MARKETING OF CRUDE RUBBER.

Thesis submitted to the faculty of the School of Business Administration of the University of Oregon.

by

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FOREWORD.

It is the aim of this thesis to describe the business of producing and marketing rubber, from its earliest history, on through the process of evolution to the present day scientific methods which go far in furnishing a sufficient quantity of the raw product to meet the necessities of civilization.

It includes a history of production, an explanation of the geographical limitations to production, the kinds and uses of the different qualities of rubber, as well as a resume of the history of early marketing, and imperialistic effort at market control. It also contains an explanation of the various demands, the possible present day markets and the methods of financing. It concludes with a forecast of the future possibilities of the industry.

Marketing of Crude Rubber.

Definition.

India rubber is the elastic substance obtained by coagulating the latex of certain plants which occurs throughout the tropics. The latex is a milk-like fluid which is usually obtained from the plants by making incisions in the bark.

On the discovery of America it was found that the natives were already familiar with the rubber products.

First Reference.

It has been stated in works on this subject that the first reference to rubber in European writings occurs in a work by a Spanish writer published in Madrid in 1536, but M. L. Tillier in a recent writing points out that P. Martyr d'Anghiera, in 1525 published a description of some rubber playing balls seen by him in Mexico.

The first study of the rubber plants of South America was made by Charles Marie-de La Condamine, the leader of the French Expedition which went to Ecuador in 1735 for the purpose of measuring a degree of the meridian. In 1736 La Condamine forwarded specimens of rubber to the French Academy to be examined.

Earliest use.

The Earliest use of rubber was made by the natives

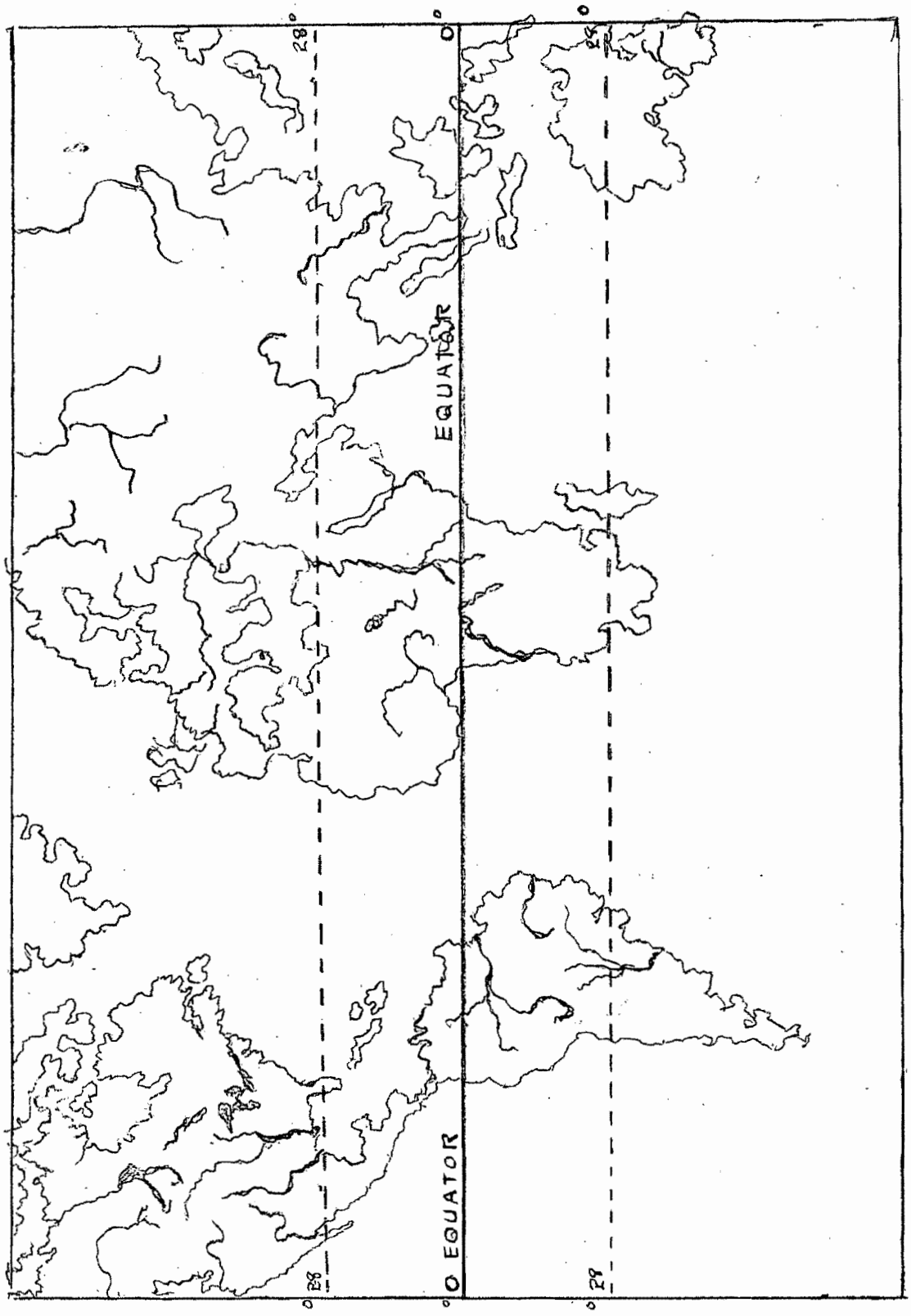
Book - Rubber (History) by Schidrowitz.
Book - Rubber. Its sources and Preparation by Brown.

of Central and South America who employed the latex for rendering boots and fabrics waterproof and for the manufacture of vessels of various kinds. For many years after it was sent into Europe it was regarded as merely a curiosity; but in 1770 it was suggested that it might be used for erasing pencil marks from paper. Its first industrial application was the process invented in 1820 for the production of waterproof fabrics. Goodyear found in 1830 that if rubber is heated with sulfur, a change takes place with the result that the material afterwards retains its elasticity through a much wider range of temperature than before. This process of hardening the rubber was known as vulcanite.

Where Obtained.

Until recently rubber was obtained exclusively from wild plants growing in the forests of tropical America, Africa, and Asia, with about half of the total supply coming from the Amazon Valley. In consequence, however, of the increasing demand for rubber and the possibility of a scarcity in the supply, owing to the destruction of large numbers of the wild rubber yielding plants, considerable attention has been devoted during the last ten years to the cultivation of rubber trees in almost all tropical countries, with the result that rubber planting

Between the dotted red lines is the rubber belt of the World.



is now one of the most important tropical industries.

The rubber yielding area is practically restricted to the tropics, and their extreme geographical limits may be placed at about twenty-eight degrees north and south of the equator. They are most widely distributed in Central and South America and in tropical Africa, as the portion of Asia lying within the above mentioned limits is only small.

In America the area in which rubber plants are indigenous comprises Mexico, the States of Central America, some of the West Indian Islands, Colombia, Venzuela, the Guianas, Ecuador, Peru, Bolivia, and Brazil.

Rubber plants are also found over practically the whole of Central Africa. They extend from Senegambia through West Africa, across the French Congo into the Bahr-el-ghazal Province of the Anglo-Egyptian Sudan, and then into Abyssinia. South of this line they are found right across the continent and also in Madigascar.

In Asia the occurence of wild rubber plants is limited to India, Indo-China, the Malay Peninsula and the neighbouring islands. Rubber plants are also indigenous in New Guinea, Fiji, and other islands of the Pacific.

Principal Countries that use Rubber.

The principal countries which use rubber for man-

Book = Rubber (History) by Schidrowitz.
Book = Rubber. Its Sources and Preparation by Brown.

know as real rubber; however there are several other vegetables sources of rubber. Hevea Brazilensis grows wild in the tropics, especially in Brazil, but it has also been very successfully put under intensive cultivation in the Far East. Scattered through the ~~interm~~forests of the Amazon basin are found the millions of wild rubber trees which are cared for by the Indians of that region. This juice that is collected by these Indians is not the sap of the tree, for it has its sap in addition. Rather it is a white exudation from the inner bark and is of about the consistency of country milk or city cream. It is not stickly. No one tree gives more than a quart or two of latex, although many of the trees ~~are~~ produce a great deal more than others.

Way to Coagulate Rubber.

Having gathered a container of rubber milk, the Amazon Indian builds a small fire, using for this purpose the native urucuri nuts. When burned, these nuts give off the fumes needed quickly to coagulate the latex. Into the milky juice the native dips his paddle and holds it in the smoke of the smoldering nuts, turning it continually as the thin coating of latex dries into rubber. This process requires the driving off of about sixty per cent of the latex in the form of water vapor.

Magazine - Scientific American. Sept., 1923. Sprayed Rubber.

Again and again the paddle is dipped and smoked until finally a ball or "biscuit" about the size and shape of a large oval hornet's nest has been built up. The paddle is then removed from the center of the mass. Thus made, the biscuits are bought up from the natives by compradores who make their way into the wilderness to dicker with the Indian.

Rubber made in the above manner is nearly black, owing to the smoking it gets. It usually contains other impurities in large quantities, and as these quantities vary with each particular lot of biscuits and as the impurities may run from leaves and dead bark to sand and gravel, every separate lot of biscuits has to be treated differently before it enters the finished product, such as the tire one buys. Formerly the Indian found it easy to drop in a few stones with the biscuit adding to its weight without adding to the work. Now the buyer has learned to cut each biscuit along an axis chosen by chance and the Indian has learned that the knife is too apt to meet with his padding of rock.

Plantation Rubber in Brazil.

Plantation rubber could be grown in Brazil, provided the white man would be willing to chance fevers and provided the native could be prevailed to work after he

~~had ear~~

Magazine - Scientific American. Spet., 1923. Sprayed Rubber.

Area Under Plantation Rubber.

