

NOTES ON USEFUL PLANTS OF MEXICO.

By J. N. ROSE.

INTRODUCTORY STATEMENT.

In presenting these notes upon the plants which are employed in one way or another by the Mexicans I wish them to be understood as chiefly a record of my own observations. A more formal and complete treatise is already in preparation by the Mexican Government, by whom it naturally should be done, but it is hoped that this paper may be of assistance in supplementing that work. My observations, in many cases meager and incomplete, were made while traveling in Mexico in 1897. I have drawn little upon published statements, contenting myself with facts personally observed or with well-authenticated reports obtained from the Mexicans themselves. Many of my observations may, doubtless, have been previously made, but I was especially fortunate in obtaining and determining botanically a number of plants which heretofore have been incorrectly named, or have been known only by their local names. An attempt was made in the case of each species to obtain both good botanical specimens and examples of the parts or products of the plant useful to man. That the results are not entirely satisfactory is partly owing to the shortness of my stay in any one place, which was usually but for a day or two, often only for the night.

To obtain the fullest information from the natives, and especially from the Indians of the Sierra Madre, one ought to spend considerable time among them. Naturally suspicious and shy, it is not surprising that one can not readily obtain information from them. But if one could live with them for a short time, treat them kindly, and gain their confidence, he could, with a free use of coppers and small silver change, soon have the contents of their homes and their knowledge at his disposal. One other hindrance to my work was a lack of equipment for a long inland journey. In one case I traveled nearly 600 miles on horseback, and of course could not carry many fleshy fruits, berries, or other bulky things.

Among some of the interesting enterprises suggested by my observations which might be taken up by our Government the following may be mentioned:

(1) The introduction of the best Mexican tunas into the subarid parts of our Southwestern States and the encouragement of the impor-

tation of tuna fruits from Mexico into our Eastern cities, as they are now being imported from Sicily.

(2) An investigation of the Tampico hemp industry, with a view of making use of the agave plants of western Texas or of growing better varieties on the waste lands in some of our Southwestern States; also some supervision of the importations to prevent adulterations with cheaper and worthless fibers.

(3) The introduction and testing of certain vegetables, such as beans and red peppers, and certain fruits, like the Mexican plums (ciruelas).

(4) The gathering of a collection of all the various products used by the Mexicans and Indians which are made from the agave. Such a collection would include many hundred specimens, for there is no plant in Mexico which has so many and varied uses.

(5) A botanical study of the genus *Agave* in the field and the preparation of numerous photographs and specimens.

(6) The institution of a full collection of living agaves. These should be placed in the Botanic Garden at Washington.

(7) A study of the pulque and mescal plants with the view of determining definitely the species used in the production of those beverages.

These various plants being of great economic value to the Mexican people, assistance would doubtless be given by the Mexican Government toward any investigations along this line. Indeed, assistance has already been offered by the Instituto Medico Nacional.

CEREALS AND VEGETABLES.

The food plants of the country are very many. Those, however, which may be said to be almost universally used are indian corn, red peppers (*Capsicum* spp.), "tomatoes" (*Physalis* spp.), and beans.

Zea mays L.

In the towns wheat bread and cakes can easily be had, but in the country, both in the mountains and in the table-land region, one finds only corn bread or, more properly, corn cakes. The corn cakes are called "tortillas" (Pl. XXVIII, fig. 2), and are made out of corn meal. The corn is first soaked in limewater to soften it and is then mashed or ground by hand between stones into a kind of dough. This dough, without any other ingredients, not even a pinch of salt, is then molded or rather patted between the hands into thin cakes, which are baked on clay griddles. The "tortillas" are torn in pieces and eaten alone or used in scooping up beans or soup, thus taking the place of spoons and forks. The work of grinding the corn and making the cakes is all done by women. More than once I have come to a Mexican's hut after a long day's ride, tired and hungry, and found that I had to wait until the woman of the house had made her little fire on the ground, mashed her corn on her "metate," patted it into little cakes, and baked them. For the first meal these tortillas are served hot, being brought directly

from the griddle and passed about in a gourd or clay dish, covered with a rag or cloth.

A great number of tortillas are usually baked at one time and are served, until they are gone, cold or else warmed simply by throwing them on a bed of live coals. Sometimes cold beans or cheese are folded up in one of them, and it is then called "gordo," meaning "fat one."

Capsicum spp.

CHILE.

Many kinds of red peppers are used both in seasoning food and in making chili sauce. This sauce is made by crushing red peppers (usually the long red ones) with ripe tomatoes on the metate, or sometimes the crushing is done in a clay dish with a pestle. It is used with nearly all kinds of food, especially with beans and meats. Although I brought back only 8 varieties there must be many more kinds grown in Mexico, and it certainly would be a very interesting undertaking to collect and classify the varieties used. The Department of Agriculture could very properly and profitably take this subject up in connection with the plant-introduction work. I have named my specimens, with the assistance of Mr. Irish, according to his excellent monograph recently published in the Report of the Missouri Botanical Garden, but only with partial success, as some of my plants seem not to belong to varieties now in the trade. These varieties, with their Mexican names, may be described briefly as follows:

"Chile mirasol" is an oblong red pepper 2.5 to 3.75 cm. (1 to 1½ inches) long. I purchased it in the market at Guadalajara. It is said to be the fruit of *Capsicum frutescens*, but seems very different from the next.

"Pequin," the fruit of *Capsicum frutescens*, was found in the markets in the City of Mexico. It is very small, 10 to 12 mm. (5 to 6 lines) long, oblong to ovate, and red.

"Chile pequin," the fruit of *Capsicum annuum cerasiforme*, was purchased in the market at Guadalajara. The fruit is red, nearly spherical, and only slightly larger than the last.

"Chile," the fruit of *Capsicum annuum longum*, is perhaps the commonest form to be seen in the western table-land region. The fruit is found in all the markets. It is red, or blackish in some forms, oblong to oblong-linear, and 10 to 15 cm. (4 to 6 inches) long. My specimens were purchased in the markets of Guadalajara and Monte Escobedo, in western Zacatecas.

"Chile cara" is the name for a smaller fruit form, which Mr. Irish also calls *Capsicum annuum longum*.

"Chile" is the name given me for the fruit of *Capsicum annuum acuminatum* Fingerh. This pepper is red, slender, somewhat acuminate, and about 5 cm. (2 inches) long.

"Chile ancho" is the fruit of *Capsicum annuum grossum*. The fruit is black, 10 cm. (4 inches) long, and 8.75 cm. (3½ inches) broad. I saw it only in the markets at Guadalajara.

Physalis spp.

TOMATO.

Various species of *Physalis* are always to be seen in the markets. The fruits are called "tomatoes," and are used to make a dressing for meats, etc., or are combined with red peppers to make chili sauce. (Pl. XXVIII, figs. 3, 4.)

EXPLANATION OF PLATE XXVIII.—Fig. 1, tamarinds; fig. 2, tortilla or corn cake; figs. 3, 4, "tomatoes"—fruits of *Physalis* spp.

Phaseolus spp.

FRIJOL.

The bean is, next to corn, the most important food plant of Mexico. In fact it is used all over the country. No meal is complete without a dish of beans, while many a meal consists of nothing else. It is cultivated everywhere, from the low tropical plains to the high mountain tops. Many varieties are found in the markets, some of which undoubtedly have been introduced into cultivation from native plants, while others have certainly come from foreign countries, but have long been grown in Mexico.

Nearly 50 native species of *Phaseolus* have been reported from Mexico and Central America, and I have no doubt but many yet remain undescribed. I collected myself some 10 wild species, about half of which I have not definitely identified. As is well known, some of our most common varieties of beans came originally from several of the wild species of Mexico.

I am quite sure that new and valuable varieties suitable for cultivation in the United States might be obtained from the markets of certain cities of Mexico. It seems to me that some money might very profitably be spent by the Department of Agriculture in connection with its seed introduction in obtaining and distributing some of the best varieties of Mexican beans.

In compliance with my instructions, I obtained about 20 varieties, but only in small quantities, as my equipment and the fund at my disposal did not warrant a greater outlay.

I have compared my beans with the large series in the seed collection of the Department of Agriculture, but I do not find over three varieties represented. In the accompanying list I have briefly described them as to color and have in most cases given the Mexican name of each.¹

No. 49. FRIJOL APASTEADO.

This is a small purplish bean, somewhat mottled with buff, much used at Bolaños.

No. 50. FRIJOL.

A small roundish pinkish bean also used at Bolaños.

No. 83. FRIJOL HORTELANO.

A small buff bean sold at Colotlan.

No. 104. FRIJOL BLANCO (*Phaseolus lunatus* L. ?).

A dwarf white bean cultivated at Acaponeta. Apparently the same form as cultivated in this country.

¹The numbers refer to the Ethnobotanic collections of the author



FRUITS AND TORTILLA.

No. 85. FRIJOL ENCREVADO.

A small drab-colored bean. Seed not very pure, but mixed with black, whitish, and purple beans.

No. 86. FRIJOL BLANCO NALLADO.

A small, light drab-colored bean. Seed not very pure.

No. 87. SEMILLA DE GICAURA.

A small 4-sided somewhat flattened seed of dark or light-brown color. Probably not a *Phaseolus*.

No. 89. FRIJOL GARVANODE PICACHOS.

A small light tan bean.

No. 90. FRIJOL NUEVO TEMPRANILLO.

A small, shortly oblong bean of somewhat greenish cast.

No. 91. FRIJOL MEXICANO.

An oblong light-brown bean.

No. 92. GARVANCILLO VERDE.

A somewhat globular greenish-colored seed.

No. 93. FRIJOL CANDO.

A small brownish-pink bean.

No. 94. FRIJOL GUERO. (Large white pole.)

A small oblong white bean.

No. 95. GARVANZO DE PICACHOS.

A small oblong drab bean.

No. 96. FRIJOL SEQUIN.

An oblong dark-red bean.

No. 97. FRIJOL MORADO BOLA.

A small purplish-red bean.

No. 98. FRIJOL MESQUITILLO.

A small yellowish bean.

No. 99. FRIJOL NEGRO. (Wax bean?)

An oblong black bean.

No. 100. FRIJOL LAVARENO.

A very pale yellow or cream-colored bean.

Nos. 86 to 100 were obtained at Guadalajara.

No. 101. FRIJOL.

An oblong drab colored bean.

No. 102. FRIJOL.

An oblong light-brown bean.

Nos. 101 and 102 were obtained in the market of the City of Mexico.

No. 103. PATOL.

A large oblong black, reddish, or white bean. Obtained at Colotlan.

No. 125. FABA VULGARIS.

This bean was repeatedly seen in the markets and occasionally growing in fields. I was told that it was called "hava," which may be a corruption of "faba."

No. 126 to 128. CICER ARIETINUM.

Found in the markets. My seeds are from Mazatlan (No. 127) and Guadalajara (No. 128).

The long roots of a plant called "cudrado" are prepared for eating by being peeled and boiled like potatoes. The fruit, which is about 2 to 2.5 dm. long, is said to be pale green when ripe. It is eaten both raw and roasted. I have not yet been able to identify the plant.

FRUITS.

Mexico has many peculiar and interesting fruits. With its extremely varied climate, almost any kind of fruit can be grown. Only those are here described which came under my observation while making a hasty journey through the country.

Many fruits common in our own markets are also abundant there, such as apples, peaches, pears, bananas, etc. Apples and peaches are seen in all the markets, but I saw only a few orchards. These were in Indian villages on the top of the Sierra Madre at an altitude of 6,800 feet. From here the fruit is carried down the mountain side on backs of donkeys and taken 100 to 200 miles to market. A rude crate is commonly used. This has four nearly equal sides made of small sticks, which are tied together at the corners with agave fiber. The top and bottom are usually made of a layer of leafy twigs (often willow) drawn through the lowest and uppermost openings.

Bananas are very common. Quite a number of varieties were seen. More kinds are met with there than will be seen in our own markets. Bananas grow not only along the coast, but in the hot barrancas of the interior.

Oranges and lemons are found everywhere. At Guaymas there are some large orange orchards, which of course are irrigated. I was astonished at the abundance of limes which are grown throughout the tropical regions. This fruit deserves a greater popularity in the United States than it now has.

I saw pineapples for sale at Guaymas which had been shipped thither from Manzanillo. It is said to be a very profitable crop to grow.

Blackberries are used, but how extensively I did not learn. The wild species seen on the top of Sierra Madre ripens its fruit in August. Apricots are cultivated in Sonora and were for sale at several of the railroad stations. Figs are grown in the gardens at Guaymas.

Cocoanut and date palms are common in many gardens, and the nut of a wild species is brought into the towns in great quantities.

The melon zapote or papaya (*Carica papaya* L.) is a great favorite and is grown in plazas and yards. I found the mango in all the markets. The fruit, which is about 7 to 7.5 cm. (3 inches) long, is always eaten raw. Trees were seen growing up to an altitude of 750 meters (2,500 feet).

PALMACEAE.

Acrocomia sclerocarpa Mart.

COCOJUL.

In the markets at Mazatlan, Rosario, and Acaponeta great quantities of a small palm nut are sold. This nut is about the size of a small black walnut. I was told that the outer pulp is first eaten and afterwards the seeds. The nuts are often brought from a long distance. The trees grow only in the foothills and lower mountains.

BROMELIACEAE.

Bromelia spp.

COCURSTLE or COCURSTE.

At least two species of *Bromelia* are very common on the west coast, and their fruit is often for sale in the markets. In one it is oblong in shape, 6.5 cm. (2½ inches) long, and of a deep purple color. The other is smaller, ovate, and yellow in color. Both are slightly acid to the taste; a drink similar to lemonade is made from the ripe fruit. It is generally eaten raw, but sometimes cooked. It is said in the latter case to resemble apricots.

ANONACEAE.

Anona cherimolia Mill.

CHIRIMOYA.

Chirimoya is a very abundant fruit in the markets of Mexico. The annual crop is valued at over \$45,000.

The fruit of several species of *Anona* must go under this name. I found on the streets of Guadalajara two varieties of this fruit, one of which is perhaps *A. longiflora*. The chirimoya is 6.25 to 7.5 cm. (2½ to 3 inches) long, ovate in outline, with a brownish skin, either smooth or tuberculate.

Anona glabra L.

ANONA.

A number of fruits go under the name of anona. I collected specimens of three species of the genus, all of which are called by the one common name. The chirimoya also belongs to this genus. I was told that the rough-fruited species of *Anona* were called chirimoya, while the smooth-fruited ones are called anona.

The anona most largely cultivated is said to be *A. glabra*, of which I collected specimens on the west coast. The annual crop is valued at over \$19,000.

LAURACEAE.

Persea gratissima Gaertn.

AGUACATE.

The aguacate or alligator pear is a common fruit in the markets of Mexico. It is commonly used as a table fruit eaten raw with pepper and salt, as a salad, in soups, or spread on bread. The fruit is somewhat obovate in outline, 7.5 to 8.75 cm. (3 to 3½ inches) long, containing in the center a large loose seed. Two varieties were seen, one having a green skin with lighter spots, the other nearly black or a dark purple. The pulp is rather firm, in appearance suggesting butter, and hence the popular name "vegetable butter."

The trees are widely cultivated in the tropical and subtropical parts of the country. The annual crop is valued at about \$14,000. As is well known, it is not restricted to Mexico but now cultivated in most tropical countries, and some trees are grown in south Florida and California.

The fruit is sometimes sold in our markets, but has never received the attention it deserves.

The following are the names applied to the fruit: Aguacate, ahucate chico, ahucate grande, avocado, avocado pear, alligator pear, midshipman's butter, vegetable butter, vegetable marrow.

ROSACEAE.

Couepia polyandra (H. B. K.) Rose.

ZAPOTE AMARILLO.

This species is little known botanically. It seems to be common along the west coast of Mexico, where it is evidently native. It grows to the height of 3 to 7.5 meters (10 to 25 feet). The fruit is yellow and about 7.5 cm. (3 inches) long. It is edible, but I was not able to learn whether or not it is extensively used.

The name "zapote amarillo" is also given to *Sapota elongata*.

Crataegus spp.

TEJOCOTE.

The fruits of two species of *Crataegus* were seen in the market at Guadalajara, sold under the name of "tejocote." The fruits are often strung on small strips of isote fiber. About 20 of them are in each strand and the strands sell at a cent apiece. The fruits are made into various jams and jellies.

LEGUMINOSAE.

Pithecolobium dulce Benth.

HUAMUCHIL.

The seeds of this tree (fig. 31) are considerably used by the people on the west coast of Mexico, where it has been largely planted. It is found



FIG. 31.—Huamuchil, *Pithecolobium dulce*.

all through tropical Mexico, where it is probably native, but on account of its rapid growth and delicious fruit it has also been much planted. It is very common in yards about towns and along streams.

When the trees are irrigated they make rapid growth and are said

to stand the drought extremely well. Large trees were seen about Guaymas surrounded by almost desert conditions.

The fruits ripen toward the close of the dry season. At Guaymas and Mazatlan they ripen the last of May. The boys and men gather the pods by the basketful and sell them in the streets as bananas are sold in our own cities. The pods and seeds are largely sold in the markets. The latter are often put up in little cone-shaped wrappers, which, with their contents, are sold for a cent apiece. An old tree will produce many bushels of fruit, which is valued at the rate of \$25 per tree. The pods are about 10 to 15 cm. long; when mature, somewhat reddish or flesh-colored and irregularly swollen. After the seeds have fallen the valves usually become strongly coiled. The part which is eaten is not the seed proper, but the large, fleshy aril, which almost completely surrounds and hides it, measuring 30 mm. (15 lines) long by 15 mm. (7 lines) thick. The aril is usually white, sometimes reddish, very crisp, sweetish, and very palatable. It is always eaten raw. At first sight it appears to be composed of a single covering, but in reality it is probably composed of many separate series of fleshy cells strongly compressed. The seed proper is small, black, flattened, 10 mm. long.

Pithecolobium ligusticifolium also has a very large aril, but it is not at all edible. The aril is a bright scarlet, much less fleshy and more fibrous than in *P. dulce*.

MALPIGHIACEAE.

Byrsonima crassifolia H. B. K.

NANCHE.

Nanche is a wild fruit which is brought into all the markets in great quantities. It grows on a small bush or shrub 1.8 to 3.6 meters (6 to 12 feet) high. The drupe is about the size of a small cherry, yellow in color, and of somewhat acid taste. It is generally eaten raw, but is sometimes put into soups as a flavoring, and sometimes added to the stuffing of tomares.

At Colomas I saw nanche, rice, and olives cooked with stewed chicken.

RUTACEAE.

Casimiroa edulis Lalave.

ZAPOTE BLANCO.

I did not see much of this fruit, but it is said to be very common in all the markets. A few specimens were seen at Mazatlan.

The fruit is about 5 cm. (2 inches) in diameter and contains 5 large seeds. The tree is said to be native, but I saw it only in cultivation.

ANACARDIACEAE.

Spondias spp.

CIRUELA.

The ciruela or Mexican plum (fruit of the ciruelo) is one of the important fruits of Mexico. The annual crop is valued at over \$70,000. In its season it is a universal favorite and is then the most common fruit seen in the markets.

The trees are grown all over tropical Mexico. I saw them in gardens at Guaymas, Mazatlan, Rosario, Acaponeta, and elsewhere, and the fruit in the markets of these towns, as also in those of Guadalajara and the City of Mexico. It is said that the fruit can be profitably raised in all the States of Mexico.

The ciruela tree is 3 to 7.5 meters (10 to 25 feet) high and has a short trunk, usually 8 to 10 inches, but sometimes in old trees 37 to 45 cm. (15 to 18 inches) in diameter, with smooth grayish or even white bark, a very large spreading top, and pinnate leaves. The fruit matures at the very close of the dry season. The branches are then entirely bare of foliage, and have a peculiar aspect, lined as they are with yellow knobs.

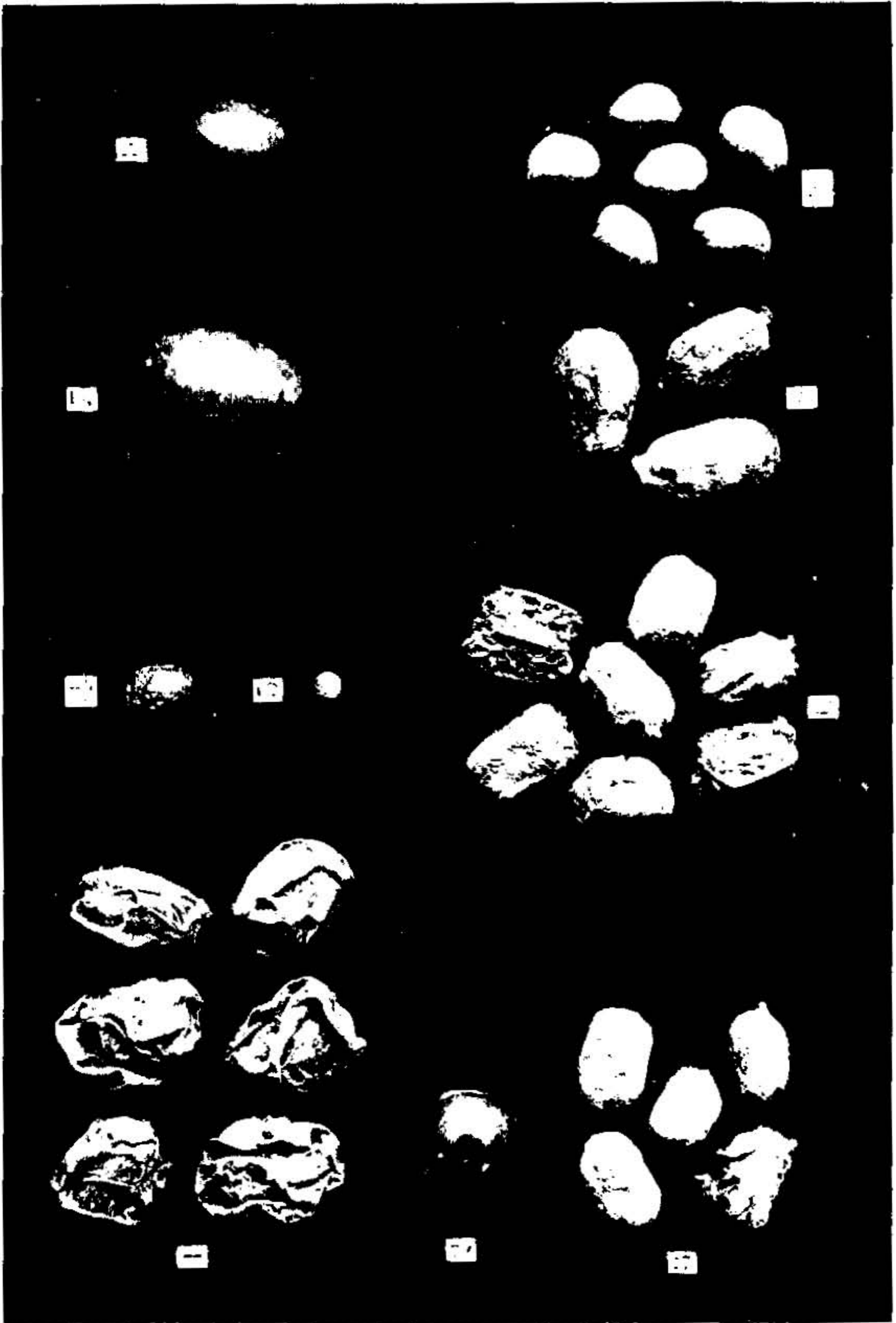
These plums are used in a great many ways. In their season they are seen everywhere; in the larger towns they are hawked about the streets, and in the markets every stall or countryman has a tray or box of them for sale, and retails them 6 for a cent. Both immature (green in color) and well-ripened fruit is sold. The mature fruit is plump, spherical or somewhat ovate in outline, with a rather tough yellow or red skin. The pulp has the consistency and somewhat the taste of the May apple of the North. The fruit is usually eaten raw and is very popular. It is also cooked and used in a number of ways. Sometimes it is served in hotels for dessert or made into "dulce." Dr. Palmer reports that it is made into sweetmeats and the juice is put into "atole." The ripened fruit does not keep well, but when scalded or boiled for a short time it may be dried and then kept for a long time. The dried fruit is thus found in the markets long after the fruiting season is over.

