians. He spoke English and had done much to promote better cultural relations between Brazil, Great Britain, and the United States. At the time of his death he was a Federal Senator.

Trends in Industry. The day has passed when it was a disparagement to say of a manufactured product that it was "Made in Brazil." All goods now manufactured in the country must be so identified.

The trend of Brazilian industry is to uphold quality, reduce the cost of production, maintain reasonable prices, and guard against too high protective tariffs. Brazilian industry makes an effort to find necessary raw materials inside the country and to keep plants abreast of technical advances in manufacture. The economy of the nation and the welfare of its people are thus promoted.

Definite steps are being taken to bring about these things. The newly organized industrial training for skilled laborers, the new technical courses for foremen, courses for mechanical and mining engineers, are all designed to increase the number of men with adequate technical knowledge for actual industrial practice and leadership. Notable progress has been made in the improvement of manufacturing processes, and higher standards of quality are demanded by the consumer and are being furnished by the industries. Laboratory control of raw materials and manufacturing processes is becoming the rule, not the exception.

A certain amount of economic control is being exercised by the government to limit profits to reasonable figures, and a marked tendency toward advanced methods with standardization of industrial practice is in evidence. Modern social legislation has been adopted in Brazil. There is some danger that these laws may be passed so rapidly that they cannot be properly carried out. It may justly be said that labor would probably enjoy adequate protection under the present labor laws, were they properly enforced.

XXIV

"Made in Brazil"

"MADE IN U. S. A.," "Made in Great Britain," "Made in Germany," and even "Made in Japan" were frequently seen stamped on manufactured articles offered for sale to Brazilians. Until a few years ago it was current opinion that only imported goods were of the best quality. But a change has come about, and today the manufactured goods stamped *"Industria Brasileira"* far outnumber those with foreign trade marks. All manufactured goods must carry a consumer's tax stamp—green for the national product and red for the imported article—so it is easy to know which articles are of foreign origin. In one of the larger five-and-ten-cent chain stores, with branches in several large cities, 90 per cent of the articles offered for sale, even between the two World Wars, was of national manufacture.

Difficult or impossible conditions for the importation of manufactured articles during war years gave a tremendous stimulus to Brazilian manufacture, so much so that a new high in industrial activity was reached, and the home market assured for most consumer goods. Numerous American and a few British concerns have branch factories in Brazil or produce under licensed contracts. Only the more complicated machinery products, such as typewriters, automobiles, and airplanes, are almost entirely imported. Airplanes and even airplane motors are beginning to be manufactured locally, and it is only a question of a few years until practically all types of manufactured goods can be supplied by local factories. Most of these goods will be produced in sufficient quantities for home consumption, and in many cases on a scale permitting some exportation.

Classification of Manufactured Articles. Three industrial censuses have been made—1907, 1920, and 1938. Comparisons between these three are illuminating. The total value of industrial production in 1907 was given as 669 million cruzeiros; in 1920 as 2 billion cruzeiros; and in 1938 as 20 billion cruzeiros (about one billion dollars). From

1938 to 1940 there was an estimated increase of 25 per cent, and in 1947 the total production increase was 65 billion cruzeiros.

In the official figures given in government publications the following subdivision of manufactured articles is used: food products; textiles; clothing; chemical products, including drugs and perfumes; steel and metals; wood and furniture; mining and mine products; building material; paper and printing; tools and machinery; tobacco and cigarettes; rolling stock and vehicles; toys and musical instruments; rugs and mattresses; and rubber goods. The order given is the order of their value. Food products make up 35% of the total and textiles 23%, these two classifications alone accounting for nearly 60% of the total. Steel and metal production was so small in 1927 that it received no special classification, yet in 1938 it accounted for nearly 6% of the total. The last seven groups together account for only about 7% of the total at the present time, but the smallest group—rubber goods—produces two million dollars' worth of manufactured goods a year and is rapidly advancing. Manufactured foods accounted for 41% in 1920 and fell to 34% in 1938. This percentage will continue to decrease as that of other goods increases. In 1940 it had already decreased to 30%—just above textiles, according to the estimates published in *Brazil 1940-41*. Each of these groups increased its production by 23% from 1938 to 1940, while the total manufactured group increased 25% in these two years. This apparent confusion is due to the fact that Brazilian industry is growing by leaps and bounds. Generalizations based on statistics before World War II are even now so far out of date as to be practically useless for the purpose of understanding present-day Brazil.

Food Products. In addition to exporting enormous supplies of food products as raw materials, Brazil is supplying the home market, with the exception of some few important items. The principal food exports are meat, grains, beverages, sugar, breads and biscuits, canned goods, and dairy products.

About one-third of all manufactured food supplies of Brazil, as far as money value is concerned, is meat products. Of course, the packing houses stand out in this regard. Armour, Wilson, and Swift are the three American concerns, and Vestey Brothers is the chief British packer operating in the country. Several Brazilian concerns handle a small part of the meat business. The large companies were established during World War I and have continued to expand. Their export business reached new highs in 1939-41, but in 1942 meat supplies became so low that exportation was prohibited for a time. Almost all

the meat products put up in the United States have their counterpart in Brazil. The meat packers of Brazil supply their home market with ham, bacon, and sausages. As already stated, by far the major part of the meat consumed in Brazil is freshly killed in local slaughterhouses and goes through no industrial process of chilling or refrigeration.

The processed grains are principally wheat, corn, and rice, and to a much lesser degree oats and rye. The greater part of the wheat is imported from Argentina but is milled in Brazil. Forty years ago little wheat flour was consumed in Brazil, but now wheat bread is used by a large percentage of Brazilians. Bakeries exist even in the smallest towns and villages. An entirely new manufacturing industry has arisen now that grains are prepared in many ways (as grits, for example), and marketed in attractive cellophane packages. The most important single grain product is probably corn meal, prepared by large mills in the cities and ground at home on the farms. (See Chapter VIII.)

Beverages. While Brazilians are not heavy drinkers of hard liquors, they consume enormous quantities of light alcoholic drinks and of bottled mineral waters and other nonalcoholic beverages. A cheap rum is the principal by-product of most sugar mills. Ten cents' worth would make one who is not used to it drunk. It is consumed principally by the poorer classes, and in some rural sections its use is a great curse. The principal beverage is beer, of which little is imported. Many types are brewed, and it is usually sold in bottles. The Federal District is the principal center of production, followed by São Paulo. Possibly because of the large foreign population, the three southernmost states are the largest consumers.

The commonest table beverage is wine. This would be expected in a country which has a large European immigration from wine-producing countries such as Portugal, Italy, and Spain.

For the past twenty years the importations of wines have diminished to one-tenth of their former value, while national production has increased threefold in the same period. Fairly good wines of several European types are produced, and some native types as well. A national champagne comes in increasing quantities from Rio Grande do Sul, which produces four-fifths of all the wines of the country. Good wines are imported from Argentina and Chile.

Fine mineral waters of all kinds abound in Brazil. The State of Minas Gerais has the greatest variety. Some years ago, when the water supplies of some of the larger cities were none too safe for drinking, the well-to-do used mineral waters almost exclusively. In many cities distribution is made in demijohns.

Nonalcoholic beverages are sold everywhere and vary in quality from ordinary soda pop to several standard brands of soft drinks. The most popular of these is Guaraná, which takes at least its name from the guaraná produced in the Amazon Valley. The beverage made in northern Brazil really has guaraná (see Chapter IV) as an ingredient. The Antarctica Company in São Paulo puts out millions of bottles a year. Most visitors from the United States like the beverage very much. It is similar to Coca Cola, which was introduced on the Brazilian market in 1942 and has become very popular.

Sugar production has been discussed in Chapter IX. Brazilian consumption is on the increase, especially since there are many new industrial products, such as confections, beverages, and canned sweets.

Bread and Crackers. While there is no National Biscuit Company in Brazil, supplying a whole nation with an infinite variety of biscuits and crackers, the Moinho Inglês, or English Flour Mills, nearly does that. This firm supplied to several of the most populous states a large proportion of the wheat flour they consume, and its crackers and biscuits in bulk or in small tins can be bought anywhere. A fair variety of good products is offered by this company and a few others. A small quantity of biscuits of only the finest quality is imported nowadays. There are no baking companies supplying bread all over large cities and over many states, but commercial bakers' bread is on the market throughout the country. The ordinary American loaf is not common. It is used almost exclusively for sandwiches in restaurants and cafés. A harder, crusty type of long bread loaf, so common in Europe, is the prevailing type. Small loaves—they might be called penny loaves—are on sale to accommodate the purchasing power of the poorer classes. Bread is delivered daily to the homes in the early morning hours, just as milk is delivered. Large quantities of macaroni and similar products are sold, about 100,000 tons annually. Sixty per cent of the national production comes from the State of São Paulo.

Canned Goods. Until a few years ago, the few cans offered for sale in Brazilian grocery stores were imported. For some years canned meats have been put out by the meat packers, but the principal canned goods are sweets. Guava, quince, and banana paste are the main items of this line of goods. Recently canned fruits and preserves have become more plentiful (see Chapter XV). Tomato products have come into fashion, and canned tomatoes and tomato juice put up in Brazil are on sale all over the country. Canned vegetables are also beginning to appear. For years only the familiar green peas were

canned, but now other lines are appearing. Canned sweet corn, however, must still be imported.

Notable progress has been made in fish canneries. Formerly Brazilians depended on dried codfish and imported sardines, in places where fresh fish was not available. With abundantly productive fisheries along Brazil's 4,000 miles of coast line, it is but natural that sardines and many other fish products should be produced locally. From 1925 to 1938 the value of canned goods multiplied sixfold, and now that large concerns with specialized factories scattered over the country are becoming more and more efficient, prepared food products will form an increasing part of the Brazilian diet.

Dairy Products. The consumption of dairy products (see Chapter XVIII) has increased with improved industrial methods in preparing and marketing them. Modern pasteurizing plants have been installed in large numbers. Butter increased from 19,000 tons in 1925 to 43,000 tons in 1939. If a profitable export trade in both butter and cheese can be opened up, the national production will greatly increase. Most of the butter is produced in small creameries scattered over the country. Possibly half the cheese is produced in small cheese factories in dairy districts, but the better cheeses are made in the larger factories, which are usually provided with better machinery.

Textiles. Cotton was an important crop a century ago. Though many types of cloth were imported until recently, Brazil gradually developed its own textile mills. Textile goods were exported on a large scale during World War II. Since Brazil produces a large part of the raw material needed for many kinds of cloth, it is but natural that this industry should become one of the most profitable of Brazilian industries. Forty per cent of the textiles in Brazil is manufactured in the State of São Paulo. The Federal District (city of Rio de Janeiro) has second place, followed by Pernambuco, Minas Gerais, and the State of Rio de Janeiro. Rio Grande do Sul leads in woolens as might be expected, since Brazilian wool production is largely localized in that state.

Cotton Goods. A large variety of cotton goods of good quality is made by Brazilian mills. Brazil is the only country in the world producing on a large scale both short-staple and long-staple cottons. In the northern states the long staple is grown, while the major portion of short-staple cotton comes from São Paulo. Not only are all national mills supplied, but since they consume only a third of the crop, foreign

needs are also met. Formerly some of the finer threads were imported and then woven in Brazil, but at the present time almost every type of cotton goods is made from Brazilian cotton. Dyes are imported and skillfully applied during the processing of various types of cloth. One big manufacturer in Pernambuco has a chain of retail stores throughout the country and produces all he sells. Very little cotton goods is imported, and large amounts are exported. Brazilian-woven linen goods is on the market, at a much lower price than Irish or Belgian linens, but they are usually woven from imported flax.

Jute and Rough Fibers. Some 38,000,000 meters of burlap are woven yearly in Brazil, largely from imported raw material. Most of the cloth goes into sacks used in the shipping and exportation of coffee. Endeavors to produce jute in the Amazon Valley have had some slight success. Experiments are constantly being made to use native Brazilian fibers as a substitute for hemp and jute. Still another drive has been made by the cotton growers to substitute cotton cloth for the jute in the manufacture of sacks.

Brazil is now producing increasing quantities of jute, papoula de São Francisco, guaxima, caroá, sisal, paco-paco, ramie, and flax.[1] The 1942 production of jute was estimated to be 3,000 metric tons, three times as much as for the previous year. Papoula de São Francisco (*Hibiscus canabrius*) is similar in many respects to jute. It is grown in the State of São Paulo. The fiber is used in the manufacture of burlap. Several native plants such as guaxima and caroá produce excellent fibers. The principal source of caroá is the State of Pernambuco, and the monthly production is around 700 tons of fiber. It is used in making cord, rope, and twine and is mixed with other raw materials for the manufacture of burlap and cloth. Sisal and ramie are being planted on a greatly increased scale. As sisal grows well on poor land, it may be a valuable crop for less favored regions.

Woolen Goods. Formerly, to be considered a well-dressed man in Brazil one had to wear a custom-made suit of English woolen cloth. Women used some woolen goods but preferred silks, which also were imported. Brazilian mills have for years been producing woolens and now produce such excellent cloth that only the most fastidious insist on English goods. Quantity is sufficient to supply national yearly consumption and amounts to more than 6,500,000 meters. Much of the woolen thread is imported. Brazilian cloth sells at half the cost of the imported goods. A very small amount is exported.

[1] "Fiber Production in Brazil," *Brazilian Business*, No. 3, XXIII, March, 1943, pp. 45-51.


PERCY LAU

Silk and Rayon. Silk goods production increased from 220 tons in 1925 to 8,000 tons in 1941. When the importation of raw silk from Japan was cut off, an effort was made to increase raw silk production so that it would supply national mills. The enormous increase in Brazilian silk weaving has so materially reduced the price of silk goods that those with even moderate incomes can afford some silk clothing. Most women's dresses are made at home or by local dressmakers. Ready-made dresses are on sale in a few high-class stores, but the manufacture and sale of this type of merchandise is just beginning. The average value of São Paulo silk production is twenty million cruzeiros.

Before World War II rayon manufacture had just begun, and there were four rayon factories in São Paulo.

Textile Exports. Mention has been made of the stimulating effect of World War II on the whole textile industry. In 1938 the total exports of textile goods amounted to 430 tons, valued at 5,400,000 cruzeiros. By 1940 the volume of exports reached 6,154 tons, valued at 89,950,000 cruzeiros. From 1941 to 1943, a greater increase took place. During the first half of 1944 an average of one thousand tons was exported each month. Total exports during 1943 were valued at one and a quarter billion cruzeiros, five times the value exported in 1941. Brazil is fortunate in being able to supply its own needs and have a surplus for export.

Clothing. The manufacture of cloth for home and personal use is a great industry, and the use of these products in other manufacturing enterprises to produce clothes, bedding material, shoes, hats, and numerous other articles makes this group account for about 9 per cent of the total national manufacturing production. The outstanding fact about this class of goods is that national manufacture supplies the bulk of the market, and in case of absolute necessity can practically carry on without importations except of raw and semiprepared materials (woolen thread, for example).

Only one item will be taken up here—shoes. In the State of São Paulo alone the annual production of shoes is more than 20,000,000 pairs. The oldest shoe manufacturing concern is the Clark Company, which is Scotch-owned. It has completed more than a century of operation and has a chain of retail stores scattered over the country which sells most of its production. The total national production of shoes in 1939 was 43,000,000 pairs—one pair per inhabitant. This means, of course, that many Brazilians of the poorer rural class went without shoes.

The use of shoes is becoming universal as standards of living rise. Good shoes are manufactured and offered in all cities and trade centers. Custom-made shoes are as good as those of the United States and cost about one-fourth as much. The importation of shoes in 1940 was one-eighth of the 1928 importations, which shows that there are very few foreign shoes on the local markets.

About seven million hats are manufactured each year.

Iron, Steel, and Metal Products. As iron and steel production by national mills increases, raw material should become more readily available for a greater number of industries and manufactured products. It is in this group that the greatest progress has been made during the last two decades, and it is also the group sure to make the greatest progress in the coming decade. Iron and steel production have been discussed in Chapter XXI, so only manufactured metal products will be taken up here. Sheet iron, sheet steel, and basic supplies of all types of steel and iron are necessary for the manufacture of a great variety of tools, machinery, electrical supplies, wire, cutlery, etc. The manufacture of these articles has been undertaken in Brazil as basic raw materials have become available. Much steel is still imported because home production is inadequate. Part of the steel now produced is smelted with the use of wood charcoal, and only when an abundant supply of coke becomes available can a sufficient supply of steel be produced. National mills expect to use mostly national coal to make coke, but no doubt imported coal will also be needed.

Most of the iron and steel is produced in the State of Minas Gerais, but nearly all the manufactured iron and metal products are made in São Paulo (38 per cent), and the Federal District (27 per cent). Rio Grande do Sul produces 16 per cent of these manufactured lines. The production of building materials, cutlery, stoves (wood and gas), sanitary and plumbing material, and wire is increasing rapidly.

Machine Tools and Machinery. Brazil's heaviest imports in iron and steel have been machines for industrial uses. These are manufactured in Brazil in very small quantity. Farm machinery on a small scale, and machines for cleaning rice and coffee are practically all national products. Steam engines, some locomotives, and rolling stock are being produced.

Electrical Supplies. Annually some 340,000 pieces of small electrical appliances are manufactured, and 16,000,000 electric bulbs are

turned out by General Electric. Much small apparatus is manufactured by Byington & Co.

General Electric has a large bulb plant in Rio de Janeiro, and its capacity was increased with a $1,000,000 addition. Already 2,000 people are employed. A plant of this same company has been built in the city of São Paulo, at a cost of $2,000,000, for manufacturing motors and assembling apparatus shipped from the United States. These plants represent an investment of $10,000,000 and will employ some 5,000 people.

Wiring material for electrical needs and of every conceivable type is manufactured in the São Paulo plant of Pirelli S. A., Cia. Industrial Brasileira. All kinds of wires, from the most simple electric cord to a complicated telephone cable with 1,800 pairs of wire, are turned out in this modern factory. Copper wires are produced from the raw copper wire bars imported from Chile. Insulations of rubber and coverings of woven material are made for a great variety of uses. More than 2,000 workers are employed in the factory, which has modern equipment. The production of trolley wire for railroad electrification was of strategical importance during World War II. In São Paulo several factories are producing electric motors.

The Institute of Electrotechnics and the Institute of Technological Research have established standards for the production of all nationally manufactured electrical equipment.

Building Material. Brick yards are omnipresent in Brazil, for nearly all construction is of brick. For roofing, tiles of the old colonial Portuguese type are used to a great extent, but Marseilles French tiles are becoming more popular in the cities and even in rural districts. The former can be made without any special machinery wherever good clay can be found. The latter depend on the use of considerable machinery and are produced in larger establishments. Sewer pipes, tiles for floors and roofs, and many other ceramic products are manufactured in ever-increasing quantities. They supply the building trades of the rapidly growing cities of São Paulo, Rio de Janeiro, Belo Horizonte, and Pôrto Alegre, to mention only a few. Glass, sanitary equipment (made of clay or of porcelain-lined iron), and crockery are produced on an increasing scale and almost to the exclusion of imported articles.

Chemical Products. Brazil has always imported large quantities of chemicals, drugs, and cosmetics. For the last fifteen years their pro-

duction has greatly increased. This is true to such an extent that one of the greatest difficulties and drawbacks of the industry has been the shortage of trained technical and professional men. There are some chain drugstores, and one new firm has recently installed in São Paulo a complete drug retailing store on a heretofore unknown scale. It is called the Drogadada, "National Drug Store." Selling at cut rates and covering all lines of drugs, medicines, and hospital supplies, the firm has met with signal success. The shortage of chemicals in World War II made the country put forth every effort to manufacture its own supplies of basic materials, such as caustic soda. Most drugs and pharmaceutical supplies are now manufactured in Brazil, either by national companies or by subsidiaries or branch factories of international drug concerns. Park, Davis and Co., and Merck (formerly German-owned) are among the American concerns having branch factories in Brazil. Many proprietary medicines of wide sale in the United States and Europe are under license in Brazil and sold on the basis of national production, this being done to escape high import duties. Fourteen classes of chemical products are now manufactured in the country. Exports of pharmaceutical and chemical products in 1943 were valued at 73,000,000 cruzeiros. One of the greatest industrial needs of Brazil is rapid and extensive expansion of the production of chemicals.

Rubber Goods.[2] As the country of origin and one-time exclusive producer of rubber, Brazil should certainly supply itself with all the manufactured rubber goods it consumes. Eighty or more factories, a few of them with a thousand employees, are now engaged in rubber manufacture. The value of the total production of rubber goods in 1940 was about $2,000,000, or approximately (at that time) 40,000,000 cruzeiros. This industry has been expanding rapidly within the past few years. Production was almost doubled in the two years 1938-40. In 1940 practically no rubber goods were imported, and some 23,000 tons were exported. In 1943 exports of rubber products reached the value of more than 200,000,000 cruzeiros.

The largest producer in Brazil of rubber goods, exclusive of automobile tires, is the S. A. Fábricas Orión, in São Paulo. In 1942 this firm employed more than a thousand workmen and produced more than a million dollars' worth of goods. The consumption of raw rubber was 381,000 metric tons, which, with 145,000 tons of reclaimed rubber consumed in 1942, makes a total of 526,000 metric tons, more than five times the amount used in 1934.

[2] See Chapter X.

Paper and Printing.[3] Paper manufacture developed rapidly in the ten years preceding 1945. Practically all the pulp employed previously had been imported. As shipping conditions due to the war made it difficult to import either paper or pulp, great strides were made in the national production of both. The Paraná pine produces a high-grade pulp. A few other native timbers, bamboo, and rice straw have been used with varying degrees of success.

The printing business in Brazil is fairly well developed, and the publishing of books and magazines is an increasingly important industry.

[3] See Chapter XVII.

XXV

International Trade

FROM ITS earliest days, Brazil has taken part in overseas trade, for even in colonial days every Portuguese ship returning home from the colony was loaded with brazilwood for the extraction of dyes, sugar, cotton, tobacco. Hides, leather, gold, and precious stones were important exports of Brazil two centuries ago.

After the opening of the ports of Brazil to international commerce in 1808, real progress began to be made in the development of the country. By 1830 fairly large trade with foreign ports had been established, and it increased by about 50 per cent each decade for the remainder of the century. The production and exportation of coffee was the principal factor in increasing foreign trade during the whole of the nineteenth century. Eight exports—coffee, cotton, sugar, rubber, cocoa, hides and skins, tobacco and mate—have figured in the country's foreign trade since 1821.

Favorable Trade Balance. It is to the advantage of any country, especially a new country, to have a favorable trade balance. More goods must be exported than are imported. Up to 1860 Brazil rarely had such a balance, but from 1860 to the present only three years have shown an unfavorable balance. These years were 1885, 1913, and 1920. Purchases in foreign markets are paid for by counterbalancing sales. Foreign loans and their interest make a drastic demand on any "superavit" in sales. A country as new in development and industrialization as Brazil needs a decidedly favorable trade balance, and every effort is put forth to maintain it year after year.

With the exportation and importation of a great number of products it is, of course, impossible to determine exactly what balances will be struck at the end of any given year. Trade movement statistics are published monthly in great detail. Along with the figures of the year of publication date are placed corresponding figures for preceding years. In this way, trade movements can be followed. But so many

factors enter into consideration that it is difficult to make an accurate predetermination to assure a favorable balance of trade. After a run of trade under unfavorable conditions, it is natural for a reaction to set in against heavy purchases abroad. With exchange becoming unfavorable, this factor alone automatically reduces purchases and increases sales.

Goods Imported and Exported. Brazil until recently imported manufactured goods and exported principally raw materials. Trade statistics compiled by the government for 1938 listed forty principal products imported and forty-five exported.[1]

During the five years 1938-42, a marked change came about in the make-up of foreign trade. Manufactured goods for the first time appeared in increasing volume among the items exported. On the other hand, the importation of food products, formerly imported on a large scale, declined enormously, some items entirely ceasing to be imported. The only food product imported in large quantities continued to be wheat occupying third place in value. Machinery and tools were in first place (1939), manufactured iron goods in second, and automobiles in fourth. Another significant change was in the relative importance of coffee and cotton in the export trade. Coffee formerly represented over half the value of all exports, but in 1939 it was only 32 per cent of the total. Cotton, from nothing in 1929, reached 17 per cent in 1939. Manufactured goods representing 6.4 per cent in 1938 had risen to 18 per cent in 1940. Recent developments in the exportation of textile products to neighboring South American countries seem to indicate that Brazil can supply the continent with cotton goods. With its rapid industrial development, Brazilian manufacturers of many products—especially iron goods—are seeking to supply the markets of nearby countries.

[1] The imported items are as follows (not given in the order of their importance): livestock (for breeding purposes); raw materials, such as acetate of cellulose, cotton, aluminum, aniline, coal, cement, copper, iron and steel, gasoline, jute, wool, hops, fuel oil, lubricating oils, wood pulp for paper manufacture, skins and hides, kerosene, raw silk, foodstuffs, olive oil, olives, codfish, beverages, malt; wheat, wheat flour; fruits and meats; manufactured articles, such as cotton piece-goods; motor cars and trucks, other vehicles, and accessories; copper; iron; wool; linen; earthenware and porcelain; paper, rubber tires; chemical products.

The export list follows: livestock, raw materials such as skins and hides, tallow and grease, rubber, carnaúba wax; castor oil beans, cottonseed, Brazilian nuts, babaçú nuts, oil-producing seeds; tobacco; lumber; manganese ore, iron ore, miscellaneous ores; precious and semiprecious stones; raw cotton, wool, raw textile material; foodstuffs, beverages, rice, cassava meal, corn, bananas, oranges, fruits and nuts, sugar, cacao seeds, mate, frozen and chilled meats, preserved canned meats, jerked beef, lard, bran, cottonseed oil cake, miscellaneous foodstuffs; and a few manufactured articles.