Date of Planting	Total for year acres	Grand total acres
1905	116,500	116,500
1906	177,700	294,200
1907	212,350	506,550
1908	180,800	687,350
1909	173,800	861,150
1910	261,400	1,122,550
1911	382,800	1,505,350
1912	312,000	1,817,350
1913	204,400	2,021,750
1914	159,300	2,181,050
1915	112,700	2,293,750
1916	165,200	2,458,950
1918	148,600	2,759,950
1919	150,800	2,910,750
1921	49,000	3,069,750

had earned enough to buy him the few things he wants from civilization. It is healthier for the white man in the Far East, and the native supply of labor, none to/ energetic, can be increased by the Chinese who are found all over Malaysia and who are intelligent and industrious. Moreover, rubber can be grown more cheaply in Malaysia than Brazil.

Our greatest rubber supply of today comes not from Brazil but from the Far East. The Amazonian continues to produce at about the same old rate, but the automobile tire industry has called for greater expansion than he could accomplish. The Far East rubber is all grown on plantations in the Federated Malay States. Straits Settlements, Ceylon, Sumatra, Java, Borneo and Indo-China.

Way to Coagulate Rubber in Malay.

The rubber of Malaysia is treated by the coagulation process. This process has nothing in common with the process of the Indian and his smoky fire. The latex is collected in pans and vats on the plantations and if left in the warm sun natural coagulation takes place within twnety-four hours. However, most of the latex is coagulated by the addition of diluted acetic acid. As it is stirred it curdles into a mass resembling whey. The curds are passed through rollers to separate out the

Magazine-Scientific American. Spet.,1923. Sprayed Rubber.

water and it is made up into thin sheets which enables the purchaser to see what he is buying and to judge knowingly of the amount of dirt, if any, contained. One of the faults of this process is that the acid to some extent injures the resulting rubber. Another fault is that several of the valuable minor constituents of the latex, such as albumins, resins and proteins, are dissolved and lost.

Pure rubber would not be at all suited to most uses. It must be vulcanized, that is, combined with sulfur under low heat. This makes it more elastic in either extreme of cold or heat. If as much as twenty-five per cent of the sulfur is used, hard rubber is produced. If red rubber is desired, sulfide of antimoney is substituted for sulfur.

Hevea Braziliensis.

This tree is a native of Brazil. It is found in the extensive forests drained by the Amazon and Orinoco rivers and their tributaries. It occurs not only in Brazil, but in Bolivia, Peru, and other parts of tropical South America. The name Para is derived from the chief port on the Amazon from which the rubber is shipped. This tree thrives best in the hot damp forests of the Amazon Valley and lands lying back from the valley of the

Book - Rubber, by H. P. Stevens and C. Beadle.
Magazine-Scieftific American. Sept. 1923. Sprayed Rubber.

river. The average temperature of this region is about eighty degrees, and the daily temperature ranges usually between seventy-five degrees and ninety degrees with an annual rainfall of from 80 to 120 inches.

The Hevea rubber tree is about sixty feet high and is from eight to ten feet in circumference. This species of rubber tree was transplanted to the Malay Peninsula and now that country is producing a great deal more rubber than that of its native country, South America.

Gutta Percha.

Some people think that india rubber and gutta percha are practically identical bodies, though this is by no means the case. Not only are the substances yielded by different trees, but they also show a wide divergence in their properties and it is only in rare cases that the once can replace the other. J. Trandescant, an Englishman, is credited with having brought the first sample of gutta-percha to England in 1656, but it was not until 1832 that it really attracted any attention. The area that produces gutta-percha is a great deal smaller than that that produces india rubber. It is produced in the Straits Settlements and Malay Archipelago, Borneo, Sumatra, the southern end of the Malaysan Peninsula, Java, the Celebes and Sulu Islands.

Book - India Rubber and Its Manufacture by H. L. Terry.
Book - Rubber by H. P Stevens and C. Beadle.

Full grown trees have a trunk that is from one to two yards in circumference. The gutta-percha occurs as a mikly latex in the bark, and is always obtained by cutting the tree down and allowing the latex to drain in to receptacles placed under cuts. The latex, which is called su su in North Borneo, is coagulated by being poured into boilding water. The whole business is in the hands of Chinese Merchants and native collectors and is carried on in a very wateful and unscientific manner.

Little has been done in the way of gutta-percha plantations. The annual exports of gutta percha from Singapore amounts to something between 6,000,000 pounds and 9,000,000 pounds.

Guayule.

Guayule is produced on a very large scale, the amount manufactured during the year 1910 was about 10,000 tons which is about ten per cent of the world's total rubber supply.

The Guayule shrub prefers an altitude of 4,000 to 5,000 feet, occurs in a belt of territory from one to a hundred miles in breadth, extending roughly from Fort Stockton in Texas to the Tropic of Cancer in Mexico. In some parts of this tract there is a heavy production while in other sections it occurs only sparsely. In this shrub rubber does not occur in the form of a latex,

Book - India Rubber and its Manufacture by H. L. Terry.
Book - Rubber (History) by Schidrowitz.

but in solid particles dispersed through the mass of woody fibre. Mr. M. P. Fox says, "The wood contains from six to eighteen per cent of rubber, a similar quantity of resin, and about ten per cent of extractives, the residue being wood, fiber, water, and so on". The shrub is havvested either by pulling it up by the roots, or preferably by cutting the plant. It is then baled and sent to the factory where it goes through its various processes in order to extract the rubber.

The future of the Guayule industry is somewhat doubtfut. Until quite recently it was believed that the plant could not be cultivated or renewed, the period of growth being too slow and cultivation from seeds impracticable. It was later shown that reproduction from seeds may be possible in some districts but not in other. The plant if cut close to the root throws out lateral shoots and this growth may be sufficiently rapid for a continuation of the industry on a limited scale after the present growths have been exhausted.

The capital invested in Guayule is very large. It is computed that the capital of the main companies working the State of Coahuila amounts to sixty-five million dollars, of which nearly one-half is represented by a single company.

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Book - Rubber (History) by Schidrowitz.

Balata.

Balata is better known to Engineers than to any other classes because its principal application is used in the manufacture of belting for machinery. It occurs as a milky latex in the bark of certain trees and is very similar to gutta-percha., and was at one time supposed to be identical with it; but it has now for the last twenty-five years been recognized as a distinct substance. This tree is found in many equatorial districts but to the greatest extent in Venzuela, the Guianas, and the West Indies. Comparative little of the output goes to America, most of it being sent to the European markets.

The custom of gathering the balata in Venequela is to cut down the tree and let the latex run into vessels from the trunk while in a horizontal position. This process is said to be necessary owing to the very stagnant flow from cuts made in the bark of the living tree. In the Guianas the falling of the trees is the exception rather than the rule. The usual time for collection is in the wet season. If the season happens to be a dry one the latex cannot be made to run at all from incisions in the bark, and not even when the tree is fell. The trees reach a height of about 120 feet. The coagulation is done by exposing the latex to the sun's rays in shallow

Book - India rubber and its Manufacture by H. L. Terry.

pans made of tinplate or of woodlined with leaves. The wood of the balata tree is of a deep red color, and its hardness has caused it to be in great demand for building purposes. The yield of balata is stated by Clouth to be four pounds of dry substance from a gallon of the latex.

Jelutong.

Another type of rubber which possesses particular interest from an industrial point of view is that which is derived from Jelutong. the tree grows to a very large size, and according to information obtained from Sarawak and Malaya, a diameter of four to six feet is quite common for old trees. Jelutong varieties are among the commonest forest trees in Borneo, the Malay Peninsula and Sumatra. Some idea of the quantity of raw material available will be gathered from the fact that for the year ending June 30, 1910, the United States alone imported some 23,000 tons of it. Substantially the whole of thos comes from Borneo and Sumatra. As very large quantities are used in Europe,, ~~Isestimate~~ it is estimated that the total production during the twelve months from July 1909 to June 1910 must have been something like 40,000 tons. Furthermore, large jelutong bearing areas such as the Federated Malay States and parts of Borneo and Smuatra, which are undoubtedly very rich in jelutong, have not yet been worked, and it appears probable that in a very short

Book - India Rubber and its Manufacture by H. L. Terry.
Book - Rubber (History) by Schidrowitz.

time it should be possible with proper organizations to produce annually some 60,000 to 70,000 tons of this raw material. Different qualities of Jelutong are known to the trade, according to the districts from which they are derived, as Palembang (Sumatra,) Pontianac or Dead Borneo (South Borneo), Sarawak and so on.

Commercial jelutong is obtained by coagulating the latex derived from the Jelutong tree, and in this respect, therefore the preparation of jelutong rubber resembles the process by which ordinary rubber varieties are obtained. The jelutong tree yields large quantities of latex. Experiments have shown that a tree may be tapped at least forty times annually without injury, and on this basis a mature tree should yield about one hundred pounds of latex per annum. The latex is very rich in solids, particularly in some districts in Malaya, and on the average yields about sixty to sixty-five per cent of solid rubber.

Native Way of Coagulation.

For the coagulation of the latex the natives employe a number of curious mixtures, including kerosene oil on the one hand and a number of "powders" on the other. The latter are sold to them by the Chinese dealers. The native method is to add some of the kerosene and a little of the posder and stir the "pot" vigorously. Then a

Book - Rubber (History) by Schidrowitz.

kerosene and powder alternately are gradually added until the whole of the latex sets to a more or less firm block. By this method a very good rubber can be extracted. It is, however equally certain that by improved methods of coagulation much better rubber can be obtained. Commercial jelutong comes into the market in the form of large, almost white, balls or blocks, weighing about thirty to fifty pounds. When fresh it is of a stiff cheesy constituency, and in this state contains roughly sixty to seventy per cent water, the balance consisting mainly of resin. Jelutong rubber is of a very high grade when properly prepared as compared to other high class rubbers.

With regard to the production of rubber that may be expected from this source it is said that the Goebilt works were designed to produce 10,000 pounds of finished rubber per day, and that new works were being erected on the Karimon Island (close to Singapore) will have treble this capacity. The supply of raw material appears to be adequately assured.

Other Types of Rubber Vines.

In tropical Africa, in Madagascar, and other parts of the world there are immense districts abounding with rubber vines and creepers. Native methods for obtaining rubber from these plants generally consist in cutting them down and tapping or "bleeding" them until the latex

Book - Rubber (History) by Schidrowitz.

ceases to flow. This method is wasteful.

