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CONTENTS

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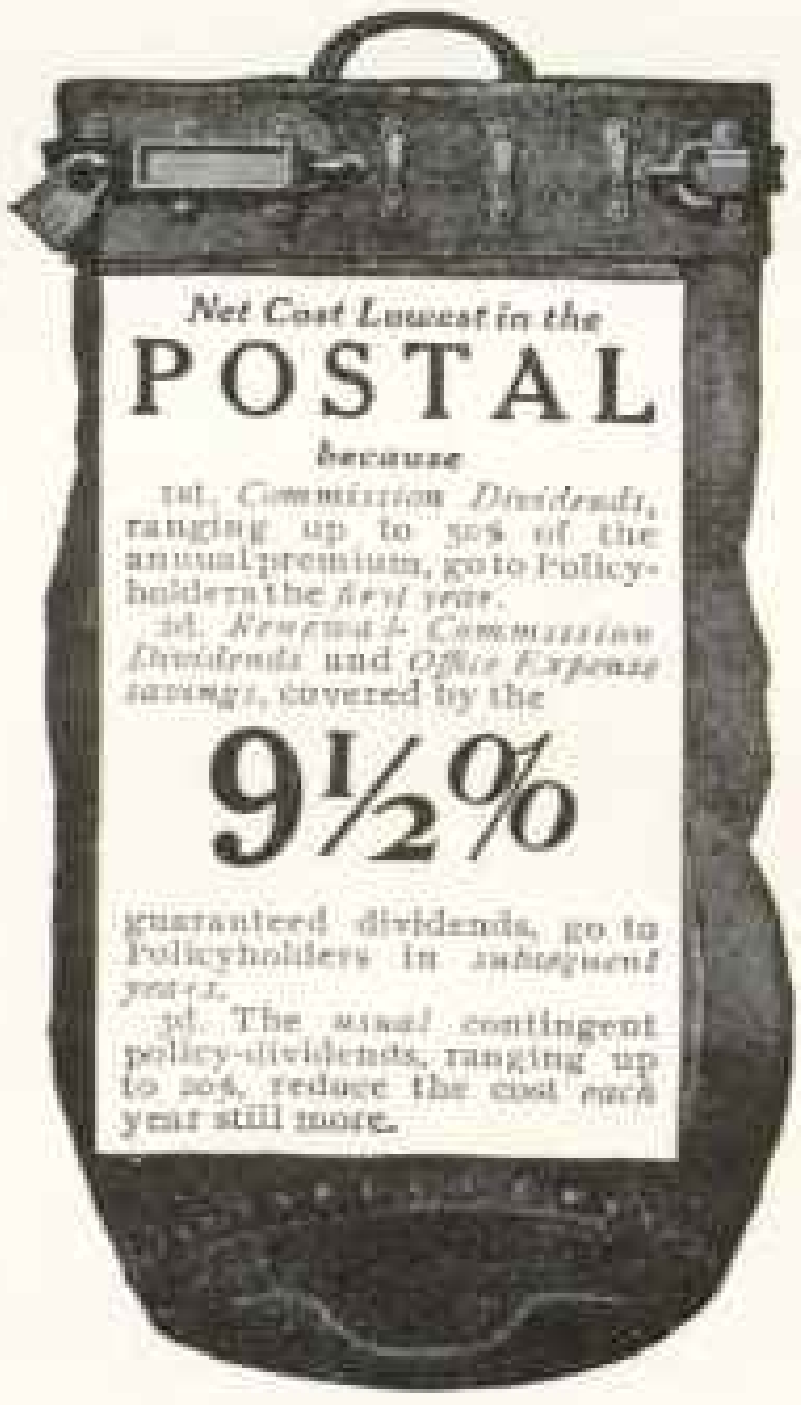

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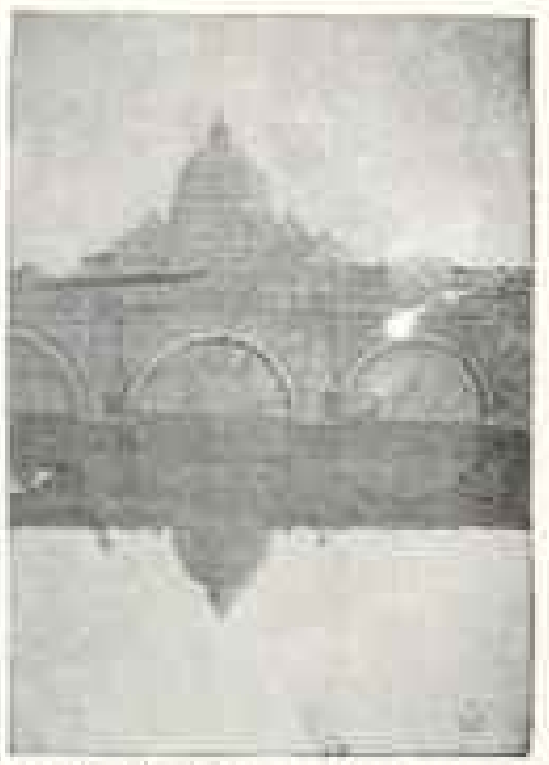

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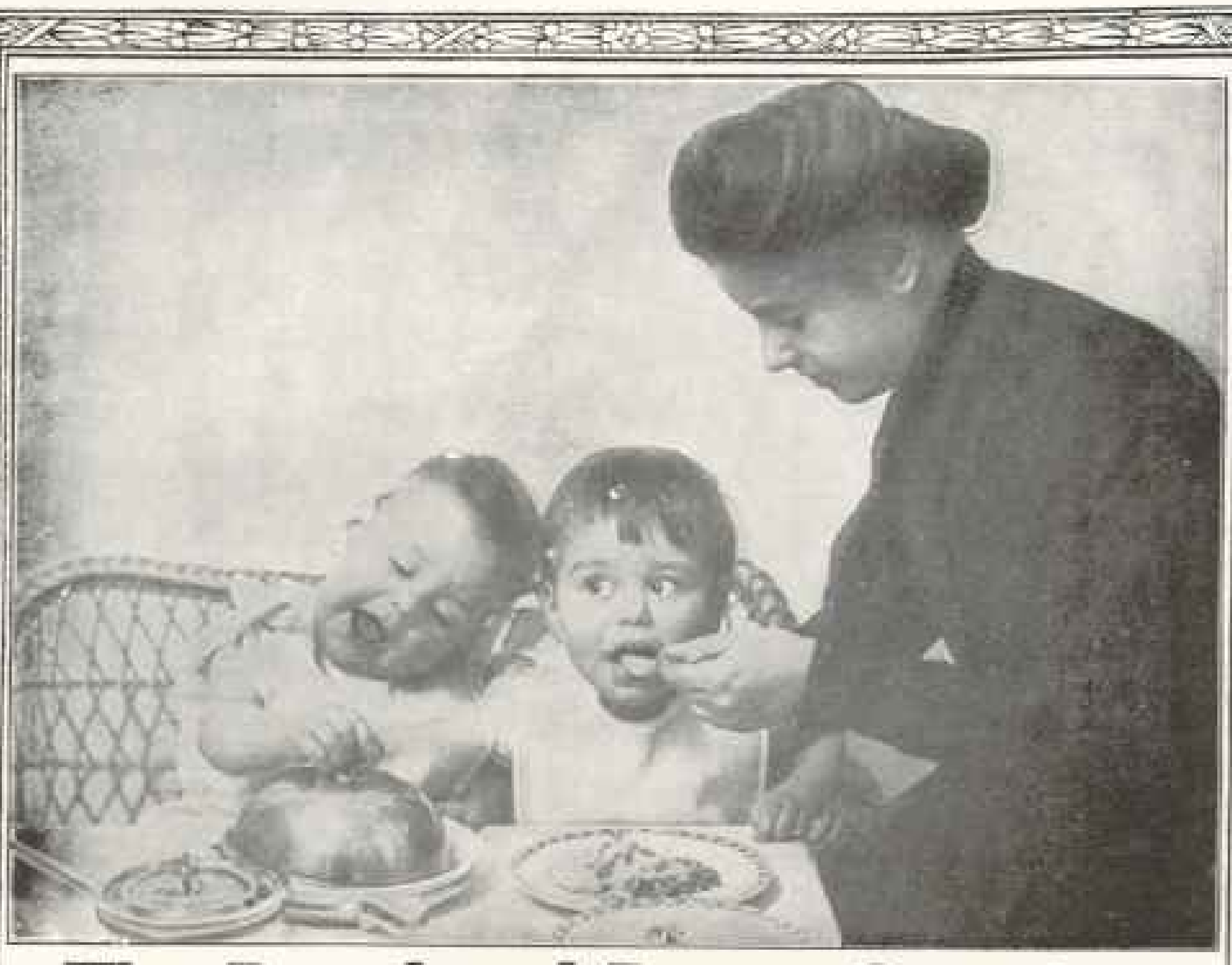

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VOL. XXII, NO. 10 WASHINGTON OCTOBER, 1911

THE NATIONAL GEOGRAPHIC MAGAZINE

NEW PLANT IMMIGRANTS*

By David Fairchild

Agricultural Explorer in Charge of Foreign Seed and Plant Introduction, United States Department of Agriculture

TO READERS of the National Geographic Magazine who have wandered with men of many tastes all over the world, the thought must often have come, "Of what use are all the strange plants which make up the landscapes of the pictures?" The globe, with its kaleidoscopic panorama of people, animals, and plants, has been whirled before you, as it were, and you have in your minds the picture of a ball circling through space, covered with a film of plants, animals, and men in constant change. So varied is this film of plants that there are probably half a million distinct, specific forms in it, and yet man uses only a few hundreds for his own purposes.

To change, in a measure, the distribution of the really useful plants of the world is what the office of Foreign Seed and Plant Introduction of the Department of Agriculture is trying to do. The motive underlying this work might be called the ambition to make the world more habitable. If one is inclined to be pessimistic with regard to the food supply of the world, he has only to talk to any one of the enthusiasts of the Department of Agriculture to get a picture of the widening vista of agricultural possibilities which would make him realize that the food problems of the race are not hung in the balance of our Great Plains area, and that the food-producing power of the world is still practically unknown, because we have just begun to study in a modern way the relative performance of different plants.

We may not always grow the plants we do now. Some of them are expensive food producers, some produce foods that are difficult to digest, and some we may leave behind as we learn to like others better.

What to grow was not so serious a question to the early Phœnician peasant, who knew perhaps a dozen crops, as it is becoming to the American agriculturist, who can pick from the crops of all the world the one best suited to his land and climate. Changes come so rapidly nowadays that if a man today talks of "pears" he may mean what are ordinarily thought of as pears, or he may refer to alligator pears which he is growing in Florida, or prickly pears which he is cultivating in Texas. Both the alligator pear and the prickly pear have come in as crops to be reckoned with within

*See also "Our Plant Immigrants," by David Fairchild, National Geographic Magazine, April, 1906.

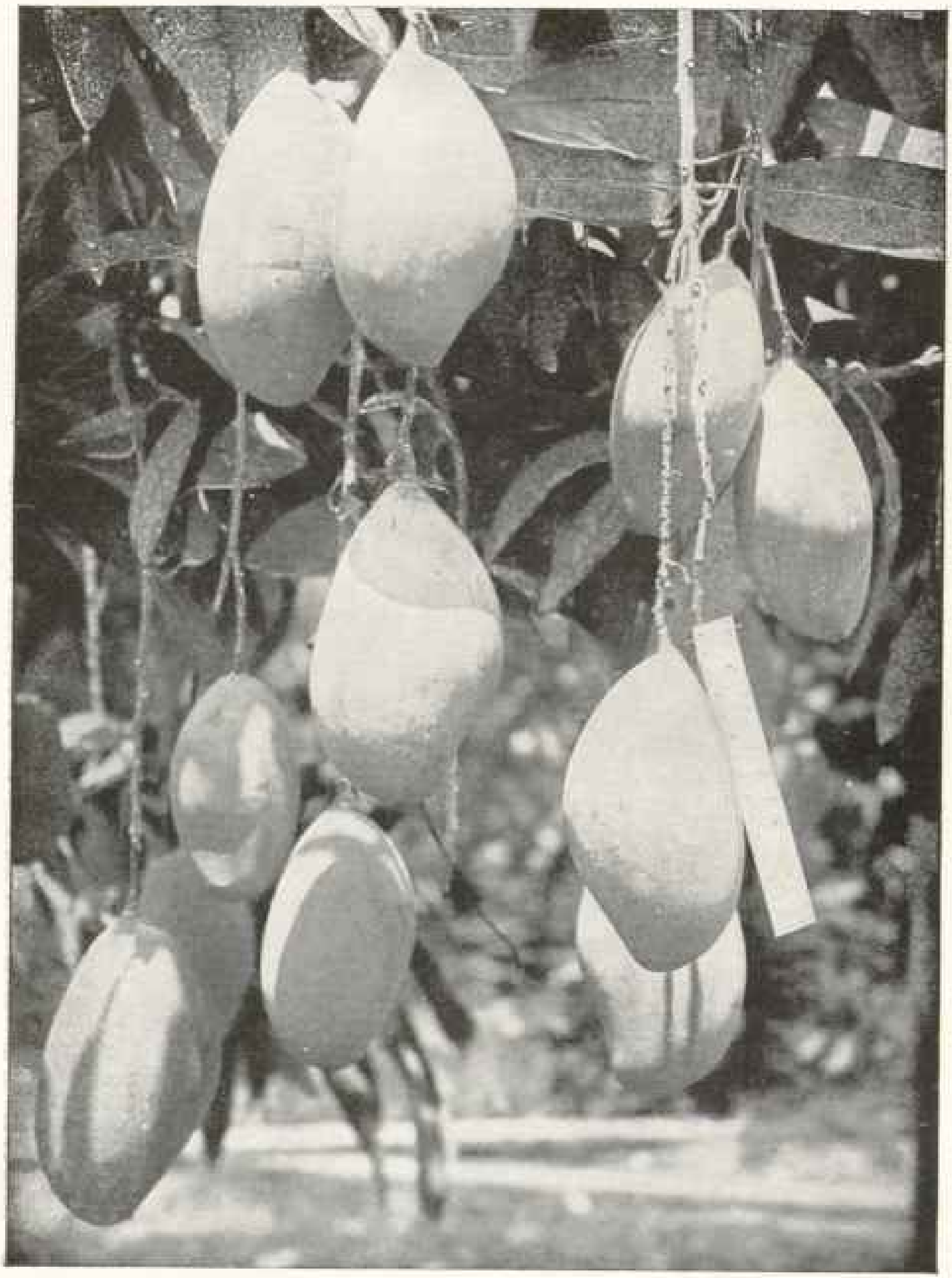


Photo by P. H. Dorsett

THE SANDERSHAW MANGO OF INDIA FRUITING IN FLORIDA

A six-year-old tree of this variety, which was introduced by the Department, bore sixty fruits at Miami, and these were submitted to the fancy fruit dealers of New York and other large cities, who declared that they could dispose of any quantity of such fruits at the fanciest prices. Three hundred dozen fruits of the Mulgoba, another East Indian introduction of the Department, sold last year at three dollars a dozen (see text, page 889).

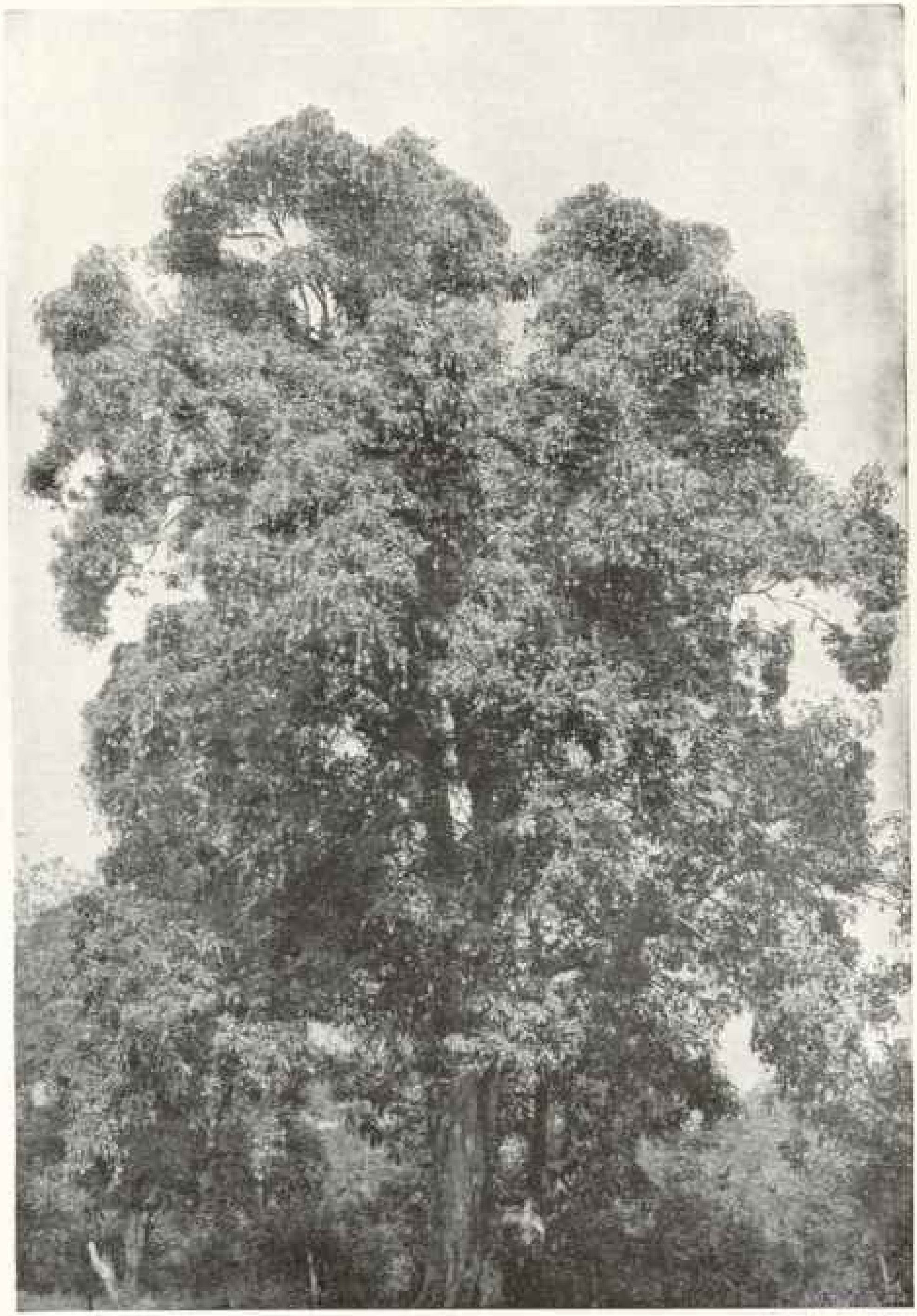


Photo by G. N. Collins

A MANGO TREE IN FULL FRUIT

The mango is one of the most important fruits in the world. In India it is so valuable as to be held sacred, and to deserve annual ceremonies and celebrations. Full-sized trees grow to 70 feet in height, and have been known to produce in India as much as $150 worth of fruit in a single season.

Photo by G. N. Collins

A SEEDLING MANGO TREE IN FULL BEARING

The fruits of many of the seedlings are so strongly flavored with turpentine that their sale in America has given people an idea that the mango is little more than a ball of tow soaked in turpentine. There are 500 varieties of grafted manges in India, however, some of which rank among the most delicious fruits in the world. Some weigh as much as 6 pounds, are entirely free from fibres, and are produced in quantity. Trainloads of them are shipped to the large cities of India.

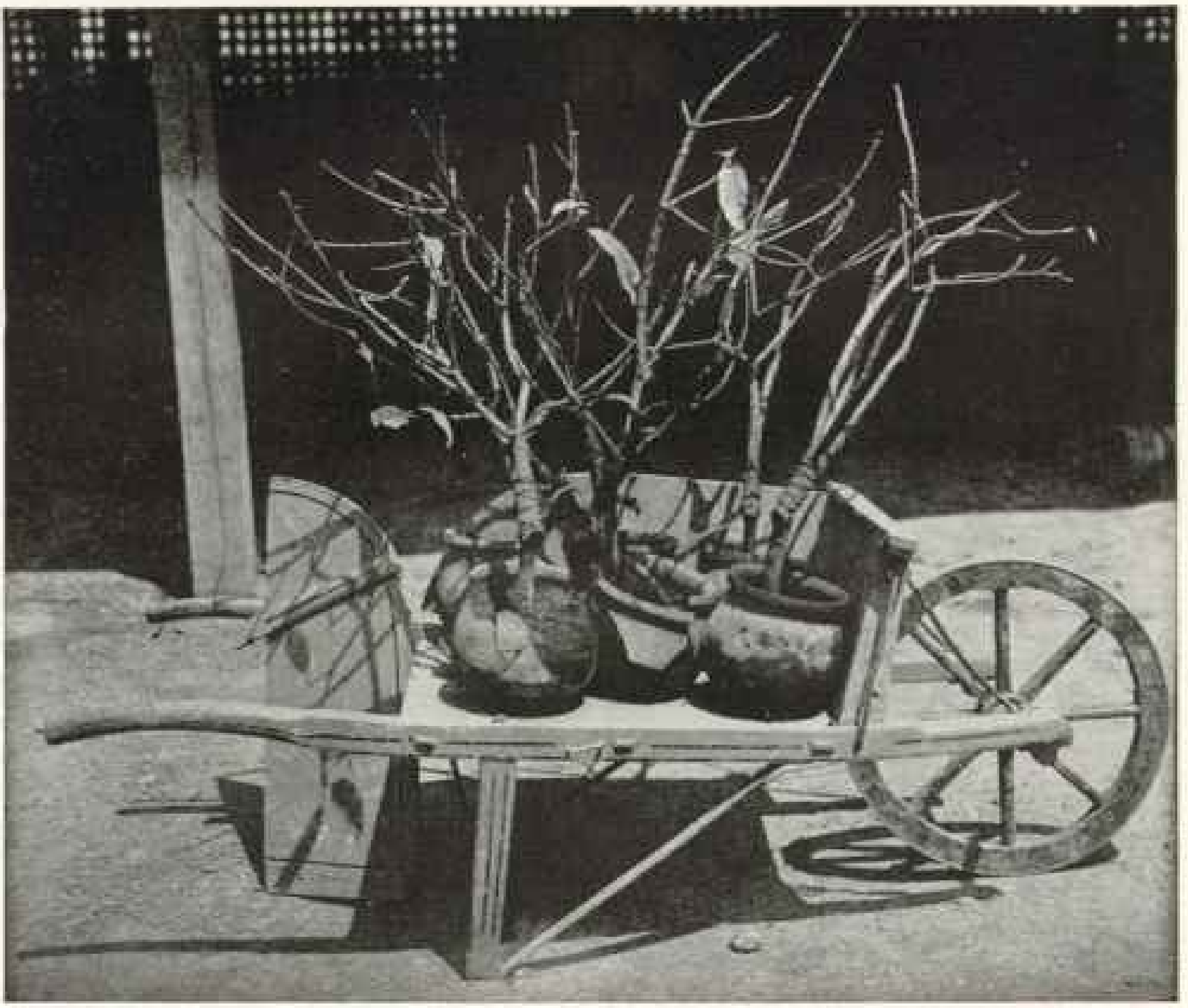


Photo by Crandall

NEW MANGO PLANTS AS THEY ARRIVED FROM BOMBAY

In India the mango is propagated by an expensive method of inarching, and the only way we have been able to get the plants for trial in Florida has been by importing the plants in pots. A Florida nurseryman, Mr. Cellon, of Miami, first learned how to bud the mango, and finds it almost as easy to bud as the peach. This is a great step in advance, and will make the distribution of the fine varieties an easy matter. This method of propagation is now being successfully practiced by Mr. Edward Simmonds at our Plant Introduction Garden at Miami, Florida.

the past 15 years, and already the stock-raisers of the South are wondering if they should plant spiny or spineless forms of the prickly pear cactus, and the fruit-growers of Florida are inquiring as to which of the several varieties of alligator pear tree is going to be the most productive and profitable.

To help find the plant which will produce the best results of any that can be grown, on every acre of land in the United States, is, in general, the broad policy of the Office of Seed and Plant Introduction of the Bureau of Plant Industry.

Although begun in a systematic way and as a distinct activity of the Department in 1897, it has barely touched the fringe of its possibilities. The 31,000 different plant immigrants which have come in, and have either died or are now growing somewhere in this country, represent a small beginning only, and have merely helped to show the great-

Photo by Frank N. Meyer

A NEW BAMBOO GROVE IN THE CAUCASUS, ESTABLISHED RECENTLY BY THE RUSSIAN GOVERNMENT

The Russians have foreseen the great commercial possibilities of the timber bamboos of the Orient, and have started a grove of considerable size at Chakva in the Caucasus, which experiment is a success, according to the investigations of Mr. Frank N. Meyer, our Agricultural Explorer. New methods of steaming the bamboo poles under pressure have been devised, and a demand far exceeding the supply has sprung up for the cheap irrigating pipes, telegraph poles, scaffolding material, ladders, and furniture which are made from the timber already cut from the grove (see text, page 904).

ness of the possibilities which progress in agricultural research is creating.

"You will soon have all the crops in," is the remark of those who have given the matter little thought. Our own lives change with every moment of time, and so do the lives of plants. The strains of potato which our grandfathers grew are, with few exception, different from the strains in vogue today; and, fitting their lives into the various conditions of soil and climate, the original wild South American species of potato, *Solanum tuberosum*, assumes in the hands of men a thousand different forms.

In whatever parts of the world new forms may spring into existence it matters not; our potato-growers should be able to try every sport of importance and every wild, hardy species, whether it comes from the manse of a Scottish parson, is discovered as a wild species along the Paraguay River by an American railway bridge-builder, is found among the mountains of Colombia by a Jesuit priest, is gathered by a forest ranger in

Photo by Frank N. Meyer

BAMBOO TIMBER AS IT IS RAFTED DOWN THE TRIBUTARIES OF THE YANG-TSE RIVER

It is difficult to give an adequate idea of the magnitude of the bamboo timber business of China and Japan, because it is scattered throughout the country, and every farmer has his own little grove, from which he cuts irrigation pipes, timbers for his house and shingles for his roof, and from which he makes all sorts of useful articles for his household.

the dry regions of an Indian reservation in New Mexico, or is secured by a trained collector from the Chiloe Islands off the coast of Chile. It makes little difference; they must all come in as plant immigrants to show what they can do in the gardens of American experts. There is always the chance that they may be thrown out as unprofitable; but, if they have desirable characters, they can be blended with others, or exploited with others, if they are superior for any of the potato regions of this country.

It may be new to many that every day plant immigrants from different parts of the world arrive in Washington, and every day, through the mails, hundreds of these disinfected arrivals go out to find a new home in some part of the country.

It is a difficult matter to give an adequate impression of the magnitude and importance to the country of this stream of new plant immigrants which for 14 years has been pouring into the country, and has been directed by a great and growing body of research men and women into those regions where it was thought they might make their homes.

In the brief space of a short article, and to avoid what would be almost a bare enumeration of plant names, I pre-

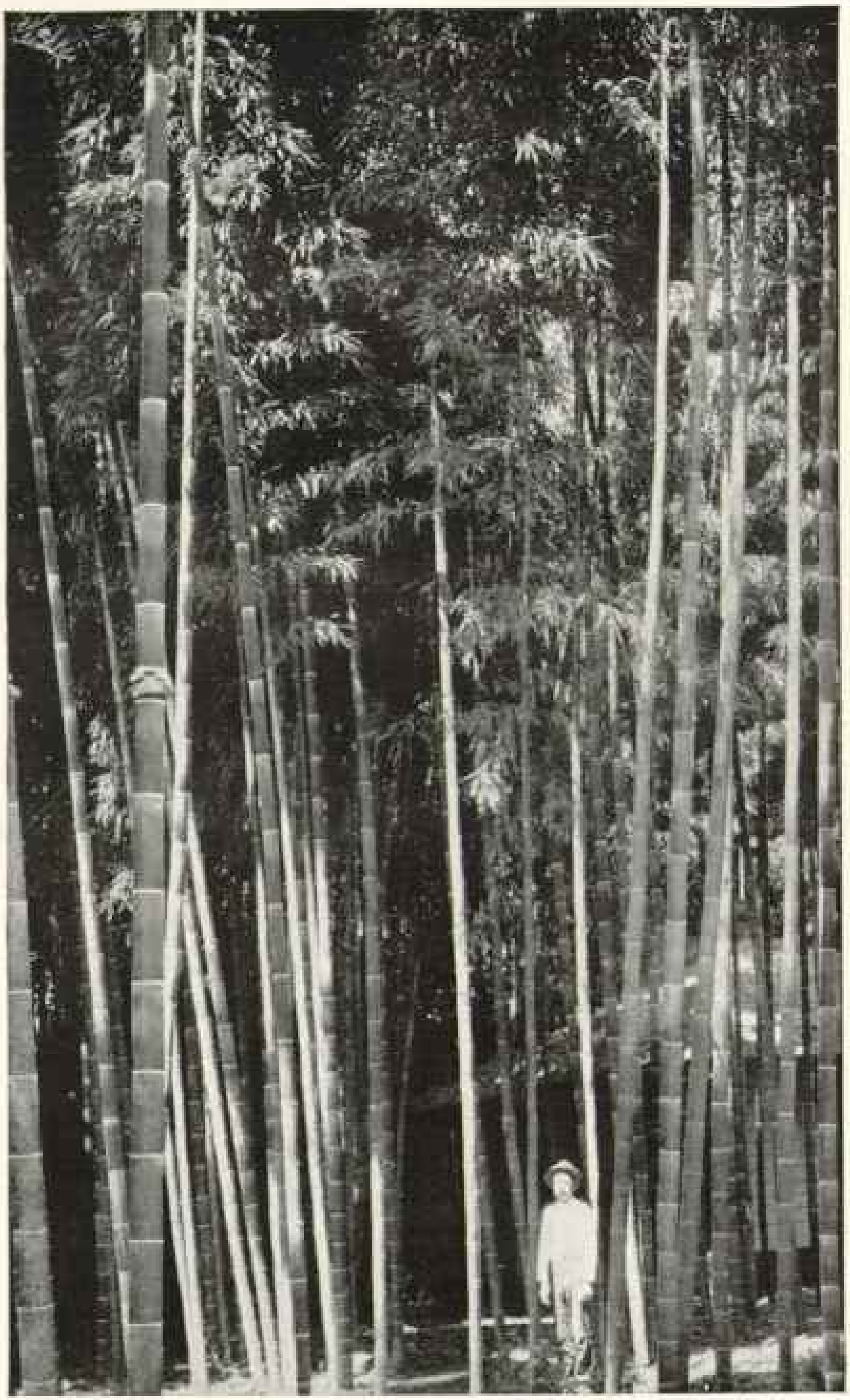


Photo by P. H. Dorsett

THE TEVIS BAMBOO GROVE OF BAKERSFIELD, CALIFORNIA

This is the first grove of any size to be established in America. Mr. William Tevis, of San Francisco, the owner, bought a single plant of the "Giant Japanese Bamboo" from a Japanese nurseryman in San Francisco about twelve years ago, and from this single plant has grown a grove which is so strikingly beautiful that those who have seen it declare it to be one of the most fascinating things in the country. The graceful, plume-like stems rise over fifty feet in the air, and cast an enchanting shade on the carpet of brown dead leaves below.

