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The STORY OF TWINE

CONTENTS

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INTRODUCTORY

More than 150,000 tons of twine are required annually to bind the grain crops of the world.

Sisal Fibre, from which sisal and standard twines are made, is grown in Yucatan, Mexico, where it is carefully cultivated by up-to-date plantation owners. Modern machines are used to remove the fibre from the leaves, and every effort is made to retain the smoothness and strength of the natural fibre.

Manila Fibre is grown in the Philippine Islands; the fibre has a lustrous sheen, somewhat similar to wheat straw. The lower the grade, the darker the color. When manufactured into twine, the oil that is added gives a slightly darker tint.

The manufacturers of twine maintain a corps of expert inspectors in the field and a second corps in the mills, where the twines are made, and in this way the inferior fibre is detected and thrown out. During the busy rush of harvest it is very important that the twine shall neither knot nor break in the field, and that it be full length and have uniform tensile strength.

THE HUMAN SIDE OF TWINE

When we drive home from the implement dealer with our little load of sisal twine for the coming harvest, we do not often realize that we are giving that twine its final lift on the journey of many thousands of miles which it has taken months to make. Seldom do we appreciate when we give it its final resting place in the twine can, that the first hands which touched it were those of a Maya boy or girl in far-off tropical Yucatan—Yucatan whose inhabitants were a great civilized people with temples and literature, centuries before Columbus came ashore in his red velvet suit.

Or, if it is manila twine, the first step in its long pilgrimage was under the guidance of a bare-footed, brown-skinned little Filipino, who perhaps never heard of a binder, and whose agricultural implements are a pointed stone or a crooked stick.

Yet, if it were not for the industry of those two widely separated nations, the farmers of this rich country would still be obliged to bind their grain with old-fashioned wire. In fact, the problem of twine was the problem of successful binding for years after the self-binder was an established fact.

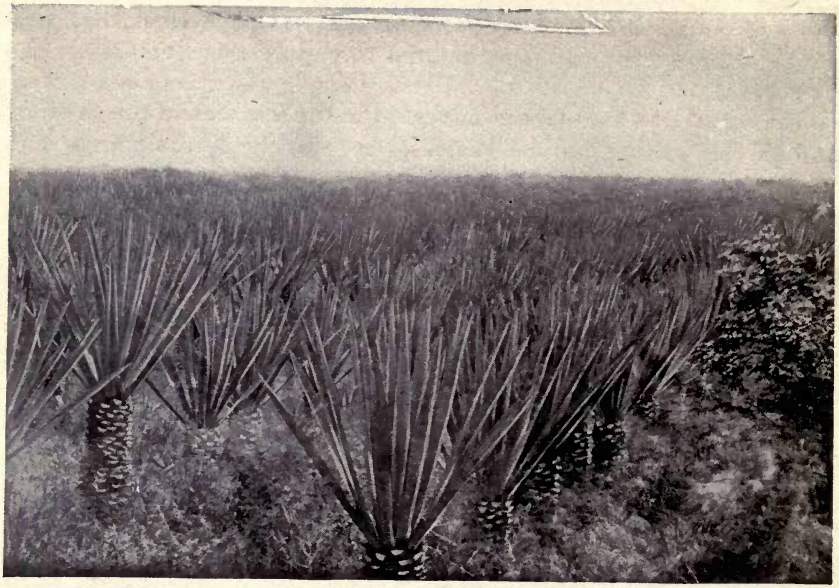
It took many years and thousands of dollars to eliminate this primary drawback to the early grain growers of the country. One manufacturer alone spent $15,000 trying to make twine out of grass, $35,000 using paper as a substitute, and $43,000 on straw,—all in the end to be discarded as unsatisfactory. Then, after searching the world with a close-tooth rake, as it were, it was found that two fibres could be made to do the work—manila and sisal. The manila—long, soft and even—had generally been used in multiple strands for making cable and cordage; while the sisal—strong, pliable and smooth—was found to lend itself perfectly to the manufacture of a single-strand cord, such as the self-binder necessitated.

Then commenced a merry struggle between the distant races for the honor of supplying the twine which was to make His Majesty, the American farmer, the greatest food producer in the world. At first, owing to the established position of the manila hemp trade caused by the cordage industry, the little brown brother in the Philippines forged ahead, but he made no progress in his methods of production, using the knife and block and other simple methods followed by his primi-

tive forefathers in extracting the fibre. It was soon seen that sisal would either be the ultimate material to supply this demand or the demand would not be filled. At this point in the race a number of clever, aggressive Yucatecans, educated in the sciences in this country and abroad, sprang into the game. They saw the future commercial possibilities of the neglected sisal plant. At their own expense they built railroads into the arid, dry territories where henequen grew. They invented new machines, capable of cleaning 100,000 leaves a day, and soon began to compete on an equal basis with the manila fibre.

The Spanish-American war temporarily advanced the price of manila fibre to such an extent that good grades of manila fibre commanded a price which was practically prohibitive for binder twine. Therefore, manufacturers of binder twine concentrated their energy and genius in the production of a perfect binder twine from sisal. This required some adjustment of machinery and some change in methods, but manufacturers of twine succeeded so that the twine made from sisal has for some years been as perfect and satisfactory as any binder twine ever made from any material. This has resulted in the increased use of sisal, until during the past season a large per cent of the material which was used in the manufacture of binder twine in the United States was sisal fibre.

More than $20,000,000 is spent yearly in the purchase of sisal and manila fibres which are imported from Yucatan and the Philippine Islands. In an effort to find a satisfactory substitute for these tropical fibres, the International Harvester Company expended more than $1,000,000 experimenting with home grown flax. The experimental work was successful, and a twine was produced which was satisfactory in every way except that crickets and grasshoppers ate it, causing the bundles to fall open in the field. Experiments extending over a period of several years have failed to find any treatment to which the twine could be subjected to make it immune from the attacks of insects, and twine manufacturers are compelled to continue the importation of sisal and manila fibres.



A Field of Sisal

Manila Plants

THE HISTORY OF BINDER TWINE

Binder twine as a staple article of commerce had its beginning in the year 1880. Experiments with machines which bound grain with twine began several years prior to 1880, and in 1879 a few twine binders were successfully operated. From the beginning of these experiments, twines of various kinds were utilized, principally consisting of small cords composed of two or more strands and made from Kentucky and other soft fibres. Those engaged in the development of the twine binder early recognized the difficulty of securing binder twine of proper quality. Naturally the first experiments were made with types of twine and cord then in use, and as the work progressed the experts discovered that twine, in order to bind grain successfully, must possess some qualifications in addition to strength and uniformity of size. In order to work well on the knotter, the twine must possess a firmness or coarseness in order to strip from the hook after the knot is formed. It frequently developed that a very soft twine which was strong enough to do the work would cling to the knotter hook so tenaciously that when the bundle was discharged the twine would break instead of stripping off the hook. Another important qualification was strength on the knot. Many twines with sufficient tensile strength cut or break easily on the knot, which renders them unfit for binder twine.

William Deering was one of the first to make thorough field experiments with the twine binder, and during the harvest season of 1879 he operated with considerable success a few Appleby binders. The question of twine suitable to do this work was found to be most difficult of solution; notwithstanding which, Mr. Deering had such faith in the new invention that he undertook the manufacture of three thousand twine binders for the harvest of 1880. He immediately gave the problem of securing suitable twine his close, personal attention. Among other experiments he untwisted a manila rope and used the strands, and became convinced that, if these rope yarns could be spun small enough, a successful binder twine would be the result. He approached several ropemakers, who promptly turned him down. Finally he went to Philadelphia, visited one of the leading cordage factories where large quantities of wrapping twine and other coarse cords were made, and tried to induce the proprietor, Mr. Bailey, to make some experiments with manila fibre. This Mr. Bailey refused to do,

but stated that Edwin H. Fitler, who owned a large rope factory in Philadelphia, was better equipped to make this experiment than anyone else with whom he was acquainted. Acting on this suggestion, Mr. Deering visited Mr. Fitler, who, by the way, was for several terms mayor of Philadelphia, and who was a very keen and successful business man. Mr. Fitler was disinclined to make any experiments, stating that rope yarn as they were making it ran only 300 feet to the pound and that it was practically impossible to spin it down to 700 feet to the pound, which was the size Mr. Deering required. However, upon learning that if the experiment proved successful, Mr. Deering would place an immediate order with him for a number of carloads, Mr. Fitler, with his usual business acumen, recognized the possibility of increasing his business and immediately entered into an arrangement with Mr. Deering. He promptly began making adjustments on his preparation and spinning machinery and quickly produced an article which in the tests at the Deering factory proved the superior qualities of this type of twine. A large order was executed, and that was the beginning of a business which in thirty years has grown to 300,000,000 pounds annually, valued at $20,000,000.00.