A cooling drink is sometimes made out of the dried fruit, or it may be ground into "alote."

While the ciruela is a popular fruit in the Tropics and is especially suited to a dry country, yet the very large stone or nut which it contains is much against it. Doubtless little effort has been made to select the best varieties. The trees grow with so little care that the tendency seems to be to let them develop as they please. Orchards are planted by simply breaking off limbs and putting them into the ground, then allowing them to shift for themselves. If an experienced horticulturist should take hold of this fruit he would probably be able not only to reduce the size of the stone, but to increase the pulp, and thus add much to its value.

It is usually considered that there are but two varieties of the ciruela cultivated in Mexico. These are the yellow and the red, called, respectively, ciruela amarilla and ciruela roja (Pl. XXIX). In the part of the country visited I found four very distinct varieties, or rather species, in cultivation and one wild species, making five in all.

Mr. Hemsley, in the *Biologia Centrali-Americana*, lists five species, all of them coming, however, from south Mexico and only one named specifically, viz, *Spondias lutea*. The yellow and red forms mentioned



CIRUELAS FRUIT OF SPONDIAS 20

above are referred to in Mexican works as *S. lutea* and *S. purpurea*, but they probably represent more than two species, if, indeed, these species are found in Mexico at all. In 1887 Dr. S. Watson described from Tequila, State of Jalisco, a yellow-fruited form under the name of *S. mexicana*, which appears to be the "ciruela amarilla," cultivated and sold on the west coast as far north as Guaymas.

The red-fruited form, which I saw only on the west coast, does not answer the description of *S. purpurea*, nor are the specimens like those so named in the National Herbarium.

The five forms obtained by me may be described briefly as follows:

1. *Yellow ciruela*.—Fruit spherical, 2.5 to 3.1 cm. (1 to 1¼ inches) in diameter, of light yellow color; surface of nut strongly roughened with a kind of filigree work.

2. *Red ciruela*.—Fruit similar to the above, but perhaps smaller and red in color. Trees said to be taller and less spreading.

3. *Wild ciruela*.—Fruit much smaller than the two preceding, red in color, the leaves of very different shape and size; a small shrub or bush 0.6 to 1.2 meters (2 to 4 feet) high. Found on low hills near Acaponeta.

4. *Ciruela* (from State of Jalisco).—A tree similar to the common yellow ciruela, but with very pubescent leaves; fruit yellow, about 2.5 cm. (1 inch) in diameter; nut with smooth surface. Only seen once, in the State of Jalisco. The fruit is said not to be edible.

5. *Ciruela* (from City of Mexico).—This was the largest plum seen. Fruit oblong to obovate, 4.4 cm. (1¾ inches) long, yellowish with a pronounced blush; nuts large, not so much roughened as in the common yellow-fruited form. I did not see the trees or foliage. I was told at the National Museum of Mexico that this was true *Spondias lutea*.

EXPLANATION OF PLATE XXIX.—Fig. 1, yellow ciruela, dried; fig. 2, the same, fresh; fig. 3, seed of same; figs. 4, 5, dried fruit and seed of a wild species; fig. 6, seeds of the cultivated red variety; figs. 7, 8, fruit and seeds of a large yellow variety; figs. 9, 10, fruit and seeds of a wild variety.

I collected considerable material, but, as was usually the case, not as much as would be desirable. Besides the herbarium specimens the following material was obtained:¹

EB No. 108. One fruit in alcohol, of common yellow ciruela, from Mazatlan, June 18, 1897.

EB No. 109. Nuts of same from Acaponeta, June, 1897.

EB No. 110. Dry fruit of red ciruela from Acaponeta, June, 1897.

EB No. 111. Nuts of same.

Herb. No. 3076. Two fruits in formalin of ciruela from State of Jalisco.

Herb. No. 3076. Nuts of the same.

EB No. 112. The dried fruit as sold at Guadalajara, probably of the yellow form.

EB No. 113. Two fruits in formalin of the larger ciruela purchased on the streets in the city of Mexico.

EB No. 115. Nuts of the same.

¹ The symbol EB denotes the Ethnobotanic collections of the author.

The following names are used for these fruits:

Cirucla.—A generic name applied to all plumlike fruits, but especially to the species of *Spondias*. It is often used for the various kinds without a qualifying term.

Cirucla amarilla.—Usually applied to the fruit of *S. lutea*, but also given to any of the yellow kinds.

Cirucla roja.—Supposed to belong to *S. purpurea*, but probably used for any of the red fruits.

Cirucla campechana.—Cuban name for the fruit of *S. purpurea*.

Cirucla colorada.—Another Cuban name for the same.

Jabo.—The Cuban name for *S. lutea*.

CACTACEAE.

The Cactaceae furnish a great variety of fruits, many of which are highly prized in Mexico. These come from various species of *Opuntia* and *Cereus* and of some other genera.

Opuntia spp.

TUNA.

Quite a number of *Opuntias* furnish choice fruits, all known by the name of "tuna." The species which are said to furnish the tunas are generally given as *O. tuna* and *O. ficus-indica*, but it is not at all certain that these are the ones which furnish the best tunas of Mexico. Both of these species are said to be introduced into the Old World, but the fruit sent to this country from Italy appears to be different from the common tunas of Mexico. The whole subject should be taken up by some botanist who has access to large collections, after having made extensive field collections of fruits, flowers, and stems, and having secured numerous photographs. In the markets at Mazatlan, on the west coast, I found a small, deep red colored tuna, perhaps 2.5 cm. (1 inch) long, to be very common. The large tunas were not met with until I reached the Sierra Madre. These were very common at Santa Teresa, Tepic, altitude 2,040 meters (6,800 feet), and at most of the towns at which I stopped in the table-land region of Zacatecas and Jalisco. One of the best and largest of these tunas is the "crystalina." This is one of the most delicious fruits I met with in Mexico, and ought to be introduced into the United States. Plants that grow in Mexico at an altitude of 1,500 to 2,100 meters (5,000 to 7,000 feet) could be easily grown in parts of Arizona and New Mexico.

Cereus geometrizzans Mart.

GARAMBULLO.

This is a common species on the table-lands of western Mexico. The fruit, which is a small, oblong berry about 1 cm. ($\frac{2}{5}$ inch) long, is said to be very common in the markets during its season, which must be after the close of the rainy season. At the time of my visit, about the 1st of September, I found the fruit nearly ripe. (Pl. XXX.)

Cereus spp.

PITAYA, PITAHAYA.

The pitaya is said by some to be the fruit of *C. variabilis* and by others to be that of *C. pitahaya*. The name is also applied to the fruit of *C. thurberi*, *C. giganteus*, etc., and "pitahaya" is probably better con-



GARAMBULLO *CEREUS GEOMETRIZANS* Mart.)

sidered as a generic term applied to the edible fruits of several species of *Cereus*, whence the terms "pitahaya dulce," "pitahaya acre," etc. I did not see any of these fruits, but the plant which was pointed out as the pitahaya of central Mexico was a very large species, 7.5 to 10.5 meters (25 to 35 feet) high, somewhat resembling *C. pecten-aboriginum*, but probably referable to *C. tetazo*.

Tomales are made out of the dried fruit of one or more pitahayas. For drying, the inner part of the fruit is taken out and allowed to lie in the sun for several days. It is said to be very sweet and will keep for a year.

MYRTACEAE.

Myrtus arayan H. B. K.

ARRAYAN.

I saw this tree only about Indian villages in the foothills of the Sierra Madre. The tree here grows to be 6 to 10.5 meters (20 to 35 feet) high, the trunk 4 meters (12 feet) high, and sometimes 36 cm. (15 inches) in diameter, with smooth, gray bark and erect branches. In no place did it appear to be native, but it seems to be cultivated somewhat extensively in Mexico. It is grown in sufficient quantities in some twelve States to be listed among their fruits, and the annual crop is valued at over \$1,200. The ripe fruit is sold in the fresh state in all the larger markets, and, according to Dr. Palmer, also in the dried state. I obtained some of the ripe fruit at Guadalajara. It was greenish yellow, 1.25 to 1.87 cm. ($\frac{1}{2}$ to $\frac{3}{4}$ inch) in diameter, smooth, with a large, irregular disk at the top and a smooth nutlet in the center; very juicy, and said to have a rich, spicy, subacid flavor.

One of the popular "soft" drinks of the country, which is said to be very refreshing, is made from these fruits.

The following specimens were obtained:

EB No. 105. Fruit in formalin, obtained at Guadalajara, September, 1897.

Herb. No. 2006. Specimens from a tree seen in the Indian village of San Blascito, Tepic, August 4, 1897.

Psidium spp.

GUAYABA.

Guavas, or "guayabas," as they are called in Mexico, are common along the coast and in the hot valleys of the interior. I saw four species, two of which are wild. *Psidium guava* appears to be the one commonly cultivated. It is usually a small tree, 3 to 4.5 meters (10 to 15 feet) high, often with a large top. The fruit is used everywhere. It is often eaten raw, but generally made into preserves, jams, and jellies.

COMBRETACEAE.

Terminalia catappa L.

ALMENDRA.

I saw this tree only in the town of Rosario and at La Paz, Lower California, where it was cultivated. Dr. Palmer states that the nuts are known as "almendras" or Mexican almonds. He says the children eat the outer pulpy husk. The fruit, which is a drupe, is much flattened, elliptical, and about $\frac{2}{3}$ inches long. The stone contains a small, sweet

and edible seed. Dr. Palmer states that the tree is also called "story tree," because the horizontal branches are given off in whorls or "stories." These trees seem to be frequent in the towns of western Mexico and furnish one of the few shade trees there, growing to the height of 10.5 to 12 meters (35 to 40 feet). It is now frequently met with in Guatemala and south Florida. The tree is native of tropical Asia.

SAPOTACEAE.

Achras sapota L.

ZAPOTE CHICO.

This is a common tree in cultivation. Some large trees were seen at Acaponeta, perhaps 40 to 50 feet high. The fruit is nearly orbicular in outline, 2.5 to 3.75 cm. (1 to 1½ inches) in diameter, with a rough, brownish skin. It is sold in the markets in June and July. The annual crop is valued at \$38,000.

This is said to be the tree which produces most of the "chicle," a gum extensively imported into the United States, and used in the manufacture of chewing gum, which is almost wholly composed of it. It is said that *Vitellaria mammosa* (L.) Radlk. as well as other species of the genus *Vitellaria* produce chicle, and that the best gum for "masticatory" purposes is that obtained from *V. mammosa*.

According to Treasury reports for 1897, 5,315,902 pounds of this gum, valued at \$1,091,892, was imported into the United States in the year 1896-97. The crop for 1897-98 is estimated at only 2,600,000 pounds. Under the Wilson bill the gum was admitted free of duty but now there is a duty of 10 cents per pound.

The following tables will show the quantities of chicle gum received at New York in 1897 and 1898 from several ports:

Comparison of monthly and annual receipts of chicle gum at New York, months of January, 1897 and 1898, and years of 1897 and 1898.

From—	Jan., 1898.	Jan., 1897.	Sept. 1, 1897, to Sept. 1, 1898.	Sept. 1, 1896, to Sept. 1, 1897.
	<i>Bales.</i>	<i>Bales.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Tuxpan.....	544	887	304,000	552,000
Vera Cruz.....	11	309	29,000	114,000
Campecho.....		150	40,000	117,000
Laguna.....	259	797	114,000	183,000
Progreso.....	998	1,228	332,000	562,000
Belize.....	256	490	76,000	174,000
Various.....	79	15	39,000	24,000
Total.....	2,147	3,876	934,000	1,696,000
Or pounds.....	335,000	608,000		

Comparison of stock on hand for two years.

February 1, 1898:	Pounds.
Free.....	539,000
In bond.....	397,000
February 1, 1897.....	886,000

Comparison of prices.

	Cents.
Lowest price;	
January 5, 1898.....	27½
January 29, 1897.....	21
Highest price:	
January 31, 1898.....	29
January 4, 1897.....	23

EBENACEAE.

Diospyros ebenaster Retz.

ZAPOTE PRIETO.

The fruit is also called "zapote negro." The annual crop is valued at \$27,000. I did not see the fruit of this plant either used or sold, although it is said to be cultivated in many places. Fruiting specimens of a species probably the above were obtained at Acaponeta at an altitude of about 30 meters (100 feet). It has heretofore been reported to grow at an altitude of 450 to 1,800 meters (1,500 to 6,000 feet), and it is not at all unlikely that more than one species goes under this name. Two other specimens were collected—one at Altata (at sea level) and the other at Colomas, altitude 750 meters (2,500 feet), which seem to represent two very distinct species.

VERBENACEAE.

Vitex mollis H. B. K.

UVALAMA.

Uvalama, or better, perhaps, walama, is a small drupe which is very common in the markets of the west coast at the close of the dry season. The fruit is black or bluish black, nearly spherical, and 15 to 20 mm. in diameter. It is eaten raw. (EB Nos. 112 and 113.)

CUCURBITACEAE.

Cucurbita ficifolia Bouché.

CHILACAYOTE.

The pulp of this fruit is boiled with sugar and used as a dessert. I was told that the fruit is about 0.45 meters (1½ feet) long, with a hard shell and a fibrous pulp. The seeds are black, resembling those of the watermelon, but larger. The fruit is cut in two and the pulp is taken out and cooked. The shell is filled with water and allowed to stand and sour. From this a vinegar is made which the people use in making a kind of soda water.

BEVERAGE PLANTS.

The drinks of Mexico derived from plants are of the intoxicating and the nonintoxicating classes.

Agave spp.

MAGUEY.

The intoxicating drinks are several, but the most important by far are those made from the agave plants or magueys. Of these drinks there are two classes, the fermented and the distilled. The fermented drink is called pulque. It is largely used all over the country and especially about the City of Mexico. The pulque plant (Pls. XXXI to XXXIII) is cultivated throughout the mountain regions and on the table-lands. Almost every house has a few plants growing near it which supply pulque for the family.

The pulque magueys are several in number. They all have large, broad, thick leaves and belong to the Euagave section of the genus. A large cavity or bowl is hollowed out of the center of the plant by taking out the bud or core, and into this sap from the cut leaves oozes. The accumulation is gathered twice a day, as sugar water is in our maple orchards. This sap when fermented forms the pulque. Each day the surface of the bowl is scraped to increase the flow and this is kept up for several weeks. It is customary to bend over and fasten together the leaves of the agave plant at the top to retard evaporation.

The distilled drink called mescal, or now perhaps more commonly tequila, is made from what are called the mescal magueys. These have much thinner leaves than the pulque magueys and, in the case of the species so largely used in the manufacture of tequila, the leaf is very narrow. The Indians and Mexicans of the mountainous regions use a number of the wild species for making their mescal. The tequila maguey, however, is cultivated in great plantations. I have not been able to learn what the species is which goes under this name. At Bolaños there is cultivated under the name of the "huila" what is perhaps the same species.

One of the most interesting studies connected with the botany of Mexico would be the determining of the species of *Agave* which are used by the people in making their drinks—a subject upon which there is much ignorance.

Carl Lumholtz, the well-known Mexican traveler, states that "the Mexicans derive their famous tequila or mescal from the maguey (*Agave americana*). One of the inferior kinds of brandy, sotol, is produced from a plant of the same family." While it is uncertain from what species tequila is made, it is at any rate not *A. americana*, and sotol, as we shall see, is derived from plants of another genus.

Dasyllirion spp.

SOTOL.

Sotol, a common distilled drink of the table-land region, is made from the species of *Dasyllirion*, the crown of the plant being utilized. The drink is similar to mescal and is often mixed with it. (EB No. 43, a bottle of sotol liquor.)

Aguardiente, made from cane sugar, is also one of the chief distilled drinks of the country.

The nonintoxicating drinks of the country are very many. They are usually made of some acid fruit, such as limes, tamarinds, etc., or of mucilaginous seeds, such as those of certain mustards and mints. I shall not attempt to enumerate all of them, but wish to refer briefly to the few which came under my observation.

Some of these drinks are peddled about the streets carried in "olla" on the top of men's heads, and some are for sale in the markets or at the hotel bars, etc. Women have regular stands for selling them in the arcades about the public squares of most large towns and in market buildings.



PULOUE PLANT OR MAGUE Y AGAVE ATROVIRENS KUNZ.



PULQUE PLANT OR MAGUEY (AGAVE ATROVIRENS KARW. F.)



PULQUE PLANT OR MAGUEY (*AGAVE ATROVIRENS* KAW.)

Hibiscus sabdariffa L.

JAMAICA.

One of the most popular of the summer drinks of Mexico is made from "jamaica." Jamaica is made from the involucres, calyces, and capsules of *Hibiscus sabdariffa* which have been gathered and dried. The jamaica gives to the water a reddish color and a slightly acid taste. In the markets at Guadalajara it is seen packed in large shallow baskets where it is retailed.

Sisymbrium canescens Nutt.

PAMITA.

From pamita the seeds of *Sisymbrium canescens*, a most refreshing drink, is prepared in the following manner: About a gill of the seed is put into a glass and thoroughly mixed with water; a little lime juice is then added and the mixture again stirred, then a little sirup, then a little blackberry brandy or claret, the stirring process being repeated as each new ingredient is added, until finally the glass is filled with water, when it is ready for drinking. A straw is generally used in drinking this mixture. *Sisymbrium canescens* is very common in Sonora. The seed is collected in great quantities about Altar and is sold at Guaymas. These seeds, when wet, give off a great quantity of some mucilaginous substance.

Salvia spp.

CHIA.

The well-known drink made from chia, the seeds of species of *Salvia* and related genera, is sold all over the country. At Guadalajara the seed is mixed with barley water. I obtained specimens at Colomas (EB No. 111).

Chia seed has been obtained from various markets in Mexico, and plants have been grown in Washington from which herbarium specimens have been made. These specimens have been determined by Mr. M. L. Fernald, who reports that the *Salvias* are *S. hispanica* L. and *S. tiliaefolia* Vahl. Seed and specimens of *chia grande* sent in by Dr. E. Palmer prove to be *Mesosphaerum suaveolens*.

Tamarindus indica L.

The tamarind tree (*Tamarindus indica*) is now grown all over tropical Mexico. The fruit is largely used in making a cooling drink, and is sold everywhere. At Guadalajara it is displayed in great shallow baskets 9 dm. (3 feet) in diameter and 20 cm. (8 inches) deep. (Pl. XXVIII, fig. 1.)

The fruit of two species of *Bromelia* is often used in making a sub-acid drink.

A drink is sometimes made of the dried fruit of the ciruelo¹ (*Spondias lutea*), while in many places the ripe fruit of arrayan² (*Myrtus arayan*) is used in the same way.

In Guadalajara I saw a drink called "tehuino," which is said to be made from cooked corn.

A drink called "agua de cebada" is made by adding to water barley flour, or more commonly softened barley ground on a "metate,"

¹ See p. 217.² See p. 221.

together with sugar, cinnamon bark, and "ajonjoli," i. e. sesame, the seed of *Sesamum indicum* L.

This mixture is of a muddy gray color, with a sweetish, starchy taste. It is carried about the streets in earthen jars and sold for 1 cent a glass.

SEASONING AND FLAVORING PLANTS.

Some very curious dishes are served. Roast beef is eaten with a dressing of squashes, onions, and oil, while beefsteak is sometimes dressed with a mixture of red peppers, onions, and whole potatoes the size of cherries. Aguacate salad is made of mashed aguacate, onions, and cheese, while a "tomale" which I dissected was found to be made up of a combination of chicken, onion, red peppers, olives, and raisins. At Guaymas red peppers stuffed with cheese were served. Another interesting preparation called "enchalada" is made out of chile Colorado, queso (cheese), and cebollos (onions) folded up in a tortilla. These are mentioned not because they are peculiar, but as samples of scores of others.

LAURACEAE.

Litsea glaucescens H. B. K. var.

LAUREL.

The leaves of this plant are much used in flavoring meats, soups, etc. It can be found in the little stores and markets everywhere. It is also considered to have some medicinal virtues. The leafy branches are gathered in bundles and dried. The crushed leaves are very fragrant and aromatic. It is a small glabrous shrub with narrow lanceolate leaves, pale green above, whitish beneath, and thickly covered with small pellucid dots. It grows high upon the mountains. Specimens were collected in the mountains near the Indian village of Santa Teresa, Territorio de Tepic, and near Plateado, in the State of Zacatecas, while dried specimens were bought at Bolaños.

UMBELLIFERAE.

Carum petroselinum Benth.

PERJIL.

Cultivated in gardens, and used in flavoring all kinds of dishes.

Coriandrum sativum L.

Commonly used as a flavoring for soups, etc. It is largely sold in the markets, usually with cabbage and squash, small pieces of these and a stem of coriander being frequently seen laid out together, ready for purchasers.

VERBENACEAE.

Lippia spp.

OREGANO.¹

The leaves of oregano are very much used to flavor food. Dr. Palmer states that at Acapulco they are used much as we use sage. It is cooked with fish, sausage, and other foods.

¹ Also spelled oregeno, oragano.

The name "oregano" seems to be a generic term applied to the leaves thus used of several species of *Lippia*. The plant so called at Acapulco is *L. berlandieri* Schauer; in Lower California, *L. palmeri spicata* Rose, while on the table-land I found it to be *L. purpurea* Jacq.

SOLANACEAE.

Solanum tuberosum.

PAPA.

Strange as it may seem the potato, as used in Mexico, is to be classed as a flavoring rather than as a vegetable. I never saw the potato there used as we use it. A few only, and these whole and very small, are added to soups and stews, along with raisins, olives, nanches, etc. Most that I saw were from about the size of cherries up to the size of small walnuts. The potatoes which they have are either the wild potatoes from the mountains or those which have recently been transplanted thence. The wild potato is apparently common. I collected specimens in the foothills, near Colomas, at an altitude of 840 meters (2,800 feet), and on the top of the Sierra Madre, altitude 2,040 meters (6,800 feet).

Sweet potatoes, on the other hand, often reach a good size. These are cooked and brought to the markets in great quantities, and sold on the plaza and along the sidewalks.

EUPHORBIACEAE.

Argithamnia sp.

AZAFRAN.

A kind of seed used in giving an orange color to soups, etc.

MEDICINAL PLANTS.

The native plants used as medicines, or supposed to have medicinal properties, are legion. Many of these, doubtless, have little or no real value.

The country people and Indians seem to have but little knowledge of medicine, generally using teas made of bitter and strong-smelling herbs.

More or less superstition is associated with certain plants, and great stress is laid upon some superstitious practices, for instance, that of sticking certain seeds on the temples to cure headache.

Along the coast, Indian peddlers bring down from the mountains various seeds or dried herbs to sell, or these may be found in the little stores of the towns. Sometimes on the plaza one finds the "herb doctor" dealing out a paltry stock of medicines in cent packages.

Much of the material which I saw for sale was in the form of dried roots or leaves, and in such cases specimens were not taken unless I saw the material collected and could identify the plant botanically.

The uses of these plants as given below are as they were told me.

FILICES.

Adiantum capillus-veneris L.

CELANTILLO DE OJO DE AGUA.

At Colomas this plant is used as a tea to relieve colic, but at Colotlan is taken as a tea for amenorrhea. This furnishes a good example of the diverse uses plants are often put to. The dried fronds were for sale in the plaza at Colotlan (EB No. 29).

Polypodium lanceolatum L.

LENGUA DE CERVO.

A tea made from the fronds of this fern is taken to cure the itch. The dried fronds were for sale in the plaza at Colotlan (EB No. 27).

LILIACEAE.

Aloe sp.

SAVILA.

The crushed leaves of this plant are used with oil in making a poultice to reduce swellings caused by venereal diseases. The plant was only seen about houses and towns where it had apparently been planted. My specimens came from La Paz (Herb. No. 1303).

CHENOPODIACEAE.

Chenopodium incisum (L.) Poir.