Prewar Geography of Brazilian Export Trade. The common saying current in Brazil is "The United States is our best customer." The United States was and is the largest buyer of Brazilian products and ranked in second place (Germany had first place) as a supplier of Brazil's needs in 1938. Previous to World War II, Germany took a leading place in supplying Brazil and a prominent place in the purchase of Brazilian goods, owing to the barter system, whereby discounts of from 20 to 40 per cent (on a higher price) were made on goods sold. The following table shows how Brazil's international trade was distributed in the year 1938 as compared with 1943:

PER CENT OF BRAZIL'S TOTAL EXPORTS AND IMPORTS
(Principal Countries)

PRINCIPAL COUNTRIES	EXPORTS		IMPORTS	
	1938	1943	1938	1943
United States	34.2	50.6	24.2	54.5
Germany	19.1	...	25.0	...
United Kingdom	8.8	14.1	10.4	7.2
France	6.4	...	3.2	...
Italy	2.1	...	1.8	...
Argentina	4.5	9.2	11.8	18.9
Japan	4.6	...	1.3	...

Although the percentages fluctuate from year to year, these figures demonstrate clearly where Brazil's principal commercial interests lie. In the 1930's Great Britain was nosed out of second place by Germany both in imports and exports.

Japan figured with a mere two-tenths of 1 per cent of Brazil's exports in 1932, but pushed ahead to 4.6 per cent in 1938. This large increase was due principally to the importation of Brazilian cotton. A great effort was made to increase Brazil's importation of Japanese manufactured goods, but the percentage passed from four-tenths of 1 per cent in 1932 to 1.3 per cent in 1938. The Japanese improved their shipping facilities up to the time of the war and thus increased their trade. Japan was the only Asiatic country carrying on a significant trade with Brazil.

Great Britain held a favored position in the international trade of Brazil during the first half of the nineteenth century, but has not been able to maintain it. The Scandinavian countries increased their importations from Brazil. France and Italy held the same relative positions

for ten years before World War II, but their Brazilian imports and exports were steadily decreasing.

The only South American country with any considerable share of Brazilian trade is Argentina. Brazilian exports to Argentina have remained fairly steady at an average of 5 per cent of the total, but Argentina's position as an exporter to Brazil has been much more favored. In 1913, 7.4 per cent of Brazil's imports came from Argentina. By 1938 that percentage had almost doubled. This is owing to the enormous amount of Argentine wheat imported. The consumption of wheat bread in Brazil has multiplied rapidly during the last twenty years, and Argentina, being the largest supplier of the grain for the manufacture of flour, has been able to double its exports to its northern neighbor.

Brazil's commerce with Africa is small but increasing. The two countries are only 1,700 miles apart, but because of similarity of production there is little stimulus for reciprocal trade.

Wartime Distribution of Foreign Trade. During the first two years of the war and until the middle of 1941, Germany and Japan continued to receive goods from Brazil. However, in 1940 Germany dropped from second place to seventh and Japan was fourth in imports from Brazil. Brazilian trade changed decidedly during these years, the United States supplying more than 50 per cent of the imports and taking more than 50 per cent of the exports.

As the war continued, Brazil's foreign commerce changed radically. One year large shipments of cotton were made to Canada; other large shipments were made to Spain and Sweden. Germany, Italy, and Japan in 1942 disappeared entirely from Brazilian foreign trade. Neighboring American republics, especially Argentina, took increasingly important positions, Argentina ranking second to the United States in Brazil's imports and third in her exports.

The disastrous submarine attacks on the South American shipping routes in 1942 provoked still further changes and led to Brazil's declaration of war against Germany in August of that year. New trade agreements signed between the United States and Brazil affected Brazil's foreign trade for a period of five years. The United States stood ready to aid Brazil develop home industries to the maximum and to buy ever-increasing quantities of raw material.

Trade between Brazil and the United States. The following table shows the place Brazilian trade occupied in United States imports and exports up to 1938:

UNITED STATES EXPORTS TO AND IMPORTS FROM BRAZIL [2]

(VALUE IN MILLIONS OF DOLLARS)[2]

YEAR	EXPORTS		IMPORTS		
	Value	% of U. S. Exports	Value	% of U. S. Imports	Duty free (%)
1913	39.9	1.6	100.9	5.6	99.9
1929	108.8	2.1	207.7	4.7	97.8
1932	28.6	1.8	82.1	6.2	97.5
1933	29.7	1.8	82.6	5.7	96.3
1934	40.4	1.9	91.5	5.5	96.0
1935	43.6	1.9	99.7	4.9	91.3
1936	49.0	2.0	102.0	4.2	89.0
1937	68.6	2.1	120.6	3.9	87.0
1938	62.0	2.0	97.9	5.0	...

2 *Economic Conditions,* monthly publication of the National City Bank, New York, March, 1939, p. 31.

This trade is only about 2 per cent of the total United States exports and from 4 to 6 per cent of imports, but foreign commerce with Brazil exceeds in value its percentage of volume. In 1938 Brazil ranked in sixteenth place in the United States export market, and in sixth place as a supplier of imports.

Coffee, cacao, and carnaúba wax are among the principal duty-free imports of the United States. Brazil and the United States compete in foreign commerce in the other markets of the world in only two important products—cotton and oranges. The rapid rise of the production of common upland cotton in central Brazil has been of some concern to the United States. Brazil has passed from sixth to fifth place as an exporter of cotton in the world market. (See Chapter XII.)

The trade balance between the two countries has been constantly in favor of Brazil. The total value of this advantage ran from $140,000,000 in 1926 to as low as $36,000,000 in 1938. The commerce between the two countries was described by the National City Bank as follows:

One of the most interesting features of the trade figures has been the evidence supplied of the changing character of the Brazilian economy—the result of efforts to diversify in order to mitigate the loss of coffee markets and lower prices. In our own trade with Brazil, the principal item of import continues to be coffee, but the proportion of other products has

been increasing. Thus, nearly 30 per cent now consists of canned meats, hides, carnaúba wax, cabinet woods, vegetable oils and nuts, and other tropical products, many of which are new to trade and have increased several times in volume. Even greater changes have taken place in our export trade to Brazil. As a result of a rapid growth of Brazilian industries since the depression, the importance in the trade figures of textiles, paper products, cement, leather goods, and many other products now manufactured in Brazil has declined. Over half of our total exports to Brazil is now accounted for by motor vehicles and machinery. Another sign of the country's growing motorization and industrialization is our expanding export of petroleum products and coal, and of semimanufactures and raw materials for further fabrication within Brazil.[3]

The Necessity of Increase in Trade between the United States and Brazil. It is no secret that the United States, as the largest consumer in the world's markets of raw materials from tropical regions, views with much interest the development of production throughout such regions of the world. The elimination of Oriental rubber from our markets is a striking example. Brazil could not possibly, in a whole year, supply a single month's consumption of this raw product in the United States. Everything was done during World War II to stimulate rubber production in Brazil with purchase guarantees, financial backing, and technical help. This same aid was extended to Brazil for all its purely tropical production.

Before the war there was a definite trend on the part of the United States to place at the disposition of Brazil and other Latin American countries its scientific and technical resources, so that these countries might engage in active competition with Africa and Asia in the production of tropical raw materials. Brazil could only profit by accepting this cooperation. With vast undeveloped areas available and an absolute necessity for increasing the value of its export products and for widening its export markets, Brazil made every effort to find new products for international trade channels.

Exploitation of many little-known products of potential value could greatly increase Brazil's already impressive favorable trade balance between the United States. For example, timbó, a plant of the Amazon Valley, has attained considerable commercial importance as a raw product for the manufacture of insecticides, and oiticica, a forest tree, has seeds which produce a varnish oil similar to tung oil. The effort to increase the supply of oiticica oil has had marked success.

A careful study of Brazilian production of tropical vegetable oils made by a commission of technical experts sent to Brazil by the United

[3] *Ibid.*

States Government in 1942 came to the conclusion that Brazil can supply the needs of the American hemisphere for oils which formerly came from the East. The group reported: "Brazilian resources of vegetable oil-bearing raw materials are so tremendous they stagger the imagination. Brazil is aware of its possibilities as a major supplier of vegetable oils. Authorities are attacking problems which heretofore have restricted exports, such as inadequate transportation and port facilities to serve oil-bearing regions. We may look forward, therefore, to considerable increase in this trade over the long range." [4]

A warning to Brazil by the National Foreign Trade Council (New York), given as long ago as 1933, might well be repeated here:

> The history of Brazilian money crops as exemplified by sugar, rubber, and coffee is that of persistent efforts on the part of the government to control and maintain prices which have, in the case of the first two mentioned products, resulted adversely for the Brazilian industry. It would appear that the economic welfare of the country could be promoted better if the government would engage in a scientific study to determine those products which could be produced in Brazil to the best natural advantage with the aim of diversifying the production as much as possible so that the prosperity of the country would not depend to any great extent on one product alone as it does at the present time. In conjunction with the study it is further suggested that the Brazilian Government should engage in an active promotional campaign to introduce and advertise its products abroad and to take advantage of every channel and medium of publicity to create a consistent demand for the exports of the country. The ultimate success of such a campaign would rest, of course, on the competitive position of Brazilian products both in regard to quality and price.[5]

Quality as Well as Quantity. That brings us to one of the greatest needs of Brazilian export trade. It is the necessity for high-grade goods, even of the grossest raw material, properly graded and classified. In other words, high-grade goods, well classified and maintained at an exact standard, win in today's world-wide competition. Of course, these are not the only factors, but frequently they are the determining factors. Brazil has recognized this, and an effort is being made to establish grades and standards for all export products. A law has gone into effect which requires the use of these standards in the case of all raw materials and prepared articles. Coffee and cotton have well established grades, and all export sales are based on them, with official government certificates accompanying the exported product. In case of

[4] *Brazil* (Organ of the American Brazilian Association, New York), August, 1942, p. 12.

[5] *Survey of the Financial and Trade Problems of Brazil in Their Relation to the United States of America* (New York: National Foreign Trade Council, 1933), p. 14.

disagreement after receipt of the product in a foreign market, settlement is made through the regular channels of commercial arbitration.

Insufficient attention has been paid by Brazil to maintaining quality at all cost. In world markets the greatest determining factor in improving prices is quality. Brazil has entered many a market with its goods when demands were so great that any article was salable, only to drop out when conditions changed so that the laws of supply and demand functioned normally.

Federal Council of Foreign Trade. In 1934 the Brazilian Government established the Federal Council of Foreign Trade for the purpose of promoting foreign trade. It has fifteen members, three of which must represent the trade organizations of agriculture, industry, and commerce. The Council is charged with a number of technical duties and, in addition, with gathering and disseminating valuable information in regard to all exportable goods. It is also charged with foreign trade promotion.

A certain amount of control of production is contemplated, but actual control is carried out by other bodies, one established for each major product. The most important bodies now in action are the Institutes of Coffee, Cacao, Mate, Pine, and Sugar, each one being regulated by a special law determining its powers and duties. They have become, as was almost inevitable, heavily weighted bureaucracies but, in spite of this, achieve considerable advantages for the producers.

Trade Agreements. Brazil has followed in the steps of the United States in making a large number of trade agreements—with forty-eight countries, in fact. Some are of the most-favored-nation type, and others are simply trade-mark recognitions. Earlier agreements are described and listed in *Brazil 1938*.[6] The United States has a most-favored-nation commercial agreement with Brazil and rightly so. Coffee is Brazil's leading export product and enters the United States duty-free. In fact, more than 80 per cent of the total importations from Brazil into the United States enters duty-free. The concessions in tariffs made on United States exportations to Brazil are a tremendous aid in increasing trade.

The Foreign Office of the Brazilian Government, under the brilliant leadership of its ministers, has forged ahead in the establishment of similar agreements with Argentina, Uruguay, Chile, Bolivia, and Venezuela.

6 *Brazil, 1938* (Rio de Janeiro: Serviço Grafico do Instituto Brasileiro de Geografia e Estatística, 1939), pp. 258-73.

A large number of trade agreements between Brazil and the United States was made as a direct result of World War II and as a specific result of the shutting off from the world's markets of the Far East. These agreements introduced a new phase into the whole basic fabric of international trade, in that their duration covered a period of five years, with fixed prices for the products involved. As many raw materials take time to accumulate a surplus for export purposes, this period of five years gave a strong guarantee to the producer and relieved him in regard to the possibility of his market disappearing just as his production became established.

On the other hand, the United States had a great advantage in knowing that its need for certain raw materials would have a reliable source of supply over this period of five years. Never in all its history did Brazil have such bright prospects for the development of its foreign trade.

The soundness of this development was based on the following factors: (1) trade agreements with the United States; (2) capital for industrial development supplied by the United States; (3) technical aids that helped speed up production not only in manufacturing processes but also in the production of raw materials; (4) guaranteed purchases even when immediate transportation was not available.

Favoring Factors. Cheap labor, abundance of land, abundance of many types of raw materials, shipping facilities, and good weather all the year round for commerce and trade are some factors which increase the possibilities of growth of Brazil's international commerce. Brazil has four thousand miles of Atlantic coast line. It has two major ports (Rio de Janeiro and Santos), four other important ports (Recife, Bahia, Belém, and Rio Grande do Sul), and some six or eight others that can handle international trade. There are a number of steamship lines plying principally to Europe and the United States.

Brazil leads South American countries in goods bought from and sold to the United States. This trade more than doubled in value in 1943 compared with the prewar year of 1938, as seen by the following figures:

YEARS	BOUGHT FROM THE UNITED STATES	SOLD TO THE UNITED STATES
1938 (in thousands of cruzeiros)	1,257,926	1,749,281
1943 (in thousands of cruzeiros)	3,309,843	4,419,676

The possibilities of this mutually beneficial trade are well understood in both countries. Better understanding between the two countries, better friendship, better business (possibly this should have been stated in inverted order), all draw the two countries closer together. Necessity for common defense did much to nurture mutual interest.

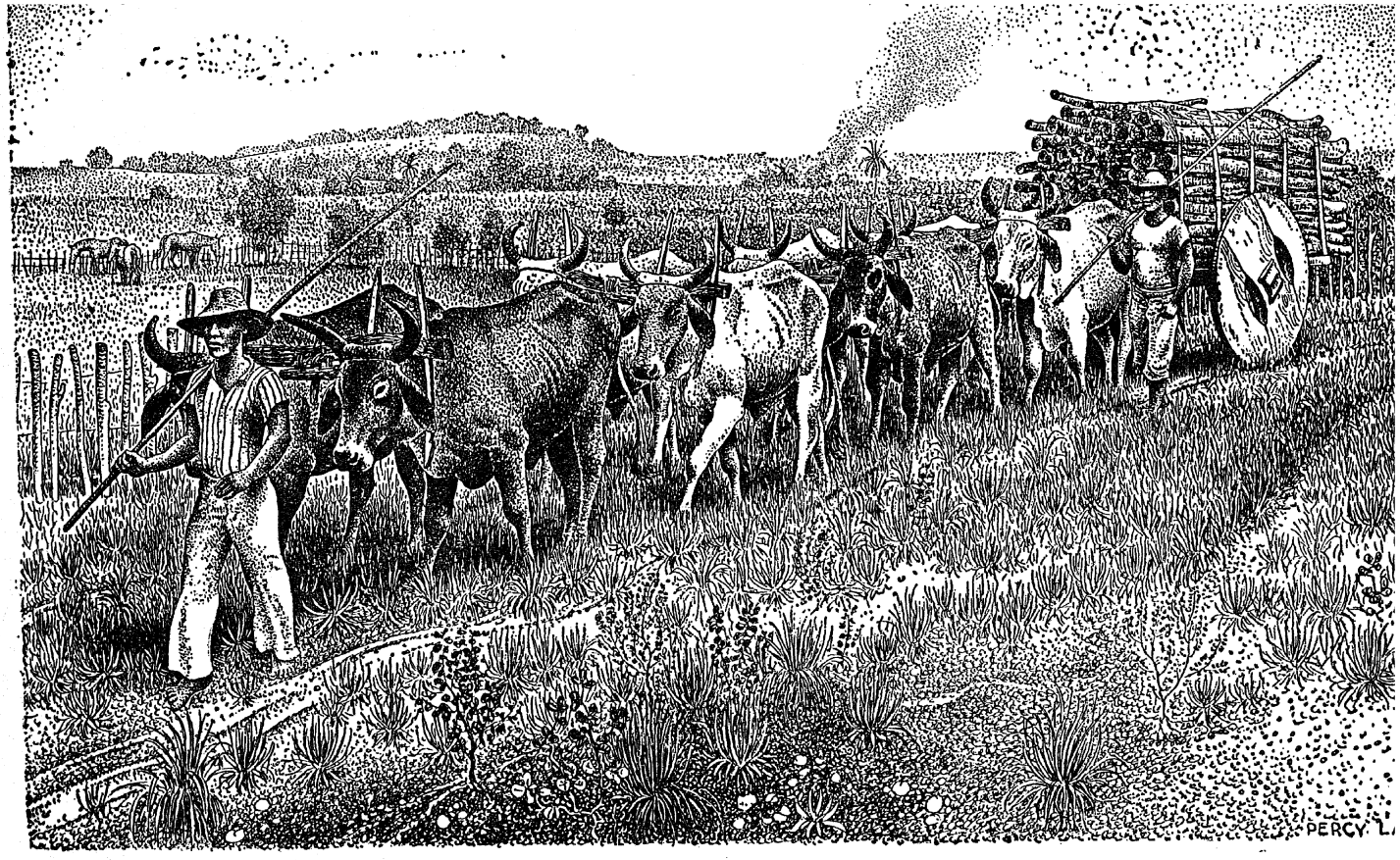
XXVI

Travel Facilities

DISTANCE may be expressed in two ways—in miles and in time. Nowadays we think more about the time than about the measured distance. Before railways were built, the trip from Rio to Ouro Preto, former capital of Minas Gerais, was made on mule back, and weeks were consumed to cover the six hundred kilometers (372 miles). Distance was then measured in leagues, each league four miles, or six kilometers. About sixty years ago Ouro Preto was reached by the Central Railroad of Brazil, and travel time was reduced to two or three days. With improved railroad service, the journey was reduced to a matter of seventeen hours. In 1897 the state capital was transferred to Belo Horizonte, which is about the same distance from Rio as is Ouro Preto. Travel time over this distance was reduced to ten hours by fast trains. But today people are impatient and want to reach their destinations quickly, so air service has been established, and the trip is made in an hour and fifteen minutes. First it took weeks, then days, then seventeen hours, then ten hours, and now seventy-five minutes.

The development of any country depends on its means of transportation. In those countries which cover great areas, such as the United States, China, Russia, and Brazil, the four largest in the world, travel facilities are of paramount importance. China has been retarded by inadequacy of all forms of transportation. The United States has been greatly benefited by having so many miles of railways and highways—250,000 miles and 4,000,000 miles respectively. Brazil has 21,000 miles of railways and 170,000 miles of highways, but this is supplemented by waterways—23,000 miles of navigable rivers and 4,000 miles of Atlantic coast.

"Space is Brazil's pride," said Roy Nash. "Space is equally Brazil's weakness. Social power is attained through its annihilation, not through its exaltation. Isolation and poor communications spell social stagnation, localism, death. Landways spell life—the movement of restless, inquisitive, adventurous men; intercourse within the nation; ease and



Typical ox-cart with movable axle

cheapness, and regularity of transport—these are the conquerors of space and the weavers of nationalism. The facility with which men and goods travel from place to place is a very accurate index of the degree of man's mastery of his environment." [1]

Nash did not mention air communication when he wrote in 1926. Now this has become one of the most powerful factors in Brazil's new day of internal and external expansion.

Ocean Transportation. With such a long coast line—four thousand miles in extent—ocean travel has always been of importance to Brazil. Until 1800 most of the people of Brazil lived along the coast. Only one city of more than two hundred thousand people, Belo Horizonte, has been developed in the interior. (São Paulo is only forty miles from the ocean.)

The international ocean-going trade is handled by vessels of many nationalities. English, French, Dutch, and American lines handle the bulk of this trade, but Scandinavian lines are also important cargo carriers. The national Brazilian shipping company maintains regular service with North America and Europe. Few foreign lines have Brazil as the terminal point. Most of them terminate in Buenos Aires, stopping at two or more Brazilian ports on both the north- and southbound journeys. Altogether Brazil has fourteen ports of importance which have been organized and equipped to engage in international trade. Rio de Janeiro and Santos handle about three-fourths of this movement, owing to the size of the cities and the better port facilities offered.

Coastwise cargo shipments between national ports must be made only on nationally owned lines. This limitation of coast traffic to national operators is the practice in many countries, including the United States. All passenger steamers, however, of whatever nationality they may be, are allowed to take interport passenger traffic. Foreign vessels charge a much higher rate than national lines, but are frequently used by Brazilians because of their greater speed, greater size, and greater comfort.

Before World War II, Brazil had 276 vessels amounting to a half million tons. Two of the largest lines belong to the Federal Government. The government recently took over the fleet of the Amazon River Steam Navigation Co. Coastwise shipping in 1940 was 7,966,967 tons, as against 7,757,791 for foreign ports. One of the very great necessities of the country is an increase in the number of coastwise

[1] Roy Nash, *The Conquest of Brazil* (New York: Harcourt, Brace & Co., 1926), p. 185.

vessels and an improvement in the passenger service offered. Prices, it is true, are very low, but at least a few vessels offering first-class accommodations and service should be added.

Three important ports are on rivers, but are visited by ocean-going steamers. These are Belém, Manáus, and Pôrto Alegre. In addition to the principal ports—São Luiz, Tutóia, Fortaleza, Natal, Cabedelo, Recife, Bahia, Maceió, Vitória, Angra dos Reis, Rio de Janeiro, Santos, Paranaguá, São Francisco, Florianópolis, and Rio Grande—there are many others receiving the visits of only coastwise steamers. Regular coastwise service is maintained from Pôrto Alegre to Manáus, some lines going the entire distance, others only to intermediate ports.

International trade was carried on by a number of European lines, a Japanese line, and four North American lines. Better passenger accommodations have been available from Europe to Brazil, and there were many times as many passengers to Europe as to the United States. Large, rapid steamers, such as run between New York and Europe, have never been put on the South American route, except for the ill-fated French liner Atlantique. This ship was destroyed by fire off the French coast. The United States lines were not a very important factor in passenger service until shortly before World War II. A real bid was made for the increase of travel between Brazil and the United States. Fares for travel to South America are very much higher than for travel to Europe, and the vessels are slow in comparison with the trans-Atlantic steamers. Both these factors greatly retard the development of travel between North and South America. Many large vessels were used for tours direct to Brazil, or around the world with stops at several Brazilian ports. Travel between the Americas is increasing. Passenger boats making the New York-Rio run in seven to eight days are anticipated.

The Delta Line has cargo steamers, with comfortable accommodations for a limited number of passengers, plying between the east coast of South America and New Orleans. It is called the coffee fleet. The ships go south loaded with machinery, automobiles, and manufactured articles, returning with cargoes of coffee. Steamers with air-conditioned accommodations for more than a hundred passengers have been put into service by this line, and the time of the voyage has been considerably reduced.

Shipping facilities between the United States and Brazil are being greatly improved. Faster and bigger passenger steamers should come into use, in spite of the increase in air travel.

The Japanese line made the trip around the world, taking four months from Rio back to Rio. Going to Japan, the ships passed

through the Panama Canal, and returning from Japan they came around the Cape of Good Hope. They left Brazil loaded principally with cotton. Sometimes the whole cargo consisted of cotton—30,000 bales on a single ship. From Japan, immigrants came to Brazil—at one time many thousands a year. Large and well-appointed steamers were in use on this line, so that a trip around the world was comfortable for Brazilian travelers. Manufactured goods of all kinds were imported from Japan, and offered at advantageous prices in Brazil.

As Brazilian prosperity depends largely on exports, an active international shipping is essential to the nation's well-being. Some day Brazil will be a great exporter of iron ore or manufactured steel, and a great many more ships will be necessary for foreign service.

River Transportation. With more than 36,000 miles of rivers, 22,880 of them navigable, Brazil occupies first place among the countries of the world in the extent of her natural waterways. But since there is a sparse population over most of the country, and since rapids on the rivers are numerous, these waterways are not yet used to any great extent. The tendency has been to rely on the coastwise traffic or steamers and the railroads that have penetrated the inland states. When rubber was a great wealth producer in the Amazon basin, the river had many steamers in regular traffic, but of late years many of these steamers have been idle.

In the interior of Brazil, on the São Francisco, Rio Grande, and Paraná rivers, regular traffic is maintained. Large, modern steamers go up the Paraguay River from Argentina to Corumbá in Mato Grosso. It is somewhat doubtful just what part river transportation will play in the future development of Brazil, but with the increasing density of population in the interior it will become more important. However, other forms of transportation are much more rapid and are preferred for that reason, even though they are more expensive.

Railways. The development of a bigger and better railway system has been a great economic problem of Brazil during the past sixty years. Now the development of automobile roads is of major importance, superseding the railways, owing to the fact that modern automobile traffic opens up a new region more expeditiously than does the railroad. Examine carefully the railway lines on the map of Brazil. It can easily be seen that the 21,000 miles of railroads in Brazil are entirely inadequate for such a large country, even though it is still sparsely settled. It is not possible to reach all the state capitals by railway, and between many states there are no connecting railways.

It will be noted also that many railways penetrate a short distance inland from the coast, but connect with no other penetration line. Twelve thousand miles of railroads, which is more than 50 per cent of the total mileage in Brazil, are entirely within three states of the eastern and southern regions, namely, Minas Gerais, São Paulo, and Rio Grande do Sul. This is as it should be, because these three states have more than 40 per cent of the population of Brazil. Before the new territorial division of 1943 (see Chapter III), the State of Amazonas had an area of 700,000 square miles and only five kilometers of railway, but in compensation there were more than 9,000 miles of navigable rivers. The population of this little world-in-itself was only 484,100 (1943).

There has been a recent tendency in Brazil toward the consolidation of small railroads into systems, and the connecting of these roads wherever this is necessary. One example will be cited. In the State of Minas Gerais, there were two important roads running through the same districts with parallel lines, namely, the Oeste de Minas (Western Minas) and the Rede Sul Mineira (Southern Minas System). After many years of lack of connection between these two roads, a short line of sixty miles was built from Lavras to Três Corações, and shortly afterward these two lines were united to form one system called the Rede Mineira de Viação (Minas Railway System). Through trains are now operated over all the lines, and many trips that formerly took thirty-six hours have been reduced to less than six hours. This line also has a comparatively new spur from Belo Horizonte, the state capital, to Uberaba, an important city in the extreme northwest of the state. This connection shortened the trip by more than a thousand kilometers, and reduced the travel time from sixty to twenty-four hours.