The knowledge of Fitler's success spread rapidly, and nearly all manufacturers of hard fibre rope began the manufacture of binder twine, and finally some large mills were built and equipped solely for the production of binder twine.

The early success of Fitler, followed by other rope manufacturers, was possible for the reason that practically the same method of preparation and same kind of spinning machinery were used then as now. Rope of good quality was produced at that time, but previous to the binder twine era no effort had been made to spin the yarns fine or to make them absolutely uniform. The twisting of several strands into a rope made absolute uniformity of the individual yarns unnecessary. The cordage manufacturers at that time also had balling machines which were practically identical with those now used, and wrapping and other commercial twines were put up in balls like the balls of binder twine to-day. These points are mentioned simply to call attention to the fact that the cordage manufacturers of 1880 were only compelled to adjust themselves to the new product. There was no necessity for radical changes in their mechanical equipment.

It will be of interest to know that the young man who was conducting field experiments for Mr. Deering at that time was no other

than J. F. Steward, now expert of the I H C patent department. In the first days of the harvest of 1880, Mr. Steward was in Texas, and while toiling in the broiling sun in an attempt to make a twine binder work successfully with a very poor article of hemp twine, he received the first ball of the manila twine made by Fitler. This ball of manila twine worked perfectly, and turned a difficult and more or less disappointing experiment into a pleasurable success. Mr. Steward at the earliest opportunity rushed to a telegraph office and sent Mr. Deering a characteristic and laconic message, "Manila splendid."

Manila fibre at this time commanded a high price, and sisal, which had begun to attract the attention of rope makers, was much cheaper. Early in the history of binder twine, sisal was mixed with manila in about equal proportions and a very satisfactory binder twine running about 600 feet to the pound was produced. Finally some experiments were made with sisal alone, which, in consequence of the equipment and adjustment of machines then in use, were not in the beginning very successful, as sisal fibre was much shorter than the manila for which the machines were originally constructed. However, minor changes in construction and adjustment of the machinery followed, and the result was a perfect binder twine from sisal fibre. The use of manila, however, has never been abandoned, and in some years when prices are favorable, a considerable quantity of pure manila and mixed manila twines is used.

While the great bulk of the binder twine of recent years has been made from sisal and manila, there have been other fibres used successfully; usually, however, in connection with larger proportions of sisal or manila. New Zealand fibre, either in a mixture or used exclusively, makes a satisfactory twine, but it does not possess the lasting qualities found in the two principal fibres. Twine made from New Zealand fibre does not retain its strength if kept for a period of years, while sisal or manila twines do not deteriorate perceptibly for a long time. Manila maguey, mauritius, and istle, together with some other varieties of hard fibre, have been used to a limited extent with fair success. Fairly good working twine has been made from a mixture of jute and American hemp. A perfect working twine has been made from flax, but here again uniformity of product has been found very difficult, and with the increasing production of sisal and manila, and the lower prices which follow increased production, the percentage of binder twine made from other fibres is not important.

SISAL FIBRE

The plant from which sisal fibre is produced is known in Yucatan as henequen. It is one of the numerous species of agave, many varieties of which are found in tropical countries, and which when transplanted to our greenhouses and conservatories in the North are usually called century plants. It would appear from careful investigation that the variation in agave plants is mainly attributable to differences of soil and climate. Yucatan furnishes the most ideal conditions for plants of this nature, existing and flourishing as they do largely on air and moisture in the atmosphere, and not being dependent upon rich soil. While all of the agave plants contain fibre, only a few are capable of successful cultivation. It can be stated as a general rule that plants which grow slowly contain a fibre superior in quality to that found in plants of rapid growth. It is also essential that the leaves contain enough moist pulp to permit the easy extraction of the fibre, which is very difficult where the leaves are thin and dry, and the pulp of an adhesive nature. It very frequently happens that plants closely resembling sisal are found in large numbers in different tropical countries, surrounded by conditions which would indicate the probability of satisfactory results from cultivation. However, after careful experiments running through a series of years it is frequently found that the plants grow too rapidly, mature quickly, and die while still comparatively young, thereby producing fibre of inferior quality and necessitating the frequent renewal of plants, which is expensive and renders the business unprofitable. There are immense tracts of unimproved land in the tropics, and it is not unlikely that at some time in the future sisal will be successfully produced at some point outside the peninsula of Yucatan, but that country now produces a very large proportion of all the fibre of that class that reaches our markets.

The northern part of the peninsula is a flat, low country barely twenty-five feet above sea level, and is a solid ledge of lime rock, originally of coral formation. There is only a limited amount of soil on the surface of this lime rock, probably little more than half the surface being covered with soil. In its natural condition the whole surface is covered with a jungle growth of tropical woods and plants ranging in height from ten to thirty feet. This jungle is cut and the

wood burned in order to prepare the land for planting. After the land is cleared, sisal plants of about two years' growth, previously started in the nurseries, are set out in rows eight feet apart, which will give about one thousand plants to the acre. There is no further cultivation necessary except the occasional cutting of the undergrowth, which is done with the machete, a large knife with a straight blade from eighteen to twenty-four inches in length. While the plants are young this undergrowth is usually cut twice each year. After the plants are mature one cutting each year is sufficient. It requires from five to seven years for these plants to mature after having been set out in the plantation, so that the man opening a new plantation must be possessed of a good deal of patience as well as a means of support for a considerable period of time. When the plants reach maturity the cutting of leaves begins. Only the under or mature leaves are taken. It is possible to cut from twelve to twenty leaves from each plant. The leaves average a little less than two pounds in weight. Usually from 3 to 3½ per cent of marketable fibre, or about one ounce, is secured from an average leaf, making an average of perhaps one pound from each plant, or one thousand pounds from an acre. This is the result of a year's operations.

There is no particular season when leaves are harvested; on the contrary, leaves are cut every week in the year. Usually the manager starts on one side of his plantation and gradually works across, timing his work so that some of his plants are always ready for cutting. Each leaf is handled individually, being first cut from the plant, then the spines removed from the edge of the leaf, then the leaves packed in bundles of about fifty and carried to the edge of the plantation or to the nearest tramway. From there they are conveyed to the cleaning plant, which is centrally located on each plantation. The leaves are put through the cleaning machine at the rate of about three thousand per hour. The fibre, after it leaves the machine, is carried into the drying yards and is spread on galvanized wire where it dries and bleaches in the sun, after which it is gathered and taken into the warehouse where it is pressed into bales in the same form in which it reaches the mills. The various operations have been so frequently described that we do not go into them in detail, but call attention to the immense amount of labor required to produce a comparatively small amount of fibre. This can be profit-