If the bark is stripped and allowed to dry, the latex rapidly coagulates, and the rubber can then be extracted by mechanical means on the same principles as those employed on the plantation. The designing of efficient machinery for this purpose has made a rapid progress during recent years, and as a result, large tracts of country are being opened up principally in Madagascar and in the continent of Africa, with a view to extracting vine rubber in a scientific manner. Districts rich in vines are selected, and in these modern machinery is being erected. It is proposed to use the areas cleared of vines for replanting, so as to assure continuous supply of the raw material.

The average yield per acre on a plantation is from 300 to 500 pounds. There is on an average around one hundred trees or a little better planted to the acre.

Shipping of Plantation Rubber.

It is now agreed that it is desirable to ship plantation rubber in a thoroughly dry condition. The advantages of shipping rubber in a perfectly dry and clear condition are so important that any radical change in the direction indicated is not likely to come about, except as the result of further experiments. Rubber which is dry and clean is obviously more economical to ship

Book - Rubber (History) by Schidrowitz.

than an article containing a large quantity of waste matter; in other words, it is not desireable to pay cartage and freight on water and dirt. Dry clean material shows very little inclination to become mouldy or "tacky".

When a score or more yearg ago enterprising factors in the rubber industry of the world laid their plans to cultivate the rubber tree artificially under strict scientific control so as to get away from difficulties and dissatisfaction experienced with the jungle product, they did not foresee conditions as they have existed for the past two or three years in the rubber market. Overproduction was far from their minds, but the plantations were successful and have flooded the market with exeess production. To counteract thid condition, extensive experiments and propaganda were undertaken to find new uses to absorb the excess production.

Uses for Rubber.

In England where the rubber question has been given most serious attention, a patent has been issued for the use of rubber latex for making a special rubberized paper.

Another use for rubber latex has been suggested in the manufacture of tile and slate for building purposes.

Rubber latex can also be used to good advantage in the manufacture of blocks for paving streets.

By s slight modification of the ingrediatns in the

Book - Rubber 'History) by Schidrowitz.
Magazine - Scientific American. Feb., 1923. Uses of Rubber.

mixture and the proportions used, it is possible to make compositions which can be formed into various fourms of insulators for electrical purposes.

Race tracks, tennis courts, football fields, fields for playing croquet, and other sports can be lined with rubber latex compositions. It is conceivable that certain important advantages can be secured in this manner. The ground can be made softer and still just as springy or even springier than before.

It has also been suggested that the rubber latex can be used directly in the making of roads by mixing it with sand and powdered waste materials, such as old tires, spreading it over the surface of the ground and rolling it smooth with the aid of a steam roller.

When in the effort to find new uses for rubber, rubber chemists turn their attention to producing such products as transparent rubber, a rubber glass. Rubber as transparent as glass and still as elastic and non-breakeable as ordinary rubber offers many advantages and products or rare and strange effects could be made from it.

Rubber trees in the United States.

Rubber trees are growing without being cultivated in the United States. The "Stillingia Sebifera" was brought here many years ago from the semitropical climate of China to the Southern States; but it only contains a

Magazine - Scientific American. February 2, 1923.
Magazine - Scientific American. September 1922.
Magazine - The India Rubber World. Januaryl, 1924.

small amount of rubber in its latex. It is cultivated in South Carolina and Georgia and there it grows to a height of about forty feet.

Rubber in the Philippines.

The Philippines are trying to get laws passed that will allow rubber planters to operate as safely and profitably as in the British and Dutch possessions.

One suggestion that is being considered is that they are to be allowed the free use of public land for rubber plantations up to 20,000 "hectares" in extent under a twenty year lease from the Bureau of Forestry and no charges of any nature to be collected for the use of this land until the money invested has been recovered, after which the usual forest charges of ten per cent of the value of the crude product will be collected.

The planting of rubber will be of great value to the government as it will be considered as reforestation, and the benefits derived, the control of the water, destruction by erosion, and of converting cogon lands which are breeding places for locusts, will more than compensate them for the loss in land taxes and fees.

A law that will allow a twenty-five year lease and a twenty-five year renewal, with a possible additional twenty-five year, giving seventy-five years total, is now under consideration.

Magazine - The India Rubber World. January 1, 1924.
Magazine - The India Rubber World. September 1, 1923.

With thousands of square miles as rich as any land in the world, hundreds of miles south of the typhoon belt, with a rainfall that is ideal, and a climate almost identical with atht of the lower Amazon there is no reason why rubber plantations should not be promoted in the Philippines.

British restriction of crude rubber production has revived wide apread interest in America rubber planting. Investigations both government and private, of the principal source of rubber supply and of plantation possibilities in various countries are already under way. The Philippines and South and Central America are the most promising rubber producing regions. Of them all, the readlly best place for rubber planting is the Amazon Valley of Brazil, the original source of seed for plantation rubber in the East.

The natural conditions are favorable. They have vast areas of land, the climate is right in respect to temperature, rainfall and humidity. The soil is rich and ~~does~~ never needs any fertilizer. Plenty of seed is available, there is no high wind and no droughts.

Rubber Industry in Germany.

At the outbreak of the war Germany stood second to the United States in the extent of her rubber manufacturers and held first place among European countries.

Magazine - The India Rubber World. September 1, 1923.
Magazine - The India Rubber Wofld. April 1, 1923.
Magazine - The India Rubber World. Nov. 1, 1923.

Germany lead the United Stated in rubber goods exports three to one.

In 1914 German rubber industries numbered approximately 600 manufacturing plants. The total authorized capitalization was about $25,000,000 with a working capital probably twice that size. Forty thousand men were employed turning out manufactureed rubber goods amounting in value of $80,000,000 annually of which $32,500,000 or over forty per cent was exported.

During the war Germanys rubber industry weakened. Before the war Germany was using about 18,000 tons of the crude rubber, or about sixteen per cent of the worlds production, of which one fifth came from German Colonies now controlled by the Allies. In 1917 and 1918 crude rubber imports decreased to about 1,000 tons. Following the Armistace the consumption of crude rubber increased rapidly to 13,400 tons in 1920, 22,428 tons in 1921, and was then estimated at 30,000 tons for 1922.

Japan Rubber Industry.

The terriffic earthquake, followed by fire and tidal wave, which on September 2, 1923, took an apalling toll of Japanese lives and property has seriously crippled but by no menas destroyed the flourishing young rubber industry of the Island Empire. In the cities of Yokohama and Tokyo were located many rubber goods

Magazine = The India Rubber World. November 1, 1923.
Magazine = The India Rubber World. October 1, 1923.

factories owned by natives, Europeans and Americans.

The rubber industry in Japan increased a great deal during and since the war. In 1919 exports amounted to $9,689,922 against imports amounting to only $1,422,966. At the outbreak of the war the rubber goods shipment to Japan was stopped and was the cause for the papid growth of the rubber industry in that country.

In 1914 there were in Japan sixty general rubber companies having an aggregate capitalization of $2,500,000 and employing about 4,000 men.

The Japanese rubber industry has brown up in two districts about 250 miles apart, the first centering in Tokyo and Yokohama, and the second and larger in Kobe and Osaka.

The rubber plants in the latter district are intact and at capacity production can meet much of the immediate demand developed by the disaster. As a result, the Kobe Osaka district, already in the the lead because of its better shipping facilities and situation with respect to export markets, now promises to propper more than ever in commerce and industry and to become the unquestioned center of the Japanese rubber industry.

Index Mark Falls.

While commodity prices, as a whole, advanced from an index of one hundred in 1913 to 242 in 1920, the price

Magazine - The India Rubber World. October 1, 1923.
Magazine - The India Rubber World. February 24, 1923.
Magazine - The Economic World. February 24, 1923.

of rubber dropped from an index of one hundred to fourty-one. In 1913 crude rubber sold as high as $1.12 per pound, and in the Fall of 1921 as low as thirteen cents per pound. Since the Fall of 1922, another astounding price trend has developed, as a result crude rubber has advanced to over thirty- seven cents per pound. From 1913 to 1922 crude rubber imports into the United States had increased over five times. In none of these years was the demand in the excess of the quantity imported. For example: in the year 1919 while imports amounted to 535,940,000 pounds only 437,292,800 pounds were consumed. Similarly in 1921, imports totaled 415,280,000 pounds while the consumption was 368,110,000 pounds. This situation resulted in the accumulation of large stocks, not only in this country but in the principal producing countries as well.

Stevenson Plan.

This rubber situation was studied over for some time and finally a scheme, which is now known as the "Stevenson Plan", for the compulsory control of rubber production through price fixing, was decided upon. This British plan has faced considerable opposition, especially from the producers of Ceylon and the Dutch East Indies. The Ceylon producers, believing their cost of production to be far below that of all others, were not seeking

Magazine - The Economic World. February 24, 1923.

governmental aid. Negotiations with the Dutch Government tp co-operate with the British failed, the reason being given that the Dutch had already signed selling contracts for large quantities of low priced rubber, running into 1925; thus, any program now put into force could not prove of any immediate benefit to them. Despite these various objections, the British Government finally decided to adopt the "Stevenson Plan", which is as follows:

This plan aimed to restrict the rubber production of at least to control the quantity coming upon the market, and to increase the price by means of a graduated export tax on crude rubber. The plan provides that only sixty per cent of an arbitrarily estimated normal crop (1920 is taken as a normal crop year) ibe exported at a minimum duty of one d., or a little over two cents per pound. Exports of rubber in excess on this sixty per cent basis are to be taxed on a graduated basis up to as much as twenty-four cents per pound; that is all exports in excess of the 1920 total would be taxed at the latter figure. This plan is either to restrict actual production by menas of the tax, or at least to keep more than a certain quantity from coming upon the market, except under conditions that will force the price to a higher level in such a way that the Government

producing countries will profit. The idea of Great Britain is to maintain the average price of spot rubber in London during the first three months's period that the plan is in operation at about thirty-two cents per pound. If this is accomplished, then the minimum duty output limit will be automatically raised to sixty-five per cent of the total normal production. Should the second three months show a decline in the average price of rubber to be below one s. three d. a pound, then the minimum duty out put rate will automatically be reduced to fifty-five per cent of the normal production for the ensuing period; that is instead of permitting sixty per cent of the crop to be exported at a minimum duty this percentage might be raised or lowered according as conditions warrant.