Photo by Frank N. Meyer

BAMBOO WARES AS THEY ARE OFFERED FOR SALE IN CHINESE VILLAGES

No material is to be compared with the bamboo for the construction of this kind of work. It can be split into strands no larger than a horsehair, and from the same shoot can be made broad bands and hard, rigid framing pieces. The most delicate baskets in the world are made of bamboo, and at the same time the coarsest, roughest weirs, to be filled with stones and rolled into the streams for holding embankments.

fer to treat of only a few of the many important problems with which the office is working, passing by, also, the introduction of the Durum wheat, the Japanese rice, and giving the Siberian alfalfas, which are earning for the farmers of the country many millions of dollars a year, a bare mention, for the reason that they have been so often described in the magazines and daily papers.

The mango is one of the really great fruits of the world. India, with its hundreds of millions of people, has for centuries held it sacred, and celebrates annual ceremonies in its honor. The great Mogul Akbar, who reigned in the 16th century, planted the famous Lak Bag, an orchard of a hundred thousand mangos, and some of these still remain alive. It is a fruit the importance of which Americans are at last beginning to recognize, notwithstanding the unfortunate discredit which the worthless seedling mangos of the West Indies have given it in the minds of Americans generally.

There are probably more varieties of mangos than there are of peaches. I have heard of one collection of 500 different sorts in India. There are exquisitely flavored varieties no larger than a

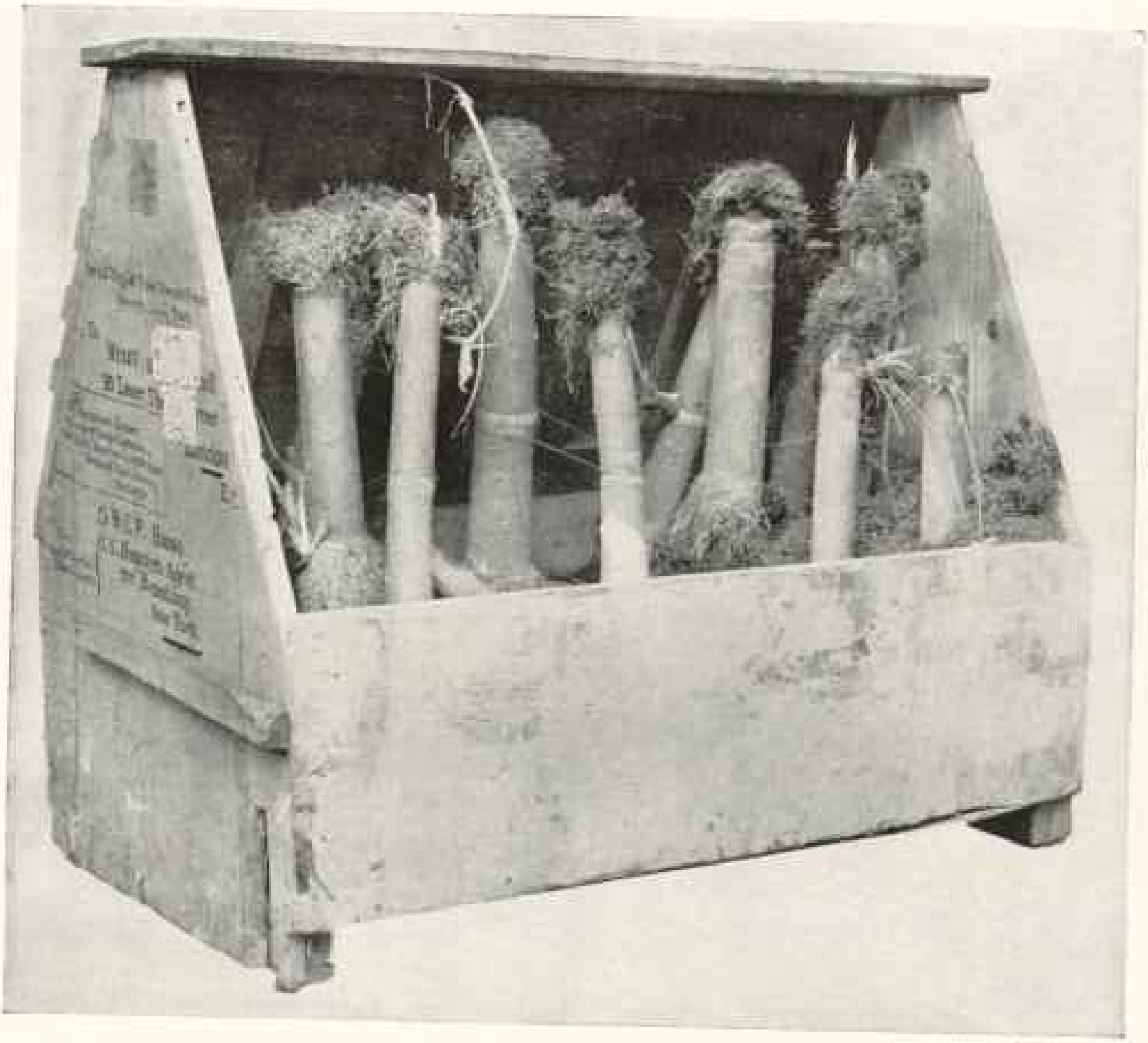


Photo by Crandall

LIVING PLANTS OF THE INDIAN BAMBOO, FROM WHICH THE SPLIT BAMBOO FISHING POLES ARE MADE, AS THEY ARRIVED AT THE DEPARTMENT OF AGRICULTURE

As there are many species of bamboo which produce seed only once in 40 years, the only way to get them into this country is by means of special shipping cases, called Wardian cases, which are in effect miniature greenhouses, in which the plants are permitted to grow during the voyage, being watered on the way.

plum, and there are delicious sorts the fruits of which are six pounds in weight. In India, where the wage of a coolie is not over 10 cents a day, there are varieties which sell for $6.60 a hundred, and the commonest sorts bring over a cent apiece.

The great mango trees of India are said to reach a height of 70 feet, and are so loaded down with fruit that over $150 worth has been sold from a single tree.

These fine varieties, practically as free from fiber as a freestone peach, can be eaten with a spoon as easily as a cantaloupe. Train-loads of these are shipped from the mango-growing centers of India and distributed in the densely peopled cities of that great semi-tropical empire; and yet, notwithstanding the great importance of this fruit, the agricultural study of it from the new standpoint has scarcely been begun. I believe that it has never, for example, been tested on any but its own roots.

Photo by Frank N. Meyer

THE CHILDREN ARE HOLDING SHOOTS OF TWO SPECIES OF EDIBLE BAMBOO

Bamboo shoots form one of the favorite vegetables of the Chinese, and the cultivation, both in China and Japan, of the species which yield the edible shoots is a lucrative business, in which large amounts of capital are invested. To the Oriental the edible bamboo is more important than asparagus; in fact, while we are introducing into America the bamboo, the Japanese and Chinese are introducing the asparagus into their countries.

We have gathered together in Florida and Porto Rico and Hawaii more than a hundred varieties, and some which we have fruited have already attracted the attention of the fancy fruit-dealers, who agree that the demand for these will increase as fast as the supply can be created, and maintain that extravagant prices, such as 50 or even 75 cents apiece, will be paid for the large, showy, delicious fruits. Last year 300 dozen Mulgoba mangos were sold in Florida for $3 a dozen. The Governor of Porto Rico has committed himself to a policy which, if carried out, will cover the island with hundreds of thousands of mango trees of the better varieties.

One of the oldest cultivated plants in the world is the date palm. At least 4,000 years ago it was growing on the banks of the Euphrates, and it is this plant and the camel that together made it possible for the Arabs to populate the great deserts of northern Africa and Asia. The date palms would grow where the water was alkaline, and the camels were able to make long journeys across the desert to take the dates to the coast to market and sell them for wheat and olives.

In these deserts of the old world, millions of Arabs live on dates, for the date palm can be cultivated on land so salty as to prevent the culture of any other

Photo by P. H. Dorsett

THE FIRST GOVERNMENT GROVE OF TIMBER AND EDIBLE BAMBOO, ESTABLISHED IN A CLEARING ON THE RICH LANDS OF NORTHERN FLORIDA

In the Orient the commercial groves of bamboo stretch for miles along the streams, and, aside from the fact that they are lucrative investments, they form the most enchantingly beautiful landscape effects. It is with the object of creating a sufficiently large grove of these plants for the commercially inventive minds of Americans to work upon that this planting at Brooksville, Florida, has been made.

Photo by P. H. Dorsett

A BAMBOO WINDBREAK AT THE PLANT-INTRODUCTION GARDEN AT BROWNSVILLE, TEXAS

Protection from the northers is afforded in south Texas by any dense, bushy growth, but it has been difficult to find the right plant to form such a growth. Such a plant has been discovered in a drought-resistant species of bamboo from Bengal. This forms an impenetrable hedge, and makes it possible to grow certain plants which need protection from the cold, drying winds of winter.

paying crop, and it will live in the hottest regions on the face of the globe; not even a temperature of 125 degrees F. will affect it. This obliging plant does not, however, insist on such temperatures, but will stand some frost, and has been known to live where the mercury falls to 12 degrees F.

It is also the only wood obtainable in the oases of the Sahara, and on the shores of Arabia boats are made of it.

The date palm has both male and female flowers and they occur on separate plants, and the Arabs have to plant one male for every plantation of a hundred females, making a harem as it were. The artificial pollination or fertilization of the female palms is one of the most interesting processes practiced with plants, a spray of flowers from a male palm being bound with a bit of palm-leaf fiber in each inflorescence of the female tree. Propagation of the date palm can be accomplished by means of seeds, or suckers, which are thrown up at the base of the palm. Suckers will start, however, on land so salty that the seeds refuse to grown on it.

Four years from seed, trees of some varieties begin to bear and in six years will have paying crops of dates. They live to a much greater age than almost any other of the fruit trees, and specimens a century old are said to be still a good investment.

The date is not a dry-land crop, but requires irrigation to grow and produce fruit. A plantation once established requires to be kept free of weeds, to be pollinated when the palms come into bloom, and to have the fruit harvested when ripe. Of insect pests we know too little as yet, though the prospective planter should count this in his estimate of expense; remembering, however, that modern scientific methods have overcome the greatest fruit pests, and that

Photo by David Fairchild

AN ARAB IRRIGATING HIS DATE PALMS IN BAGDAD

Four thousand years ago his ancestors watered their date palms along the banks of the Tigris. The introduction of this oldest of cultivated crops into America will remain as a historical event after generations of Americans have come and gone.

these on the palm are not different in general character from those which are now under complete control.

Very little pruning of the palms is necessary, and the harvesting is very simple, since the dates grow in great bunches, which often weigh from 20 to 40 pounds apiece.

There are over a hundred varieties of dates now growing in the government gardens in California and Arizona, from

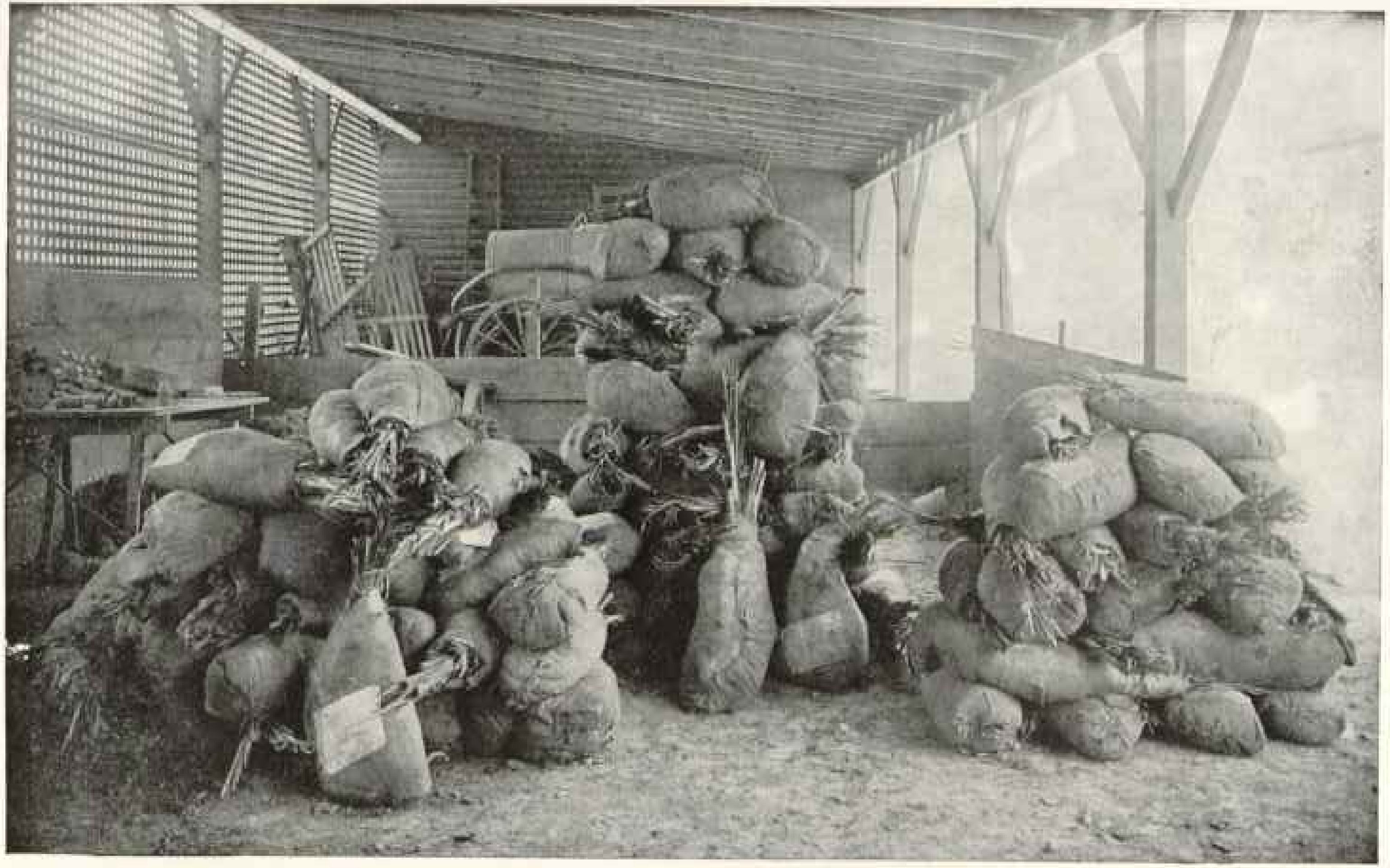


Photo by Crandall

PLANT IMMIGRANTS FROM BAGDAD AS THEY ARRIVED IN WASHINGTON

Suckers of Arabian date palms received three years ago from Consul Maggleson, which are now growing and will fruit in a year or two in the desert region of the Southwest

Photo by P. H. Dorsett

THE TUNG OIL TREE OF CHINA AT THE FOOT OF MOUNT RUBIDO, RIVERSIDE, CALIFORNIA

Photo by David Fairchild

AN ARAB IN EGYPT CLIMBING A DATE PALM FOR THE PURPOSE OF FERTILIZING THE FLOWERS TO INSURE A CROP OF FRUIT

This four-year-old tree produced 50 fruits, and indicates the possibility of its cultivation in America. The tung oil, which is made from the seeds of this tree, is considered by paint manufacturers as the best drying oil known, and immense quantities are shipped down the Yang-Tse-Kiang and through the Suez Canal to New York.

Photo by P. H. Dorsett

A BUNCH OF DATES RIPENING IN THE DESERT REGION OF SOUTHERN CALIFORNIA

There are few fruit crops which present a more beautiful show than the date, for it has its golden yellow or brilliant red fruits all gathered together in great clusters, as though harvested and in baskets.

Photo by David Fairchild

LOOKING FOR THE RIPE DATES

This is possibly the first time in history that an American child has had the experience of hunting in America for ripe dates in the orchard of date palms about the house. Many thousands of children will have this experience before this one is a grown woman.

Photo by N. E. Hansen

RUSSIAN PEASANTS GATHERING SEEDS OF THE WILD ALFALFA NEAR THE EDGE OF THE GOBI DESERT FOR THE AGRICULTURAL EXPLORER, N. E. HANSEN

This is the yellow-flowered *Medicago falcata*, the hardiest of the alfalfas; destined, it is believed, to make its home on our northwestern ranges, or when bred with the ordinary alfalfa to render it proof against the severest drought and the most intense cold which visits the northwest.

Photo by David Fairchild

A 15-ACRE OASIS OF DATE PALMS IN CALIFORNIA

This plantation was started by the government six years ago, and into it were gathered the best dates of the world. Most of them fruited this summer and attracted thousands of visitors.

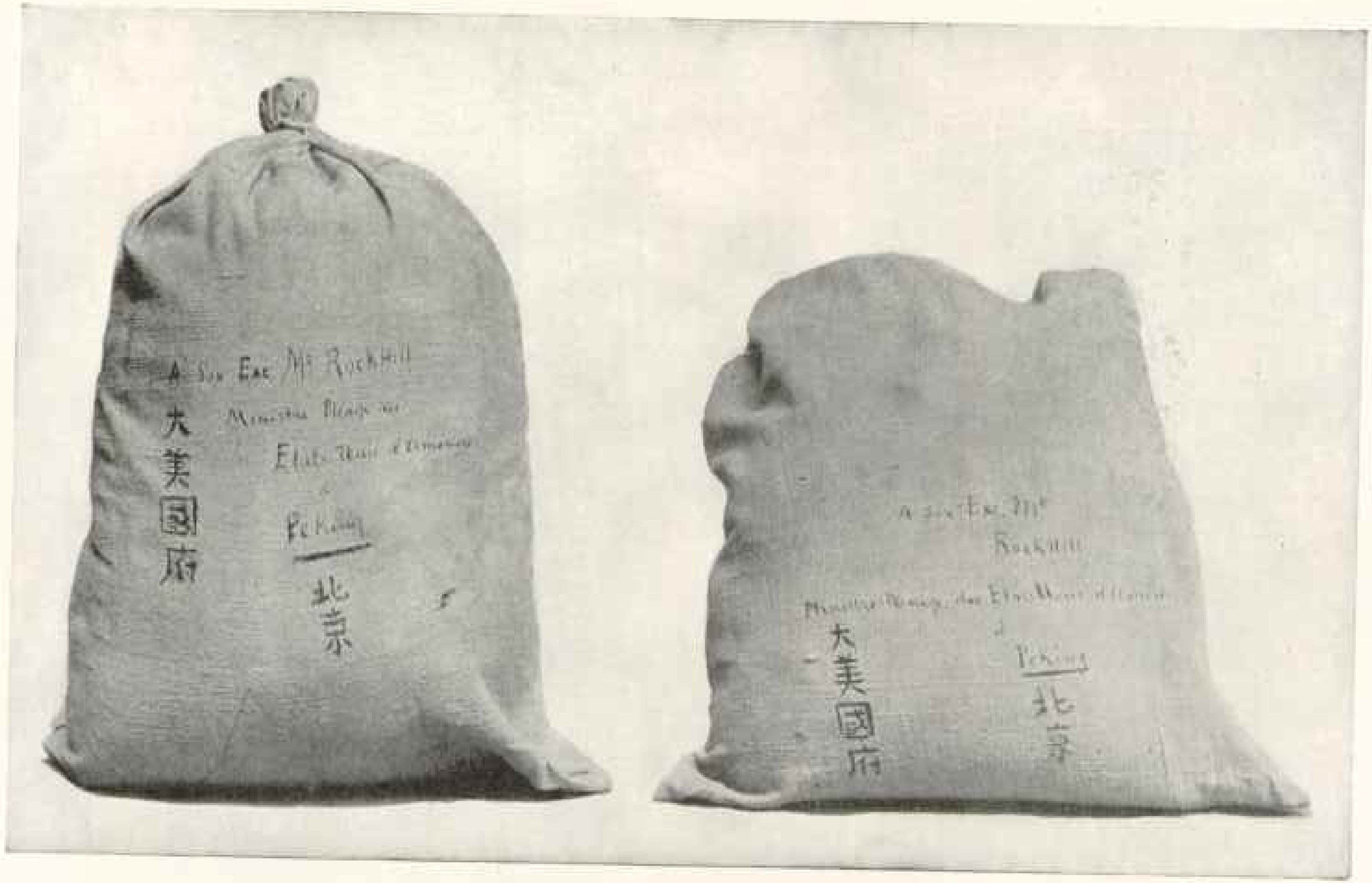


Photo by Crandall

TWO SACKS OF ALFALFA SEED OBTAINED BY AMBASSADOR ROCKHILL FROM A JESUIT MISSIONARY OF HIS ACQUAINTANCE LIVING IN MONGOLIA: THIS IS A DESERT FORM, WHICH IS NOW BEING EXPERIMENTED WITH IN THE SOUTHWEST

Photo by Westgate

Although alfalfa was brought by the Persians into Greece 490 B. C., there was scarcely an acre in this country sixty years ago. Today it is considered the best rough forage known, and there are over 7,500,000 acres of it in the Western Hemisphere. The search for hardier, drought-resistant, winter-growing, better-stooling, heavier-yielding varieties has taken explorers all over the world, and this search has attracted the attention of millions of people. As a result there are now in the Great Plains region breeding plots like the above, where are gathered together for the purpose of cross-breeding and selection the principal alfalfas of the world. The creation of entirely new forms, combining new characteristics, has already begun, and the effects will be as surely felt by this gigantic industry as good mining has felt the discovery of the cyanide process.

Photo by Crandall

NEW PLANT IMMIGRANTS ARRIVING AT THE DEPARTMENT OF AGRICULTURE

A shipment of living plants and seeds from the Coedilleras of Chile, which is being opened preparatory to inspection by an entomologist and plant pathologist for the presence of dangerous plant diseases or insect pests. These plants are either growing now in some part of the United States or have been discarded by some specialist who, after having tested them, has decided that they are not yet on the program.

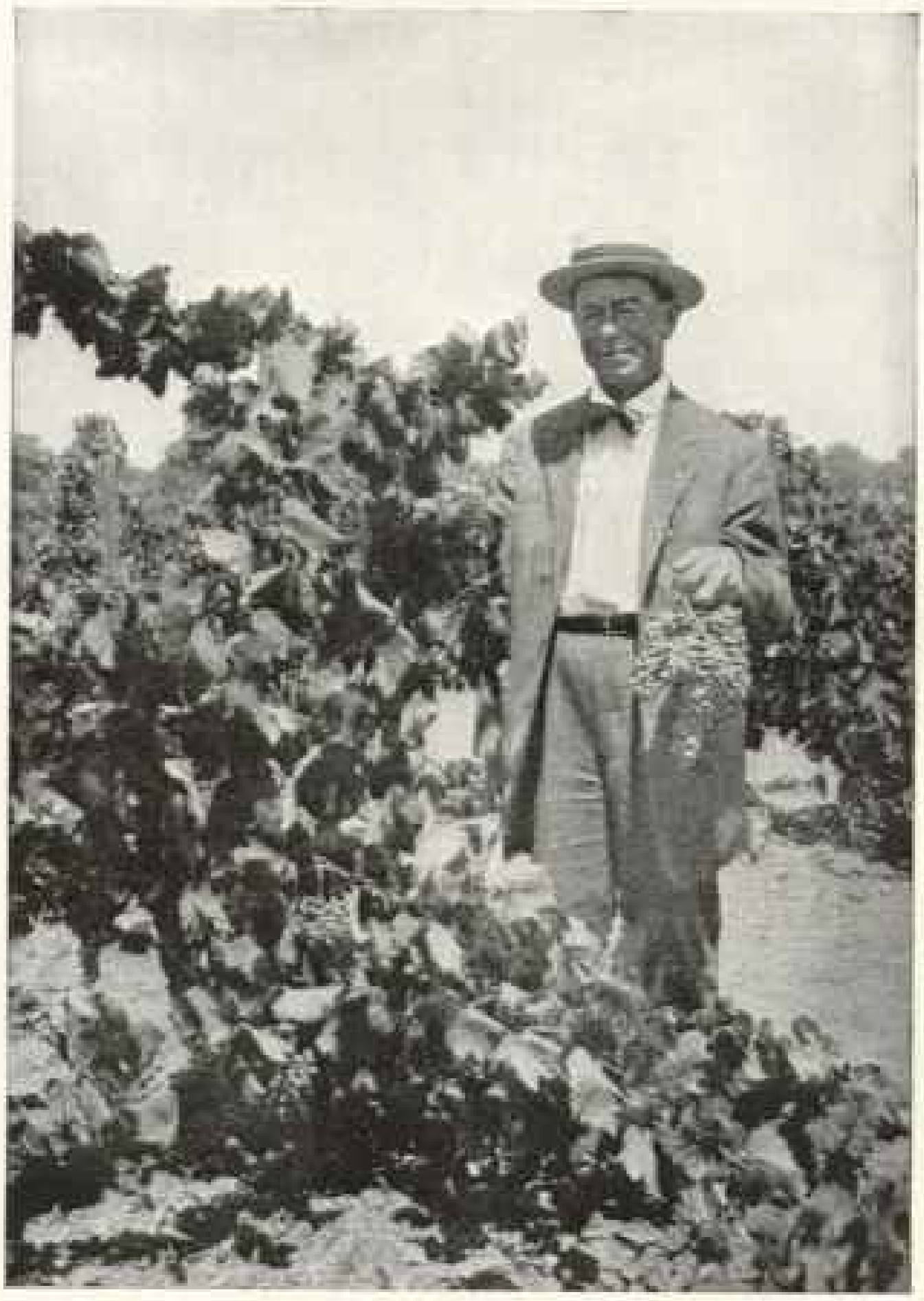


Photo by David Fairchild

We are so used to finding seeds in grapes that we do not realize how imperfect the grape is as a fruit until we eat seedless ones. This variety, the *Sultanina rosea*, was discovered near an old monastery in Padua by Messrs. Lathrop and Fairchild, and, because it is bright rose-colored and of fine flavor, is being rapidly propagated and planted in California.

which are being distributed to prospective planters the suckers as they grow. This accomplishment of the Department of Agriculture is not the result of any one man's effort, but the product of at least a dozen minds working over a period of 20 years and in seven different countries. And the names of these investigators deserve to be here chronicled before their part of this unusual work is forgotten, as the industry which is now growing rapidly brings new personalities into the field. Walter T. Swingle, to whom is due the credit for the most profound work which has been done; H. E. Van Deman, J. W. Toumey, R. H. Forbes, T. H. Kearney, P. H. Dorsett, A. V. Stubenrauch, S. C. Mason, A. J. Pieters, Bruce Drummond, Consul Maggleson, E. A. Bessey, Dr. Vinson, Bernard Johnson, and David Fairchild are the names of those who took the most active part in this problem, while the name of Mr. Barbour Lathrop, of Chicago, should be specially mentioned, since it was through his generosity that the writer was able to make a study of the Persian and Arabian date regions.

There are among these hundred varieties those which candy on the tree, others which are used mainly for cooking, and some which are hard and not sticky. There are early varieties and late-ripening ones, varieties short and long, and every sort can be told by the grooves on its seeds.

One of the finest varieties is the Deglet Noor, which will bear from 80 to 132 pounds of dates per tree. As the dates sell from 8 to 35 and even 50 cents a pound, the possibilities of a profit of at least $150 an acre has been set as the probable mean on well-managed plantations.

The date as a delicacy is known to every American child, but, as a food, remains to be discovered by the American public. When the date plantations of Arizona and California come into full bearing, as they should in about 10 years, the hard, dry dates, for example, now quite unknown on our markets, are sure-

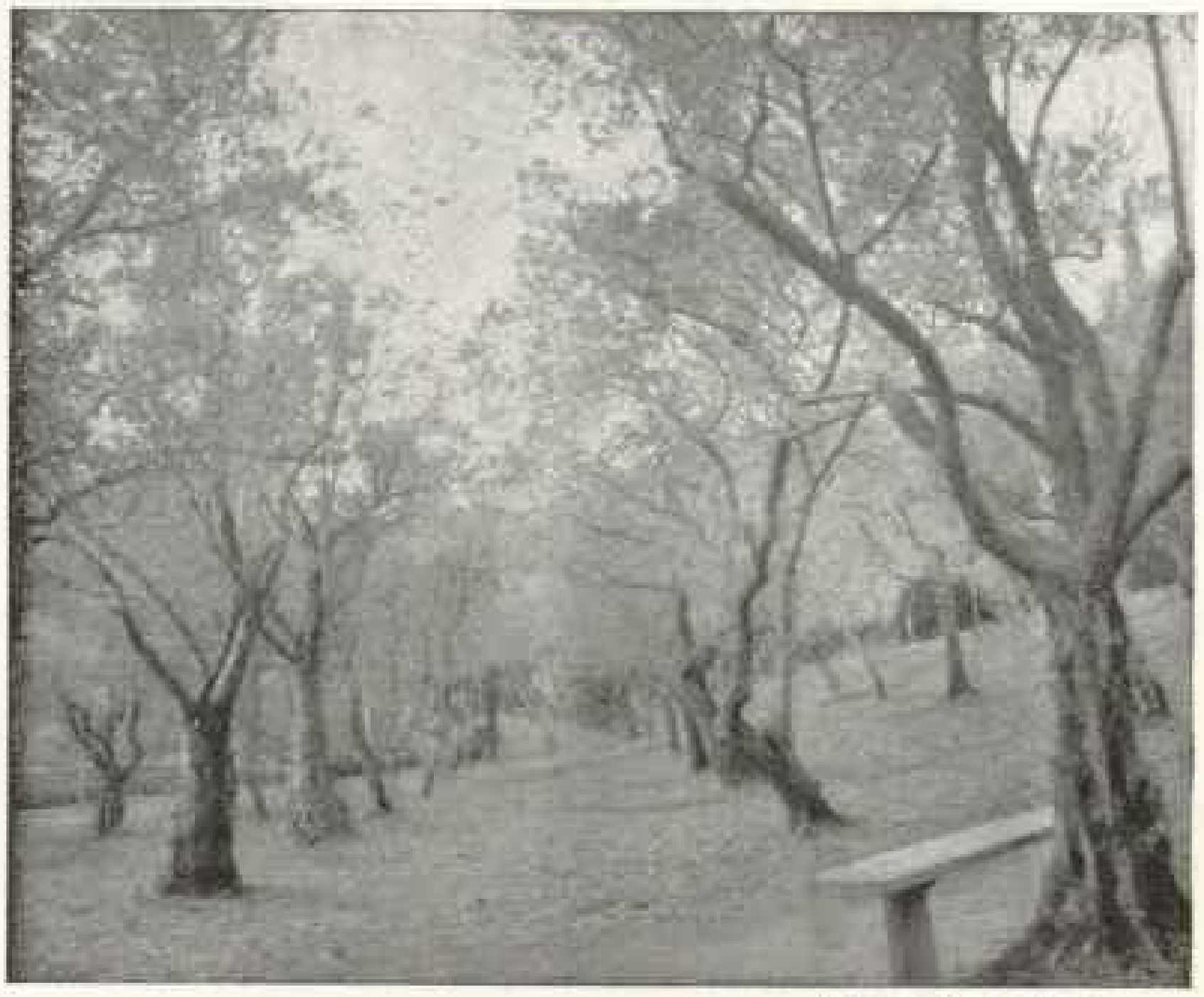


Photo by Frank N. Meyer

THE HARDIEST BEARING OLIVE TREES OF WHICH WE HAVE ANY RECORD

A variety which has withstood a temperature of 2 degrees F. below zero, and which bears good crops of fruit. Cuttings of this variety have been secured by Mr. Frank Meyer from the Crimea.

to come into prominence and find their way to the tables of the poor as well as of the rich. The heat of our American summers is forcing us to study the hot-weather diets of other countries, and dates are sure to become important items of food.