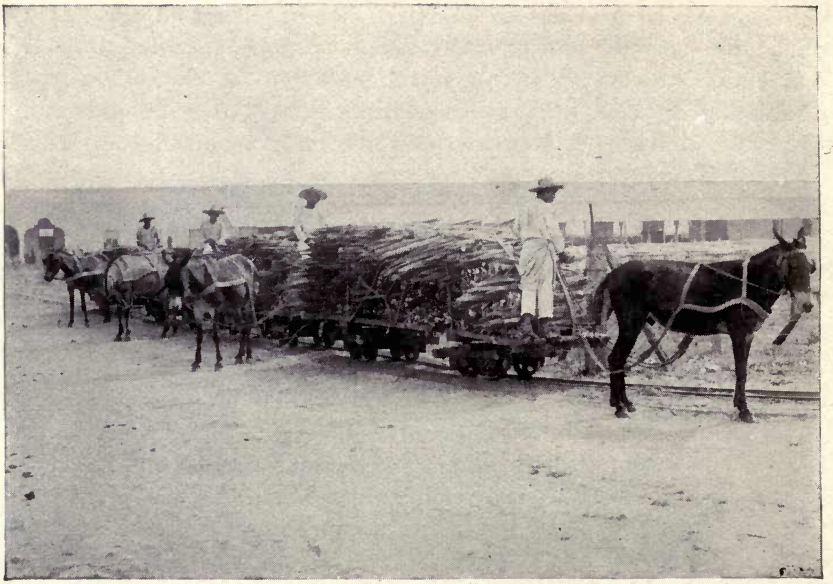
Cutting the Sisal Leaves

Loading Sisal Leaves on a Tram Car

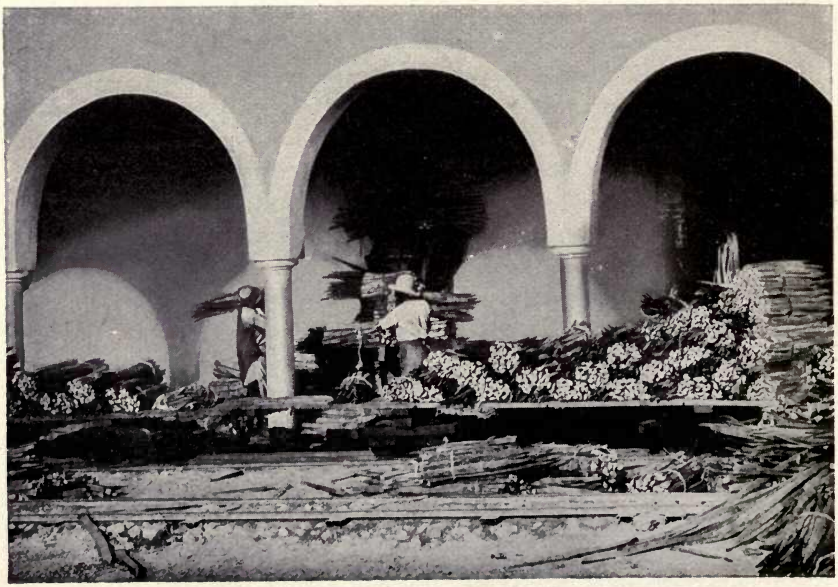
ably accomplished only in countries where living is simple and cheap and where, consequently, labor is not expensive. In this connection, however, it is only fair to state that the cost of labor has doubled in Yucatan during the last ten years. The population is not great and climatic conditions are not specially attractive to immigration; consequently the supply of labor is limited, and the natural competition among planters to increase the size of their henequen fields has resulted in every laborer being employed, and at increased wages.

It may be of interest to know something concerning the characteristics of the people who form the principal laboring element of Yucatan. They are Maya Indians and are the descendants of an aboriginal race which has left behind it proof of a higher type of civilization than was found in other parts of the western hemisphere (possibly in making this statement regarding the ancient Mayas an exception should be made of the Inca Indians found in the Andes mountains of South America, although the latter did not possess the architectural ability of the Mayas). Yucatan possesses many ruined cities which students declare to have been in existence for at least two thousand years, some of the buildings being nearly intact and showing beauty of design and accuracy of finish of a very high order. Just why this ancient people became decimated and cities abandoned is not positively known. Legends handed down from generation to generation seem to indicate that at the height of their development they became the victims of internal dissensions and rival cities and tribes warred on one another until the race was nearly extinct.

The present natives are amiable, cleanly, industrious, and capable. Although rather undersized, they are well formed and very powerful. They are trustworthy and faithful, and perform the labor required in that country better, perhaps, than any other workmen who could be employed. Notwithstanding some of the magazine articles written on the subject, there is nothing in the nature of slavery in Yucatan. Every man is free and receives his pay as regularly as the workmen in the American factories. The plantations are usually large, and in consequence of their size, somewhat isolated. A plantation consists of several thousand acres of land, only a part of which is cultivated. The buildings are usually in the center of the plantation. On the larger plantations there are several hundred families of natives. Each family has a small house, the workmen's houses usually being



Hauling Sisal Leaves to the Decorticating Mill

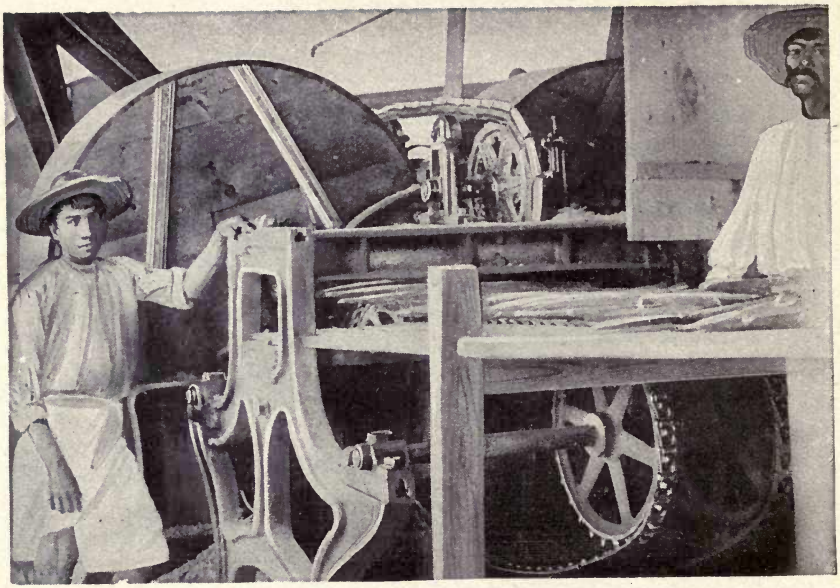


Exterior View of Decorticating Mill

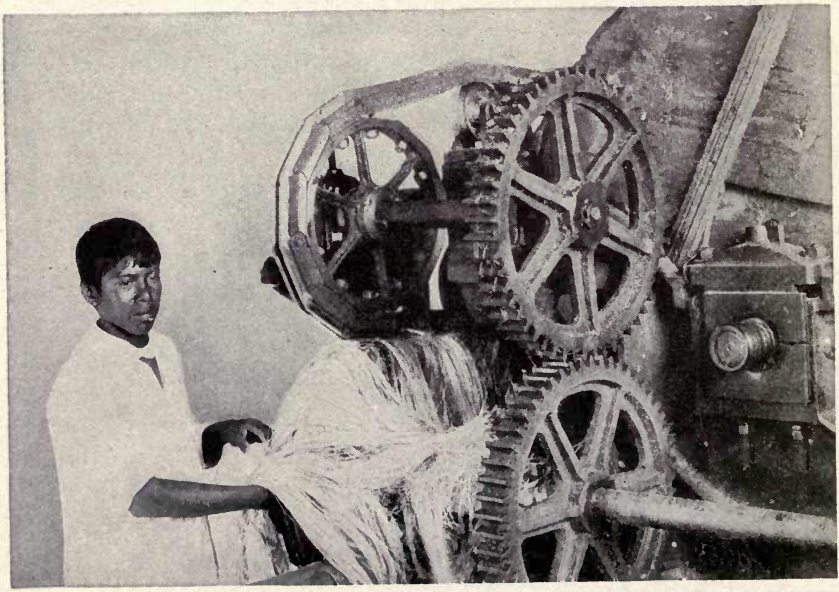
clustered about the main structures. The plantation always contains a church, and there is a resident physician employed by the plantation owner.

Usually the manager of the plantation is the local magistrate, and this clothes him with authority, which all will recognize as necessary in order to preserve discipline in a community of several hundred people. Each workman is usually given one day off during each week. He frequently utilizes this day for taking care of his little garden patch, where he raises corn, beans and other vegetables. The planter permits each family to have its own plot of ground and to raise its own food. The houses furnished by the planter are usually made of stone, often with tile roofs, and are superior in every respect to the huts which the natives build for themselves when they are not employed on the big plantations. After extensive traveling through the fibre plantations of Yucatan, one is convinced that these workmen are better housed, better clothed, better fed, more cleanly, and are treated with greater consideration than the negroes in the southern part of our own country. There is a law which prevents a workman from leaving his employer while in debt, and it may be possible that at times this law is construed and the conditions manipulated to the disadvantage of the workman, but such cases are rare, and there is usually the very best of relations between the workmen and their managers. Suitable laws and their proper enforcement must be determined by the mental, moral, and physical condition of the governed.

