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A NEW MEXICAN SUBSTITUTE CORDAGE FIBER.

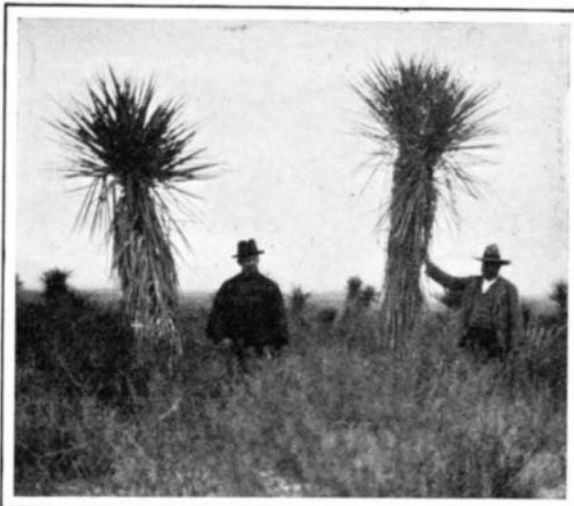
By CHARLES RICHARDS DODGE.

SUBSTITUTE fibers are chiefly useful to mix with the standard commercial kinds where a quality of manufactured product is desired that, while almost as good as the standard, can be sold at a less price. The standard cordage fibers are Manila hemp from the Philippines, and Sisal hemp from Yucatan.

A new substitute fiber, produced in Mexico, is now finding a market in the United States though not as yet in large quantities. It is derived from several species of the yucca family, which grow wild over the more northerly states of the republic, and southward to central Mexico. The fiber is known by several trade names, "*palma istle*," "*pita silvestre*" and "*zamandaque*" being the most common. The name *palma istle*, however, should not be confounded with the true istle, or Tampico, the commercial brush fiber, produced from an agave growing in the same region.

The product sold as *pita silvestre* is secured from a tree-like species of yucca, either *Y. australis*, or *Y. treculeana*, both species abounding in northern Mexico, the source of the fiber being the *cogollo* or central spike of unopened leaves. The annexed cut shows the

form of the plant as it grows over vast areas of waste lands in the State of Nuevo Leon, and southward.



TREE-LIKE YUCCAS OF NORTHERN MEXICO.

Fiber is being produced, after crudest methods, at many points, one of the first establishments to exploit the industry being the company La Anglo-Mexicana, with works at Bajan.

The "works" at this place consist merely of a plant with deep wells for a constant water supply, several immense steaming vats or kettles for cooking the leaves, to facilitate extraction of the fiber, a warehouse and a one-story adobe used by the superintendent. Mention should also be made of a "street" of huts—mere pens—where the Indian work-people live. The raw material is gathered at a distance, wherever there is a supply of "trees," and it frequently has to be transported three to five miles to the *ranch*, over a country without roads, by means of ox-carts. Only the leaf-spike, or central cluster of unopened leaves, is used, this being cut out from the mass of expanded leaves which form the crown of the tree. For convenience in handling, the leaf spikes are put up in bundles of fifty.

When the ox-carts come in with their loads, the fires are started under the kettles, which are built into rude masonry with a platform above and fire holes beneath. The bundles of the raw material are thrown into the kettles, covered with refuse, and left to cook until thor-



A FIBER WAREHOUSE.



HUTS OF THE WORK PEOPLE.

THE CULTIVATION AND MANUFACTURE OF MEXICAN SUBSTITUTE CORDAGE FIBER.

oughly steamed and softened (see illustration below). A small army of Indians—men and boys, and even girls—stand ready to receive the material when sufficiently cooked, and as the bundles are broken up and distributed, each carries off a quantity and the work of extraction begins. It is a simple operation and quickly performed. The individual leaves are first stripped from the *cogollo*, smoking hot, and each leaf, held firmly in the hand, is deftly scraped upon a piece of hard wood with a blunt-edged knife. One half of the leaf is scraped on both sides, then reversed and the cleaned end (or fiber) wrapped around a bit of wood for a purchase, when the other end is cleaned in like manner. After the fiber has been sun-dried it is put up in small bunches of a few pounds each and stored in the warehouse, awaiting orders for purchase, when it is baled and shipped.