Many other examples of such connecting links could be given. Distances are also being shortened by better roadbeds and better equipment. For example, the Sorocabana Line in the State of São Paulo rebuilt and double-tracked part of its line a few years ago, greatly reducing the time. The amount of freight hauled on each train was doubled by the use of better locomotives. This company has recently established a branch connecting its main line with the port of Santos, thus providing an additional railroad for this very important port. Following the general tendency in Brazil, the Sorocabana is being electrified.

Four railways of Brazil are being electrified. The most extensive electrification has been undertaken by the Paulista Railway. This road runs from Jundiaí, near the city of São Paulo, into the interior of

RAILWAYS IN BRAZIL 1941-43

STATES, TERRITORIES, AND DISTRICT	LENGTH OF LINES OPERATED (Kilometers)[2]		
	1941	1942	1943
NORTH			
Guaporé (Territory)	.....	.....	366
Amazonas	5	5	.....
Pará	376	376	376
Total	381	381	742
NORTHEAST			
Maranhão	449	449	449
Piauí	247	247	247
Ceará	1,288	1,292	1,291
Rio Grande do Norte	530	530	530
Paraíba	489	489	489
Pernambuco	1,102	1,102	1,102
Alagoas	346	346	346
Total	4,451	4,455	4,454
EAST			
Sergipe	303	303	303
Bahia	2,193	2,274	2,269
Minas Gerais	8,179	8,275	8,311
Espírito Santo	696	696	696
Rio de Janeiro	2,712	2,711	2,687
Distrito Federal	147	148	147
Total	14,230	14,407	14,413
SOUTH			
São Paulo	7,427	7,380	7,448
Paraná	1,595	1,595	1,545
Iguaçú (Territory)	.....	.....	68
Santa Catarina	1,191	1,191	1,191
Rio Grande do Sul	3,449	3,446	3,562
Total	13,662	13,612	13,814
CENTRAL WEST			
Mato Grosso	1,174	1,174	813
Goiás	386	409	409
Total	1,559	1,583	1,222
GRAND TOTAL	34,283	34,438	34,645

[2] According to data published by the National Department of Railways. The railway lines shown in the new Territory of Guaporé were formerly in the States of Amazonas (5 k) and Mato Grosso (361 k). The Iguaçú Territory took its lines from the State of Paraná.

the State of São Paulo and hauls a large part of the coffee produced in the state. An economy of 80 per cent in hauling its trains was effected by electrification. This system has some all-steel trains. It has a good passenger and freight service, and is one of the most profitably operated railroads in the world at the present time. An interesting thing about this line is that it has been a pioneer in reforestation along its system.

Many farms were bought during periods of depression, and millions of eucalyptus trees were planted, originally with the purpose of supplying the locomotives with wood as fuel. The electrification of the main lines has greatly reduced the use of wood for this purpose, but the timber is valuable for many other purposes, such as crossties, telegraph poles, etc., so the company continues to make yearly plantings.

The next railroad to electrify part of its lines was the Western of Minas. There was a mountain climb on the road between Barra Mansa and Lavras, making it difficult and expensive to haul freight, since all the coal was imported. With electrification, the expense was so greatly reduced that the saving paid for the cost of electrification, and each year additional miles of track are thus equipped. The Mineira Railways System is the second largest in Brazil.

More recently the Central Railroad of Brazil has electrified its suburban lines. This line, in many ways the most important in Brazil, connects Rio de Janeiro with São Paulo. It also connects Rio with Belo Horizonte and more distant points in the State of Minas Gerais. Its suburban lines into the city of Rio handle more than a hundred thousand passengers a day. The part already electrified has greatly increased the speed of the trains and the traveling comfort of the passengers. Trains are run at intervals of less than ten minutes all day and until late at night. The present contract calls for electrification to the city of Barra do Piraí, a distance of sixty-seven miles from Rio. The electric service is being extended to Volta Redonda, forty miles farther on, because of the big steel plant there. Part of this distance has four tracks, and the remainder is double-tracked. The first year's operation of the small part already electrified proved to be so economical that studies are being made to electrify other sections of the line. The Central Railroad of Brazil is owned and operated by the Federal Government.

The most strategically important line in Brazil is the short road from Santos to São Paulo and Jundiaí (formerly owned by a British company), because it has a virtual monopoly on all freight and passenger service from Santos to São Paulo and to the interior. Its main

line is only eighty-six miles long, yet it handles nearly as much freight as any line in Brazil. It has a very fine roadbed and excellent rolling stock, and it put on the first streamlined passenger train operated in Brazil. It uses coal, though a 700,000-horsepower electric power station is in sight of its lines. The electrification of the line between São Paulo and Jundiaí is now in the preliminary stage. Perhaps eventually the present cable system of hauling the trains up the mountain can be discontinued.

Streamlined Diesel engine trains have been put in service on the Central of Brazil. The light trains imported from Italy proved to be inadequate for the heavy traffic needs of the road. Many sections on this key line of Brazil are being improved, grades lowered, curves eliminated, and heavier rails laid. A tremendous economy in distance and improved roadbed conditions will make possible better passenger and freight service. It is planned to reduce fast passenger service between Rio de Janeiro and São Paulo from eleven and a half hours to six hours; and similarly to reduce the travel time between Rio de Janeiro and Belo Horizonte. All-steel passenger cars and a number of Diesel engines have been imported from the United States. This line has been made autonomous, although government-owned. It is undergoing a thorough overhauling. Most of the railways greatly need modern passenger equipment. There are two gauges in use: (1) a wide one of 5 feet and 3 inches, used by three of the roads, and (2) the meter gauge (3 feet, 3 inches), which is almost universal. There are a few gauges only 29 inches in width. These very narrow gauges will eventually disappear. Of course, it is a great economic handicap that a common gauge, such as is used in the United States, is not in use all over Brazil.

Surveys and construction of the greatest importance have been begun on two transcontinental lines. One is the extension north of the Central of Brazil, from the banks of the São Francisco River at Pirapora to Belém, Pará. Looking at the map, one sees at once what a strategic line this will be. Now the only connection between the northern and southern cities is along the coast by steamer, or by plane. This railroad connection will take years for completion.

The other construction work is on an east-to-west line from Corumbá in Mato Grosso to Santa Cruz de la Sierra in Bolivia. These railroads are almost always paralleled by automobile highways and new towns and settlements are sure to spring up all along the line. Hence, vast new areas will become settled as these two new transcontinental lines are opened up.

Highways. Brazil was slow to begin road construction for automobile traffic. There are still few concrete highways connecting the larger cities, although all large cities have well-graded highways leading inland that are graveled or top-surfaced. All told, the country has only about 170,000 miles of highways—an insignificant mileage when we realize how large a country it is. On the other hand, we must remember that these existing roads have been built in the last two decades and that many miles are being surveyed and added each year. The State Highway Departments in the more populous states have a fair amount of equipment for the surveying and building of roads, and each year modern road equipment is being purchased in increasing quantities.

Two obstacles in almost all eastern Brazil that make road building very expensive are mountains and rivers. Being the best watered country has its drawbacks when it comes to the matter of roads. Bridges have been built by the hundreds during the past ten years in Brazil, and hundreds more will be built within the next ten years, many of modern concrete construction.

Before World War II some twenty-five thousand automobiles and trucks were being imported each year, more than 90 per cent coming from the United States. The three largest manufacturers of the United States have assembly plants in Brazil, which makes it possible for Brazilians to buy cars at a fairly reasonable price. But traffic is on a tremendous increase, both urban and interurban. The city of São Paulo had expected to eliminate street cars entirely in 1941, but with its cheap electricity this has proved to be unwise. Rio de Janeiro decreed that no horse-drawn vehicles were to be permitted on the streets after 1940, but with the war shortage of gasoline, this restriction was postponed. The whole travel tendency in Brazil is toward motor travel. Hauling of freight by truck has greatly increased. It is planned to hard-surface the highway from Rio to São Paulo, a distance of more than three hundred miles.

A modern highway has been built between São Paulo and Santos, which makes it possible to drive from one city to the other in less than an hour. Another important highway is being built between São Paulo and Campinas, which will reduce travel time by automobile between the two cities to an hour. The entire State of São Paulo has been carefully surveyed, and millions of cruzeiros will be spent opening new roads and improving old ones.

A Federal Highway Commission has planned cross-continental highways. Some of these are being built by the Engineering Corps of the Army. Each state has a highway commission. These commissions re-

ceive funds from the federal gasoline tax as well as from the usual state taxes. Larger sums are now available for road construction than ever before, and even the county governments will receive federal aid from the gasoline tax. A large number of firms is competing for road-building contracts. Some use modern machinery. The more important centers of the country should soon be connected by hard-surface, all-weather highways. Cement production is increasing rapidly. Import duties on cement have been suspended to permit the importation of large supplementary supplies. The United States has agreed to allow a special exportation of trucks and automobiles to Brazil.

Within the next twenty years all Brazil should have a well-connected system of highways besides international connections with Uruguay, Argentina, Paraguay, and Bolivia. The Inter-American Highway will eventually link up all the Americas.

Airways. Probably no country in the world has made such rapid progress in aviation, relative to its development of other methods of transportation, as has Brazil. The tremendous distances to be covered have encouraged people to travel by air. International interests involved have caused companies representing various foreign nations to vie with one another in establishing international connections.

Because the distance between Natal in Brazil and Dakar in Africa (1,600 miles) is the shortest distance between continents of the Western and Eastern Hemispheres, and because climatic conditions are safer in the South Atlantic, trans-Atlantic flying has brought great benefits to Brazil.

XXVII

Via Aérea

THE "Air Way" is changing Brazil. Few nations of the world have more to gain through use of the air as a means of transportation than the United States and Brazil, because of their size. Both countries have pioneered and made valuable contributions to the development of the airplane and air traffic. A Brazilian, Santos Dumont, flew the first dirigible balloon. He also made the first flight in Europe in a heavier-than-air machine. Brazil was the first destination of the transoceanic lines of the United States, France, Italy, and Germany, and became during the decade 1930-40 the great trial ground for long-distance flying. Brazil was also the terminus of the first airship (dirigible) line.

Lacking the necessary manufacturing facilities, Brazil has only begun to produce airplanes, but it is an air-minded nation and air transportation has developed considerably. Aviation is facilitating travel over Brazil's vast expanse of territory. New landing fields are being built, training schools for pilots are increasing in number and efficiency, commercial lines open new routes constantly, the manufacture of planes in the country has been provided for—so progress will be rapid.

The Father of Flight. It has long been a touchy point with Brazilians that the part their favorite son, Santos Dumont, had in the discovery of flying machines was not accepted in the United States for a time. Fortunately the facts in the case are no longer disputed, and it is firmly established that his historic flight in Paris on September 18, 1898, was the first time man steered himself through the air. This was accomplished in a nonrigid dirigible, which rose to an altitude of 1,300 feet. Santos Dumont's wealth made it possible for him to make a great number of trials, and even though his dirigibles cost the considerable sum of $30,000 each, he built successively six of them. In his No. 6 dirigible, on October 14, 1901, he won a prize of 100,000 francs ($20,000) offered by M. Henry Deutsch for the first successful flight

from St. Cloud around the Eiffel Tower and back in a half hour. Brazil conferred on him a medal and a prize of $25,000.

Santos Dumont divided the French prize between his ground crew and the poor of Paris, still further endearing himself to the French people, to whom he was a popular idol. He flew frequently over Paris and came to have a fleet of four dirigibles of his own.

Not satisfied with dirigibles alone, he turned to heavier-than-air machines, and on November 17, 1906, made a public demonstration flight in a machine of his own construction. The distance covered was about 250 yards (220 meters). He had flown unofficially twice before this during the months of September and October, and his flight of October 23 is really considered the first, although not officially recorded by the French Air Club. The Wright brothers—Wilbur and Orville—had been the first to invent a successful man-carrying and power-driven airplane, and the first to fly it (December 17, 1903), but they had made their flights in isolated Kitty Hawk, North Carolina. It was Santos Dumont's public flights, and the interest they aroused in France, that brought Wilbur Wright to Paris in 1908 to stage a public exhibition. To exalt Santos Dumont is not to diminish in any way the great achievements of the Wright brothers—but simply to give recognition to the man whom Brazilians call the "Father of Flight."

Brazil a Trial Ground for International Routes. In 1929 the New York-Rio-Buenos Aires Line, NYRBA, an American company, began operation between the United States and Brazil. In 1930 the company was taken over by the Pan American Airways System, and the intercontinental service was greatly increased and improved. The Deutsche Lufthansa put in operation a line from Germany. The French first flew a regular line, called Latécoère, across the South Atlantic in 1925. It was followed by the Air France and the Lati (Italian). These European lines at first carried only mail, then became passenger lines. The German Condor line has been taken over by the Brazilian Government. The British, Dutch, and Scandinavians have regular lines to Brazil.

What needs to be stressed here is that transoceanic flight on a fast scale was carried on between Africa and Brazil and between North America and Brazil. This was done for two apparent reasons—as a tryout for oceanic flights where the best possible flight conditions existed, and in a fervent desire to promote closer relations with Brazil and South America in general. Without a doubt the commercial value of these lines was far overshadowed by the military value of the experience gained in long flights. The only line maintained on a truly commercial basis was the Pan American, but even it had government sub-

sidies for operation. As a net result of these oceanic flights, better and bigger planes were built and a record of safe flying was achieved. Only after more experience had been gained here did the Pan American undertake cross-Pacific and cross-Atlantic flights on regular schedule.

Unification by Air. A great value of air travel and transport in Brazil is that it contributes so signally to bringing closer together the far-flung outposts of the nation. Trips of days have been reduced to hours, and trips of months have been reduced to a few days. Just when separatism was most in danger of dividing the country, a government determined on unification came into power. Under Getulio Vargas a vast work toward this end was done, and a prime factor in making this possible was air transportation. A few years ago the whole northeastern part of Brazil was 10, 15, or even 30 days by sea travel from the capital of the republic. Now the capitals of these states are only one day away by air, and several of them have a choice of more than one line. The development of commercial routes has been rapid. Each shortening of travel time between distant regions of the country is a definite contribution to national unification.

Air-minded Government. The Brazilian Government is air minded to the fullest degree. Former President Vargas frequently flew to distant parts of the country. Practically all the Ministers of State travel by air. The creation of the Ministry of Aeronautics (1941) marked a great advance, for civil, military, and naval aviation were joined up under one general supervision. From a simple department in the Ministry of Transport, the work expanded into a full-fledged cabinet ministry. Some 20,000 kilometers of mail lines are flown on regular schedule by the army, helping to speed up communications and to furnish a vast training program for military pilots. These military mail lines cover 14 routes and reach 119 cities.

	1937	1942	1944	1946
Length of lines (kms)	68,932	62,911	116,165	121,301
Kilometers flown	6,112,658	7,912,547	16,755,942	.....
Passengers carried	61,875	99,688	244,566	541,739
Mail carried (tons)	143	233	733	596
Freight carried (tons)	235	735	3,469	7,173

The Brazilian Government has consistently subsidized commercial aviation, generally on the basis of kilometers flown. Some of the state

governments have given special subsidies for specified service. The State of São Paulo is the principal owner of the company operating out of its territory. The Federal Government has nationalized all the companies of the country, requiring that all flight personnel be Brazilian. This requirement does not apply to international routes crossing the country or terminating in Brazil.

Both the manufacture of steel on a large scale and the production in the near future of aluminum in the country will contribute raw materials necessary for the production of planes. Great activity in pilot training, hangar construction, airport building, and the manufacture of national planes all evidence the fact that the government realizes how important aviation is to the country.

Early Air Lines. The oldest commercial air line in Brazil is the Varig, founded in 1927. At that time there were no postage stamps for air mail, so the company issued its own stamps. The Brazilian Government soon surcharged stamps for this type of mail. The company was originally under German influence and used only German planes. Now it is a Brazilian company and serves fifteen towns within the State of Rio Grande do Sul alone. It has extended its lines northward to Rio de Janeiro, and outside the boundaries of Brazil, into Uruguay and Argentina.

The Panair do Brasil, subsidiary of Pan American Airways, came into existence in 1930; the Viação Aérea de São Paulo (VASP) in 1934; and the Navegação Aérea Brasileira (NAB) in 1941.

Pan American Airways and Panair do Brasil. The Panair, national subsidiary of the Pan American Airways, covers the most extensive routes of any company in the country—42,182 kilometers (1943). The company has made rapid progress both in the extension of its lines and in the improvement of its service and equipment. The Amazon River line—Belém-Manáus—was inaugurated in 1933, and has done much to bring far-away Manáus in quick touch with the rest of the world.

International aviation had its real boost with the coming of the clippers. The great Pan American Airways terminal station at Miami was inaugurated in 1933. In 1936 the fast-flying Lockheeds came into service, and travel time was greatly reduced on all lines. The following year many new lines were opened in Brazil, and the Amazon River travel was extended clear across the country. The same year the great Panair building was opened at the Santos Dumont Airport in Rio de Janeiro. In 1938 the millionth passenger was carried over the system. In 1940 the overland line direct from Belém, Pará, to Rio de Janeiro

was installed, cutting the flying time in half—to less than nine hours. The Strato-Clippers from Belém to Miami make the trip in one and a half days, thereby reducing the trip from Rio to Miami to three days. This overland trip became possible because at Barreiros, in the heart of the State of Bahia, on a large table plateau, Panair built a modern airport with eight runways, capable of receiving planes of all sizes and speeds. This construction, way out in a completely unoccupied part of the country, with material hauled up the mountain by ox teams, was a signal feat of American engineering. No single airport in Brazil is so strategically important as this one, unless it be the one at Natal, the hop-off post for the African continent. While this port was built by Panair, it is open to all lines under full direction of the Brazilian aviation authorities.

In 1941 many extensions to the already existing lines of the company were made. In 1942 the Panair purchased ten Lodestars, thus greatly increasing its fleet. As commercial airports are opened and a larger number of Brazilian pilots become available, the company is expanding its service. Military service and government priorities—both American and Brazilian—played havoc with ordinary passenger traffic during the months of intense war activity when Africa was attacked and thousands of military planes had to be ferried over the regular air routes. In 1943 Panair had a passenger list of 56,223 and hauled 1,446 tons of freight and 236 tons of mail. In the same year the movement of the Pan American Airways was 22,277 passengers, 344 tons of freight, and 208 tons of mail.

The Brazilian subsidiary to Pan American Airways, Panair do Brasil, in 1946 had increased its lines to the total of 56,483 kilometers, and carried 119,824 passengers. Its lines have been extended to Rome, Lisbon and London, Cairo and Beyruth, Madrid and Berlin.

Pan American Airways now has two direct flights a day, one from Rio de Janeiro to New York and one from São Paulo, the former taking approximately twenty-four hours. A nonstop nine-hour flight from Rio to New York is planned, with jet propulsion planes.

Braniff Airways. The latest entry in the inter-American airfield is Braniff, chosen as the second line to operate from the United States to Brazil, after the two countries signed the aviation agreement in September, 1946. By this treaty, two lines may operate from each country, with free access to the other country. With several lines in operation, the keen competition will bring benefits in services rendered and rates charged. Braniff operations, which began in 1947, will link

Brazil and the western part of the United States more directly than other lines.

Viação Aérea de São Paulo. This nationally organized and owned company of São Paulo began operation in 1934 with English planes. Later a change was made to German equipment. Its principal line is from Rio to São Paulo, and it now offers four trips each way daily, making it possible for a passenger to go from one city to the other on urgent business and return the same day. The train trip is 12 hours, the flying distance is 360 kilometers, and the travel time is 1 hour and 20 minutes. Almost as much time is consumed in getting to and from the airport in São Paulo as in the actual flying. Helicopters may help to bring a solution to this vital problem to all air travel in cities where airports are some distance from the centers.

The VASP also operates a line from São Paulo across the State of São Paulo and part of the State of Minas, and as far as Goiânia in the State of Goiás—a distance of 950 kilometers. A line to the south to Pôrto Alegre was discontinued owing to shortage of equipment, but it will no doubt be put in operation again in the future. This company carried the largest number of passengers of any in Brazil in 1943—36,639. It also handled 125 tons of freight and 21 tons of mail. The company has been thoroughly nationalized. It has a reputation for safety in its flights, in spite of the fact that frequent fogs in the São Paulo area make landing rather dangerous.

Services of the VASP have been extended to new lines within the State of São Paulo, and flights to Rio de Janeiro have been increased to one an hour each way during the day.

Cruzeiro do Sul. This formerly German-owned line (until 1942, when it was taken over by the Brazilian Government) operated routes from north to south and on to Argentina, and a cross-continent line from east to west. It had good equipment and for a while the largest planes—4-motor—in service in Brazil. It carried 21,817 passengers in 1941, but its traffic was tremendously reduced during the war period. It is now becoming a first-class line as a national company. Before the war this company was called the Condor. In 1943 the traffic rose to 36,986 passengers, 736 tons of freight, and 44 tons of mail.

The Cruzeiro do Sul was the first Brazilian line to fly to the United States. It flies twenty-seven regular routes within Brazil, and is one of the strongest national lines. It has excellent equipment.

Navegação Aérea Brasileira (NAB). Most aviation companies in Brazil are known by their initials or a single word nickname for the

long official company titles. This national line came into service in 1941, after more than a year of intensive preparation of ground service. Its equipment is all American-made, of good quality, and its principal effort has been to have everything in the organization ship-shape before flying. It opened its own training school for mechanics, for pilots, and for agency work. For specialties, like weather forecast, where study or preparation could not be undertaken in Brazil, selected young men were sent to the United States to take courses in American universities. Lines are in operation linking capital cities in the north with Rio de Janeiro. The NAB traffic totaled 8,483 passengers, 138 tons of luggage, 55 tons of freight, and 32 tons of mail in 1943. Its lines will be extended as rapidly as ground and pilot crew preparation can be carried out. This company is 100 per cent Brazilian, in ownership, technical administration, and personnel.

Aérovias Brasil. Shipping shortages due to war losses had as a natural consequence the hauling of high-priced goods by air freight. Aérovias Brasil, a Brazilian line, was launched to meet the situation. It operates a service to the United States. The Aérovias handled 155 tons of freight in 1943.

New Lines. A number of new lines has been formed since the war. At present some twenty lines are operating routes with a total of more than 112,000 kilometers regularly scheduled, using about a hundred and fifty planes. New routes are constantly being added, so that accurate data today become obsolete tomorrow.

Air service between the cities of Rio de Janeiro and São Paulo is the most frequent in the nation, there being more than twenty flights each way every day. Many small cities are anxious to have air connections, so local companies are being formed to fly short routes. Airports in southern Brazil are badly overcrowded. Northern ports, however, which were designed to accommodate military air traffic, will be more than adequate for commercial air movements for some years to come.

Air Express. Each air line has its regularly organized service of passengers, mail, express, and freight. Recently an air express company was formed with agencies in the principal cities, making use of all lines. It remains to be seen whether special flights can profitably be made for hauling express, or if it must necessarily be only a complement of passenger traffic planes. But more rapid transportation of goods as well as of people is the demand of today. The Brazilian Avia-

tion Company was formed to offer taxi service between cities. So with an air freight line, air expresses, and air taxis, a complete set of services is available. Many private planes are also in use, sometimes piloted by the owner, sometimes by professional pilots.

European Lines. As soon as World War II was concluded, European lines began the struggle to get under way as soon as possible. Service to Europe is maintained by the Brazilian line Panair, already described, and by the following lines: Air France, Royal Dutch, British South America, and Scandinavian Lines. The Italians are planning a line, and others may develop.

The fast new planes make the trans-Atlantic flight in a short time and with an almost perfect score on safety. The thousands of flights across the oceans made during the war trained many pilots and flight crews, so that these South American-European services can now be maintained to advantage. The commercial significance of these intercontinental services is of vast importance. Brazil, more than almost any other South American country, will benefit tremendously by their development.

Flying Facilities. There are more than one hundred commercial airports in the country, and more are coming into being all the time. The great Santos Dumont Airport of Rio de Janeiro offers exceptional advantages because of its nearness to the business section of the city and because it can receive land and sea-planes equally well. It is being equipped with all modern port equipment and can handle heavy traffic.

A new airport has recently been opened in Rio de Janeiro, at the Ponto de Galeão, to accommodate the large Constellation type of planes that are too large for safe landings at the Santos Dumont Field. São Paulo has the military field of Cumbica, where large planes can land. Doubtless the fast commercial planes will eventually land there. São Paulo has been deprived of the services of these larger planes up to the present, because of the lack of certain landing facilities.

The official government military field and airport, the Campo dos Afonsos, is on the outskirts of the city. It has, in addition to the official flying school, immense shops for the maintenance of planes, where more than 800 men are employed. Hundreds of motors have been overhauled and many damaged planes put back into service at this port. Military airfields of vast proportions have been constructed all along the northern coastal regions, and others are being made in each of the military regional headquarters, so that civil, military, and com-

mercial ports are being improved. A large aeronautical school will be located in São Paulo, with special training grounds and large shops. The Ministry of Aeronautics has planned to make São Paulo one of the main centers of Brazilian aviation, not only for civil and commercial purposes but for military purposes as well. The city has three airports, the one most recently built being for the army. Much is lacking in the way of radio beacon wave service and concrete runways capable of receiving the gigantic planes now being put out, but these needed improvements will come in time. Facilities for night flying are much needed, and installations are now being made at many airports. Air France did a great deal of night flying, and Panair is operating regular night schedules over some routes.

Pilot Training. How to get more pilots was mostly a question of getting planes in which young people could learn to fly. Assis Chateaubriand, head of a chain of newspapers covering all Brazil, hit upon the happy idea of launching a campaign for obtaining training planes through private donations. Individuals, firms, and civic groups were called upon to donate funds for the purchase of planes. Those donated in any given city or state were always distributed to far-away cities. All were christened with patriotic names. In this way each plane became an element for increasing national civic pride and for bringing widely distant regions into closer contact. Eight hundred planes, costing over a million dollars, have been donated, and 230 aviation clubs have received one or more planes. Most of them are the simplest type of American planes, but a few are more advanced types for special training. Now 1,500 pilots a year are being added to the number of Brazilians who know how to fly, and each successive year will see this number increase. Regular military cadet training is available in the army and navy.