The population of Yucatan, other than the natives above referred to, consists largely of people of Spanish descent, many families tracing their ancestry back to the conquest three hundred and fifty years ago. While there is a sprinkling of English, German and perhaps other European races, the Spanish type prevails. As the country has developed only one important resource—sisal—there has not been the rapid development nor the accumulation of great fortunes which has been witnessed in the United States. It is true that the owners of large plantations have acquired a reasonable competence and are living in comfort. They educate their children, and in many instances send them to Europe or to the United States in order to give them the benefit of a wider culture. They build comfortable homes and furnish them very much as the well-to-do American furnishes his. They are people of intelligence and refinement, who take life earnestly and



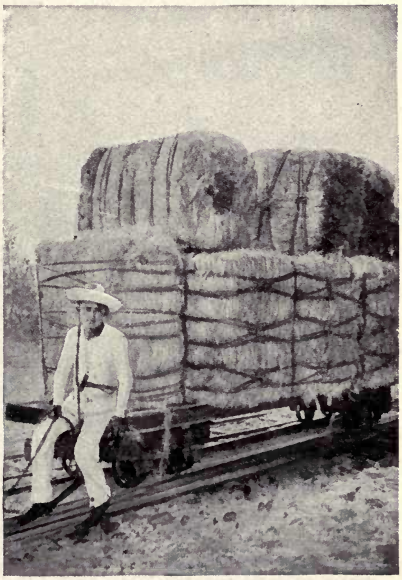
Feeding Sisal Leaves into the Decorticator



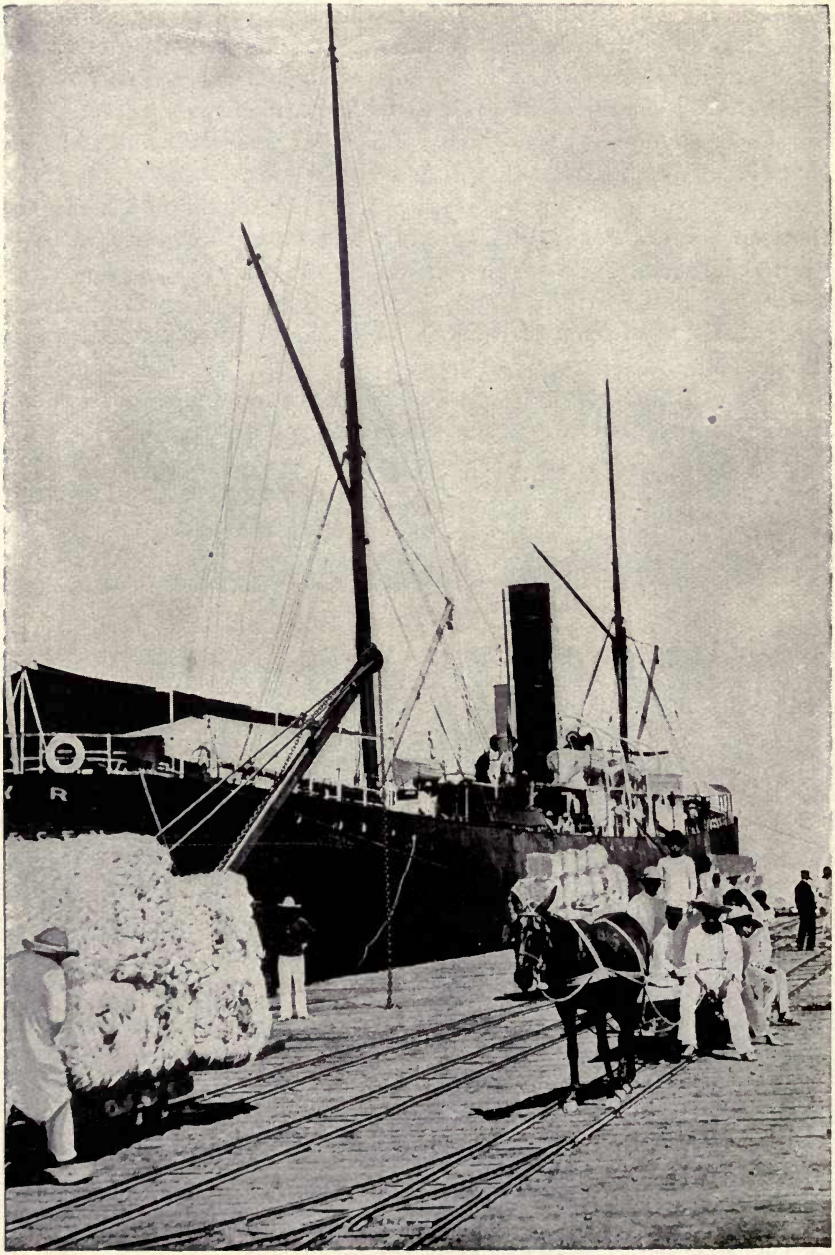
Fibre Coming from the Decorticator

who are loyal to their country, remaining in Yucatan and improving their property after becoming financially independent. They put back on the plantations a large part of the money, which the production of fibre yields. The plantation buildings are substantial and attractive. The best of machinery has been purchased and installed in their cleaning and pressing plants. Thousands of miles of narrow-gauge tramways have been laid through the plantations, making the transportation of leaves economical. Everything has been done to get the largest possible results from the limited amount of labor at their command. In this connection it may be well to state that not more than 20 per cent of the best fibre-producing lands of Yucatan are cultivated, the scarcity of labor being the reason. The planters are almost universally men of a high type, hospitable and courteous to an extent seldom found outside the Latin countries.

Drying Sisal Fibre



Bales of Sisal Fibre



Loading Sisal Fibre at Progreso, Yucatan

MANILA FIBRE

The manila fibre of commerce is the product of a plant or tree known to the scientist as musa textilis, but called abacá by the natives of the Philippine Islands, which country alone produces this plant. Efforts to cultivate it in other countries have so far failed. It is therefore evident that we must continue to look to our island possessions for the necessary supplies of this fibre, which is most important in the manufacture of rope and many other forms of cordage.

The manila plant is identical in general appearance with the banana tree. The trunk consists of a cluster of from twelve to twenty sheathing leaf-stalks which spread out into a crown of huge leaves, rising to a height of from 12 to 25 feet. These leaf-stalks overlap each other and grow together tightly so as to give the appearance of a solid trunk from six to twelve feet in height. It is from these stalks or layers that the fibre is extracted, and not, as many have supposed, from the long leaves, as in the case of the sisal plant.

About four years are required for the mature growth of manila plants from the time the suckers or young shoots are set out in the plantation. Before the plant reaches maturity other shoots spring up from the root of the original plant, so that after the mature plant has been cut it will be only a few months until the oldest shoot is also mature.

Soil which is largely composed of volcanic ash appears to be the natural home of the manila plant; in fact, it does not thrive outside the volcanic zone. The plant requires plenty of rain, but must be grown in a soil where the drainage is good, and it is, therefore, cultivated with the greatest success on the sides of mountains and hills. While there are a few large manila plantations, the great bulk of this fibre is produced from small parcels of ground cleared out of the jungle, frequently containing only five or six acres, and sometimes even less. The land is largely owned by wealthy merchants who arrange with the natives to work these small tracts of abacá; thus, one man may have a large number of these small fields of cultivated ground. This small field is called a laté (lat-ta). The native usually takes care of the laté and strips the fibre "on shares," receiving one-half of what he produces. The work is done in a very crude manner and with tools

Cutting Down a Manila Plant

Removing Layers from a Manila Plant

of the most primitive sort. The principal item of equipment is a heavy steel knife from twelve to sixteen inches in length, exclusive of the handle, fitted with a wooden handle from eighteen to twenty inches in length. The handle acts as a lever and is fitted into a fulcrum at the inner end of the handle near where it connects with the steel knife. A piece of very hard mahogany wood is made to exactly fit the edge of the knife. This block is placed on the top of a convenient log or section of a large bamboo tree. To this same log is fastened the fulcrum in which the knife is operated. Sometimes this fulcrum consists of two stakes driven on either side of the log and tied together with thongs of rattan, which grows plentifully in the jungle. The edge of the knife, in order to obtain the best results, should be smooth. However, as a rule, it is provided with small notches like saw-teeth. The natives prefer this condition of the knife for the reason that the fibre strips more easily. The edge of the knife is held down on the hardwood block by a spring pole which is connected with the outer end of the handle by a string or thong, the amount of tension on the knife being regulated by the size of the pole or the extent to which it is bent when the connection with the handle is made.