The fiber runs about 25 to 30 inches in length. In color it varies from a dirty cream white to yellowish, sometimes with a faint greenish hue, when carelessly cleaned. It is harsh to the touch, though it shows fair strength in a lateral strain, but is apt to be somewhat brittle under the torsion test. It is doubtful if it could be used to advantage alone, though it can be mixed with better fibers in the proportion of one to three, and give a substantial manufactured product that can be sold at a less price than the standard product, and for some uses prove almost as serviceable.

In Mexico it is beginning to be considerably employed as a mixture with the trueistle, and with maguay fiber, in the manufacture of bags, nearly all of the native bagging being made of cordage fibers, instead of spinning fibers as in the United States.

The kinds locally known as *palma istle* and *zaman-doque* are practically the same thing as *pita silvestre*. They are produced from different plants, however, and represent two species of the yucca family, which abound in portions of Tamaulipas and San Luis Potosi, the first named being extracted from *Samuella carnerosana*, and the second from *Hesperaloe funifera*. The name *palma istle* is sometimes given to the fiber of both species indiscriminately.

I have been informed that a species of yucca growing in the state of Jalisco, known to the natives as *izote*, yields a finer and more valuable fiber than either of the others mentioned, but I have not heard of the fiber as a commercial proposition, and doubt if it has ever been exploited. Several species of this family of plants are found in the United States, two or three of which might be utilized for fiber, and especially the heavier leaved varieties growing down near the Mexican border. But we are slow to take up new and untried industries in this country, especially in competition with the cheap labor of other countries. The Mexican Indians work for 37 cents per day (about 16 cents in gold), and many for even less, and probably receive all that they earn considering the crude methods employed. In exploiting these lesser fiber industries, it would seem that American enterprise, with American methods and the use of machinery instead of hand labor, might easily overcome differences in wages, and by utilizing certain of these wild products of the soil, some new and profitable, if not large, industries might be built up, particularly in the Southwest.

There is a growing market for substitute fibers. Much of cordage, and particularly twine, is used but once, and in late years there has been a certain demand for cheaper twines. With the standard fibers worth 10 cents per pound in gold, the only possible way in which a cheaper product can be made is to use cheaper fibers, i. e., substitute fibers, many of which, for most

THE WORK OF THE COAST AND GEODETIC SURVEY.

THE report of the Coast and Geodetic Survey for 1904 is a record of manifold labors and results which have for their theater of action an area practically coterminous with that of the United States and all its island possessions. The main body of the report contains a detailed account of the wide range of important duties



HESPERALOE FUNIFERA.

devolving upon this Bureau, and in the appendices we have a presentation of discussions and results which must prove of great economical value and interest to surveyors, engineers, navigators, and physicists.

The resurveys and developments imperatively required to show the changes in harbors and approaches due to works of improvement or the ceaseless action of natural causes along the Atlantic, Pacific, and Gulf coasts of the United States, and to meet the ever-increasing demands of our commerce and navy for up-to-date charts, particularly of the waters of Alaska, Porto Rico, Hawaii, and the Philippines, gave constant employment to the eleven vessels available for these duties. The hydrography was prosecuted within the limits of the waters of sixteen States and Territories, and the topography was carried on in nine.

In Alaska the work included the continuation of the survey of Prince William Sound, the survey of Controller Bay, and a deep-sea examination from the Strait of Juan de Fuca to Prince William Sound, preliminary to the laying of a deep-sea cable from Seattle to Valdez. The Porto Rico work was continued in certain bays and harbors, as well as in the development of the conditions in the off-shore waters. In the Philippine Archipelago the Survey has secured the co-operation of the insular government, and a detailed *résumé* shows a most satisfactory progress of the triangulation, hydrographic, topographic, magnetic, and astronomical operations. By utilizing native assistance in the Manila sub-office, twenty-one charts were prepared for publication during the year, and the outcome of the experience

along the 98th meridian was completed to the Canadian border, and a scheme was extended eastward connecting this work with the triangulation of the Mississippi River Commission. The execution of the primary triangulation in the Dakotas and Texas was prosecuted at a rate which surpassed even the notable record which had already secured an enviable reputation for the geodetic operations along the 98th meridian, the total extension amounting to 300 miles (500 kilometers). An equal distinction must be accredited to similar work in California and Oregon, whereon remarkable progress has been made in connecting the Transcontinental Arc work with Puget Sound.