A Decade of Progress. Travel by air really got under way in Brazil in 1930. By 1940 the number of passengers has been increased eighteenfold—from 4,667 to 86,071. Mail carried increased in the same ten years eightfold, and freight and express increased sixtyfold. The end of these ten years saw the country actually launched on an air transportation program, in which much had been accomplished and which serves as a foundation for future development. World War II made the whole world air-minded. "Thunder Birds," as the South American Indians called the planes, became common sights everywhere.

The Present Decade. A report issued by the Civil Air Board of the Ministry of Aeronautics shows that, for the seven companies in

operation in 1943-44, the aggregate air traffic over 90,593 kilometers of air routes in 1943 and over 116,165 kilometers in 1944 was as follows:

	1943	1944
Kilometers flown	17,593,188	20,683,901
Flying time (hours)	71,882	84,388
Passengers carried	171,860	244,120
Baggage (kilos)	3,043,893	4,027,206
Mail (kilos)	556,940	733,731
Freight (kilos)	2,953,926	3,433,042

The number of passengers and freight carried by the Aérovias S. A. Minas Gerais and the Viaçã Aérea Santos Dumont, both having started operations in 1944, is not included in these totals.

Improvements in velocity, quality, and security in military planes were so rapid during the war that faster, larger, and safer civilian planes are at least one inheritance from the war. A direct Miami-Rio flight that until World War II took five days now takes but twenty-one hours. Imagine leaving Rio at 9 a.m. and arriving in Miami the following morning at 6 a.m.

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PART V

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Education and Culture

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XXVIII

Science at Work

THE PEOPLE of tropical countries have been slower in progress and development than those of the temperate zones. The greater vigor of the people of the Northern Hemisphere has generally been attributed to the effects of climate. No doubt colder climates are more invigorating, and resistance to the rigors of climate makes people more active in the common pursuits of life, while the heat of warmer climates makes people listless and lazy. Though it must be admitted that excessive heat diminishes body energy and correspondingly mental acumen, other causes of lethargy in tropical climates, of graver importance, have gone unknown for centuries. The hookworm and the mosquito have contributed to it. Intestinal parasites undermine body energy to an exceptional degree. The mosquito has been the carrier of two of the world's most dread diseases—malaria and yellow fever. The discovery of the facts in regard to the transmission of virus by this disease carrier has permitted mankind to develop a defense and has completely transformed possibilities of human life in the tropics.

Other enemies, larger and more readily identifiable, that take their toll of dwellers in the tropics are snakes and venomous scorpions. It remained for a Brazilian scientific institution to conquer this danger.

Venereal diseases are more prevalent and virulent in warmer climates than in cold climates, but in Brazil modern clinics put treatment within reach of all classes, and constant educational work is enabling the population as a whole to understand and combat these diseases.

Food in the Tropics. Another great problem to be met by those living in warmer climates is that of adequate nourishment. Discoveries in modern nutrition, especially in vitamin requirements, have revealed the great necessity of improving food standards in the tropics. Many of the most nutritious fruits and vegetables growing in cooler climates are entirely absent from the diet of most people living near the Equator. Cows' milk is almost lacking from the diet of the poorer classes in

Brazil. Even in the larger cities, per capita milk consumption is less than one-fourth that of New York City.

Enormous advances have been made in Brazil both in the combating of disease and in the improvement in nutrition. Fruits and vegetables are available in increasing quantities and of better quality. The consumption of oranges, considered valuable in present-day nutrition, has increased considerably in Brazil in the past ten years. Improvement in the production and handling of milk and milk products has greatly increased their use.

Science and Progress. It is encouraging that these conquests are showing visible results in diminishing disease and improving nutrition. The Brazilian is stronger, more robust, and more active now than ever before in the history of the country. In central and south Brazil one can live in comfort, be well fed, and lead an active life with as little danger from diseases as in any other part of the world. With every forward step of science in sanitation and nutrition the northern half of the country becomes more and more available for human habitation. Brazil can justly be proud of a number of its scientific institutions, for their contribution to the national welfare.

The Instituto Agronômico of São Paulo. Brazilian prosperity and progress depend largely on agricultural production and exportation. It naturally follows that scientific investigation in agriculture is needed so that farmers can be informed on problems of soil management and crop production. The need was great enough to produce the result, and an agricultural experiment station in the State of São Paulo has been developing for a half century until now it is in a position of leadership. Its major contribution has been in the improvement and standardization of cotton growing (see Chapter XII). This one result alone would have justified the entire cost of the station.

The Agricultural Experiment Station of the State of São Paulo is at Campinas, sixty-five miles from the city of São Paulo. It celebrated its fiftieth anniversary in June, 1937. It has made contributions to the agricultural development of the state in coffee growing, sugar cane development, and in cottonseed production. Its first director was Dr. F. W. Dafert, a German of true scientific training and insight. It is now under the scientific direction and administration of Brazilians. Altogether, a staff of more than two hundred is working constantly on problems of the farmer, horticulturist, and fruit grower. New plants are tried out, new varieties are bred. Fertilizer experiments

determine what is most needed on the various soils of the state and the amounts that will bring the best results.

In addition to modern and well-equipped laboratories at the main station, a large farm is used for field tests. Over the state a number of substations deals with specific crop problems of different districts and special crops. In one locality a substation is entirely devoted to the study of the problems of sugar cane, in another work is on rice growing, methods of irrigation, time of planting, distance between rows, selection of seed, etc.

One station is devoted to the study of problems to be met by the horticulturist and fruit grower. New vegetables and improved fruit varieties are tested and developed. Grape growing comes in for special attention. Another section of the station is devoted to citrus fruits—oranges, grapefruits, lemons, and tangerines. Experiments on avocados are being conducted, and commercial-scale plantings are made.

Instituto Biológico. The State of São Paulo has another scientific institution of which it is very proud—the Biological Institute. It was organized in 1928 and has had a phenomenal growth and development. It deals with all problems related to plant diseases and their control and has charge of all the work of vegetable pathology in the state. It also carries on scientific investigations in the fields of chemistry, botany, plant physiology, entomology, and plant and animal pathology. It has been under the direction of Professor H. da Rocha Lima since 1933. It is similar in its organization to Rockefeller Institute in New York.

The study of plant diseases, and their prevention and control, is carried on at the Biological Institute. A staff of 88 scientific investigators is maintained, and they have 129 assistants. More than 200 workers are employed in Plant Disease Control. A minute study is made of drugs used in combating plant diseases in the state, and practical instructions are given in their use. There are also seven sections for the study of animal diseases. Poultry diseases, especially, are being studied and efficiently controlled.

The Biological Institute maintains a splendid library, which receives current scientific publications in many languages. The Institute is installed in one of the finest public buildings in the State of São Paulo. A large farm has been purchased near Campinas. On this farm, practical applications of the results of the laboratory studies can be made under controlled conditions before information is passed on to the farmers of the state. Many scientific papers are published, and the annual report is highly prized by contemporary workers in Brazil and other countries. Each year eminent scientists are invited from

Europe and the United States to come and work in the Institute on specific problems. The late Dr. H. S. Fawcett, of the California Citrus Experiment Station, and Dr. Anna E. Jenkins, of the United States Department of Agriculture, have visited São Paulo to work on citrus diseases. Dr. A. A. Bitancourt has gone from Brazil to make studies and investigations in the United States. This splendid example of cooperation between scientists of the two countries merits emulation in many other fields of scientific endeavor.

Butantan. Another scientific institution is Butantan, the São Paulo Snake Farm. As it is located in the suburbs of the city of São Paulo, it has been given much publicity by tourist agencies, and received thousands of visitors annually. These stand back timidly and look at the hundreds of deadly rattlers and *jararacas* in the enclosures, or crowd up as close as possible to these reptiles, according to their respective natures. In one of the enclosures are kept the harmless snakes. Some bask in the sun, while others seek shade in the trees.

It was in São Paulo that Dr. Vital Brazil made his important discovery that a serum could be prepared from the poison taken from the snake itself, and that a person bitten by a rattlesnake or other poisonous snake, if treated at once with the proper serum, would recover.

Farmers all over Brazil catch snakes with a noose on a long pole, place them in boxes, and deliver them to railway stations. The snakes are carried free to the city of São Paulo, and every day a truckload or more goes to the Institute, where each snake is placed in the proper enclosure. The farmer receives a tube of serum for his trouble. These tubes are kept on hand, and in case anyone in the neighborhood is bitten an injection is given immediately. This system of treatment has been copied in the United States and a number of other countries.

Some nonpoisonous snakes kill poisonous ones. Be sure to read the late President Theodore Roosevelt's account of his visit to Butantan in his book *Through the Brazilian Wilderness*. It is a very interesting book, and much can be learned from it about some of the lesser known regions of Brazil.

The Institute does not limit itself to the study of poisonous snakes, spiders, scorpions, and insects, and to the preparation of serums to combat their deadly bites. It is engaged in many other interesting lines of scientific investigation. One of these is to discover a use for snake poisons in medicinal treatments. Vaccines against smallpox and diphtheria are prepared, and these and other substances for preventive inoculation are furnished to the doctors and health officers of the state.

An effort is being made to discover a treatment for the deadly typhus fever communicated by the cattle tick to human beings. Several investigators have lost their lives while working on this problem. More than a hundred men and women are constantly at work in these investigations and in preparing serums and vaccines.

Horses are bred especially to furnish the needed blood for the preparation of the serums. The director, asked how many animals they had for experimental purposes, replied: "Three thousand rabbits, about the same number of guinea pigs, and to tell you the number of white rats we would have to count them every half hour." This institute is frequently described in books and magazines.

The Botanical Gardens of Rio de Janeiro. The Botanical Gardens in Rio are among the oldest of the famous Brazilian scientific institutions. The organization of the gardens dates back to the year 1806. Brazil at that time was a colony of Portugal. The Prince Regent (later King João VI) officially opened the Botanical Gardens in 1808 and planted the first royal palm of the famous avenue now existing in the gardens, which cover an area of 140 acres. They contain plants representing some two hundred families. Many tropical plants from Africa and Asia, as well as those native to Brazil, may be seen there. Brazil has always been a botanist's paradise and for two centuries has attracted the world's best botanists.

Palms, orchids, tropical trees, climbing vines, water plants—and what not—grow in unending variety. The late Dr. F. Lamson Scribner, one of the leading botanists of the United States, made a number of visits to the gardens (see the *Scientific Monthly,* January, 1938, pages 5-15). He says: "Few gardens have a more attractive entrance or present within their gates larger or more interesting collections of plants from tropical regions. . . . The Botanical Gardens of Rio de Janeiro, with its shaded avenues and well-filled area, is unrivaled in beauty of plan. . . . The student may here experience all the delights of original research and discovery in the science of Botany." An excellent herbarium includes many thousands of specimens, and a group of botanists is at work studying Brazil's tremendously rich and varied plant life.

To supplement the Botanical Gardens in Rio de Janeiro, with its tropical climate, the government has set aside a large tract on one of the highest mountains in Brazil, namely, Itatiaia. Here the wild plant life of temperate Brazil may be studied. This mountain is only a few hours by railroad from Rio. It reaches an altitude of 9,140 feet. It is the third highest mountain of Brazil, the highest being only 350

feet higher. The whole area has been set aside as a National Park, and good automobile roads are being built to make it more easily accessible. Both places should be visited by botanists and laymen, because of the wealth of beauty and the many interesting plants to be seen.

Oswaldo Cruz Institute. Scientific laboratories for the diagnosis and treatment of disease were not common in Brazil until the end of the nineteenth century. Then, in 1899, Dr. Oswaldo Cruz, who had studied with Pasteur in Paris, was entrusted with the organization of a laboratory in Rio de Janeiro where vaccines and serums could be prepared. The laboratory, called the Oswaldo Cruz Institute, was set up on an abandoned farm in the suburbs of the city of Manguinhos. At first the work was limited, since there was little equipment and a staff of only a half dozen workers. But the material limitations and shortage of personnel did not cause those who worked there to be unproductive. On the contrary! They were stimulated to a maximum effort in all lines. The very lack of many kinds of commonplace equipment caused them to invent ingenious devices for perfecting their bacteriological study methods.

Early in their investigations, a vaccine was discovered to combat blackleg, a disease that was causing the death of from 80 to 90 per cent of the young calves on certain cattle farms. This vaccine was 100 per cent effective as a preventive, and its use rapidly became universal throughout Brazil. Now more than a million farms have their syringes, and at any county seat the vaccine can be bought at less than cost of production. Thus millions of head of cattle have been saved as a result of the work of this institution.

Some twenty different serums are produced at the laboratories, and hundreds of scientific investigations have been carried on. At first some Brazilian doctors were skeptical about the innovations in the use of serums, but from its inception the value of the scientific work done here received recognition in other countries. In 1907 Brazil was invited to take part in the Berlin Hygiene Congress and Exposition, and was awarded first prize and a gold medal for the work presented by the Oswaldo Cruz Institute. This act of recognition from Germany made the Brazilians begin to appreciate their own institution, and Congress soon made funds available for the construction of adequate buildings and a hospital where investigation could be carried on with patients suffering from the diseases being studied. Dr. Carlos Chagas became director of the Institute after the death of Dr. Oswaldo Cruz, in 1917. Dr. Chagas, in 1909, had discovered, in the State of Minas Gerais, a new disease which took his name. It is caused by the bite of an

insect, the *Conorhinus megistu* or *Triatoma megista.* Special research on leprosy is now in progress at the Institute.

The fame of the Institute spread widely over the world because of Dr. Oswaldo Cruz's wonderful work in the elimination of yellow fever from the city of Rio de Janeiro in the early part of this century. It may well be said that Oswaldo Cruz was the Pasteur of Brazil. His work laid the basis for much of the medical advancement of the country.

The Institute of Geography and Statistics. A single unified system of statistics operating under a central directive body has been organized. This National Council of Statistics, originally established to guide and direct the activities of the National Institute of Statistics (established in July, 1934), retained its identity when the latter body was absorbed into the Institute of Geography and Statistics in 1938. The Council has direct relationships with all federal and state statistical agencies, through representation of such agencies in the membership of the Council; it has full autonomy of technical action for the purpose of efficient coordination in the planning and execution of statistics; and it promotes statistical studies and the comparison of data from federal, state, and local governments under the principle of inter-administrative cooperation. For many years some of the federal departments maintained statistical service, especially in the Ministry of Finance, which gathered data on imports and exports, but the work in various fields was usually done without relation to the others. The first census of Brazil was taken in 1872. Other years in which a census was taken were 1890, 1900, 1920, and 1940. One was ordered for 1910 but was delayed and later suspended because of political agitation. The proposed 1930 census was also suspended. The last general census was taken in September, 1940. This census covers population, agriculture, industry, commerce, and other features. In 1907 the General Directorate of Statistics was remodeled, and for many years it was directed by José L. S. de Bullhões Carvalho. The National Bureau of Statistics was formed in 1931, bringing the various sections under one head, but they were again placed under the various ministries when this bureau was dissolved in 1934 to form the present system of statistics.

The Institute of Geography and Statistics itself is an official national body immediately subordinate to the President of the Republic. Since the organization of the whole system, it has been under the presidency of José Carlos de Macedo Soares, a well-known scholar. It has developed a high degree of efficiency in the gathering of all manner of statistics of Brazilian life and economy and has taken an active interest

in linking up its work with international bodies of the same nature. The Institute administers three general branches of service: (1) a geographical branch, through the National Council of Geography; (2) a statistical branch, through the National Council of Statistics; and (3) a Census, through the National Bureau of the Census under the National Census Commission, a temporary organization which functions only to plan and supervise the decennial census. The presidency of the latter is held by Dr. J. Carneiro Felippe, a renowned Brazilian scientist. The three branches have their own offices and office staff, but a common General Secretariat. Dr. M. A. Teixeira de Freitas, the Secretary-general, is president of the Inter-American Statistical Institute, which has been created with the broad objective of fostering statistical development in the Western Hemisphere.

The National Council of Statistics consists of a General Assembly, which holds an annual session presided over by the president of the Institute; a Central Executive Board, which functions in the interim between meetings of the General Assembly; Regional Executive Boards, which control statistics of the states; and advisory organs, consisting of technical committees and consultants. In each state there is a Central Regional Office of General Statistics, usually called Departamento Estadual de Estatística. A system of statistical agencies in each municipality has recently been developed and placed under direct control of the Institute. The federal statistical branches over which supervision is exercised are the following: Bureau of Demographic, Social, and Political Statistics, in the Ministry of Justice; Bureau of Economic and Financial Statistics, in the Ministry of Finance; Bureau of Production Statistics, in the Ministry of Agriculture; Bureau of Social Insurance and Labor Statistics, in the Ministry of Labor; Bureau of Education and Health Statistics, in the Ministry of Education and Health.

In general according to subject field, the statistical work of the Institute is classified into seven groups: physical, demographic, economic, social, cultural, administrative, and political. Various agencies contribute statistics to the various subdivisions of each field. The Institute maintains an excellent printing office, which published the results of the General Census of 1940 in addition to its regular work on the Statistical Yearbook, Revista Brasileira de Estatística, Boletim Estatístico, Sinopses Estatísticas Regionais, and other work of statistical interest.

The National Council of Geography, which also has a General Secretariat, consists of a General Assembly, a central and various regional governing bodies, cooperative agencies within the federal administra-

tion, and various regional and local bureaus operating cooperatively as geographical agencies. The program under way in geography covers administrative, cartographical, and cultural indoor activities, and astronomical, geodetic, topographical, and aerophotogrammetric field activities. Among other things the program includes scientific surveys in Brazil by means of organized expeditions, systematic control of the territorial division of the country, preparation of the geographical map of Brazil on the millionth scale as a contribution to the map of the world, publication of the Revista Brasileira de Geografia, the Brazilian Geographical Dictionary, the Bulletin of Geography, and many other cultural works in the field. The Secretary-General of the Council is Christovam Leite de Castro, an engineer who is a member of the Sociedade de Geografia do Rio de Janeiro, the Historical and Geographical Institute, and other scientific societies, including the American Geographical Society and the Inter-American Society of Anthropology and Geography.

Instituto de Organização Racional do Trabalho. This institution, commonly known as the IDORT, is a Scientific Management Society. It was founded in 1931 with 92 members in the city of São Paulo. This membership has grown to 1,800. About half its members are from the State of São Paulo, and the remainder represent different parts of the country. It publishes a monthly review on scientific management and has a fine over-all program for the improvement of civil and private management from both an administrative and technical point of view. Each year the organization sponsors a campaign for some type of public improvement, including such subjects as accident prevention, better municipal administration, savings, cheap transportation, rational nutrition, better housing, rural economy, and postwar problems. Public meetings are held which are addressed by outstanding authorities. The society is under the able leadership of Dr. Moacyr E. Alvaro, an eye specialist of international reputation.

The Rockefeller Foundation. Through the Rockefeller Foundation, the United States has made an invaluable contribution to scientific progress in Brazil in four ways: (1) Original investigation of health problems, principally as related to epidemics of yellow fever and malaria, aided effectively in combating the new type of malaria which was brought over from Africa in the airplanes, by the mosquito *Anopheles gambiae.* The Foundation also revealed to Brazil, as clearly as it did to the South in the United States, the devastation caused by hookworm and the comparatively simple means of its elimination. (2)

Half of the money for the building of the great medical school of São Paulo was donated by the Foundation. (3) A large number of scholarships has been given Brazilian doctors, enabling them to go to the United States for special graduate study. (4) Special guidance, instruction, and scholarships have been given to establish modern nursing on a firm basis. The first trained nurses in Brazil were prepared with the help of this Foundation.

The Hygiene Institute, which is a part of the Medical School of São Paulo, was founded in 1918, through the cooperation of the Rockefeller Foundation and the State of São Paulo. The Foundation not only furnished the laboratory equipment, but sent from the United States, to direct its work, Professor Samuel T. Darling, noted expert on tropical sanitation with long experience in the Canal Zone, Malay States, and South Africa. Later, Professor Wilson G. Smillie came as assistant. The Foundation contributed one-third of the cost of the fine building which now houses the Institute.

Since 1922, the Hygiene Institute has been entirely under the direction of Brazilians, and since 1925 it has been a government institution. Dr. Geraldo Paula Souza is the present head and leading spirit in its research and instruction. In addition to the teaching of hygiene in the Medical College, courses of two years' duration are given to graduates in medicine who wish to specialize in public health work. Courses of one year are given normal school graduates who wish to become visiting health officers or otherwise engage in community health betterment. Dietitians are also being prepared by the Institute to work in the improvement of nutrition. Research work is carried on in many lines connected with public health and its improvement. In 1944 the Institute was made into a College of Public Health, as part of the University of São Paulo.

The work of the Rockefeller Foundation in helping medical progress in Brazil is the outstanding aid extended Brazil by the people of the United States. Exceptional educational work has also been done by the Protestant missions.

Gafrée-Guinle Foundation. The various Brazilian scientific institutions that have been described are government-owned and -controlled. Mention has been made of the admirable health work done by the Rockefeller Foundation in cooperation with the Government authorities representing an American philanthropic contribution. The question arises, What have wealthy Brazilians done for their own people? A satisfactory answer can be made in at least one case—the Gafrée-Guinle Foundation for venereal diseases, which was built and

equipped at an expense of considerably more than a million dollars given by the Guinle family. Its maintenance is guaranteed from its normal income as a hospital, plus a large annual appropriation by the government to be used in clinics. In its first ten years of activity 700,000 patients were examined, and 48 per cent were found to be infected with some venereal disease. In their treatment, 7,000,000 injections were given. The Foundation has a central hospital with 250 beds, ample laboratories and nine clinics in the city of Rio de Janeiro.

Treatment of patients is not the only work of the Foundation. One building is devoted exclusively to research, and an active group of doctors and laboratory specialists works here in investigations of the diseases treated. With such an enormous number of people under treatment, all possible phases of venereal diseases are observable for study. In addition to the investigations along these lines, a special section is maintained for the study and treatment of cancer.

Instituto Histórico e Geográfico Brasileiro. More than a hundred years old, the Instituto Histórico e Geográfico Brasileiro is the famous "Oldest Learned Society in South America." Since 1838 it has upheld with dignity the concept of advanced studies in historical and geographical fields. Its membership includes outstanding names in the humanities and social sciences. It has organized literary and scientific chapters, provided lecturers, and issued many interesting publications. The president of the Institute is the eminent statesman, Ambassador José Carlos de Macedo Soares, historian and writer. He is also president of the Brazilian Academy of Letters. The secretary is Dr. Virgilio Corrêa Filho. The late Dr. Max Fleiuss, former *Secretário Perpétuo,* wrote a history of the organization, a summary of which appeared in the *Bulletin of the Pan American Union.*[1] The 1937 issue of the *Handbook of Latin American Studies*[2] was dedicated to the Instituto in commemoration of the centenary of its founding. An article in this Handbook, by Senhora Lydia de Queiroz Sambaquy, gives a complete record of the publications of the old Instituto and of a number of other important learned societies in Brazil.

Scientists of Note. Brazil has come of age, so to speak, in the development of institutions such as are described in this chapter. Each of the institutions is a leader, already calling into being similar institutions in other parts of the country. The most notable Brazilian scientists have been Oswaldo Cruz, Carlos Chagas, and Barbosa Rodrigues. Among

1 Vol. 73, p. 557 ff.
2 Harvard University.

the French scientists should be named A. Saint Hilaire. Many German scientists have made their contributions to knowledge of Brazil, probably the most noteworthy being Martius, whose Brazilian botany, published a century ago in forty volumes, is one of the greatest botanical works yet produced. Humboldt, the German naturalist, also made a notable contribution. Dafert has already been mentioned in this chapter. Among the North American scientists who have made special contributions in Brazil are Agassiz, John C. Branner, Orville Derby, and, more recently, the late P. H. Rolfs and Mrs. Agnes Chase. Among Englishmen, Bates and Wallace should be mentioned.

A small number of refugee scientists recently arrived in the country have found opportunity for continuing their work in Brazilian scientific institutions.

XXIX

The Educational Problem

TO RAISE the level of literacy is Brazil's major educational problem. During the course of the nineteenth century, as the general levels of culture in various countries became an object of attention, the literacy rate was usually regarded as one of the most significant indices of social heritage. But statistics of illiteracy in the past were not always collected in such a way as to provide a reliable and uniform basis for international comparison. Figures for different countries did not represent the same age groups and these were not classified as to sex, nationality, and race. Variations in methods used were manifold. Literacy rates, with no regional distribution, ranged from a sample of the total population (all ages) to samples of those of age five, six, seven, ten, or fifteen years, or even of those of marriageable age, or of army conscripts. For instance, in England the percentages were based upon the proportion of those signing their names in the marriage register with a mark, 32.6 per cent for males and 48.9 per cent for females in 1845. In certain other groups, percentage of illiteracy was determined by the number of those ten years of age and over who were unable to read or write a short letter. India and Egypt had an illiteracy rate above 90 per cent. Argentina had an illiteracy rate of 78 per cent in 1870. Among Negroes in the United States illiteracy was estimated at 70 per cent in 1880. In 1900, illiteracy among immigrants on arrival in the United States was calculated at 25 per cent, while the rate of all Americans of ten years of age and over had declined to 10.7 per cent by that time. Statistics gathered during World War I demonstrated that 24.9 per cent of the American soldiers were functionally illiterate, and laws were passed imposing a literacy test upon all immigrants. In 1930 the rate for the entire United States was given as only 4.3 per cent, and at present it is negligible.

In Brazil, illiteracy was estimated in 1872 to be about 80 per cent of the total population, which was chiefly rural. With great effort the rate has been reduced in the last seventy years, but it is still high. In

many places a better record has been achieved, and the general prospects for advancement were perhaps never brighter. The 1940 census gives the number of illiterates at 55 per cent of the total population. Much remains to be accomplished, and Brazil needs to be surer of the road to take in the elimination of illiteracy.