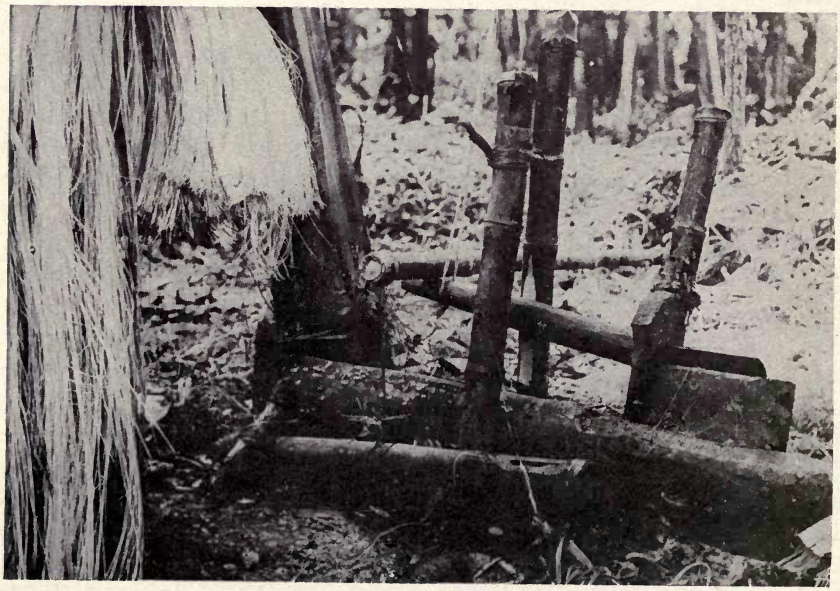
The device for raising the knife from the block of mahogany in order to insert a layer for cleaning is very simple. Another string, also attached to the outer end of the handle, is connected with a short bamboo pole, one end of which lies on the ground, the other being suspended a few inches above the ground by this last named string. When the operator wishes to raise the knife from the block he steps on this partially suspended pole, which acts as a foot lever or treadle. When released by the operator's foot, the knife returns to its position on the block, and, as previously described, is held there by a large spring pole which is swung overhead.

When the strip or layer from the plant is drawn under the knife only the fibre is pulled through; the pulp and skin of the strip, being scraped loose from the fibre, fall in front of the knife. The strip is usually held more easily and more firmly by the operator by the use of a small, short stick of hardwood or bamboo, around which the strip is wound. In order to clean the end originally held, a second and reverse movement is necessary during which the cleaned ends of the fibre are held in the same manner.

The operator places the cleaned fibre on a convenient pole, or

Note Length of Layers

Stripping Fibre from Layers



Device Used to Remove Fibre

sometimes in the crotch of a tree, from which it is taken by the women and children and spread out on bamboo poles in an open spot where the sun dries the fibre in a few hours. The product of each day is gathered up toward night and twisted into convenient hanks and placed under cover.

The work of cutting the plants, separating the strips, and carrying the strips to the apparatus above described, is usually performed by the workman's wife and children, who also spread the fibre and gather it after it is dried.

Some of the latés are so located that the fibre stripper goes each morning from his hut in the village. Frequently, however, the distance to the laté is so great that the fibre stripper and his family leave the village and remain in the laté for two, three, or four days at a time. They improvise temporary shelter from branches of palm trees and the leaves of the manila plant, and seem to live about as comfortably under those circumstances as the ordinary American does when in camp during a summer vacation.

The stripping apparatus is so simple that the operator carries to the laté only his stripping knife and the hardwood block which is fitted to the blade. With his machete or bolo he very quickly installs the knife and block and is ready to begin stripping. Under the conditions described, the equipment is so easily moved that only a small number of trees are cleaned on one spot. Another reason for frequently changing location is the rapid accumulation of the refuse from the stripping, the cleaned and dried fibre representing only from one to two per cent of the weight of the trunk which is stripped. The average day's work of an expert stripper is about twenty-five pounds.

The best quality of fibre is produced by stripping the same day the plants are cut. If the plants or the separated layers are permitted to lie for any considerable time after being cut, fermentation, the beginning of decomposition, takes place, and this is a distinct injury not only to the color but also to the strength of the fibre.

Possibly the reader, after considering the crude methods followed in the production of this important article of commerce, resulting as it does in a business of from $15,000,000 to $20,000,000 (gold) annually, may wonder why machinery has not been introduced for stripping this fibre. Large prizes and bounties have been offered to the inventor who would first produce a successful fibre-cleaning machine. Many attempts have been made, and while some machines have given

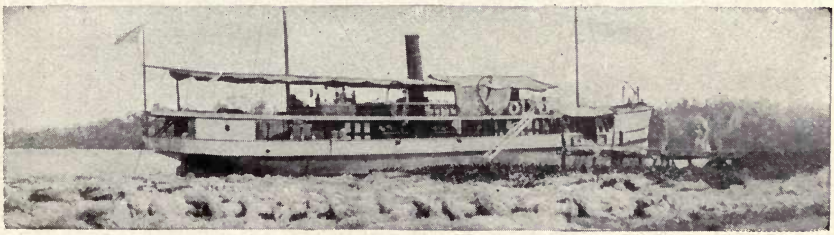
Drying Manila Fibre—Notice the Length

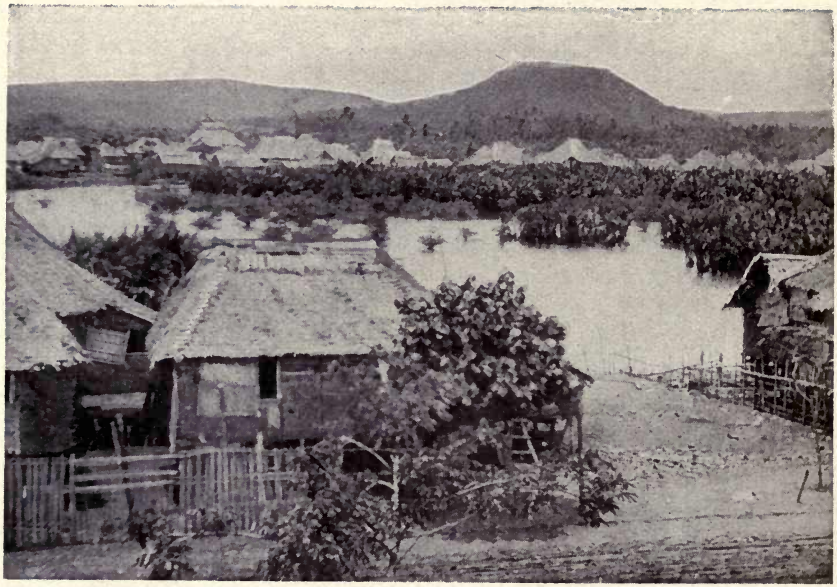
Bringing Fibre Down from the Mountains

considerable promise, none has reached a point where general introduction is possible. The great difficulty seems to be in the lack of uniformity of the texture of the fibre itself, and of the layers from which it is extracted; and no machine yet produced has the delicate sensitiveness of the human hand to adjust itself to the varying conditions. It may interest the reader to study for a little time the character and surrounding conditions of the fibre stripper. As a rule, he is possessed of a kindly nature and a cheerful disposition; is fairly temperate, and not particularly indolent when his necessities are taken into consideration. At maturity he usually marries and nearly always lives happily with his wife during their lifetime. They raise a family of children, and there appears to be a very strong family affection. The man is neither cruel nor arbitrary. At the beginning of his domestic career he proceeds immediately to build what, in that country, is a thoroughly satisfactory dwelling. His wants are few. A small amount of cotton cloth provides clothing for the entire family. In many instances the women manufacture fabrics from which a large part of their clothing is made. These fabrics are made from either very fine manila fibres, or from the fibre of the pineapple plant. Consequently the expense for clothing is very slight.