IPAZOTE DEL ZORILLO.

The skunk ipazote is a general medicine in use among the common people and supposed to have various virtues, being usually taken in the form of a tea, which is reported to cure colic, pneumonia, etc. (Herb. No. 3610 and EB No. 28.) My specimens were bought on the plaza at Colotlan, September, 1897.

MAGNOLIACEAE.

Magnolia sp.

CORPUS.

From the flowers a tea is made which is used to cure scorpion bites. The flowers are brought from trees which grow in the western foothills at an altitude of 3,000 to 3,500 feet.

ANONACEAE.

Anona sp.

The bark of this plant is boiled in urine and used to kill the mange on all kinds of animals. (Herb. No. 1681.)

LAURACEAE.

Litsea glaucescens H. B. K. var.

LAUREL.

A tea made from the leaves of laurel is taken for colds. The plant is, however, more largely used as a flavoring. (Herb. No. 3436 and EB No. 63.)

LEGUMINOSAE.

Enterolobium cyclocarpum Griseb.

HUINECASTLE.

A sweet sirup is made from the bark of this tree, which is used in cases of colds, etc.

The bark is also used as a soap and in tanning. My specimen came from Colomas (Herb. No. 1759).

Leucaena sp.

TEPAHUCAJE.

The country people use the bark to harden their gums. My herbarium specimen was obtained at Colomas, July, 1896 (Herb. No. 1725. EB No. 124, pieces of bark as used by the people at Colomas.)

ZYGOPHYLLACEAE.

Covillea tridentata (DC.) Vail.

GOBERNADORA.

A sample of this plant, as sold at Acaponeta, was purchased of an Indian peddler at that place.

A tea made out of the leaves and branches is taken by women for pains in the womb, or the material, when fried in tallow, is used for rheumatism.

The specimen is said to have come from the mountains east of Acaponeta, but I saw no plants of it. (EB No. 76.)

MELIACEAE.

Swietenia humilis (?) Zucc.

FLOR DE VENODILLO.

The seeds of the "flor de venodillo," which means "little-deer flower," are made into a tea which is taken for pains in the chest. Seeds were being sold at Acaponeta by Indian peddlers, who stated that they came from the coast near Acaponeta. (EB No. 77, seeds as sold by peddlers.)

EUPHORBIACEAE.

Acalypha phleoides (?) Cav.

YERBA DEL CANCER.

The leaves and stems of this plant are made up into small bundles and dried. The leaves and flowers are crushed into a powder and applied to sores, etc. A tea is made from it and taken to cure itch. My specimens were purchased on the plaza at Colotlan, September, 1897. (EB No. 26.)

Euphorbia sp.

YERBA DE COYOTE.

A tea is made from the dried plant which is supposed to relieve rheumatic pains. My specimen was purchased on the plaza at Colotlan, September, 1897. (EB No. 25.)

Euphorbia sp.

YERBA DE GOLONDRINA.

This plant is a small *Euphorbia* said to have come from the high mountains east of Acaponeta. (Herb. No. 1520 and EB No. 122.)

It is boiled and used as a poultice to reduce swellings and cure sores.

Jatropha curcas L.

SANGRE GRADO.

The plant is found in great quantities about fields. It is said to be used as a purgative, the seeds (physic nuts) being doubtless, as elsewhere, the part used.

RHAMNACEAE.

Karwinskia humboldtiana Zucc.

MARGARITA.

The leaves of this plant are crushed and soaked in water and the cold infusion used in cases of fevers. It has a wide use in Mexico. My

botanical specimens came from Colomas, but the plant has a wide distribution. (Herb. No. 3264.)

MALVACEAE.

Anoda hastata Cav.

ALTEA.

The leaves of this plant mixed with olive oil are taken for inflammation of the stomach. My specimens came from near Plateado, August 31, 1897. (Herb. No. 2709.)

TURNERACEAE.

Turnera humifusa (Presl) Endlich.

DAMIANA.

As is well known this plant is widely used in Mexico. At Acaponeta I obtained medical specimens which had been brought from La Noria, above Mazatlan. It is here used as a tea, and taken to relieve pains in the stomach and bowels. My specimens were purchased of Indian peddlers at Acaponeta, August 2, 1897. (EB No. 120.)

POLEMONIACEAE.

Loeselia coccinea Don.

ESPINOCILLA.

The specimens were purchased at Acaponeta, and were said to have come from the mountains east of Acaponeta. From the leaves and stems an infusion or tea is made, which is taken to stop fevers. (EB No. 121.)

Loeselia sp.

HINSESELL.

A tea is made of the leaves, which is used in fever and ague, while a cold infusion is used as a purgative.

VERBENACEAE.

Lantana sp.

MAJORANA.

This is said to be much used to relieve indigestion. My specimen came from Plateado, September, 1897. (EB No. 119.)

Lantana sp.

SONORITA.

The leaves of this plant, when boiled with barley, are given to women in childbirth.

LABIATAE.

Marrubium vulgare L.

MARRUBIO.

A preparation made from the leaves of this is used for rheumatism. It is also added to mescal and applied as liniment for rheumatism. My specimens (EB No. 116) came from Plateado.

SOLANACEAE.

Datura tatula L.

TOLOACHIL.

This plant is reputed to have many medicinal virtues.

An unguent is made from the leaves by boiling the juice of the crushed leaves with tobacco and lard. The seeds are ground and used in the same way.

My specimen was obtained at Plateado, where the species grows common in waste places about houses. Collected September 2, 1897. (Herb. No. 2775; EB No. 37.)

BIGNONIACEAE.

Pithecoctenium sp.

BEJUCO DE HUICO.

The large, winged seeds of this plant are applied to the temples, and are supposed to cure headaches.

The same use is made of rose leaves and also of a paste made from the vanilla bean. My specimens came from Colomas, July, 1897. (Herb. No. 1696; EB No. 123.)

COMPOSITAE.

Hieracium sp.

LECHUGUILLA.

Small bundles of the green plant are for sale in the markets. From it is made an infusion which is used as a wash for sores and skin diseases. It is also applied as a powder. My specimens were obtained in the market at Colotlan, September, 1897. (Herb. No. 2680; EB No. 30.)

Piqueria trinervia Cav. ?

TABARDILLO.

The crushed leaves are made into an infusion and taken as a remedy for typhoid fever. It is also said to be used to relieve deafness caused by typhoid fever. My specimens came from Plateado. (EB No. 118.)

Tagetes lucida Cav.

YERBA NIL.

This is one of the most widely used medicinal plants of western Mexico. The species has a wide distribution. The plants gathered by the country people are made up into small bundles and dried, and then put away for use. It is made into a tea, and is supposed to have numerous virtues, including efficacy against scorpion bites, fever and ague, etc.

Dr. Palmer says that at Colima it is made into an insect powder. This is the same plant as the "Santa Maria" of the Cora Indians. My specimens were obtained at Colotlan and Plateado, September, 1897. (EB Nos. 24, 117.)

Zinnia linearis Benth.

YERBA DE TORRO.

This plant is very common on the table-lands in Jalisco. The plants are broken off or pulled up by the roots and dried in small bundles, in which state they may be seen on the walls of the Mexican's hut. A tea is made from these dry stems, which is taken for pains in the stomach. My specimens were bought at a small ranch, one day's journey south of Bolaños, September 20, 1897. (Herb. No. 3079; EB No. 78.)

MANZANILLA.

The leaves are made into a tea and taken with olive oil for colic. With alcohol added the tea is given for nervousness.

SOAP PLANTS.

The Mexican countryman uses many of the native plants either in the place of soap or in its manufacture. In the country certain roots, fruits, barks, etc., called "amole," are extensively used in the raw state.

These are either rubbed upon the garment or added to the wash water. Among these are the roots of various agaves, yuccas, etc., and several fruits, as that of the soap berry and of *Zizyphus*. Manufactured soap is now widely used, either imported from the United States or made in the country. For the domestic soaps oils are obtained from the seeds and fruits both of native and introduced plants, the most important being a palm oil much used on the west coast, castor oil, and cottonseed oil.

In the notes which follow I have included both the species which were collected by myself and those which have been sent in by our collectors, especially Dr. E. Palmer. In the list at the end are recorded all the species which have been reported as used for soap or in soap making.

PALMACEAE.

Attalea cohune Mart. ?

COQUITO.

A palm known to the trade as the coquito grows in abundance about Manzanillo and furnishes large quantities of oil, which is shipped to the larger towns along the coast and manufactured into soap. Sufficient material has not been seen positively to identify the species, but it seems best to refer it as above until it can be definitely named.

Through the kindness of Mr. Alfred Gill, in charge of Mr. N. Graff's soap factory at Guaymas, I obtained a sample of soap and of the palm oil made from this nut. The oil comes from Manzanillo and San Blas, and is made from the nuts grown about Manzanillo and perhaps other places in south Mexico. About 100,000 pounds of this oil is used each year by Mr. Graff in his soap factory. A consignment of 57,000 pounds had just been ordered from San Blas at the time of my visit. The oil has much the odor of olive oil, and is said to make a very fine laundry soap, especially valuable for washing flannels. It is sold all over the State of Sonora, and is said to be liked much better than any soaps from the States. The soap is first made into a large cake which weighs 2,000 pounds. The large cake is at last cut into small pieces of 3, 3½, 4, 5, 7, 8, and 10 ounces, and then boxed for shipment to various places along the coast. In the making of each cake 350 pounds of the oil is used and 800 pounds of tallow.

The following specimens were secured:

EB No. 128. Palm oil obtained at Guaymas.

EB No. 129. A piece of soap obtained at Guaymas

LILIACEAE.

Yucca baccata Torr.

It probably will be a surprise to many to learn that amole soap is much used in the United States.

The large rootstocks of *Yucca baccata* have long been used at Peoria, Ill., in making a fine toilet soap. A thousand pounds of this plant is consumed each month by the Mexican Amole Soap Company,

who obtain their supply from the Organ Mountains, near Las Cruces, N. Mex. This company manufactures some twenty different kinds of soap preparations.¹

AMARYLLIDACEAE.

Agave heteracantha Zucc.

Dr. E. Palmer has recently (November, 1898) brought back a large quantity of the rootstock of an *Agave*, probably *A. heteracantha*, or a species very near it, which he says is largely sold in the market at Saltillo, Coahuila, for soap. These rootstocks, or bases of the stem, are about 7.5 cm. (3 inches) long, 3.8 to 5 cm. (1½ to 2 inches) in diameter, and are covered with black scales or leaf bases. These pieces are sold in the open markets at 6 or 8 for a cent, according to size. They are prepared for use much as are the other native amoles.

Agave lechuguilla Torr.

Agave lechuguilla is very common on the hills about El Paso, both in Texas and Mexico, where I obtained botanical specimens. Dr. Havard states that the leaves contain a valuable substitute for soap. (Herb. No. 1101.)

Agave variegata Jacobi.

Mr. Fred. Stark, of Brownsville, Tex., writes that the rootstock of this species is called "amole," and that a piece the size of a small walnut when "grated and mixed with a quart of warm water is enough to clean a full suit of clothes."

Agave sp. ?

AMOLE.

Dr. Palmer procured in the market at Guaymas specimens of another soap plant with leaves resembling those of *Agave angustissima* Engelm. As noted by him, it is found in the mountains near that place. The stems are cut off just above the ground and the leaf clusters, two tied up together, a smaller within a larger one, are brought to market to be sold as a substitute for soap. This material after being pounded is thrown into water to be used for washing blankets or woolen clothing.

Manfreda spp.

AMOLE.

The herbaceous annual-leaved agaves (§ *Manfreda* of most authors) are called "amole" all over Mexico in contrast with the perennial-leaved ones (*Agave* proper), which are called "maguey." These are used as generic terms, and throughout my whole trip I did not find them used interchangeably. This is, I know, at variance with many printed statements. The species of the *Manfreda* group most generally used is supposed to be *Agave brachystachys*, sometimes called *A. saponaria* on account of its use as soap. I did not see this species in flower or even growing, but I brought back roots which are now in cultivation and will sooner or later flower. The roots were purchased in the markets where they were being sold under the name of amole. Specimens were

¹For further notes on the use of this plant see Havard in Proceedings U. S. National Museum, vol. 8, p. 516, 1885.

obtained both at Bolaños and Guadalajara. At the former place I was told that the roots were used in every household of the town. The plants are said to grow high up in the Sierra Madre. They are brought down by the Huichole Indians, and this forms the principal occupation of many of them. The part of the plant which is used as soap is really not the root, but a thick, irregular rootstock sometimes forming large masses (Pl. XXXIV). The natives dry these rootstocks, and when grated and put into water they form a good lather.

The specimens obtained are:

EB No. 61. Amole. Bought in the market at Bolaños.

EB No. 72. Amole. Bought in the market at Guadalajara.

Specimens were purchased by Dr. Palmer in 1898 at Zacatecas of another amole which has a quite different rootstock from that of *A. brachystachys*, belonging perhaps to *A. guttata*. The rootstocks are always single, 5 to 6.25 cm. (2 to 2½ inches) long. Dr. Palmer states that a frequent way of preparing it, practiced by the Mexicans, is to mash or pound the rootstocks between stones, put the powder into a small quantity of water, and, after allowing it to soak, drain the water off into the wash water.

It is not at all unlikely that quite a number of the species of *Manfreda* are used as soap, but have not yet been reported. The roots which are sold in the markets are brought in by the Indians or country people without any vestige of foliage or flowers, and of course are not in condition for identification. These roots, however, are very tenacious of life and can be planted long after they have been taken from the ground. Dry rootstocks which I purchased in Mexico showed considerable vitality after sixteen months.

Prochnyanthes viridescens Wats.

AMOLILLA.

"Amolilla" was the name given to me for *Prochnyanthes viridescens*, a common plant of the mountains with rootstocks very similar to those of the herbaceous *Agaves* and said to be used for soap in the same way. (Herb. Nos. 2045, 2679, 3724, etc.)

PIPERACEAE.

Piper palmeri C. DC.

HACHOGUE.

This plant was collected by Dr. Palmer at Colima. He states that it is used by laundresses for cleaning clothes, and that the liquid obtained by boiling it is used to cure colic in man and in horses and mules, and for pains in the stomach and chest, also for cutaneous diseases. It is applied either externally or internally. The fruits, which resemble small candles, are edible.

PHYTOLACCACEAE.

Stegnosperma halimifolia Benth.

The powdered root of *Stegnosperma halimifolia* is used by the people of Lower California, according to Dr. E. Palmer, as a substitute for soap.



ROOTSTOCKS OF AN AGAVE (MANIHOTA) USED FOR SOAP.

ROSACEAE.

Licania arborea Seem.

CANA DULCE.

The seeds of a *Licania* (probably *L. arborea*) which grows about Acapulco are very rich in oil. According to Dr. E. Palmer the people at Acapulco make from them a vegetable tallow which is added to other oils in soap making. This tallow gives a green color to the soap. The plant grows in the lowland and on mountain sides about Acapulco, growing to the height of 4.5 to 6 meters (15 to 20 feet).

It is known under various names, such as cana dulce, cacahuate, cacahuianche.

LEGUMINOSAE.

Entada polystachya DC.

BEJUCO DE AMOLE.

Dr. Palmer furnishes the following data:

"This is a vine, hanging for support upon other plants. Its numerous large seed pods flapping in the wind are a novel sight. It has curious hooks, by which it swings itself from tree to tree. The older wood of this plant is cut up into suitable lengths, then pounded with stones until the entire mass is separated into shred-like form, when it is tied into bundles and sold in the market to be used as a substitute for soap by the poor."

Specimens were collected by Dr. E. Palmer at Acapulco, 1894-95. (Herb. No. 159.)

Enterolobium cyclocarpum Griseb.

HUINECASTLE.

The bark and pods of *Enterolobium cyclocarpum*, called "huinecastle," are used in place of soap for washing woolen clothes at Colomas, a little hamlet in southeastern Sinaloa.

EUPHORBIACEAE.

Ricinus communis L.

HIGUERILLA.

The castor-oil bean is largely grown in Mexico. It there often assumes a tree-like form, reaching a height of 4.5 to 6 meters (15 to 20 feet). The seeds furnish much oil. I saw the plant only on the tablelands, but it seems to be common elsewhere. According to Dr. Palmer this oil is also used in soap making.

RHAMNACEAE.

Zizyphus mexicana Rose.

The fruits of *Zizyphus mexicana*, according to Dr. Palmer, are highly prized for washing woolen goods. He found them used in the State of Colima, where they are seen for sale in the markets.

MALVACEAE.

Gossypium spp.

Dr. Palmer states that much cotton-seed oil is used in soap making in the States of Durango and Coahuila. He does not know which species of *Gossypium* furnishes the seed, but it is probably *G. herbaceum*.

PEDALIACEAE.

Sesamum indicum L.

AJONJOLI.

Sesamum indicum is cultivated at Acapulco and other places in Mexico. The seeds are very oily and are used in many ways in cooking, candies, etc. According to Dr. Palmer the oil is used in making soap. In Mexico this plant grows to the height of 0.9 to 1.2 meters (3 to 4 feet).

CUCURBITACEAE.

Cayaponia dubia (Hook. & Arn.) Rose.

Cayaponia dubia is a vine common on the west coast of Mexico. The vine, with the ripened or half-ripened fruit, is gathered and sold in the markets at Rosario and elsewhere. It is said to be used in the place of soap. The dry stems and fruit are crushed before using. (Herb. No. 1481; EB No. 81.)

Cucurbita foetidissima H. B. K.

CALALEASILLA.

Dr. Palmer tells me that a *Cucurbita* (probably *C. foetidissima*) with small fruit is much used by the washerwomen in northern Mexico. He states that they mash the fruit and vines into a kind of pulp and add it to their wash water.

Dr. Manuel Urbina published a short paper on "Los Amoles Mexicanos," in 1897, in which he listed 21 species of plants used as amole.

In the list which follows 30 species are recorded. So far as known I have given the Mexican name and the part of the plant used.

Soap plants of Mexico.

Systematic name.	Common name.	Parts used.
RHAMNACEAE:		
<i>Zizyphus mexicana</i> Rose.....	Amole.....	Fruit.
SAPINDACEAE:		
<i>Sapindus galeotti</i> Gray.....		Fruit.
<i>Sapindus inequalis</i> DC.....		Do.
<i>Sapindus marginatus</i> Willd.....		Do.
<i>Sapindus saponaria</i> L.....		Fruit (!).
<i>Sapindus</i> sp.....		Fruit.
LEGUMINOSAE:		
<i>Entada polystachya</i> DC.....	Bejuco de amole.....	Wood.
<i>Enterolobium cyclocarpum</i> Griseb.....	Huinecastle.....	Bark and pods.
CUCURBITACEAE:		
<i>Cayaponia dubia</i> (Hook. & Arn.) Rose.....		Fruit and vine.
<i>Cucurbita foetidissima</i> H. B. K.....		Do.
PHYTOLACCACEAE:		
<i>Phytolacca octandra</i> L.....		
<i>Phytolacca icosandra</i> L.....		
<i>Stegnosperma halimifolia</i> Benth.....	Amole.....	Roots.
DIOSCOREACEAE:		
<i>Dioscorea convolvulacea</i> Cham. & Schlecht.....		
<i>Dioscorea</i> sp.....		
PIPERACEAE:		
<i>Piper palmeri</i> C. DC.....		

Soap plants of Mexico—Continued.

Systematic name.	Common name.	Parts used.
LILIACEAE:		
<i>Yucca rupicola rigida</i> Engelm		
<i>Yucca baccata</i> Nutt.	Amole	Roots and rootstocks.
<i>Yucca angustifolia</i> Pursh		
AMARYLLIDACEAE:		
(§ <i>Agave</i> proper.)		
<i>Agave filifera</i> Salm Dyck		
<i>Agave heteracantha</i> (?) Zucc.		Rootstock.
<i>Agave lechuguilla</i> Torr.		Leaves.
<i>Agave mexicana</i> Lam		
<i>Agave parryi</i> Engelm		
(§ <i>Maufreda</i> .)		
<i>Agave brachystachys</i> Cav.	Amole, lechuguilla.	Rootstock.
<i>Agave guttata</i> Jacobi & Bouché.	do	Do.
<i>Agave variegata</i> Jacobi	do	Do.
<i>Bravoa geminiflora</i> Llav. & Lex		Do.
<i>Polianthes tuberosa</i> L.	Amole	Do.
<i>Prochnyanthes viridescens</i> Watson	Amolilla, amole	Do.
<i>Zephyranthes carinata</i> Herbert		Bulbs.

The above list of soap plants are all used in their native state. The following is a list of plants which furnish oil used in soap making. Only five species are given although doubtless others are used.

Mexican plants furnishing oils used in soap making.

Specific name.	Common name.	Part used.
MALVACEAE.		
<i>Gossypium</i> spp		Seeds.
PEDALIACEAE.		
<i>Sesamum indicum</i> L.	Ajonjoli	Do.
EUPHORBACEAE.		
<i>Ricinus communis</i> L.	Higuerilla	Do.
PALMACEAE.		
<i>Attalea cohune</i> Mart.?	Coquito.	Do.
ROSACEAE.		
<i>Licania arborea</i> (?) Swom.	Caua dulce.	Fruit.

TANNING AND DYE PLANTS.

I was not able to obtain much information regarding the plants used for tanning or dyes, but a few notes were made which are here brought together.

LEGUMINOSAE.

Haematoxylon boreale Wats.

BRAZIL.

The wood is known as "brazil," and is largely used throughout the country as a dyewood, giving a dark brown or red color. Among its applications was noted its use to color tomales, mats, and agave fiber.

Haematoxylon campechianum is supposed to be the logwood of commerce, but the above species is largely exported under that name, and has been for many years. Seemann, as long ago as 1848-1850, stated that the wood was largely exported from Mazatlan. It is not now so extensively exported from the west coast as formerly, but it is one of the chief exports from Altata, while much wood is shipped from Piaxtla, a small place down the coast, and also from Mazatlan.

The wood from Altata goes chiefly to Havre and Hamburg, ships often being loaded with this wood alone.

On account of this extensive cutting it is hard to find specimens of any size along the coast, but in some of the hot interior valleys large shrubs or even small trees are to be seen. Although so very common, this species is rarely collected botanically, there being specimens in the National Herbarium from only three localities. This is undoubtedly the *Haematoxylon campechianum* referred to by Seemann as coming from near Mazatlan.

Lysiloma candida Brandegee.

PALO BLANCO.

A great quantity of tanbark is used at Guaymas. It is brought from Lower California in small boats. I saw one consignment of 170 bags landed June 9, 1897. Sometimes 1,000 bags are brought over at one time. Each bag contains about 200 pounds. It is worth \$25 per ton in Lower California and about \$30 at Guaymas.

There is a tannery some 3 miles southwest of Guaymas, which I visited. I found that the chief bark used was the palo blanco (*Lysiloma candida*), of which great quantities are consumed. It is said to be very strong in tannic acid. The work in the tannery is chiefly done by Yaqui Indians, but is superintended by Mexicans or Americans. Modern methods are followed in the treatment of the hides, etc., and a very good quality of leather is produced. "Torote" wood is used to some extent. This is perhaps *Bursera microphylla*. In this case it is not the bark that is used, but the wood. This is split up much like kindling wood into pieces 10 to 15 cm. (4 to 6 inches) long.

The cascalote bean (*Caesalpinia coriaria*) is used in tanning small hides. It is shipped in bags in great quantities from Manzanillo.

For this information and for samples I am indebted to Mr. P. B. Chism, the owner of the tannery, and to Messrs. C. E. Randall and Frank Parkhurst.

The bark of huinecastle (*Enterolobium cyclocarpum*) is used at Colomas for tanning purposes. At Colotlan the bark from one of the oaks found on the mountain sides is used.

The specimens brought back are:

EB No. 109. Bark of *Lysiloma candida*, used in tanning.

EB No. 110. Wood of *Bursera microphylla*, used in tanning.

Jatropha spathulata occidentalis.

TECOTE PRIETO.

This bush is very common on the west coast, and is, according to Dr. Palmer, sometimes exported, being used both as a dye and for tanning purposes.