In the colonial period, settlers transplanted, generally speaking, the educational conditions of the country from which they came, and the great mass of immigrants coming to Brazil was made up of poor, relatively ignorant, laborers and peasants.[1] The schools were closely associated with the Church, and while the Jesuits supplied some elementary education and established seminaries in the country, it is certain that thousands grew to manhood with no schooling and that other thousands received only a meager amount in the few government schools of that time. During the Regency in the first quarter of the nineteenth century, popular instruction was still far from progressive. In Rio de Janeiro there were classes in philosophy, rhetoric, Greek, Latin, military science, as well as some primary instruction. A long fight was waged before the policy of public school education for all those of school age was adopted. A few institutions of higher education were provided by the Prince Regent, but they were, in general, open to professional and leisure classes only. He also established the Public National Library, the Botanical Gardens, the Military Academy (1810), and other institutions. A Laboratory of Practical Chemistry was established in Rio in 1812. During the Empire (1822-89) the average amount of schooling showed a statistical increase. The first law on public elementary instruction appeared in 1827, and the earliest normal schools were established in Niteroi (1835), in Bahia (1842), in Ceará (1845), and in Rio de Janeiro and São Paulo (1880). Statesmen of the Empire at least had ideas or plans. A number of other educational establishments were started, and many drafts for new educational policies submitted to the government were made into law.[2] But there was a landed aristocracy, about which Professor Lourenço Filho says:

> The economy of the Empire was based upon slavery and latifundia (large estates). The cultural pattern was that of an agrarian civilization, to which the people's education was a matter of no direct concern. What was of

1 Large surpluses of European rural population coming to Brazil, from the earlier migrations of groups down to the extensive colonization in modern times, were mostly from countries which as late as 1872 had an illiteracy rate of between 69 and 82 per cent (Portugal, Italy, and Spain). It was not until after World War I that restrictions were put into force to control the entrance of foreign illiterates.

2 See article by Raul Briquet, "Instrução Publica na Colônia e no Império (1500-1889)" in *Revista Brasileira de Estudos Pedagógicos*, II, No. 4, October, 1944.

interest was the preparation of an elite capable of preserving the Court's privileges. This tendency gained strength. Thus, when the Monarchy ended, for a population of fourteen million the general enrollment in primary schools was only a little over 250 thousand pupils. On a rather high level, academic education was maintained (medicine, law, and engineering), and the fine arts also attracted students even from other American countries. But both the secondary and the primary instruction were insufficient and badly conducted in relation to the real needs of the people.

The Republic maintained the same tendency. The idea of an education to serve and direct social organization found no support in the national thinking, imbued as it was of *a priori* juridical forms rather than of the capacity to see and feel the real problems of the social change. The Ministry of Public Instruction, under Benjamin Constant, for this reason, would be an ephemeral episode. And for many long years it was questioned whether the central government could or not take care of the primary education in the states.[3]

From statements in Ministerial reports for 1878 and 1880, it has been inferred that by that time there were 5,661 private and public primary schools in the Provinces of the Empire. In addition to the three normal schools, manual-training schools, and the old Seminario São Joaquim, which had been transformed into the Colégio Pedro II in 1837 and had come to be the official standard for the country's regular secondary course, there were one hundred or so public and private high schools in the country. Higher education was offered in the Schools of Medicine in Rio de Janeiro and Bahia, the Schools of Law in Recife and São Paulo, and the School of Mines in Ouro Preto. A Conservatory of Music and a few other cultural institutions were functioning in Rio. The most renowned Brazilian Colégios of Imperial times, besides Pedro II in Rio, were Caraça, near Ouro Preto, in Minas Gerais, and São Luis, in Itú, São Paulo. The old Escola Normal da Praça, now called Escola Caetano de Campos, a standard institution in the city of São Paulo, was also connected with the significant educational developments of those times.

Pioneering in Modern Curricula. Public school education in Brazil, in the modern sense of the word, is only some seventy-five years old, although primary education existed in the country throughout all of the past century. It had its foundation in two or three small institutions, which began to function in 1870 or thereabouts.

Professor Kopke, in Rio de Janeiro, and his famous elementary school had a great deal to do with the beginning of modern methods

[3] Lourenço Filho, "Tendências da Educação Brasileiro," *Revista Brasileira de Estatistica*, No. 2, April-June, 1940.

in the country. Possibly no single influence was greater than that of the Escola Americana (American School)—the primary school which is part of Mackenzie College in São Paulo. During the latter decades of the past century, this primary school was under the able direction of Dr. Horace M. Lane. In view of the signal success of his methods, the state government requested him to bring teachers from the United States. A small group, under the leadership of Miss Marcia Browne, came and organized the first modern primary school in the then small city of São Paulo.

This nucleus became the basis of the state-wide system of public schools, where reforms under Caetano de Campos, Cesário Mota, and Gabriel Prestes reflected North American ideas and technique. The schools, of course, have been remodeled and improved with the passing of years, and nearly every state in the union has copied the São Paulo system with more or less efficiency. Several Protestant mission schools also wielded a very large influence at this time. The Piracicabano, founded by the Methodists in Piracicaba in 1881, and Colégio Internacional, founded by the Southern Presbyterians in Campinas in 1868, should be mentioned. The last-named school continues as the Gammon Institute at Lavras, Minas Gerais.

In the nineteenth century, practically all primary education was carried on in private schools, usually of a single class and employing the most antiquated methods. In the few public schools of the time, reading, writing, spelling, arithmetic, and religion were the only subjects taught. Those who could afford to do so sent their children to private schools, but they were not much better than the public schools. Lessons were studied aloud, learning was by rote. The most advanced pupils in arithmetic might do one or two problems in a day, if they could do them without the master's help. By the middle of the century, the general conditions in Brazilian public schools were still no better than those which Horace Mann had seen earlier in Massachusetts, where he found conditions in schools, "perhaps not appalling, but judged by our standards today extremely bad. The teachers were usually inferior and consistently underpaid; texts and teaching methods were alike antiquated and pedantic; the buildings were improperly lighted and ventilated; and worst of all, the schools were under the control of local trustees who all too frequently let the twin considerations of gain and narrow religious sectarianism eclipse what little educational light they may have had." [4]

[4] From a publication issued by Antioch College, Yellow Springs, Ohio, 1938, on the occasion of a conference commemorating the centennial of Horace Mann's entrance into the field of education.

Vastness of Territory. In addition to its newness, public education has to overcome a tremendous obstacle in the vastness of the territory to be covered. Forty-four million people live in Brazil, and a large number of them at some distance from adequate schools. The scarcity of good roads and the frequency of mountain ranges isolate many communities. Progress can come only as the number of schools is increased, and as more highways are opened, waterways improved, and railroads built.

Increase in Population. The number of children to be educated, not to speak of illiterate adults, is a problem in itself. In a study of a hundred families made in the interior of Brazil a few years ago, the average number of persons per family was found to be six, which is higher than the average for a similar group that was being studied in China about the same time. Brazilians were not more prolific than Chinese, but climatic and economic conditions in this particular rural region were better than in the region studied in China, so that the average number of children surviving was higher.

Though the birth rate among Brazilian families in the big cities is decreasing, better health conditions and large families in the rural and laboring classes continue to give the country a rapid increase in population. So the problem of mere physical equipment in education—schools to house the pupils, desks, blackboards, etc.—is one of great magnitude. The large proportion of the population which has an extremely low standard of living also aggravates the difficulties.

Economics Involved. Brazil has not had the money nor the material resources to make public education available to all its citzens. Three million children are receiving primary education, about 85 per cent of them in free public schools, the remainder in private schools, the parents paying tuition. But even so, more than one million children of school age go without schooling. Probably a half million live within reach of a school that has no room for them.

A large percentage of public school buildings does double duty: one group of children comes in the morning, and another, with different teachers, in the afternoon. Many buildings are too inadequate to accommodate all the children even on this basis. Taxes are low in Brazil, and tax-paying ability is also low, so that the educational problem is part of the fundamental economic problem of the whole country. The present Constitution requires that states and counties expend 20 per cent of their income on education, and programs for modernizing education and providing new public school buildngs are under way.

Primary Teaching. The day has passed when one could teach without special preparation. A normal school course is required of all teachers. The degree of training and preparation varies considerably from state to state. The tendency is for constantly higher requirements. At present, in the State of São Paulo, normal school courses have as a prerequisite a full high-school course. This is also true in the States of Rio de Janeiro, Pernambuco, Ceará, and Rio Grande do Sul, and in some others. In a few states the normal school course parallels the last years of high school. In a number of states there was in past years a surplus of graduates of these courses, because of the lack of buildings and appropriations for education.

Campaign for Adult Education. For many years the vital necessity of decreasing radically the percentage of illiterates has been recognized by Brazilian statesmen. Some decades ago, only 20 per cent of the population could read and write. At the present time, about one-half are illiterate, and the problem remains of vital importance. The Federal Government has launched a campaign to establish some 10,000 classes for adolescents and adults. The program calls for the instruction of 500,000 students each year. Approximately $1,500,000 will be expended annually for these special classes. It is anticipated that much volunteer work will be done by patriotic citizens.

A new series of readers, based on the famous Laubach system for illiterate adults, has been prepared, and millions of copies will be distributed free of charge to special classes and to those individuals who offer to teach at least one person to read and write. It is proposed to establish community centers, similar to the "Casas del Pueblo" in Mexico, where instruction can be continued beyond the three R's.

It is understood that merely knowing how to read and write does not in any sense establish the fact that a person has an education. In order that each citizen may be helped, some instruction will be given in civic duties, health and sanitation, and the ultrapractical subject of how to make a better living.

The project is receiving wide publicity, so that illiterates will be stimulated to avail themselves of the opportunity. Illiterates must be made to understand that there is no shame in *not knowing* how to read and write, but there is in *not wanting* to know. For the first time in Brazil, a nation-wide, concerted attack is being made on illiteracy. Progress will be realized along social, civic, and economic lines. Fortunately the program has as its leader Dr. Lourenço Filho, whose appreciation of the seriousness of the problem, coupled with his

dynamic personality, assures, to a great extent, the success of the undertaking.

Public Concern. It would not be fair to have it appear, even by inference, that the people of Brazil are indifferent to the problem of education. On the contrary, the newspapers, daily and weekly, magazines and pamphlets, public speakers and government authorities, constantly stress the needs of education. By law, public school primary education is free and compulsory. The law cannot be enforced for the lack of funds and schools, but it shows the ideal in view. Public primary education has been entirely under state supervision and provided for out of state and county funds. Recently the Federal Government has begun to supply supplementary funds to some of the weaker states, especially those where large groups of immigrants have settled and much of the primary education was formerly done in a foreign language. At present it is against the law to carry on primary work in any language but Portuguese. This is advisable to hasten the nationalization of foreign elements of the population.

Federal aid, from special funds, for the construction of 1,500 rural primary schools of simple types of construction, with residences for teachers, has been planned. The units will consist of one or more classrooms.

Progress. By the time of the establishment of the Republic in 1889, a number of social changes and intellectual movements had contributed to the development of the modern primary school in the States of Rio de Janeiro and São Paulo and some of the other states, but relatively slight advances had taken place in the country as a whole. In 1878 Leoncio de Carvalho proposed to make primary school attendance compulsory for children from 7 to 14 years of age. Five years later Ruy Barbosa spoke in favor of compulsory education. According to Carvalho's reform there would have been a liberal exemption in the case of children whose parents could prove that they were giving them proper education. But the enactment of such laws was slow.

The progress that has now been made in the field of education is shown in the following report of the Ministry of Foreign Affairs:

> In 1907, for the first time in the history of the Republic, it was proposed to compile proper statistics regarding general education in this country, but it was not until 1916 that the result of this labor came to be known. Education was left to the states, and they published numerous volumes which, however, were based on insufficient data and followed no definite system of compilation which would permit accurate comparisons.

In the present phase of national reconstruction, this situation has completely changed. Towards the end of 1930, the Ministry of Education was created, including a statistical office (Bureau of Education and Health Statistics). Following the necessary preliminaries an Inter-State Educational Statistics Convention was entered into between the Federal Government and the Federated Units in 1931. From 1932 on, we have therefore been having absolutely regular and reliable annual statistical information, making it possible to exercise firm control and serving as the groundwork of an efficient educational policy.[5]

The extent and direction of the trends in primary school enrollment (public and private school units), as compared with population figures, are illustrated by the following table for a series of years between 1872 and 1942 (the index numbers are fixed on the figures for 1920):

YEARS	Total population (All ages)	Index numbers	Total primary school enrollment	Index numbers	Pupils per 10,000 population
1872	(1) 10,112,061	33	139,321	11	138
1888	(2) 13,788,867	45	258,302	21	190
1907	(2) 21,163,827	69	638,378	51	302
1920	(3) 30,635,605	100	1,250,729	100	408
1932	(4) 35,475,398	116	2,071,437	166	584
1942	(4) 42,396,385	138	3,340,952	267	788

(1) Census data. (2) Official estimates based on Census data. (3) General Census of 1920. (4) Estimates for the beginning of the school year based on the Census data.

The number of primary schools in the country, which was 27,662 in 1932, was 43,975 in 1942. In the same period the number of primary school teachers increased from 56,320 to 85,577. From 1920 to 1942, with a 38 per cent increase in population, school registration increased 167 per cent.

At the beginning of 1940 there were 774 primary schools under the direction of foreigners. These were suppressed, and in their stead 876 schools were established under Brazilians. Now, not only is teaching done in Portuguese, but the children of foreign-born parents are taught to become intelligent citizens.

In passing it should be noted that in 1932 there were 394 high schools with 5,173 teachers and 56,208 students. In 1942 the number

[5] *Brazil, 1943—Resources and Possibilities.* (Rio de Janeiro: Ministry of Foreign Affairs), p. 533.

of high schools was 893, with 13,371 teachers and a student registration of 197,130. The relative increase in 1942, as compared with 1932, was 127 per cent in schools, 158 per cent in teachers, and 250 per cent in students.

The total number of public and private schools [6] of all kinds, and the pupils enrolled in them, by grades, are shown on the following table:

ADMINISTRATION AND GRADES		IN 1932		IN 1942	
		Schools	Pupils	Schools	Pupils
Public	Elementary	20,873	1,714,938	34,089	2,807,008
	Secondary	242	40,978	556	75,157
	College	155	18,665	204	20,323
	Total	21,270	1,774,581	34,849	2,902,488
Private	Elementary	7,433	408,367	11,798	720,745
	Secondary	1,072	79,434	2,061	193,260
	College	173	11,831	299	18,022
	Total	8,678	499,632	14,158	932,027
GRAND TOTAL		29,948	2,274,213	49,007	3,834,515

Considering the totals given for 1932 and 1942, the relative increases observed were 64 per cent for schools and 60 per cent for pupils. The number of teachers in all schools (public and private) was 76,025 in 1932 and 122,871 in 1942, an increase of 62 per cent. About half of them were men.

[6] The figures given for the educational movement in 1942 here and in the other parts of this chapter are subject to revision.

XXX

The Educational Effort

BRAZIL'S rapid industrial development has created openings for trained workers of many types. Technically trained foremen are in demand. Laboratory workers by the thousands are needed, and they cannot always be recruited from college graduates, as these expect and generally obtain better positions. Farm foremen and workers trained to handle farm machinery are also in demand. Many special trade schools have been established, mostly in the capital cities, and some rural schools teaching elementary agriculture have been organized, but only a beginning has been made. Some years ago the government was especially active in developing schools for technical education and brought forty teachers from Switzerland to teach in Rio de Janeiro, as well as a number from the United States.

Technical Education. A recent federal law on industrial education provides trade instruction in thirteen federal schools in various parts of the country and levies a per capita tax on each workman to be paid by all industrial plants, which is used exclusively for industrial training. Twenty-two trade courses are to be given. A primary education is required and after four years in these schools pupils may go to work at the various trades, industrial and manufacturing, or they may continue three to four years longer in the technical courses. Fifteen technical courses have been planned, the principal ones being in chemistry, electricity, mechanical drawing, textile work, construction work, mechanics, and airplane construction. The Federal Government is establishing technical schools in various sections of the country. The government is at the same time permitting state and private schools to give similar courses. These modern technical and trade courses will supply industry with better trained workers, foremen, and technicians.

Physical Education. A division of the federal Ministry of Education has been organized for physical education, which is now required

of all secondary students. In addition to the classes in gymnastics under licensed instructors, periodical physical examination of all students is mandatory so that development and progress in health and physique may be followed. At present, sports are much encouraged. The better organized schools have provisions for basketball, soccer, and tennis, and a few have swimming pools. Interstate and national competitions among university students are gaining in popularity.

Improvement in health and bodily development in Brazilian youth has already been brought about. In São Paulo and Rio de Janeiro well-organized schools of physical education prepare instructors, who readily find work in schools and institutions of higher learning, and as coaches and instructors in sports associations and athletic clubs all over Brazil.

A permanent student camp is in operation on the seashore in Santos for students of the state schools in the interior. An annual track meet of state high schools brings together 2,500 students either in São Paulo or Santos for a week.

Secondary Education. Statistics of secondary and higher education show increasing attendance. Before these two types of education are discussed in any detail, it is necessary to establish two or three fundamental facts. The first of these is that the concept of schools and colleges in Brazil is essentially European and radically different from that common in the United States. One studies to acquire knowledge in Brazil, and all courses from the high school up are so modeled as to present to the pupil a maximum of accumulated knowledge. The number of subjects taught and the manner in which they are taught are all made to contribute to the students' accumulating the greatest possible sum total of knowledge. In other words, a school or college exists for instruction rather than for education, if by education we understand a full knowledge of how to live—knowing how to use what has been learned. It should be stated, however, that there is a strong movement against encyclopedic learning, and recent changes in Brazilian school programs tend toward simplification and greater emphasis on education as we understand it.

The second point is that throughout the field of secondary and higher education a single rigid invariable national pattern is followed. From it there can be no deviation on the part of the school or pupil. There are two courses in secondary education offered in all Brazil: (1) the general high school course of four years (after a five-year primary course) designed for preparation for the senior high school, and (2) the

colégio, or senior high school, course of three years, which is more specialized in nature.

The former is based on the program of the Federal Government school Dom Pedro Segundo, in Rio de Janeiro. No high school is officially recognized unless it gives exactly the same program as that given in Dom Pedro Segundo. A federal inspector is maintained in every school for the purpose of certifying to the fact that this single standard course is carried out to the letter and that the proper work is done. No child can get into this course except by admission examinations to the first year, and the course must be taken in its successive four years by promotion. No one can enter any university in Brazil unless he has had this four-year high school course, supplemented by three years of senior high school work, which may be either scientific or classical, according to whether the student intends to take engineering or medicine, law or humanities.

The twelve years of schooling necessary for admission to a professional college represents more preparation than is given in an eleven- or twelve-year course (through high school) in the United States. It is difficult to obtain credit for work done in other countries and almost impossible for a child coming to Brazil to break in where he is normally prepared to enter. He may take certain examinations in official government high schools to ascertain his standing, or else he must start at the beginning, losing whatever work he may have already done in high school. If the student has reached eighteen years of age, he can complete the high school course in three years, which allows him to begin his professional course at twenty-one years of age.

Dom Pedro Segundo, the federal high school in Rio, establishes the pattern. Each state government has one or more high schools, and a few counties maintain a high school at the county seat. But about 93 per cent of secondary education is done in private schools, all under Federal Government supervision and inspection. In the United States just the contrary is true, since only 7 per cent of secondary education is carried on by private schools.

In a complete reorganization of secondary education contemplated by the Minister of Education, the old ideal of encyclopedic education was repudiated and the statement made that "the reorganization gives secondary education its real goal, which is the formation of adolescent personality." It was declared that "the specific character of secondary education is its function of forming in adolescents a solid general culture marked both by the cultivation of the ancient and the modern humanities." The new regime is opposed to the old scheme of simple steppingstones to higher courses, and its aim is to have "character-

forming education." If these results are obtained, great progress will have been made. Not only will the higher courses receive better trained candidates, but those who stop their education at the end of the secondary course will have a much better preparation for an understanding of life.

The following table, showing significant facts on courses other than primary and higher instruction, has been adapted from data published by the Instituto Nacional de Estudos Pedagógicos (the Federal Institute for Educational Research) on the basis of statistics collected on a nation-wide scale by the Serviço de Estatística da Educação e Saúde (the Federal Bureau of Education and Health Statistics):

GRADE AND BRANCH OF LEARNING	1932		1942		RELATIVE INCREASES	
	Number of Schools	Number of Students	Number of Schools	Number of Students	Schools %	Students %
Secondary	394	56,208	893	197,130	127	250
Industrial	108	14,638	169	15,106	56	3
Commercial	401	19,268	631	57,120	57	196
Art	213	7,132	623	13,127	194	84
Normal	258	27,243	526	31,470	104	16
Home Economics	184	15,714	726	45,448	295	189
Other grades and branches	538	41,047	1,228	116,126	128	283

The teachers under the above classifications totaled 16,867 in 1932. This number was doubled by 1942 (33,168 teachers). Of these totals, 5,157 in 1932 and 13,371 in 1942 were teaching in secondary schools. In the commercial schools there were 3,186 teachers in 1932 and 4,893 in 1942. The grand total of 122,871 reported, including also the primary and higher education teachers, divided into specified grades and branches, showed the following percentages in 1942: primary education 74%; secondary education 7%; higher education 4%; industrial education 1%; commercial education 4%; art education 1%; normal school education 4%; home economics 1%; other grades and branches 4%.

Higher Education. At the end of twelve years' work, the student finishes his course by taking an entrance examination for a professional course, the last three years of preparation having been slightly specialized. Ninety-eight per cent of the enrollment in institutions of higher education is in professional colleges. The course in law, medicine, or

engineering requires five years; agriculture, four years; and pharmacy and dentistry, three years each.

These colleges are coeducational, but there are no colleges exclusively for women in Brazil. A recently organized federal College of Philosophy has a three-year general course in ten specialties—mathematics, languages, philosophy, school administration, etc.—plus a one-year general course in teaching methods. The law requires that all teachers in high schools shall possess a degree of graduation from this course.

Compact universities, all on one campus under a central administration, each college being an integral part of the whole, are not the pattern in Brazil. In Rio de Janeiro there is the University of Brazil, owned and controlled by the Federal Government. This university, which was reorganized by Law No. 452, of July 5, 1937, is administered by the Ministry of Education. It consists of the following national institutions:

Faculty of Philosophy
School of Engineering
School of Mines and Metallurgy
School of Chemistry
Faculty of Medicine
Faculty of Dentistry
Faculty of Pharmacy
Faculty of Law
Faculty of Political Science and Economics
School of Architecture
School of Fine Arts
School of Music
School of Physical Education and Sports

As an integral part of the University of Brazil, there are, within the structure of the Ministry of Education, several scientific institutions, including museums, institutes, and services devoted to research and studies in technical, scientific, and social fields.

A University City has been planned by the Minister of Education for the city of Rio de Janeiro. A similar plan has been elaborated for the University of the State of São Paulo.

Programs of university extension have been developed, and the number of extension students in various fields is increasing, both in formal college courses and in noncredit short courses, institutes, and lectures.

The colleges of the University of Brazil serve as a pattern, just as Dom Pedro Segundo High School serves as a pattern for all high schools. All professional colleges anywhere in Brazil must duplicate the organization and courses of the federal university. The Federal Government regulates rigidly every institution of higher education and maintains an inspector in each. He reports monthly on what has been accomplished in the college for which he is responsible.

No one is allowed to practice any of the professions unless he holds a degree from a Brazilian school, and in some cases only those who are Brazilian-born may practice their profession. This excludes completely the possibility of a foreigner moving to Brazil with the expectation of exercising his profession, although foreigners are allowed to teach most subjects when they have been duly registered and licensed.

The State of São Paulo has a university with schools of law, medicine, engineering, philosophy, agriculture, dentistry, and pharmacy. Each college has a director and a chancellor, or rector. The Medical College has a very fine plant, toward which the Rockefeller Foundation contributed a half million dollars. An enormous hospital clinic has been built adjoining the college, with a capacity of eleven hundred beds and the most modern equipment. Additional units now under construction include an emergency department, a department for children, and separate wards for maternity, mental and infantile paralysis patients. The hospital will be one of the finest health centers in the world.

The College of Law has a magnificent building in the heart of São Paulo. The Agricultural College is in the city of Piracicaba. It probably has the best equipment and largest faculty of any agricultural college in South America.

In addition to the State of São Paulo, the States of Minas Gerais, Rio Grande do Sul, Paraná, Bahia, and Pernambuco have universities in their capitals. Several other states have one or more professional colleges.

Foreign Students. Work done in foreign colleges does not receive adequate recognition or credit in Brazilian professional schools and universities. Generally speaking, undergraduate students in the United States should not plan to study in Brazil unless the work can be properly accredited in the United States. Some day conditions of study for credit may become more liberal, but any student planning work in Brazil should make previous arrangements and should possess accurate information about details of courses planned before going to Brazil.

United States Educational Influence in Brazil. In addition to the notable American influence exercised on Brazilian educational developments in the primary schools already mentioned in this chapter, a number of other facts may well be mentioned here. The oldest commercial school in Brazil, organized in 1896 by Mackenzie College, has had a profound influence on all schools of business in Brazil. Alfred A. Anderson from Connecticut, director for more than thirty years, through methods evolved and textbooks prepared based on American commercial standards, together with high standards maintained, has made a great contribution to the development of commercial education.

Modern library practices were also first introduced into the country at Mackenzie College. The librarian of the college, Mrs. Adelpha R. Figueiredo, was granted a scholarship for study in the United States, and after taking a course at Columbia University she put her knowledge into practice in the library of Mackenzie College. She is now connected with the municipal library of the city of São Paulo.

In its engineering school, long under the charter of the University of the State of New York, Mackenzie College made another notable contribution by introducing American engineering methods. The course in architecture, with Dean Christiano S. das Neves in charge, has made a worth-while contribution to the development of Brazilian architecture. Its graduates have frequently won prizes in national and international competitions and have designed many fine buildings, both public and private. American building methods and designs were first taught at Mackenzie.

At Lavras, in Minas Gerais, Gammon Institute has made many worth-while contributions through its agricultural college and other schools. At Viçosa, also in the State of Minas Gerais, the late Dr. P. H. Rolfs, formerly dean of the Florida Agricultural College, organized the Minas State Agricultural College, along American lines.

The American Graded School of São Paulo has for many years cared for the educational needs of English-speaking children of the community. It was founded and is sponsored by the American Chamber of Commerce and now has a complete school plant on property of its own.

Through a few wisely distributed scholarships, some key educators in Brazil were given the chance to study at Teachers College of Columbia, and a number of professional men have been trained in the United States. Brazilian education is cast in European molds, but American influence is strong.

Literally hundreds of Brazilian students are intent on going to the United States on scholarships if there is any possibility of doing so.

Many American universities and colleges are offering scholarships to foreign students, and many of these will be taken by Brazilians, most of whom, on their return, will favor American as against European models in education.