The food consists principally of fish, which is very abundant and costs nothing; and rice, which in most cases the fibre stripper is compelled to buy, as very little rice is produced in those sections of the country where fibre grows. The meat which they consume is largely chicken and pork, which they themselves raise, although these two articles are considered a luxury, and are not very frequently indulged in. Fruit is used to a considerable extent, and that is always at hand.

This simple life makes it possible for the fibre stripper to secure for himself and his family everything which he desires by laboring three or four days each week. Consequently he does not exert himself to "lay up something for a rainy day," which in his case seldom or never comes.





Filipino Village

Filipino Cart and Water Buffalo

A FEW FACTS ABOUT TWINE

In the preceding pages we have been told how the fibres for manufacturing binder twine are obtained, and the following pages will be devoted to the finished product, the twine itself. The rapid increase in the use of the twine binder soon created a demand for sisal and manila twines far in excess of the surplus capacity of the cordage factories where the first binder twine was made, and the inability of the binder manufacturers to secure binder twine in sufficient quantities, at the proper time, and of the right quality, became a serious draw-back to the progress of the twine binder industry. They were, therefore, brought face to face with the problem of either providing for a larger supply of better and cheaper twine, or seeing their already established binder business seriously handicapped, and thus they were forcibly brought to consider the question of manufacturing their own binder twine.

To do this required the spending of large amounts of money in factory buildings and expensive machinery. Practically all the machinery at that time had to be imported from abroad, and this, together with the fact that the season for using twine covered only a small portion of the year, which made it necessary to purchase, pay for, and manufacture large stocks of fibre into twine several months in advance of the time that it could be disposed of, made the proposition one which involved large expenditures of money with very little prospect of satisfactory, direct returns. The purpose being to encourage and stimulate the use of twine binders by furnishing good, cheap twine, even though it had to be manufactured and sold at very little or no profit, the investment of money in the twine industry by the harvester companies was looked upon as a matter of necessity rather than one of profit.

The first harvester company to build a mill for the manufacturing of binder twine was William Deering & Company, this mill being built in 1886. From this starts the history of the manufacturing of binder twine by the harvester companies, who within the next few years, nearly all found it necessary to follow the same course as a matter of self-preservation. They knew that the future of the twine binder depended largely on their ability to supply the purchasers with a sufficient quantity of suitable twine at a reasonable price.

Storing Fibre in the Warehouse

Inspecting the Fibre at the Warehouse

When the harvester companies engaged in the manufacture of twine, it was done for no other purpose than to insure the success of their binder business which was already established; therefore, the question of the highest possible quality was their first consideration.

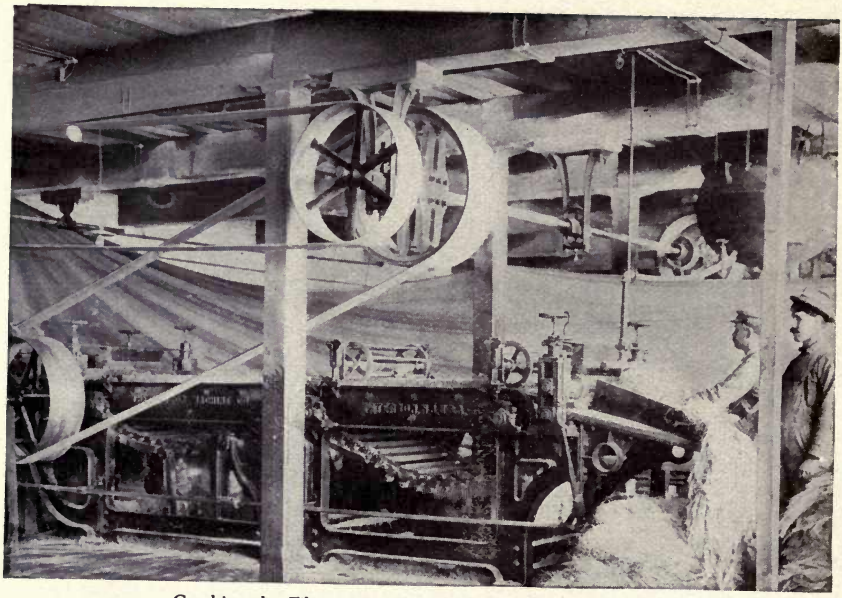
It was well known by the users of twine that some fibres were more suitable for binder twine purposes than others, but the question as to just what available fibers were best suited had never been definitely settled, and this, and the proper kind of machinery to be installed, were some of the first problems that had to be solved.

It was soon found that much of the fibre ordinarily used in the manufacture of rope and commercial twines was not at all suited for binder twine purposes, due to the variety of conditions that had to be met by the new product. First, it had to be strong and of uniform size so as to work satisfactorily through the tensions, on the knotter hook, and in the disk, and remain soft and pliable when subjected to treatment met when shipped and stored under all kinds of conditions. Second, after it was put on the bundle of grain, it had to stand the weather exposure for quite long periods. Third, it was necessary that it be immune from the ravage of insects.

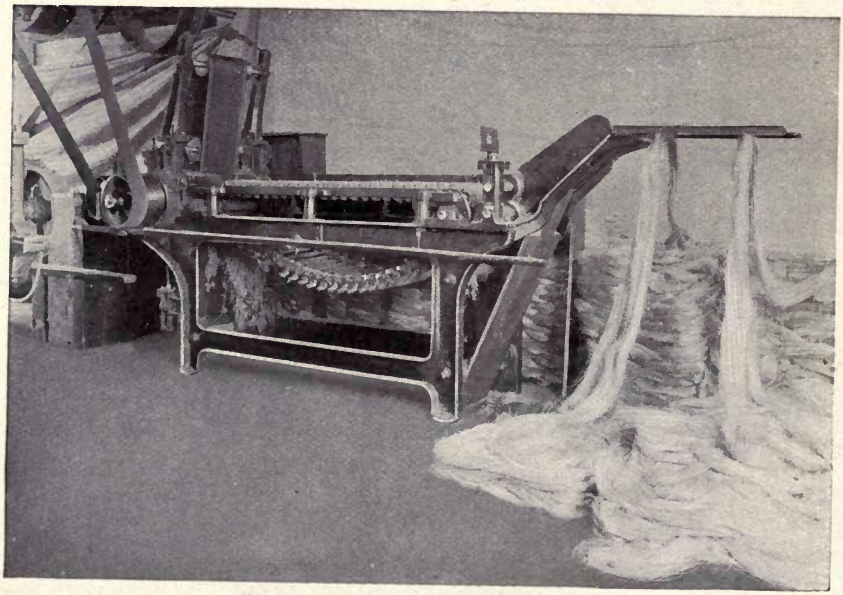
In the early years manila fibre was very extensively used for this purpose, but in later years 85 to 90 per cent of the binder twine used has been manufactured from sisal fibre. The reason for this is that sisal fibre as it is procured on the market is of much more uniform quality than manila; that is to say, there is very little variation between the higher and lower grades. Therefore, twine manufactured from sisal fibre can be depended upon to give more uniform results than that made from manila of low grade. The comparative value of sisal fibre and high grade manila makes it necessary to run manila twine a greater number of feet per pound, and consequently of smaller size, to get the price per unit of length to compare favorably with that of sisal. Therefore, it has not, as a general thing, met with the same favor from the user as the shorter and larger twines.

In the manufacture of fibre into twine, the first operation is the selecting, mixing, and grading of the different fibres. This part of the work falls to the inspection department, where all the different shipments of fibre, both manila and sisal, are inspected and passed upon as they are received.