This plan was put into actual operation on November 1, 1922. Since the plan has been in operation crude rubber prices have been advancing steadily.

Increase in demand.

Before the advent of the automobile fifty odd thousand tons of rubber a year were all that the trade of the world demande. During 1922 there were 375,000 tons used.

Nearly all the rubber used in 1900 came from Brazil and Peru, where where the very best rubber grows in a wild

state. The trees found wild in the Amazon Valley do not grow in groups, but are found scattered throughout the jungles.

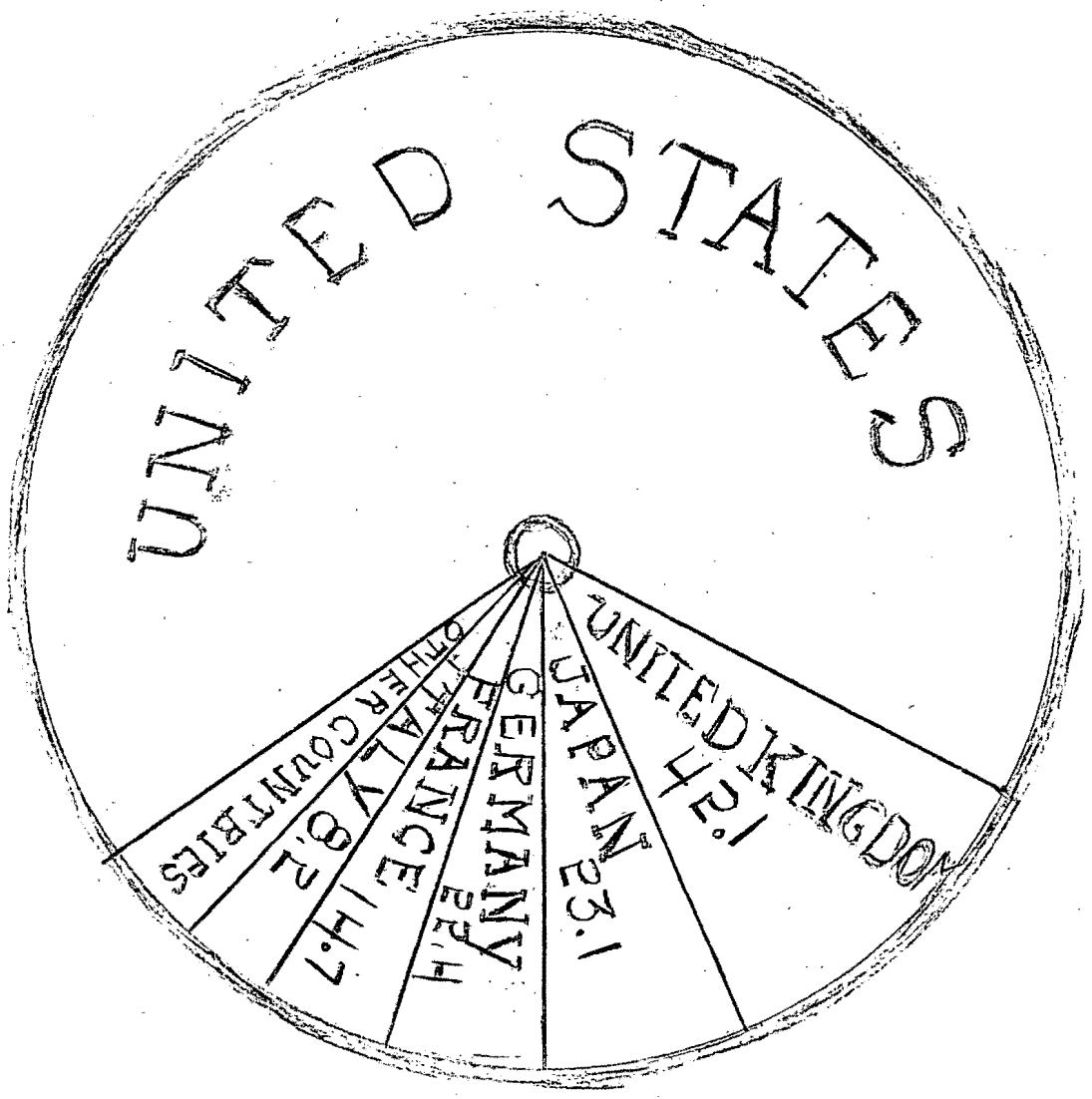
For the first five years on a plantation no rubber is produced. Between five and six years after planting, authorities place the production at 120 pounds per acre, which is a little more than one pound per tree. One gallon of latex produces approximately three and one-half pounds of rubber. Between the sixth and seventh year the production is approximately 180 pounds, the next year probably 240 pounds and thereafter about 400 pounds per acre.

In 1913, fourty-four per cent of the world's production of crude rubber was from plantations, and in 1914 fifty-nine per cent was plantation rubber while in 1920 eighty-nine per cent of the world's rubber had come from cultivated areas. This per centage has still further increased, until today well over ninety-two per cent of the world's supply comes from plantation sources.

The presidents of most of the large tire manufacturing companies think that it is logical to pay a price for rubber high enough to encourage planting, which must be done on a large scale to avoid a shortage in the future. They also believe that it is best to have a

Magazine - The Satufday Evening Post. May 26, 1923.
Magazine - The Annalist. February 12, 1923.

Rubber Distribution 1921. T otal Quantity 302,346 Tons.



Quantities by Countries Given in Thousands of tons.

fair and stable price at all times then to get rubber below cost for a while and then have it at very high prices at other times.

Future Demand.

The great increase in the consumption of rubber by industries in the last ten years and the certainty that there will be an advance in requirements in the next ten years calls for expansion of production if adequate supplies are to be assured for the American consumer. Statistics complied by the United States Government show that in 1910 that the consumption of rubber by the industries in this country totaled 37,491 tons whereas in 1922 the quantity consumed was probably as much as 285,000 tons. It is predicted that the needs for 1923 will be over 300,000 tons. There has also been an increase in the demands of most of the other nations of the world but not on such a large scale as in the United States.

United States Consumption.

The United States now consumes approxomately seventy-five per cent of the rubber of the world. It is impossible to produce rubber in continental United States. Restrictive laws and other factors some years ago reduced production in Latin America to an almost

Magazine - The Annalist. February 12, 1923.

negligible quantity and the American consumer is dependent almost entirely on the plantations of the Far East.

The automobile and truck industry in the United States consume about eighty per cent of the imports of crude rubber. Road construction and the development of electrical industry are consuming more and more rubber. "Sith runaway prices and a real shortage of rubber, amny industries would suffer, and the advanced cost to the consumer would suffer." Rubber was at it high point in 1910, when it was three dollars a pound, but that level was not as severe a blow to American consumers as dollar rubber or even fifty cent rubber would be today. There is at this time a serious problem to be solved and that is, "How are we going to fill our increasing requirements"? It is believed that an agreement will be reached with Great Britain, who at present control the situation in the Far East, that will keep prices at a fairly reasonable level. The Federated Malay States, Ceylon and the Dutch East Indies produce ninety-five per cent of the world's supply of crude rubber today.

The government is going to have to give assistance to the people who are interested with the industry to investigate where rubber can be raised in the United States or in some of its territories. Rubber plantat-

Magazine - The Annalist. February 12, 1923.

Long Tons of Rubber Retained by Various Countries 1910 – 1920

Year	United Kingdom	United States.	France	Germany	Italy	Japan	Canada
1910	20,454	37,491	1508	13,730	1825	704	1300
1911	16,735	34,464	5310	15,223	2,360	910	1200
1912	18,724	50,249	5,468	15,395	3,287	887	1900
1913	25,275	49,851	5,855	16,264	2,505	1187	2500
1914	18,569	61,250	4,389		2,739	1021	1900
1915	15,071	96,793	9,475		4,956	1728	2,900
1916	26,759	116,478	12782		4,768	2,936	4400
1917	25,947	177,088	16,652		5,593	3,717	4800
1918	30,043	142,771	14,237		7,139	7,247	5,800
1919	42,671	236,976	17,556		9,893	10,775	8,500
1920	56,844	248,762	15,868		6,123	6,061	10,907
1921	42,087	179,668	14,666	16,727	3905	23,159	10,181
1922	11,102	206,678	22,963	23,734	3059	11,717	8,460

ions are not productive until about seven years after planting and it requires a great deal of capital to back up a plantation.

Reasons for the Restriction or Production.

It was in the hope of obtaining an arrangement which would hold down the present price and also bring about an exchange of opinion that there were brought together recently at the department of Commerce, representatives of the British Rubber Producers Association and the American Consumers Association. They found out that if demands increased as much in the next ten years as it had in the past ten years that it would overtax the possibilities of the British production and that the expansion of rubber production in other parts of the world was necessary. The British representatives explained the recent plan of the British Colonies in restriction of rubber production and price control as having been necessary in view of the collapse of the industry in 1920-1921, due to prices being below the cost of production, and stated that there objective was to establish a price under which reasonable returns could be secured and the necessary expansion in rubber plantations obtained to keep in pace with the increasing world demands.

Magazine - The Annalist. February 12, 1923.

British Control.

More than seventy-two percent of plantation rubber is grown in British Colonial possessions. An additional eight per cent is controlled by British capital. The relative importance of wild plantation rubber is shown by the estimated production in 1922 of 340,000 tons of plantation rubber as against 23,000 tons of wild rubber. The plantation industry was enormously prosperous from 1910 to 1920. Following the business depression of 1920, stock accumulated and prices went down.

Eighty per cent of the rubber now produced comes from the British Colonies, since about 1900, sixty per cent of the worlds output has been consumed in the United States. It is said that Akron Ohio consumes one-third of the worlds output. The largest quantity of rubber imported into the United States was in 1920, amounting to 566,546,000 pounds.

Between January1, 1920, and July 88, 1921, the London stock of crude rubber climbed from 21,992 tons to 70,859 tons; in the same period the price declined from seventy cents per pound to eighteen cents.