The persimmon of the South, on which the opossum fattens, is a very different fruit from its relative the kaki, or persimmon of the Orient, the growing of which is so great an industry in Japan as to nearly equal the Japanese orange-growing industry in importance. Our persimmon is a wild fruit, which will some day be domesticated, while the kaki has been cultivated so long that it is represented by hundreds of distinct varieties of different forms and colors. It is true that the Oriental persimmon has been grown in this country; in fact, the census records a production of 68 tons; but this is scarcely a beginning as compared with the 104,000 tons which is the output of Japan.

We have misunderstood the persimmon. Our own wild ones we can eat only after they have been touched by the frost, and the imported Japanese ones we have left until they become soft and mushy and almost on the verge of decay. We never thought until quite recently of wondering whether in a land where the persimmon had been cultivated for centuries they would not have worked out some artificial method for removing the objectionable pucker. In Japan we find this is done by packing the fruit in barrels saturated with sake, and Mr. H. C. Gore, of the Department of Agriculture, is now working out new methods of processing the Oriental persimmon, so that it can be eaten when hard as an apple, and there will no longer be any reason

Photo by Frank N. Meyer

THE GIANT CHINESE PERSIMMONS IN BASKETS ON THEIR WAY TO THE PEKIN MARKET

Americans have no idea of the extent and value of this great industry in the Orient, where it means as much to the people as the apple industry does to us. Some day, when the plants which have been imported come into bearing, our horticulturists will see the great food-producing value of this neglected crop.

Photo by Frank N. Meyer

AN ORCHARD OF CHINESE PERSIMMONS IN THE MING TOMBS VALLEY WEST OF PEKIN

Professor Sargent, of Harvard, predicted that the introduction of this giant persimmon, which was accomplished by Mr. Frank N. Meyer, Agricultural Explorer of the Department, would be worth a million dollars to the country.

Photo by Frank N. Meyer

GIANT ORIENTAL PERSIMMON TREE

The trees of these Chinese persimmons are remarkable for vigor, productiveness, and long life. The fruits are quite distinct from the Japanese persimmons, or kaki, and entirely different from our Virginia persimmon. They may be said to constitute a new and valuable class of fruit for the American horticulturist.

why it should not take its place among the great fruits of the country.

We have also introduced a Chinese persimmon which Mr. Frank Meyer found in the Ming Tombs Valley, the Tamopan, four inches in diameter, seedless and puckerless.

The whole question of the improvement of the persimmon has been opened up, and we are getting for this work the small-fruited species called "lotus," from Algeria; a tropical species with white, cheese-like pulp, from Manila, Mexico, Erithea, and Rhodesia; species from Bangalore, from Sydney, from Madras, from the Nankau Pass, in China, and from the Caucasus.

There are large areas of the West where the native persimmon is the slowest tree to wake up in the warm spells that visit that region in February. It is reported that in Oklahoma last February the temperature went up to 80 degrees F., which is as high as the average midsummer temperature. This will wake up almost any tree or plant except the persimmon, and when a temperature of 17 degrees below zero follows, it kills thousands of plants to the ground. If the fine imported varieties can by breeding be made to share this characteristic with their American relatives, it will be an added reason for their extensive cultivation.

Photo by Crandall

THE TAMOPAN PERSIMMON: A NEW FRUIT FOR AMERICA

A natural-size photograph of a seedless and puckerless persimmon which is often four inches in diameter, and because it can be eaten while as hard as an apple, is destined to play a great rôle in the remaking of the persimmon industry.

If the Oriental timber bamboo had produced seeds oftener than once in 40 years it would long ago have been introduced and be now growing in the South. The fact that it had to be brought over in the form of living plants, and that these plants required special treatment, has stood in the way of the quick distribution of this most important plant throughout those portions of America where it will grow. After several unsuccessful attempts, a beginning has at last been made, and the Department has a grove of Oriental bamboos in northern Florida, and a search is being made in different parts of the world for all those species which are adapted to our climate.

It was while I was traveling in Japan for Mr. Barbour Lathrop, of Chicago, that he called my attention to the great

Photo by Frank N. Meyer

THE WILD PEACH OF CHINA, WHICH IS USED THERE AS A STOCK FOR STONE FRUITS

A stock which will resist drought and cold is worthy of the serious consideration of peach growers; and this Chinese wild peach, which probably is in reality the progenitor of all our cultivated peaches, appears to be such a stock. Experiments are in progress which will prove what our peaches will do when they are furnished with the root system of this wild, hardy peach from the mountains of North China.

Photo by P. H. Dorsett

A YOUNG ORCHARD AT THE CHICO PLANT-INTRODUCTION GARDEN IN CALIFORNIA, EVERY TREE OF WHICH IS FURNISHED WITH THE ROOT SYSTEM OF THE WILD PEACH OF CHINA

The statement has already been made that this is the earliest stock for stone fruits ever introduced into California. The orchard comprises plums, apricots, prunes, and almonds, as well as peaches, and will give an indication of the value to America of this new peach stock from the Orient.

Photo by David Fairchild

BLANCHED SHOOTS OF THE JAPANESE UDO

This is a new vegetable, with a unique flavor. It has been pronounced delicious by a great many people; and, because it can be grown throughout a wide range of territory in the United States, is one of the earliest in the spring, and can also be blanched in the autumn, it has attracted the attention of one of the largest growers of asparagus in the world, Mr. W. H. Meeks, who has planted several acres of it on the lowlands of the Sacramento River, California. It is as easy to grow as asparagus and yields a crop sooner.

importance of the bamboo as a new crop for the South. He was so firmly convinced of its importance that he offered to purchase and send as a gift to the country 2,000 plants for trial. Unfortunately, the offer was not accepted, and it was not until several years later that the large shipment was made which is now establishing itself in northern Florida, where the first commercial grove of these remarkable plants is to find its home.

"Of what practical use is the bamboo?" is the question of the Occidental, and it must seem to the Oriental as singular as his question would be, "Of what use is the white pine to the American?" For there is no plant in the world which is put to so many uses as the bamboo, and in the regions where it grows it is apparently the most indispensable of all plants.

In this country I predict it will be used earliest for barrel hoops, for cheap irrigating pipes, for vine-stakes and trellises, for light ladders and stays for overloaded fruit trees, for baskets and light-fruit shipping crates, and for food. As wind-breaks and to hold canal banks and prevent the erosion of steep hillsides, there are species which excel all other plants, while for light furniture and jalousies it is sure to find a market whenever the green timber is available.

Unlike the forest trees, the giant bamboos are true grasses. They send underground stems long distances through the soil, binding it together with hard, flint-like rhizomes. They send up from this network of roots and rhizomes the most rapid-growing shoots of any plants known; and, like giant asparagus stems, these shoot at the rate of a foot a day into the air. So fresh and tender are these shoots that they can be snapped off with the hand, and when cooked they form one of the great vegetable delicacies of the world.

Photo by P. H. Dorsett

THE FIRST COMMERCIAL BUNCH OF UDO PUT UP IN THIS COUNTRY

Shoots cut from plants set from 2-inch pots in May, 1910, on Mr. W. E. Meeks' ranch, Bryford Island, near Antioch, California. The shoots are a half to three-quarters of an inch in diameter and about 12 inches long. Taken at Antioch, California, March 28, 1911.

No wonder, then, considering all the uses of this plant, that the Chief Forester of Japan, when I asked him about the value of the bamboo industry in his country, said at once: "It's the best-paying plant industry in Japan." I am aware that there enters in here that complicated question of the cheapness of Oriental labor, and that there are many things which we cannot do with the bamboo

Photo by Frank N. Meyer

FRUITS OF THE YANG TAW VINE OF THE YANG-TSE VALLEY

This vine (*Actinidia chinensis*) grows wild along the great river of China, and its fruits are said to resemble the best gooseberries in flavor, being used by Americans resident there in the making of pies and jams. The vine itself is a rampant grower, and its foliage is unusually attractive. As an ornamental plant alone, it is worthy a place on every farm. Thousands of plants have been introduced, and it will soon be in the nurserymen's hands.

which are done in Japan and China. But all these things aside, the bamboo still remains one of the most promising plant introductions.

While perhaps the great majority of these new plants are brought in or purchased directly as results of investigations carried on in Washington, some of the most valuable things have been sent in by men and women living as missionaries or voluntary exiles in the most out-of-the-way places in the world.

Plant introduction is not a matter of one generation, and it is most preëminently a work requiring many men working together, and I doubt if there is to be found within the government service, or outside of it, a better example of cooperative, constructive investigation than that connected with the Bureau of Plant Industry in the establishment of new plant industries in the United States.

On the streets of almost any Japanese city the fruit and vegetable stalls have for sale an attractive blanched vegetable called udo. It is a near relative of a well-known wild plant in New England, the spikenard, but a much larger plant. There are many ways in which it is prepared by both the Japanese and the foreigners who live in Japan; but, either as a salad or cooked in the same way in which asparagus is cooked, it deserves to rank as one of the important vegetables of the world. It is easy to grow; it does not require replanting oftener than once in nine or ten years; it can be cropped in the autumn or in the spring, and it yields large crops of shoots, which are often two feet long and an inch or more in diameter at the base. These brilliant white shoots are edible to their very bases without the least objectionable fiber, and not in this respect like asparagus, of which only the tips are fit to eat.

It was while traveling with Mr. Barbour Lathrop that the writer first made the acquaintance of this vegetable and at his suggestion that plants of it were sent to America, in 1902.

One of our best-known botanical authorities once remarked to me: "You cannot introduce a new vegetable; it's impossible." While it might be admitted that the introduction of a new vegetable is a long undertaking, extending perhaps over the period of a generation, it should not be left out of account that the means at our disposal today are immeasurably more powerful than they were even two decades ago. The advent of the great hotels and the sympathetic interest of the great magazines are two elements which today make possible what yesterday would have been quite impossible.

The magazines will talk about a new vegetable and can now illustrate it as never before and in this way encourage people to ask for it, and the great hotels have learned how to profit by the introduction of novelties.

Of course, from the narrow standpoint of the asparagus grower we should all eat asparagus, and he watches every sign that indicates any tendency on the part of the public to consume more of his vegetable, and he is not often likely to look with favor on any rival. But let fancy prices be established by a legitimate publicity and the encouragement of some of the large hotels, and the growers of asparagus will soon find out that there is money in growing the new vegetable. We can trust to a final readjustment of things, once the new plant is thoroughly established.

It was with this point in view that an arrangement was made with the National Geographic Society, at its last Annual Banquet, to serve as one of the courses the dasheen, which is the root of a large-leaved plant related to the Hawaiian taro. The guests of the Society were kind enough to pass judgment on this new introduction, deciding it to be a valuable addition to the menu, many even going so far as to declare that it surpassed the potato in excellence.

The stimulus given to the cultivation of this dasheen by this exhibition has been very great and today thousands have heard of it, and, if they saw it offered on the menu of a first-class hotel, would be much more likely to call for it than if they had never read of its peculiar adaptability to the moist but well-drained lands of the Southern States.

A VISIT TO THE BRAZILIAN COFFEE COUNTRY

By Robert De C. Ward, Harvard University,
Cambridge, Mass.

ON THE gently sloping hillsides of the northern portion of a single State of the great Brazilian Republic there are growing 700 million coffee trees. Here on the famous rich, red soil (*terra rossa*), under extraordinarily favorable climatic conditions, the State of São Paulo is producing annually about three-quarters of the world's total coffee crop. Small wonder is it that this State ranks so high in the number and in the character of its population; in the development of its railroads; in its general commercial and industrial activity. Small wonder is it that the city of São Paulo is so full of life and energy; that Santos has become so famous a port; that the Santos docks and the São Paulo Railway attract so many visitors. Coffee is the mainspring of all this development. Coffee is the prevailing topic of conversation. Coffee is the key to the financial situation. Coffee is king.

As a famous waterfall, or an immense steel plant, or a great forest, or a wonderful view attracts the traveler, so this remarkable Brazilian coffee district has a fascination all its own for the "globe-trotter," or for the more leisurely traveler who seeks to know something more definite about our South American neighbors; or, more particularly, for any one to whom man's achievements in changing the face of nature by making the earth produce what he needs and what he finds profitable are a source of satisfaction and of inspiration.

Recently the writer had the good fortune to visit this famous coffee district. The direct object of the trip was for the purpose of collecting information, at first hand, concerning the general geographic, and especially the climatic, conditions under which the Brazilian coffee grows, and also for the purpose of seeing the various stages in the cultivation and harvesting of coffee and in its preparation for market. Surely a crop whose importance is so great that a national government has gone into the business of conserving it deserves careful study.

The heart of the coffee country can be reached in less than three weeks from New York. To any one whose experiences in crossing the Atlantic are limited to the "Atlantic Ferry," with its crowded steamers, its frequently boisterous seas, and its changeable and stormy weather, the voyage to and from Rio de Janeiro will be a delight which cannot fail to satisfy even those who are not naturally lovers of the sea. What can be more ideal for any one who is tired out with the wear and tear of a busy life than that voyage of 16 or 17 days from New York to Rio, over the calm seas and under the bright skies of the tropics?

Most of the voyage is spent sailing in the trades, those wonderful easterly winds, blowing steadily day and night, year in and year out; where the sea is smooth, but where there are enough whitecaps to give it life; where the beautiful, cumulus clouds, like our own summer clouds at home, only more slender and more delicate, shine brilliantly in the tropical sun by day, grow to larger size in the afternoon hours, sometimes giving brief showers, but dissolve after glorious sunsets; where the temperature never varies more than a very few degrees above and below 80, and is perfectly comfortable because of the fresh breeze.

From Rio to the Coffee Center

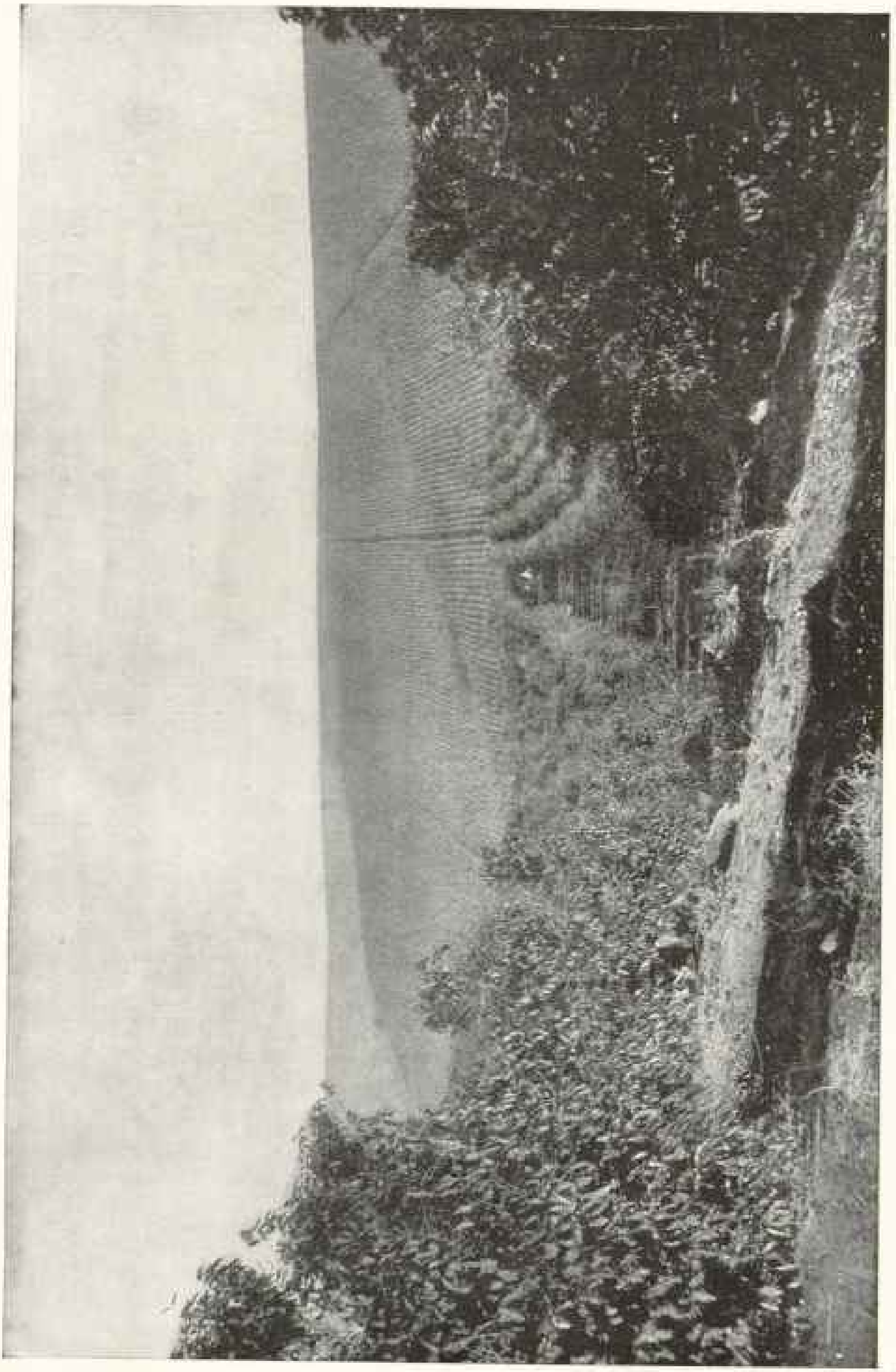
From Rio de Janeiro a journey of about eight hours takes the traveler across the coast range of mountains (Serra do Mar) and along the valley of

MAP OF COFFEE DISTRICT OF BRAZIL.

the Parahyba River to the city of São Paulo, which lies in a position of immense advantage to its commercial development. To it from the north and west and south converge the numerous lines of railway, which tap the coffee plantations on the north, and over which, from the southwest, will soon come the through trains from Montevideo, across the great rolling campos of southern Brazil. From São Paulo to the seacoast, as if it were the narrow neck of a wide funnel, runs the the São Paulo Railway, across the open country and then down the steep, heavily forested, seaward slopes of the Serra do Mar to the port of Santos—a wonderful piece of engineering, whose embankments and viaducts and masonry-work are well worth a long trip to see. Santos is the natural outlet for a great interior country, the importance and value of whose products are every day increasing.

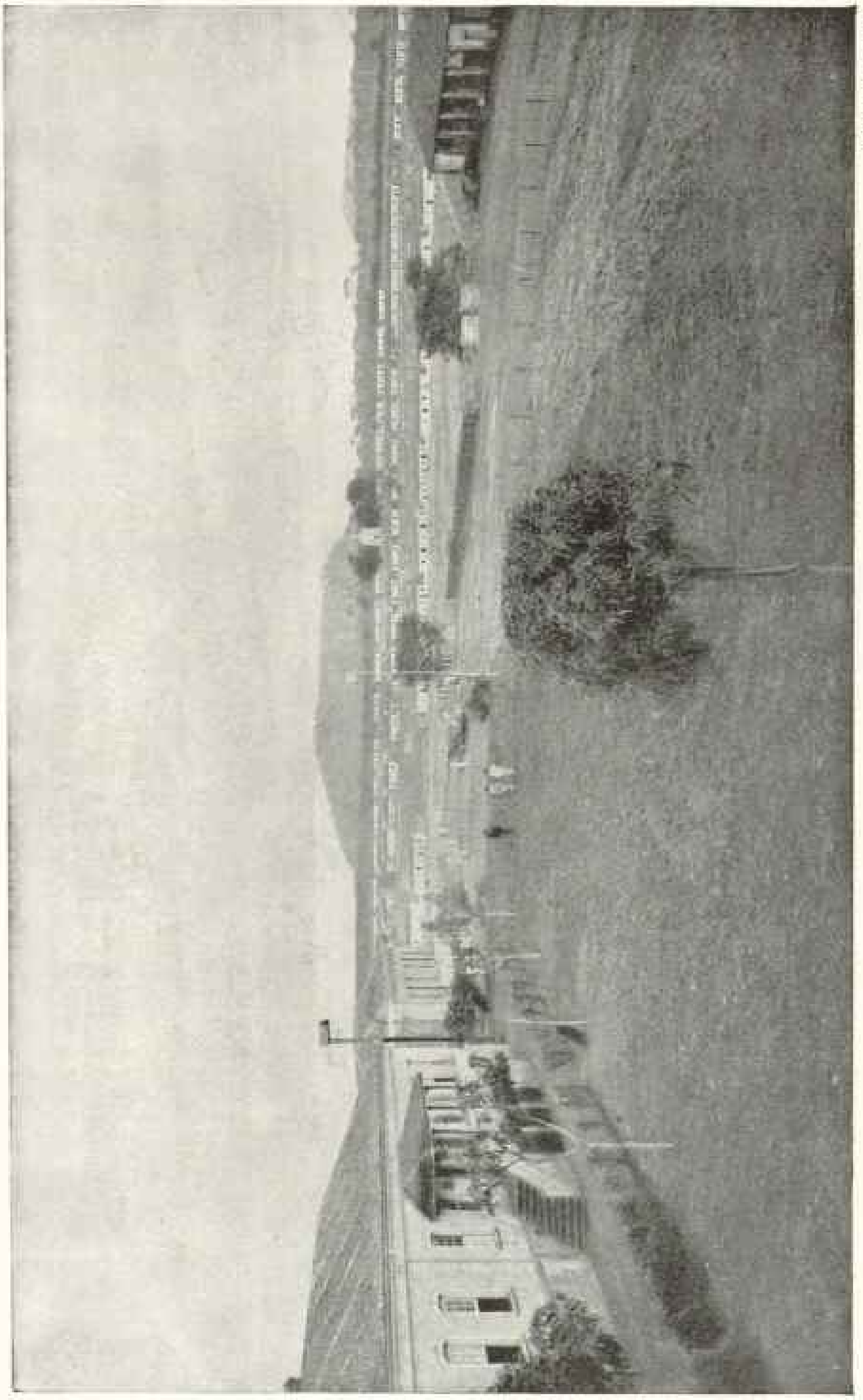
From the city of São Paulo the heart of the coffee country is reached in a short day's journey along one of the lines of railroad which go in a northerly or northwesterly direction across the open campos or through the scattering woodlands. Under the able direction of Dr. Orville A. Derby, at present chief of the Brazilian Geological and Mineralogical Survey, the State of São Paulo has been well mapped. Portions of it have even been modeled, as in the case of the vicinity of São Paulo and Santos, and of the coffee district of Botucatú and São Manoel.

In about two hours after leaving the city of São Paulo the traveler begins to see the first considerable coffee plantations, and from that time on the journey



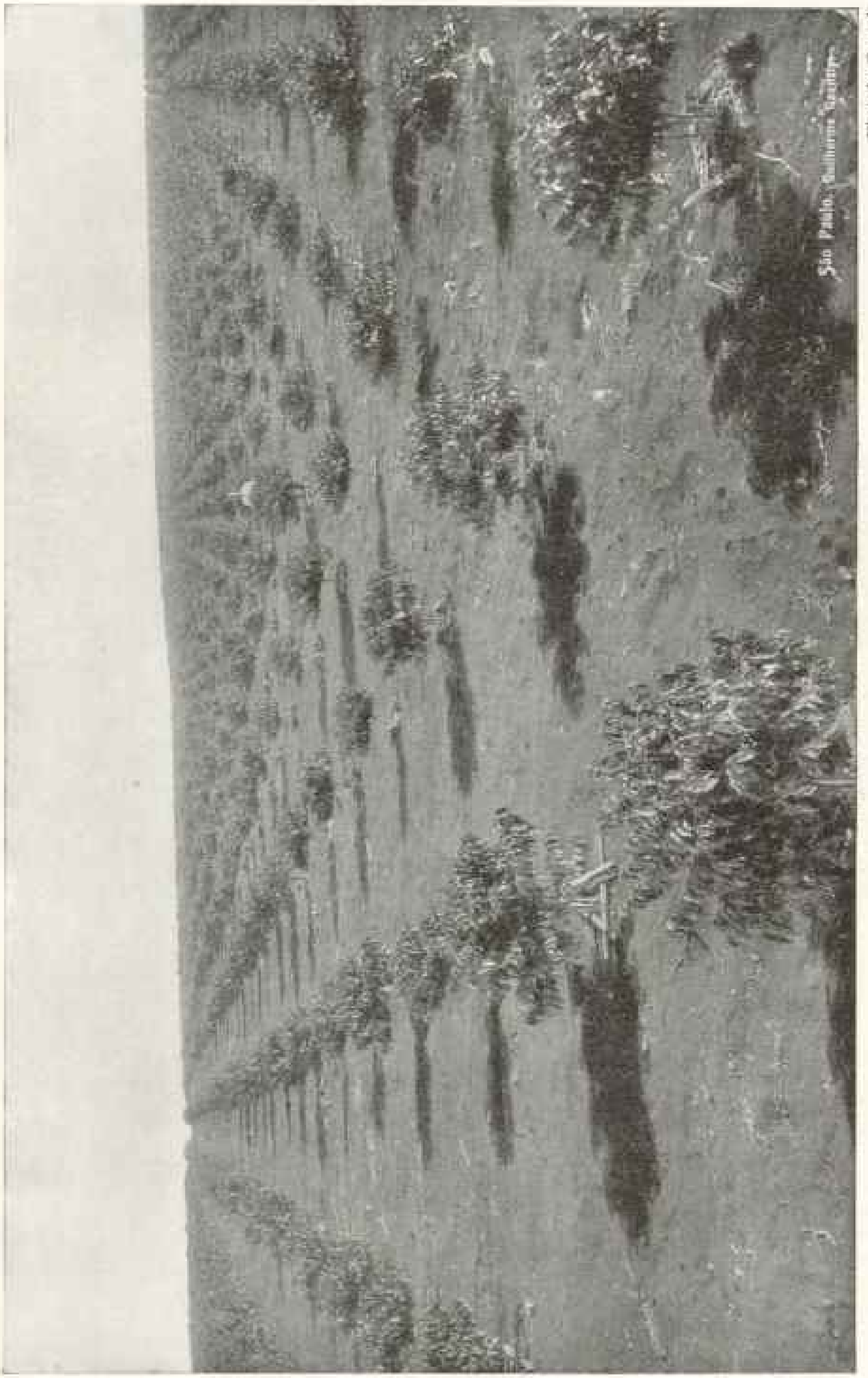
GENERAL VIEW OF A BRAZILIAN COFFEE PLANTATION

Photo by Gaensly



COFFEE FAZENDA: SANTA VERIDIANA, SÃO PAULO, BRAZIL: THE SMALL HOUSES ARE THE HOMES OF THE MANY HUNDREDS OF WHOM ARE EMPLOYED BY THIS LARGE ESTATE

Photo by Carmody



YOUNG COFFEE TREES: SÃO PAULO, BRAZIL

Photo by Gaensly

is one of the greatest interest. Coffee is everywhere. Miles and miles of coffee trees stretch away, up and down the gentle slopes of the rolling topography, often as far as the eye can see—great broad waves of green, with the narrow lines of the red soil showing in marked contrast with the green of the leaves. It is a sight which is not soon forgotten. Here and there are small patches of forest which have not yet been destroyed to make way for the coffee. And then there come great stretches of rugged grass-lands, partly used for grazing purposes, or locally for farming, where the soil is not right for the coffee tree.

Here and there on the lower slopes of the hills or on the lowlands, standing out in marked contrast with the green coffee trees, are the white buildings of the *fazendas*—great, substantial stone and stucco manor-houses, with wide verandas and large windows, surrounded by gardens filled with palm, and banana, and orange, and mango trees; the extensive outbuildings, for the stables and for the machinery, for the laborers and for the superintendent, being placed at a respectful distance from the manor-house.

HOSPITALITY THAT IS PROVERBIAL

Picturesque these Brazilian *fazendas* surely are, and hospitality to the stranger is one of the proverbial characteristics of their owners. Through the courtesy of Dr. Plinio da Silva Prado, of São Paulo, the writer, on his recent trip, was entertained at two well-known and representative coffee *fazendas*—that of Santa Veridiana and that of Santa Crux.

At the former (see picture, page 911) he was the sole occupant of the great house, which was put entirely at his disposal. There was nothing in the way of hospitality which the excellent *administrador* of Santa Veridiana, Senhor Rosetti, left unthought of or undone. The same thing was true of Administrador Carlos Meizner, of the *fazenda* Santa Cruz, which, by the way, was the one selected for inspection by Senator (then Secretary) Root during his trip to South America, a few years ago. The name of the nearest railroad station was at that time changed to "Elihu Root" in his honor.