The Ministry of Education and Health, and Other Official Educational Agencies. Set up by Decree No. 19,402 on November 14, 1930, the Ministry of Education and Health was reorganized by Law No. 378 on January 13, 1937. Through its eight divisions (primary education, industrial education, commercial education, home economics, secondary education, higher education, extracurricular education, and physical education), all under the National Department of Education, the Ministry has charge of the administration of the activities relating to school and out-of-school education. Under its general supervision are also public health and hospital activities and other social services in the country, and many of the private institutions that receive national subsidies. In the Federal District, the Ministry maintains schools of various types and levels, for nearly all kinds of students, including institutions for the deaf and blind and for the care of abandoned children. Courses on hygiene and public health, museum and library courses, schools of nursing (male and female), and a school of drama also come within the scope of its activities.

For general supervision of education and for the direction of other social and cultural activities, the Ministry of Education has regular administrative departments, divisions, bureaus, and services, and several advisory bodies. The Ministry controls the National Museum, Historical Museums, the National Observatory, the National Library, the Fine Arts Museum, and the art exhibitions held periodically under its auspices. It assists in the publication of national bibliography, promotes distribution of books, encourages the organization of popular libraries throughout the country, and owns a broadcasting station.

Other ministries control a number of educational institutions such as military secondary schools, academies, and colleges. The Health School and Veterinary School of the Army, Quartermaster Corps Officer School, Technical School of the Army, Physical Education School, Reserve Officers School, and the School of War are all administered by the War Office. Schools of military and civilian aviators are under the Ministry of Aeronautics, which administers the School of Aeronautics and Schools of Aircraft Specialists. The Ministry of Agriculture administers the National School of Veterinary, the National School of Agronomy, the Courses for Specialists in Petroleum, and certain other educational activities on experiment stations and farms. The Minis-

try of Justice and Interior administers schools for the abnormal, destitute, and delinquent, as well as the fire corps and military police schools. The Ministry of the Navy has a diverse selection of educational activities assigned to it, among which are the Navy War School for navy officers, the Naval Academy, a school for subaltern personnel of the navy, a navy male nurses' school, a department of physical education, and a merchant marine school. The Ministry of Transportation and Public Works deals with educational organizations for workers on railroads and for employees in railway offices and stations, and it gives telegraph and postal courses.

To the Administrative Department of Civil Service is assigned a large task—the management of public service education, which includes many clerical and technical courses and the conduct of official competitions for various government jobs.

These organizations and institutions work on various levels to aid in the advancement of knowledge and to increase generally the learning and culture of the Brazilians.

Educational Research. The National Institute of Pedagogical Studies, founded in 1938, is charged with special duties in research and historical documentation of all educational interests of the nation. It is also the organ for maintaining interchange with national and foreign institutions, and is expected to do research and make inquiries into all problems affecting the pedagogical methods employed in Brazil. It has as part of its work the physical examination of all candidates for civil service employment in the country. The results of these examinations receive intensive study, so that they serve a double purpose: (1) winnowing out the physically unfit and (2) giving a mass of detailed information for studies in Applied Psychology. Many thousands of individuals have been examined. The Institute has also furnished the technical bases for a large number of competitive civil service examinations.

The foregoing federal institute for educational research was organized by Dr. Lourenço Filho,[1] who continued at its head for some years.

[1] M. B. Lourenço Filho, Director of the Instituto Nacional de Estudos Pedagógicos, Ministry of Education and Health, was born in 1897, in São Paulo. He is a professor, educator, and statistician in the field of education, besides being technical consultant of the National Council of Statistics and Chairman of the Committee of Statistical Education, Inter-American Statistical Institute. He is professor of educational psychology, University of Brazil. He was a professor at the University of São Paulo, 1933; director of Department of Education, State of São Paulo, 1930-31; director of National Department of Education. *Member:* Brazilian Educational Society (president, 1934); Academy of Society of Biology of São Paulo; International Bureau of Education, Geneva. Degree of bachelor of juridical and social sciences, School of Juridical and Social Sciences of São Paulo, 1928. He is the author of numerous works, largely in the field of educational psychology.

He has traveled widely in the United States, understands and approves of the American approach to educational problems, and is in favor of cultural interchange between Brazil and the United States.

Educational Policies. Universal literacy is the goal of Brazilian education. Education of the Brazilian for Brazil through the nationalization of primary education may be said to be another main goal. Secondary education has, at present, one main aim—preparation for the professional college. College education has entrance to the practice of a profession as its chief object. The base should be widened. There could well be more education and somewhat less emphasis on mere instruction. In a country where educational advantages are open to such a small percentage of the population, it would seem that a more flexible curriculum, without the lowering of standards, would help.

Private initiative has been, up to the present, permitted in the whole range of educational work, but the tendency is definitely in the direction of the official institution.

The government has not been able to do without the aid of private schools. Were it in a financial position to care for all educational needs, no doubt the situation would be different. Officially, education is lay—nonreligious. But the church is not prohibited from having schools, which must conform to the same set standards as public schools and submit to the same rigid inspection. There are some strong church schools, both Roman Catholic and Protestant.

XXXI

Cultural Relations

SOME pessimists claim that "culture" is a word without meaning in the modern world.[1] However, during the last decade the expression "cultural relations" has come to have a very real significance, especially in Latin America.

Cultural Warfare. For the past five or six years a cultural warfare has been waged in many parts of South America. Nations of Europe and Asia vied with each other to see which could obtain for itself cultural predominance over the thoughts and lives of the inhabitants of the South American continent. Various nations made definite plans to influence thought in every sphere of human interests through literature, education, exchange of professors (generally a one-sided affair), and invitations to students to visit the interested country in carefully conducted tours.

Cultural relations, under these well-laid plans, were amplified to include practically all forms of thought, written and spoken, philosophical or factual, present, past, or future. Any aspect of life that might bring two nations closer together in thought and action was exploited as a means to further cultural relations. The aims in view in all this are important. No one could question the value and importance of cultural exchange between nations, when unselfish motives and high ideals for mutual benefits were all that were involved. But often this has not been the case. The nations aggressive in imposing their own cultures on other nations have often had an underlying motive of selfish interest—cultivation for exploitation. The whole process seemed like passing out sugar-coated pills to be followed by active trade promotion. In some extreme cases it was undoubtedly a desire for territorial annexation.

Many would dismiss this as an exaggeration. But trying to frighten away a problem by simply doubting its existence does not get us any-

1 *Atlantic Monthly*, Vol. 165, No. 4, April, 1940, p. 459.

where. The prewar activities of a number of nations in actively promoting cultural relations in Brazil could only lead to one conclusion: they were seeking trade, if not political hegemony. World War II temporarily suspended such activities by the Axis countries.

Brazilians are only partially aware of the dangers of foreign propaganda to which they are exposed. They are naturally inclined to accept scholarships and free trips to foreign countries, even though they realize that these are sometimes for propaganda purposes. For the Brazilians who may read this book, this word of warning will not be amiss, since some cultural activities carried on against the good of the country have not been adequately exposed.

Inter-American Cultural Relations. Is it improper and harmful to promote cultural relations between the countries of this continent? Certainly not, when motives are those of mutual benefit. The kind of promotion that is harmful occurs when one party has hidden economic or political motives. One very noticeable effect of World War II was to make the people of the United States realize, as never before, the importance of inter-American cultural relations. The United States has often been suspected in South America of imperialistic motives toward this continent. But let it be said that Brazil apparently has not participated in these fears. Brazil has done much to allay the suspicions of certain of its nationals and to bring about a better understanding of its relations with the United States. Recent world affairs have been of such a nature as greatly to enhance the value of the Good Neighbor Policy and stress the need of continental defense.

Most to be feared is that, owing to its greater cultural and material wealth, the United States might so dominate the relationship between the two nations as to bring about a one-sided situation unfavorable to Brazil. It will take a lot of good will and good judgment based on accurate knowledge to avoid this. To all appearances, neither the United States Government nor the American people wish a one-sided exchange.

The Pan American Union. Under the able leadership of the late Dr. L. S. Rowe, the Pan American Union has been a factor in bettering inter-American relations. Its purpose is "to promote peace, commerce, and friendship between the Republics of the American Continent by fostering economic, juridical, social, and cultural relations." It has sponsored many inter-American conferences held to promote better commercial agreements, sanitation laws, social welfare, and intellectual exchange. As an adjunct to regular diplomatic channels, it has

smoothed the way for progress in mutual understanding and esteem between the countries of North and South America. The Union has promoted the exchange of students and professors and published some important literature. Its bulletins, in three languages, contribute interesting and worthwhile information about each country. It has the high esteem of the American Republics—no mean accomplishment in itself. The collection of books on Brazil in its library is one of the finest in the world.

The Institute of International Education. This philanthropic institution, designed to facilitate exchange of students, professors, and lecturers between other nations and the United States, has always been greatly interested in South America. It has guided many students from Brazil into proper academic channels and kept in touch with them after they returned home. Dr. Stephen Duggan, former director of the Institute, visited Brazil and other South American countries in an effort to intensify interest in exchange of students and professors. A large number of scholarships in the United States was made available to South American students. Owing to the high exchange value of the dollar in Brazilian currency, and prevailing low salaries, it is only by means of liberal endowments for scholarships that many extremely worthwhile Brazilian students can study in the United States.

Many feel that only graduate students should study in the United States, and conversely that no undergraduate student of the United States should plan to study in Brazil, unless he pursues a full organized course under American auspices.

Cultural Unions. Headquarters of various cultural unions are maintained in Rio de Janeiro, São Paulo, and some other state capitals, where information on scholarships and other things American may be obtained. Brazilians furnish the leadership. Courses of study on cultural subjects as well as the study of the English language are provided. A library of American books is available, and American educational films are on loan to promote a more intelligent appreciation of our country. Prominent Brazilians, students who have recently returned from the States, and American educators and scientists visiting Brazil, are invited to speak on the various phases of American life that they represent. Large and enthusiastic audiences come to hear these speeches, and much information and good will is disseminated.

The promotion of good informative literature about both continents is one of the activities of these cultural groups, and a number of noteworthy books will be published as a result of these efforts. Ameri-

can students in Brazil receive helpful guidance, though more could be done in this regard.

The Instituto Brasil-Estados Unidos in Rio and the União Cultural Brasil-Estados Unidos in São Paulo maintain English courses for both beginners and advanced students. In São Paulo, not only such courses are given but also advanced courses in American history and a course in Portuguese for Americans who have recently arrived in Brazil. There are branch groups of this União operating in Santos, Piracicaba, and São João da Boa Vista in the State of São Paulo. In several cities of other states similar institutions cooperate to develop this program.

Division of Intellectual Cooperation. Ever since the League of Nations was organized, intellectual cooperation between nations has been given emphasis. Brazil set up a Committee on Intellectual Cooperation, with forty members, in 1923. Aloysio de Castro, first, and Miguel Ozorio de Almeida, later, are outstanding names in this cooperative movement. In 1937 the Committee was reorganized, and since then has had its headquarters in the Foreign Office. This was done because of the larger interest in intellectual cooperation aroused at the Pan American Conference in Buenos Aires in 1936. Other Pan American Conferences stress such cooperation, and in 1938 the Department of Intellectual Cooperation was set up in the Foreign Office, and Minister Temistocles da Graça Aranha was for many years its chief. Conventions of Intellectual Cooperation between Brazil and Argentina, Cuba, Bolivia, Uruguay, Chile, Peru, Panama, Canada, China, and other nations have been signed. The department is in charge of promoting literary, artistic, and scientific exchange. The promotion of exchange of professors and students, information about Brazilian intellectuals, lectures on cultural subjects, the general overseeing of cultural societies promoting international relations—all come under this department. In the postwar period the work has become increasingly important, since the whole question of intellectual exchange, not only between the Americas but with other nations of other continents, has come in for considerable attention. Brazil has much of cultural value to share with others, just as the Brazilians have a real need for the cultures of the rest of the world.

Study Tours. The University of Pennsylvania, in 1939, and Harvard University, in 1940, sponsored study tours to Brazil. Properly organized, with high-grade personnel in charge, these tours met with hearty cooperation on the part of the Brazilian Government and educational authorities. Accommodations are not available for large

groups, but it is doubtful if very large groups are advisable. The World Educational Conference brought six hundred teachers to Brazil. They had an enjoyable week in Rio de Janeiro, but hurried trips give little time for valuable study and contacts. Regular summer schools or courses that any student from the United States can attend may yet become available in Brazil. At present, however, one should come on an organized study tour or know exactly what arrangements can be made before coming for special study.

Scholarships and Foundations. For years the Rockefeller Foundation, in connection with its health and sanitation work in Brazil, has sent carefully chosen Brazilian doctors and nurses to the United States for specialized study. This has been the most systematic work of the kind done. For some years the Pan American Airways System has given an annual scholarship to Brazilian students. More recently, Guggenheim scholarships have been made available for South Americans, and several have been awarded to Brazilians. The American Association of University Women has for a number of years offered a scholarship to Latin-American women, and this has occasionally been awarded to a Brazilian woman.

The fact is, however, that, while American foundations have been extremely liberal toward Europe, the Near East, and Asia, they have done relatively little for South America. North American interests in Brazil are not extremely large commercially, but they are even smaller culturally and socially.

Graduate Work. In view of the fact that Brazilian institutions of higher learning are not keyed to the same level as ours, especially in the graduate field, we must recognize that if graduate work is to be undertaken in Brazil by American students, it is essential that a graduate school with American orientation be established. If some one of the American foundations would make funds available, such a school could be founded. It could sponsor short courses of study with a part-time faculty and an annually recruited lecturing faculty. In addition, it could guide longer-term students in their studies in Brazil and give them credits that would be acceptable in the American university of their choice. Such a graduate school, toward which much valuable spade work has been done by the Escola Livre de Sociologia e Politica in São Paulo, would avoid loss of time and effort on the part of students coming to Brazil and promote their graduate work. It would make it possible and desirable for American students to come to Brazil and avoid the one-sidedness that is certain to develop if only Brazilian stu-

dents go on scholarships to the United States and if there is no interchange. The average Brazilian is North American-minded to a much greater extent than the average American is Brazilian-minded.

Government Scholarships. Twenty years ago the Brazilian Government regularly sent a group of graduates of agricultural schools to make special studies in the United States. Some of the outstanding leaders in present-day agriculture of Brazil acquired not only their inspiration there, but also the technical knowledge that has promoted them to places of leadership. Recently one Brazilian state (Bahia) sent a group of ten officials to the United States for specialized study, most of them to study agriculture. The State of São Paulo always has at least one of its agricultural specialists studying in the United States. For ten or more years, the State of Minas Gerais has always had two professors from the Agricultural College at Viçosa in the United States for graduate study.

The Federal Government has perfected plans by which ten employees of the government can qualify each year to study in the United States. A member of the Brazilian Census Bureau spent two years in specialized study in Washington, and the knowledge he acquired was later applied in the taking of the Brazilian Census. Recently two other Brazilian Government statisticians received training in the United States. One specialized in the field of applied vital statistics at the United States Bureau of the Census; and the other studied, under the direction of the Bureau of Foreign and Domestic Commerce, all phases of the collection, processing, and utilization for analytical purposes of the foreign trade statistics of the United States.

The Inter-American Statistical Institute has arranged a program for interchange of statistical technicians. Professionals of high standing—specialists in selected subject matter fields—are being released by their governments to one period of service in the Permanent Office in Washington. From Brazil, Professors Octavio Alexander de Morais and Milton da Silva Rodrigues, both engineers and statisticians, were the first assignees under this program. Morais worked on comparability of foreign trade statistics, and Milton Rodrigues on the problems of statistical education looking toward a hemispheral plan in connection with methods and materials for statistical training.

Exchange of Professors. There are occasionally American professors at Brazilian universities. Paul Vanorden Shaw was for several years professor of American history in the University of São Paulo, and Dr. Donald Pierson was head of the Department of Sociology in the

School of Sociology and Political Science, which is also in the city of São Paulo. Dr. John W. Culver was in charge of the English School of the Cultural Union of São Paulo. No systematic exchange of professors has been undertaken. Undoubtedly, exchanges for short terms will become more popular and methods of procedure will be worked out. The inherent differences between the educational systems of Brazil and the United States are discussed in Chapters 29 and 30.

Mission Schools. The largest American educational influence over a long period of years has been that exercised by the twenty or more schools spread over the entire country and maintained by the North American Protestant Missions. These schools have not been spectacular nor aggressive, but they brought American educational methods and ideals to Brazil. Any consideration of cultural interchange between the two countries that overlooks them will be incomplete. Their contribution to the progress of education in Brazil has been fully acknowledged by historians of Brazilian education, by whom they are credited with many innovations. This influence has been widespread because geographically the schools have been located in the larger centers from north to south, and pedagogically they have been distributed from primary schools through to professional colleges. Many thousands of Brazilians have studied in mission schools, the annual registration now being well over ten thousand—a large number in itself, even though it represents a small percentage of the total number of Brazilian students.

One of the valuable contributions made by these institutions has been the introduction of new methods of teaching and new types of education. The change from medieval primary systems of education to modern methods grew chiefly out of the work of the Escola Americana in São Paulo. Better normal training methods came from the training course annexed to the same school. In this case the influence was national in scope because, being adopted successfully in the state school system of São Paulo, other states adopted the same methods.

These schools of the missions have never been elements of denationalization, but have always strengthened ties of friendship between North America and Brazil. At the same time that they were educating the sons and daughters of many of the first families of the nation, they were democratically receiving many poor boys and girls on scholarships. Many a prominent Brazilian today owes his education to a helping hand from some mission school. Many Brazilian professors have profited from scholarships in the United States and have in turn brought back to their country new ideas and new methods. Most mission

schools have modernized their physical equipment and built up a campus life seldom found in other Brazilian schools. They have adapted American ideas and methods to Brazilian life and needs in a remarkable way. Now they are passing rapidly into the control of Brazilian administrators and professors.

Books and Literature. Until recently it was very difficult for a Brazilian to purchase an American book. No bookstores in Brazil regularly stocked current American books. Practically no newsstands handled American periodicals, and Brazilian newspapers published practically no news from the United States. The single contact that the Brazilian in general had with our culture was through the motion picture. Now things have changed. American news is rated on a par with European news in the space allotted to it in the daily papers.

An exhibit of 2,200 American books held in Rio de Janeiro in 1939 opened the eyes of the general reading public and of the trade as well. A number of bookstores is beginning to specialize in American books, which are usually sold at reasonable prices, but generally far too high for popular purchase. In the large cities, many of the American periodicals are sold on the bookstands, and many people subscribe directly or through local agencies. A successful American book is generally translated in Portuguese within twelve months after its publication in the United States. The duties on books have been lowered, which brought about increased importations. While there is yet much to be done in the field, publishers have finally waked up and the problem is being approached more intelligently. A good start has been made, but a fine market awaits an aggressive selling campaign.

Because of the low value of Brazilian currency in United States dollars, American books sell at five times the cost of a Brazilian book. This represents a real difficulty, but it is not an unsurmountable one.

Many books published in Brazil should be in American libraries, accessible to the growing number of students who can read Portuguese, and this is a phase of the problem which should not be neglected. American publishers are seeking Brazilian books, and writers to translate them into English. They are also having their own publications translated into Portuguese. The remarkable success of the Portuguese edition of the *Reader's Digest,* launched early in the year 1942, merits mention. Within a few months after its appearance it reached the impressive figure of 300,000 copies a month, far more than the circulation of any Brazilian newspaper or periodical. Many newsstands have a monthly sale of this magazine exceeding a thousand copies, and many small up-country towns absorb that many copies of each issue.

The cultural value of the wide diffusion of the cream of American current literature is beyond calculation.

The Cinema. Many Americans would shudder to think of the motion picture as their most potent cultural influence in all foreign countries. One tries to imagine what sort of idea other people can have of us when we are chiefly to be seen through the movies. If we deluge Brazil with poor pictures, Brazilians rate us as we reveal ourselves. If we send out high-grade pictures like "Boy's Town" or "The Yearling"—just to mention two that come to mind—our rating goes up. If the majority of pictures are worth while, the people's appreciation of our country rises, and we, the American people, receive a correspondingly higher rating. The really good picture is highly prized in Brazil, as in the United States, and the really bad one suffers much the same discount. If it is prize fights, sightly legs, or divorce that is uppermost in our minds and our shows, that's the picture we create of ourselves in the Brazilian mind. If it is character, true value of life, and real art that we have to show—then we make a better impression. It still has to be remembered that the United States of America reveals itself more fully to Brazil and the rest of the world through the motion picture than through all other agencies combined.

Radio. Short-wave radio transmission offers a rapid and widespread diffusion of information. How much culture, how much publicity, and how much propaganda are transmitted by the radio depends entirely on the end in view. It is difficult to describe the cultural value of current short-wave transmissions from the United States, which sends out two types of programs—one in Portuguese directly for Brazilian consumption, the other a long-wave program for American consumption, routed over short waves. Apparently, thousands of listeners tune in on American stations each night. It should be said in passing that English, Russian, and German transmissions were much stronger than American before World War II. By 1944 great improvements had been made in both programs and transmissions from the United States.

Better programs, with special attention given to the listener to be reached, are still necessary. Stress on cultural affairs should be made, especially in the non-commercial short-wave programs. The war streamlined our efforts in this line.

Commerce and Culture. A discussion of the cultural values of everyday trade and commercial interchange would not be amiss, but such values are somewhat elusive.

Trade relations between the United States and Brazil for more than a century have been satisfactory. The trade balance has always been in favor of Brazil, but that is as it should be. Recently, American industry has moved into Brazil. More and more of its manufacturing is done locally, and that is also as it should be. (See Chapter XXIII.) The American businessman, on the whole, has liked being in Brazil and has been generally well received by the Brazilians. There is not so much aloofness or apartness as some reporters would have you believe. Nationalistic requirements tend to reduce the number of Americans in Brazil, rather than the contrary, but those who come can make real contributions to a better understanding between the two peoples by intelligent and sympathetic interest.

Rotary in Brazil. International Rotary has been well received by the business and commercial classes, and there are about 200 clubs, with more than 3,000 members. The country is divided into five districts, according to the geographical groupings of the cities having Rotary. Brazil was the first South American country to furnish an international president—Armando Arruda Pereira, from São Paulo. The fellowship approach to life and the motive of "service before self" appeals to the Brazilian, so that Rotary ideals make headway in promoting better relations between the various sections of Brazil and between this country and the outside world. Practically all the larger clubs have a very cosmopolitan membership, which in itself contributes to the promotion of better friendship between nations and nationalities.

The Division of Cultural Relations, Department of State, Washington, D. C. This division for the promotion of cultural relations between the United States and the rest of the world is only a few years old, and so has yet to demonstrate its practical value. It is significant that the United States Government should have finally come to establish a division in the Department of State for furthering cultural relations. It is still more significant that this division came into being prompted by the need of aggressive cultural promotion in South America, as over and against what was being done in that area by European and Asiatic powers. It is also significant that the government thus entered a field heretofore left entirely to private initiative and private foundations. "The decision to establish the Division of Cultural Relations in the Department of State was the result of mature consideration and careful thought. It is the opinion of the Department that there are certain limitations on private efforts which can be overcome through the existence of an official agency which can operate with

and advise, suggest and aid private enterprises in every possible way." [2] The practical workings of this division can prove to be of the greatest importance in future cultural developments. Its budget is far too meager to enable it to do much more than promote cooperation at present, but that may be remedied as time goes on.

Office of Inter-American Affairs. The Office of the Coordinator of Inter-American Affairs, a department of the United States Government, carried on a constructive program of commercial and cultural exchange between the United States and Latin American countries. The Office was headed for several years by Nelson A. Rockefeller.

In the latter half of 1942 Mr. Rockefeller visited Brazil, Chile, and Peru, and greatly enhanced the value of the work of his office through personal contacts and exchange of information. Through radio, press, motion pictures, science, and education, a well-planned approach has been made to give Brazilians and other South Americans access to the accumulated funds of knowledge of the United States. To do this in a way that would not offend sensitive South Americans required diplomacy and tact. The effort to improve motion picture productions that portray South American life has been another help. The increase in scholarships for study in the United States, and the bringing north of a whole graduating class of an agricultural college—from Piracicaba, in the State of São Paulo—these too make definite and lasting impressions. A program was launched to supply Brazilian libraries with much-coveted technical books in English.

The office has been discontinued, but much of its work has been taken over by privately sponsored organizations. The Institute of Inter-American Education (734 15th Street, Washington 5, D. C.), is carrying forward most of the activities of the office along educational lines. This work is entirely cooperative in nature and has to do principally with industrial education and some forms of rural education.

The Council for Inter-American Cooperation has been active in securing the services of competent speakers on Latin-American subjects for audiences in the United States.

American International Association. The Rockefeller interests, under the guidance of Nelson Rockefeller, have set up, in the American International Association, a new type of cultural and economic aid. This is a nonprofit organization, with headquarters in New York, formed to forward specific measures looking toward economic and

[2] Richard Pattee, *Coral Gables,* "University of Miami Hispanic American Studies," No. 1, p. 195.

social improvements, throughout the entire world, where populations suffer from low standards of living.

In order that these specific problems may be attacked directly, in a semicommercial manner, a subsidiary organization called the International Basis Economy Corporation has been formed. It is operating in Brazil with a definite program for agricultural improvement. Another corporation is being formed to study methods of improving the breeding and feeding of hogs. Three or four farms are to be set aside for this purpose and here young men will be trained in the new methods. It is generally conceded that Brazil could produce something like five times as many hogs as at present, with profitable results. Both lard and pork are now selling for record prices; so an increase in production will mean a disproportionately large increase in the revenue of the Brazilian farmer.

Another corporation is being formed for the purpose of developing a hybrid corn of optimum quality. A large farm in the State of Paraná, near its boundary with São Paulo, will raise hybrid seed corn on a large scale. Profits from its sales will be used in furthering the campaign for more and better corn, which in turn will result in more hogs. Farmers cooperating in this work will profit handsomely by their efforts.

Corporations will also be formed for the production of new and better fertilizers and the upgrading of vegetable seeds.

In each case, capital and technical direction will be supplied, so that on a commercial basis the industrial or agricultural project will receive backing and technical direction. Both direct and indirect benefits will accrue to entire population areas.