The voluntary restriction by legislation having proved futile many of the British and Dutch planters who belong to these various associations came to the

Magazine - The Annalist. February 12, 1923.
Magazine - Commercial American. March 1923.
Commerce Reports. September 12, 1921.

conclusion that there was a need for a more effective means of co-operation among themselves which led to the formation of the "Rubber producers' Corporation (Ltd.)" whose five purposes are stated as follows:

(1) To control the rubh output of its members.

(2) To fix the selling price and regulate the sales of the rubber produced by its members.

(3) To regulate the opening of further rubber lands by its members.

(4) To purchase or make advances on the rubber harvested by its members.

(5) If deemed advisable, to make advances on security and on terms to be agreed to approved rubber estates belonging to its members.

British and Dutch Co-operate.

A working agreement between the British and the Dutch provide the organizers with the control of the rubber production of the world. The scheme also carried a provision that the project should not come into being until owners of two-thirds of the acerage planted should have agreed to come into the proposition. This minimum amounts to 2,200,000 acres, divided between British and Dutch owners. The remainder of the Far Eastern rubber acreage, 1,100,000 acres, is largely in the hands of the

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native producers and private companies. They ordinarily produce rubber of a poorer quality and are not regarded as an important factor in the plan. The organization proposed to limit the life of the corporation to five years.

The new corporation would control the output and sales as follows:

(1) The output of rubber by members, including provision for young areas on their reaching maturity, will be regulated equitably by the court of directors and may be varied from time to time according to the market conditions.

(2) The court of directors shall fix from time to time the prices at which the rubber controlled by the corporation may be sold.

(3) On all sales of rubber controlled by the corporation there shall be paid to the corporation a sum per pound to be fixed by the court of directors, which must be sufficient to enable the corporation to pay the expenses of management, to pay interest on and to provide a sinking fund for the redemption of debentures.

(4) All rubber harvested by members will be consigned as at present and sold as authorized by the court of directors through the asual channels, the

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brokers being responsible for the passing directly to the corporation, of the charge before referred to.

(5) All forward contracts which existed on July 15, 1921, shall be notified to the corporation on its formation and then shall be duly recognized.

Colonial Law Restricts Exportation.

The British Government appointed the Stevenson Commission to investigate the condition of the plantation industry. It failed to get like action by the Dutch Government, but recommended the adoption of Colonial laws restricting exportation of rubber in order to absorb an excessive surplus of crude rubber stock and to restore the market price so that plantations could produce at a profit. These laws became effective November 1, 1922.

Two remedies for this present trouble have been proposed by the British Rubber Growers's Association - restriction of output and increase use of cheaper rubber.

After the price had dropped this Association suggested in a bulletin that growers should tap their trees every other day instead of daily as was then the practice. In September 1920, the Association issued another circular strongly recommending that all growers should take care to make "a genuine reduction of twenty-

Magazine - The Annalist. February 12, 1923.
Commerce Reports. September 12, 1921.

five per cent of the estimated normal monthly output".

This plan was not successful because the small producer did not co-operate. Subsequently, growers in Malay requested the rubber growers to pass legislation to enforce a fifty per cent restriction. The government failed to do this through lack of co-operation of the Dutch Growers.

Export Tax.

The export tax was the means used to restrict production. "Standard production was fixed as of 1920 - 335,000 tons. Exportations up to sixty per cent of standard production was to bear a nominal duty of one and one eight cents gold per pound exchange at par. If exports exceeded sixty per cent of 1920 production, every pound exported in the year was to be subjected to a progressive prohibitive duty which went as high as 23.85 cents per pound if export exceeded one hundred per cent of standard production.

Statistics compiled by department experts show that the proportion of "standard production" obtained from the restricted area, (including British controlled interests in the Dutch East Indies) is about 275,000 tons. Approximately 77,500 tons are expected in 1923 from other plantations in unrestricted areas.

Distribution.

Magazine - The Annalist. February 12, 1923.

Rubber Shipments 1921. Total Quantity 295,960 tons.

Quantities by countries given in thousands of tons.

According to the estimates of the Stevenson Committee the standard production for the world for the whole plantation industry is placed at 330,000 tons and is distributed over the producing countries approximately as follows:

Countries	Tons.
Malaya	189,750
Ceylon	41,250
South India &Burma	6,600
Dutch East Indies	84,150
Others	8,250

The supply of Brazilian and wild rubber is put at 20000 tons. The net shipments were 38,900 tons in 1920, and 24,900 tons in 1922.

Failure of Stevenson Plan.

It is stated in a recent issue of the "Daily Financial America", New York, that the Stevenson plan, which was put into effect in November 1922, in the British controlled crude rubber growing areas for the purpose of restricting the production and exportation of the commodity and thereby indirectly stabilizing its price, appears to have failed thus far in curtailing production and shipments, although it has had some effect in advancing prices.

Magazine - The Annalist April 23, 1923.
Magazine - The Economic World. February 24, 1923.

Imports of Crude Rubber, Gutta Percha, and Substitutes Therefor into the United States During the Month of Jan., 1924.

Crude Rubber From	Pounds	Long Tons	Dollars
Belgium	112,226		26,450
France	66,390		15,661
Germany	16,500		5,080
Netherlands	377,522		94,505
Portugal	1,854		180
England	5,346,547		1,383,367
Nicaragua	2,661		325
Brazil	2,201,983		422,742
Colombia	56,726		10,747
Ecuador	81,093		18,690
Peru	78,240		17,954
Armenia & Kurdisten	22,400		5,918
British India	62,739		17,406
Ceylon	4,089,398		1,035,289
Straits Settlements	28,817,204		7,094,562
Java and Madura	5,496,151		1,302,766
Other Dutch East Indies	1,802,696		502,375
Japan	448,000		112,912
Crude Rubber Total	49,080,330	21,911	12,066,929

Total Imports of Crude Rubber for the Month of January	1923	1922
	79,763,620 (35,609 tons)	54,010,946 (24,112 tons)

Jelutong or Pontianack	640,270	285	114,938
Balata	111,924	50	61,409
Gutta Percha	111,778	50	15,807
Guayule	---	--	----
Other crude, scrap and reclaimed	607,253	271	28,718
Grand Total	50,551,555	22,567	12,287,801

Imports of Crude Rubber Into the United States.

1923.

	Quantity Long tons.	Value Dollars.
January	35,609	14,310,825.
February	26,955	13,150,823.
March	30,929	19,041,565.
April	31,062	21,925,814.
May	35,762	24,953,222.
June	35,352	23,941,937.
July	19,926	13,008,840.
August	19,081	11,612,618.
September	11,564	6,509,319.
October	17,622	10,375,347.
November	15,545	9,236,078.
December	29,731	16,991,331.
Total	309,139	$ 185,057,719.

Year	Quantity (Long tons)	Value.
1919	239,259	$215,820,113.
1920	252,922	242,795,773.
1921	185,349	73,752,677.
1922	301,076	101,843,188.

America Makes Investigation.

The fact that seventy-five per cent of the world's output of raw material of which we imported seventy-nine per cent of the total produced in 1922, is controlled by one foreign power was emphasized by the crude rubber restriction measures adopted on November 1, 1922, by the British Colonies of the Far East. As a result, Congress authorized the Department of Commerce and the Department of Agriculture to make a thorough study of the production, marketing, and control of this and other raw materials, with a view of making the United States less dependent on such sources.

In an effort to locate certain areas closer to the United States and competitive to British and other non-American operations in the Far East, that might possible be found suitable for growing rubber, four field parties were sent out by the Department of Commerce one to the Philippines, one to the Amazon Valley, one to countries bordering on the Caribbean Sea, and the fourth to the Far East to gather information concerning the production of crude rubber there.

Kinds of Rubber Plantations.

There are two general types of rubber plantations in the Far East, large areas financed and conducted by Europeans and smaller areas in the hands of the Asiatic or native population. . . . .

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American rubber manufacturers may buy their supplies of rubber by different methods. Those who use small quantities generally obtain their supplies through New York dealers. The large users of crude rubber in the United States, besides buying from delaers, usually have agents located in the principal primary markets of the Far East and in London and Amsterdam to act as direct buyers of a large portion of the rubber that they need.

Crude Rubber Sources.

Crude rubber comes from two general sources: (1) Several species of plants growing wild in different parts of the Tropics, and (2) planted crops of one species that has been introduced principally into the tropical Far East, that is, southeastern Asia and certain neighboring Islands. This latter species is Hevea Braziliensis, which is also the principal wild species, indigenous only to the Amazon Valley and producing most of the wild rubber ov commerce. The product of the wild species is known as "Para rubber".

From the time when rubber reached the markets of the world in any great quantities the United States has been the leading importer of it. The Following table shows the position the United States has held in this respect. . . . . .

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Worlds Production of Rubber; Quantity and Value of United States Imports, and Reexports of Rubber.

Year	Worlds Production				Imports into United States			Reexports Prom United States	Retained in United States
	Plantation Long Ton	Brazil Long Ton	other Long ton	Total Longton	Amount Long ton	% of Total	Value		
1910	8,200	40,800	21,500	70,500	45038	64	103,673,742	2764	42,274
1911	14,419	37,730	23,000	75,149	36987	49	74,410,550	2523	34,464
1912	28,518	42410	28,000	98,928	52705	53	99,567,071	2456	50249
1913	47,618	39,370	21,452	108,440	51,732	49	76,820,739	1,881	50,852
1914	71,380	37,000	12,000	120,380	63,868	53	70,472,704	2618	61,250
1915	107,876	37,220	13,615	158,702	98,876	62	111,031,144	2082	96,794
1916	152,650	36,500	12,448	201,598	120,576	60	159,745,542	4098	116,478
1917	213,070	39,370	13,258	265,698	181,089	68	233,220,904	4,000	177,089
1918	255,950	30,700	9929	296,579	145,518	49	146,378,313	2746	142,772
1919	285,225	34,285	7350	328,860	239,259	73	215,820,113	2,282	236,977
1920	304 816	30,790	8,125	343,731	252922	74	242,795,773	4160	248,762
1921	271,233	19,837	2890	293,960	185,394	63	73,772,677	5,716	179,678
1922	354 980	4,735	3205	379,920	301,076	79	101,843,185	4809	296,267

Increase in Use of Rubber in U.S.