FIBER PLANTS.

There are many fiber-producing plants in Mexico regarding which very much has already been written. What is now especially needed is some careful botanical research and collecting for the purpose of determining the species of plants which produce certain well-known fibers. There is no place where this work is so much needed as among the Mexican agaves. Particularly is the want noticeable in the literature of istle, or Tampico hemp. This fiber has usually been attributed to *Agave heteracantha*, but it is now known that several very different plants, one at least being a yucca, furnish fiber for the Tampico market; and even the so-called *Agave heteracantha* seems to be an aggregate of species. Our botanical names for the Sisal hemp plant are very much confused, as several apparently very distinct species pass under the name of *Agave rigida*. Other cases might be mentioned which are scarcely less confusing.

I have not attempted here to compile the information available regarding Mexican fibers, but to bring together chiefly my own observations upon the few fiber plants met with in my travels through Mexico, and for this reason my notes are largely fragmentary.

I have also included the information collected by Mr. E. W. Nelson and Dr. E. Palmer in 1898, both of whom had been requested to gather all data they could regarding fiber plants.

PALMACEAE.

The palms are among the most valuable plants of Mexico. Their trunk supplies lumber or material for building houses, fences, etc. The leaves are used in covering houses and huts and made into mats, baskets, brushes, hats, etc. Some species furnish fiber, which is used in many ways, as for saddle sweaters, etc. These saddle sweaters, called "suadaderos," are said to be made from the trunk of some palm which is beaten into a fibrous mass. They were seen on sale in the markets of Colotlan, Guadalajara, etc.

Several species furnish edible fruits or oil, which is used in the manufacture of soap, etc. These fruit-producing palms are referred to elsewhere in this paper.

The making of hats from palm leaves is a very important industry. A species with fan-shaped leaves furnishes the fiber. At Colotlan, where I saw hats in process of making, the material came from trees growing near Tapasco, a small town near Tequila. The leaves are cut, dried, and bleached before they are brought to the market (see EB No. 31). The various segments of the leaf are cut down to the base, and each of them slit with a pin into narrow threads, 2 mm. (one-sixteenth of an inch) wide and about 4.5 dm. (1½ feet) long. The strips are tied into large bundles, and are then ready for use (see EB No. 32). Some eight of these strips are taken and worked into a very close

braid, 3 mm. (one-eighth inch) wide, the strips being repeatedly moistened to make them more pliable (see EB No. 33). Then these braids (see EB No. 33) are carefully trimmed and worked into the hat, two being sewed in at a time. They are sewed together with thread made from agave fiber. The thread is made up by the workman only as needed. He keeps a large skein of the fiber at his side (see EB No. 35), and as he needs a new thread withdraws several fibers from the skein. These he draws through his mouth to moisten, and then rubs them with the palm of his hand over the upper part of his bare leg. Then he draws them through his mouth again and then over his leg, and repeats the process until the thread is complete (see EB No. 36). A tall wooden form is used to shape the hat. A plain hat made in this manner sells for \$10.

Rain coats are also made from the leaves of palm and other similar leaves. They are formed of numerous overlapping leaf segments, and are said to make very satisfactory coats.

The accompanying photograph (Pl. XXXV) shows a party of Guerrero Indians returning from the Pacific coast with bundles of bleached palm leaves.

The following specimens were secured:

EB No. 3. An odd little brush made from palm leaves. It was bought from an Indian who lived in the mountains east of Acaponeta.

EB No. 2. A fly brush made from the common *Sabal* of Sinaloa and Territorio de Tepic.

Sabal sp.

Along the coast a species of *Sabal* (*Sabal* sp. nov.) which has a slender trunk is used in making corrals, the framework of huts, etc. In some places great quantities of the leaves are used to form the sides or roofs of rude huts. In Acaponeta many houses are covered in this way. Leaves for this purpose are cut in the dry season and brought to the town on the backs of donkeys. Here they are piled up and allowed to dry and bleach. In the country the roofs are not repaired until after the first hard rains have located all the leaks, and in the meantime have spoiled much of the contents of the huts.

LILIACEAE.

Dasyllirion sp.

SOTOL.

Nolina sp.

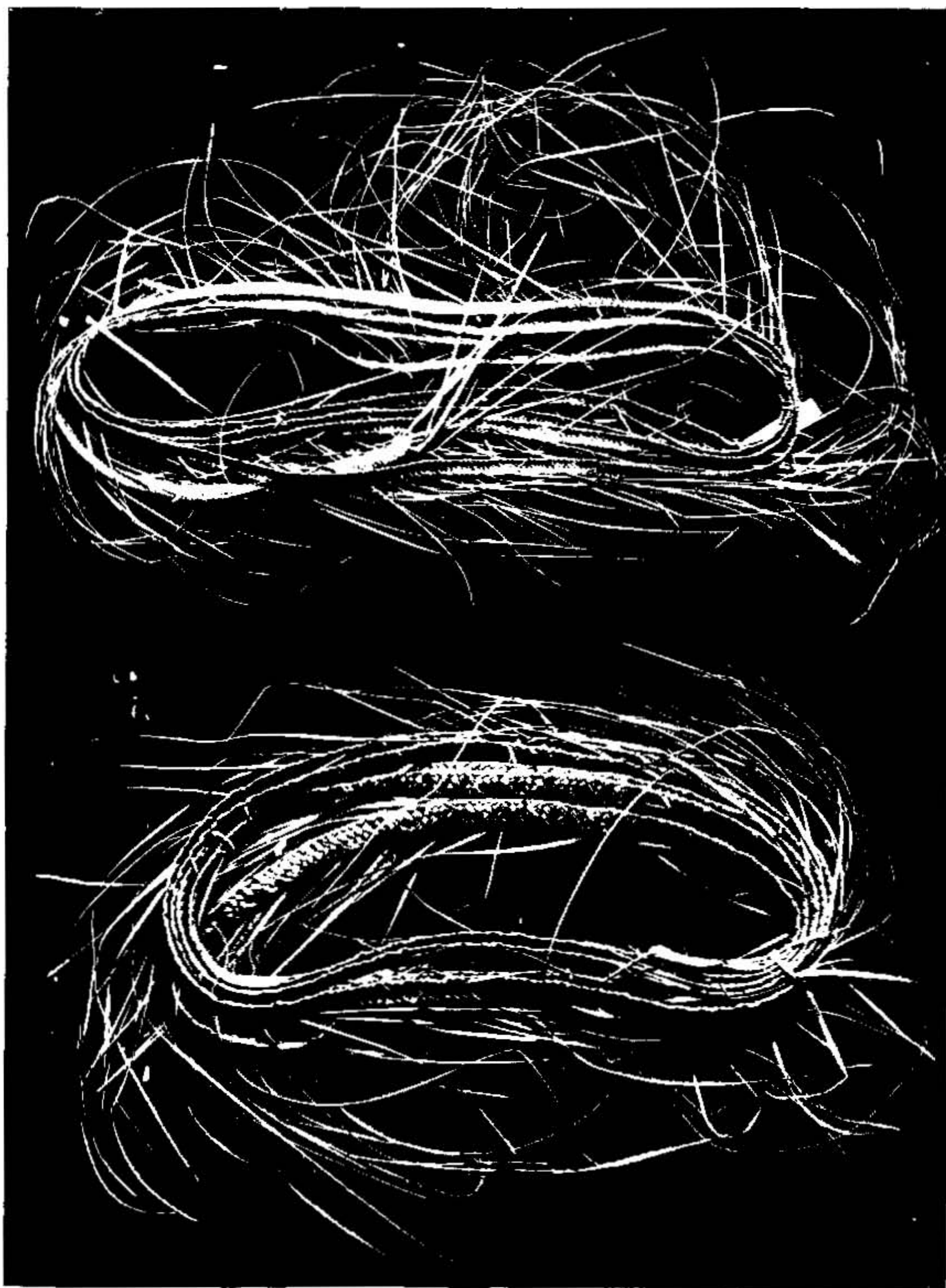
SOYATE.

The leaves of both these plants are used in the making of hats, either separately or together, or mixed with wheat straw or palm leaves (Pl. XXXVI). It is very common to see bundles of leaves about the huts of the Indians or Mexicans. The leaves are laid into swaths and dried and bleached in the sun, and then stowed away for use.

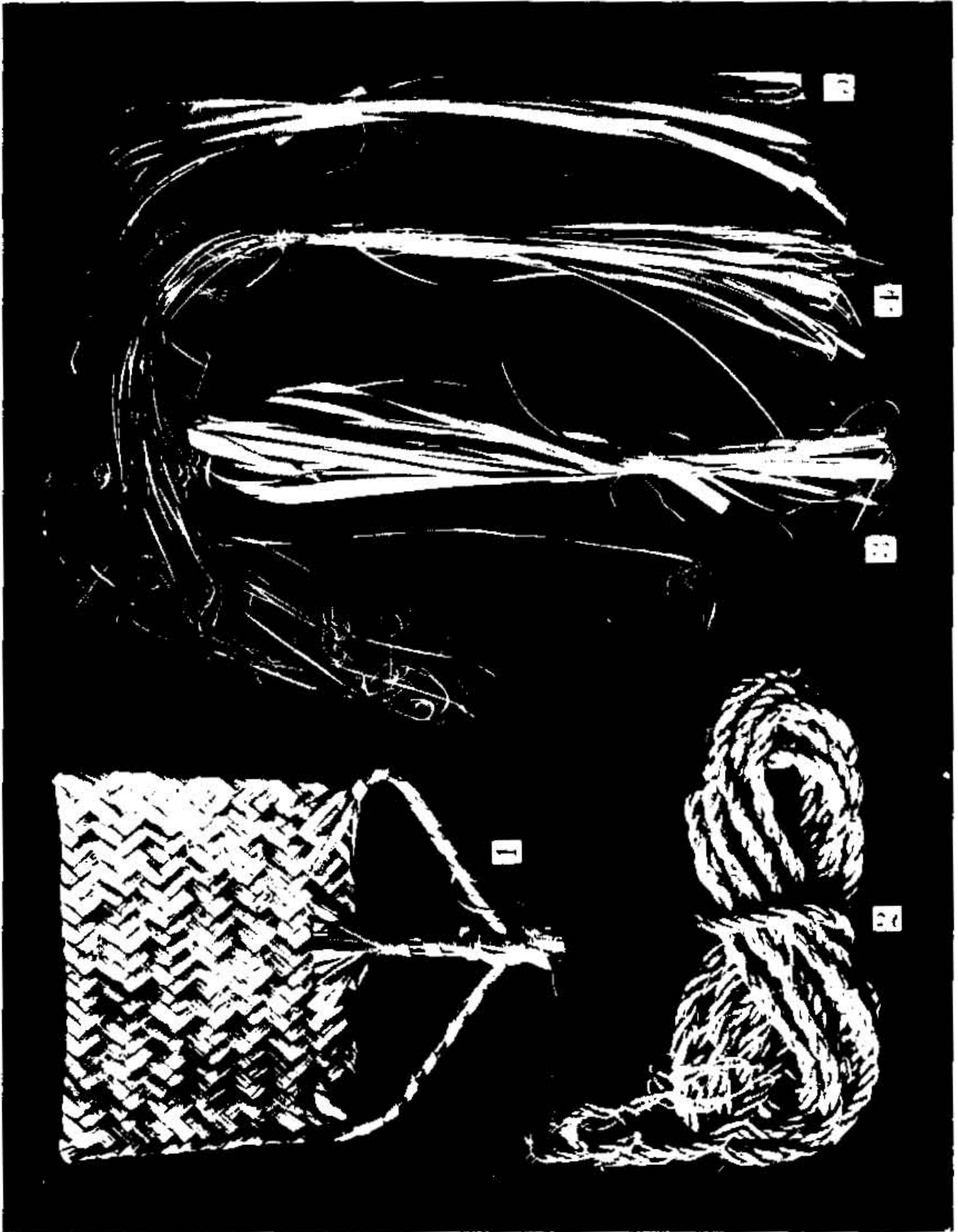
They are also made into floor mats. While many of these are roughly made, others are carefully and tastefully put together. These are sometimes banded with blue and red. The latter color is obtained by dyeing with Brazil wood and the former (so I was told) by adding



GUERRERO INDIANS BRINGING PALM LEAVES FROM THE PACIFIC.



HAT BRAIDS MADE FROM SOTUL AND SOYATE.



ARTICLES MADE FROM SOTOL AND SOYATE LEAVES.



ISOTE (YUCCA TRECULEANA Carr. 171), AS SEEN NEAR THE PIRAMIDE DEL SOL, NORTHEAST OF THE CITY OF MEXICO.

lime to the Brazil wood dye. These mats are often spread on the ground or over board or bamboo-covered cots to sleep upon. By twisting the leaves rude ropes are made, a specimen of which I obtained at Plateado. A fan-shaped blower, made by braiding the leaves, is much used in starting fires (Pl. XXXVII).

The following specimens were obtained:

EB No. 114. Leaves of sotol in the process of bleaching.

EB No. 39. The same partially bleached and split into strips suitable for braiding into hats.

EB No. 40. The same mixed with soyate made into hat braid which is left untrimmed.

EB No. 41. Leaves of soyate partially bleached.

EB No. 42. Untrimmed hat braid made from leaves of soyate.

EB No. 44. A blower made from the leaves of sotol.

EB No. 52. Mat made from green leaves of sotol.

EB No. 38. A small rope made from leaves of the soyate. This was obtained at Plateado, Zacatecas.

EXPLANATION OF PLATE XXXVII.—Fig. 1, fire blower made from sotol leaves; fig. 2, rope made from sotol leaves; fig. 3, soyate leaves used in hat making; figs. 4, 5, sotol leaves used in hat making.

Yucca filifera Chabaud.

PALMA LOCA.

There has been some confusion heretofore as to the botanical name of the palma loca. In the Kew Bulletin for 1890 it was stated to be *Agave striata*, but Mr. Nelson's notes and specimens seem to establish that it is a *Yucca*.

Mr. Nelson writes of it as follows:

The palma loca is the single-stemmed *Yucca* with upright flower stalk, and is very abundant. The fiber is more abundant than in the lechuguilla but is a little more difficult to obtain and is coarser and more brittle, so that its commercial value is less. An attempt was made at Miquihuana a few years ago to export this fiber, but it was given up in favor of the lechuguilla. The trial shipment was sent to New York.

The cleaned fiber is about 5 dm. long.

Mr. Nelson's specimens may be described as follows: Stems 1.8 to 7.5 meters high; leaves 6 dm. long, 4 cm. broad at widest point, narrowed to 2 cm. at the base and upward to a stout spine 1.5 to 2 cm. long, the margin splitting off into long threads; flower stalk single and upright. Leaves and fiber were collected by Mr. E. W. Nelson, at Matehuala, Tamaulipas, 1898.

Yucca treculeana (?) Carr.

ISOTE.

The isote is a tall arborescent *Yucca* very common in the western table-lands. This plant sometimes reaches 15 meters in height, with a trunk 24 dm. in diameter. The leaves are 6 to 7 dm. long, and are cut into narrow strips by the country people and used as strings for tying grass brooms, and for stringing crab apples (tejocotes). (Pl. XXXVIII.)

Specimens were obtained as follows:

EB No. 64. A strand of *Crataegus* fruits upon isote fiber.

EB No. 65, 66. A narrow strip of the fiber.

EB No. 67. A part of the leaf from which strips were being taken.

EB No. 68. An entire leaf.

AMARYLLIDACEAE.

Agave spp.

MAGUEY, LECHUGUILLA, TAPEMETE, etc.

By far the most important fiber-producing plants are the numerous species of agave. These have various common and local names.

The maguey is a generic term applied to most of the agaves proper, usually with some specific designation. Lechuguilla, meaning "cabbage-like," is applied to several of the smaller agaves and Manfredas, as well as to plants in other families. (Pl. XLVII.)

The quality of the agave fibers varies greatly in the different species, being suitable in some for making the finest thread, while in others it is used in making great ropes and cables. Not only are all kinds of threads, strings, and ropes made from the various qualities of agave fiber, but it is woven into many kinds of cloth, handbags, ore and grain sacks, matting, etc., or made up into brushes for scouring, for whitewashing, and for toilet purposes.

In all the interior parts of the country the people obtain their supply from their local species, each locality having one or more, or else they bring the leaves from the neighboring mountains.

Along our southern border, especially in the vicinity of El Paso, Tex., *Agave lechuguilla* is very abundant, and from it a short coarse fiber is obtained. This species has been confused with *A. heteracantha*, from which, although the two are closely related, it appears to be distinct. It is not unlikely that *A. lechuguilla* may furnish a part of the Tampico hemp of commerce. It is a rather small species, having only 20 to 30 leaves. The leaves are about 26 cm. (10 inches) long and 25 mm. (1 inch) broad, green and not at all banded down the face. Our herbarium seems to show at least four good species of the *heteracantha* group, all from the general region from which the Tampico hemp is produced. I should not hesitate to describe some of them as new if I understood what is really the type of *A. heteracantha* Zucc. and *A. poselgerii* Salm. I have the type of *A. lechuguilla* and have seen the description of *A. heteracantha*, but the latter answers to no specimens we have.

Mr. E. W. Nelson collected leaves, flowers, and fibers of two species of agave in Jaumave Valley and near Matehuala, Tamaulipas, which he states are the ixtle fiber plants of that region, and whose fiber is sent to Tampico for shipment.

One of these is perhaps *A. lophantha*, but as only two "cogollos" (bunches of young leaves) were collected the identification is uncertain. Even in these young leaves the marginal spines are widely separated, in some cases being 5 cm. apart and in this respect unlike the following species. The leaves of both differ from those of the *A. heteracantha* group in being narrowed at base.

I have identified the other as *Agave univittata* Haw. The leaves almost exactly agree with specimens recently sent me from Kew,



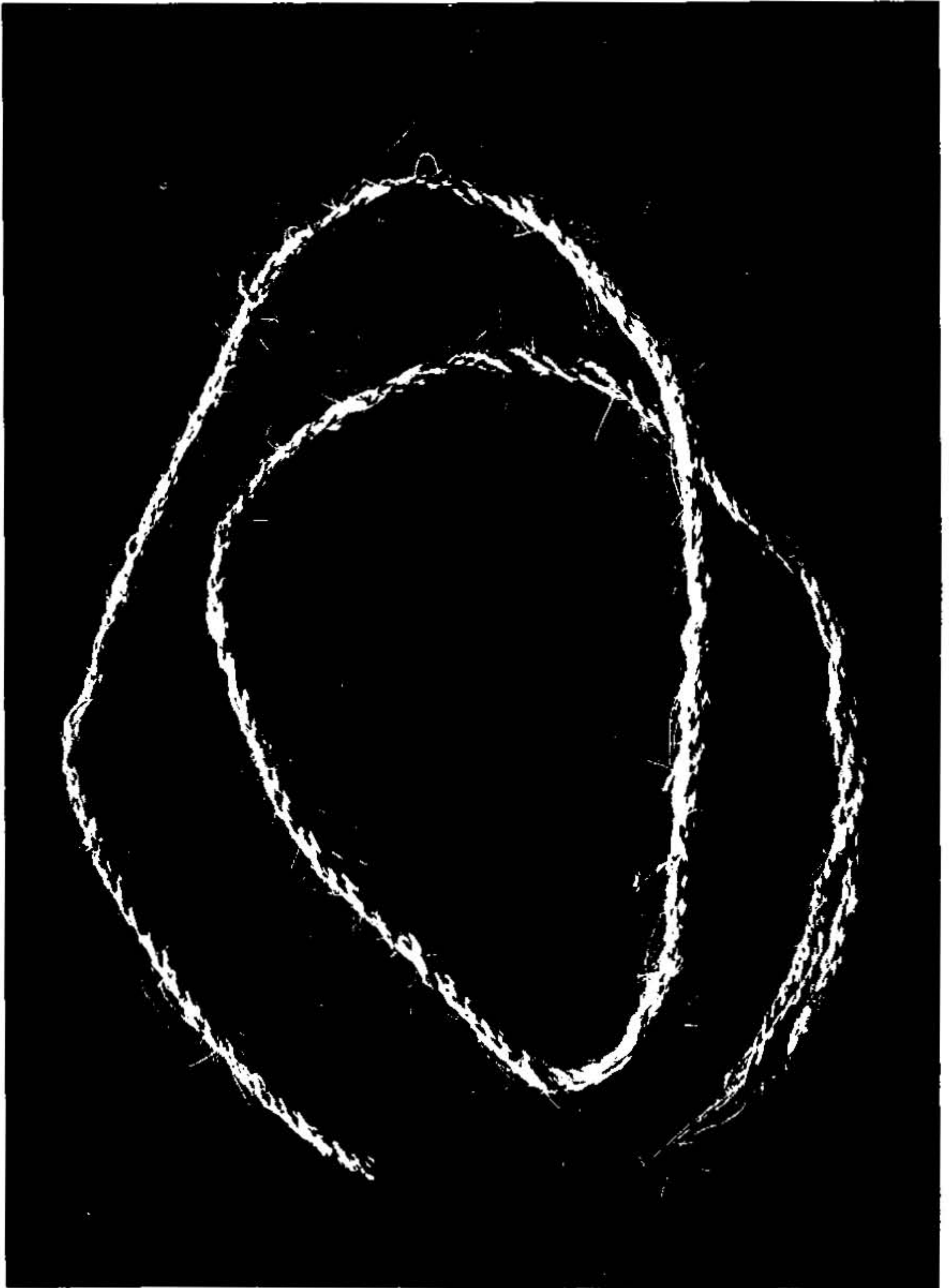
SMALL BUNCH OF TAMU OF FIELD.



COGILLUS OF PLANT FURNISHING TAMBOHEM.



SMALL BUNCH OF TAMPICO FIBER.



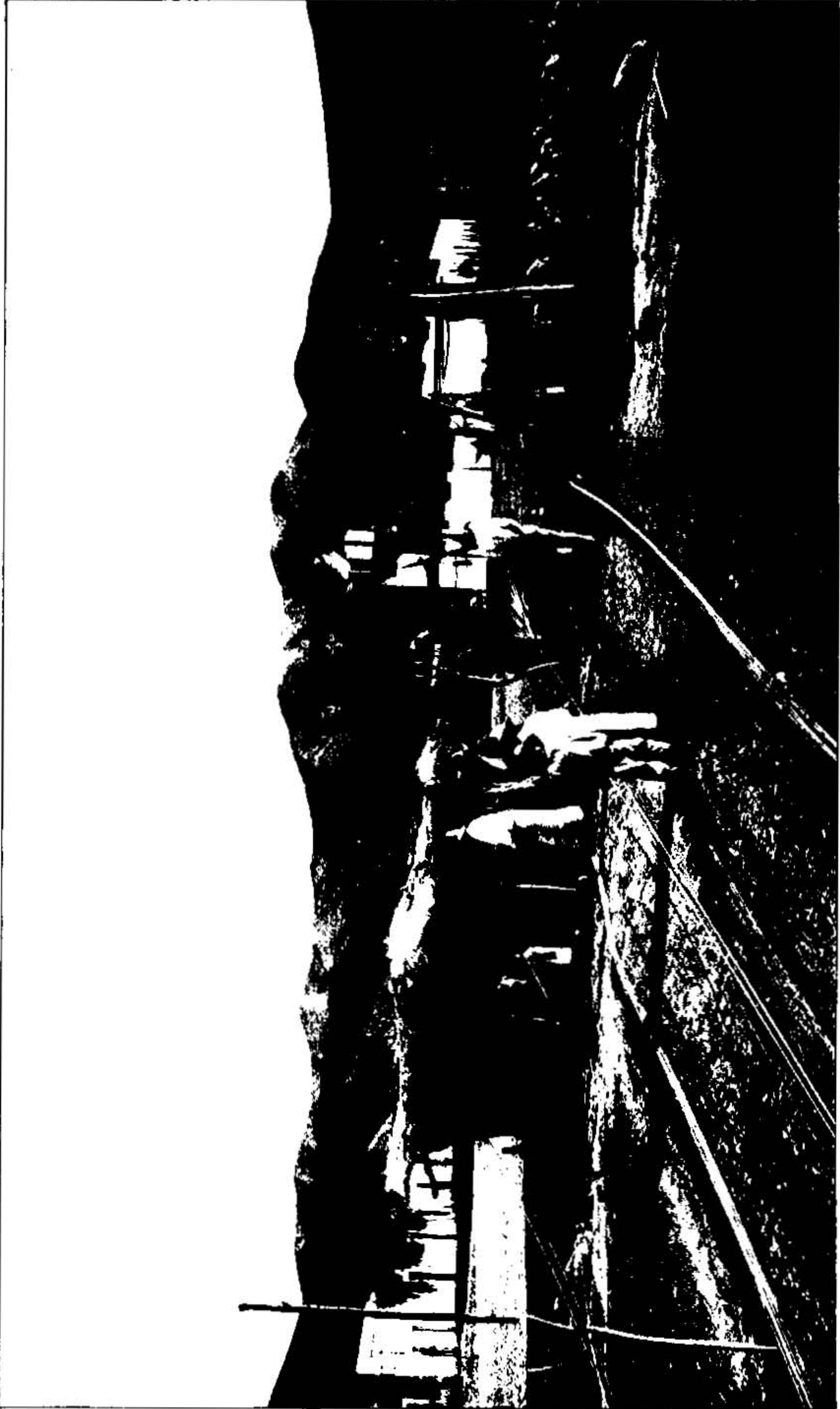
STRING MADE BY HAND FROM TAMPICO FIBER.