The progress of the magnetic work is shown in detail in Appendix No. 3, which includes a table of results of the magnetic declinations, dip, and intensity of force observed on land and sea during the year, this being supplemented with full descriptions of the magnetic stations occupied and meridian lines observed. A new feature is the inclusion of the observations of the three magnetic elements at sea by the Coast and Geodetic Survey vessels in the course of their regular surveying operations. The paper is replete with matters of interest to the surveyor, the mariner, the geographer, and the geologist. Thus comprehensive examination has been made of certain locally disturbed areas, as, for example, in Douglas Island, Alaska, in the region of the local magnetic pole found in 1900; and the completion of the magnetic survey of Louisiana in co-operation with the State Geological Survey revealed interesting and important results, both as regards the magnetic distribution and the secular variation.

The table contains the magnetic results at 384 land stations distributed over twenty-four States and Territories and two foreign countries. The table of sea results contains 52 entries of magnetic declination, 34 dips, and 32 values of the total intensity of the magnetic force in the Atlantic and in the Pacific Ocean. The methods and instruments adopted for the sea work, which have thus far proven successful, are described in detail. In a general retrospective consideration of the work of the past five years, it is pointed out that in this period observations have been made at 1,636 stations, of which about one-eighth are points previously occupied by the Survey, and since used for observations to secure data for ascertaining the secular change of the magnetic elements. The work in about a dozen States has been practically completed except for special investigations and secular change observations. During the year a bureau of international research in terrestrial magnetism has been created by the Carnegie Institution of Washington, with the inspector of the magnetic work of the Coast Survey in charge, as director, and the co-operation thus insured is certain to prove extremely profitable in results.

The determination of the longitude of Manila from San Francisco, thus completing the first longitude circuit of the earth, was one of the astronomical events of the year, and in Appendix No. 4 is a comprehensive illustrated report on the various instruments and operations used in the undertaking, with a comparative *résumé* of the various links and results from which the longitude of Manila had been determined from the westward. The generous co-operation of the Commercial Cable Company, through whose patriotic enterprise the work was made feasible, is gratefully acknowledged. The results of the determinations from the eastward and westward differ only by 0.006s., or about 8.8 feet. The other results of this expedition are the determinations by the telegraphic method of the longitudes of Honolulu and Midway and Guam Islands.

The third attempt at representing the tide for the world at large, the first having been made by Whewell and Airy and the second by Berghaus, is described in Appendix No. 5. The advancement in recent years of the general use of the harmonic analysis, and the greatly improved tidal data that are now obtainable for such a great part of the globe, co-ordinate to make a new presentation of this subject very opportune. The theoretical discussion of the problems involved, the wide range of data and authorities consulted and referred to, the graphic presentation of the co-tidal lines, the results presented, and the conclusions deduced, make a most suggestive paper, and one which will be highly interesting to all students of the subject.

The results of the precise leveling operations for the year are published in Appendices Nos. 6 and 7, which submit them in a detail that makes them immediately available for the requirements of surveyors and engineers. These extend the precise level net, as previously published, six hundred miles to the westward, from Red Desert, Wyoming, to Owyhee in eastern Idaho; and from Holland, Texas, two hundred miles southwest, to Seguin, Texas. An interesting feature is an account of the change in the manner of support for the leveling rods, with the comparative discussion of the old and the new methods, and the consequent confirmation of the importance of the new system.

The account of operations submitted by the assistant in charge gives the story of the work of the various computing, drawing, engraving, and chart divisions of the office, in which the results of the field work are discussed or prepared for the publications and charts wherein they are placed at the service of the public.

A full account of the first recording transit micrometer devised for use in the telegraphic longitude determinations of the Coast and Geodetic Survey is submitted in Appendix No. 8, with an account of the exhaustive tests it was subjected to, and a recapitulation of the results of experience with this form of instrument, mainly in Europe, during the last thirteen years. The results of these experiments indicate that with the transit micrometer the accuracy of telegraphic longi-



KETTLES FOR COOKING THE FIBER SUBSTITUTE LEAVES.

THE CULTIVATION AND MANUFACTURE OF MEXICAN SUBSTITUTE CORDAGE FIBER.

purposes, are "almost as good." It may be stated that the finest lariats made in southern Mexico are produced from fibers not known commercially, and which, if they were known, could only rank as substitutes. The meanest of this class of fibers are better than jute for cordage, and they are worth more money, and the product is stronger and more durable.

with Filipinos as draftsmen, computers, and engravers is the gratifying demonstration that they will prove quite as competent as the Hindoos have been found in the British Indian operations and the Malagassys have proved themselves in the French surveying work in Madagascar.

The reconnaissance for the primary triangulation