This table shows that in 1900 the United States imported forty-one per cent of the world's production; from that time on, with some ups and downs, there has been a steady increase in the United States proportion of imports until, in 1922, seventy-nine per cent of the production reached this country. Comparatively little of this amount was exported, and in late years the re-exports were a very small fraction of the total imports.

Crude Rubber Markets.

The chief crude rubber markets of the world can be divided into two classes, those in or near the countries of origin of the product, and those in the countries where the rubber is consumed. The former can be called primary markets, the latter secondary markets.

Anyone having the funds or credit can buy crude rubber in any quantity through or from a number of crude rubber importers (delaers) in New York, London, Singapore, and the other primary and secondary markets, or through the buying organizations of the various rubber manufacturing companies which have branches or agents in those markets.

The following statements shows the relative importance of the principal primary markets in 1922, expressed in tons of rubber shipped to the various secondary markets:

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British Malaya	248,158 tons.
Ceylon (Colombo)	47,367 tons.
Sumatra (Medan principally)	40,552 tons.
Java (Batavia and Soerabaya)	31,558 tons.
Brazil (Mainly Para and Manaos)	21,735 tons.
Africa (Various small markets)	3,205 tons.

Thus the primary markets of British Malay, principally Singapore, are the most important ones in the world at the present time.

Up to 1914 the production of wild rubber exceeded that of plantation, and until this time Para and Manaos, the chief ports of the Amazon region, were the principal primary markets for rubber. With the increase in the production of plantation rubber the importance of these markets were diminished and the chief primary market was shifted to Singapore and other ports of the Far East.

The principal secondary markets, where the rubber is received for consumption or redistribution, are located ~~th~~ in the United Kingdom, (London and Liverpool(, mainly London, and in the United States, mainly New York.

The standing of London as a market for the reception and redistribution of rubber to other countries is shown by the following table.

Imports.

This table shows that in 1907 the imports into the

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Imports, exports, and amount of Rubber Retained in United Kingdom.

Year	Imports Tons	Percent of total Production	Exports Tons	Exports to United States Tons	Amount Retained Tons
1907	33,364	48	17,451	4,481	15,913
1908	28,753	44	17,925	3,040	10,828
1909	35,003	50	19,896	5,726	15,107
1910	43,848	62	23,393	6,945	20,455
1911	45,297	60	28,561	7,122	16,736
1912	55,023	56	36,299	13,272	18,724
1913	70,287	65	45,011	15,252	25,276
1914	67,623	56	49,074	21,553	18,549
1915	78,592	50	63,520	33,557	15,072
1916	75,218	38	48,458	32,348	26,760
1917	78,420	30	52,437	31,905	25,983
1918	46,904	16	16,800	2,959	30,104
1919	101,891	31	59,371	26,898	42,520
1920	110,878	32	53,905	33,615	56,972
1921	84,989	29	42,873	18,536	42,116
1922	63,917	17	52753	22,714	11,164

United Kingdom were forty-eight per cent of the world's production. A comparision of this table with the import figures into the United States show that up to 1915, with the exception of two years, the imports into England exceeded those into the United States, but in 1915 and after the proportional amounts of rubber imported into the United States exceeded greatly the amounts imported into the United Kingdom. The United Kingdom markets, however as shown by the tables, are the most important secondary markets for accumulation of stocks of rubber for re-export to other countries.

The most important secondary markets other than those of the United States and the United Kingdom are Amsterdam, Antwerp, and those of France. As the British, Dutch, Belgian, and French in the order named are the main financial centers of the control of production of rubber, they consequently are more important than the actual amount of rubber reaching them would indicate.

"Up to 1915 most of the rubber of the Far East reached the markets of the United States through Europe. The war greatly disturbed this method of routing. The main difficulties of shipping rubber direct to the United States from the Far East were lack of trained American personnel and proper financial connections. The obstacles were eventually overcome and practically all

. . . . . .

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of the American large manufacturing concerns and delaers now having buying representatives or branches located in the principal rubber markets of the Far East. In this way most of the rubber consumed in the United States now reaches us direct from the chief ports of the rubber producing regions".

Central Market in U.S.

The main manufacturing rubber center of the United States is located in Ohio, principally at Akron, where more than one-half of the rubber consumed in the United States is manufactured. Other rubber manufacturing centers are located around New York, at Trenton, New Jersey, and in the New England States, though there are rubber factories as far west as California and Oregon and as far south as Georgia.

Purchasing.

There are two general methods employed by the manufacturers in purchasing their supply of crude rubber. They are: (1) through the manufacturers' own buying branches or agents located in the various markets; (2) through dealers and importing firms who buy and sell rubber on a speculative basis in those markets.

Duties.

The duties of the branch or agency firms are the carrying on of negotiations with sellers and the details

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The Following table shows the principal states in the Manufacture of rubber goods, the value of their products in 1919 and their percentage of the total amount:

Ohio	$552,339,000	(48.5%)
Massachusets	115,544,000	(13.3%)
New Jersey	97,951,000	(8.6%)
Conneticut	56,379,000	(5.0%)
Michigan	50,318,000	(4.4%)
Pennsylvania	39,783,000	(3.5%)
Wisconsin	39,069,000	(3.4%)
New York	37,541,000	(3.3%)
Indiana	37,270,000	(3.3%)
Rhode Island	37,151,000	(3.3%)

incident to receiving, inspecting, weighing, shipping, and financing of the lots of rubber purchased, all of which necessitates the maintainance of an efficient staff. The difference between a branch and an agency firm is that the former is either a component part of the manufacturer's organization or a subsidiary of that organization, where as an agent is usually a local firm carrying on business in that particular market and charging a commission for its services, which commission is generally a percentage of the amount of money involved.

New York Sellers.

The manufacturer may operate on the New York Market. If so, it is done by buying from the New York crude rubber importers any grade, quantity, that he may desire to purchase.

The sellers on the New York market are firms that import rubber only or those engaged in a general importing business. They have connections in all of the world rubber markets, and the large firms maintain branch offices in the most important of these places. These dealers conduct their business along speculative lines and it is necessary for them to make an analysis of the future market conditions.

Besides selling to the manufacturers, delaers also trade among themselves, which is usually done through

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the medium of a broker, or they may buy from foreign import houses of the European or primary markets through the local or foreign agents of those firms.

Brokers.

Brokers in New York are generally used by dealers when trading among themselves, but they also serve as the middleman between the manufacturers and dealers. The custom of the trade is for the seller to pay the commission when brokers are used.

Business between the manufacturers and dealer is usually done direct, generally by telephone. The dealer makes the manufacturer an offer of a definite quantity and certain grades of rubber for a specific "position," which may be spot, on arrival or delivery during a certain period, or for shipment from a foreign market during a stated time. If the "position" is that which is desired and the price mutually satisfactory to buyer and seller, the transaction is closed and written contracts are exchanged, and when not otherwise said, based on the rules of the Rubber Association of America and those of the Rubber Trade Association of New York.

"If the rubber sold by the dealer is for a future position and not already bought, arrangements are immediately made by the dealer to cover the quantity sold either in the foreign market or from local dealers, who

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in turn cover in a foreign market, and arrange the necessary financing, usually in the form of a letter of credit. When the rubber is ready for delivery to buyer in New York, due notice is given in order to enable the buyer to check the weights and examine the quality before acceptance on the dock or at the warehouse. Upon acceptance of the rubber by the buyer, the seller sends a bill to the purchaser for the total net amount and payment is made by cash on date of delivery in New York or otherwise as contract may specify.

London and Liverpool Markets.

London's control of the world's rubber market dates back to the days when the principal sources of crude rubber were the Amazon Valley and the Congo States of Africa. It was most likely obtained and maintained through Great Britains control of the shipping and financing of the overseas trade with those territories. It was found that Hevea rubber would grow successfully in the British possessions in the Far East from the seedlings that had been transplanted so it was not surprising that the greater part of the capital for the development of plantations in the Far East was raised in London, thus leaving the British the control of the rubber industry of the world.

The London- Liverpool crude rubber organizations are made up of the manufacturers' buyers and agents, dealers,

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brokers, and the sterling plantation companies. The Liverpool market is small in comparison to London and it is operated and controlled from London. Prior to the war a large portion of the rubber sold in London was disposed of at weekly auctions. The auctions were discontinued during the war and all business is now done by private agreements.

Brokers and Dealers.

Nearly all business in London is done through brokers who guarantee the solvency of both buyer and seller. The brokers are usually paid by the seller.

The dealer houses in London operate similarly to those of New York. The pound sterling ($4.86 at par) is the currency used.

The system of sampling shipments of plantation rubber is different from that used in New York, where ten per cent of the cases are opened for drawing samples, whereas in London and Liverpool each case is opened and samples drawn. As a result of this practice there is a more accurate check upon the qualities and weights that are delivered to the buyer.

All transactions on the London and Liverpool markets are conducted under the rules and regulations of the Rubber Trade Association of London, through that body's committee of management, which committee also appoints

the standard qualities committee and the panel of arbitrators.

Amsterdam Market.

Amsterdam is the central rubber market for most of the estates controlled by Dutch Capital in the Netherlands East Indies and most of the rubber from those islands are sold on this market. The part that is brought by the Americans is usually shipped direct from the East to the United States. The members of the trade in Amsterdam are classified the same as those in London, except that there are no brokers who guarantee solvency. The marketing methods are much the same as those used in London and being much the smaller market of the two, Amsterdam generally takes and follows the ideas and policies of those that are used in London. Some of the principal distinctions are:

(1) Amsterdam has no standard quality, but sell on the sample type.

(2) Besides the business done by private treaty and generally through ordinary brokers, a certain amount of rubber is disposed of at the weekly auctions, where sales are made by sealed bids similar to those methods employed on the Batavia market. Private sales are gradually, ~~however, are~~ displacing the custom of selling in auctions.

(3) The florin (guilder) is the currency used, par

value of which is $0.402 in the United States currency.

(4) The metric system of weights is employed, and the unit used as a basis for all market transactions is the Kilo equal to 2.2046 pounds.

Antwerp Market.