STRING MADE BY HAND FROM TAMPICO FIBER.



MEXICANS MAKING BAGGING OUT OF IXTLE FIBER.



MEXICANS MAKING BAGGING OUT OF IXTLLE FIBER.



PROCESS OF TWISTING IXTLE FIBER INTO TWINE.

England, although they do not agree with the illustration of this species as given in Saunders's *Refugium Botanicum*.

Mr. Nelson's specimens may be described as follows: Leaves 25 to 50, 5 dm. long by 3 cm. wide near the middle, scarcely narrowed toward the base, green or somewhat glaucous-green with a pale band down the middle of the face, which, however, fades out in the dried specimens; flowering stalk glaucous; the bracts among the flowers filiform, 5 cm. long, persistent; the ovary 14 to 15 mm. long, glaucous, constricted above; the perianth tube very short, 2 to 3 mm. long, with lobes 15 mm. long, described as yellow, but when dry of a reddish tinge; the stamens twice as long as the segments. This agave is also known as *lechuguilla*.

Mr. Nelson writes of these species as follows:

These plants grow wild in the greatest abundance on limestone mountains and adjacent valleys from near Victoria, Tamaulipas, to the Mexican National Railroad, in San Luis Potosi, and from Peotillas, in San Luis Potosi, north to near Saltillo, Coahuila. From within this area many million pounds are exported (via Tampico) each year, nearly the entire product going to the United States.

The ixtle fiber shipped from Tampico is produced mainly in the region about the valley of Jaumave and valley of Tula, in western Tamaulipas and adjacent part of eastern San Luis Potosi. The production of this fiber is the main industry of a considerable area, with the towns of Jaumave and Tula as the centers. The fiber from the Jaumave district is shipped by pack animals to the town of Victoria, on the Monterey and Gulf Railroad, and thence by rail to Tampico. The Tula Valley output is sent to Cenito, on the Mexican Central Railroad, in eastern San Luis Potosi, and sent by rail thence to Tampico. Wagon roads lead out from Tula to the railroad, and the State government has had a large force of convicts working for a number of years building a finely constructed road from Victoria across the mountains to Jaumave. The fiber of this region is produced in the arid lower austral zone at altitudes between 2,000 and 5,000 feet. The leaves are from 15 to 30 inches long. Only the tender, unfolded leaves forming the central bunch are used, as the fiber of the old outer leaves is too coarse and brittle. This central spike of unopened leaves called "cogollo" (Pl. XXXIX) is gathered by means of a short staff, 4 feet long, with an iron ring fitted by a ferrule to one end. The iron ring is slipped over the cogollo and a quick wrench breaks it loose, and it is then placed in a basket on the laborer's back. The man gathers a back load in this way and proceeds to a large bush or small tree, where he can get shelter from the sun, and, placing the leaves in a heap near the base of the tree, proceeds to clean out the fiber.

EXPLANATION OF PLATE XXXIX.--Figs. 1, 2, cogollos of an agave which furnishes Tampico hemp; fig. 3, cogollo of a *Yucca* which furnishes Tampico hemp.

"Tampico fiber" is a term applied to all fiber shipped from the port of Tampico on the Gulf coast of Northern Mexico (Pls. XL to XLIII). It is usually considered to be synonymous with ixtle¹ (Pls. XLIV to XLVI). A better classification, however, is to confine "ixtle" to the fiber of the short-leaved agave, and apply "palma loca" to the fiber of the *Yucca*, and "guapilla" to the fiber of the linear-leaved agave.

¹By various authorities ixtle is stated to be the fiber of *Bromelia sylvestris*. The name is also sometimes applied to sisal hemp. *Agave ixtle* does not seem to furnish ixtle fiber.

Ixtle fiber is shipped to Tampico especially from San Luis Potosi, Tereone, Saltillo, Tula, and Victoria, where it forms one of the principal articles of export.

According to United States Government reports for the year of 1897-98, our supply of ixtle was from the following places, arranged according to quantity: Tampico, Saltillo, Monterey, San Luis Potosi, Victoria, Porfirio Diaz, and Matamoras. The amount, valued in American money, declared for shipment to the United States, was as follows: Tampico, \$62,002.42; Saltillo, \$45,476.43; Monterey, \$35,659.49; San Luis Potosi, \$14,424.86; Victoria, \$4,220.67; Porfirio Diaz, \$1,912.56; Matamoras, \$582.50. From these reports it might be inferred that Tampico is the immediate center of a fiber-producing district, but this is not the case. No fiber is produced near Tampico, but it comes from the mountains and table-land region, some 300 miles to the west. The other towns mentioned are the chief centers of the Tampico hemp industry.

*Imports for consumption of Tampico hemp into the United States from 1884 to 1898.*¹

Year.	Tons.	Value.	Value per ton.	Year.	Tons.	Value.	Value per ton.
1884.....	339.12	\$37,832	\$111.56	1892.....	4,646.50	\$325,059	\$69.96
1885.....	3,247.64	294,636	90.71	1893.....	4,579.88	264,617	57.78
1886.....	3,895.19	326,311	83.77	1894.....	5,127.00	286,231	55.82
1887.....	2,181.30	165,156	75.71	1895.....	9,708.00	458,404	47.22
1888.....	1,933.26	153,011	79.15	1896.....	12,205.00	717,585	58.79
1889.....	3,489.03	292,934	83.96	1897.....	6,299.08	335,241	53.22
1890.....	5,304.60	463,112	87.30	1898.....	2,556.00	129,921	50.83
1891.....	5,455.33	469,720	86.11				

The following are the most important Mexican terms relating to this plant:²

Lechuguilla—the plant itself (Pl. XLVII, figs. 1, 2, and 4). Also applied to various plants other than agave.

Cogollo (sometimes wrongly spelled cogolho), the cone of young leaves from which the fiber is taken (Pls. XXXIX, XLVII, fig. 1). Also applied to the young crown leaves of yucca, etc.

Ixtle—sometimes spelled istle and ystle—the fiber.

Burro, the instrument used to wrench loose the cogollo.

Tallador, or fierro tallador, the scraper.

Estoca banco, the block on which the fiber is cleaned.

Retranca, the small peg which braces the estoca.

Banco del ide, the large peg with notch under which the end of the tallador is placed.

Boliyo, the grasper.

¹ Commerce and Navigation of the United States, 1896, vol. 2, p. 1159. Same, 1897, vol. 1, p. 535; 1898, vol. 1, p. 617.

² For illustrations of instruments see Pls. XLVII to XLIX.

Agave americana L.

This seems not to be very common in western Mexico. I saw only a few cultivated specimens, and those always about settlements. The Indians of the Sierra Madre claim to obtain from it a fine soft fiber used chiefly for thread. Contrary to general belief, *Agave americana* has little economic value as compared with some of the other species.

Herbarium specimens only were obtained of this species.

Agave cochlearis (?) Jacobi.

PULQUE MAGURY.

Mr. Nelson says of this fiber that it is very fine and strong and used for making fine cord, soft rope, small bags for carrying food or other small articles, and sweater pads for pack saddles. Owing to the fleshy character of the leaves the extraction of the fiber is difficult and expensive, so that the fiber is not of commercial importance. With suitable machinery, however, it ought to be worked profitably. Its fiber is 12 dm. (4 feet) or more long, nearly white, and very soft.

Unfortunately Mr. Nelson collected no botanical specimens, and the identification of the species is largely guesswork. It is customary to refer all the large fleshy-leaved pulque magueys to *Agave atrovirens*, while in fact several very distinct forms are readily recognized in the field. The commonest of these agaves in western Mexico—and I have also seen specimens of the same from San Luis Potosi and Saltillo—does not answer to the description of *A. atrovirens*. I have tentatively called it *A. cochlearis*, as it answers to this species better than any other which Mr. J. G. Baker recognizes in his monograph of this genus.

Agave falcata Engelm.

GUAPILLA.

Mr. Nelson states that the leaves are put into boiling water to wilt them, which facilitates the cleaning out of the fiber. He also says that the fiber is fine and soft, but difficult to obtain and not of commercial importance. This is perhaps the same fiber referred to in the Kew Bulletin as coming from Tula, although the plant is called *Agave striata*, and the Mexican name is given as "palma loca."

A. falcata may be the same as *A. striata*, although Mr. Baker keeps them distinct. I have carefully compared these leaves with garden specimens and really find no grounds for separation. Still, living specimens of both should be studied before the question of specific identity is determined. In any case this agave from north Mexico is the *A. falcata* described by Engelmann. It is very common in north Mexico. Herbarium specimens were collected by Mr. E. W. Nelson in Jaumave Valley, June 1, 1898 (No. 4457), and in the Sierra Encarnacione, Coahuila, July 28, 1896 (No. 3891). Fiber and leaves were also sent from Matehuala. The latter are more than 9 dm. (1 yard) long.

Agave geminiflora Ker-Gawl.

The Cora Indians in the mountains of the Territorio de Tepic obtain a very soft fiber from one of their local plants, which is probably *Agave geminiflora*.

Herbarium specimens and samples said to be its fiber were brought back.

Agave vivipara L.

TAPEMETE.

The most common agave seen in western Mexico was *A. vivipara*. This species is restricted to the tropics, being found from near sea level up to about 3,000 feet altitude. It was seen as far north as Guaymas, and extends at least as far south as Acapulco. It does not grow in the United States, as is sometimes stated. It was seen on the sides of all the tropical valleys which I crossed in Territorio de Tepic, Zacatecas, and Jalisco, and may be found as far south as the City of Mexico. This species yields considerable fiber, at least for local consumption. The fibers are about 2 feet long, of medium weight and good strength. I saw it used only in making a coarse thread or twine for knitting the rude hand bags so generally carried by the country people. Strings are also made by cutting off narrow strips from the leaves, as one would from rawhide. The plant is known as "tapemete." In this species the leaves are 7 to 9 dm. (28 to 36 inches) long, about 3.5 cm. (1½ inches) broad, and more or less glaucous, and the margins have small brown prickles. (For fiber, see Pl. LII.)

Its alliances seem to be with the *Rigidæ* group. It does not closely resemble *Agave virginica* (*Manfreda*), as is stated in some reference books.

Numerous herbarium specimens, and specimens of fiber and fiber products of this species, were brought back.

Agave sp.

HUILA.

In the little town of Bolaños, State of Jalisco, the natives extract considerable fiber from one of their cultivated agaves, which they call "huila." It yields a very coarse, harsh fiber, used mostly for making heavy ropes. This species has not been determined definitely. It appears to be the one so much employed in the manufacture of mescal.

Good herbarium specimens and specimens of fiber were obtained.

Agave sp.

In southeastern Sinaloa an agave grows on the sides of the highest mountains (altitude about 3,000 feet) which is said to be used by the people of that region for its fiber. I did not see any of it, however, in use, and so was not able to confirm the statement. But it is certainly true that the plant has a good, strong fiber. This species appears to be new to science. It produces about 20 leaves, which are 6 to 8 dm. (24 to 32 inches) long and 7.5 to 8.5 cm. (3 to 3½ inches) broad at the widest part, with the margin closely serrate and the apex tapering into a long, weak spine.

Good herbarium and living specimens of this species were brought back to Washington.

Agave spp.

In the Sierra Madre the people obtain most of their fiber from two or three closely related species. These species are of the *A. filifera* type, having linear leaves and a pungent tip, while the margin frays off into white threads. One of these species is the recently described

A. vestita, while two of the others appear to be undescribed. They all yield a strong fiber which is made into ropes.

Herbarium specimens, leaves, fiber, and living specimens were obtained of these species.

The following agaves collected by the writer are reported to furnish fiber. As some of them have not been determined specifically, the collection number and also the locality are given, with the hope that it may lead some one to procure more material.

Name.	Number.	Locality.
<i>Agave</i> sp. nov	1713	Southeast Sinaloa.
<i>Agave lechuguilla</i> Torr.....	1199	Chihuahua, near El Paso.
<i>Agave rigida elongata</i> Baker.....	1307	La Paz, Lower California.
<i>Agave</i> sp.....	2755	Bolaños, etc.
<i>Agave americana</i> L.....	2146	Mountains of Tepic, etc.
<i>Agave geminiflora</i> Ker-Gawl	1625	In Sinaloa, Tepic, etc.
<i>Agave vestita</i> Watson.....	3767	Zacatecas, etc.
<i>Agave vivipara</i> (?) L.....	3537	In Sinaloa, etc.
<i>Agave</i> sp. (?).....	2200	Sierra Madre.
<i>Agave</i> sp.....	2400	Do.

The following species are those recently sent in by Dr. Palmer and Mr. Nelson:

Name.	Collector.	Locality.
<i>Agave falcata</i> Engelm	Mr. Nelson	Tamaulipas, etc.
<i>Agave univittata</i> Haw.....	do	Do.
<i>Agave lophantha</i> Schiede	do	Do.
<i>Agave cochlearis</i> Jacobi.....	do	Do.
<i>Agave heteracantha</i> (?) Zucc	Dr. Palmer.....	Saltillo.
<i>Agave heteracantha</i> (?) Zucc	do	San Luis Potosi.

When the Descriptive Catalogue of Useful Fiber Plants of the World was published by the Department of Agriculture in 1897, only ten species were sufficiently well known to be described. These are given below. Only three of them are identical with plants in my list. Undoubtedly a score or more species are used locally in Mexico for their fiber.

Agave americana.

Agave aurea.

Agave decipiens.

Agave heteracantha.

Agave mexicana.

Agave morrisii.

Agave potatorum.

Agave rigida elongata.

Agave rigida sisalana.

Agave vivipara.

Although I saw no fibers in process of being extracted from the leaves, I saw plenty of the raw fiber and plants from which leaves had been cut for their fiber. Some of the methods used were extremely crude. For instance, in southeastern Sinaloa I was told that the leaves were first cooked and then allowed to stand in water for several days,

after which the pulpy part of the leaves is removed by rubbing them with a stick. On the table land the end is accomplished by driving iron spikes 8 or 9 inches long into a block of wood and drawing the leaves over this instrument until all the connecting tissue is removed.

At Bolaños still a different method is employed. The leaves are first trimmed of their marginal spines and then placed flat on a board, which is about 8 inches wide and set at an angle of about 45 degrees, one end resting on the ground and the other about reaching to a man's waist. The leaf is then scraped with a rude knife, first from one end and then from the other. After a while the leaf is turned over and the same process repeated until all the connecting tissue is removed.

Mr. Nelson describes the manner of taking the ixtle fiber at Matehuala as follows:

A short block of yucca wood is laid on the ground close to a tree and the pointed end of a long triangular blade of iron, with a wooden handle, is thrust into the base of the tree trunk and held across the block of yucca wood. The workman then strips the edges from the agave leaves to rid them of the bordering spines and, holding the butt in the right hand, lays the leaf on the wooden block and, pressing down the iron, draws the leaf through, thus scraping out most of the pulpy matter. Then a small wooden grasper with a knob at one end has the free ends of the fiber wrapped about it in a "half hitch," and by grasping this the workman can draw the leaf under the iron in a reverse direction, thus cleaning the leaf in two motions. The fiber is laid at full length on the ground and the process repeated until the supply of leaves is exhausted. Men clean from 10 to 15 pounds of fiber a day, for which they receive 2 cents a pound at Miquihuana and 2½ cents at Jaumave.

The scraper, called "tallador," referred to above has a wooden handle 12.5 cm. (5 inches) long and a triangular blade 22.5 cm. (9 inches) long, with a hooked point which can be thrust into the trunk of a tree. The block, generally of yucca wood, used as a base on which the leaves are cleaned with the tallador, is about 5 dm. (20 inches) by 6 cm. (2½ inches) by 5 cm. (2 inches). This block of wood is made firm by means of small pegs driven into the ground on each side. When the cleaning is done in the open a peculiar peg, with a special notch for the point of the tallador, is driven into the ground near the block of wood. The grasper used for seizing the end of the half-cleaned fiber is of wood, about 10 cm. (4 inches) long and somewhat larger at one end. At the smaller end there is a knob, which prevents the fiber from slipping off the grasper.

EXPLANATION OF PLATES.

PLATE XLVII.—Cogollo (central leaves) of a lechuguilla plant: fig. 2, rootstock, used for soap: fig. 3, burro, used to break off the cogollo; fig. 4, old lechuguilla plant.

PLATE XLVIII.—Fig. 1, estoca banco, consisting of a block of yucca wood; fig. 2, tallador; fig. 3, boliyo.

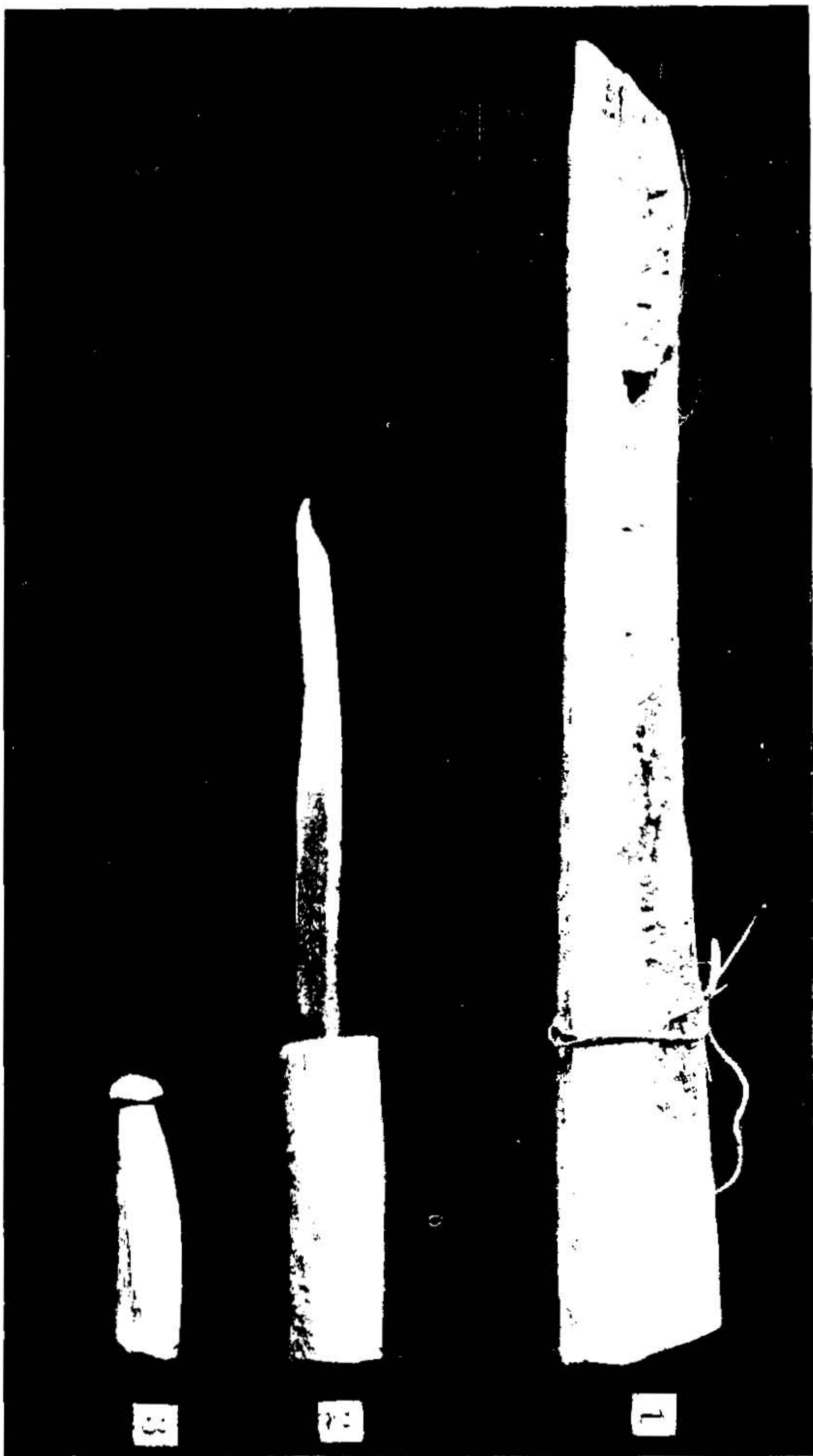
PLATE XLIX.—Fig. 1, boliyo; fig. 2, tallador; fig. 3, retranca; fig. 4, banco del ide; fig. 5, estoca banco.

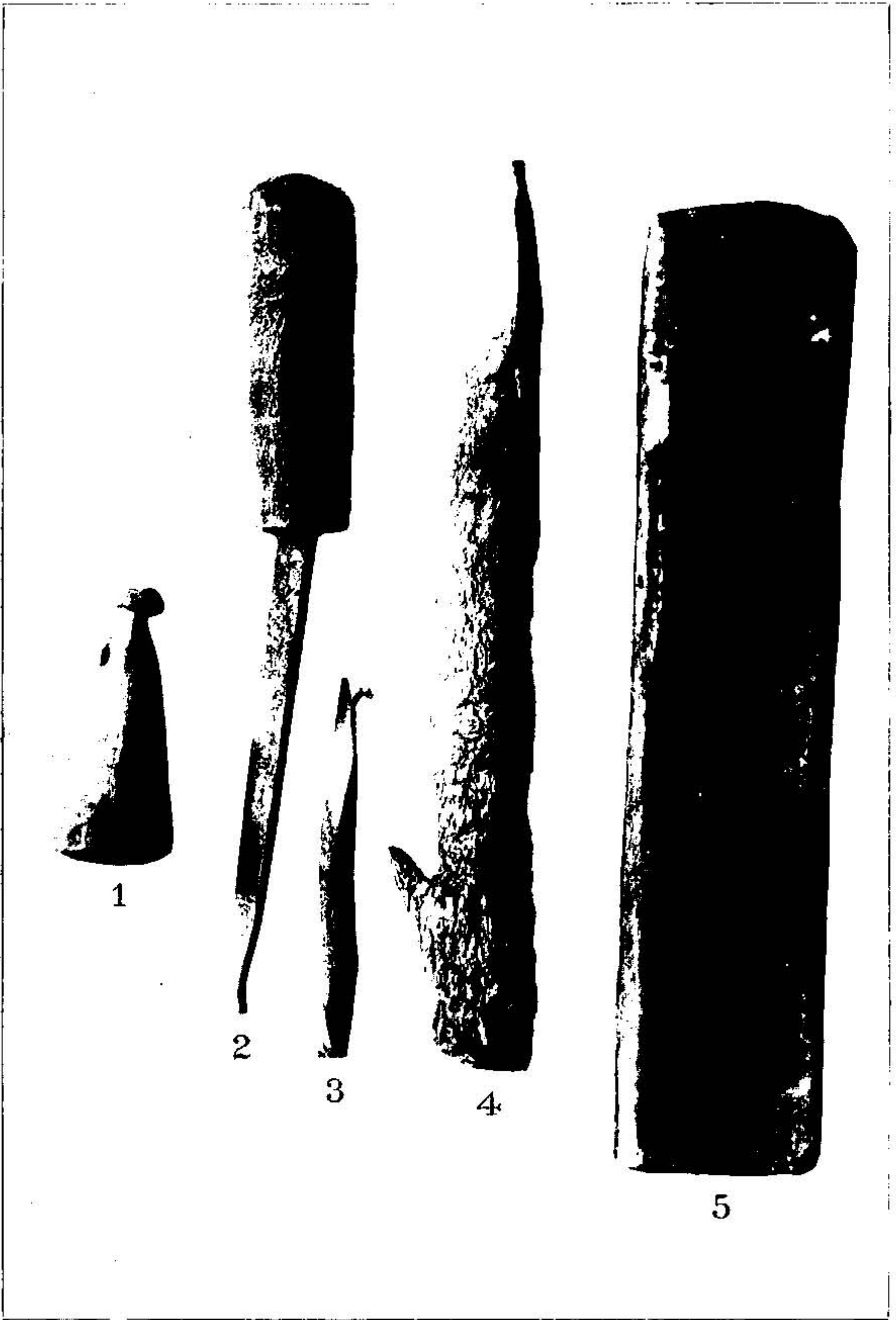
The following list represents the specimens of fibers and fiber products which I brought back from Mexico. They are deposited in the Ethnobotanic collection of the National Museum and in the National Herbarium.