The agricultural work carried out in Brazil by these corporations is directly under Dr. J. B. Griffing, former director of the Agricultural College of the State of Minas Gerais, a man of extensive experience in Brazilian agriculture and agricultural education.

Brazil and the United States are Good Neighbors.

☆

PART VI

☆

Four Centuries of Progress

☆ ☆

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XXXII

Four and a Half Centuries

BRAZIL stands out in world history as the largest tropical area that is self-governing. Other South American countries enjoy complete autonomy, but Brazil is unique in its political unity, where similar tropical areas are either colonies or in some manner subservient to foreign powers of temperate zones. Another outstanding fact in Brazilian history has been her relative freedom from wars, external and internal, and almost complete freedom from invasion, even in her weak and almost undefended early colonial days. A Portuguese colony from 1500 to 1821, Brazil suffered invasions by the Dutch at Recife in 1630, and by the French at Rio de Janeiro in 1555 and 1710, but neither Holland nor France gained a strong enough foothold to maintain territorial rights. So when Brazil declared its independence from Portugal in 1822, it was in possession of a vast area reaching from the Atlantic Ocean almost to the Andes, between longitudes 28° and 75°, from Venezuela on the north to Uruguay on the south, between latitudes 5° north and 33° south. Some frontier fighting over boundaries took place, the most important being that against the Uruguayans under Oribe, who was aided by the Argentine dictator, General Rosas. But only one real war has been waged over a boundary dispute. This was against Paraguay, from 1864 to 1870, with Argentina as an ally. Brazil's boundary disputes with other countries have been settled by arbitration.

Portuguese has remained the language over the entire area.

Through the centuries, and in spite of difficulties imposed by enormous distances, numberless mountain chains, rivers, forests, vast prairies, deserts, tropical climate, and Indian aborigines, an extraordinary degree of national unity has been achieved.

Historical Background. It is worth while remembering that Portugal rivaled Spain in navigators of unusual ability, heroic explorers of the unknown, and determination to reach India by a water route. To both of these countries the discovery of the Americas, North and South,

was quite by accident. Owing to the very great difference between the lands they discovered and the lands they hoped to reach, and their consequent disappointment, it was many long years before the discoveries aroused the attention that they deserved.

As a matter of fact, the Portuguese fleet under Cabral, on reaching American shores in 1500, kept on its way to India, sending back word by one ship, to report to the Crown the discovery of land. The brave navigators supposed they had discovered an island, and named it Santa Cruz. The following year another expedition was sent out, and an entire year was spent exploring the shore line of the territory claimed by Cabral in the name of the Portuguese Crown.

No great native empires were discovered, no architectural piles such as the Spanish found in the lands of the Aztecs and Incas, only naked nomadic tribes, nearly all cannibals, subsisting principally by hunting and fishing, sometimes engaging in a rude sort of agriculture. While each of these various tribes had its own dialect, a kind of common language (*lingua geral*) was used to some extent, which greatly facilitated later efforts of settlements. There Indians often fought the European invaders, but the Brazilian tribes were far from being the fierce, skilled warriors found on the North American Continent, or in Mexico or Peru.

The Cabral expedition, returning to Portugal from India the latter part of 1502, carried, among other things, brazilwood, a valuable source of a red dye that came to be much in demand in the textile industry of Europe. This product soon became so important that it eventually gave its name—brazil—to the country. Brazilwood was named for its color. The Portuguese word *brasil,* meaning glowing coals, has the same root as the English word brazier.

Early Settlements. Portugal had gained valuable experience in colonizing foreign territory in Africa and the Azores, and was already conditioned to exploit its new empire to the fullest possible extent. But efforts to colonize Brazil were delayed because of the great riches Portugal was reaping from its new territorial acquisitions in fabulously rich India. However, a flourishing trade in brazilwood caused successive visits to the new territory. In the early 1530's Dom João III divided the country into thirteen inheritable grants denominated as *Capitanias.* Only two of these prospered at the beginning, Pernambuco and São Vicente, in spite of the fact that the grantees had semifeudal powers. Labor was the great problem, because it was extremely difficult to obtain a sufficient number of European emigrants, and the natives of the country were almost worthless as laborers when enslaved. It was

only many years later, when the colony was of much greater economic importance, that Negroes were brought over from Africa as slaves.

The Crown appointed a Governor General in 1549, Tomé de Souza, who took up his governorship at Salvador (Bahia) and organized a form of central government that greatly improved the general status of the country. He was an efficient administrator, treated the Indians comparatively well, and traveled widely over the new territory. In 1553 he was succeeded by Duarte da Costa, who lost the area of Rio de Janeiro temporarily to the French.

Foreign Invasions. In 1558 Costa was replaced by Mem de Sá, who expelled the French from what is now Rio de Janeiro. French Huguenots had come to Brazil and sought to establish a colony where they might be free from persecution. Another French colony settled in Maranhão but remained a comparatively short time. In 1710 the French made a new attempt to invade Brazil at Rio de Janeiro, but no permanent settlement or occupation resulted.

The most serious menace to Brazilian colonial territory in colonial days came from the Dutch. In the seventeenth century Holland was the leading commercial power of Europe. It was stronger on the sea than France, Spain, or England. The little country possessed a large number of ships, and was the pivotal distribution center of trade with practically all parts of the world. Dutch merchants were the wealthiest of those times, and the two great trade organizations, the Dutch East India and Dutch West India Companies, gave good accounts of themselves as merchants, importers, explorers, and even as conquerors of foreign colonies.

The Dutch West India Company sent two expeditions to occupy Brazil. These landed in Bahia in 1624 and 1627, but neither was successful in holding territory. In 1630 the Dutch succeeded in occupying Olinda (Pernambuco) and remained there for twenty-four years. In 1637 Count Maurice of Nassau, one of Holland's most able and distinguished representatives, was sent to Brazil, and he governed the colony "so very well that the vestiges of his government are still noticeable in the northeast, especially in Pernambuco." [1]

The Dutch attempts at Brazilian occupation were naturally much influenced by European affairs. The Dutch were so weakened that efforts to expel them were successful in 1654, when a fleet came from Portugal to aid the Brazilians.[2]

1 *Brazil, 1940-41* (Rio de Janeiro: Ministry of Foreign Affairs), p. 32.

2 For further discussion of foreign invasions and rivals to Portugal see Diffie's *Latin American Civilization* (Stackpole Sons, 1945) pp. 652-73.

Opening Up the Brazilian Interior. For the first two centuries of the colonial occupation, practically all the settlements were along the coast. There were three principal reasons for this: (1) resistance by the Indians, (2) difficulties of maintaining contact with sources of supplies in the port cities, and (3) from Bahia southward, the coastal mountain ranges offered a serious obstacle to access to the interior. In the sixteenth century the first active and continuous efforts to explore and occupy large areas any distance from the coast were initiated by the inhabitants of São Paulo. Organized bands, called *bandeiras,* well armed and carrying with them food supplies, made long trips into the interior. Their principal objects were to seek gold and precious stones and to bring in new supplies of natives to serve as slaves, since the African supply was falling short. They swarmed over what is now Minas Gerais and Goiás, as far west as Mato Grosso, and southward over what now forms the States of Paraná, Santa Catarina, and Rio Grande do Sul. They went as far north as the Amazon Valley and took possession of the territory in that region for Portugal—territory that would otherwise almost certainly have gone to Spain. Some of these groups were very large and were away for as long as seven years.

The more famous leaders, whose names were used to distinguish the groups of *bandeirantes,* were Antonio Raposo Tavares, Borba Gato, Bartolomeu Bueno, Fernão Dias Paes Leme, and Pascoal Cabral. The expeditions invariably returned to the starting point, São Paulo, but they left behind them many settlements, which grew into some of the most important cities in the States of Minas and São Paulo. "The *bandeiras* constituted one of the finest examples of pioneer movements in the history of the formation of a country, not only by exploring but also by discovering mines and founding towns." [3]

The westward movement of cattle raisers also had a marked influence on the opening up of the hinterland, since occasional open range areas made cattle raising on a large scale fairly easy.[4] Cattle raising and mining are still the main incentives to the opening up of new territory in the "Westward Ho!" movement. These occupations can go on far ahead of railroad penetrations or even the appearance of trucks on the barely passable automobile trails.

Attempted Revolt. The first revolt against Portuguese rule in the colony occurred in the State of Minas Gerais, in 1789. It was led by a small group that was inspired by the successful revolution of the English colonies in North America. In Brazil the revolt was promptly

[3] *Brazil, 1940-41,* p. 32.
[4] Diffie, *Latin American Civilization,* pp. 662-65.

suppressed, and some of the leaders were exiled. Ensign Joaquim da Silva Xavier, nicknamed "Tiradentes" (tooth puller), was sentenced to death, and as the first martyr to the cause of the country's freedom became a national hero.

Portuguese Royal Family in Brazil. When Napoleon Bonaparte's troops invaded Portugal, the French General Junot arrived in Lisbon in time to see the royal family and court sailing from the port en route to Brazil. With the coming of the Prince Regent of Portugal, afterward Dom João VI, to Rio de Janeiro, the colony became the seat of the Portuguese Government. Brazil remained the seat of government of its own mother country during the twelve years he remained. This enlightened monarch brought about many beneficial changes, the most important of which was the opening of the ports in 1808, and the raising of Brazil to equality of government with Portugal in 1815. The Bank of Brazil, Academy of Sciences, School of Medicine, School of *Bellas Artes,* and Botanical Gardens owe their origin to Dom João VI's enforced visit to Brazil.

Brazilian Independence. Under the son of Dom João VI, Brazil declared its independence from Portugal, on September 7, of 1822, and, as Dom Pedro I, he became its first Emperor. Portuguese troops in Bahia resisted the new government, but no armed resistance came from Portugal itself. A leader of the movement for Brazilian independence was José Bonifacio de Andrada e Silva, one of the greatest statesmen of Brazilian history.

Dom Pedro II. The first Emperor of Brazil ruled until 1831, when he was forced to abdicate in favor of his son, who came to the throne as Dom Pedro II, when only five years of age. A Regency was established until he became Emperor, at the early age of fifteen. His rule lasted from 1840 to 1889, when the Empire came to an end.

The reign of Dom Pedro II was truly remarkable, and those interested in his complete biography should read *Dom Pedro, The Magnanimous,* by Mary Wilhelmine Williams (the University of North Carolina Press, 1937). His benign and, under the circumstances, efficient government, introduced a number of legislative reforms of far-reaching results. Laws were passed promoting and protecting industry, agriculture, and cattle raising; civil registration was established; cemeteries were secularized; immigration was initiated; and something was done for education. The press made great progress, and the first authors of note made their appearance. His long, stable rule paved

the way for the extraordinary development of the country under the republican regime.

The Republic. The movement for a republican government was manifested during the later years of the rule of Dom Pedro II, and events led rapidly to the abolition of slavery, by a decree signed by the acting ruler, the Princess Isabel, on May 13, 1888. On November 15, 1880, a military group with many civilian adherents, headed by Marshal Deodoro da Fonesca, proclaimed Brazil a republic, and Dom Pedro II with his family was exiled two days later. The first national assembly promulgated the Constitution of February 24, 1891, and named Marshal Deodoro da Fonseca as the first president. He was soon succeeded by Floriano Peixoto, who consolidated the republican form of government. Prudente de Morais, Campos Salles, and Rodrigues Alves, all from São Paulo, were the first civil presidents, each for a term of four years. They were men of integrity and energetic in their efforts to give the country wise government and to strengthen the central power.

Upon the conclusion of the term of office (1926-30) of Washington Luiz Pereira de Souza, there broke out the first revolution of any consequence, and Getulio Vargas was installed as president. The elected candidate, Julio Prestes, was not allowed to assume the presidency.

Two years later, in 1932, São Paulo revolted against the Federal Government in an effort to enforce a return to the Constitution. This revolt subsequently took on a separatist tendency, but was successfully overcome, since the Federal Government commanded greater military strength and a sufficient naval force to blockade the port of Santos.

"New State." [5] After having been elected president for one term, Getulio Vargas decreed what was denominated the "New State" under an entirely new Constitution, which was in force from 1937 to 1945. The republican regime was not entirely abolished, but Vargas was permanently settled in the presidency and in reality became a dictator. He was deposed by military authorities in November, 1945, and provisions were immediately made for the return of the country to its normal republican form of government. Among the noteworthy achievements of the "New State" regime were the electrification of some of the railroads; great activity in public works; important public constructions in Rio de Janeiro; the wholehearted cooperation of Brazil in World

[5] See *Brazil under Vargas,* by Karl Loewenstein (Macmillan, 1942).

War II (see Chapter XXXIII); a decided strengthening and improvement in the whole defense structure, in army, navy, and air forces; introduction of Civil Service examinations for public employees; many salutary labor laws improving the status of workmen throughout the country; and some notable improvements in education. A dictatorial regime necessarily entailed many drawbacks and disadvantages, some of which were transitory and will soon be forgotten. It must be remembered that the harshest punishments meted out to the enemies of the regime were imprisonment or exile, much milder sentences than frequently prevail in such cases.

Reestablishment of the Republic. The elections held on December 12, 1945, were the second elections employing the secret ballot throughout the country. (The first in which the secret ballot was used were those of 1933 for the members of the Constitutional Assembly of 1934). In 1947 elections were held and state constitutions promulgated. On January 3, 1946, Brazil returned to a republican regime, under an elected president.

XXXIII

Brazil's War Effort

CONSIDERING its strategic location on world trade routes, vast expanse of territory, rich natural resources, and small population, Brazil has probably the best peace record of any nation on the globe. Always ready to arbitrate, and surrounded by smaller and weaker nations with whom there has been little provocation for war, Brazil has been able to enjoy remarkably long periods of peace, external and internal. During colonial days, it was necessary to fight the natives in order to establish settlements, and the French and Dutch invaders in order to maintain territorial integrity. During the Empire a long war was waged against the Paraguayan tyrant López.

During World War I, Brazil entered on the side of the Allies but did not send troops overseas. Its contribution was limited to patrol service in the South Atlantic, and to furnishing food and mineral supplies to the Allied fighting troops.

World War II. During World War II, Brazil's contribution was far greater. The country made five distinct military and naval contributions: (1) the grant of the right to establish and use airports in the northern half of the country; (2) patrol duty by the navy in the South Atlantic; (3) food supplies, especially meat and vegetable oils; (4) mineral supplies, including quartz and some of the rarer and strategic minerals; (5) an expeditionary force sent to Europe. (For the first time in history, Brazilian forces entered into combat on European soil.) To these might be added the constant internal drive against Nazi interests, which were fairly well entrenched in the country.

Air Bases for the Allies. Before entering World War II aggressively, Brazil permitted the Allies to establish air bases along her northern and northeastern coast lines. The principal base was at Natal, which was built by the United States Government. At the time of its completion (1942), it was the largest air base in the world. Others

were subsequently built at Belém (Pará), São Luiz (Maranhão), Fortaleza (Ceará), Recife (Pernambuco), and São Salvador (Bahia). From Natal a regular stream of flights was made to Africa, and at a time when these movements were of extreme strategical importance in the North African campaign. That was where the Allies began to break down the Nazi military machine, and instead of Germany invading Brazil, as had been its intention, the tide was turned back on the African Continent. These air bases along the Brazilian coast constituted all-important links in the vital life-line along which the Allies transported men and materiel. It would be difficult to overrate the importance of this single contribution of Brazil's to the Allied cause. The base at Recife now serves a half dozen international air lines for their South American arrival or hop-off. The prime significance of these bases is their military value. For several years after construction, they were manned and maintained by air forces of the United States, but all have been turned over to the Brazilian Army, along with large amounts of invaluable equipment. Brazil has obligated itself to preserve them in usable condition against future military necessity. The normal civilian air traffic can contribute toward a part of their financial upkeep, and add to the technical knowledge of transoceanic flights. From these bases, the whole South Atlantic area was patrolled by air, and many dirigibles were in constant use, as a precaution against the submarine menace of the Germans.

Many Brazilian privates and officers were trained in the United States during the war for air combat service. Had the war continued longer, they would have entered into more active participation of events in Europe.

Brazilian Naval Patrol. Brazil declared war on Germany and Italy on August 22, 1942, after some of its ships engaged in coastwise trade had been sunk within its own territorial waters. A total of thirty vessels was sunk, with much loss of life among crews and passengers. Probably Brazil lost more civilian lives during the war than any other nation on the American continents. As soon as war was declared, passenger service was discontinued, and practically all shipping was in convoys. The available Brazilian naval vessels and airplanes were in intimate cooperation with American forces to patrol the South Atlantic waters. Admiral Ingram established fleet headquarters at Recife (Pernambuco), and thoroughly appreciated the loyal and courageous cooperation of the Brazilian naval forces. All ports of Brazil were open to Allied cargo and combat vessels—a cooperation that was of inestimable value during the incessant submarine warfare. Recife was used

more than any other Brazilian port, because it is near the northeastern bulge of the continent. A large American naval base was located there during the entire war.

With the waning of the submarine menace, toward the close of the war, the Brazilian Navy was able to patrol a large portion of Brazil's shores. During the war, several small naval units of Brazilian construction were commissioned, and a few others were added from the United States.

Food Supplies. Brazil exported all the food it could possibly spare during the war period, to such an extent as to greatly reduce its own supplies. This was especially true of meat, cooking fats (both animal and vegetable), rice, and sugar. Some canned goods were exported, and practically all importation of food, except for wheat, was discontinued. Unfortunately, just prior to the war, enormous amounts of cotton had been exported to Germany, Italy, and Japan. Owing to rapid industrial expansion of the country during the prewar period, lesser amounts of foodstuffs were produced than would normally have been the case. In future emergencies, Brazil could well draft agricultural workers as well as industrial workers, so as to maintain a better equilibrium between food production and manufacturing. The rationing of certain principal foods was necessary.

Transportation. International transportation shortages were acute, but steps were taken to relieve this situation as far as possible. Better highways and more of them, and production of rolling stock for railroads, are essential for such periods of national stress.

When coastwise shipping was virtually discontinued, Brazil was made painfully aware of the fact that it has no north and south railroad or highway connections. Frequently inhabitants of the northern states were suffering privation for lack of foods fairly abundant in the south and *vice versa*. These continental connections are now being provided, as is an east-west transcontinental railroad across Bolivia. Brazil already has two east-west lines in the south—one to the Bolivian border and the other to the Paraguayan border.

Mineral Supplies. The exportation of minerals necessary in the manufacture of armaments was one of Brazil's principal war contributions. Quartz, which constitutes an essential part of radios and optical instruments, exists in enormous quantities in this country. Mining of quartz was stepped up, and American grading and purchasing commissions were set up in Brazil. Large quantities were exported to the

United States by airplane. Manganese, tungsten, rutile, and numerous other minerals were also exported to the Allies.

During the war period the United States aided Brazil in the establishment of a large steel mill at Volta Redonda. The mill was installed too late to serve directly during the war, but it has definite military importance in addition to its economic and commercial aspects.

After Japan took over most of the East, the Allies were faced with shortages of many materials that come from tropical countries. Brazil was confronted with the problem of supplying as many of them as possible. But before production of the agricultural commodities could be effected on any considerable scale, the war came to an end.

Expeditionary Force. After declaring war on Germany and Italy, Brazil prepared to send an army to Europe for active combat duty. In view of the vast numbers of fighting men on both sides, Brazil's force of approximately 25,000 men was insignificant, but even so it constituted a valuable addition to the Allied cause, and was especially opportune in building up the morale of other Latin-American countries at a critical time. As an appreciation of this contribution, the United States sent General Mark Clark, under whom the Brazilian forces served in Italy, to convey an expression of gratitude of the Allies for the Brazilian Expeditionary Force. Later General Eisenhower went to Brazil on a similar mission.

The Brazilian Expeditionary Force was in action from September 6, 1944, until May 2, 1945, and saw active combat service in the Italian Sector from Livorno to Turin and from Florence to Cremona. The Brazilians captured two enemy generals, 892 officers, and 19,679 soldiers, a total almost as large as their own entire number. Brazilian losses were 451 men, including thirteen officers. More than four hundred were buried in the military cemetery at Pistoia. Brazilian doctors and nurses went with the troops, and hospital equipment was supplied by the Allies. Some of the wounded were flown directly from Italy to the United States, and were given the same care as the American wounded.

The Brazilian troops were disembarked at Naples on July 16, 1944, and moved forward at once. Great Britain and the United States transported the men and furnished most of their military equipment and food. Just enough Brazilian food and seasoning were added to the American rations, so the men would not get "off feed."

The men were called by selective draft. They had months of preliminary training, and additional months of intensive training as they were gathered along the coast. With a standing army of only some

25,000 men in peacetime, a tremendous amount of organization had to be effected to motivate an expeditionary force of equal size. The eventual size of Brazil's force, had the war continued, is difficult to approximate, possibly some 100,000 men.

The Brazilians proved themselves valiant soldiers on the battlefield and were also efficient in air combat. Their army officers gained invaluable experience from the European expedition, and as a certain result the whole military fabric of the nation has been vastly improved. General João Baptista Mascarenhas de Moraes represented Brazil splendidly as Commander of the Expeditionary Force. He was later awarded, by the Constituent Assembly, the highest rank a Brazilian soldier can achieve, that of Marshal of Brazil. He was the oldest general fighting in Italy, sixty-two at the time, but his command post was usually nearer the enemy than were those of most of the Division Commanders. By his judgment and courage, he was an inspiration to all those who served under his command. The troops returned the latter part of 1945 and were accorded an appropriate welcome, especially in Rio de Janeiro and São Paulo.

The Snake Smokes a Pipe. Germans had absolute confidence in the effectiveness of their subversive organizations in Latin America. Many of them had maintained an almost insolent attitude of superiority toward the Brazilians. In derision of Brazilian military prowess, Germans boasted that when Brazilian troops entered into combat on European soil, the snake would smoke a pipe. With the delightful sense of wit so frequently displayed by Brazilians, the Expeditionary Force, on arrival in Italy, adopted as its division emblem an erect snake smoking a pipe. German prisoners captured by Brazilian troops must have looked on this emblem with considerable disillusionment. The derision of the German leaders for Brazilian allegiance to the Allies had been definitely premature. A Brazilian stamp reproduced this emblem.

In addition to the routine hardships of war, the Brazilian Expeditionary Force had the extra hardships of meeting new conditions of many kinds, not the least of which was the rigorous Italian winter, so much colder than anything the men had experienced in their homeland.

"Pracinha." The Brazilian G. I., or "buck private," was denominated a *pracinha.* Called up by selective draft, the troops represented a fair cross section of Brazilian manhood. They got along famously with their colleagues from the United States, and even better with the Italians, whom the Germans had warned against "the barbarous

black troops from Brazil." As Brazilians and Italians are both of Latin origin, and their languages are similar, the wisdom of their selection for the Italian Sector becomes self-evident.

Among the several fine journalists who accompanied the Brazilian Expeditionary Force to Europe, perhaps the one who most distinguished himself was Rubem Braga. The stories he sent back to his paper had the same personal touch that so endeared Ernie Pyle to the American people. Unfortunately his writings, as those of the other Brazilian journalists, were so censored that little real information got through to the people at home. There was at all times great anxiety in the families of those in the Expeditionary Force, which was aggravated by delays in correspondence and other communications. Set phrases could be sent by cable, according to their number, so a soldier would often combine two or three of these in an endeavor to get some news through to his family.

An indirect but very noteworthy result of the Brazilian G. I.'s combat duty in Europe was a democratic surge in the homeland, which helped in bringing about an end to the political regime of the "New State" and in inaugurating for Brazil a new epoch.

XXXIV

Constitution, Fifth Edition

BRAZIL is now under its fifth Constitution, which was promulgated on September 18, 1946. The Constitution of the monarchy was dated March 24, 1824, and was in force until Brazil became a republic under the first republican Constitution, which bore the date of February 24, 1891. After the revolution of 1930, the normal form of government was set aside and Getulio Vargas became president under a military mandate. On July 14, 1934, Brazil adopted a new Constitution. An authoritarian state (*Estado Novo*) came into being by a simple decree, with the adoption of a new Constitution on November 10, 1937. This was in force for almost ten years, and was succeeded by the Fifth Constitution.

The Brazilian Empire. From 1822 till 1889, Brazil was the only South American monarchy with a lasting and stable government. It was what might be called a liberal monarchy, for by its Constitution citizens were assured considerable liberty and guarantees of rights, much more so than had been the case in colonial days. The country was extremely fortunate in being governed for forty-five years by Dom Pedro II, one of the most enlightened and cultured heads of any government in the world during that part of the nineteenth century.

Early Days of the Republic. Just before the republican form of government was established in Brazil, the liberation of the slaves caused an economic upheaval comparable to that following the Civil War in the United States, without, however, the disastrous effects of a prolonged civil war. Slavery was abolished without a military struggle.

The first republican Constitution (1891) was modeled very closely after that of the United States. It was so democratic, and presupposed a state of education and culture so much in advance of what actually existed, that it never functioned effectively. The provinces of the

Empire, which in colonial days had been the *Capitanias,* became the states of the republic. The states were divided into counties, which in turn were subdivided into districts. The government consisted of the three usual branches in a democracy—the executive, legislative, and judicial. In the Federal Government, as in the states, the main officers were chosen by popular vote. They were assisted by appointed officers—ministers in the Federal Government, and secretaries in the states—who had tenure for such time as the elected officer saw fit to retain his appointees in office. In the early days of the republic, only 20 per cent of the population could read and write, so naturally the entire burden of the government fell upon a small group of literates. Voting was not by secret ballot, so a wide margin for abuse at election time was inevitable. As there were no strong political parties to oppose one another, elections became a question of a struggle between oligarchic groups. Any group that once became well entrenched was difficult to dislodge.

The three most populous states—Minas Gerais, São Paulo, and Rio Grande do Sul—dominated the political situation completely and took every precaution to continue the Federal Government's being carried on in favor of their special interests, both economic and political.

The Third Constitution. In 1930, immediately after the presidential elections for the successor of Washington Luiz Pereira da Souza, discontent ran so high that a revolution resulted. Parts of the Federal Army, joined by the troops of the States of Minas Gerais and Rio Grande do Sul, placed Getulio Vargas, who was their revolutionary leader and a defeated presidential candidate, at the head of the nation. He became acting president under a military mandate, and the nation was promised a new constitution. The Constituent Assembly was duly elected, and the third Constitution was promulgated on July 14, 1934.