Regular sisal and standard twine is manufactured from sisal fibre,



Combing the Fibre—First Process Preparatory to Spinning



Fibre Passing through the Drawing Frame

and on account of the uniformity of this kind of fibre, the inspecting and mixing is comparatively simple. When we come to deal with manila fibres, where there is such a large variety of grades on the market, ranging in texture from a very fine, soft, and tough fibre to that so coarse and brittle as to resemble fine sticks, and ranging in color from snow white to black, the question of inspecting becomes a very important one, as the low grades cannot be used in the manufacture of high grade twines.

After the different fibres have been inspected and passed upon by the inspection department, they go to the preparation room where the opening and mixing is done. The fibre is then put through several softening and combing operations—the number depending upon the different grades of fibre—which soften, comb, and form the fibre into a continuous ribbon called a sliver. These slivers pass from machine to machine where they are continually doubled up and redrawn until they form a well-worked, continuous sliver of practically uniform size.

During these combing and drawing operations, the fibre is carefully watched by experienced and competent operators. All the machinery used for these purposes is very complicated and expensive.

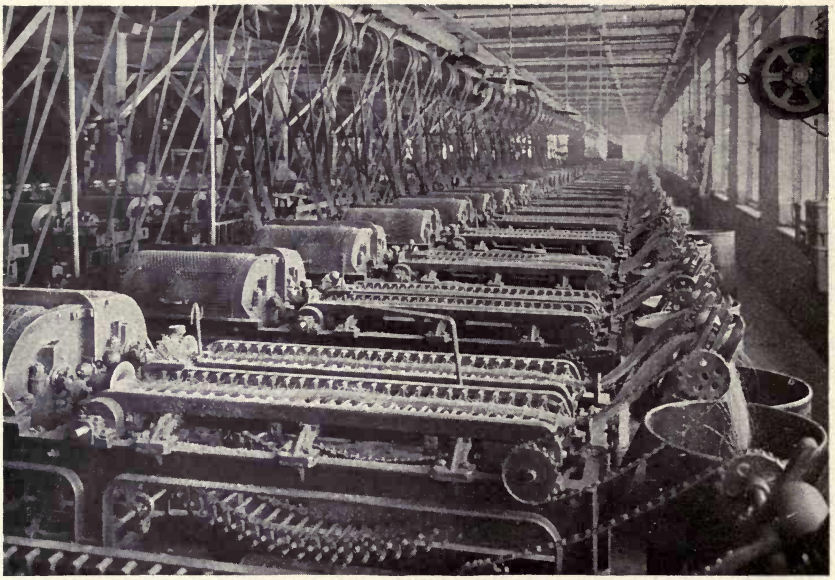
After the fibre in sliver form is finished in the preparation department, it goes to the spinning room where it is spun into twine. This process consists of combing, drawing, and twisting the fibre until it is formed into a smooth, even twine. While passing through this process, it is continually watched by competent operators, and any twine found to be of a defective nature is promptly rejected.

The spinning machinery on which this work is done is also of a very complicated nature.

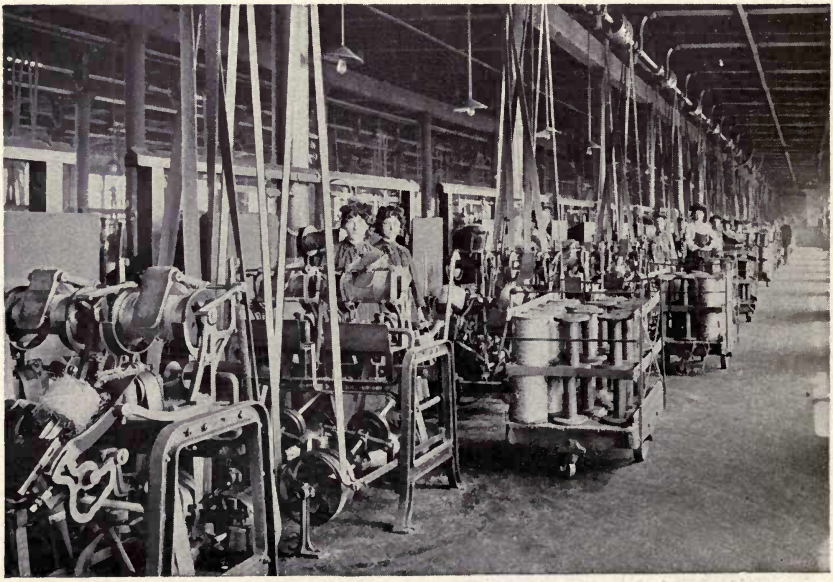
As the twine is spun, it is wound on bobbins and when these are full, they are removed from the spinning machine and passed into the balling room, where the twine is wound into balls (so familiar to every user of binder twine), weighed, inspected, and put in sacks ready for the market.

During this process, the operator of the balling machine has an opportunity to inspect every bobbin of twine from end to end and reject such as do not come fully up to standard.

The inspection is a very important part of twine manufacture. To protect the reputation of the binders as well as the twine, it is necessary that not only the finished goods, but every intermediate step



One of the Spinning Rooms



Balling Machines in Operation

in manufacturing be carefully supervised by competent inspectors. During the process of forming the fibre into sliver and of spinning sliver into yarn, every step is carefully inspected, and when the twine reaches the balling room, the twine on each bobbin is carefully inspected by the operator while it is being wound into a ball, and the operator's name or number marked on the back of the tag. In case a ball should develop any defects in the field, all the user has to do is to return the tag with the defective twine and the manufacturer can immediately locate the operator responsible for letting same pass out.

After the balls are completed and weighed, each ball is carefully inspected before it is put up in the sack. Each sack contains a slip of paper showing the number or name of the man who passed on the bale of twine, and in case any defect occurs in the bale, all the consumer has to do is to return the slip and one of the tags on the balls and all the persons responsible for allowing the bale of twine to pass out can be located. Trained testers are continually testing and watching the work as it is being done.

The ordinary consumers of twine who use from 50 to 500 pounds per year do not realize the importance of the twine industry when compared with the agricultural implements ordinarily used on the farm, until they are unable to get a supply of this article in the harvesting time.

If no harvesting machines were manufactured for a whole year the farming community would, undoubtedly, be put to some inconvenience, but would manage to get along with no serious loss. On the other hand, if the supply of twine for one harvest were suddenly to be cut off, it would mean not simply a national, but an international calamity, as it would be impossible to secure help enough to gather the crops.

Storing Twine at the Warehouse

Delivering a Rush Order

A DAY IN A TWINE MILL

By A. B. T.

I am a ball of twine — one of ten in a bale, frankly interested in girls. While I gasp for breath in this tight sack on which my latest lady love stamped the name I was created to bear, I have time to reflect on the marvelous experiences of this day.

Some one else may tell you how the fibre plants grow in the far-off Philippine Islands and on the plateaus of Yucatan, I shall tell you only about this one day at the mill. Early this morning I was dumped from a freight car to the unloading platform at this Works as "raw material." The husky men who seized the great bales of fibre of which I was a part, carted my visible bulk to a room called "opening."

Picture of the Author

Here I met many strong men who cut my clothes and rent me into strands while I struggled furiously and breathed dust and vengeance upon them. But presently my spirit softened. The noise I heard was not of battle but only that of myriad machines, and why should I fuss myself up making dust when great fans and exhaust pipes were steadily removing it.

In the next room—"preparation" it is named—I met the first girl I was to know in America. She was a foreigner like myself — came from far away Poland but a week earlier than my advent from the Philippines. With many other strong muscled, stout lunged girls she watched me, while as a bunch of fibre, I was fed from a huge pile opened on the floor into a funny machine with rows of moving teeth, each row like a big comb, maybe twelve feet long, and high over the head of the girl, who would now and then reach with a long iron hook for an armful of this whitish yellow moving fibrous mass. A man had started the evolution from the big bale where it was heavy.