All these Brazilian *fazendas* have a peculiar charm—an appearance of solidarity, of comfort, of peace, and of prosperity—as they lie there, surrounded by the wealth of their coffee trees, with cattle grazing on the neighboring fields, and with the ever-busy, picturesque Italian laborers caring for the precious crop, whose market prices are quoted daily in all the important papers throughout the civilized world. Grim and forbidding some of these manor-houses certainly do look from the *outside*, but once inside them there is no feeling except that of being at home.

THE FRUIT OF THE COFFEE TREE

The coffee trees on a Brazilian plantation begin to bear in from two to four years after they have been removed from the nurseries, where they grow in wicker baskets, under shade, to their permanent places in the open. The fruit, when ripe, is red, and resembles a small cherry, or cranberry, in general appearance. The coffee which we see in the grocery store is the seed of this coffee berry.

Normally each berry contains two seeds, flat on one side and convex on the other, the flat sides being together. The seeds are imbedded in a sticky, whitish pulp, and are further themselves surrounded by two envelopes. Of these, the inner one, when dry, is a delicate and closely adherent membrane, known as the "silver skin," and is much like the thin white skin which covers the onion. The second, or outer, covering is tougher and thicker, fits more loosely, and is not unlike the husk of wheat.

Before the coffee beans can be put upon the market the outer covering, the pulp, and the two inner coverings must be removed. This is done by first washing and softening the whole berry in water, then removing the outside skin and pulp in the pulping machine ("wet method"), then drying the beans in their two inner envelopes, and finally removing these inner coverings by friction in the hulling machines.

HOW THE BERRIES ARE PREPARED

It is customary to classify the methods of preparing coffee for market into the *wet* and the *dry*. They are alike, after a certain stage, and there is disagreement among experts as to the relative merits of the two in producing the best coffee. In the dry process the berries are dried before the pulp is removed, and then outer covering, pulp, and inner coverings are removed together. In the wet process the pulp is first removed in water, and the drying and removal of the inner envelopes come later.

There is no absolutely hard and fast rule, invariably followed on all *fazendas* alike, in the preparation for market of the coffee beans. At the two *fazendas* visited by the writer most of the coffee was treated by the wet method, the bulk of the crop being ripe and therefore in a condition to be pulped easily. In case, however, the berries were over-ripe, and therefore dry, or under-ripe, and therefore green, so that they could not be pulped, they were dried directly after being washed, and went through the so-called dry process. The following account therefore deals chiefly with the wet method.

A considerable water supply and a carefully planned system of small canals and of basins is needed in the wet method, and it is partly for this reason, as well as because of the preference of some *fazendeiros* for the dry method, that the wet method is not everywhere in use.

THE QUESTION OF LABOR

The harvest begins in May and lasts into August, or even September. This is the dry season, so that the weather conditions are very favorable, not only for the harvest itself, but for drying and transporting the crop after it has been gathered. In picking the coffee, the boughs are pulled down with the left hand and held at the outer end, while the right hand is run along the bough from the base to the tip, thus stripping off the berries as well as many leaves and twigs. For the upper branches rude step-ladders are used, but these are generally not allowed to rest against the trees.

In this work of harvesting all the laborers on the *fazenda* take part—men, women, and children—except those who are too old, or too young, or who are ill. Several hundred, or even thousand, pairs of hands are thus busy for weeks on each large *fazenda* gathering the precious crop.

Most of the laborers are now Italians, many of whom make a contract to stay for a year; but some are permanent settlers. There is a considerable amount of migration going on all the time to and from Italy and to and from Argentina. Immigration under contract has been done away with, so far as the Italians are concerned, and these people now come and go of their own initiative. In many cases the children who have been born on the *fazendas* stay permanently as laborers.

Following the custom of the old slavery days, the laborers (*colonists* they are called) live all together in small one or two-family cottages in a certain portion of the *fazenda*, which is walled or fenced off from the rest. Here they have their chapel, and can keep their own goats and pigs, and near by they cultivate their own fields of corn, or mandioc, or beans. The owner of the plantation provides medical attendance and a hospital, a corn-mill, sugar-mill, etc., but there seems to be no general organized system of schooling for the children.

As the work is usually done at considerable distances away from the "colony," the colonists start out early in the morning and do not return until darkness prevents further labor. They take their food with them and eat it under the coffee trees. The curfew rings at 8:30 or 9 p. m., and after that all must be silent in the colony.

The colonists are paid in various ways. At Santa Veridiana they are paid by the number of bags of coffee berries which each family picks, the bags being numbered and counted as they are brought in. Other laborers are paid by the day. Others, again, are paid so much for taking care of a certain definite number of

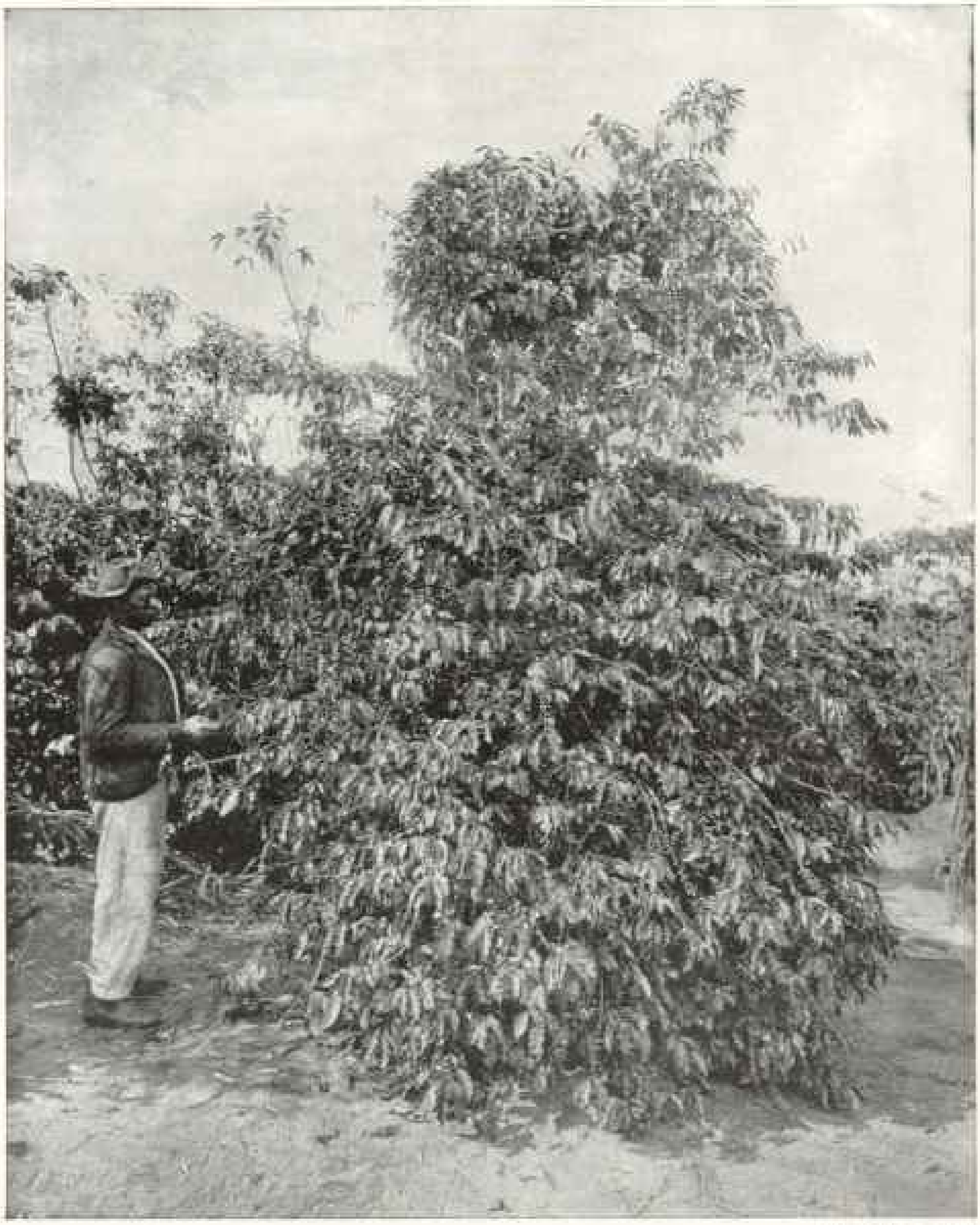
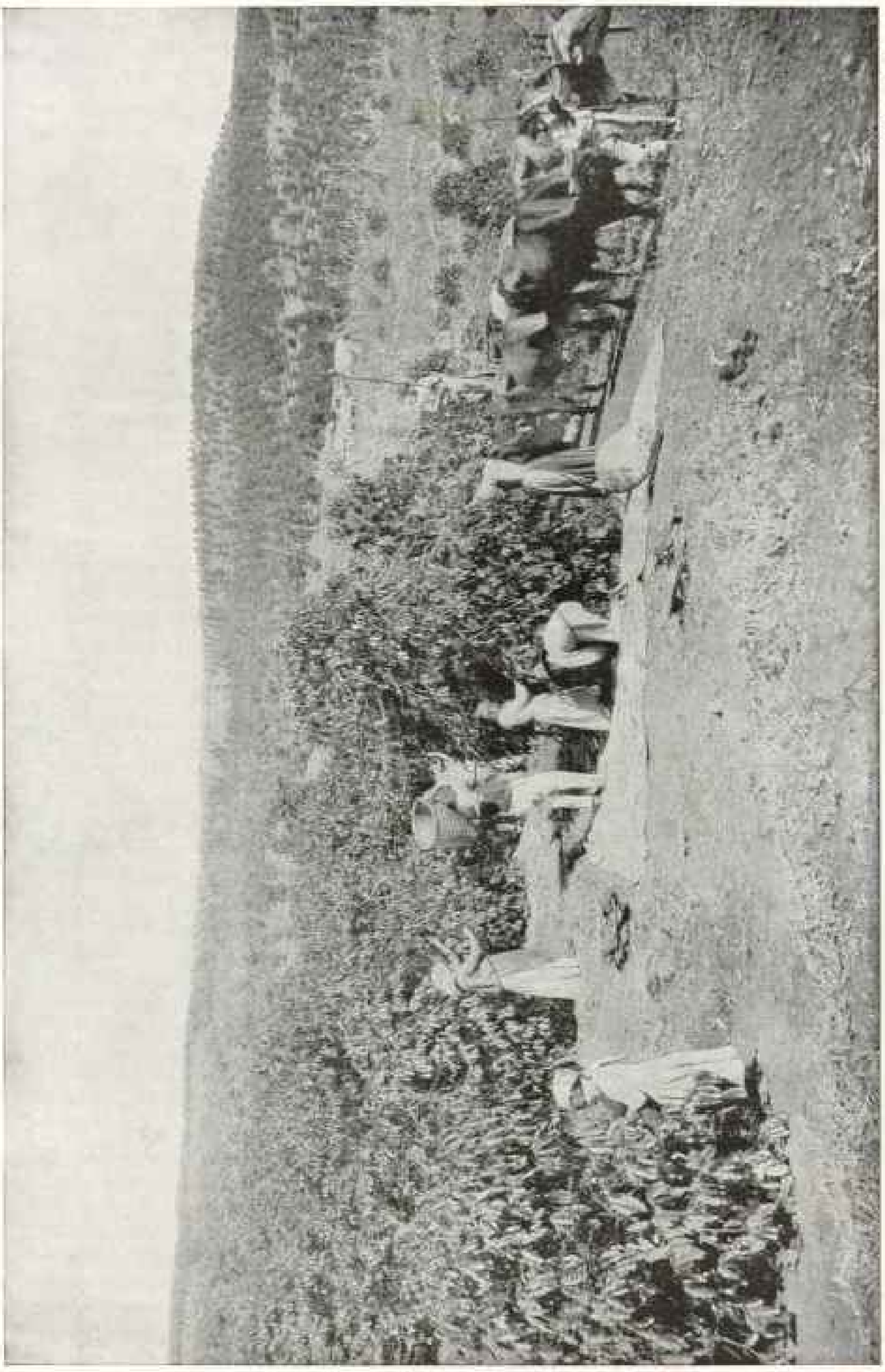


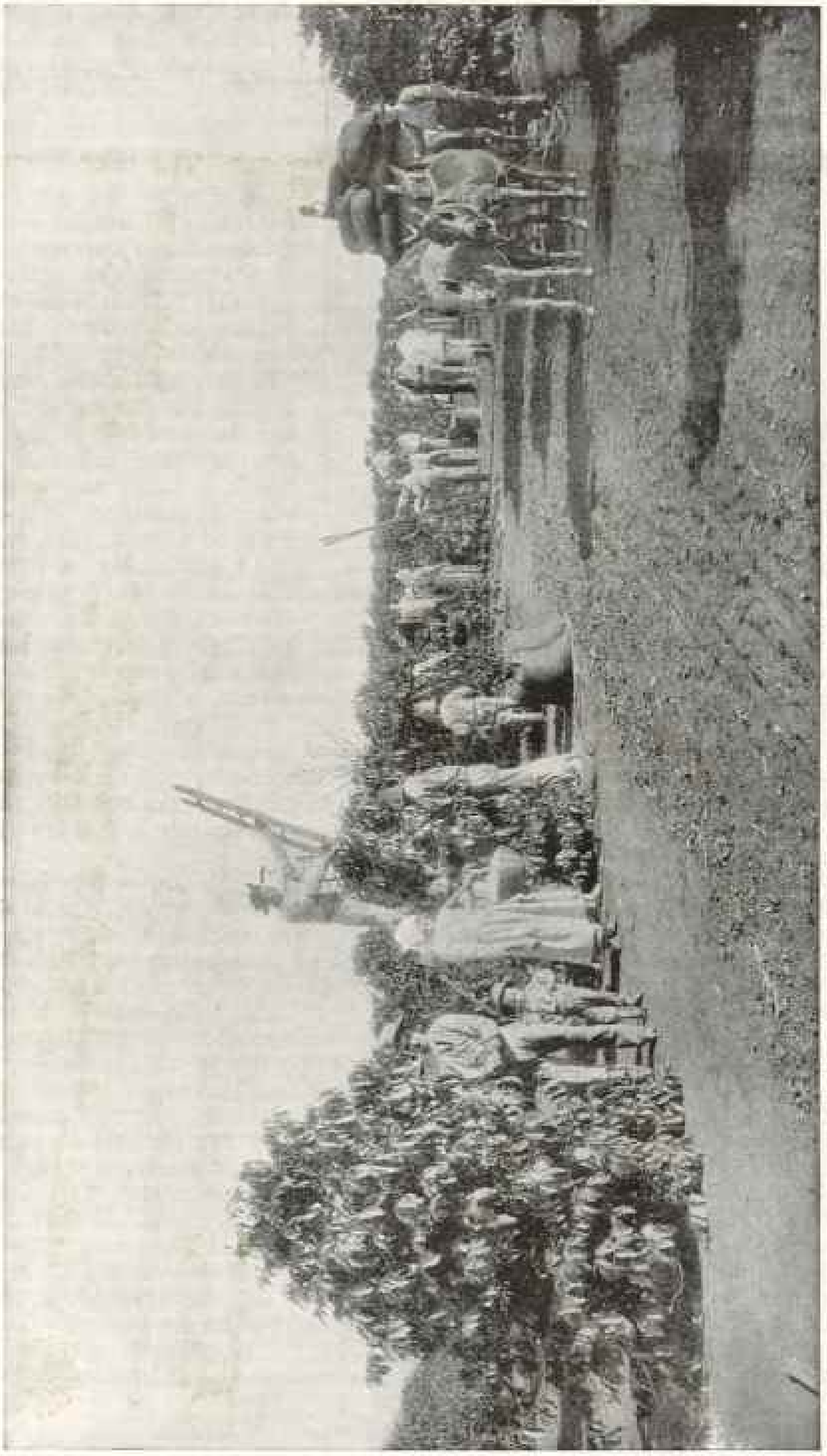
Photo by Gaensly

NEAR VIEW OF COFFEE TREE COVERED WITH BERRIES



PICKING COFFEE: SÃO PAULO, BRAZIL

Photo by Gaensly



PICKING COFFEE IN BRAZIL

Photo by Gaensly

Photo by Robert DeC. Ward

BASIN WHERE THE COFFEE IS WASHED AFTER BEING PICKED

trees. In one day each laborer may gather enough coffee berries to make 50 pounds of dried coffee.

THE HARVEST

The usual method of harvesting is to let the berries, leaves, twigs, etc., fall directly on the ground, where they are later raked together with wire rakes with rounded teeth, and the first rough sorting is made. The next stage is a winnowing by means of a wire sieve, the hand being used to pick out the twigs and leaves and the wind blowing away a good deal of the dust as the contents of the sieve are thrown up into the air and caught again several times. In a less common method the results of the harvesting are allowed to fall onto cotton cloths spread out underneath the trees. This makes the gathering of the crop quicker.

In any case, the ground underneath each tree is very carefully looked over and swept, so that none of the precious berries may be lost. When the preliminary winnowing has been completed in the field, the berries, together with some small twigs, leaves, and much dirt, are packed into sacks, which are placed at the ends of the rows of trees along the roads which traverse the plantations at intervals, and are then carried off by wagons.

SEGREGATING THE RIPE AND UNRIPE BERRY

As they are brought from the harvesting, the coffee berries are ripe (red), or over-ripe (brown or blackish), or still unripe (green). It is impossible in picking to select only those berries which happen to be ripe. The contents of the sacks, preferably on the day of picking, are dumped into a narrow cement or brick-lined canal through which a strong stream of clean water is flowing. This canal is supplied from a small reservoir, and is preferably built on a hillside above the drying grounds (*terreiros*) and the machinery, so that gravity may carry the berries to the successive early stages of the process of preparation. From this canal the water flows through a couple of large vats, or basins, being kept in motion both by the force of gravity and by means of long-handled wooden or metal rakes, or hoes, moved actively to and fro by workmen.

This manipulation results in bringing the unripe, light, imperfect, and dry berries to the surface of the water, while the heavier and riper berries sink to the bottom, the sides of the trough usually sloping toward the bottom. By allowing the level of the water surface to rise, all the berries which are floating on the surface can be run off into an adjacent maceration basin, where those which are not too dry are allowed to soften for a few hours, sometimes under canvas covers, before they are carried into the pulper (*despolpador*). If the berries are too dry for pulping, even after being softened, they are carried by water directly to the drying grounds, and are prepared by the dry method.

The ripe berries do not require the intermediate stage of maceration. These

Photo by Robert DeC. Ward

BASINS FOR MACERATION OF COFFEE BEFORE PULPING

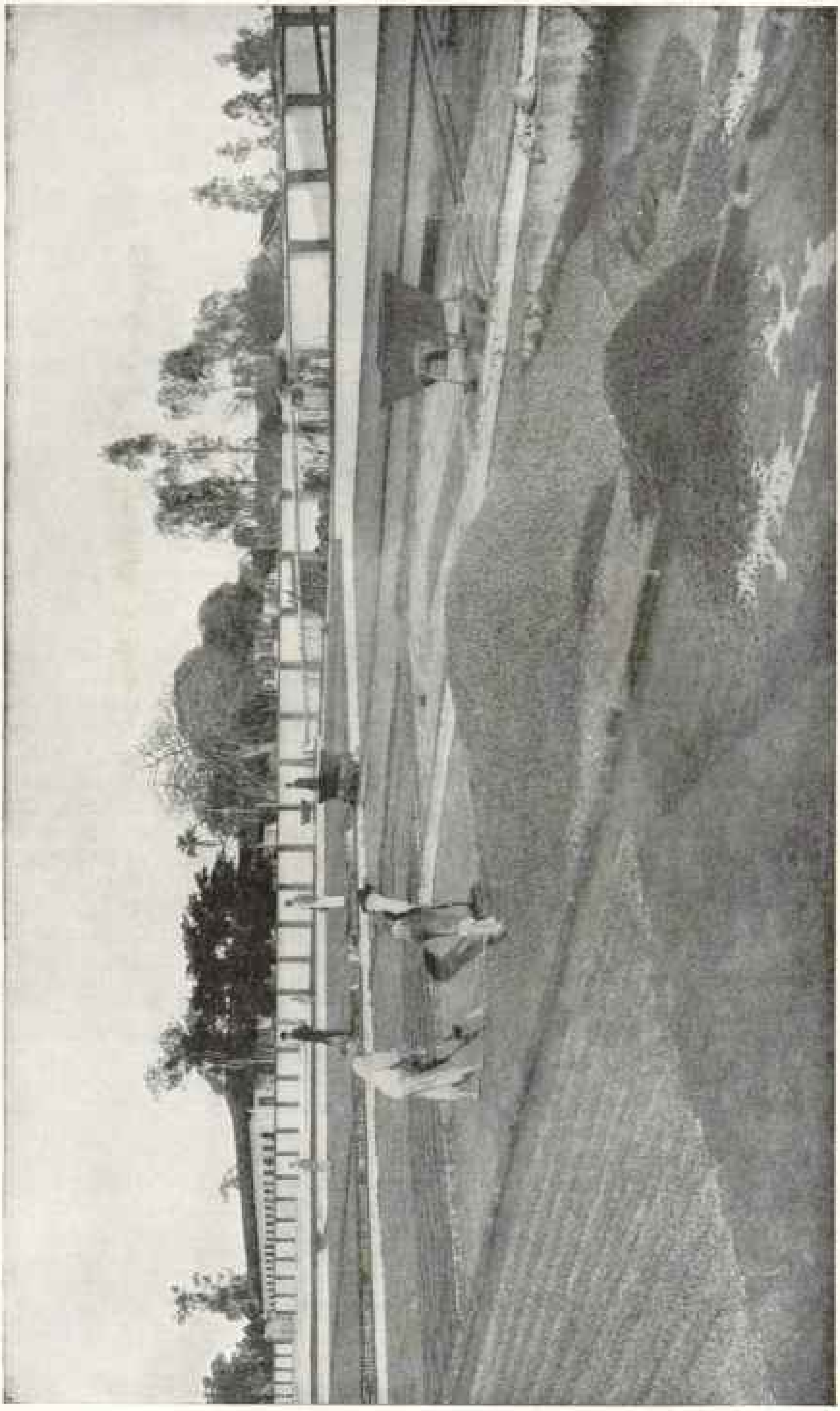
ripe berries which have fallen to the bottom of the first (*i. e.*, washing) basin are there very thoroughly raked and shoveled, the water having been lowered so that the men can stand among the berries at the bottom of the basin. The sand is generally carried off with the water through iron gratings at the bottom, or is collected at the upper end, until finally the clean, ripe berries are ready to pass out, down a narrow canal, with a stream of clean water.

For the ripe berries, the maceration basins are simply used for the purpose of temporary storage on the way between the washing basins and the pulper. To the top of the pulper the berries are carried again by a stream of water whose velocity is carefully but easily adjusted by a system of gates. The berries are dropped through the funnel-shaped top of the pulper directly into the machine.

Pulpers are made of different patterns, and are run by water, steam, or horse-power; but the general principle is the same in all of them. In one of the most widely used forms there is a revolving copper cylinder, whose surface is set with small knobs, or nipples, and is covered on one side by a surface of wood, or metal, or rubber, against which the cylinder impinges as it revolves. The coffee berries carried to the pulper by the stream of water are crushed between these two surfaces, whose distance apart can be varied to suit the particular size and condition of the berries at that time being pulped, and the pulp is thus macerated and loosened. The object is to accomplish this without injuring the two inner coverings of the seeds.

THE REDUCTION MACHINERY

The pulper reduces the coffee berries to a wet "mush," consisting of much water, coffee beans, and loose pulp. Most of the pulp adheres to the teeth of the cylinder and is dropped off at the bottom of the revolution, while the coffee beans, many of them still incompletely pulped and all having more or less pulp adhering to them, are carried, always by water, into a large copper cylinder revolving on an axis slightly inclined from the horizontal and pierced with small elongated holes, just large enough to let the pulped



DRYING GROUNDS IN THE WATER

Photo by Carmody

HACIENDA SANTA CRUZ, SÃO PAULO, BRAZIL: SHOWING ARRIVAL OF PULPED COFFEE IN THE "TRANSFORTADOR," AND FIRST SPREADING OF COFFEE

beans fall through, but keeping all beans which are not properly pulped moving on toward the lower end, where they fall into a second pulping machine, which is adjusted more finely, and are passed through a second sorting process.

All coffee which is properly pulped, either by going through one pulper or two, is carried by water into brick or cement-lined fermentation basins, which have a grilled bottom, so that the water may escape and leave the coffee in the basins.

Here the beans are allowed to remain, usually between 24 and 72 hours, according to the condition of the berries and the external temperature, until a slight fermentation has set in. The object of this fermentation is to soften and loosen any still adherent pulp. In these fermentation basins the coffee beans may be further manipulated in water by means of long-handled rakes with blunt edges; i. e., washed. They are then ready for the drying grounds, any still remaining pulp and external skin being later removed in the hulling machines. Any coffee which, after going through the second pulper, is still not properly pulped, is seen, on examination, to have been too green, or too small, or too dry to be handled by the pulper. All these berries, as well as the thoroughly pulped ripe ones, go to the drying grounds and go through the final stages, just as does the pulped coffee.

The ideal arrangement of a *fazenda* is seen at Santa Veridiana, where running water does the work of transportation from the first stage until the beans are spread out on the drying grounds, the whole plant being laid out with this end in view, and the natural slope of the ground being utilized to the utmost. At this particular *fazenda* there is a continuous slope from the place where the coffee is dumped from the sacks into the first canal down to the railroad tracks at the bottom, where the coffee beans, ready for market, are placed on the cars. Where such an ideal arrangement is not possible, elevators or hand-cars are necessary to carry the coffee from one level to another.

Photo by Robert DeC. Ward

CANAL FOR CARRYING COFFEE FROM MACERATION BASINS TO PULPING MACHINERY

(SEE PAGE 919)

THE DRYING GROUNDS

The most important and the most critical stage in the preparation of coffee for the market comes when the beans, having had their pulp removed, are dried, in order that the two inner coverings may then be removed by friction.

The drying grounds are prominent features of every *fazenda*. They are extended rectangular areas, paved with blackened tiles, or bricks, separated from one another by one or two rows of bricks, so that the various lots of coffee in different stages of drying may be kept apart, and all together forming part of a great, gently sloping surface inclosed by walls.