LECHUGUILLA PLANT WITH BURRO.

INSTRUMENTS USED IN EXPLORING IKTIE FISH





INSTRUMENTS USED IN EXTRACTING IXTLE FIBER.

- EB No. 6. The leaves of what appears to be an undescribed species of agave of the *A. filifera* type, used by the Cora Indians at Santa Teresa, Tepic.
- EB No. 7. The clean fiber ready for spinning into ropes.
- EB No. 8. A rope made out of this fiber.
- EB No. 10. A narrow strip from the leaf of *Agave vivipara* used in the place of strings in tying up packages of sugar.
- EB No. 11. Leaves of *Agave geminiflora*, from which the Cora Indians obtain a fine fiber which is spun into hand bags.
- EB No. 12. Said to be the fiber obtained from leaves of this species.
- EB No. 13. A hand bag made from this fiber.
- Herb. No. 2755. The leaf of *Agave vivipara*.
- EB No. 14. The cleaned fiber from this species.
- EB No. 15. The mixed fiber of the same ready for spinning into thread.
- EB No. 16. A coarse thread or twine made from this mixed fiber.
- EB No. 19. A partly finished hand bag knit out of this thread.
- EB No. 45. A marginal strip from the "huila" agave, sometimes called "bastard tequila," from which a coarse fiber is taken
- EB No. 46. The partially cleaned fiber.
- EB No. 47. The same, but cleaner.
- EB No. 48. The same mixed, ready to spin into ropes.
- EB No. 35. A fine, soft agave fiber used at Colotlan for thread in hat making. The fiber is very clean and white. I did not learn definitely the species from which it was obtained, but was told that it was from one of the large species in cultivation in the town, therefore probably from either *Agave americana* or *A. cochlearis*.
- EB No. 36. A rude thread used for sewing hat braids together and made from the last-mentioned fiber. The thread is made out of a few fibers which are twisted by hand.
- EB No. 60. A dishcloth composed simply of a bunch of agave fibers (Pl. L, fig. 2). Obtained at Bolaños. It seems to be common to use the plain fiber in this manner for cleaning and washing. I found in my room at one of the larger hotels of Guadalajara a bunch of this fiber in place of a wash rag.
- EB No. 130. A bunch of small twine bought at Guadalajara. In this city there is a whole block of stores which are given up almost entirely to the sale of these fiber products. In the smaller towns there is usually one or two stores where such things are for sale, or certain parts of the open market which is usually about the plaza are given up to them.
- EB Nos. 51, 79. Rude scouring brushes which are seen in all parts of western Mexico. They are made from the bases of the leaves of *Agave vivipara*. They are 15 to 18 cm. (6 to 7 inches) long. The broad, clasping base, which is 5 to 6 cm (3 to 4 inches) wide, forms the brush proper, and the contracted blade above forms the handle. None of the connecting tissue is removed, but it gradually wears away, leaving the naked stiff fibers (Pl. LVII, figs. 6, 7). These brushes are seen in all the small markets of western Mexico, and are even found in the great market house in the city of Guadalajara.
- EB No. 5. A spinner or twister used by the Cora Indians in making ropes of agave fiber.

This was the commonest spinner I saw, and is composed of 2 pieces of wood (Pl. LI). Of these one is flattened and somewhat wedge-shaped, about 3 dm. (1 foot) long, and considerably heavier at one end than the other. At its smaller and lighter end is a notch, and just below this notch is a small hole. The second piece consists of a round stick about 3 dm. (1 foot) long, which is small enough to work freely in the hole of the first piece. At one end is a small knob which prevents the heavier piece from coming off.

In making thread or twine two persons are employed. One of them sits with the mixed fiber in his lap or at his side, while the one who does the twisting stands. Some of the fiber is fastened about the notch of the first piece described, which is

then rapidly revolved about the second piece as an axis. The person who is doing the spinning retreats as the thread lengthens until the required length is reached.

In making ropes the process thus far is the same. This thread is now doubled and the twisting is continued and then again doubled until a rope of the proper size is obtained. Sometimes both persons use instruments, twisting, of course, in opposite directions. These spinners are made of various materials, such as bamboo, oak, etc.

Another instrument of this kind was composed of a stick about 3 dm. (1 foot) long, with a notch near one end, as in the above. Below the middle was a small wheel 2 dm. (8 inches) in diameter which had a toothed margin. This stick is made to revolve rapidly by striking the wheel, which is made fast to the axis, with a rude bow strung with rawhide.

EB No. 17. An instrument used in making a coarse thread from agave which I secured at the hacienda of San Juan Capistrano, in western Zacatecas.

This was a combined spinner and reel (Pl. LII, fig. 3). It was obtained of a Huichole Indian, although similar ones are used by the Mexicans themselves. This instrument has the advantage over the one described above of permitting one person to feed and spin the thread at the same time and for an indefinite period, for as soon as the thread becomes too long to handle it is wound about the reel. The instrument is used in making a coarse thread or string employed in making the hand bags so much carried in Mexico.

The instrument is composed of two upright strips of a bamboo stem 22 and 25 cm. (9 and 10 inches) long, respectively. These are joined together by two small strips 10 cm. (4 inches) long about one-fourth the distance from each end, and there fastened by small strings. This forms the reel proper. To make a spinner of this a notch is cut near the end of the longer upright piece and a small stick about 12 inches long is used as the axis of the spinner, which is put through the two upright pieces about one-third of the distance from the top. One end of this stick is tightly wrapped with a small string made of agave fiber, and a small leather washer is placed between this and the reel. To make the thread, a portion of the mixed fiber is fastened about the notch of the reel, which is then revolved rapidly with one hand and the fiber fed with the other. The reel I obtained was in use, and the thread and all the mixed fiber in the process of spinning was purchased with it.

The fiber here used is from one of the most widely distributed agaves in western Mexico. It is called "tapemete," and is probably *Agave vivipara*.¹ The cleaned fiber is about 6 dm. (two feet) long, and, although coarse, is pliable and strong. For making the pocket bags a coarse double thread is used. The needle is made of a small piece of bamboo about 12 cm. (5 inches) long.

EXPLANATION OF PLATES.

PLATE L.—Fig. 1, a bag made from agave fiber; fig. 2, a bunch of agave fiber used as a wash rag.

PLATE LII.—Fig. 1, a bunch of *Agave vivipara* fiber; fig. 2, the same being worked into a small bag, together with bamboo needle; fig. 3, a spinner and reel used with this fiber.

MALVACEAE.

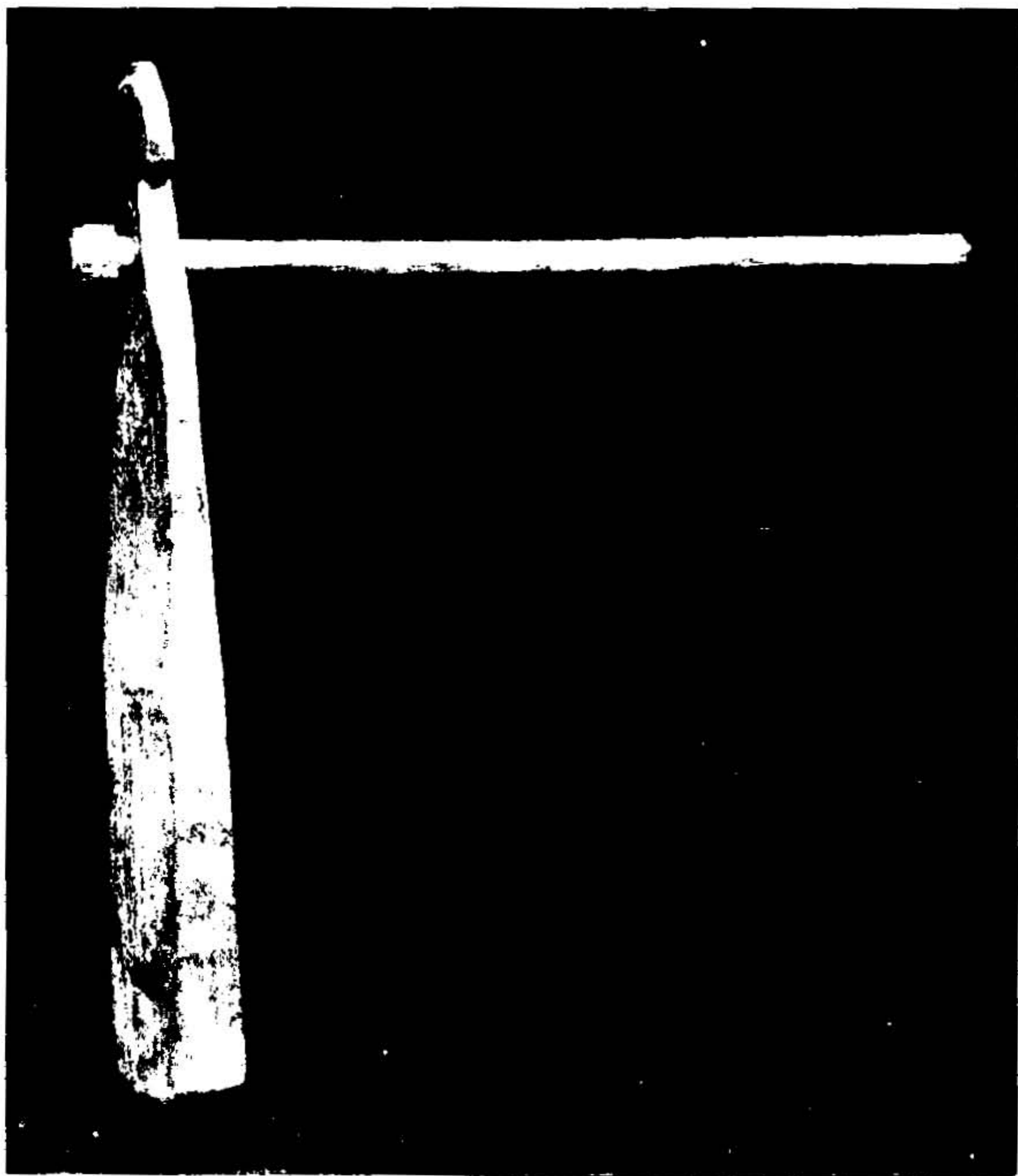
Ceiba spp.

Tree cotton, a fiber obtained from the seed pods of several species of *Ceiba*, is gathered by the Mexicans along the west coast and used for stuffing pillows, etc. At the little village of Concepcion, Sinaloa, I saw two large trees of *Ceiba casearia* Medic., one being about 27 dm. (6¾ feet) in diameter and evidently a very old tree. This species is supposed to have been introduced into Mexico. A native species, *C. grandiflora* Rose, more common and widely distributed, is said to furnish cotton which is used like that from the above species. (EB No. 1, tree-cotton fiber from *Ceiba casearia* Medic.)

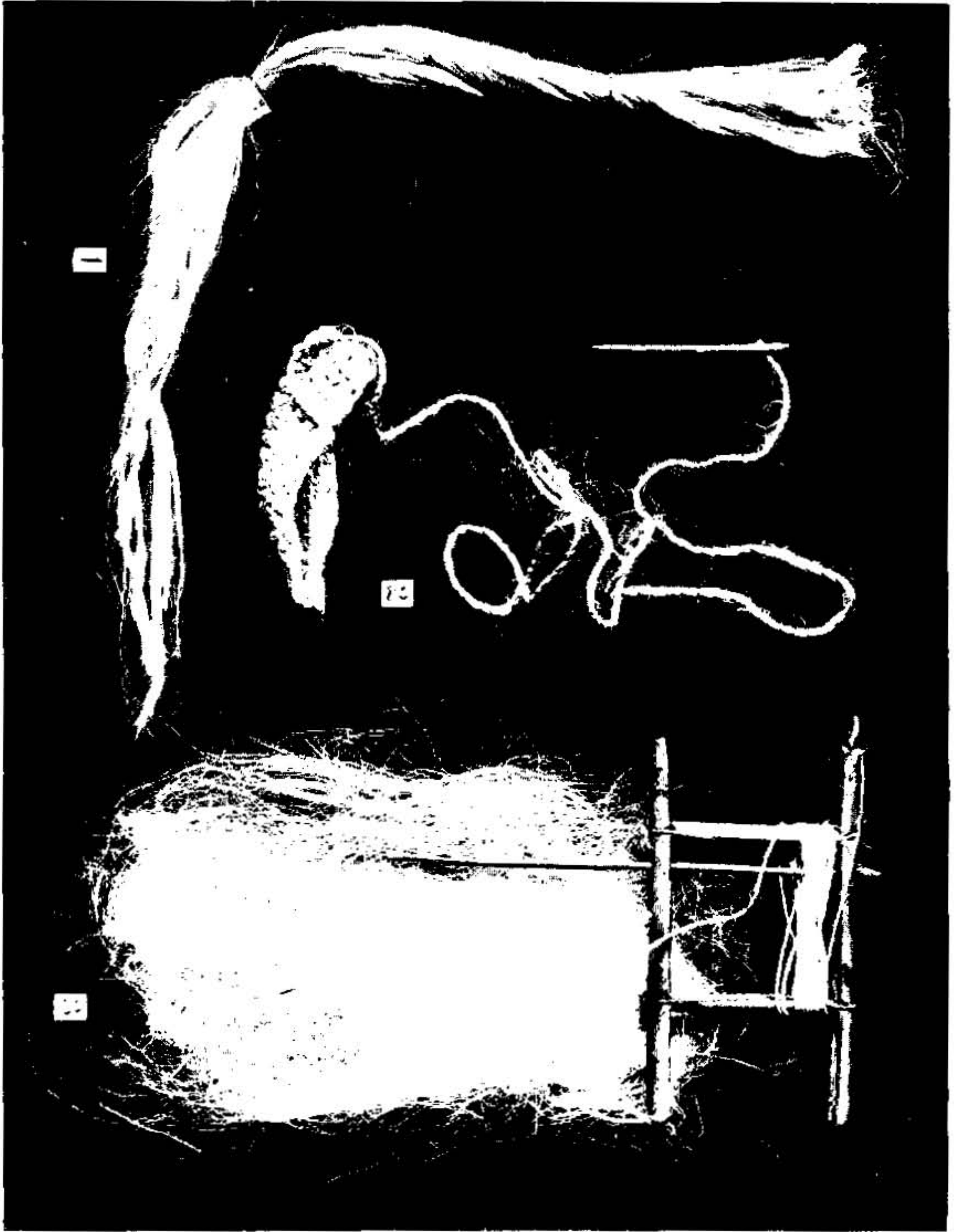
¹ See above, p. 146.



ARTICLES MADE FROM IXTELE FIBER.



A FIBER TWISTER



AGAVE FIBER AND MANUFACTURING IMPLEMENTS.



COTTON FIBER AND IMPLEMENTS.

Gossypium barbadense L.

This is a large, bushy shrub, 24 to 36 dm. (8 to 12 feet) high. It is grown in many parts of Mexico and is seen in yards and gardens. I saw shrubs at Guaymas, in the Sierra Madre, at Bolaños, etc. My specimens came from Bolaños, September, 1897 (Herb. No. 3697).

Mr. Hemsley, in the *Biologia Centrali-Americana*, states that in Mexico the species is "cultivated and wild, probably indigenous in America." In the National Herbarium we have only three other species, and these all cultivated. They are the following:

Palmer's No. 10, from the State of Jalisco.

Palmer's No. 116, from the State of Coahuila.

Charles K. Dodge's No. 70, from near Monterey.

At Bolaños and other places the uncleaned cotton is gathered and sold in the little stores. The women buy this, clean out the seeds, and spin it into thread.

For this purpose they use a rude spinner (Pl. LIII), consisting of an upright shaft or spindle 2.5 dm. (10 inches) long and less than 6 mm. ($\frac{1}{4}$ inch) in diameter, somewhat tapering toward the top. This spindle is usually made from an old Indian arrow, and my specimen appears to be of Brazil wood. Near the bottom of the spindle is a circular disk or whorl 3.8 cm. ($1\frac{1}{2}$ inches) in diameter, made of some heavy wood (in my specimen said to be ironwood), somewhat rounded below.

The thread is made in this manner: An ordinary clay bowl 12.5 cm. (5 inches) in diameter is held in the lap. The thread is begun by fastening a piece of the cotton to the middle of the spindle. The spindle is then revolved rapidly in the bowl with the right hand, while the cotton is "fed" or supplied with the left hand. As the thread lengthens it is wound around the spindle and the work of spinning continued. The women become very expert in spinning and it is very interesting to watch them.

Specimens were obtained as follows:

- EB No. 54. A bowl in which the spinner is twirled.
- EB No. 55. The cotton spinner called "trompa."
- EB No. 56. The thread and raw cotton.
- EB No. 57. The cotton with seeds as sold in the stores.
- EB No. 58. The cotton bolls.
- Herb. No. 3697. The cotton plant.

EXPLANATION OF PLATE LIII. — Fig. 1, cotton spinner with thread attached; fig. 2, clean cotton; fig. 3, bowl for holding the twister; fig. 4, cotton bolls; figs. 5, 6 parts of Huichole arrows used in repairing the cotton spinner.

CUCURBITACEAE.**Luffa cylindrica** (L.) Roem.

ESTROPAJOS.

The vegetable sponge was seen only in cultivation, where it grows as a tall vine. The fruit is about 3 dm. (12 inches) long, and the bright yellow flowers are nearly 10 cm. (4 inches) wide.

The plant is sometimes cultivated for the sponge-like tissue of the

fruit, which is left ready for use as a sponge by the natural breaking away of the epidermis.

The following material illustrates this plant:

Herb. No. 1682, flowers, leaves, etc. (EB No. 82, the mature fruit showing the interior fiber beneath the broken epidermis.)

BRUSH AND BROOM PLANTS.

Many curious brushes and brooms are met with. In the accompanying illustrations some of these are shown. Those made of agave leaves and fiber (Pl. LVI), used for the hair and for scouring and whitewashing, are spoken of on pages 248, 249. Fly brushes are made from palm leaves (Pl. LIV, fig. 1), one of which I obtained as a specimen. Brooms are also made of palm leaves, being supplied with bamboo handles. Other brooms are made out of the stems of various grasses, such as species of *Stipa* and *Muhlenbergia* (Pl. LIV, fig. 2). These stems are 9 to 10 dm. (36 to 40 inches) long, and are tied together with strips of yucca leaves (Pl. XXXVIII) called "isote."

EXPLANATION OF PLATES.

PLATE LIV.—Fig. 1, a fly brush made from the leaves of an undescribed *Sabal* which is very common on the west coast; fig. 2, a broom made from the stems of a grass, probably a *Stipa*.

PLATE LVI.—Figs. 1 to 5, several types of hairbrushes made from various agave leaves; figs. 6, 7, scouring brushes made from *Agave vivipara*; fig. 8, a palm leaf (*Sabal* sp.) brush; fig. 9, a whisk of grass roots (*Epicampes* sp.).

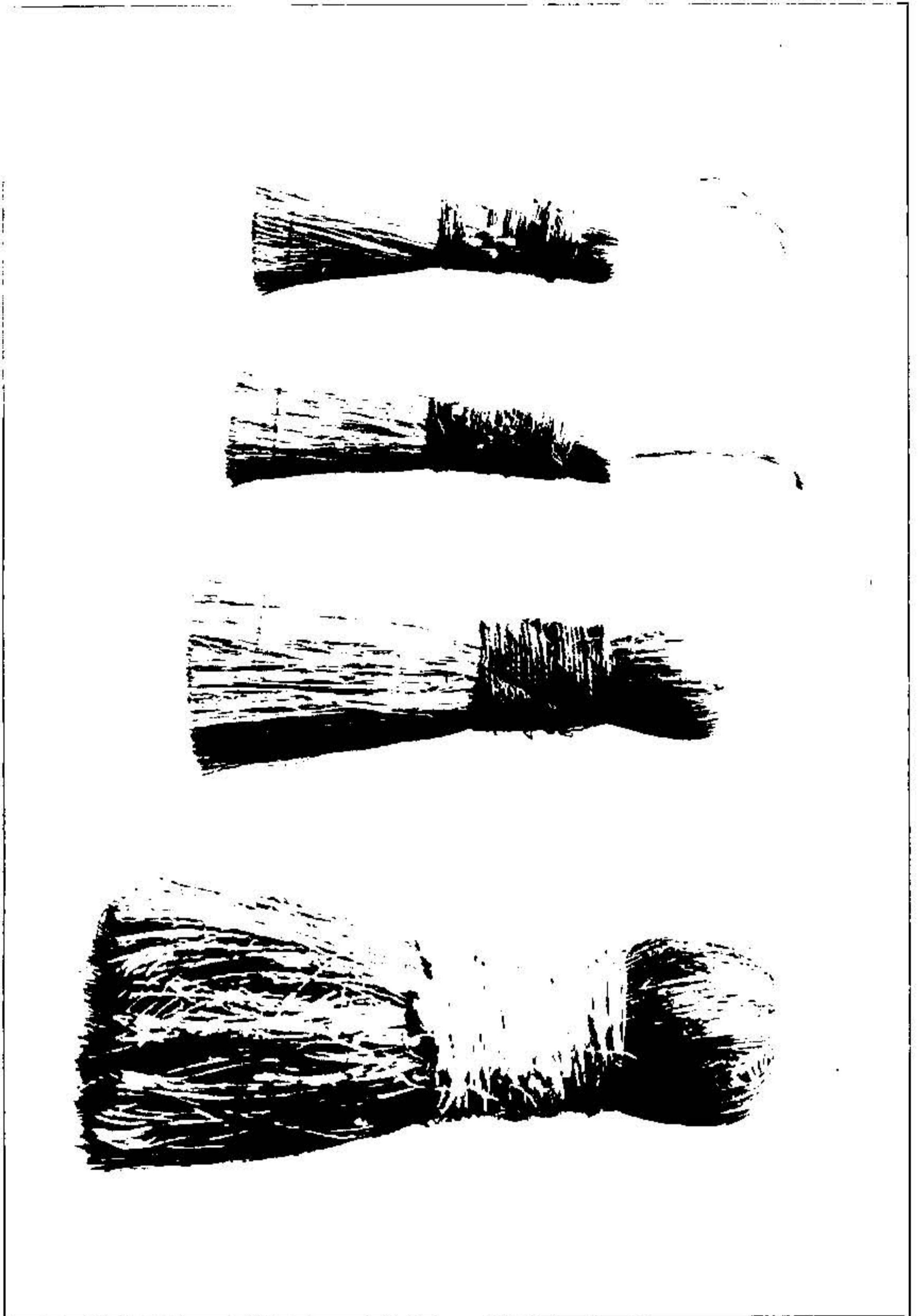
GRAMINEAE.