A considerable quantity of plantation rubber is sold on the Antwerp market, though the volume of business is smaller than that of Amsterdam, due to the smaller number of plantations controlled by Belgian capital. The rubber that is sold is of a very high standard and is equal in quality to that sold on the markets in London, New York and Singapore.

Marketing methods are based on those of London and Amsterdam, and business is transacted daily with the rest of the world's markets by cable. The Belgian franc is the currency and the kilo is the unit of weight used. The operations are similar to those of other European markets.

Paris Market.

A crude rubber market has recently been established in Paris. The principal grades dealt in is plantation Hevea. Shipments of rubber from Indo-China and French controlled estates in British Malaya and the Dutch East Indies forms the source of supply for this market, but as in Antwerp and Amsterdam, business is done with London

and transactions are based upon the cable news received from that market. The French franc and the Kilo are the units of value and weight used on the Paris market.

Rubber Markets of the Far East.

In 1922, ninety six per cent of the production of the world was plantation rubber of the Far East. The primary markets of the Far East are the main ones of the world. Seventy per cent of the plantation rubber is grown in the British possessions, twnety-five per cent in the Dutch East Indies, and five per cent in French Indo-China and elsewhere. About one-half of European capital invested in rubber properties in the Dutch East Indies is British, which gives them the control of the rubber market of the world.

Prior to the war nearly all rubber from the East was shipped to Europe, and that portion intended for American consumption was mostly transshipped to New York. With the advent of the Eastern markets many new customs and methods of selling and shipping were installed, such as direct selling of a large part of the production of sterling companies in Singapore and the forwafding of shipments direct to the United States. London and Amsterdam have succeeded in regaining control of the actual selling of the rubber from the Dutch companies to the United States. If it were not for the enormous quantities produced by the natives, which must be sold

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in the East, together with the support of the dollar and the rupee companies (those companies financially controlled in British Malaya or Ceylon), it is doubtful if the Singapore an d Colombo markets could have maintained themselves, though American interests have consistently supported them.

British Malaya.

British Malaya is the name applied to the three groups of British possessions in the Malay Peninsula. These are the Straits Settlements, the Federated Malay States, and Non Federated Malay States.

Rubber and tin are the two major exports of British Malaya and constitutes by far the greater part of the wealth of these countries. The principal rubber market of this group of British possessions is Singapore.

Singapore.

Estate Agents.

Rubber produced on European estates is disposed chiefly through the estates's agents. As agents, these firms act in an intermediary position between the directors and the estate management. In this position they visit the estates, make reports on their operations, audit the accounts, and supervise the manager in his duties and also purchase the estate supplies. In addition to these functionso they take over the disposition of the estates's

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rubber production and either sell it on the local market or export it to London and New York. For these services the firms receive a compensation and commission.

Weekly Auctions.

The importance of Singapore as a market for rubber is shown in the following table.

All lots of rubber to be offered at the weekly auctions by the estate agents are catalogued, and weight and trade classification are given. This information can be obtained by the buyer when inspecting the samples the day prior to the auction. At the auctions each estate agent has a representative who sells the various lots on their respective catalogues to the highest bidder. The currency used is the Straits dollar (par value $.5678). All sellers at the auction must be members of the Singapore Chamber of Commerce Rubber Association, and buyers must either be association members or permit holders of the association. Rubber sold at the weekly auctions is "spot" rubber to be delivered in the buyers warehouse within six days from date of sale. Due notice must be given of the intention to deliver the rubber so that the buyer may make the necessary arrangements to receive, inspect, and weigh the lot. Before sellers make delivery, buyers must deposit ninety per cent of the value of the rubber or provide a guaranty countersigned

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Importance of Singapore as a rubber market.

	pounds.
1912	1,169,262
1913	3,379,168
1914	5,973,179
1915	16,401,788
1916	37,419,573
1917	54,469,168
1918	70,930,382
1919	78,626,086
1920	59,460,715
1921	55,239,169
1922	54,486,836

by a bank acceptable to the seller. In return for the buyer's letter of guaranty or cash deposit, the seller gives him a guarnaty so that the buyer will not be responsible and protect him from loss in case of non delivery. If any disputes concerning deliveries of rubber arise these controversies are referred to certain members of the panel of arbitrators of the rubber association, and appeal from their decision can only be made to the committee of the association, whose decision is final.

The panel of arbitrators is appointed by the committee of the association from among the association membership. The committee of the association is elected by the members at their annual meeting and has charge of the general administration and management of the affairs of the association.

Private Sales.

A considerable portion of rubber is disposed of through the weekly auctions. Business is also done privately, either for "spot" rubber or for rubber to be delivered at a future date. The rubber sold at private sales, together with that sent into Singapore from small native holdings in British Malaya, South Sumatra, Borneo, and the small nieghboring Islands, amounts to a much larger quantity than is disposed of in the weekly auctions. Private sales from European estates are made either through direct

negotiations with the estate agents or with a broker acting as intermediary between buyer and seller. In the latter case the seller pays the brokerage a commission.

Rubber shipped to Singapore by native producers is generally sold privately through Chinese firms, whose local duties are those of a commission merchant. European estates and dealers in Java and Sumatra also have been shipping rubber to Singapore to be sold principally at the auctions.

Brokers.

The two classes of brokers operating in this market are guaranteed solvency brokers (who guarantee the solvency of both the buyer and the seller) and the ordinary brokers who act only as intermediaries between buyer and seller. Solvency brokers charge double the commission of the ordinary brokers. Buyers and sellers may deal direct without an intermediary.

Buyers in the Singapore market are mostly firms doing a general import and export business, and are usually representatives of interests of New York and London, to whom they make shipments for resale in those markets, though some of them act also as buying agents for American manufacturers and ship direct to them. Several of the large manufacturers, have their own organizations there who buy and ship large quantities direct to their factories in the United States.

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Financing Shipments.

After the rubber is delivered into the buyer's warehouse, quality passed, and weights approved, final settlement is made by check on oen of the local banks. The Straits dollar is the currency of British Malaya. Its value at par is $0.5678 in United States currency and two shillings four pence insterling currency.

Financing by means of an overdraft is the method generally employed, through actual funds are cabled some times to the buyer if he desires it. For the facility of an overdraft the bank makes an interest charge of a certain per cent. During the life of the overdraft the rubber purchased is technically the property of the bank, as the buyer gives the bank a lien on the rubber and at the same time insures it fully against fire and theft.

"Letters of credit in favor of the local buyer are opened in the United States by his American principal and are either insterling or United States currency, depending upon conditions, the usance being demand, sight, or for thirty, sixty or ninety days, as the case may be. Upon receipt by the buyer, through the Singapore bank, of advice that a credit has been opened, exchange is fixed, for whatever portion the buyer desires, with the bank giving the most favorable rate."

Shipping.

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Rubber bought in Singapore is delivered to the buyer's warehouse in an unpacked condition unless otherwise specified in the contract. After acceptance by the buyer, the rubber is packed for shipment in wooden cases or gunny-covered bales averaging about 190 pounds net and occupying about five cubic feet.

Upon receipt of "alongside orders" from the agnets of the shipping companies the cases and bales of rubber are loaded into a lighter, a bullock cart, or motor truck, depending upon whether the ship is loading "In the roads" or at the wharf. Upon arrival of the rubber alongside the ship, the chief officer with the aid of his assistants inspects each case or bale for water damage or improper packing, as the slings come over the ship's sides for lowering through the hatchways into the hold.

Quite often the cases and bales in which the rubber is packed are broken enroute from the warehouse to the ship, or the rubber from the lighters is damaged by rain or sea water, in which case the packages are rejected outright by the ship's officer or received with a notation as to their condition on the mate's receipt and the bill of lading that is not a clean bill of lading, due to the fact that any notations on the documents

showing the rubber to be damaged in any way would make thedocuments less readily negotiable at the bank and also lead to possible difficulties with the insurance underwriters.

In packing rubber for shipment care must be taken to keep the packed cases and bales from actual contact with the ground or cement floors, which are generally damp, in order to lessen the risk of the rubber becoming moldy. Careful shippers stow their cases or bales of rubber on a false floor or framework, thus permitting a current of air to pass between the cases and the damp floors.

India and Ceylong.

The rubber industry of Ceylon and South India is almost completely under European (white) control, there being no large areas of native rubber holdings in these countries comparable to those in British Malaya, Sumatra, and Borneo.

Colombo is the only rubber market in Ceylon. It is the only import and export center of commercial importance on that Island. The plantation rubber of Burma generally finds a market in Colombo, Singapore or Penang or is shipped direct to London.

These rubber companies generally sell only a portion of their rubber on the Colombo market, probably not more

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than is sufficient to meet the current expenses of the estates, thus making it necessary to transfer funds from London and saving bank commissions.

Rules and regulations governing the trade in this market are made by the Colombo Rubber Traders's Association, which is an organization similar to the Singapore Chamber of Commerce Rubber Association, and like that body is governed by a committee of management. There is also a panel of arbitrators to handle disputes arising between members of the association.

Brokers and Buyers.

In Colombo private sales are, as a rule made through ordinary brokers. The market is influenced a great deal by the British. Buying firms come under the same general classes as those in Singapore except that there no large native import houses dealing in rubber.

Financing.

Exactly the same procedure is used in financing rubber purchases and shipments in Colombo as in Singapore, except that Ceylon rupees (not Indian) is the currency used instead of the Straits Dollars. (Par value of the Ceylon rupee is $0.324 in United States currency and one shilling six pence in sterling.)

Shipping.

The packing and shipping is practically the same as

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in Singapore. The main difference in shipping conditions between Singapore and Colombo is that Colombo has quiet inside the harbor, where ships anchor and receive their various cargoes, thus diminishing the danger of wet or damaged rubber between the warehouse and the ship's side. As a result of better loading conditions, rubber shipments received from Colombo should be more free from mold than those from Singapore. The total exports from Ceylon for the first ten months from November 1922, to August, 1923 inclusive, were 35,214 tons.

Dutch East Indies.