To the drying grounds the pulped coffee is carried from the fermentation basins, usually by a stream of water which can be directed through any one of a number of underground channels, to any part of the drying grounds. In the ideal arrangement of a *fazenda*, as at Santa Veridiana, water running down hill does all the work of carrying the coffee beans to the separate divisions of the *terreiros*. In other cases, as at Santa Cruz, there may be need of hand-cars,

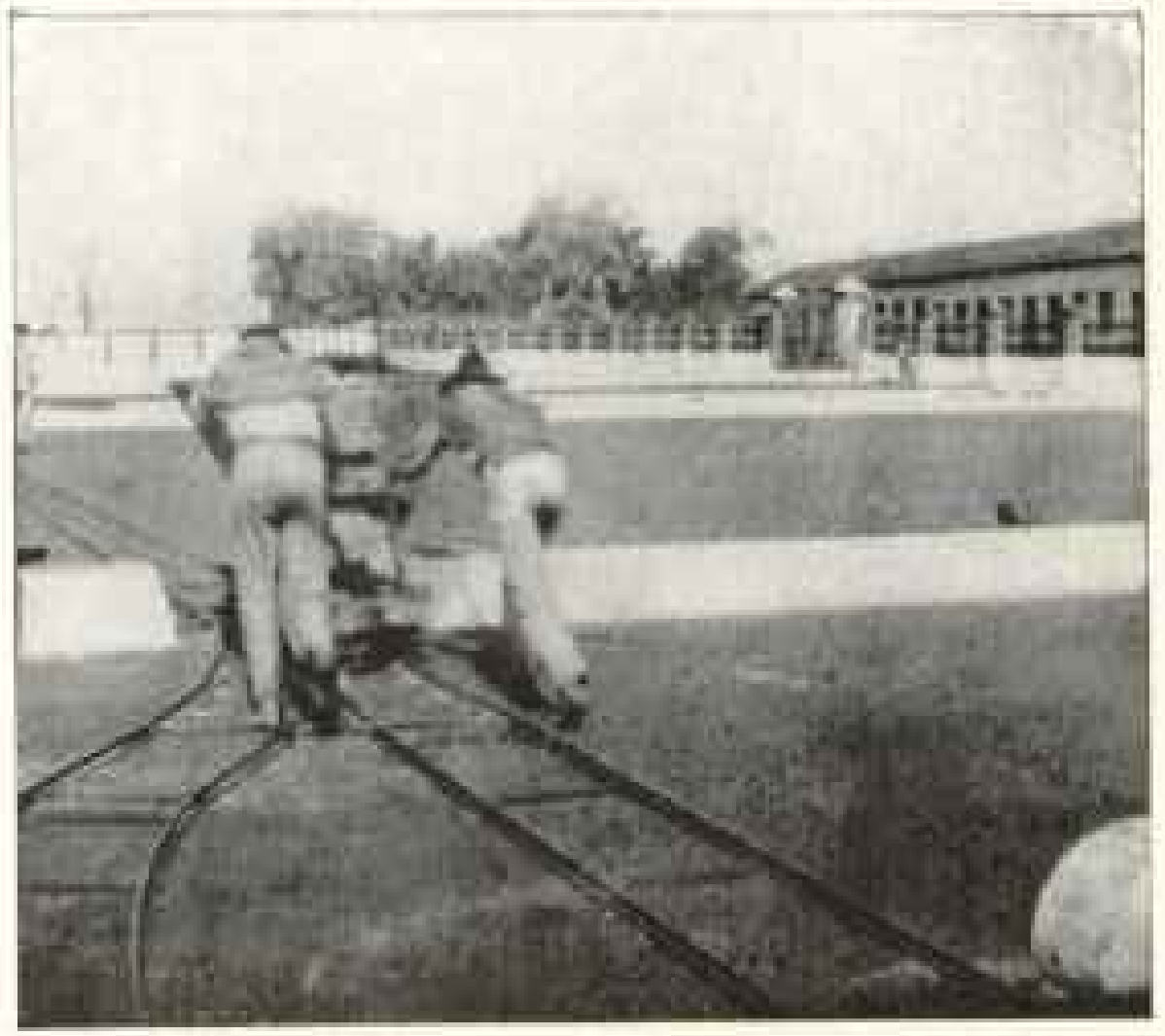


Photo by Robert DeC. Ward

DRYING GROUNDS, SHOWING METHOD OF DISTRIBUTING COFFEE BY MEANS OF HAND-CARS: FAZENDA SANTA CRUZ, SÃO PAULO, BRAZIL

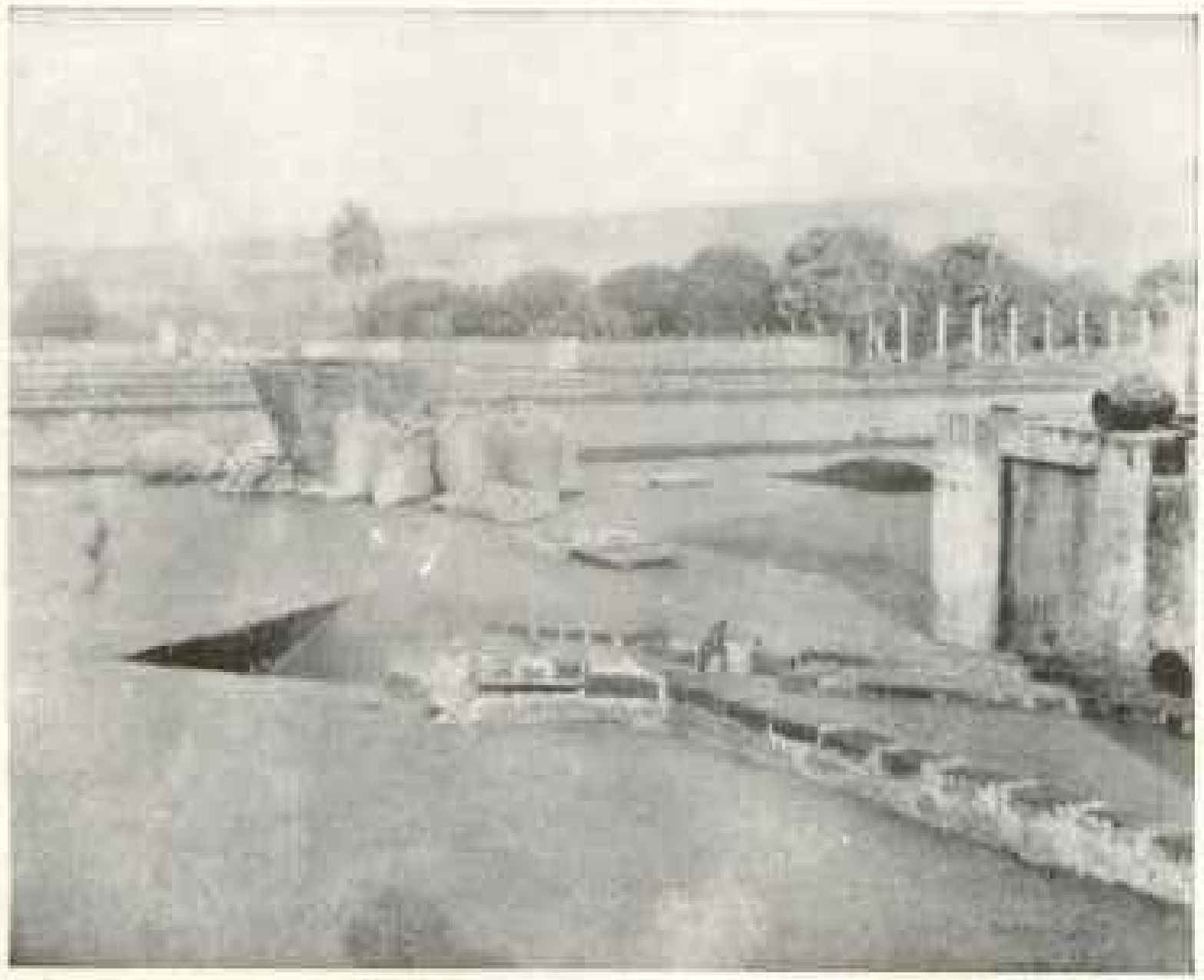


Photo by Robert DeC. Ward

DRYING GROUNDS, SHOWING THE OPENINGS FOR THE ESCAPE OF WATER

Photo by Robert DeC. Ward

DRYING GROUNDS, SHOWING METHOD OF SPREADING COFFEE: FAZENDA SANTA VERIDIANA, SÃO PAULO, BRAZIL

pushed by laborers along movable tracks, for distributing the coffee.

When carried by water, the coffee is brought through an underground channel to the surface of the drying grounds, and is there shoveled up into a heap, from which it is later distributed by means of wooden shovels, or hoes (see picture, page 922). The water runs off down the slope to openings which are provided for this purpose.

The winter weather is ideal for drying the beans. With prevailingly clear skies, light winds, strong sunshine, dry air, and rarely any showers, outdoor drying as practiced in Brazil is a remarkable success. The time needed for thoroughly drying the berries varies greatly, and it requires constant oversight and care on the part of the *administrador* to see that each lot of coffee as it lies on the *terreiros* receives just exactly the proper amount of drying.

Excessive heat, too rapid drying, too little drying, too slow drying—all injure the quality, the flavor, the color of the beans, and therefore affect the market value of the coffee. It is upon the drying grounds that the *administrador* of the coffee *fazenda* has the most need of all his training and experience. He is constantly on the ground, directing the

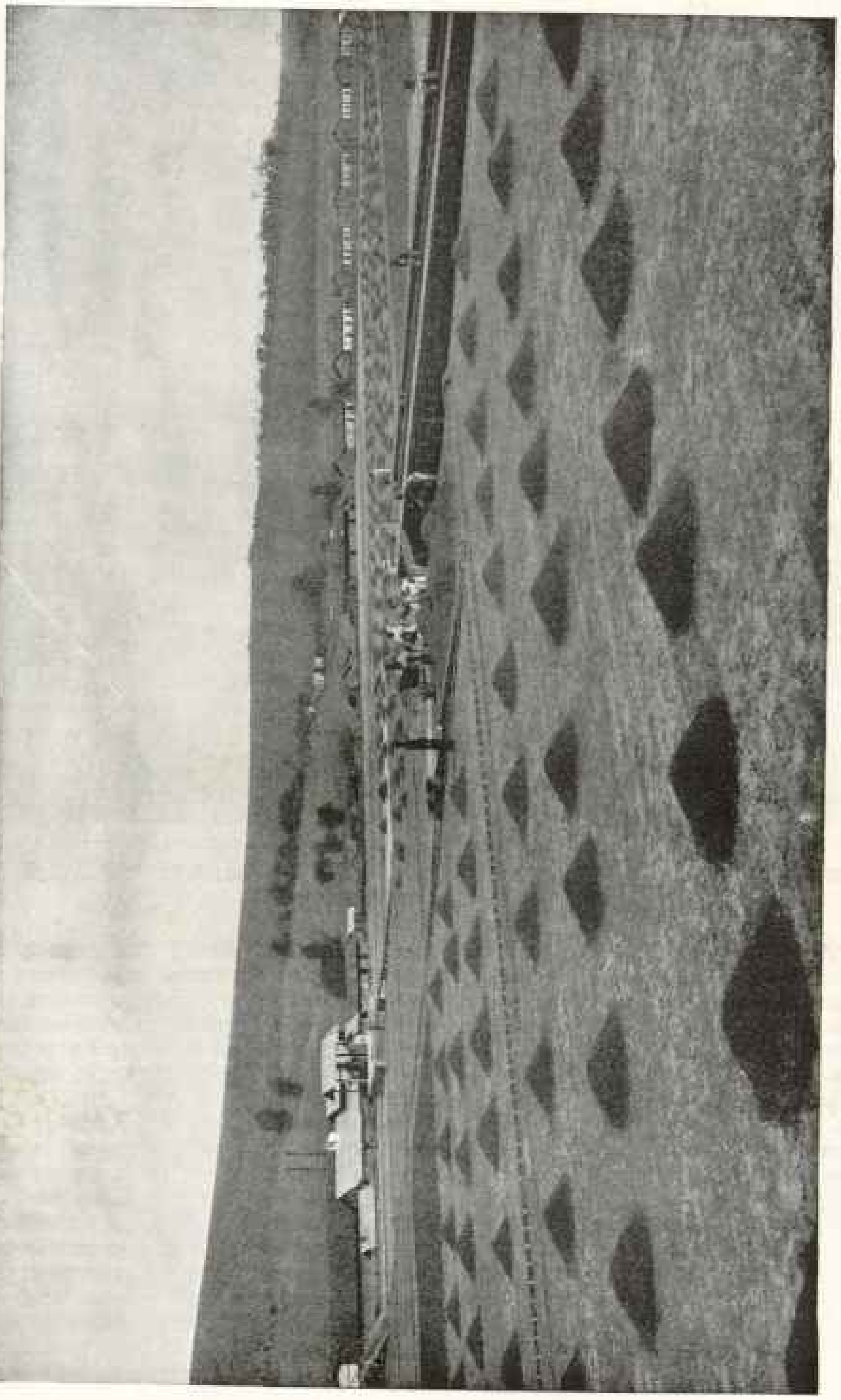


Photo by Guerdy

BRAZIL

ORIENTAL CHICORIUS (THRUSHES) : FAZENDA SUPERIOR, MONTE VERDE, SAN MANOEL, SÃO PAULO, BRAZIL

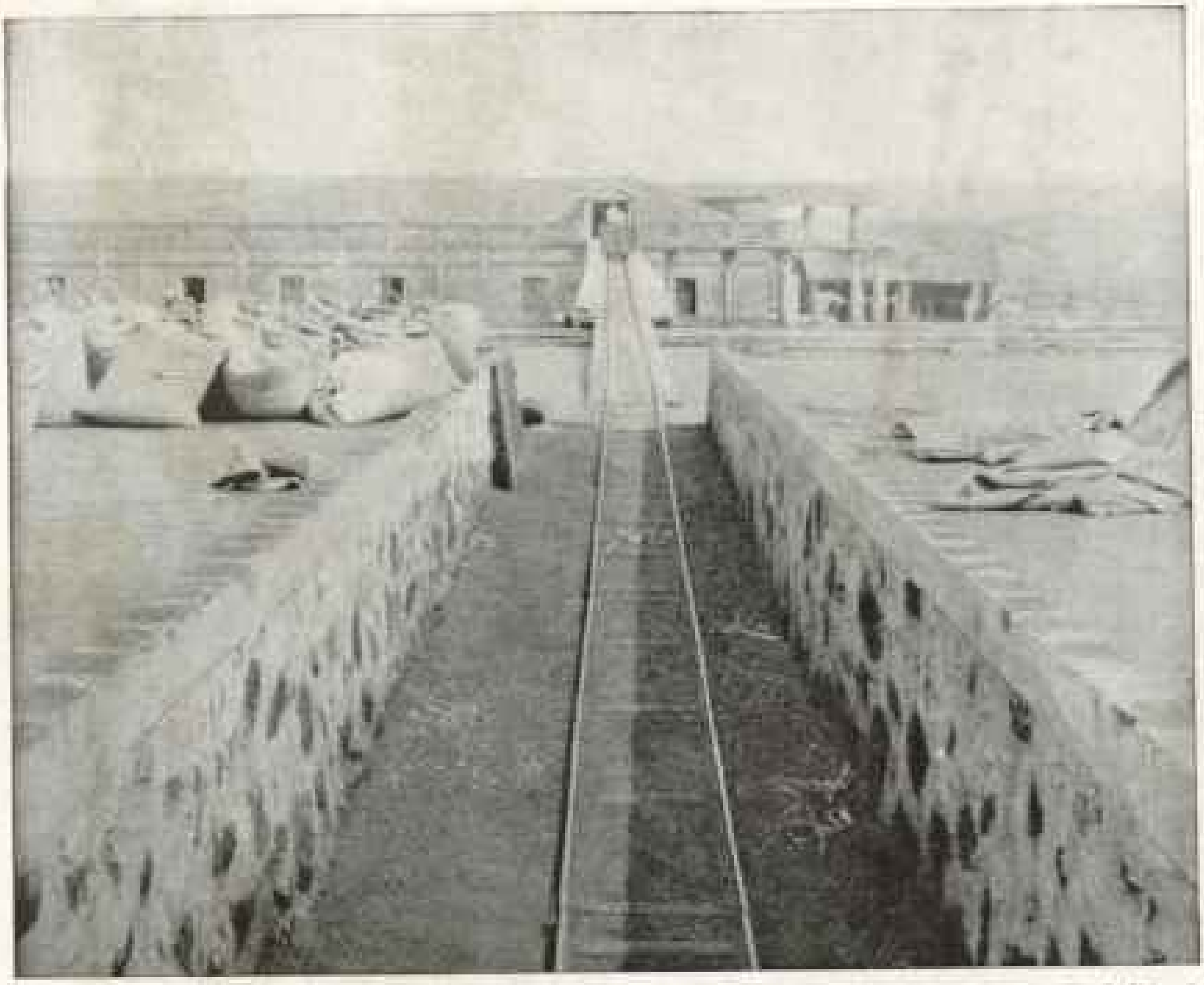


Photo by Robert DeC. Ward

TRACK FROM DRYING GROUNDS TO MACHINERY HOUSE: FAZENDA SANTA VERIDIANA, SÃO PAULO, BRAZIL.

laborers to spread this coffee out, to gather that coffee into heaps, to give this coffee another three or four hours of sunshine, to take that coffee from the *terreiros* to the warehouse. Each lot of coffee on each separate division of the drying grounds really requires and receives special treatment.

It is an extremely interesting sight, during harvest time, to watch the laborers on the drying grounds, constantly moving about from place to place, spreading out or gathering up the coffee, and at night piling it up into heaps, which, if necessary in order to protect them from rain or wind, are covered over with canvas.

The duration of the drying stage naturally varies greatly, from a few hours to many days, and depends to a large extent upon weather conditions. Coffee which has not been pulped takes much longer to dry. Thus far, in Brazil, there has been little resort to artificial drying, most of the growers preferring outdoor drying. With such winter weather as prevailed during the drying season of 1910, when the present writer was in Brazil, there is surely no need of any artificial drying.

REMOVING THE INNER SHELLS

The drying completed, the coffee beans which have been pulped are still inclosed in their inner and outer skins, or coverings, which are now dry and brittle. The next step is to remove these two envelopes. To accomplish this result without injuring the bean inside is the object of the ingenious and expensive machinery through which the coffee passes after leaving the *terreiros* and before it is finally packed in bags for shipment from the *fazenda* to Santos. Throughout this last stage in the preparation of coffee there are many different methods in use

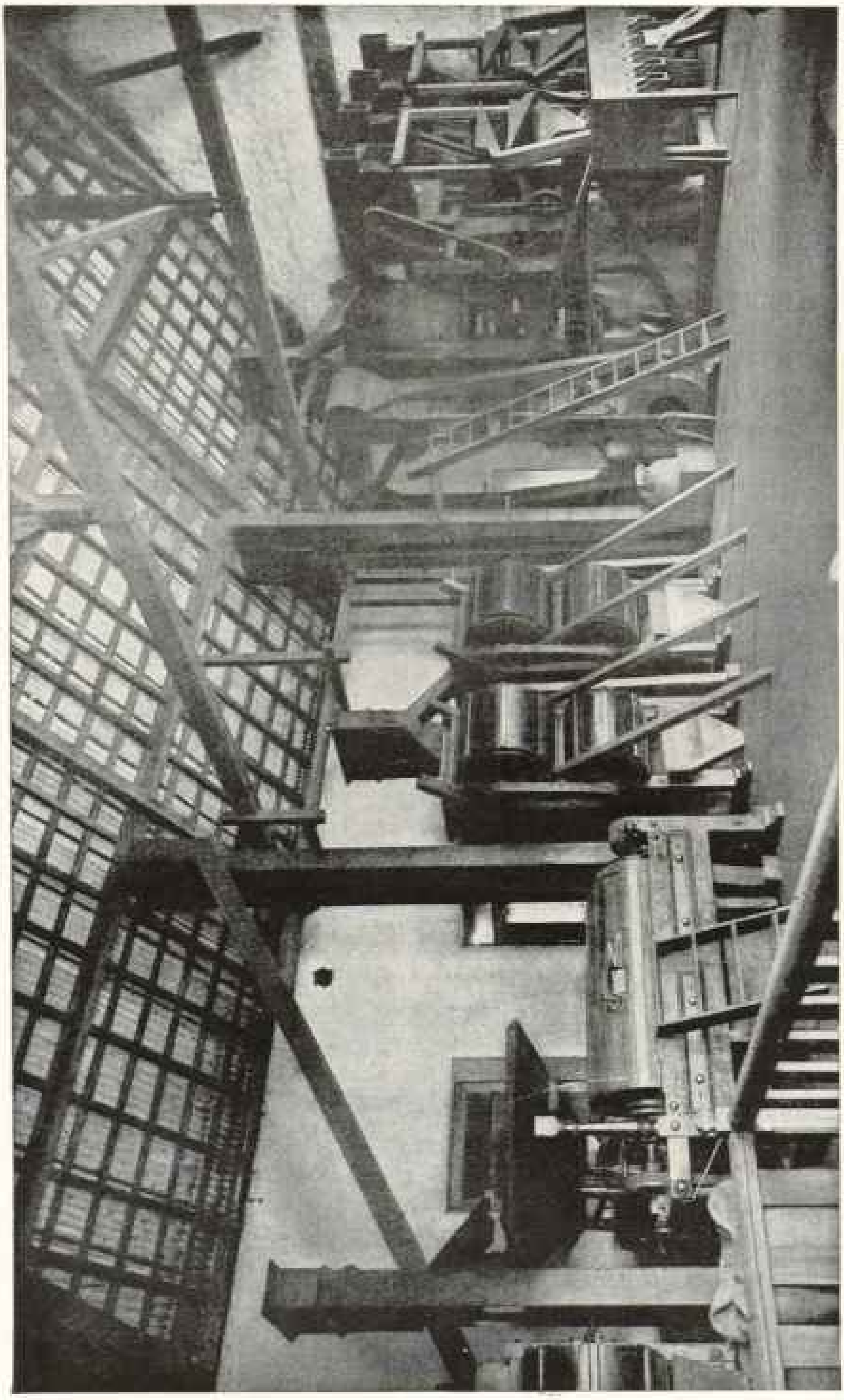
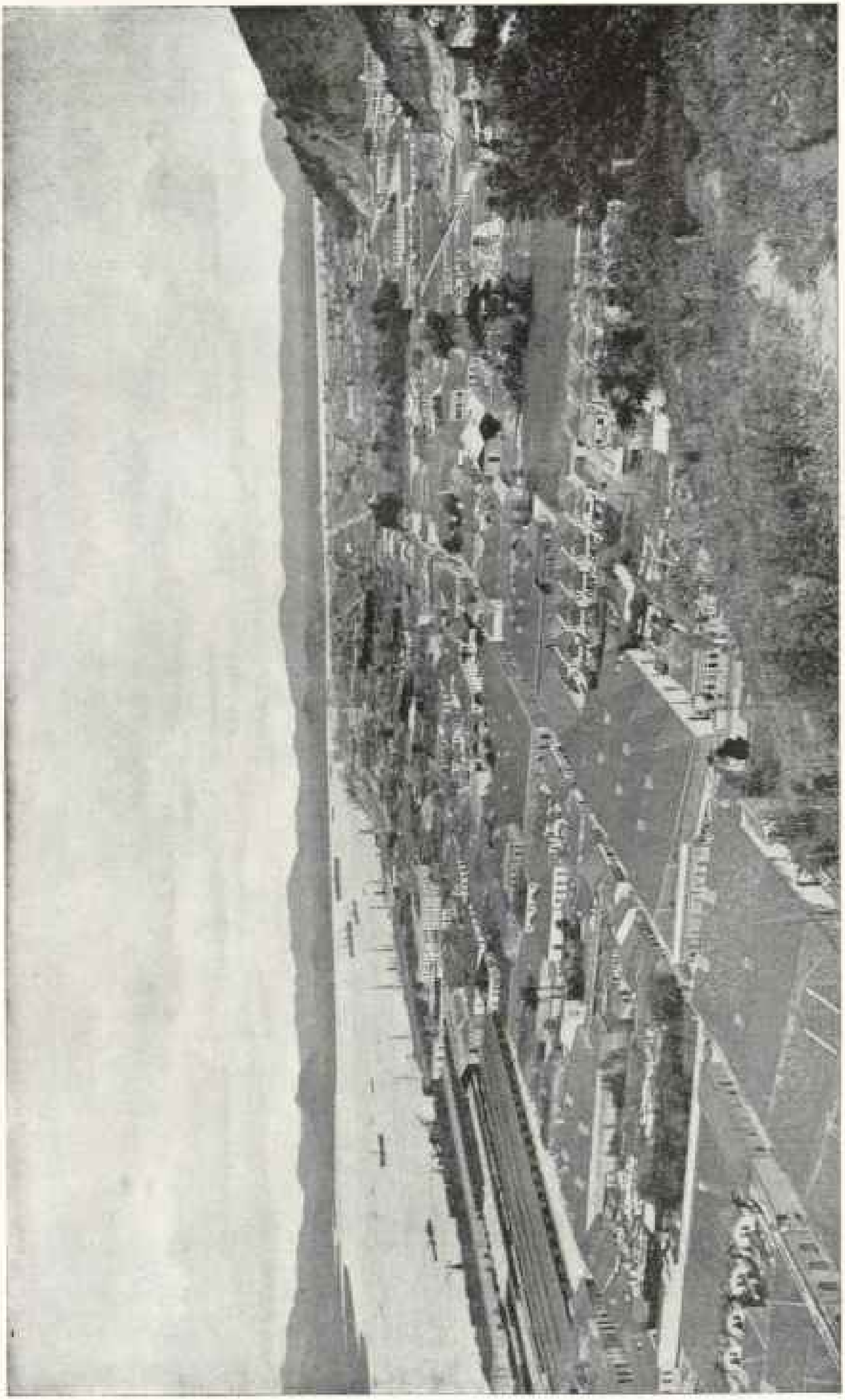


Photo by Gennaly

COFFEE MACHINERY: BRAZIL (SEE TEXT, PAGE 930)



PORT OF SANTOS, BRAZIL, WITH STEAMERS TWO AND THREE DEEP, ALL LOADING WITH COFFEE

Photo by Gleitsky

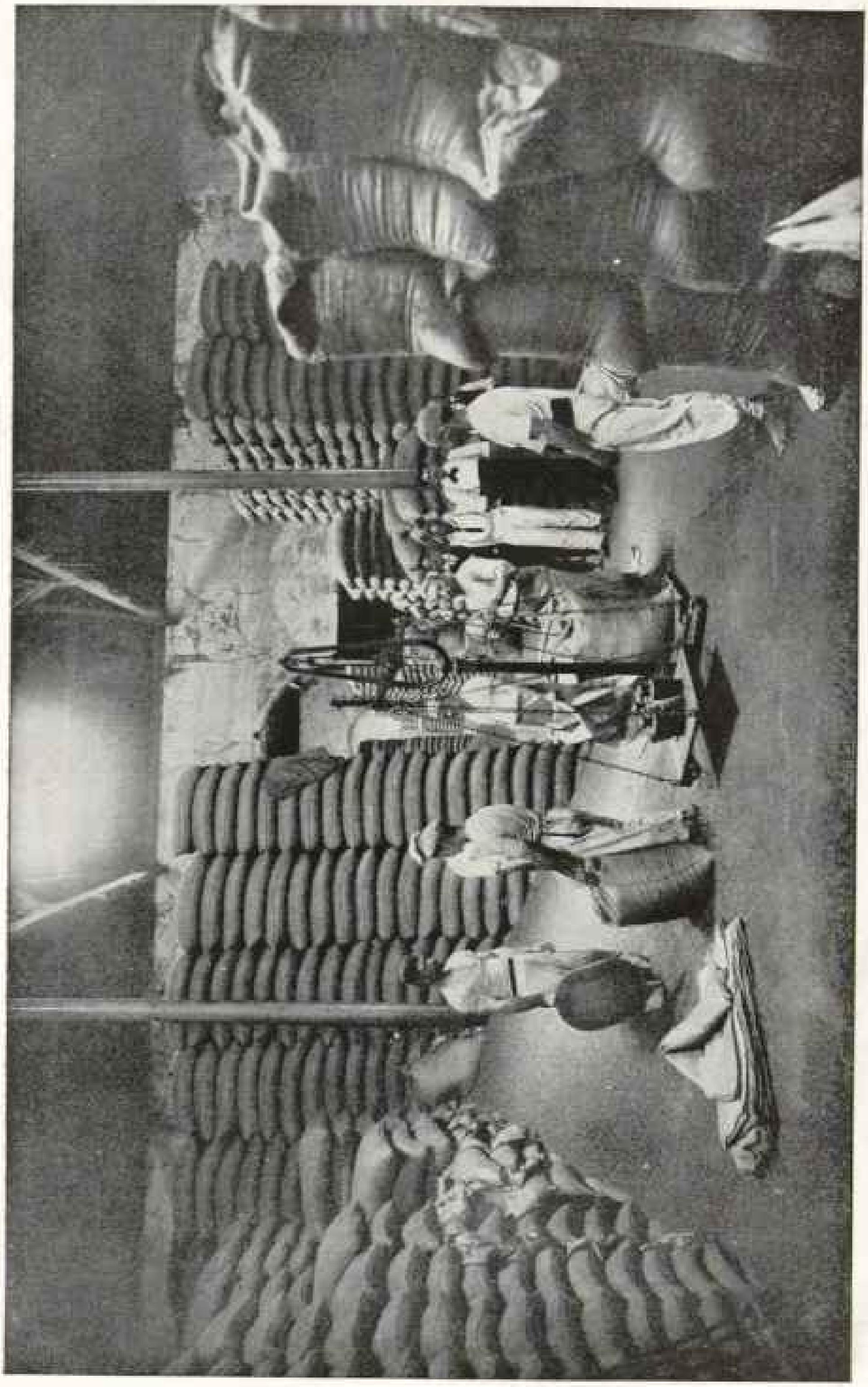
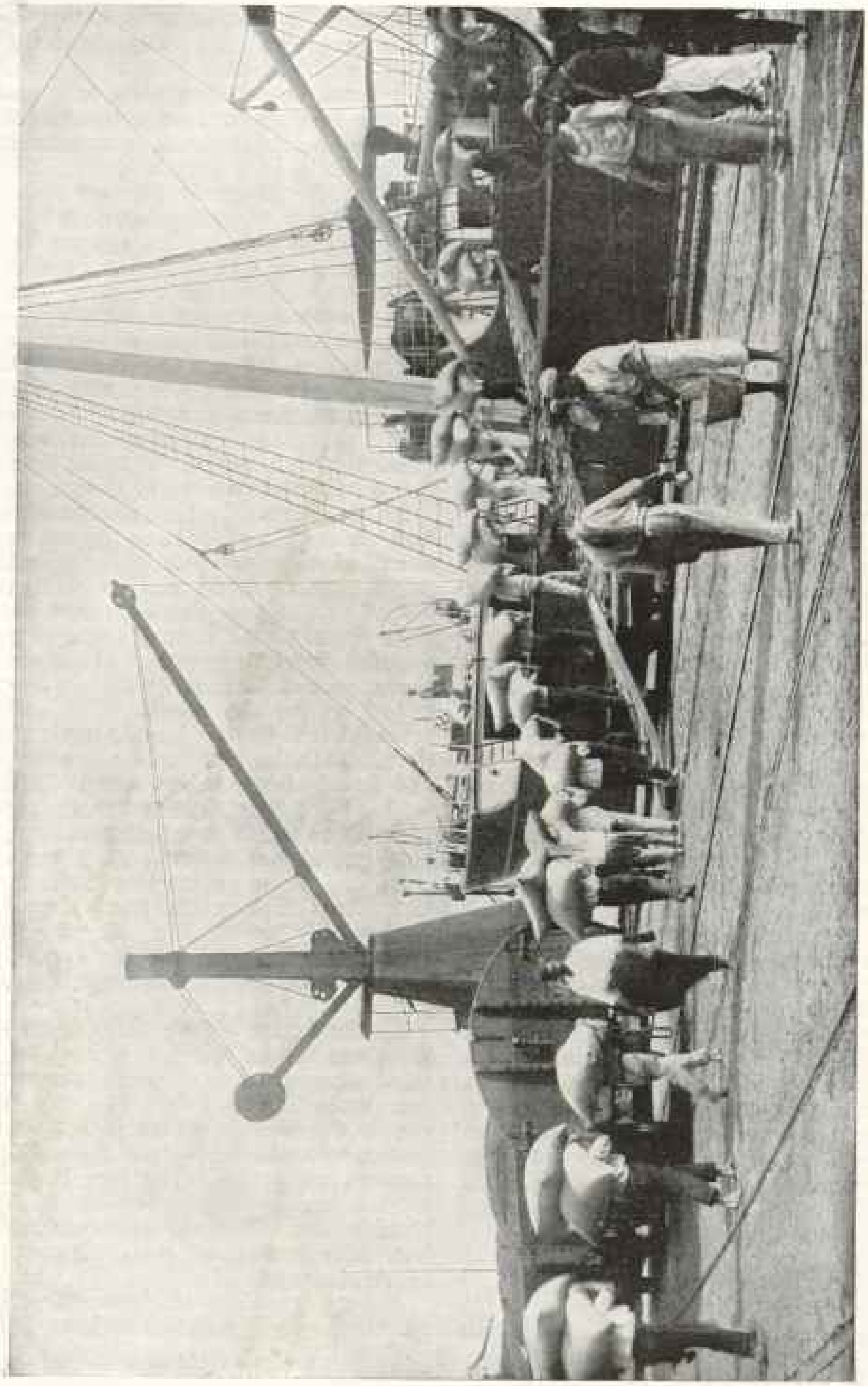


Photo by Gamboly

COFFEE WAREHOUSE: SANTOS, BRAZIL



LOADING COFFEE AT THE SANTOS DOCKS

Photo by Gamuly

and many different machines. In what follows, reference is made to what the writer himself saw.

When thoroughly dry, the coffee beans are gathered into heaps, put in sacks, and loaded on a hand-car, which travels on small tracks from the *terreiros* to a large building containing the storage bins and the machinery. The beans are first dumped into large bins containing coffee of various grades, and from these they are carried, as needed, to the first of the final stages. The first machine is a ventilator, in which an upward current of air, driven at a high velocity by a blower, carries the dust, outer shells, and lightest beans upward, but lets the heavy beans and any remaining stones and sand fall to the bottom, where a sieve, in rapid oscillation to and fro, separates the beans from the sand.