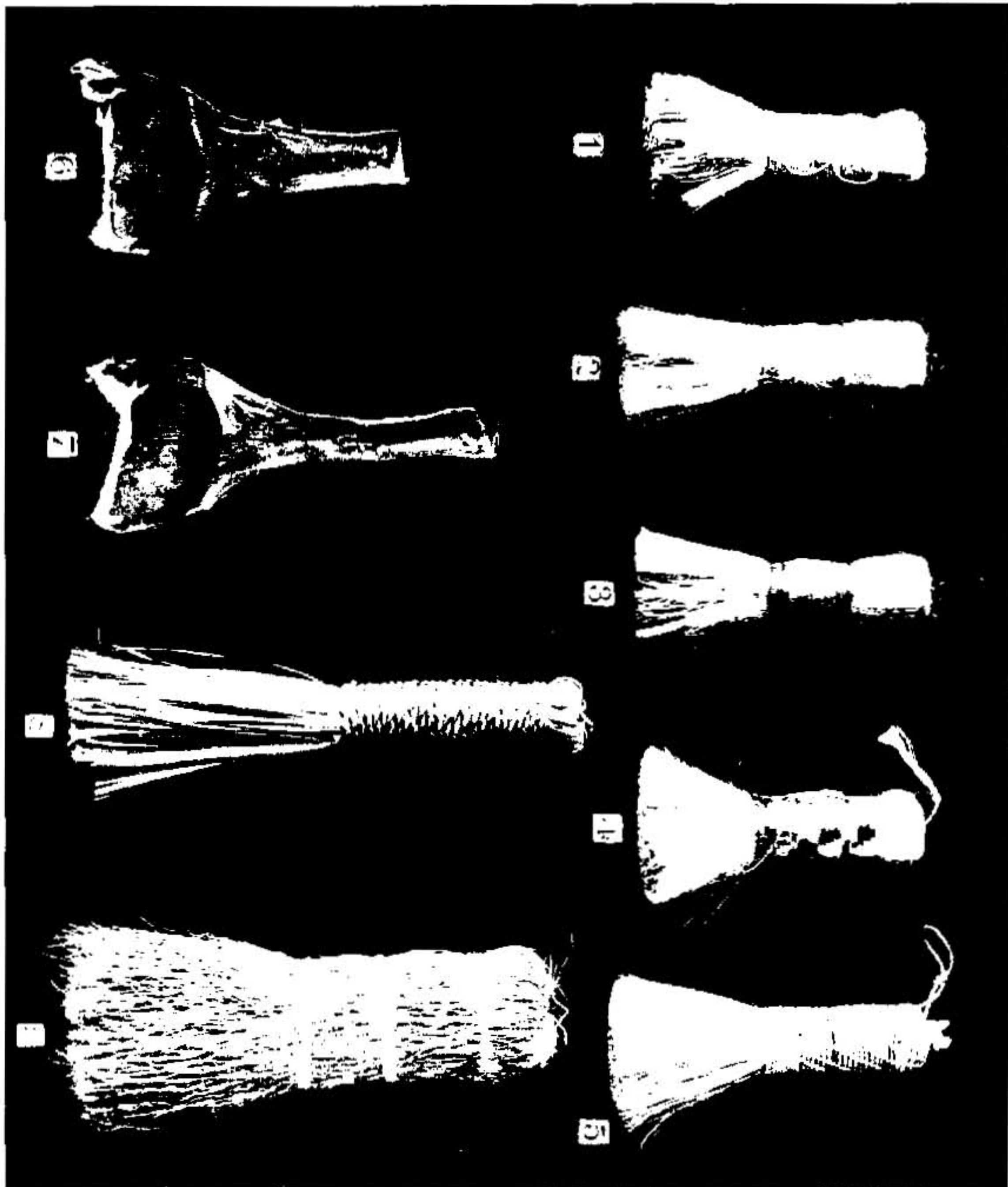
Epicampes macroura Benth.

"Raiz" (meaning "root") is largely exported from Mexico, as well as extensively consumed at home. It is usually exported into the United States as "broom root;" it is also sometimes called Mexican broom root, Mexican whisk, and sometimes erroneously "rice roots." These roots are from grasses, chiefly *Epicampes macroura*, sometimes called *Crypsinna stricta*. This is a native of the high mountains of Mexico, reaching an altitude of 3,908 meters (12,500 feet). It is largely dug in the States of Mexico, Michoacan, Queretaro, and Puebla. The roots, in Mexico, are chiefly used for making a rude brush or broom much esteemed and found for sale in all the large markets. I bought one of these in Guadalajara, which is about 15 cm. (6 inches) long and 5 cm. (2 inches) in diameter.

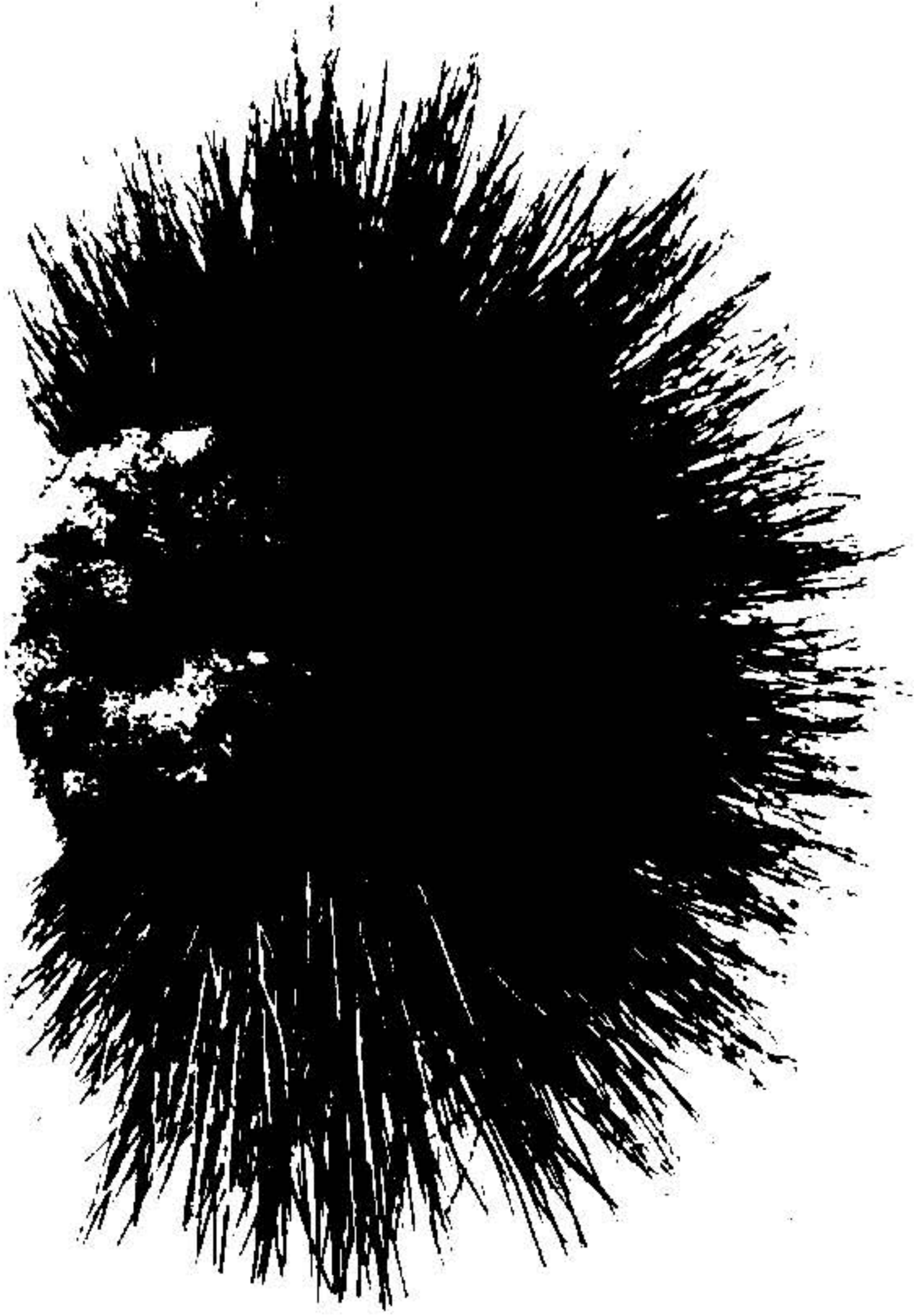
This material has been largely imported into this country, both in a raw state, then duty free, and in a partially manufactured state, subject to duty. In the latter condition it appears, under the name of rice root, in the Treasury report of 1878, and thence onward with intervals to 1891; but the amount is lumped with that of broom corn. As raw material it appears in 1884 and continues with intervals to the present date, as shown by the table below, assuming the name of "broom root" in 1893. The importation, which exceeded a value of \$125,000 in 1886, appears to have fallen to nearly none in the period from 1888 to 1893. Since then the average annual value has been

HAIRBRUSHES MADE FROM TAMPICO FIBER.





BRUSHES MADE FROM SEVERAL KINDS OF FIBER.



HAIRBRUSH MADE FROM A FRUIT OF *CEREUS PECTEN-ABORIGINUM* Engelm.

nearly \$92,000, with a value per ton in 1897 of \$199.78, and in 1898 of \$162.84, the average value for six years being about \$178.

Importation from Mexico of unmanufactured broom root for eleven years.

Year.	Amount.	Year.	Amount.
1884.....	\$397	1894.....	\$67,648
1885.....	51,017	1895.....	109,872
1886.....	125,029	1896.....	39,884
1887.....	82,834	1897.....	73,419
1890.....	169	1898.....	158,499 ¹
1893.....	101,967		

¹ Foreign Commerce and Navigation of the United States for the respective years. A partial summary occurs in volume 2 of 1896, p. 1157.

MALVACEAE.

Sida acuta carpinifolia (L. f.) Schum.

Branches of a *Sida* tied together are commonly used all over the west coast as a rude broom for sweeping yards, walks, etc. One which I saw at Acaponeta was made of 12 to 20 stems 15 dm. (5 feet) long, bound together with strips of palm leaves.

My botanical specimens (No. 3160) are composed of these stems.

CACTACEAE.

On the west coast the Indians gather the fruits of *Cereus pecten-aboriginum*, trim off the long yellow spines on one side, so that they may be grasped easily, and use them for hairbrushes (Pl. LVII). The accompanying figure (fig. 32), furnished me by Mr. E. A. Goldman, shows one of the trees. Another is shown in Plate LVIII. Dr. Palmer tells me that he first observed these brushes in use among the Papagos Indians, but has since seen them in the houses of many Indians and poor Mexicans in Sonora and Sinaloa.

FENCE AND HEDGE PLANTS.

Although barbed wire fences are now becoming very common in western Mexico, there are hundreds of miles of the native fences and hedges still in use.

EUPHORBIACEAE.

Jatropha curcas L.

SANGRE GRADO.

This is one of the most common fence plants of the west coast. The fences are made similarly to the Cactus fences; but the branches are much smaller and must be tied together by some vine, the one commonly used being the bejuco colorado (*Hippocratea* sp.). These branches take root and produce a great mass of foliage. The leaves in size are out of all proportion to those grown on ordinary plants. One of them which I brought home measures 3.5 dm. (14 inches) broad on a petiole 2.2 dm. (9 inches) long.

Jatropha platyphylla Muell.

SANGRE GRADO.

This species, called by the same name as the preceding, is also used as a hedge plant. It has a large peltate leaf and an open inflorescence. We have no specimens like it in the National Herbarium.

CACTACEAE.

Cereus pecten-aboriginum Engelm.

The most interesting of the hedges to the botanical traveler are those made of the great cereus (*Cereus pecten-aboriginum*) of western Mexico, which is perhaps the real giant of the cactus family (Pls. LVII, LVIII, and fig. 32). It often reaches 15 and 20 meters (45 to 60 feet) in height, and sends up a multitude of long naked branches. The branches are

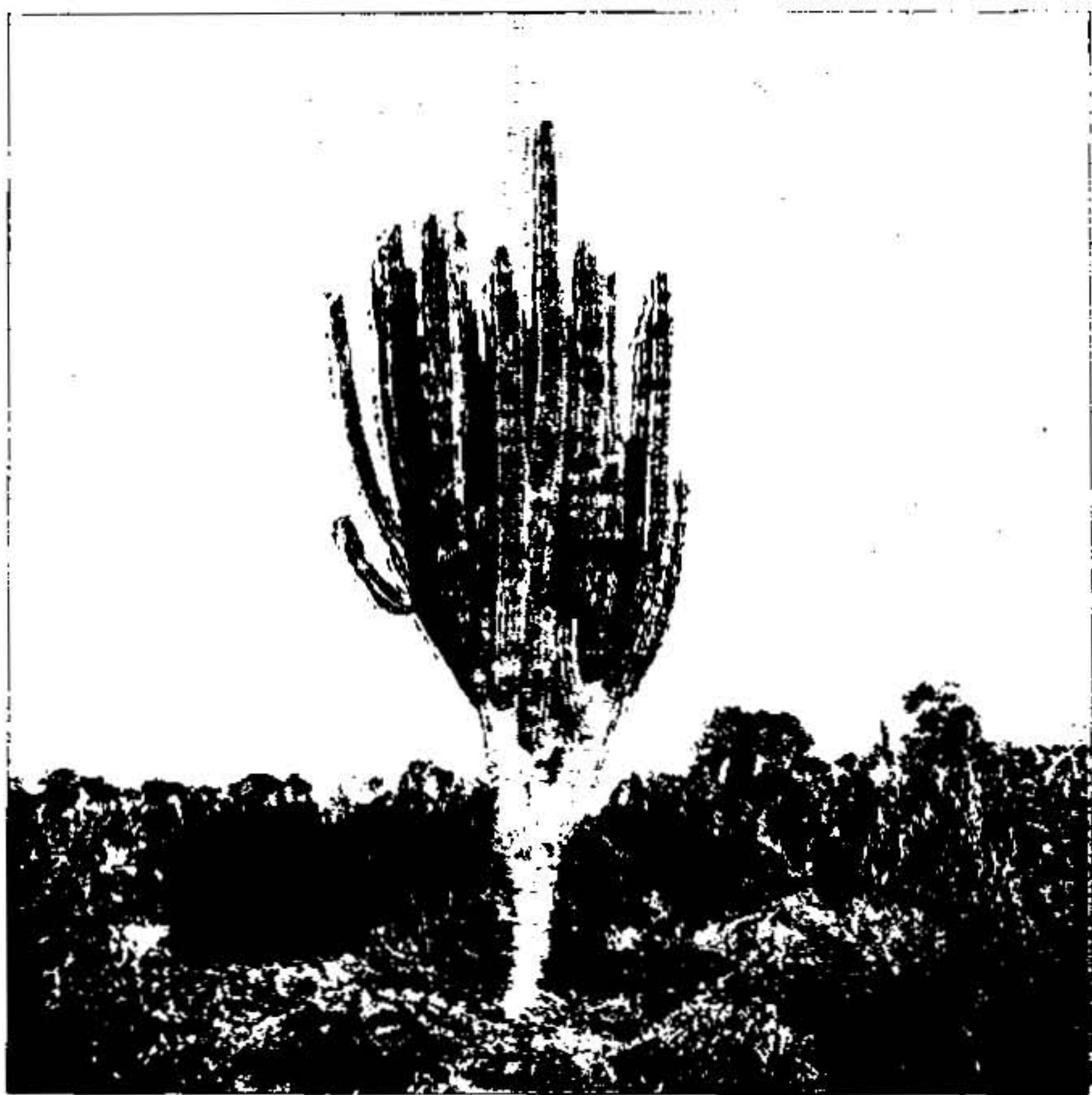


FIG. 32.—*Cereus pecten-aboriginum* Engelm.

cut off into lengths of 18 to 30 dm. (5 to 9 feet) and transplanted into rows closely set together, forming an almost impenetrable break against all kinds of stock. These branches finally take root and grow slowly, rarely sending off short side branches, and ultimately flowering and fruiting near the tops. The large fruits are covered with long yellow bristles set close against the trunk, and furnish rich granaries stored with many seeds for the birds.

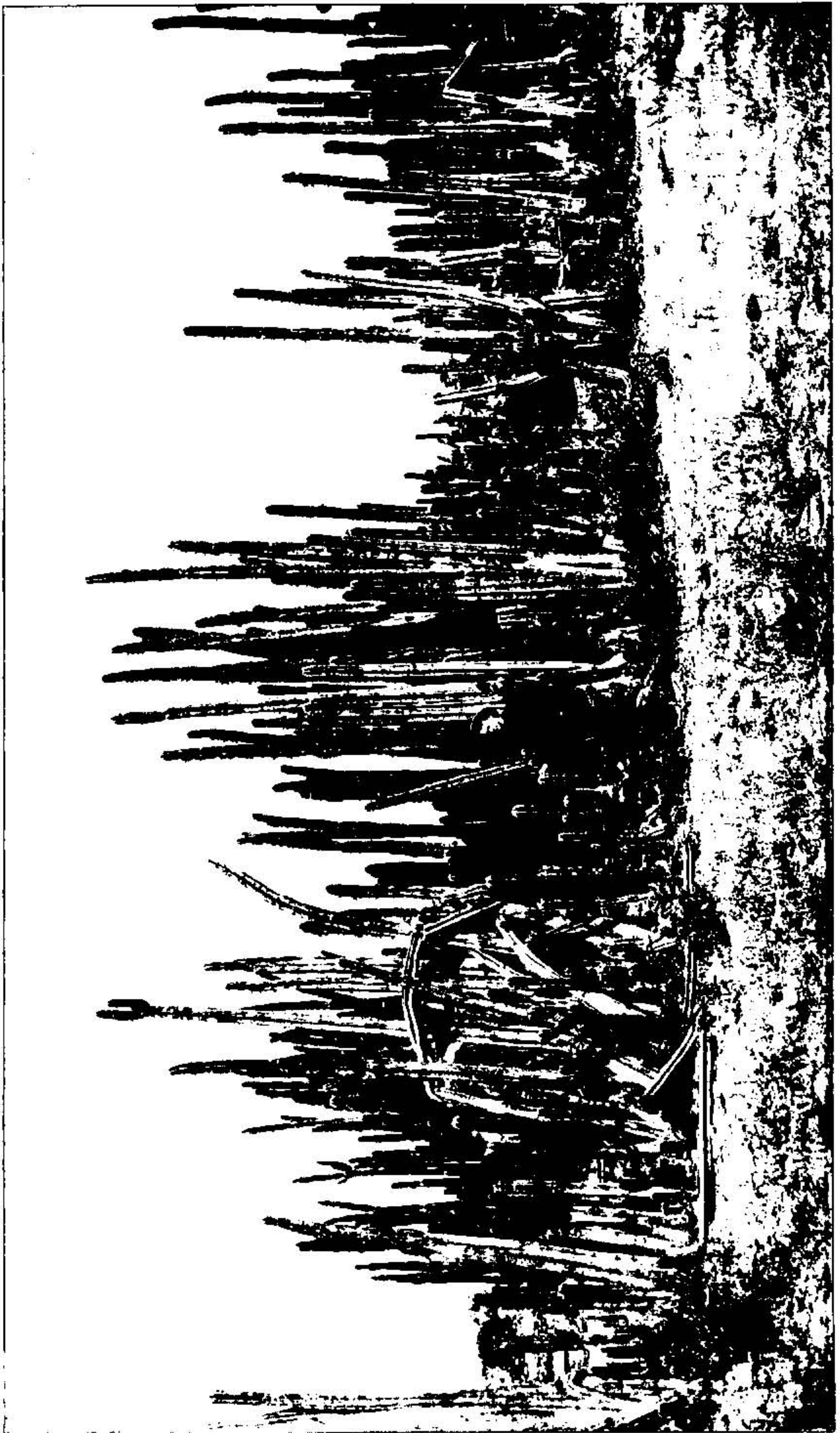
Dr. Palmer tells me that *Cereus thurberi* of northern Mexico is also used for fences. In central Mexico another of the columnar cacti, which they call "organos" (Pls. LIX, LX), is so used. This is *Cereus marginatus* DC. (?)

Opuntia spp.

Several species of *Opuntia* are grown for boundary hedges.



CEREUS PECTEN-ABORIGINUM Engelm.



ORGANO: *CEREUS MARGINATUS* DC. (C). USED FOR FENCES NEAR THE CITY OF MEXICO.



ORGAN: CEREUS MARGINATUS DC. 211. USED FOR FENCES NEAR THE CITY OF MEXICO.

OTHER FAMILIES.

Agave spp.

The large pulque agaves are planted in close rows, and form very effectual hedges.

Bromelia spp.

Bromelia pinguin (?) and perhaps other species are used for hedges, especially as boundary lines between estates.

Erythrina spp.

Several species of *Erythrina*, such as *E. lanata* and *E. flabelliformis*, are in common use for hedge fences.

Fouquieria spinosa H. B. K.

Fouquieria spinosa, so common about Guaymas, is sometimes used as a hedge plant.

Verbesina pinnatifida Cav.

Verbesina pinnatifida, which often grows to the height of 3 to 4 meters (9 to 12 feet), is a common fence plant, either grown alone or in connection with *Jatropha curcas*.

PLANTS YIELDING WOOD.

Neowashingtonia sonorae (Wats.) Rose.¹

At Guaymas a few trees remain of the rare *Neowashingtonia sonorae*, but most of them have been cut out and used as rafters for houses. It is said to be a very durable wood. A considerable number of these trees are still to be seen at La Paz, Lower California.

Salix sp.

In the markets at Colotlan rude shoe lasts, said to be made of willow, were for sale. (EB No. 23.)

Guaiacum coulteri A. Gray.

GUAYACAN.

Guayacan is one of the commonest and most useful woods about Guayamas. It is extremely hard and makes a fine firewood, yielding a great amount of heat. When burnt it gives off a strong, disagreeable, resinous odor which prevents its use as a house wood. It is much used on the Sonoran Railroad as a firewood for engines. It is used in many ways, especially where great strength is required, as in the making of cogwheels, etc. According to Dr. Palmer it has certain medicinal properties.

Hippocratea sp.

BEJUCO COLORADO.

The bejuco colorado is a very useful vine employed all along the west coast in the place of ropes, nails, etc. When green it is very pliable and can readily be tied into all kinds of knots, but when dry it becomes fixed and strong (Pl. LXI, fig. 1). It is employed in fastening together the framework of huts or in tying down the roofs. In fence building it is employed to bind the various upright pieces together. It also takes the place of the ordinary rope clothesline. One of these clotheslines which I measured was 18 meters (60 feet) long and showed little

¹ *Washingtonia sonorae* Wats. Proc. Am. Acad. 24:79. 1889.

or no variation in diameter throughout its length. This plant grows in the foothills of the Sierra Madre, where the people from the coast go to obtain it when needed in their simple industries. Here it was I found the plant and collected botanical specimens of it, discovering to my surprise that it is new to science.

Guazuma ulmifolia Lam.

GUAYACAN.

In the collection is a ladle said to be made from "guayacan," a name also applied to the wood of *Guazuma ulmifolia* (Pl. LXI). This wood is much employed in making small articles of everyday use. This ladle has a round bowl 9 cm. (3½ inches) in diameter and 2.5 cm. (1 inch) deep at the lowest point, and a handle nearly 4 dm. (16 inches) long. It is typical of the ladles which in many of the interior parts take the place of ordinary spoons or any other similar table utensil. Knives and forks are never seen outside of cities and towns.

Chocolate sticks made from Madroño wood (*Arbutus* sp.) are very common. (EB No. 69. Ladle said to be made from "guayacan," the wood of *Guazuma ulmifolia*.)

EXPLANATION OF PLATE LXI.—Fig. 1, wooden ladle; fig. 2, chocolate stick; fig. 3, bejuco colorado.