The principal innovations of this document were the secret ballot and recognition of some special rights of labor. From this Constitution sprang much of the modern labor and social legislation now prevailing in Brazil. The assembly elected Getulio Vargas for a four-year term as president. When this term expired, instead of proceeding with a presidential election, a new constitution was drawn up and made operative by presidential decree.

"O Estado Novo." Authoritarian democracy came into being in 1937, by a *coup d'etat* in which President Vargas, the creator of *O Estado Novo* ("New State"), was backed by the military machine. The principal divergence from a normal democratic government was

the abolition of the legislative branch of the government by the dictator, although the Constitution provided for this branch. There were two reasons for the abolition: (1) legislative bodies in the country had fallen into disrepute because they were so cumbersome and ineffective; and (2) the executive had almost unlimited powers anyway. This government lasted for the duration of World War II, and in spite of being a pseudo democracy, it was not officially opposed by the United States or any other of the democratic world powers, because it chose to side with the Allies in the world struggle.

Soon after World War II was over, the country grew tired of being autocratically governed, even by a benign dictator. The same military group that had maintained Vargas in office removed him suddenly and without bloodshed, returning the government to the people to be re-established along the lines of accepted normal democratic principles. This happened on October 19, 1945, and in December elections were held for the President of the Republic and a Constitutional Assembly, which was to formulate the new Constitution.

The Fifth Constitution. It was evident to everyone concerned with the work of the assembly that the constitution to be formulated had to be worked out under an entirely different orientation from any that had prevailed when the previous constitutions were evolved. The country had been governed for eight years under an autocratic system, and the surging new political concepts of labor, socialism, and communism made changes inevitable.

On the whole, a fairly satisfactory document was organized. Its salient points are the following: All men are equal before the law: any citizen can defend himself against the abuse of authority: and those in authority can be held responsible for such abuse. The usual prerogatives of the executive, legislative, and judicial departments of the government are maintained, special attention paid to upholding the dignity and high character of the judiciary. Separation of church and state is maintained, but religious marriages will be recognized when properly registered with civil authorities, and religious instruction is permitted but not required in schools. Freedom of conscience is guaranteed, and no citizen may have his rights abridged for his religious convictions unless these perturb the public order or are against good morals. As in all former constitutions, and following the precepts of the Roman Catholic Church, divorce is not permitted on any grounds.

In guaranteeing the integrity of the secret ballot, under proper procedure at elections, together with complementary measures, a great advance was made, because the people will really elect those who are

to govern them. The right to vote is granted to all citizens, men and women.

Representative Government. The first chapter of the new Constitution established the United States of Brazil as "under the representative system, the Federation and the Republic." It also states that "all power emanates from the people and shall be exercised in their name." One of its initial statements is that Brazil shall engage in war only after all efforts at conciliation and arbitration have failed, and in no case shall a war of conquest be engaged in directly or as an ally. The Federal Government reserves the usual rights to maintain foreign relations; engage in war and declare peace; declare martial law within its territory; organize the army and other organs of defense; issue money; maintain postal service; and legislate upon all matters relating to the interest of the people as a whole, especially in regard to immigration and the naturalization of foreign-born citizens. This first chapter also delimits federal intervention in state governments, a matter which has in the past been of very serious moment, because it has not been unusual for the Federal Government to declare martial law in various states for political rather than administrative reasons. As it was much the stronger power, abuse easily arose when the Federal Government could take over, for indefinite periods, the administration of state governments.

State Rights. After stating what federal taxes may be imposed, chiefly on imports and local sales, on incomes, and on fuel (especially gasoline), the Constitution goes on to define state rights and to describe how the states shall be governed. An effort was made in this document to avoid such difficulties as had previously arisen, especially those ascribable to the unequal development of the different states as regards economic production and population. Formerly the police force in a few of the stronger states constituted veritable small standing armies, and this, also, was properly taken into account.

The states have the right to levy property taxes, inheritance taxes, direct sales tax on retail articles, and export taxes under restricted conditions. It is interesting to note that all farm properties operated by owners not exceeding twenty hectares (approximately forty-five acres) in area, are exempt from the normal property tax. This, of course, tends to encourage small property owners and will go far toward increasing the number of these highly desirable citizens.

County Government. Under the first republican constitution, the county government had much the same format that prevails in many

parts of the United States, but was somewhat more under federal determination. Under the *Estado Novo,* county authority was practically abolished, as counties were placed under state control. Mayors were appointed by the "interventors" (Governors) of the states, and almost all county income went to the state treasury. Local problems were given inadequate attention, and there was a decided reduction in both local authority and local administration. The new Constitution provides for the election of county officers, mayors, and aldermen, for the re-establishment of county authority and jurisdiction, and for a large increase in county incomes. This is a great step forward.

Mayors of the state capitals and of important watering places are still appointed by the governors of the states, and the mayor of the Federal District is appointed by the President of the Republic, but these cities have governing bodies similar to the counties, and their members are elected by the people. The City of Rio de Janeiro, a Federal District with almost two million people, made a strong effort to establish itself under statehood rights, but this aspiration was not realized under the new Constitution.

No legislation—federal, state, or county—can establish any discrimination against, or limitations on, trade or commerce between other areas, except for toll taxes for road building and maintenance, nor may any government unit establish discriminations between authorities or in any way limit individual rights and liberties conceded by the Constitution.

For the first time, tax exemption is provided for churches, political party headquarters, and nonprofit educational and social welfare institutions, when their income is applied entirely within the county. States and counties are prohibited from contracting foreign loans without the consent of the Federal Senate.

Legislative Power. The legislative power is exercised by the national Congress, consisting of two bodies, the Senate and the Chamber of Deputies, whose members are elected by the voters of the states. Senators and representatives receive the same salaries and allowances, but the term of office of the former is eight years, while that of the latter is four years. Each state and the Federal District has three senators, while the representation in the House of Deputies is proportional to population. The appointment of representatives is one for each 150,000 inhabitants of a state up to a total of twenty representatives; and from this number on, one additional representative for every 250,000 inhabitants.

Ministers of State of the Federal Cabinet are required by the Constitution to appear before the Chamber of Deputies or the Senate, or any of their committees which shall call them, to give information on public affairs and legislation. Each chamber has special powers and duties, some ten of these being exercised in conjunction with the President of the Republic, and an equal number being exclusive prerogatives.

The new Constitution has an innovation in that the President of the Republic may propose legislation as well as any member of the Congress. This seems to be quite logical. Another innovation is that no appropriation bill can carry a rider.

Executive Power. The executive power is exercised by the President and Vice-President, who are elected for terms of five years and are ineligible for re-election. Their salaries are fixed for the ensuing term during the last year of Congress just preceding that term. The powers and duties of the President are stated in nineteen specific items. A section of the Constitution fixes the responsibility of the President and states that a special law shall establish the process of impeachment. The President is aided in the executive work of the government by Ministers of State, but their number and the departments over which each presides is not determined in the Constitution. This makes it possible for changes to be made at any time by the Federal Congress. Only native-born Brazilians more than twenty-five years of age may be appointed as Ministers by the President. No naturalized Brazilian may be made a minister, elected to Congress, or become a state governor.

Judicial Power. The following courts exercise judicial power: Federal Supreme Court, Federal Court of Appeals, Military Judges and Tribunals, Electoral Judges and Tribunals, Labor Judges and Tribunals. Federal judges are appointed for life tenure, and must be retired at the age of seventy. The Constitution limits the powers of each of these five tribunals. The electoral tribunal presides over federal and state elections, and since the vote is by secret ballot, its work is of great importance.

Labor tribunals are very important, because under the *Estado Novo* all labor legislation favored the employee and it was extremely difficult for the employer to obtain a fair hearing. Under the present Constitution, these courts should mete out justice without favoritism to either side.

The state courts are also designated. Judges have life tenure in state courts, but appointment may be made only after competitive examinations. Judges shall receive a salary not inferior to that of any of the Secretaries of the state government. With life tenure and adequate salaries, judgeships are aspired to by the best legal talent.

Nationality and Citizenship. All persons born within the boundaries of the country are automatically Brazilian citizens unless their parents are in the diplomatic service of a foreign government. All citizens over eighteen years of age must vote, except illiterates, who are not permitted suffrage. Naturalization processes are not determined by the Constitution, and only native-born citizens are eligible for elective public offices.

Individual Rights and Guarantees. Brazilians and foreigners alike are guaranteed full rights and protection. "All are equal before the law," and "No one may be obliged to do or refrain from doing anything except by virtue of the law." The Constitution also determines that "the manifestation of thought is free and shall not be dependent upon censorship, except as regards public spectacles and amusements. Anonymity is not permitted. The right to reply is assured. Secrecy of correspondence is inviolable. No one shall be deprived of any of his rights by reason of religious, philosophic, or political convictions, unless he shall utilize them to exempt himself from any obligation required of Brazilians in general by law."

Chaplains are to be provided for the army. Cemeteries are to be secular. Freedom of association and meetings is assured. The home is inviolable, and the right of property is guaranteed. Inventions are protected by patents, and books and literature by copyright. There is no death penalty except for military reasons in the event of war with foreign powers. The rights of citizens before the law are clearly stated, and statutory laws provide for the rapid solution of cases going to law.

The Social and Economic Order. "The economic order shall be organized according to principles of social justice, conciliating liberty of initiative with increasing value of human labor." Work shall be guaranteed to all on a scale providing a "dignified existence. Work is a social obligation."

Usury in any form is prohibited.

Labor rights include the following: (1) minimum salary capable of satisfying normal needs of worker and family; (2) prohibition of

salary differences for the same work because of age, sex, nationality, or civil status; (3) right of workmen to participate in profits of the enterprise for which they work; (4) eight-hour day; (5) weekly rest day with pay; (6) annual vacation with pay; (7) prohibition of the employment of children under fourteen years of age; (8) guarantee of rest period, with pay, for women workers before and after childbirth; (9) right of workmen to form unions; (10) obligatory accident insurance for all laborers. The right to strike is recognized, and strikes are to be governed by proper legislation.

The ownership of newspapers, magazines, and broadcasting stations must be in the hands of Brazilians.

The Family. "The family is constituted by marriage that cannot be dissolved." The marriage ceremony is performed by civil authorities without fee. Federal assistance to needy mothers, infants, and adolescents is obligatory. Needy large families are subsidized by the government.

Education and Culture. Education is to be provided for all, and primary education is obligatory. All firms or farms employing as many as one hundred persons must provide free primary instruction for illiterate adults and for the children of all their employees.

The Constitution provides that the Federal Government is to apply not less than 10 per cent of its entire revenue to educational work, and that states and counties shall apply not less than 20 per cent for this purpose.

"Support of culture is a duty of the State." The law makes provision for research institutions, principally in connection with colleges and universities.

Armed Forces. The Army, Navy, and Air Forces are directly under the authority of the President of the Republic. A National Security Council has been created to study problems of national defense.

Military service is obligatory for all male citizens.

Public Employees. The rights of all public employees are stated and responsibilities fixed. Security of employment is assured after two years for those who have taken Civil Service examinations; and after five years for those who were not required to take examinations. Obligatory retirement is at seventy years of age. Any employee may retire after thirty-five years of service, on full pay.

General Provisions. Under this head are a large number of varied provisions, such as the continued maintenance of diplomatic relations with the Holy See; defense work against droughts in the northeast; economic development of the Amazon Valley; and an especially interesting item namely, "No tax shall fall directly upon the royalties of writers nor upon the remuneration of teachers and journalists."

A National Council for Economy is created to study the economic life of the country and to suggest measures it may deem advantageous.

Amendments to the Constitution are permitted, and the process of their presentation and adoption is established.

Some thirty-six articles on transitory affairs are appended, owing to the fact that there was no legislative body during the *Estado Novo*.

On the whole, this Constitution should provide a workable basis for the democratic functioning of a progressive Brazil.

XXXV

Government and Politics

SOME indications of the form of government of Brazil have been given in previous chapters, but to complete the picture, a more exact description of the form and functions of the government should be included. The subject of politics falls almost entirely outside the scope of this book, but it must be taken into consideration from both the domestic and international points of view.

Brazil has already tried and discarded several types of government. During the *Capitanias,* the experience of the Portuguese colony was similar to that of various English proprietary colonies in North America, such as Maryland and Pennsylvania. Then followed the more centralized system under Governors General. For a brief period (twelve years), the country was governed by a resident Portuguese monarch. As an independent monarchy, it survived for sixty-seven years. These were certainly not the worst years in Brazil's national life, and an occasional dyed-in-the-wool monarchist is still to be found.

From 1889 to 1930, forty years of republican government gave ample opportunity for the people to govern themselves. From 1937 to 1945 Brazil had a dictatorial form of government. Now it again has a democratic form of a federated republican government.

The Federal Government. Brazil is a federal union of twenty-one states, five territories, and a federal district, Rio de Janeiro, in which is the capital city. The President and Vice-President have the usual duties of such offices. The national Congress legislates, and the President is the supreme executive power.

The President is aided by ten Ministers of State of his own appointment. These are the Ministers of Foreign Affairs, Justice, Finance, Communications, War, Naval Affairs, Aeronautics, Agriculture, Health and Education, and Labor. Any one of the Ministries may be subdivided at any time by the Federal Congress. There is no Prime Minister, but the incumbent of the post of Minister of Foreign Affairs

frequently enjoys the greater prestige, and the Minister of Justice is often the political whip of the President. There is considerable rivalry between the states for political ascendancy and for the ministerial posts. Generally speaking, only outstanding men are appointed as Ministers. So far no woman has ever been made a Minister. Only the honor, prestige, and a sense of duty attract men to these offices, for the salaries have always been far beneath the caliber of the services rendered. Entirely too much routine is required of the Cabinet members, and since there are no regularly appointed assistant ministers, all decisions must be made by the Minister himself or have his approval. A vast number of official documents must pass through the hands of each Minister for his signature.

Because of the necessity on the one hand of consolidating the Federal Government, and on the other hand of decentralizing it sufficiently to clear clogged-up channels, it has been difficult to set up a smoothly working, efficient organization. Formerly public employees received such low salaries that the only attractions were short hours, life tenure, and guaranteed retirement. But under the present Civil Service system, the public officeholder receives a better salary and has greater responsibilities. All applicants must undergo a rigorous health examination.

The Federal Ministries. Space will not permit more than a cursory discussion of each department of the Federal Government, but the main features of each are here outlined.

The *Ministry of Foreign Affairs* is popularly called Itamaratí. Brazil has been fortunate in her Ministers of Foreign Affairs. The first, Rio Branco, ranked high as a statesman. In the early part of the twentieth century he succeeded in settling boundary disputes, and he became known the world over as a champion of settlement of differences between nations by arbitration. More recently, Oswaldo Aranha and the late Pedro Leão Velloso have ably maintained the high esteem which Brazil has so long enjoyed in world diplomatic circles.

Diplomatic service in Brazil is on a career basis, but outsiders of importance in political circles are frequently made ambassadors to important nations. Brazilian consular service is fairly well organized, and appointees must stand Civil Service examinations and take special training courses in the Ministry in Rio de Janeiro. Because of Brazil's importance in affairs of special interest to the Americas, policies determined by the Ministry of Foreign Affairs have repercussion far beyond national boundaries. Without a doubt, Brazilian participation in world affairs will carry constantly increasing weight, causing the

incumbent of this Ministry and his assistants in the foreign service to be more and more in evidence.

The *Ministry of Finance,* since all budgetary receipts and expenditures pass through the National Treasury, is an office of great importance. It occupies the finest public building in Brazil, and one of the finest in South America. It controls the issuing of money, the collection of customs, and the handling of foreign and domestic loans. All banking establishments of the country are under its general supervision, and complete control of the Bank of Brazil is in its hands. With the tremendous increase in the amount of money in circulation, and in banking business in general, during the past few years, a great responsibility has fallen on this Ministry. While taxes are determined by Congress, the Ministry of Finance proposes to that body what levies shall be made. On the whole, taxes are not excessive in Brazil, but many direct and indirect taxes are collected, some of them falling on the very poor. For example, the sales tax on such an everyday necessity as matches is very heavy. Practically all men smoke cigarettes, which carry a high tax, as do alcoholic beverages.

The principal sources of federal income are customs duties, income taxes (personal and corporate), and sales tax on consumer goods. The central accounting system of the Ministry is organized along modern lines, and its work is facilitated by the finest of mechanical equipment.

Government expenses have increased enormously in recent years, owing especially to the very large increase in salaries of government employees. The tendency has been to issue more paper money, which may lead to inflation.

The *Ministry of Justice* is responsible for the administration of justice in the federal courts. The Supreme Court has the high esteem of the nation, and the new Constitution proposes to further strengthen and expedite federal justice. The electoral machinery is controlled by this Ministry. In personnel it is one of the smallest departments of the government, but it is in no wise the least important.

The *Ministry of Communications* is responsible for public works, post office and telegraph, railroads, highways, harbors and rivers, radio communication, and steel production. Since each of these plays a vital part in the national economy, and since the Federal Government owns many of the railroads and operates a number of them, leasing others, this Ministry occupies an important place. The Minister of Communications is generally a notable engineer, and his assistants are usually from the profession of engineering. Some of the railroads and other services have been set up as autonomous organizations, but all revenue belongs to the nation.

The *Ministries of War, Navy, and Aeronautics* offer nothing especially original except that the recent demonstration of the need for adequate continental defense, and the enormous expansion of travel by air, have given rapidly increasing importance to each. These posts are generally occupied by career men from the forces, in contradistinction to the usual practice in the United States of nominating to these positions laymen, or nonofficers. As a direct result of World War II, each of these Ministries has been greatly strengthened, and each has been aided by the cooperation of the United States, which has provided technical training and equipment. (See Chapter XXXIII.) Each of these three Ministries has a general staff, and over the three there is a special committee, to insure unity of action and command.

The three branches of national defense have their "West Point," "Annapolis," and aviation training schools. To each of these, entrance is by competitive examination. Training for reserve officers is given to male students of all institutions of higher learning. A short military training period is required of all young men, and no male can hold public office without proving that he has had this training. Each year a selection of numbers by drawing takes place, to fill the ranks, and those selected serve a full year in the Army.

Officers of the Navy spend five years in the Academy, and receive excellent training. The Brazilian Navy is very small, considering the extent of the coast line it must protect. Some additional ships are under construction in the Navy Yard at Rio de Janeiro.

Aeronautics has advanced tremendously in Brazil within recent years. (For a discussion of the civil picture, see Chapter XXVII.) The air force is as well developed as each of the other two branches for national defense, although, naturally, its organization is comparatively recent. Excellent airports were constructed by the United States in northeastern Brazil, and these have now been turned over to the Brazilian Government. Good military fields have been established in Rio de Janeiro and São Paulo, and there are smaller fields at many points throughout the country. A technical school for training aviators is maintained in Rio de Janeiro, and instruction is given at each of the military air bases. During World War II an American Technical School for training mechanics and ground forces for aviation was brought to São Paulo, and thousands of young men completed its courses. A small group is being trained especially for training others, and eventually the American instructors will be replaced by Brazilians.

An American Naval Commission is cooperating with the Brazilian Navy, and a Military Commission with the Army. Hundreds of Brazilians have had training in aviation in the United States.

The *Ministry of Agriculture* is responsible for all work related to agriculture, mining, and water power. Some of its work is inspection, as in the case of packing houses. It has charge of sanitary defense in the case of cattle and plant diseases; experiment stations; and standardization as in the case of cotton and coffee. It covers such vast areas and such varied resources that it has never been able to staff its services adequately. To overcome this difficulty, some phases of the work are carried on by the states, on a cooperative basis, with the aid of federal funds. The food shortage following World War II caused great concern, and the Ministry of Agriculture augmented its services radically in an effort to cope with the situation.

The *Ministry of Health and Education,* since all education is under federal control, plays an important role in national progress. So far it has delegated primary instruction to the states, and only recently has it begun to subsidize primary education in the weaker states. Secondary education is entirely controlled by this Ministry, but about 80 per cent of the students are in private schools, which are inspected periodically by the government. Higher education is also under the Ministry of Education, which maintains the University of Brazil in Rio de Janeiro, after which all other institutions of higher learning in the country are obligatorily patterned. A recent law gives considerable autonomy of internal government to universities, even though they are still subject to many federal laws and regulations.

Adequate funds have been made available for adult education, and a campaign has been launched to reduce the high percentage of illiteracy.

Public health service has increased in recent years. Nearly all of it is under the Federal Government; some is under the state governments. Brazil has tremendous health problems yet to be solved. The stamping out of yellow fever in the Rio de Janeiro and Santos areas has demonstrated that diseases can be controlled on a large scale. Venereal diseases constitute a scourge, as do tuberculosis, malaria, and various diseases caused by internal parasites. Leprosy is endemic to a much greater degree than is safe for the population; thousands of patients are in leproseries, undergoing treatment. New remedies have been discovered for the control and possible extinction of this disease. For many years public health work has been aided by the Rockefeller Foundation, which has also enabled many young doctors and nurses to study in the United States. Splendid research work is being done by Brazilian doctors, and hospital facilities are improving. The Brazilian Government is aware of the importance of public health work,

and proposals have been made to set up a separate Ministry for this service.

The *Ministry of Labor* is responsible for all matters relating to the laboring classes, who received little attention previous to 1930. Since that time a considerable amount of advanced legislation has given the laborer many rights. The proper regulation and enforcement of the new laws have resulted in this Ministry's having a large staff. As the commercial and industrial interests of the nation expand, the work of this Ministry becomes more and more important. Social legislation has in some instances advanced more rapidly than machinery could be set up to enforce it.

State Governments. Three-fourths of the population and economic resources of Brazil are in the three States of São Paulo (population 7,000,000), Minas Gerais (population 6,000,000), and Rio Grande do Sul (population 3,000,000). Hence the governments of these three states have been very powerful in national affairs. The "New State" made an effort to strengthen the Federal Government and weaken the governments of the stronger states. The present Constitution restores state rights, but with some restrictions. As all regulatory laws, large tax assessments, and general legislation come from the Federal Government, this has a decisive influence on state affairs. Each state government, like the federal, has an executive, a legislative, and a judicial branch. Instead of Ministries, the states have secretariats, which in many cases duplicate the departments of the Federal Government, except that the army and navy are, of course, omitted. These state departments are exceedingly important in the larger states.

São Paulo has the following departments: Finance and State Treasury; Education and Public Health; Agriculture, Industry, and Commerce; Justice and the Interior; Labor; Public Safety; and Communications and Public Works. A vast amount of work is transacted by these departments and the state income is very large in comparison with that of the Federal Government. As already mentioned, considerable work of the Federal Government is carried out by some of the states by contract, the state receiving federal financial aid for this purpose.

There was a time when several of the stronger states each had such a large police force, with such excellent military training, that any two of them combined could have well withstood the federal army. This has, however, been changed. The police force is a state organization rather than a local one as in the United States, and care has been taken

to retain federal garrisons in every state and to restrict dangerous overdevelopment of state troops.

Salaries of state employees have been greatly increased, and Civil Service rules and regulations introduced. All states have adopted new constitutions since the promulgation of the federal Constitution of 1946, and no governor or mayor may succeed himself. This is an effort to prevent ruling oligarchies, which have sometimes prevailed in the past.

The principal sources of income for the state governments are the property transfer tax (9 per cent of the value), the annual property levy, the sales tax, and numerous minor levies. No state can levy an income tax.

County Governments. Counties were greatly weakened during the "New State" regime, but they are now being built up again. Mayors and aldermen are to be elected (not appointed by the governors of the states), and the counties will have more adequate revenue. Primary education is largely a matter of state concern, but counties maintain single-class schools and maintain neighborhood roads (for which there is a direct tax levy). The state usually provides a public health center for each county.

City Government. With the exception of capital cities and watering places, cities are governed by the authorities of the county in which they are located, generally as the county seat. The larger cities, with only a few exceptions, are state capitals. These exceptions practically constitute the counties in which they are situated. A considerable number of cities has developed as watering places and health resorts. They are state-governed, their mayors are appointed by the state governors, and they receive supplementary revenue in addition to their own taxes. In some cases the states have spent fabulous amounts on their development. Formerly gambling was permitted in the luxurious casinos of the watering places, and this was a far greater attraction than the health features. Now gambling has been prohibited by law, but Brazilians have become vacation-minded, and so these resorts still have full seasons. A few are almost year-round resorts, but the beaches are too hot in summer for comfort. Summer has become the season for the mountain resorts, which are too cold during the winter to attract many visitors.

Politics. There have been epochs in the history of nearly all countries when the word politics carried a connotation of unsavory trans-

actions and personal profit. For many years in Brazil a small group controlled the political situation for the benefit of its members, and naturally took all possible steps to perpetuate itself in power. A violent reaction against this situation caused the revolution of 1930. The authoritarian government that came into power in 1937 was also organized with a view to being self-perpetuating. In Brazil there have never been two strong national political parties. There have merely been state groups that form an opportunist coalition at the time of national elections.

Since World War II the political scene has been quite different. In some of the state elections as many as ten parties vied with one another. The growing Communist party has caused great concern to liberal democrats, all the more because the great majority of the people are Roman Catholic. So far the Communists have not elected a governor, but they elected various federal senators and representatives and some state legislators. They constituted a well-organized party in Brazil and no one knew definitely what the relationship of this group was to the Soviet Union. The party was outlawed in 1947. Probably some of the weaker parties will disappear, and the stronger ones unite to offer opposition to the Communists. The Labor party is growing in strength and will eventually elect candidates to important offices.

The introduction of the secret ballot, and honest elections, have greatly improved the entire political structure. Suffrage for women has also had a good effect. Many Brazilian women are intelligently interested, to a surprising degree, in the qualifications of political candidates.

International Politics. In the field of international politics, Brazil has traditionally maintained a firm stand for the rights of the individual, minority groups, and the weaker nations. Brazil has always been in the vanguard of nations supporting settlement of international disputes by arbitration. Its participation in world conferences has brought it well-merited prestige, as is evident in the words of Anthony Eden: "In an increasing manner the voice of Brazil will be heard in the Council of the Nations, which we (the British) view with satisfaction."

Brazil's position in relation to inter-American and world political situations is of ever-increasing importance, and if its citizens will continue to so conduct internal politics as to strengthen the nation, and to choose their governing bodies wisely, they may assuredly anticipate a brilliant future for their country.

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