The modern machinery now in use in Brazil for removing the two inner envelopes from the coffee beans is of many different patterns and makes, but the object is the same in all forms, viz., to manipulate the beans between two surfaces, one of them in motion, until by friction the envelopes, or shells, come off and are carried in one direction while the beans go in another. Coffee which, because too dry, or too green, or imperfect, could not be pulped, is, as already noted, dried on the *terreiros*. It is then sent through the hulling machine just as if the outer skin and pulp had already been removed.

The general principle of the huller is very simple. A metal cylinder with a grooved or convoluted surface rotates inside of an adjustable metal cover, also grooved on the inside. The coffee beans, passing between these two grooved surfaces with much friction, gradually have their coverings rubbed off. Other hullers have a sort of Archimedes screw arrangement of varying sizes of thread, while others, again, produce the desired result by the friction of an iron or steel network against a rubber surface.

REMOVING THE DUST AND HULLS

From the hulling machine the coffee goes through a second ventilator, which throws off the dust and hulls, leaving the coffee beans clean and ready for sorting, and then to a separator. This, in a common form, is a hollow wire or copper cylinder in three or four compartments, all communicating, each compartment having holes of a certain definite size. The cylinder is gently inclined and is kept revolving, the coffee beans traveling slowly down the incline. Sometimes there is a spiral worm running down the central portion of the cylinder, which helps the beans to travel down the slope. Those which fit the openings in any one compartment fall out of the cylinder there; those which do not, slide along into the next compartment, and so on until they meet with perforations through which they can escape. There is thus a first classification, according to size.

Another form of separator, sometimes used alone or in addition to the one just described, consists of a series of wire sieves with mesh of various sizes arranged vertically so that each successive sieve slopes off at a small angle in the opposite direction from that of the sieve above, each division being slightly overlapped by the one above. The coffee beans fall in at the top, into the uppermost sieve. This, kept in rapid vibration to and fro, lets any beans which fit the mesh of the first division fall through, while those which do not fit these openings are shaken down onto the next sieve, and so on, all the way to the bottom. In this way the beans may be mechanically sorted into six or eight categories. They fall directly from the machine into the bags through funnel-shaped troughs.

The final stage is the *catador*, in which the beans are subjected to a strong upward current of air, which separates them according to weight into two (or more) categories. There is usually a glass window in the front of the *catador*, through which the beans may be seen carried up by the strong draft, the heavier ones falling, the lighter ones rising. The strength of the draft can, of course, be regulated.

A very ingenious single combination machine, recently installed at Santa Veri-

diana, does all the work which follows the *terreiro* stage, viz., that of the ventilators, the huller, the separators, and the *catador*. This machine, which was invented by a Brazilian, has thus far given perfect satisfaction, and it occupies but a small portion of the space which was formerly taken up by the six machines which it has replaced.

READY FOR SHIPMENT

The coffee beans—hulled, cleaned, and sorted—fall directly from the last machine into the bags. When these contain 132 pounds each they are sewed up and are ready for shipment to market.

Along the roads, deep in red dust, six or eight yoke of oxen draw the heavy wagons, loaded with the precious sacks, to the nearest railroad station, in cases where the railroad does not come directly into the *fazenda*, as it often does.

Off to the south go the trains, first to the city of São Paulo, and then down the steep eastern slopes of the Serra do Mar to the world's famous coffee port. In Santos, coffee absolutely dominates the lives of the people. Coffee is everywhere—on the streets, in the warehouses, on the train. Every one is busy with coffee. The docks are lined with two or three miles of steamers, often lying two abreast, all waiting to load coffee—a wonderful sight—steamers flying the British flag, and the German flag, and the French flag, and the Brazilian flag—steamers flying almost every known flag except our own glorious Stars and Stripes. Here in Santos, in the big warehouses lighted from above, the coffee dealers carefully blend and repack the precious berries. Here the holds of the waiting steamers are filled almost to the bursting point with the well-known flat bags of coffee. Here the traveler sees the last step in the progress of the coffee berry, from the time it ripens on the tree until it leaves Brazilian soil, to furnish some breakfast table in a far-off land with the favorite morning beverage of the civilized world.

A CORNER OF OLD WÜRTTEMBERG

By B. H. Buxton

With Photos by the Author

GERMANY in the middle ages was a part of the Holy Roman Empire, at the head of which was the Emperor, and under him a host of petty princes, dukes, and counts more or less independent. As the power of the Emperor waned that of the petty rulers waxed until they became quite independent, ruling their little states autocratically. By degrees the more powerful among them increased the area of their domains at the expense of the less powerful, so that at the present day under the newly constituted German Empire there are only five states of any importance and not more than about 15 unimportant ones.

North Germany consists practically of the giant Prussia, with the small kingdom of Saxony and a scattering of the insignificant states, while South Germany is made up of the kingdom of Bavaria on the east, the Grand Duchy of Baden on the west, with the kingdom of Württemberg between them.

Württemberg is a fairly compact little state, except for a small wedge of Prussian territory entering from the south. The history of Württemberg is that of the more aggressive German states. The counts of Württemberg are first heard of in the twelfth century, holding a castle on what is now the Rothenberg (Redhill), in the neighborhood of Stuttgart,

the present capital of the kingdom. By 1500 the counts had so increased their power and extent of territory that they were created dukes by the Emperor Maximilian, and dukes they remained until 1806, when Napoleon, for services rendered by Württemberg against Austria, made the duke into a king and added largely to his territory in 1806 and 1810, the new kingdom thus constituted being about one-third larger than the original dukedom.

Württemberg since that time has not increased its acreage, and is popularly, though not officially, divided into Old Württemberg and New Württemberg, the latter being that part of the state which was added by Napoleon. This unofficial division into old and new Württemberg is of importance, as will be seen in considering the distribution of religious beliefs in the country. In 1871 Württemberg joined allegiance to the newly constituted German Empire.

Württemberg for governmental purposes is divided into four "kreise," or counties, and each kreis into a number of "oberamts," or districts. In an oberamt are 30 or 40 "gemeinde," village communities, or townships, each consisting of a single village, or town, with the adjacent land. The Nagold Thal (Valley of the Nagold) lies chiefly in the oberamts Nagold and Calw, of the Schwarzwald (Black Forest) kreis, and belongs to Old Württemberg, with the exception of a small part of the watershed south of Nagold, which is in the oberamt Horb and belongs to New Württemberg. The Nagold River itself rises at Urnagold, in the oberamt Freudenstadt, runs in an easterly direction to Nagold, where it turns due north, and flows past Calw and Liebenzell into the Enz at Pforzheim, the Enz itself running from Pforzheim east to Besigheim, where it joins the Neckar.

From Urnagold to Altensteig, 10 miles above Nagold, the Nagold is an insignificant stream and rather inaccessible, but from Altensteig to Pforzheim the scenery throughout its entire course is exceedingly picturesque and beautiful, without, however, the grandeur of the mountainous Black Forest country immediately to the west. The valley is narrow and the steep slopes are clothed with pine forests, a strip of fertile meadow land on either bank of the river.

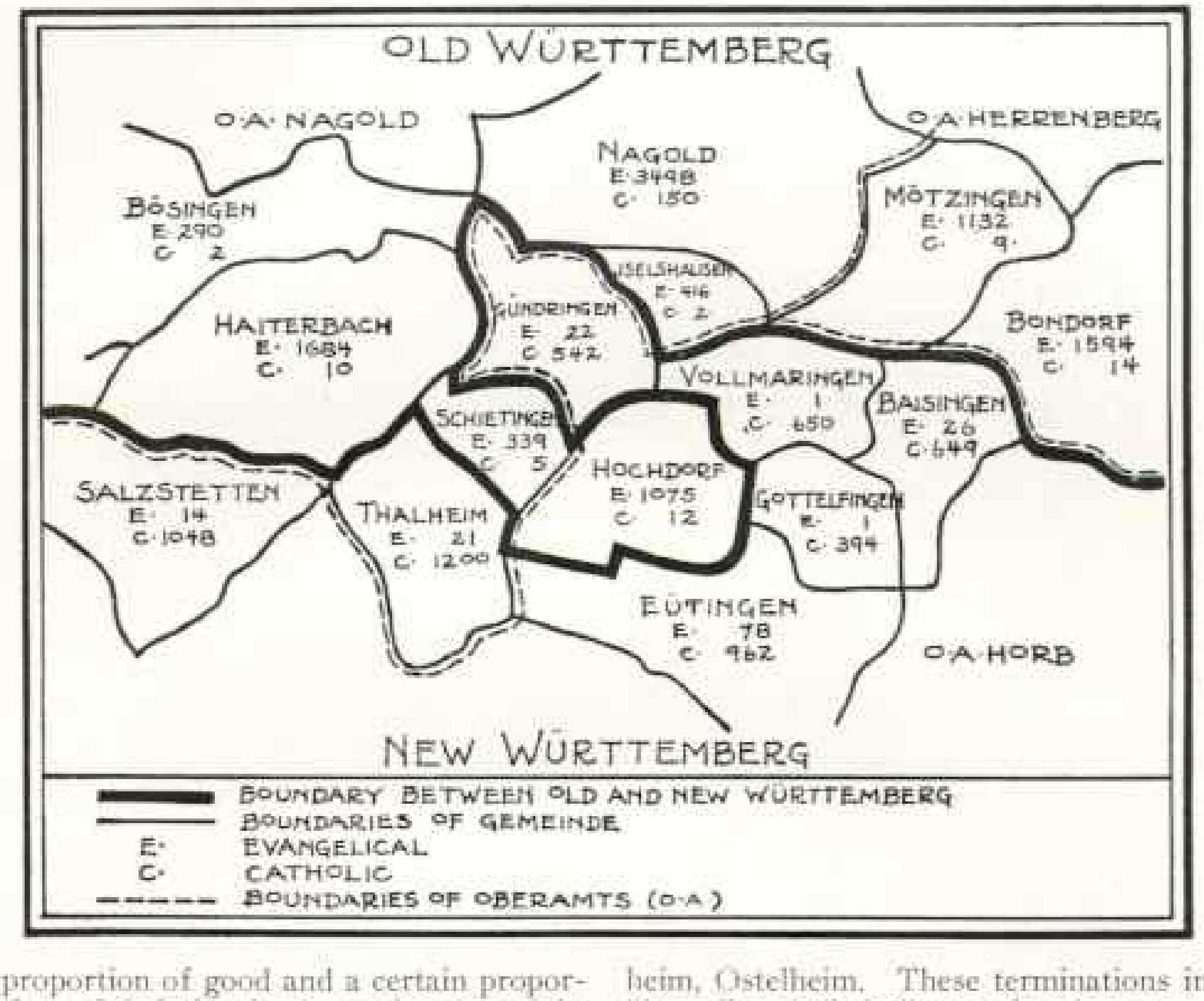
At various points are picturesque towns and villages, some, as Altensteig and Wildberg, perched on precipitous slopes overhanging the river; others, at points where the valley widens out, situated on the river banks—Nagold, Calw, Hirsau. Tanneries and sawmills abound and there are not a few cloth and woolen mills, all operated by water-power derived from the river, which is swift and too small for navigation.

The watershed on the left bank of the river presents a broken, hilly surface, the foothills of the Black Forest range. The upland country of this side of the river is heavily wooded, with relatively little devoted to agriculture, the villages being small and scattered.

The watershed of the right or east bank, mostly in the oberamt Herrenberg, presents a very different aspect, being a rolling, fertile upland with numerous compact, prosperous-looking villages, and the land entirely devoted to agriculture, except for a few acres of wood in each gemeinde, planted and controlled by the community for general use. Wheat, oats, and roots furnish abundant crops, and hops, introduced about 1840, are largely grown in sheltered spots, but the climate does not permit of vine culture. The system of farming is that of southern Germany generally.

The farmers, all of whom own their land, live in the villages and own strips of land scattered throughout the gemeinde. Not a house nor even a barn or shed is to be seen outside of the village, nor is there a single fence or hedge. The strips of land (gewannen) are long and narrow, often not wider than is necessary to turn a plow.

The system has arisen as a logical outcome of the arrangements of early days, when the land belonged to the gemeinde (gemeinde means commonwealth), and was parceled out among the farmers for yearly tenancy, each farmer receiving a



proportion of good and a certain proportion of inferior land, so that he might be allotted half a dozen plots in various parts of the common land. By degrees it became customary for the same parcels of land to be allotted to the same families each year, and, after some generations, individual ownership in the land became established.

As the individuals of each family increased in number the plots became more and more divided up among the sons, until today they can be divided no longer, and it has become the custom for one son only to remain on the farm, the others seeking their fortune elsewhere.

MARKED SIMILARITY OF NAMES BETWEEN THESE AND OLD ENGLISH CITIES

Of the villages on the rolling uplands east and south of the Nagold Thal, a great number have the termination "ingen," as Jettingen, Geckingen, etc., and some end in "heim," as Stammheim, Ostelheim. These terminations in "ingen" and "heim" are of rather peculiar interest, since they indicate the earliest Teutonic settlements. Before the time of the Romans the Celts, or a Celtic-speaking people, were in possession of what is now Württemberg, and have left their traces in the names of some rivers and mountains; the word Nagold itself probably contains a Celtic root. During the first century B. C. the Germans began to pour in from the north and the Romans from the south, but the Romans gained the upper hand and occupied the country till the fourth century A. D., towards the end of which they were finally driven out by the Alamans, or Swabians (Roman Suevi), a branch of the German Franks, who swept in from the north up the valley of the Neckar. About the same time the Angles and Saxons invaded England and founded numerous settlements with names ending in "ing," "ingham," "ing-

Photo by B. H. Buxton

WEST GATE TO THE OLD FORTIFIED TOWN OF VILLINGEN: WÜRTTEMBERG

Photo by B. H. Buxton

GATEWAY TO HORB, ON THE NECKAR RIVER, ANOTHER OLD FORTIFIED TOWN IN WÜRTTEMBERG

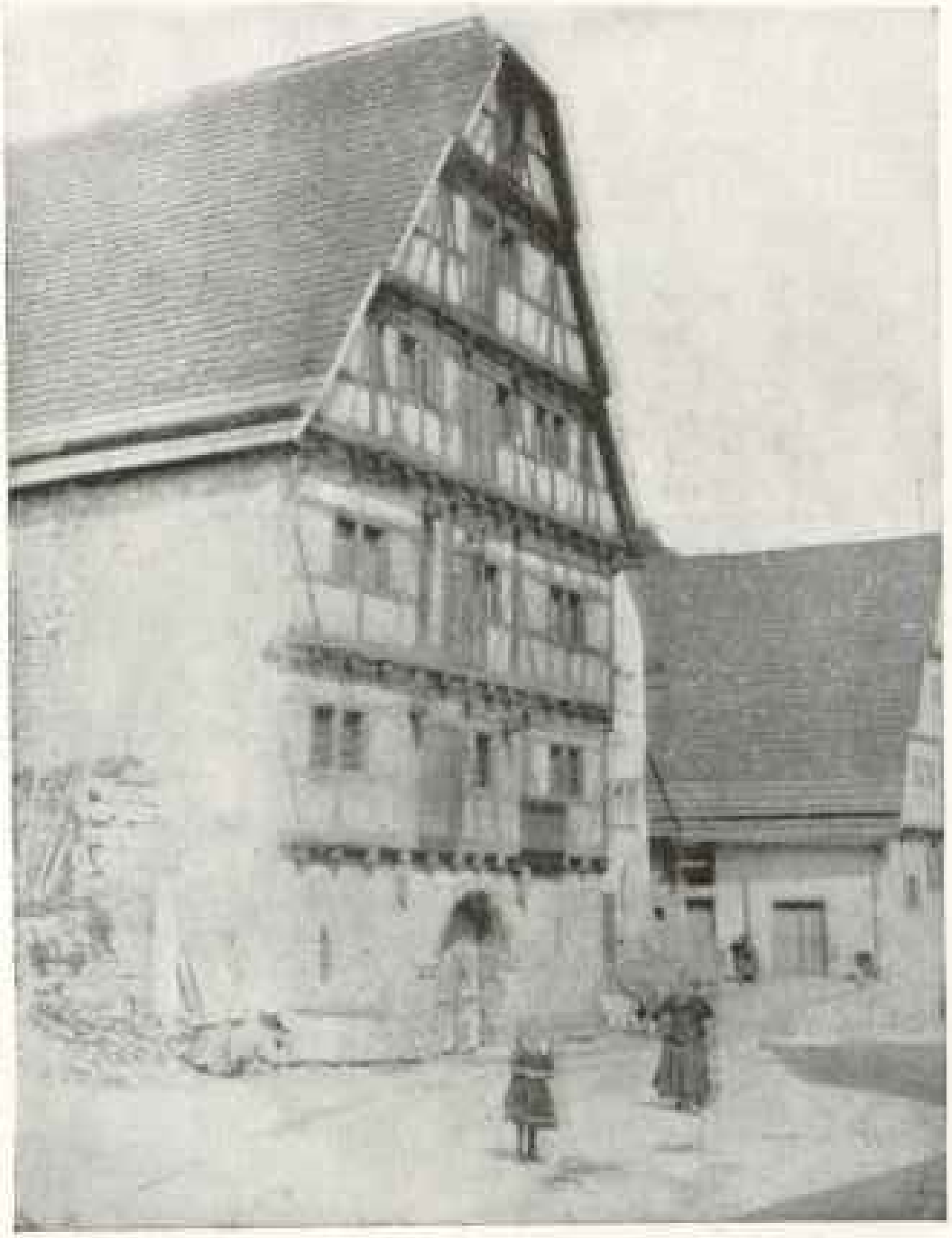


Photo by B. H. Buxton

A HOUSE IN HORB, WÜRTTEMBERG, BUILT AT LEAST 200 YEARS AGO

The houses in these old fortified towns were built 5 and 6 stories high, as the space within the walls was limited, consequently their appearance suggest to the American traveler the skyscraper of today.

Photo by B. H. Buxton

STORING HAY IN THE LOFT OF THE SAME HOUSE AS SHOWN IN THE ADJOINING PICTURE

The ground floor of these houses is generally used as a stable and cowshed; the next two stories are occupied by the family, and the three upper stories, which are practically attics, are devoted to the storage of hay and grain (see page 939).

Photo by B. H. Buxton

REAR VIEW OF SEVERAL HOUSES, SHOWING HOW CLOSELY THEY ARE PACKED TOGETHER IN SOME TOWNS (SEE PAGE 938)

Photo by B. H. Buxton

REAR VIEW OF AN OLD HOUSE AT ROTTWEIL, WÜRTTEMBERG: NOTE THE WINDOWS IN ROOF

ton." The "ing" signifies "son of," or "family," and we have the Basings, or Bas family; the Hardings, or the Hard family; the Heckings, or the Heck family, and so on.

The "ingens" are found scattered very thinly throughout Germany, except just in Württemberg, and parts of Baden, Bavaria, and Switzerland, bordering on Württemberg, and it is probable that the Anglo-Saxons who invaded England and the Alamans who migrated up the Neckar were of the same stock. Not only do the place-names have the common ending in "ing," but the family names are also very frequently exactly alike; too frequently, indeed, to make it seem probable that the resemblance is purely accidental.

Thus the family of the Basings appear to have been very widely distributed, and is represented in England by Basing, Basingstoke, Bessingham, etc., and in the South German "ingen" district by Baisingen, Bosingen (locally pronounced Baisingen), Bessingen, etc., though perhaps the Basings and the Bessings were distinct families. Again, we find in England, Effingham; and, near Stuttgart, Oefingen, which in an old map of 1608 is written Effing.

If we take the county of Norfolk, in England, in which there are a large number of "ings" and "inghams," we can compare some of the names with those in the "ingen" district.

Norfolk.	*"Ingen" District.*
Mettingham	Mettingen
Hasingham	Hasingen
Wendling	Wendlingen (3 times)
Heckling and Hecklingham	Hecklingen
Wellingham	Wellingen

and many others equally comparable.

Canon Taylor, in a little book called "Words and Places," has attempted to homologize the "inghams" of England with the "ingens" of South Germany by supposing that the "ingen" is a corruption of "ingham"; but in the earliest documents of the eighth century the "ingens" are called "inga," or "inger," which is less like "ingham" than the modern "ingen," while in a map of 1608 most of the "ingens" are written as "ing" simply, although this may have been an abbreviation to economize space. It is, at any rate, more probable that the "inga" or "ingen" is the genitive or the dative of the "ing," so that Baisingen, for instance, means "settlement of," or "at the Basings," and is the homologue of the English Basing. In England, Bessingham certainly means home of the Basings, or Bessings, and Basingstoke means inclosure of the Basings (stoke = inclosure); and again, Basington is the house of the Basings.

With regard to the "heims," they appear to have been founded by another branch of the Franks, since they are only thinly scattered in the "ingen" district, but occupy a territory exclusively their own in Alsace, on the left bank of the Rhine, between the Black Forest and the Vosges Mountains.

The race of Franks which founded the "heims" does not appear to have had family names ending in "ing," as we find no "ingheims," but such places as Knorsheim, Shäffersheim, Sigolsheim—*i. e.*, home of Knor, Shäffer, Sigol—or else Quartzenheim, Bolzenheim, Witternheim; *i. e.*, the home of, or at the Quartzes, Bolzes, Witters. There are, however, a few, but very few, "igheims," as Besigheim, Hurtigheim, which were probably originally "ingheims."

Besides the "ingens" and the "heims," there are a number of places ending in "weil," "weier," "weiler," "viller"; *e. g.*, Rottweil, Bodersweier, Gebweiler, Nebviller, which are found edging the forests and mountains of the Black Forest and Vosges. The "weil," or "weiler," was a single habitation, not the settlement of a family group, the broken ground where the "weilers" occur not having been sufficiently cultivated at the time of settlement to support more than a single couple in each open spot. The "weilers" were probably of later date than the "ingens" and the "heims."

The accompanying map shows the distribution of these three place-name endings in parts of Württemberg, Baden,

Photo by R. H. Huston

HORB FROM THE CITY WALL, SHOWING THE STEEP TILED ROOFS OF THE HOUSES

Alsace, and northern Switzerland. The "ingen" settlements appear to have spread over the fertile uplands of Württemberg, south to the Rhine, across it, and then in a westerly direction to Basel and a little way beyond. From Basel, on the right bank of the river, they ran up north about half way to Strassburg. On the west of the Black Forest the "ingens" do not seem to have come down from the north, as there are none in Baden except towards its southern boundaries. There is another small isolated group of "ingens" in northwestern Alsace.

The "heims" appear to have spread from the north up the left bank of the Rhine as far as Basel, and, crossing the river at some points, to have mingled with the "ingens."

The "weilers" for the most part edge the mountains, and wherever they are found away from the ranges, the maps show considerable stretches of wood, an indication that in these spots the land is below the average in fertility and was avoided by the earliest settlers. In the Black Forest and the Vosges ranges themselves the place-names mostly bear some such meaning as hill, brook, wood, often with the name of some wild animal, such as boar, beaver, or deer, tacked on to them, and may be rendered as Boarswood, Beaverbrook, and so on.

TYPES OF ANCIENT VILLAGES

The ancient "ingens" and "heims" are found in the fertile plains and rolling uplands, and present a particular, compact type of plan for the villages, which are known as "geschlossene dörfer" (closed villages), the houses being closely packed together, often very lofty, grouped around a center, which is the market-place of the larger towns. The church does not often take a central position, but Christianity came later than the settlement.

Of a very different type are the villages of the foothills of the Black Forest; for example, on the uplands of the left bank of the Nagold. In these villages the houses lie relatively far apart from

each other, and are scattered in long rows on each side of the road running through them. Such villages are known as "reihen dörfer" (row villages), and are of much later date than the "ingens" and "heims," being attributed to the 11th century, before which time the Black Forest region had been practically uninhabited except for the "weilers" on its borders. The "reihen dörfer" do not appear to possess any specific endings, although "hardt" (wood) is a very common one, as Langenhardt, Ebershardt.

CONSTRUCTION OF THE HOUSES

The typical house, though subject to many variations, in the closed village and more particularly in the towns, which were originally fortified, and in which space was therefore limited, is lofty, five or six stories high, built with massive wooden uprights and beams, the interstices forming the walls being filled with rubble and plaster. The house is built, therefore, upon what may be called a vertebrate plan, and foreshadows the epoch of skyscrapers, which are essentially similar in design, but in which steel replaces the wood of former days as the skeleton which supports the structure.

The steep, tiled roofs slope down over the three upper stories, so that they are all practically attics. The ground floor is generally used as a stable and cowshed, the fenceless system of farming precluding the pasturing of cattle and sheep, which have to be stall-fed. The next two stories are occupied by the family, and the upper three stories forming the attic are devoted to storage of hay and grain, hauled up by pulleys and ropes. All agricultural produce is brought into the village or town instead of being stacked outside in the fields, a custom which may be attributed to the insecurity of early times, and has been perpetuated, although today there is no especial need for it.

The town of Calw is the best spot in the Nagold Thal for a study of these quaint, lofty wood and plaster houses, some of them dating back to the 17th century, and the village Geckingen, a visit to which should not be omitted, has some beautiful examples.

The typical house in the "reihen dörfer," on the west side of the Nagold, is not so lofty, and the walls are usually faced with shingles, as is the custom in Switzerland. Since the houses are much further apart than in the closed villages, there is not the same reason for economizing space, and the barns and stables are usually separate from the house.

RELIGIOUS SEGREGATION IN THE TOWNS

In histories we read that Württemberg has a population of two millions, of whom two-thirds are Protestant and one-third Catholic; but a bald statement of this sort gives one no idea of the real distribution of religious belief, which to one coming fresh to the subject appears to be of a most extraordinary character. Leaving out of consideration the larger towns, which are mainly Protestant, but naturally show considerable intermingling of religions, we find that the small towns and villages are either overwhelmingly Catholic or overwhelmingly Protestant, 95 to 99 per cent on one side or the other, and on following up the boundaries between old and new Württemberg it becomes clear that the Protestant villages are in old and the Catholic in new Württemberg.

So sharply defined are the dividing lines that one may, in many places, walk from one village 99 per cent Protestant to another two or three miles off and find 99 per cent Catholics. The sketch-map shows the boundary line of Old Württemberg, just south of Nagold, with the names of the gemeinde and the number of Protestants (evangelicals) and Catholics in each.

For an explanation of the astonishing figures given in the map, one has to go back to the time of the Reformation, in the 16th century, when the religion of the people had to conform to that of their rulers. If the ruler remained Catholic he burnt all his Protestant subjects, and if he embraced the new tenets he burnt all the Catholics. As a matter of fact,

Photo by B. H. Baxton

SCENE AT ALTENSTEIG, ON THE NAGOLD RIVER

however, very few loving subjects were actually burnt, because at that time the mass of the people cared nothing for religion, but set a high value on their lives.

In many of the German states the inhabitants had to change their religion several times before settling down; but the Württemberg rulers were consistently Protestant, with the exception of a certain Duke Carl Alexander, who about 1750 proposed to introduce Catholicism into Old Württemberg again. But by that time the people had no desire to change, and had got beyond the stage of allowing their rulers to choose their religion for them, so that there certainly would have been a revolution had not the Duke's plans been nipped in the bud by his sudden death—whether natural or artificial is uncertain.

Of the territory gained by Württemberg in 1806 and 1810, almost all had belonged to Catholic rulers, and the new king wisely refrained from courting revolution or official apoplexy by trying to make his recently acquired subjects Protestants, and Catholics they have remained to this day.

Human relics of the stone, bronze, and early iron ages are scarce, and the only important historic finds date from the Alamanic period. At Gültlingen, near Wildberg, a number of the well-known row graves of the Alamans have been opened, and the beautiful metal objects found there may be seen in the museum at Stuttgart. In the guide-book to the Stuttgart Museum there are 13 places mentioned where important Alamanic finds have been made in Württemberg. Of these 13 places, 9 are "ingens," two are "heims," and only two with other endings—a proportion which seems to fit in with the theory that the "ingens" were founded by the Alamans.

INTERESTING MEDIEVAL ARCHITECTURE

For details of the medieval remains, the guide-books must be consulted, but the ruined castle of Zavelstein, on the

Photo by R. H. Buxton

AN OLD HOUSE IN NAGOLD WHICH HAS BEEN RENOVATED

Teinach stream, as well as those of Hohennagold and Liebenzell, may be mentioned, all of them being very picturesquely situated, though not of any special historical interest.

The cloister of Hirsau, between Calw and Liebenzell, was founded in the 11th century, and possessed the largest romanesque basilica in Württemberg. The cloister became of great importance, and even after the Reformation was utilized as an evangelical cloister school. It was destroyed by the French in 1692, and during the 18th century the ruined buildings served the purposes of a stone quarry, so that there is not much left at the present time.

At Wildberg considerable remains of the old town walls are still standing, and there are some very ancient stone houses among the later wood and plaster houses, which themselves date back to the 17th and 18th centuries.

In considering racial questions, it must in the first place be borne in mind that language is no criterion of race, and secondly, that broadly speaking we may distinguish three main types in Europe.

1. *Northern.*—The Scandinavian, Teutonic, or Baltic race. Tall, very fair, blue eyes, pink-and-white complexion, dolichocephalic. Developed in the fogs of the Baltic region. Purest in Sweden.

2. *Central.*—The Alpine race. Medium height, dark, brown or gray eyes, brachycephalic. Probably of Asiatic prehistoric origin. Purest in Piedmont.

3. *Southern.*—The Mediterranean race. Short, very dark, black eyes, olive complexion, dolichocephalic. Developed in the sunny south. Purest in Sardinia.

Owing to centuries of intermingling and a hundred other disturbing factors, such as climate, quality of nourishment, and so on, these types are scarcely to be found in their original purity; but in North Germany the Baltic type is approximated, and in South Germany the Alpine type predominates. Nevertheless, in Württemberg there is a wedge running south up the valley of the Neckar in which the population approaches the

Photo by R. H. Buxton

HAULING HAY UP TO THE LOFT OF A HOUSE IN CALW

This town is the best place for a study of these quaint, lofty wood and plaster houses

Photo by R. H. Buxton

VIEW OF ALTENSTEIG FROM THE BRIDGE ACROSS THE NAGOLD RIVER

Photo by B. H. Buxton

A SEVEN-STORY HOUSE OF CALW, BUILT IN 1694

Photo by B. H. Paxton

A CITIZEN OF CALW AND HIS WIFE STORING HAY

A mass of hay has broken away from the bundle and is falling down

Photo by B. H. Paxton

A RECENTLY BUILT HOUSE IN STAMMHEIM, WÜRTTEMBERG

Photo by B. H. Buxton

GECKINGEN: WORKERS RETURNING FROM THE FIELDS FOR THEIR MIDDAY MEAL

Baltic type more nearly than the inhabitants of the Black Forest on the west or of Bavaria on the east, due no doubt to the Alaman invasion from the north. The people we encounter, therefore, in the Nagold Thal are on the whole rather tall, with fair complexion and blue eyes.