The Netherlands, next to Great Britain, controls the largest investment and acreage of plantation rubber, all of which area is located in the Dutch East Indian Archipelago and principally in the Islands of Java, Sumatra, and Borneo. Native plantations and holdings play an important part in the marketing and export of this essential commodity. It has been stated that one- third of the area under plantation rubber is native controlled, though there is no way of obtaining true statistics on this point, but it is believed that the proportion of native rubber would be found to be even greater than one-third.

Rubber Markets of Java.

The Java rubber market is divided between Batavia

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and Soerabaya. Rubber from the estates in the Lampong district of South Sumatra and the Padang district of the West coast of Sumatra is shipped to Batavia and either sold on that market or transhipped with other rubber from Java to the United States or Europe against direct sales made in London or Amsterdam. Singapore also receives from Batavia and Soerabaya some Java rubber for sale in that market.

Batavia.

Weekly Auctions.

The weekly auctions of Batavia are really a system of selling by sealed bids submitted to the secretary of the Batavia Rubber Association, which makes the rules and regulations covering this market. Sealed bids are made after inspecting sealed samples, and the rubber is sold to the highest bidder, provided the price offered is equal to or greater than the reserve price placed upon the lot by the seller. All sales, whether in auction or by private treaty pass through brokers, the buyer and the seller each paying half the commission.

Buyers.

The Dutch houses are in the majority as buyers and sellers, though British interests are important and their ~~and~~ buyers are very influential on the market. New York, London, and other foreign buyers are represented by

Dutch, American, British and export firms of other nationalities in a manner similar to that employed in Singapore. Buyers in Batavia operate on the Soerabaya market through branch houses or subagents, placing orders by telegraph or telephone. English is the usual language of business between Dutch and American firms, as nearly all Dutch business men speak several languages including English. It is a big asset for an American in business in the Dutch East Indies to be able to speak the official language of the country.

Financing.

The florin (guilder) is the currency of the Dutch East Indies. Its par value is $0.402, but daily fluctuations take place, similar to those of the Straits dollar, and the Ceylon rupee, which fluctuations demand constnat and careful watching by commercial interest.

Shipping.

Trandjong Prick is the port and is about ten miles from Batavia. Tansportation between the two places is made either by railroad or by canal. The procedure regarding shipments of rubber is the same for Batavia as for Singapore.

Soerabaya.

Soerabaya is the princpal market of Java for rubber

which comes mainly for large European owned plantations in South Java and Madura and the Islands East of Java. Macassar, the principal port of Celebes, sends a portion of the products of those Islands to Soerabaya also, the balance, expecially that controlled by the natives, going to Singapore.

Unlike Batavia, Soerabyaya has its own port and does not need to make the additional transshipment that is necessary for cargo which is sent to Batavia for export. The other conditions concerning the Soerabaya rubber market are the same as those which govern the Batavia market.

Native Markets.

The native markets of Jambi, Palembang, Banjermasin, are controlled by the small native ~~producer-sells-his--~~ (mostly Chinese) merchants, to whom the native producer sells his rubber and quite often receives payment in trade, such as clothes, food, other necessities, and native ornaments. When the Chinese shopkeeper has bought or exchanged his goods for a sufficient quantity of rubber, it is baled and shipped to a Chinese merchant in Singapore, who in turn disposes of the shipment to some export firm and charges a commission for his services. This same system of collecting native rubber and the shipping of it to Singapore is employed in the territories surrounding

the native markets of Kuala Lumpur, Taiping, Ipoh, Kuala Kangsar, Telok, Anslon etc., all of which places are located in British Malaya.

Medan, Sumatra.

The country which has the largest investment of American capital in all the rubber producing sections of the Far East in Hevea plantations is the East Coast of Sumatra. On this island American interests control nearly 100,000 acres of rubber estates, most of which are planted.

Medan is the capital and commercial center of the East coast. Similar to Batavia, Medan is not situated on the coast, but has Belawan, eleven miles distant as its port.

The rubber industry of the East Coast of Sumatra is almost entirely controlled by European capital, though the Japanese control several thousand acres of rubber plantations there. Other European interests that control extensive rubber properties in the East Coast are those of Great Britain, France, Belgium, Switzerland, and Germany. About half of the total European area is owned by the British.

Medan became important as a rubber center during the World War and by the time of the Armistice this market had grown to one of considerable importance. At that time London and Amsterdam controlled estates sold

most of their production in this market. Several American manufacturers opened buying houses here during the war and most of them are still in operation.

Sales are made for delivery to Belawan in shippable cases. The rubber upon arrival at that place is inspected and checked for weight, then stored in the warehouse usually owned by the steamship companies or their agents, until shipped direct or via Singapore to the United States or Europe.

Financing and Shipping.

The same method of financing purchases and shipments is employed here as in the Java markets.

Until recently large ships were unable to reach Belawan, which rade it necessary for most rubber to be transshipped at Penang, Singapore, or Batavia, but being the port for Medan, and the one through which most of the imports and exports of the rapidly developing hinterland passed, the Dutch East Indian Government is building extensive new wharves and docks to take care of the future growth of the country.

French Indo-China.

There were 4,500 metric tons of plantation rubber exported from French Indo-China during 1922, almost exclusively by Frnch Capital, nearly all of which was sent to rubber manufacturers of France, and the balance being sent to Singapore for sale.

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Netherlands East Indies.

The area planted to rubber increased from 513010 bouws in 1921 to 526,190 bouws (1754 acres) in 1922. Production at the same time rose from 61,987 metric tons (2,204 pounds) in 1921 to 72,163 tons in 1922. The price of rubber for the first six months in this part of the country was twenty to thirty gilders per picul (a picul equals 133 1/3 pounds; a gilder is equavilent tl $.40) and in the last six months the market increased to sixty and sixty-five gilders.

Malay.

Malayan producers are at present chiefly occupied in studying the statistical position and market trend of rubber.

In January, 22,871 tons of rubber were exported; in February 19,907 tons; in March, 23,646 tons; in April, 24,008 tons; may, 20115 tons, June, 18621, tons, July, 17017 tons; and August, 16,011 tons. Imports alone into the United States Amounted up to the end of June to 193,000 tons. The estimated world's output of plantation rubber in 1923 is 360,000 tons. The consumption for the same year is put at 416,000 tons, Americans share

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Magazine - The India Rubber World. December 1, 1923.

being ~~conservat~~ placed at 296,000 tons and 120,000 tons allowed for the rest of the world.

Rubber Manufacturers in Australia.

Three factories have been producing rubber goods in Australia, the Barnet Glass Rubber Co. and the Dunlop Rubber Co. in Melbourne and the Perdriau Rubber Co. in Sidney. The aggregate capital of the three companies is about $10,000,000 and the number of men they employe is over 4,000. The Barnet Glass Factory now covers seven acres and the Dunlop factory over fourteen.

Several foreign companies have contemplated establishing factories in Australia to get within the tariff wall, but there are many reasons, principally the labor situation to discourage such plans. Tasmania is bidding for rubber factories from overseas on the basis of the Island's favorable climate and hydroelectric power. Any American plant that wished to put up a plant in Tasmania, which is only 270 miles from Melbourne, can probably get inducements from the Tasmania Government.

Sources of Australian Rubber Supply.

The raw rubber used in Australia is imported from the Dutch East Indies, and South America. No rubber trees are found in Australia proper, but they do grow in Papua and in former German New Guinea, which altogether comprise the eastern half of the big island of New Guinea.

Commerce Reports. April 17, 1922.

Papua has been for some years under Australian dominion, and former German New Guinea has been mandated to Australia by the League of nations. There are about 8,000 acres of rubber plantation in Papua, a large portion of this being owned by the Australian Gevernment. The German plantations in New Guinea were somewhat over 15,000 acres. There German owners have been expropriated and the plantations have not been well looked after. Neither Papua or New Guinea has produced any considerable quantity of rubber, the trees being rather young.

Conclusion

A Review of Foreign Opinion.

More than two-thirds of the total rubber put put goes into automobile tires. It was estimated that the consumption of rubber for 1922 for the world was 300,000 tons and the surplus stood at 110,000 tons. The acerage under plantation rubber is 3,300,000 of which in 1922, possibly 2,300,000 acres were in bearing. Except for about 100,000 acres this was all planted before 1920. The upkeep of European owned estates (some sixty-six per cent of the total acerage) has, on the whole been maintained during the slump; technique on the larger estates has improved; trees have been rested, and despite losses of labor and reduction of administrative staffs large re-

Magazines - The Annalist. April 23, 1923.
Commerce Reports. April 17, 1922.
Book - Rubber (History) by Schidrowitz.

ductions in the normal increase of the supply which should result from trees coming into full bearing in the next few years, are not expected.

Future.

The future of the plantation industry may, broadly speaking, be said to be definitely bound up with the three following factors:

(1) The quality of the rubber produced.

(2) The cost of production.

(3) The competition from other sources.

In addition there is, of course, the somewhat uncertain factor of the demand, which necessarily dominates the situation as a whole.

There are two main factors to be considered in the cost of production:

(1) Cost of bringing into bearing.

(2) Upkeep and manufacture.

The cost of bringing into bearing varies from eighteen to twenty pounds (British Money) per acre and upward. The total manufacture and upkeep cost is about 12.74 pence. To place the rubber on the European market a further three pence to three and a half pence (freight, brokerage, insurance, etc.) must be added making a total of about one shilling four pence per pound.

One of the most important points to be considered in connection with the future cost of production is that

of labor. At present the bulk of plantation labour in Malay is drawn from Southern India and consist of Tanuls. A small portion consists of Javanese, Chinese, and Malays. It is remarkable fact that the Malays - the natural inhabitants of the country - have a rooted objection to working on plantations, or in fact to any kind of work involving routine and the sinking of individuality. The Malay will readily cut paths through apparently impenenetrable jungles and fetch out wild rubber and other jungle products; as long as he is practically his own master. He will work intelligently, skilfully, and sufficiently hard if it is made worth his while. This characteristic of the malay is likely to be felt somewhat acutely in the future, for there are already signs that the Governments respectively of India and Java will not be able idefinitely to permit the continued emigration of labor from these countries. It may be necessary ultimately to have recourse on a large scale to Chinese labor. The better class of Chinese soolies will do excellent individual work if he is his own master, but is not particular anxious, to work which requires some individual skill for a low rate of pay.

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