Randia sp.

PURO CECILIA.

Shoe pegs as used at Acaponeta are made from the wood of a species of *Randia*; this is a small bush. (EB No. 4, pegs bought at Acaponeta.)

MISCELLANEOUS USEFUL PLANTS.

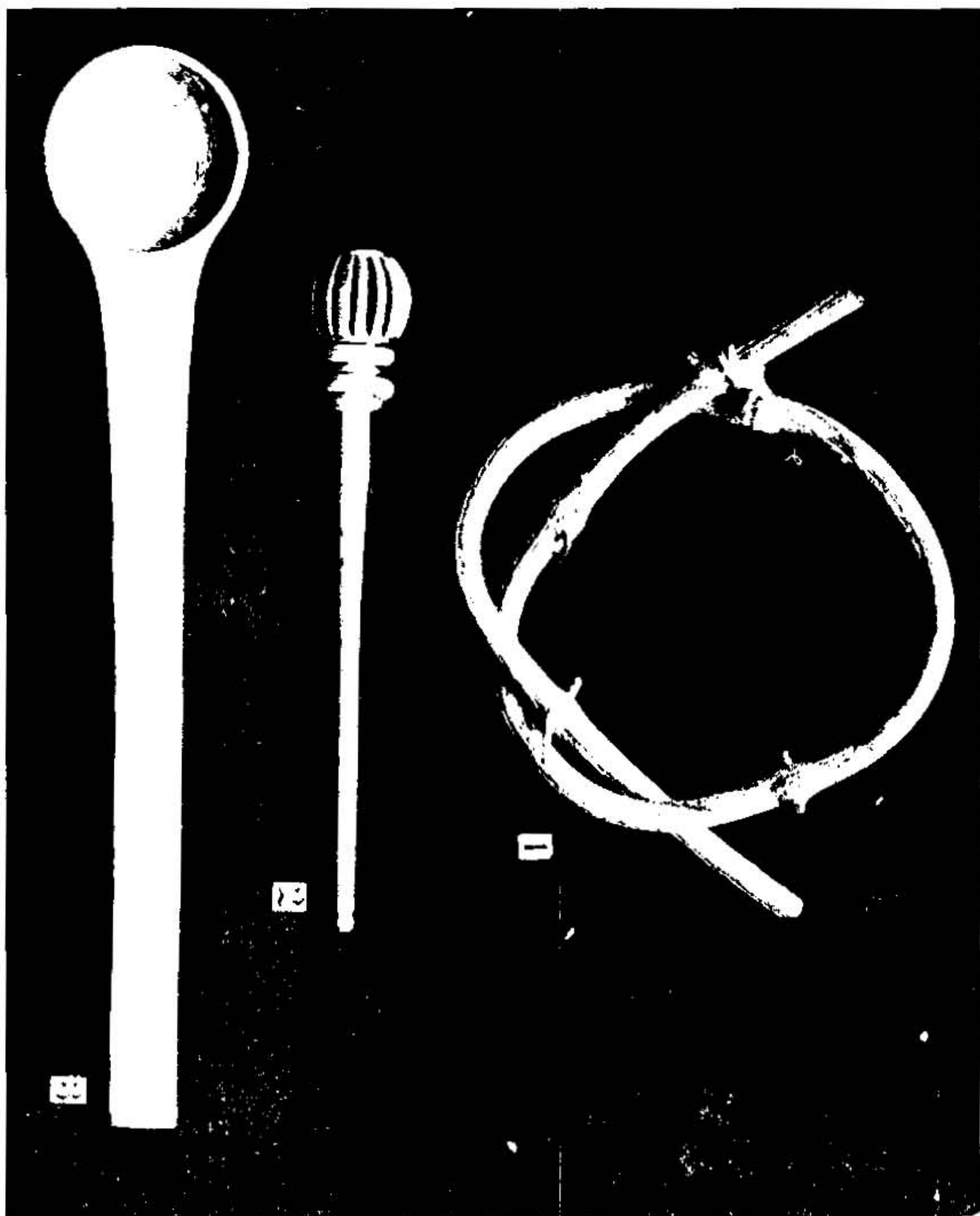
Bessera fistulosa (Herbert) Printz.

ARETE.

The liliaceous genus *Bessera*, though usually considered monotypic, may really be composed of several species. One of these, probably *B. fistulosa*, is very common on the foothills on the west coast, reaching up to 2,500 feet altitude. It has very pretty red flowers and is quite a favorite with the country people, who often use it to decorate the altars in their churches, etc. Their earrings are sometimes patterned after it.

Other wild flowers are gathered to cover arches which are placed over the doorways of the churches. Among plants so used which I recognized are *Zinnia linearis* and *Tagetes lucida*. The churches of the Cora Indians are the most gloomy houses one can imagine. They are usually made of rude stones, with a filling of mud, and are without windows. The roofs are thatched with mountain grass (*Epicampes* sp.) laid upon bamboo stems. This roof often extends forward several feet over the front entrance. Here are found several church bells which are hung by means of vines (probably *Hippocratea* sp.) The bells have no clapper, and are reached by a ladder and then rung by being struck with a stone or some other solid object.

Even the Spanish bull fight has some botanical interest. The wreath with which the victor is decorated is made of branches of trees with bright, shining leaves. I obtained specimens from one at Guaymas, which was made of leaves from an undetermined tree.



WOODEN ARTICLES.

The note may be thrown in here that although more of the names of Mexican towns have a religious derivation than any other, yet a great many towns and hamlets, especially of the smaller ones, are named for plants. Among the first class one finds such names as Jesus Maria, Pedro Paulo, Concepcion, and hundreds of names with the prefixes "San" and "Santa." The following places named for plants were along my route: "Colomas," named for a little Arum-like plant of the neighborhood; "Tamarindo," named for *Tamarindus indica*, a widely introduced and highly prized tree; "Aguacote," named for the well-known fruit of the same name, *Persea gratissima*; "Palmareta," named for a small palm (*Sabal*) of that region; "Mesquitic," named for a *Prosopis*. Other such names for towns of this region are "Nanches" (*Byrsonima crassifolia*), "Ocote" (*Pinus*), and San Francisco Mesquital.

Acacia spadicigera Cham. & Schlecht.

Among the decorations used by the Cora Indians to ornament their quivers are the large thorns of *Acacia spadicigera*.

These thorns are cut into lengths of 2.5 cm. (1 inch) or more and fastened by means of agave strings into great clusters of 50 or so. My specimen (EB No. 73) came from one of these clusters.

Hura crepitans L.

HABA.

This is a large tree belonging to the order Euphorbiaceae. The Mexicans use its sap to poison or stun fish so that they may be more easily caught. A series of Vs, one above the other, are cut with a machete on the side of a tree. The sap oozes out from the wounds, runs down to the apex of the V and joins with the contents of the one below, and so on through the series, the entire contents being caught in an earthen vessel placed at the base of the tree. One rarely sees a tree without these V-shaped scars.

South American Indians also use the sap of this for killing fish.

This tree is known under a great many names, among which are the the following: In the Republic of Colombia, "l'aguapan," "acupa," and "hibillo;" in Guiana, "soliman;" among certain South American Indians, "sablier;" in Panama, "javilla;" in Guatemala, "tetereta;" at San Ignacio, "pepita" and "habilla." It is also called "monkey's dinner bell" and the "sandbox tree." In the State of Sinaloa, on the west coast of Mexico, where I saw the tree, it is called "haba" or "hava," and in other places in Mexico "quahtlatlatzin." Here it is planted along the roadsides, often in long rows beside the fences. Occasionally trees were seen in out-of-the-way canyons, appearing as if native; but this part of Mexico has so long been inhabited that seeds may readily have been carried from cultivated trees of the neighboring region.

Cactaceae.

Considerable has been written of a more or less fanciful character regarding plant worship among the Mexican Indians. While I obtained no special information along this line, I succeeded in obtaining specimens which have enabled me to identify accurately some of the plants

reported to be used for this purpose. Humboldt, the Mexican traveler, says that "all the small cacti are regarded with superstitious reverence by the Tarahumari [Indians]. They have different properties, the most pronounced of them being to drive off wizards, robbers, and Apaches, and to ward off diseases." They are generically called "hikora," "hikora sunama" being *Areocarpus fissuratus*, and "hikora wanami," *Lophophora williamsii*. In the high Sierra Madre in the Territorio de Tepic I collected specimens of one of these cacti which proves to be *Mamillaria senilis* (Pl. LXII). It is a curious little Mamillaria covered with long white spines, whence the specific name. It has also been made the type of a new genus, Mamillopsis, by Dr. Weber, but as I have seen neither flower nor fruit I am not prepared to pass on its generic position. My specimen is growing in the Botanical Garden at Washington. This seems to be the "hikora rosapara" of which Humboldt writes: "Rosapara is a white and spiny hikora differing from the two already mentioned. It must be touched with clean hands and only by people who are well baptized, for he is a good Christian, say the Christian Tarahumaris, and keeps a sharp eye upon the people around him."

Mr. E. W. Nelson visited the Sierra Madre again in 1898, where he collected specimens and furnished me with the following interesting note:

The small hook-spined cactus grows on the rocks in the pine forest of the Sierra Madre of northern Durango and southern Chihuahua. It was found at between 6,500 and 9,000 feet altitude. This is one of the sacred plants of the Tarahumari Indians, and I was informed that the Indians who have had little intercourse with the Mexicans can not be induced to touch one of them. The specimens I secured were gathered by a Tarahumari man living on the ranch where I stopped. When I told the Indian to gather the plants from the top of a great rock he hesitated and only did it when I insisted upon his compliance. In pulling the specimen loose he tore out another plant and before descending he raised the fallen plant and replacing its roots in position packed the soil very carefully about it. This little incident illustrates the respect in which these people hold this plant.

Nicotiana rustica L.

TABACO DE MACUCHI.

The tobacco used by the Cora Indians is obtained from *Nicotiana rustica*, which they call "tabaco de macuchi." It is grown in the hot river valley near the little Indian hamlet of San Blascito, Tepic.

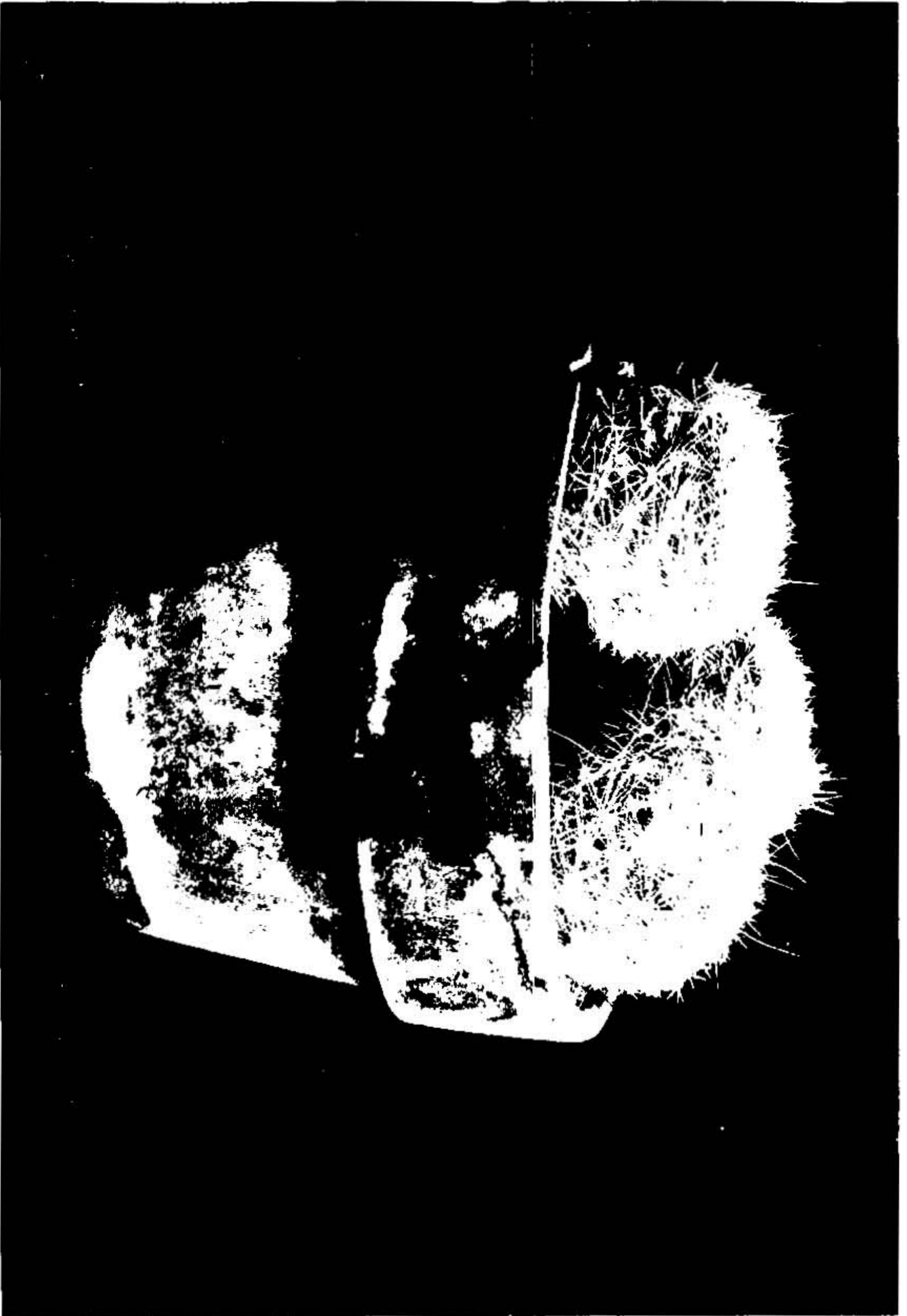
Crescentia alata H. B. K.

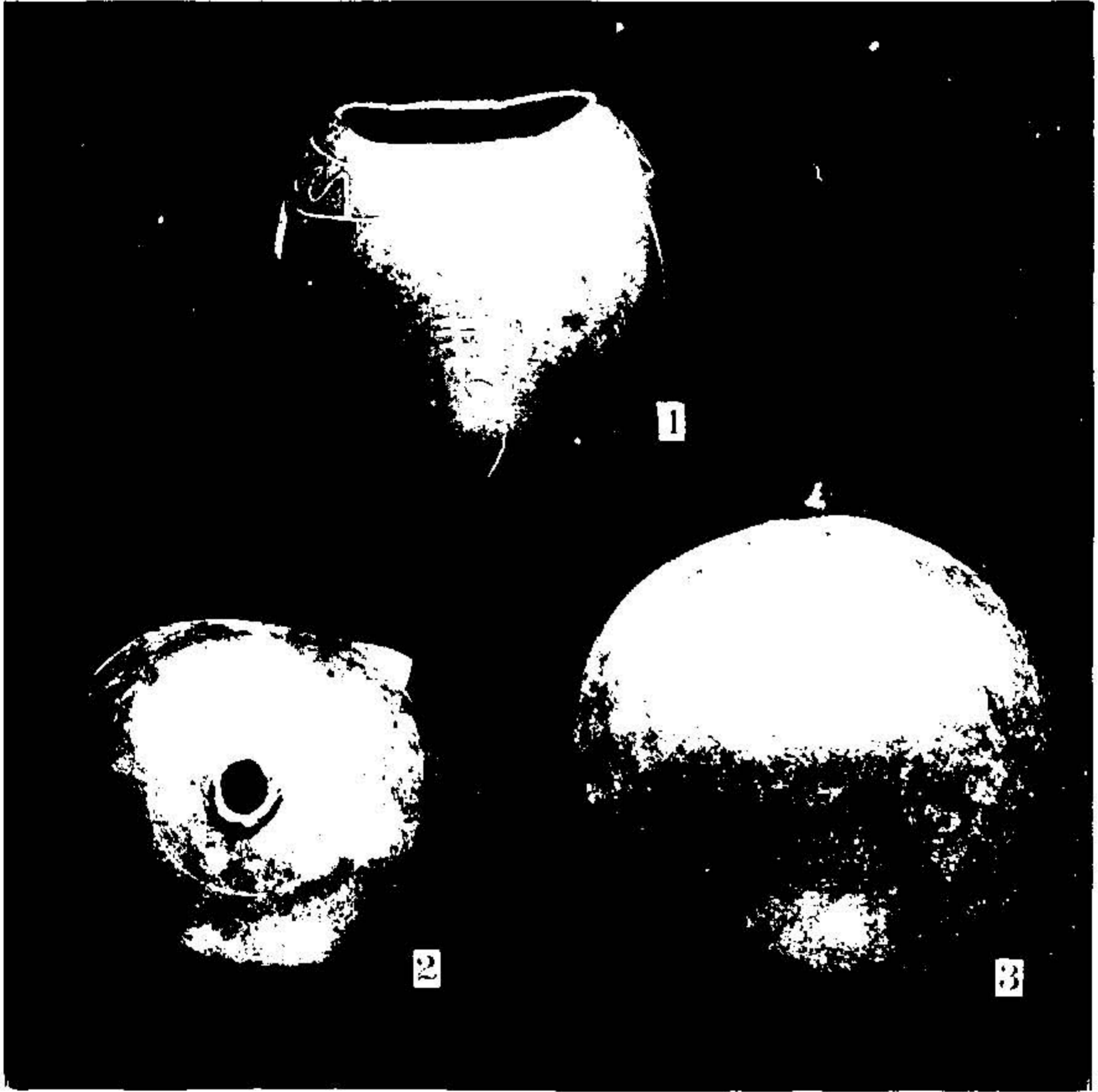
TECOMATE.

This is one of the most interesting trees which was seen on the west coast of Mexico. It is peculiar in fruit, flower, foliage, and habit. While the genus belongs to the Bignoniaceae, the hard, indehiscent, gourd-like fruit and the wingless seeds are opposed to our usual ideas of this order. The large brownish flowers are borne on the old wood, often on the largest branches, frequently even low down on the main trunk itself, and thus the fruits look as if they were glued on the sides of the tree. The leaves have a broad, winged petiole, tipped with 3 small leaflets. The branches are usually erect, long, and whip-like.

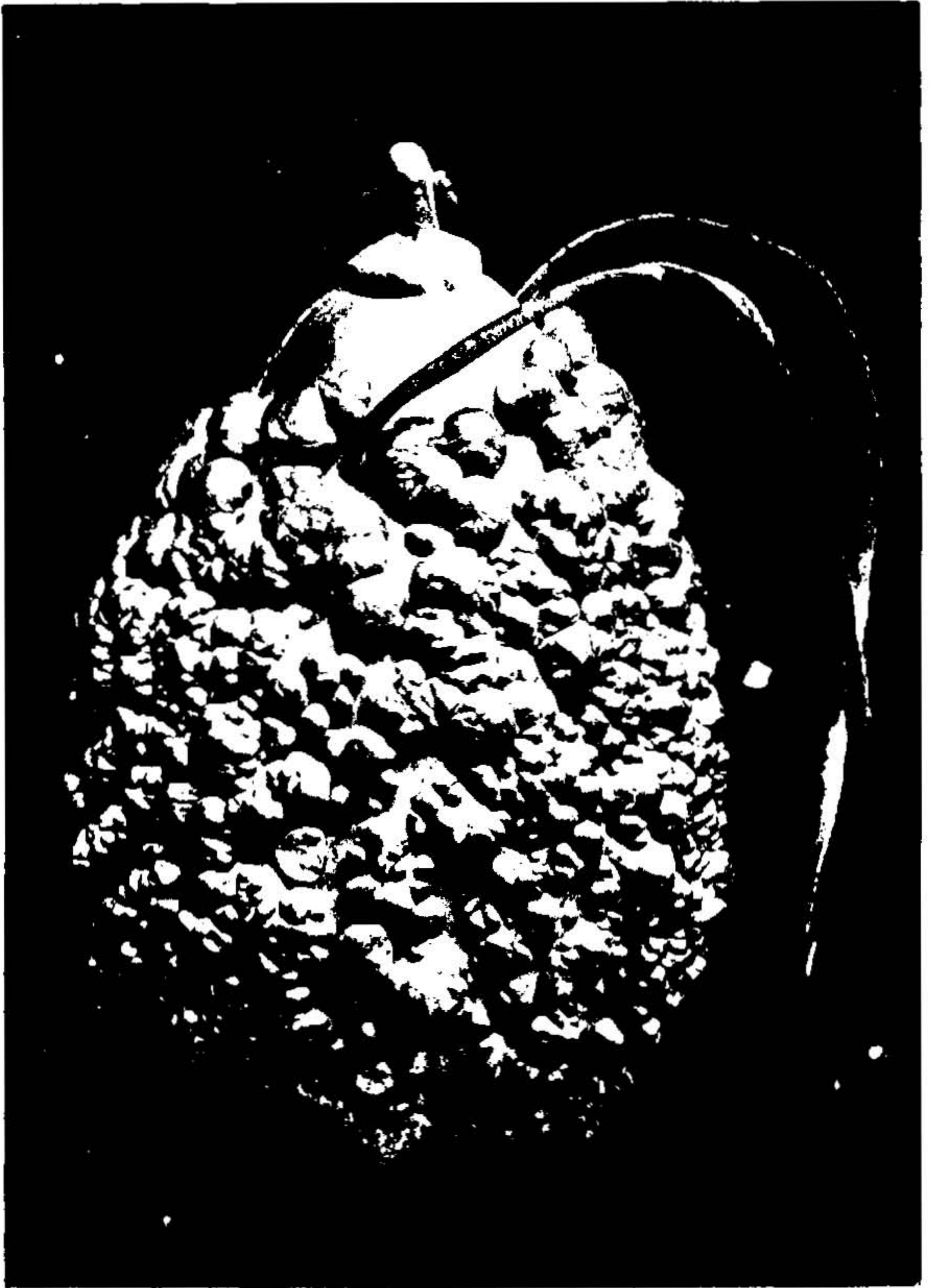
The trees are very common along the coast, often occurring in small groves.

SPPREY CACTUS. MAMILLARIA SENILIS (P. & R.)





VESSELS MADE FROM CRESCENTIA FRUITS.



GOURD USED FOR A WATER VESSEL.

The fruit is used in many ways. Small drinking cups are made by cutting off its lower part (Pl. LXIII). They are most commonly used as a kind of flask for holding mescal. This is made simply by boring a small hole through the base of the fruit the diameter of a lead pencil or a little larger. The seeds and pulp are allowed to dry, but are not taken out. It is then filled with mescal, which they call "vino tecamate." It has a somewhat sweetish taste. One is told that it is much used by miners for lung trouble, but from the quantity which is used and its effects one is inclined to believe that it is taken for other purposes.

These cups and flasks, while sometimes plain, usually have more or less carving upon them, which add much to the expense. I saw one fruit, which was elaborately wrought, that was valued at \$1.50. The carving is usually done before the outer shell becomes hard and dry.

Seemann states that the fruit "contains a pulp of a sourish-bitter taste, which is boiled with sugar in its native country, and taken against complaints of the chest." Watson, on the strength of Dr. Palmer's notes, says: "It is cultivated at Guaymas under the name of 'azal,' for shade and for the medical properties of the fruit, which is filled with water and the liquid afterwards taken as a remedy for contusions and internal bruises."

Crescentia cujete, a closely related species, has much larger fruits and these are used in many ways in making dishes, cups, etc.

Besides various botanical specimens of *Crescentia alata*, I obtained the following articles: EB No. 106, a drinking cup from Colomas made from a shell of a fruit. On one side has been cut the form of a scorpion. (EB Nos. 106 and 107, mescal flasks.)

EXPLANATION OF PLATE LXIII.—Fig. 1, drinking cup made from the fruit of *Crescentia alata*; figs. 2, 3, mescal flasks made from the same.

Lagenaria sp.

Besides the curious clay water jar, one may see many water vessels made out of gourds of various shapes and sizes. Almost every countryman carries one of these on the horn of his saddle. The favorite one is about 4.5 dm. (1½ feet) long, with a constriction at the middle and the ends nearly equal. Other forms are also used (Pl. LXIV). (EB No. 20.)