COSTUMES OF THE PEOPLE

The local costumes are rapidly being discarded and today can be better studied in the museums and on the picture postal cards than on the backs of the natives. Nevertheless a few examples may occasionally be seen *in situ*, in the Protestant districts men and in the Catholic districts women, having to some extent adhered to the old costumes.

The typical costume of the men is a long, dark blue coat with large brass buttons, the buttons being only ornamental, as the coat is always thrown open, showing a bright scarlet waistcoat, also with conspicuous brass or perhaps silver buttons. Knee breeches of yellow or black leather are worn, with either high boots or with low shoes and dark blue stockings. The hat is round, of soft, rough felt, and the general effect is very striking; but unless one observes rather closely, one does not get further than the showy red waistcoat and the brass buttons, which first catch the eye and are apt to keep it. The best example I saw was in Nagold—a man who had come in from the country for some special occasion.

The costumes of the women are not so picturesque as those of the men, the dress being of black satin, the particular cut of which would have to be described by an expert; but that part of the costume which strikes the eye is the headdress. The hair is brushed flat back over the head, and over it is worn a black satin hood tightly bound down over the head and ears by broad bands, which are tied in a bow under the chin. I saw none of these in the Nagold Thal itself, but in the Catholic towns of Horb and Villingen, to the south, one may see a few every day, worn by the older women. The younger women no longer wear this

Photo by B. H. Buxton

A PICTURESQUE STREET IN CALW

Photo by B. H. Buxton

SCENE ON BIERGASSE (BEER LANE): CALW

head-dress, and a certain baron is said to have remarked that his daughters were accustomed to pick up the latest things in hats from those they saw in church on the heads of the peasant girls.

In the Protestant town of Calw, on a market day the women from the country round all wore red or white handkerchiefs bound over their heads; but except for this there was nothing to remark in their dress. A fair sprinkling of the men showed up in their red waistcoats and knee breeches, though for the most part rather dilapidated.

NOTES ON TAHITI

By H. W. Smith, Massachusetts Institute of Technology

With Photographs by the Author

SO MUCH has been written about the South Sea Islands by careful and accurate observers, as well as by those who possess the faculty of forming complete impressions in a few days, that there remains little of general interest to describe. Indeed, one must go far from the more accessible islands to find conditions approaching those so charmingly presented by Charles Warren Stoddard and by Stevenson, and the changes that have taken place will be more likely to impress the traveler than the things which have fascinated him in those authors.

While the simplicity and attractiveness of character of the native Polynesian is now much as it was in the time of Stevenson, the depopulation of the islands has continued where the natives have been unable to develop a resistance to the white man's diseases, and in other islands the increase of alien population has much changed the character of the people. The Chinese, bringing with them habits of industry from a densely settled and less productive land, have proved formidable competitors with the easy-going Kanaka, who for generations has found abundant living from the fish of the reef and the bread-fruit and "fei" of the mountains.

Tahiti, of the Society Islands, is one of the most important of the French possessions in the Pacific, with steamship connection to San Francisco and New Zealand. The hotel accommodations at Papeete, the principal town, and at a few other places, are comfortable and well adapted to tropical life, and in July many tourists visit the island to be present at the annual native festivities that occur in connection with the anniversary of the fall of the Bastile. At that time canoes from many of the neighboring islands come to Papeete, bringing crowds of pleasure-seekers, who, with their dances and songs, give the traveler a glimpse of the native life of former days.

The Society Islands are of volcanic origin, rising from the low bed of the ocean, which has depths near the islands of 1,500 to 2,000 fathoms, while the highest peak, in the center of the island of Tahiti, reaches an altitude of 7,300 feet! On a clear morning the view as the ship approaches the harbor of Papeete is most beautiful, showing deep valleys penetrating from the coast to the mountain peaks of the interior. On page 948 is a view of the hills by the coast at Papara, with the water from recent showers falling in cascades down the sides of the cliffs.

An interesting and somewhat strenuous excursion is to follow one of the valleys upward to the center of the island, and the writer made one such trip in the Waihiraia Valley. It is preferable to camp near the head of the valley, in order to have the opportunity of reaching the highest part of the trip before the clouds, which gather early, have cut off the view. Page 949 shows the spot where

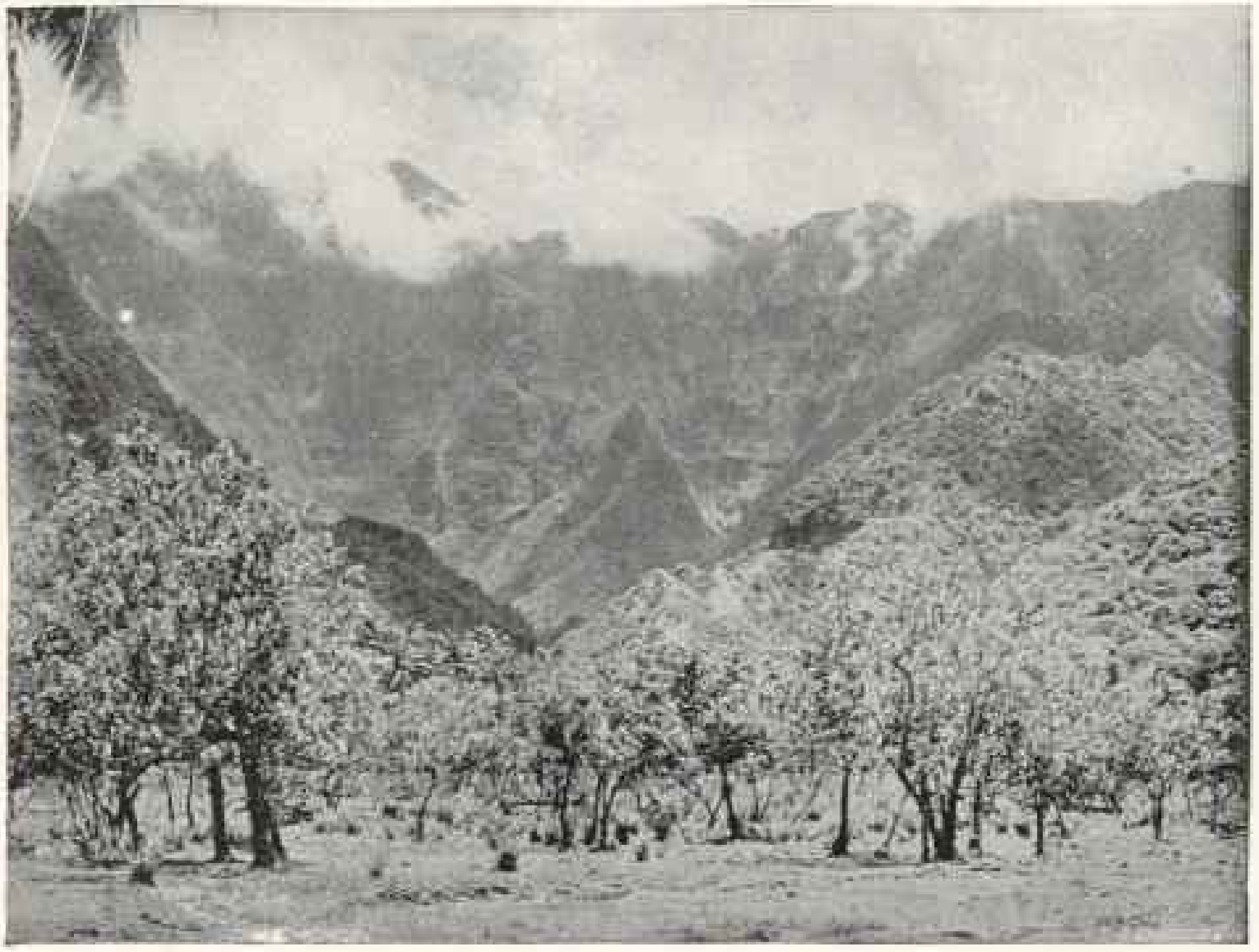


Photo by Harrison W. Smith

PAPARA HILLS, ON THE SOUTH COAST OF TAHITI: AFTER A SHOWER LITTLE WATERFALLS MAY BE SEEN ON THE HIGH CLIFFS, AS IN THIS VIEW

lunch was taken and page 950 the stream by which the camp was made.

The trail up the valley is practically the bed of the stream, for it crosses and recrosses, traversing a bit of low land, first on one side and then on the other, plunging through tunnels of dense vegetation dripping with water, so that one is quite as dry wading up the stream as pushing through the high grass and tree ferns. These streams abound in fish and prawns, which the man in the picture on page 950 is in the act of spearing.

The camp was a simple affair; a rubber sheet stretched on poles would have made a good roof if it had been a couple of feet longer; but in fact it necessitated a shortening-up process on the part of the sleepers for each shower during the night. Dead banana leaves, which, hanging straight down from the stalk of the tree, are sheltered from the rains and thus become dry, were gathered for the beds.

The exhilaration of waking in the fresh morning life of the tropical forest is worth the discomfort, provided one may feel sure, as is the case in these favored islands, that no fevers have taken root during the night.

Proceeding up the valley, the sides become more precipitous, until finally the trail leaves the bed of the stream and climbs up the steep wall through great tree-ferns and tangled vines. Page 951 is a view from a point near the top of the trail, which continues on a short distance over a ridge to a pretty little lake shut in by cloud-capped peaks. On the left side of the picture may be seen the leaves of the tree-fern, six or seven feet in length, and the compact clusters of leaves of the "fei," a large variety of banana.

Photo by Harrison W. Smith

ROASTING "FEI" AND BREAD-FRUIT FOR OUR LUNCHEON IN THE WAIHIRAIA VALLEY

Near Papeete the beautiful Fataua Valley may be visited in an afternoon. For a good part of the way a carriage road leads up the valley, offering changing vistas, such as shown on page 952. At the end of the road a foot-bridge leads across a lively mountain stream to an easy trail, which one ascends but a short distance to obtain the view shown on page 953. At the end of an hour's climb the Fataua Falls, 600 feet in height, are seen on the opposite side of the canyon.

A native house with palm-leaf mats drying in the sun, to be used as thatch, is given on page 954. The food supply is at the door, for back of the house may be seen the serrated leaves of the bread-fruit tree. A short journey into the hills will provide several days' supply of "fei," a delicious fruit for baking, shown on the same page, and fish may be caught upon the reef.

Why, indeed, should the Tahitian toil? The picture, page 955, shows the great leaves of the wild "taro" growing by the roadside; the young leaves are delicious boiled, and the curious stranger will find many other new delicacies of the table—the alligator-pear, the baked papya, the Mantis crab, the raw fish, as good as the best oyster, served with Tahitian sauce, and, on rare occasions, a salad made from the heart of the cocoanut tree.

The photograph on page 956 shows how a little pig was brought one day for dinner, and nowhere is roast pig more prized or better prepared. A fire is built on the ground, covered with stones, and, when all is ready, the pig is carefully laid on with bread-fruit leaves to roast.

The view on page 957 is the garden of

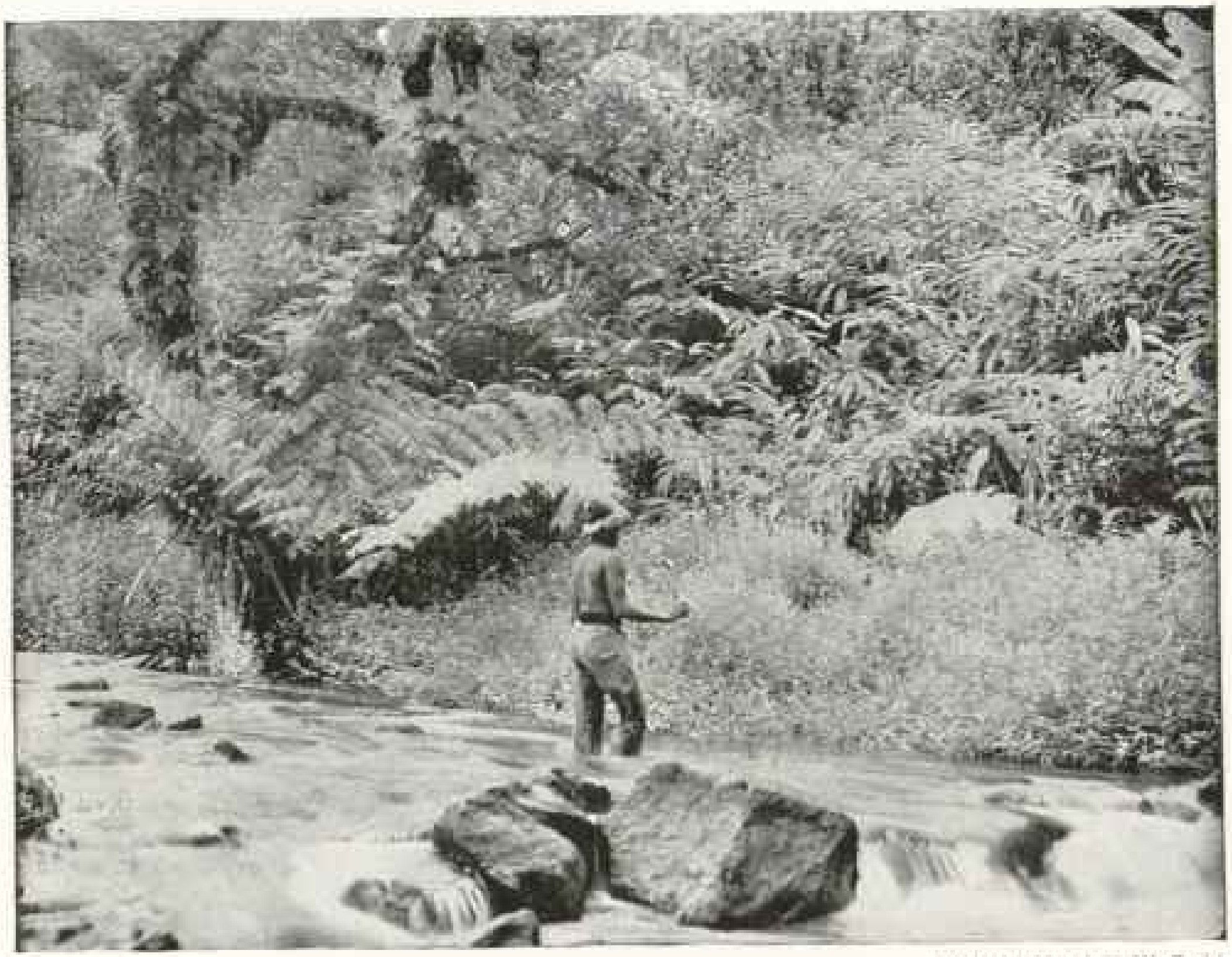


Photo by Harrison W. Smith

SPEARING PRAWNS, WHICH ARE LARGE AND PLENTIFUL IN THE STREAMS OF TAHITI

an American who has lived for several years in Tahiti. Pineapple plants are seen in the foreground, young cocoanut trees on each side, and in the center a large cluster of the Samoan banana. It will be noticed that the tree is unusually short, but the fruit is large and of particularly fine flavor.

The man shown on page 958 is a fisherman who took the writer in his canoe to see the wonders of the coral reef, perhaps the most novel sight for the traveler in tropical islands. Early in the morning, after the land breeze has died away and before the sea breeze has ruffled the surface of the water over the shoal parts of the reef, the spectacle of brilliant-colored fish and of strange forms of coral is one of fascinating interest.

A mass of coral, photographed through the water, is shown on page 960. Near the center appear some fine white lines; these are the upper edges, bright yellow in color, of coral of delicate structure that grows in thin vertical walls. Directly below is seen a coarser, fan-shaped growth rising from the rough bottom by a thick stem. On page 959 are other forms growing on a large rock. In the deep water at the top and left of this picture may be noticed the effect of small waves in focusing the sunlight into bright bands on the bottom, while the same cause has produced a slight distortion in the image of the growing coral on the top of the rock.

From the wharves at Papeete may be seen Morea island, about 10 miles distant. There are few bays more beautiful than that of Opunohu, in this island, with the mountain Mauroa rising 2,900 feet above the sea (page 961).

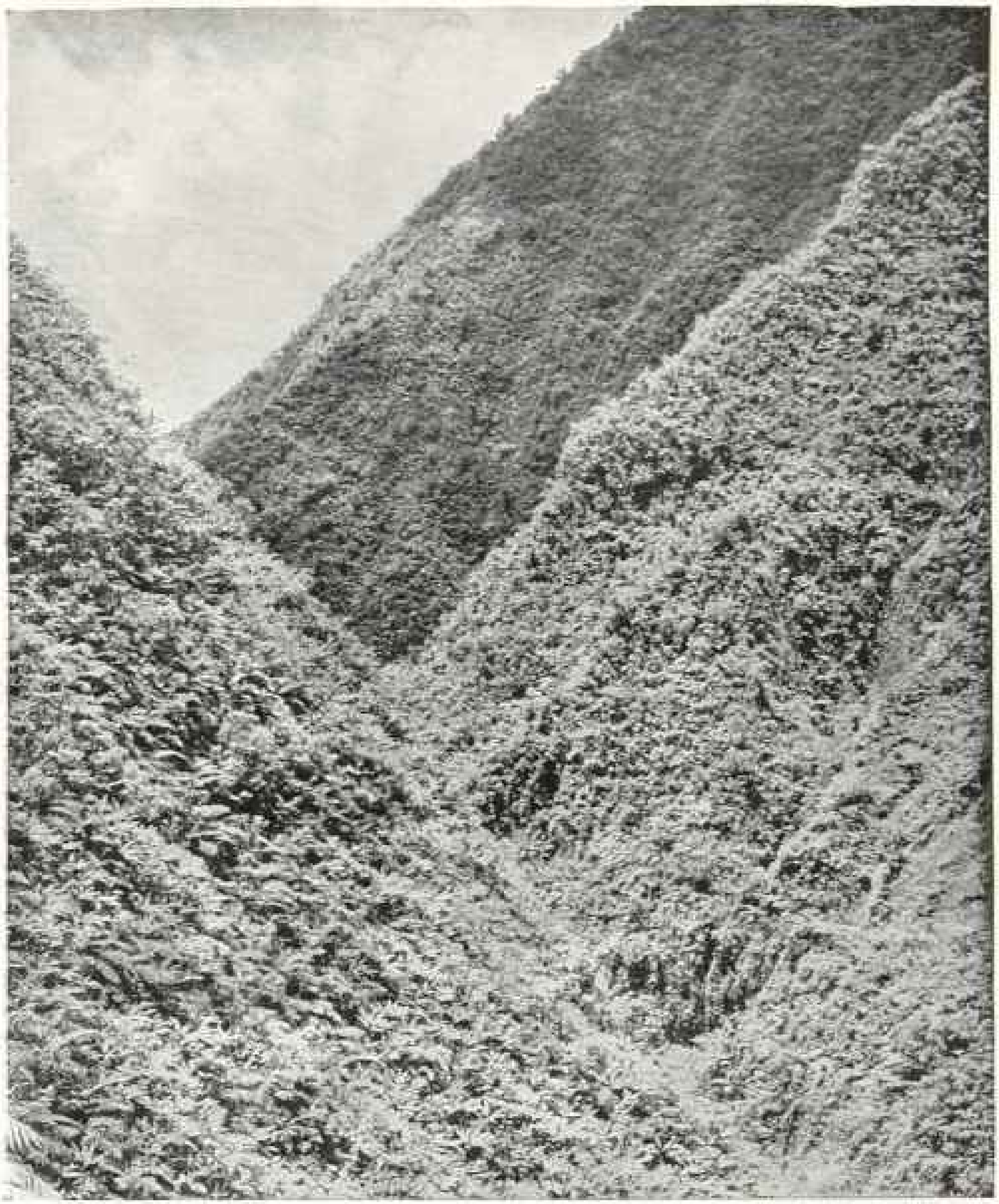


Photo by Harrison W. Smith

IN THE WAIHIRAIA VALLEY, LOOKING BACK FROM THE TRAIL THAT LEADS TO A LITTLE CRATER LAKE: THE SIDES OF THE VALLEY ARE COVERED WITH TREE FERN AND "FEI"

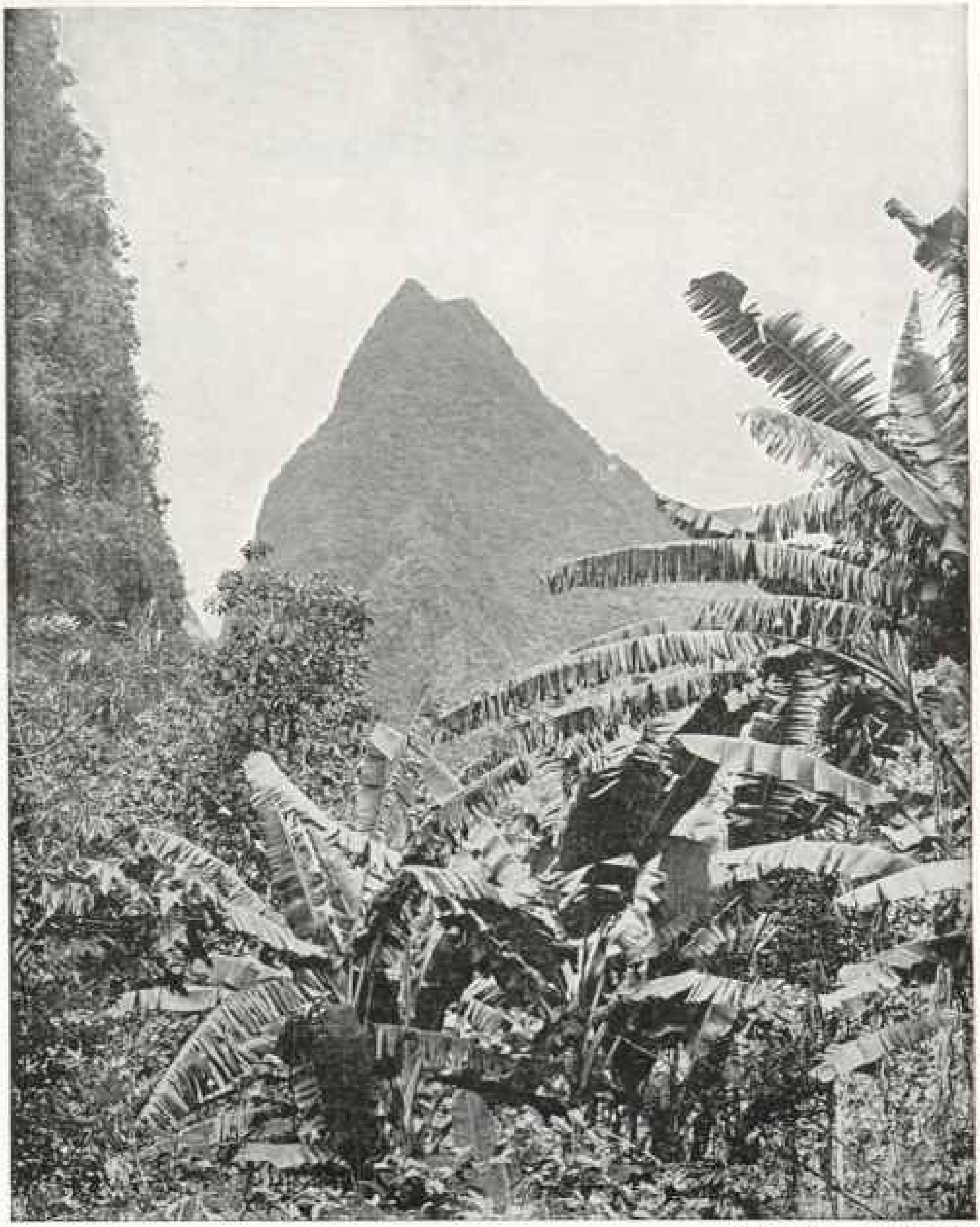


Photo by Harrison W. Smith

VIEW IN THE FATAUUA VALLEY

Photo by Harrison W. Smith

LOOKING DOWN THE FATAUUA VALLEY FROM THE STEEP TRAIL WHICH LEADS THROUGH THE TROPICAL FOREST TO THE FATAUUA FALLS, OVER 600 FEET IN HEIGHT

As the difficulties of photographic work in the tropics are well known, it may be of interest to describe a convenient feature of the writer's outfit—the dark-room for plates. All plates were given the 20-minute pyro development in the Eastman tank, according to the Eastman formula. Page 962 shows a suit-case that formed the body of the dark-room. The right half is occupied by a water-tight rubber bag, supported on three sides by the sides of the suit-case and on the fourth by a brass rod, which may be seen extending over the edge of the case and hooked into the lock. The developing tank, filled with developer at a temperature sufficiently below the normal to allow for rise of temperature before development begins, rests in this rubber bag, as shown. The object of the rubber bag is to prevent damage to plate-holders that are placed in the other half of the suit-case in the event of the tank spilling over.

The cover of the suit-case is held up by means of a light wooden rod at each corner, and a dark bag is then placed over the whole.

The other illustration shows how two long sleeves permit the operator to transfer the plates from the holders to the tank without the necessity of himself being in the confinement of a dark-room, a distinct convenience in the tropics even on the rare occasions when a dark-room is available.

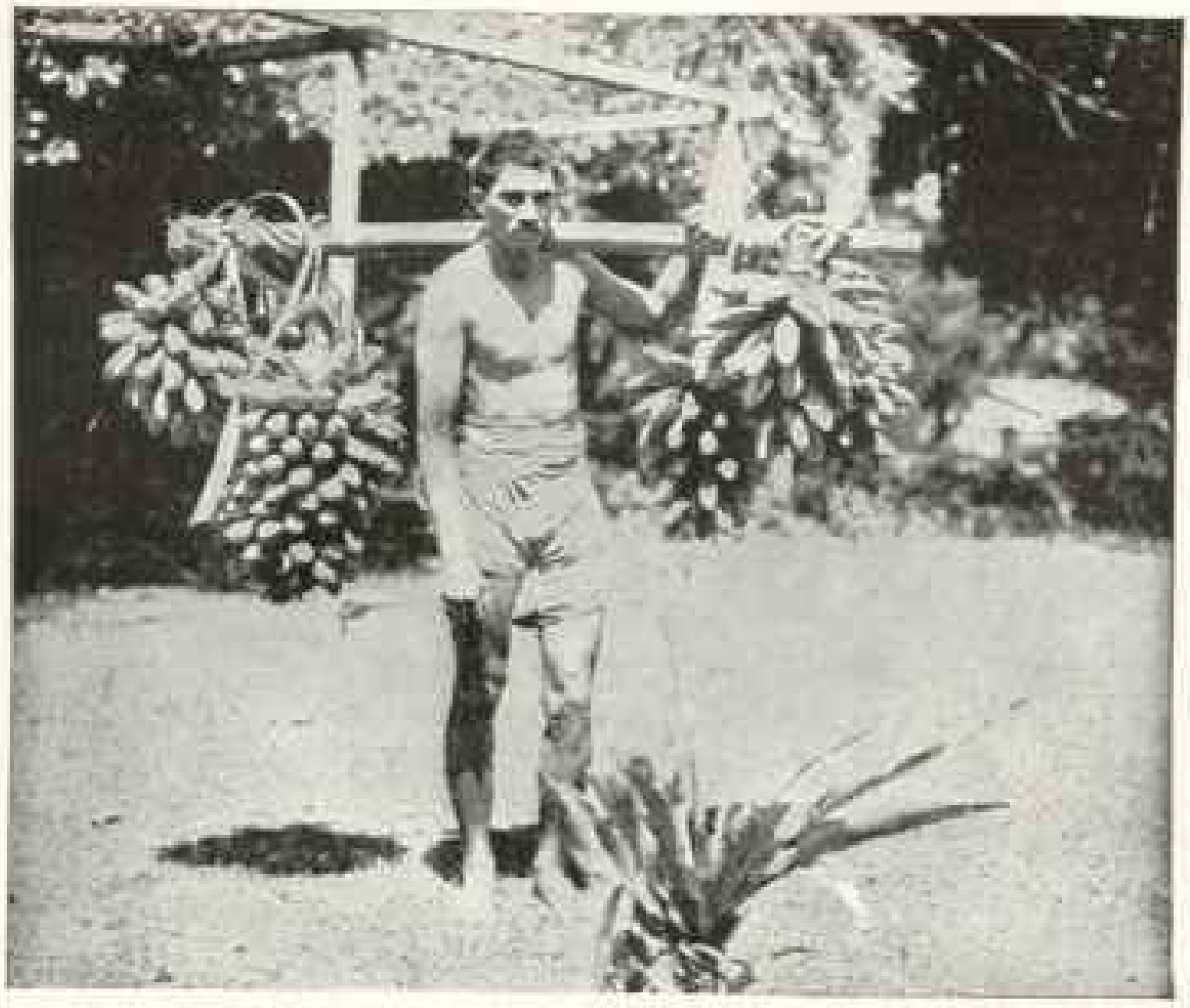


Photo by Harrison W. Smith

TAHITIAN BOY WITH A LOAD OF "FEI," BROUGHT FROM THE MOUNTAINS: THE GREEN FRUIT, ROASTED IN AN OPEN FIRE, IS A STAPLE ARTICLE OF DIET

Photo by Harrison W. Smith

A NATIVE HOUSE, TAHITI, WITH MATS OF PANDANUS LEAVES FOR THATCHED ROOFS DRYING IN THE SUN

Photo by Harrison W. Smith

THE GREAT TARO PLANT GROWING BY THE ROADSIDE: THE YOUNG LEAVES OF THE WILD TARO WHEN BOILED CONSTITUTE ONE OF THE DELICIOUS NATIVE DISHES

As soon as the plates are in the developer, the tank is sealed, removed from the dark bag, and placed in a wooden box lined with thick hair-felt to maintain constant temperature. During development it is important to stir the developer three or four times to prevent uneven development over different portions of the plate. Under particular conditions it is easy to find the temperature at which the process must be started in order that the average may be 65 degrees. At the end of development the cover of the tank is loosened in subdued daylight, the developer is poured off and the plates are rinsed by pouring in fresh water quickly after removing the cover, and the fixing completed in the ordinary manner. The dark bag is made of double-fabric gossamer with the seams vulcanized, and is absolutely light-tight.

A NATURALIST'S VISIT TO TAHITI

*We paid several visits to the barrier-reef, where the water was so clear that we could see everything as in a glass tank. There were many large holothurians, one of which on being captured ejected an example of the long silvery fish which has been described as living in these "sea-slugs."

The coral was covered in many places with sea-urchins, which were possessed of spines three or four inches in length, so that when walking on the reef great care had to be taken to prevent a nasty wound.

One evening we watched some natives spearing fish by torch-light. Two canoes paddled out a few yards apart until they

* Abstracted from an entertaining narrative, "Three Voyages of a Naturalist," by M. J. Nicoll. Witterby & Co.

Photo by Harrison W. Smith

A LITTLE PIG FOR DINNER

A fire is made in a small pit in the ground and covered with stones. When the fire is burned out the pig, wrapped in leaves, is placed upon the hot stones, with breadfruit and "fei," a variety of plantain. Then the whole is covered with many layers of the large leaves of the breadfruit tree and left to roast.

were exactly over the reef. A torch, composed of dead leaves of the cocoanut palm, was then lighted and waved to and fro until the fish, attracted by the glare, rose to the surface of the water and swam near the boats. Then followed a delightful exhibition of skill. A native, standing up in the bow of his canoe, would hurl his long spear at a fish as it crossed in front of him, and so deadly was the aim that even small fish, several yards distant, were seldom fortunate enough to escape. The spears were made of light wood, with five straightened fish-hooks bound in a cluster at the end.

Afterwards we all waded on the reef, attempting, in native fashion, to spear the fish as they darted about in the masses of coral; but we were not very successful and soon were glad to abandon the sport, since several of us were badly pricked by the sea-urchins, the spines of which broke off short after entering the flesh and producing intense pain.

One day our friends on shore arranged a picnic in our honor at a place called Fautawa, which was reached by about an hour's drive through magnificent scenery. The road for a great part of the way led along the edge of a mountain stream, winding through a deep valley in which Fautawa is situated. At the top of the valley there towered above us a tall peak the summit of which was composed of a series of jagged points clustered together in the shape of a crown.

Having arrived at our destination, we

Photo by Harrison W. Smith

A PRIVATE GARDEN IN PAPEETE, SHOWING PINEAPPLE AND YOUNG COCOANUT TREES AND THE SAMOAN BANANA: THE RED-SKIN BANANA IS ONE OF THE FINEST FLAVORED VARIETIES

were in time to see the last of the festal preparations made by the natives for our entertainment—the removal of the sucking pig from the oven. The oven was a hole dug in the ground and lined with large stones, which had been previously heated in a fire. Banana leaves had been placed over the hot stones; then the pig had been laid in whole and completely buried, first with the banana leaves and finally with a layer of earth. Here it had remained for an hour or more, and certainly when it was exhumed it was perfectly cooked; and, served up with plantains, it made a most palatable dish.

We were given several other native dishes, of which the most choice perhaps was the famous "cocoanut salad." This salad is made of the heart of the green top of a cocoanut tree; and, as each salad involves the destruction of a tree, it is only prepared on a special occasion.

After a few days' stay at Papeete, we were invited to pay a visit to the village of Tautira, which is reputed to be the most picturesque spot in Tahiti. We gladly accepted the invitation and got under way early one morning. Steaming close to the land, we had a fine view of the wild, rugged coast and of the high, jagged peaks, with their cloud-covered summits. Many waterfalls, looking in the distance like threads of silver, were falling sheer down the precipitous wall of rock which forms the coast in this part of Tahiti. Now and again valleys

Photo by Harrison W. Smith

A TAHITIAN FISHERMAN

would open into view, and down them sparkling rivers rushed into the sea.

It was late in the afternoon when we reached Tautira, and a boat at once put off from the shore. In it came the chief of the village, who piloted us safely through the passage in the reef. We anchored off the mouth of the small river, near the banks of which the village of Tautira is built.

The barrier-reef in this part of the island is almost awash at high tide; it is nearly semicircular in shape, and so perfectly flat on the top that, as we entered the passage, we seemed to be steaming through a gateway in a low wall.

The shore is a strip of red-colored sand, with a narrow belt of cocoanut palms. Behind the palm trees lies the village, and beyond rises a magnificent range of hills clothed to the summit with almost impenetrable forests. The houses are well built, of native pattern: the walls are made of upright bamboos, with a half-inch space between each to allow a free passage of air into the house. Rows of mats are so arranged that they can be let down to cover the walls in case of rain, while at other times they are rolled up under the eaves. All the houses are thatched with leaves of either the cocoanut palm or *pandanus*.

The surroundings of Tautira are very beautiful. The ground is covered with a thick growth of green grass, studded with *hibiscus* and other flowering plants, while orange trees grow in great profusion.

In Tahiti, as well as in most of the South Sea Islands, great numbers of cocoanuts are grown, and, after being dried for copra, are shipped in large

Photo by Harrison W. Smith

CORAL GROWING ON THE REEF: PHOTOGRAPHED IN THE EARLY MORNING, BEFORE THE BREEZE HAS RUFFLED THE SURFACE OF THE WATER

quantities to Europe. We were much interested in the different methods of gathering the nuts in various islands. In Tahiti the natives climb the trees with the help of a strip of green, fibrous bark torn off the stem of a *hibiscus* tree. After knotting the two ends together, the climber slips his feet half through the circle, and, standing with his legs apart, so as to stretch the thong tight, ascends the tree in a series of leaps, with a foot on each side of the trunk. A practiced climber will thus mount trees of a very considerable height with a celerity and ease which do not suggest the long practice actually required. On making a trial myself, I found it difficult to climb even so much as a foot from the ground.

In its fresh, green state the cocoanut provides a most refreshing drink, but as it grows older the "milk" hardens and forms the white kernel with which we are all familiar. This kernel is the celebrated copra and is commercially put to many different uses. In Tahiti it is used for sauces and for cocoanut oil. One sauce, which was served with fish at the above-mentioned picnic, although compounded of scraped nut and sea-water, was really quite palatable.

At Tautira one of the sailors brought me the dried shell of a cocoanut, which he told me was full of lizards. I at once plugged the "eye-holes" and took the nutshell on board, where a careful examination showed that it contained 136 lizard eggs, 204 empty egg-shells, and 13 newly hatched lizards. It would seem, therefore, that many females of this species repair to the same place to deposit their eggs. The eggs themselves were found to be in all stages of incu-

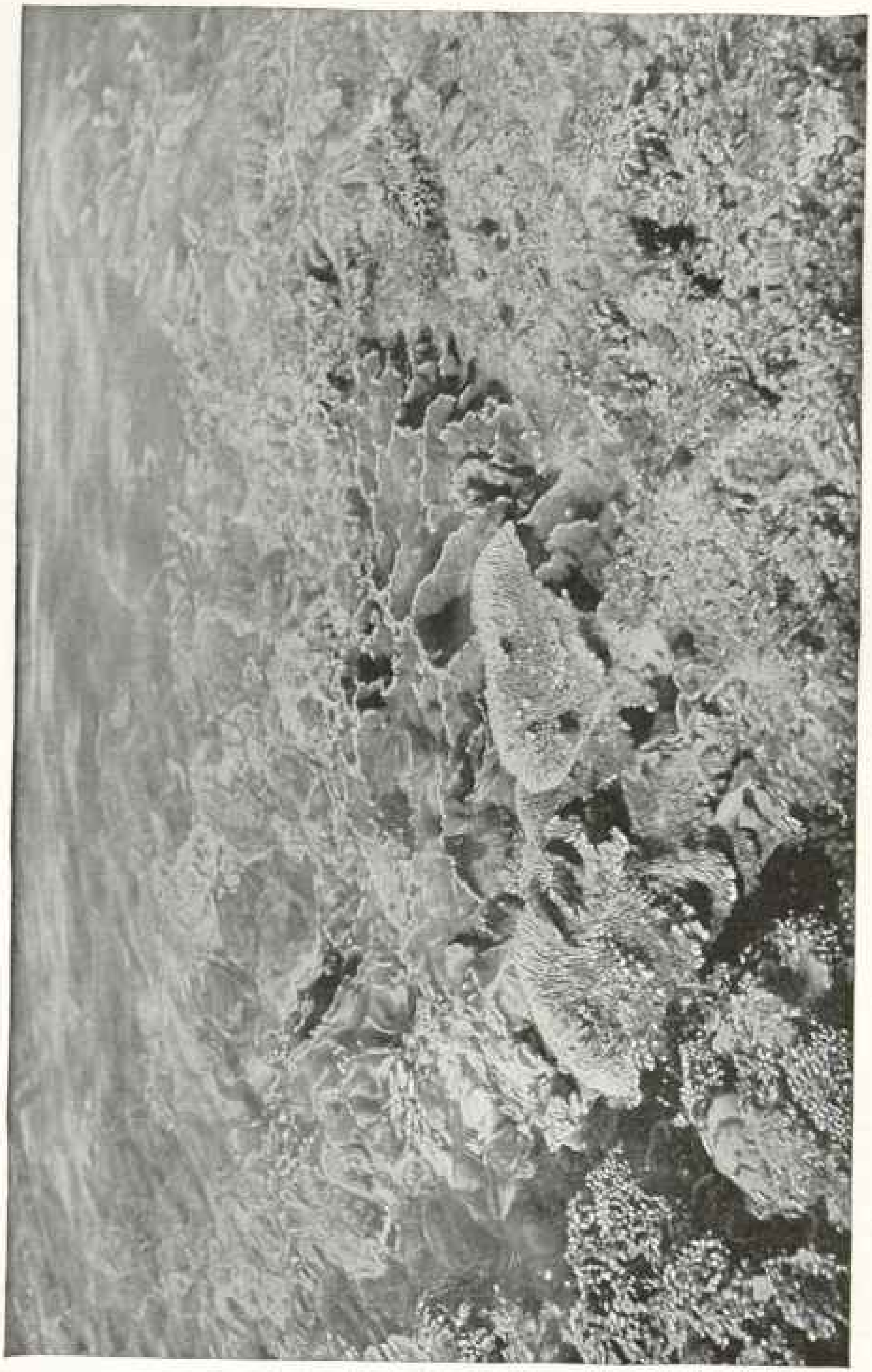
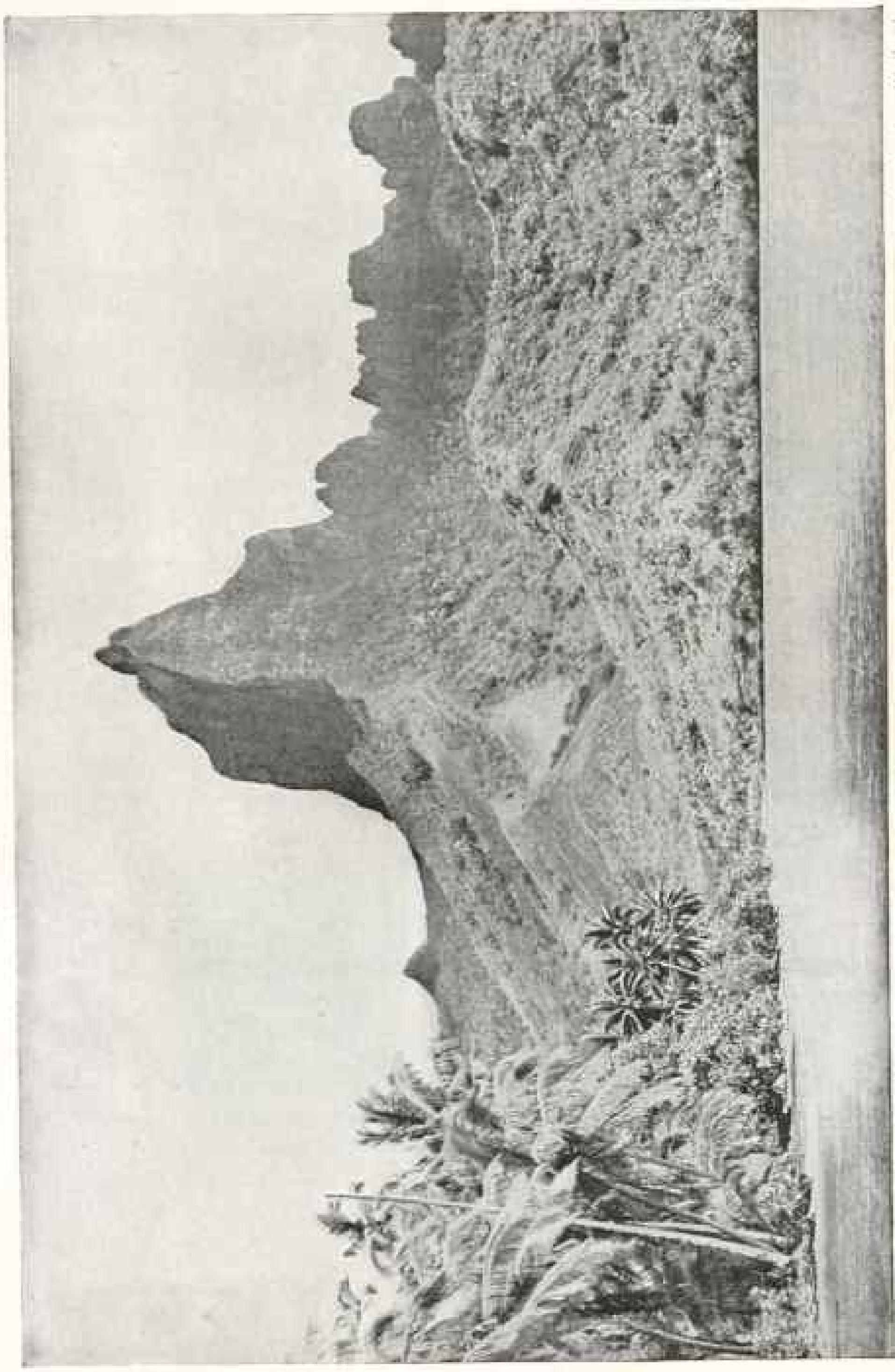


Photo by Hamilton W. Smith

WALLS OF CORAL IN THE CENTER OF THE PICTURE, THE UPPER EDGES OF THE THIN WALLS ARE BRIGHT COLOR DART IN AND OUT AMONG THE CREVICES AND LITTLE FISHES OF BRILLIANT COLOR

CORAL GROWING ON A REEF NEAR THE SURFACE, THE UPPER EDGES OF THE THIN WALLS ARE BRIGHT YELLOW, AND LITTLE FISHES OF BRILLIANT COLOR DART IN AND OUT AMONG THE CREVICES



THE PEAK MAUAROA, 7,339 FEET HIGH, IN MOREA, 2,900 FEET HIGHER THAN ORONO'HU BAY, ON THE ISLAND OF MOREA, 10 MILES FROM TAHITI

Photo by Harriet W. Smith

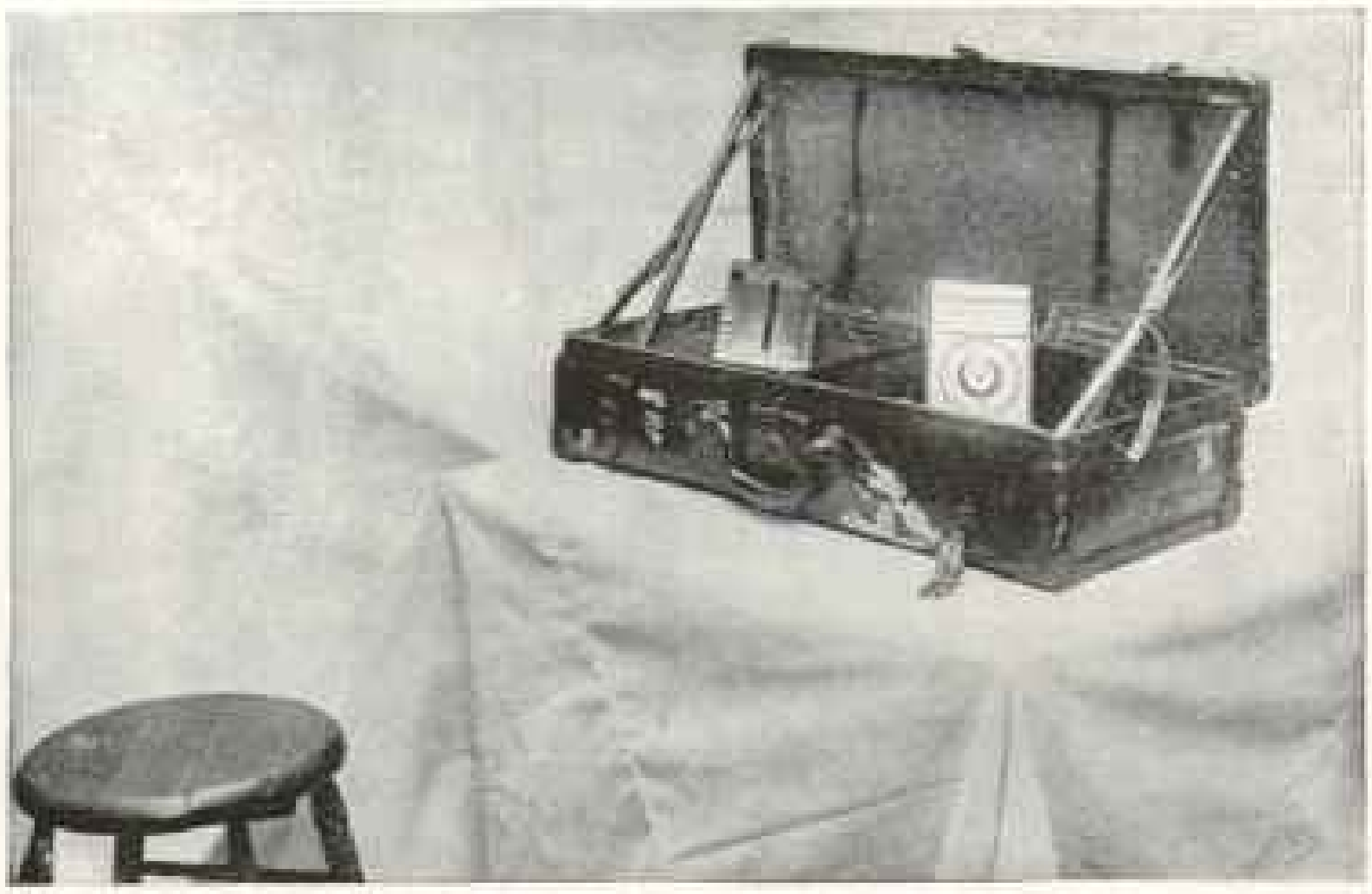


Photo by Harrison W. Smith

SUIT-CASE USED AS A DARK-ROOM FOR PHOTOGRAPHIC PLATES IN THE TROPICS

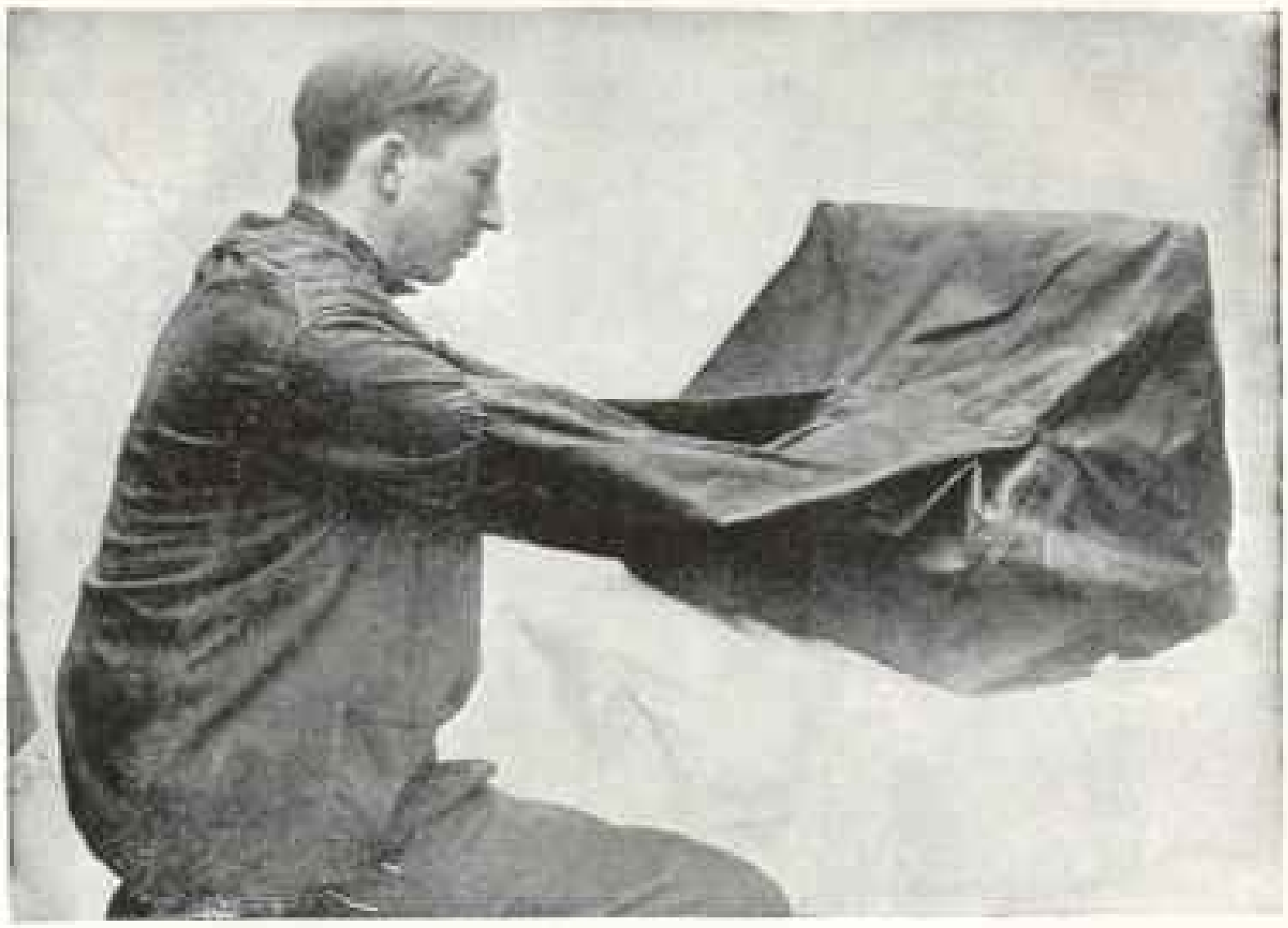


Photo by Harrison W. Smith

THE COMPLETE DARK-ROOM (SEE PAGE 953)

bation, from "newly laid" to shells containing perfect lizards. I afterwards found several hundreds of eggs of this species in a hole in the ground, close to the sea, at Papeete. Butterflies were very scarce on Tahiti; at Papeete we met with only one species, and on a small coral island some miles from Tautira with but one more.

Mosquitoes were extremely troublesome on shore, but very few appeared on the ship until after we left the island, when we discovered that they had been breeding freely in a can of water containing a growing "ti" plant.

Everywhere along the seashore and about the villages the ground was honeycombed with the burrows of land-crabs, and in some places the whole surface appeared to be moving with these creatures. At the least alarm they popped into their holes, from which they never strayed far during the day. When chased a crab would often hurry into the wrong burrow, and be ejected immediately by the rightful owner; but the inhospitality did not help one to catch them, owing to the speed with which they vanished ultimately underground. If one stood quite still they would reappear at the mouth of the burrow, waving their stalk-eyes in all directions on the lookout for danger. I caught one by cutting it off from its burrow and driving it against a fallen tree, where it turned at bay, rolling its eyes and waving its claws in a formidable manner.

Some of the smaller species of land-crabs on these islands have yellow, others bright blue, claws, and one gains a striking impression of color when some hundreds of these crabs wave their bright claws as they run over the dried mud close to the sea.

The day before we left Tautira the ship was visited by a continual stream of canoes, which came from far and near, bringing gifts of fruit, etc., to Lord Crawford. By nightfall the *Valhalla* had the appearance of a huge vegetable and fruit market. There must have been at least a ton of bananas, oranges, plantain, cocoanuts, and other fruit on board, as well as several Muscovy ducks and a little piebald pig. When all was aboard, the chief of Tautira, one of the finest-looking men I have ever seen, made a speech, and formally presented the gifts.

At 10 o'clock the next morning we left Tautira for Papeete again, to complete our coaling, which took a long time, owing to the scarcity of lighters.

During our last day at Tahiti we were confined to the ship by one of the heaviest storms I have ever witnessed, the rain falling in such torrents that in a few minutes the streets were literally full of water.

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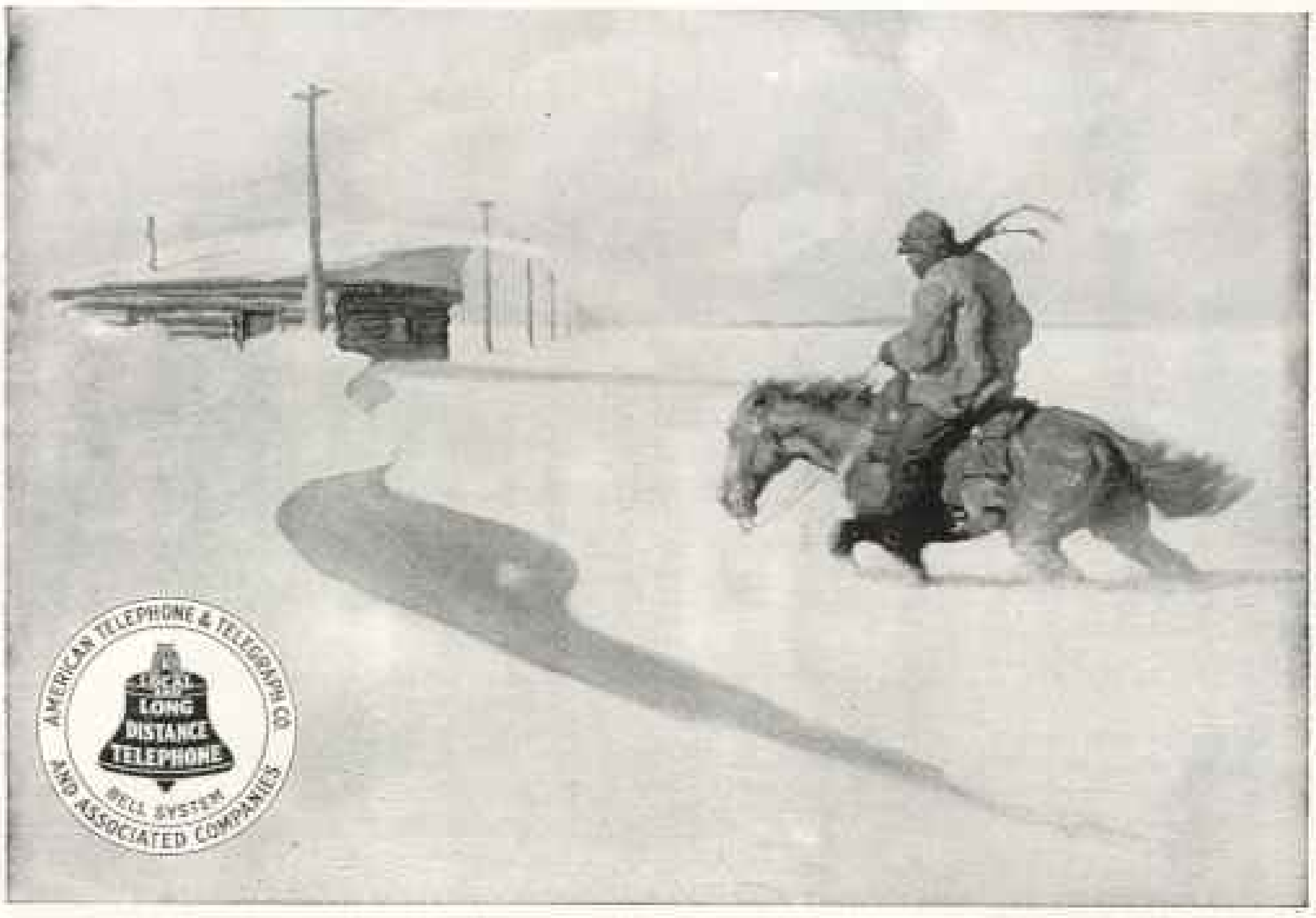

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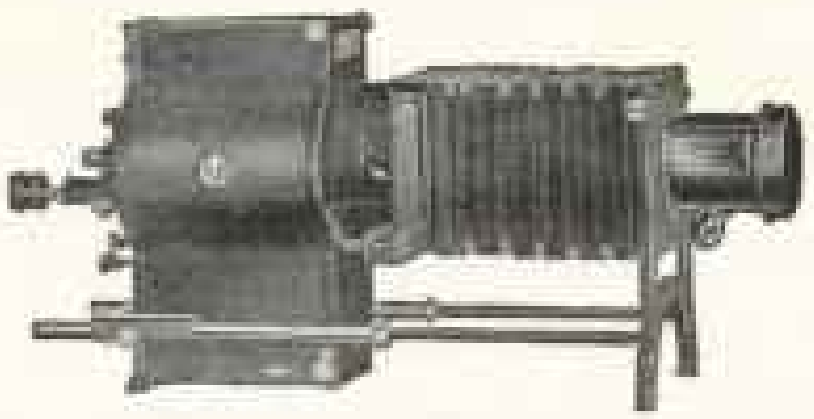

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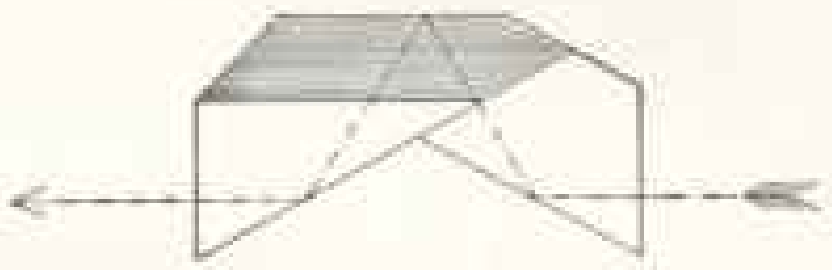

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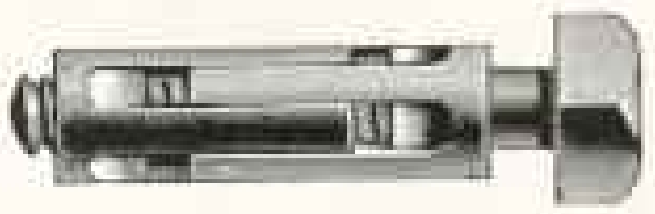

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