I "chased myself" across the machine to see the girl who was waiting to tend the ends of the strands and pile into cans the really beautiful stream into which I had evolved after being combed. "Looks like molasses candy," a visitor said to the girl who got up from her seat to twist me a little and change the cans that were to

carry me and my relatives to the spinning room. The girl workers stood around or sat down and watched me. Although I could talk with the girls, I noticed the men in the rooms were not so privileged — they could only "look pleasant."

A Group of Pretty Twine Mill Girls on one of their Picnics

I got interested in one girl who looked especially happy, and listened to her description of a dance she had taken part in the night before at some Company club house. It sounded good to me and I wanted to stay right there, the better to hear her soft voice when the machinery stopped, so I snarled myself all up.

No use, she called her foreman when I was obstinate and wouldn't be straightened out, and he sent a man to attend to me and the machine. I made up my mind there wasn't any use hanging around, I would have to go on, so I was glad to know I was leaving my new girl in safe hands. They tore my hair so much by constant combing in every room, that I was glad to see the girls all had their heads covered safely with cotton caps—very becoming to some of them and protecting the hair from dust as well as saving them from the danger of getting loose locks drawn into the machinery. I know something about styles, so, like most men, I noticed first thing how the girls were dressed. Stout aprons and cotton waists usually, and always close sleeves. No flying apron strings to tease

A Corner of the Rest Room at Deering Twine Mills

the mischievous boys and to catch in a whirling gear, and no "raggedy" ends of sleeves or waist.

Well, thinks I to myself, I wonder if the girls can sew and mend a torn frock, so I was ready to listen when a good, sensible looking woman came along, just as I, in my can, was being loaded on a truck and sent to the spinning room. Very considerate for the girls, I thought, for the men to do all the heavy lifting. This woman, they called her the matron, seemed to know everybody. She said to a girl, "Will you be over to the cottage to-night? We will be sewing on dressing sacques, and next week you know we begin skirts;" and to another, "Come to the nurse at noon;" and to another, "Have you been examined for membership in the Benefit Association?" and to another, "Remember what I told you about the rule not to clean your machine when it is in motion. We will have to make you guard yourself against accidents by discharging you if you disobey again;" or "When shall we have another outing?" I learned that all the women, and there were several hundred, belonged to this Benefit Association just the same as the men, and if they fell ill they could draw half pay, and if hurt either at work or at play, or going to and from their homes, that little half-pay envelope regularly would keep the wolf from the door for many weeks.

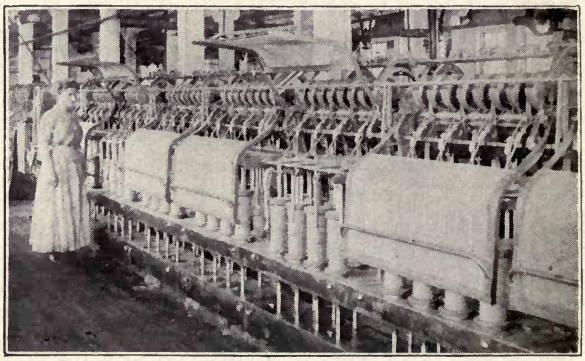
By noon in my evolution from "raw material" to finished product I had reached the spinning department. The noise was appalling when I first slipped out from my red can, and as I looked down the long, well-lighted rooms, I saw ever so many girls, but they didn't seem to mind the noise at all. One told the foreman that she didn't hear the noise after two or three days, and yet I noticed they were not deaf, for they heard the whistle blow for lunch and responded promptly. How they scattered for the lunch room! Some stopped in a big wash room to look in the glass, and to wash their hands—plenty of hot and cold water, and clean towels, and sanitary soap. They didn't stay long fixing up, for they were hungry, and in the big lunch room the girls were all together eating the lunch brought from home, or the soup or meat and potatoes bought from the counter.

A pianola played jolly tunes and after the luncheon was over a number of the girls joined in dancing for a few minutes. This was their own party—the men had to eat their luncheon in a separate room or at a bench in no room at all, according to their notion. It was not long before an alarm whistle blew and they scattered up and

down the stairs like a flock of eager birds. Hot milk for a penny or two at noon helps out a lunch, and I thought the girls were quite as well off as their associates, the men, for whom coffee was provided but beer denied in the mill. "Good business," a visitor said, and I guessed he might be right.

Section of the Lunch Room at McCormick Twine Mills

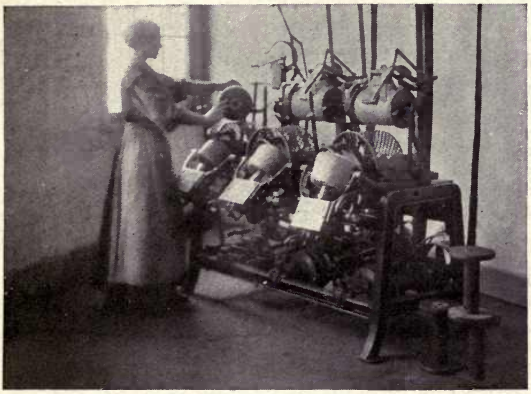
Back from lunch to the spinning room and the eighty or ninety girls who were taking care of two to four machines each, if I understood right. A boy wheeled the cans of fibre by the machine and the girl took the coil, only two or three inches thick now, and threaded it across a huge combing machine again, and before I knew I was in it, I had slipped from her hand and was winding around a big bobbin, whirling like mad but covered up tight by a sort of hood—a guard, the girls called it, so that if the bobbin got too excited and "flew off the handle" it couldn't hurt the girl and she was safe from getting her hands caught in what they called the "flyer."



This shows how effectively the Twine Making Machines are guarded

The girl snatched me and the bobbin off the rods just at the right moment, "all full," slipped another empty bobbin in the place and then she walked around or sat down where she could watch the

fibre creeping across the comb and then having hysterics around the bobbin. Not the girl having hysterics—she seemed to be dreaming of Poland, or sunny Italy, or Dakota. I was on a rack by the side until a big boy came along and loaded all of the full bobbins on a truck and wheeled us away to the ballers.



At the Balling Machine

More girls to work at my life, but no more combing—top floor of a big building and twine bobbins and balls everywhere, a few men still doing the heavy lifting and ever so many girls "balling." It was not so noisy here and I could hear the girls saying a word to a neighbor sometimes—not always in English but often in the language of their mother country. More than twenty nations have in one way or another greeted me today and they were all represented by the women—no girls under sixteen, nor many over twenty-five. The younger age cannot be employed because of laws, and the older ones slip away because of loves. They get married and go to housekeeping. All this I learned by hearing the answers to questions put by one they called "the welfare lady."

But listen to what happened. Just as I thought I could find out about a new "contraption" put on the machine so the girl could pull the ball off more easily without bumping it up with her knee—collapsible spindle it was—suddenly the fire whistle sounded, machinery at once shut off, employes formed in lines, single and double, marching out through different sections in accordance with signals given on air whistles.

There was no fire that day. Fire Chief Pollard, without notifying anybody, had the signal sounded to see how quickly the floor could be cleared, and whether the superintendent might feel satisfied that the women employes were really so well drilled that their safety was absolutely assured. They all went in directions in accordance with signals sounded, guided by one of the staff through doors which

would lead to safety. Men were stationed at the firedoors to keep them open until employes passed out. Some firemen mounted the hose, others the extinguishers and other fire equipment in the room.

From the time the alarm was sounded until the room was cleared of all employes, the time was fifty-four seconds as shown by the stop watch in the chief's hand. There must have been one hundred women in the room or perhaps more, and only two persons knew whether it was a real fire or a drill.

"How often are these given?" was asked the superintendent, and the answer was, "Usually weekly."

All windows are balance weighted so they can be raised immediately, and if they are directed to such an exit, the girls would go safely down the fire escapes, which reach to the ground.

After the drill, when the girls were notified by a signal that the fire was over, several were asked, "Were you frightened?" The invariable answer was, "Oh, no, we know what to do."

There was a fire at this Works once where a girl pulled down the hose and extinguished the fire. One day there was a fire on the first floor in the room adjoining the girls, and they worked along, saying, "Oh! the foreman will let us know if there is danger." All the floors can be signaled from the ground floor.

And so in this factory where the material is of an inflammable nature, the fire protection is as it should be — of the highest standard, and the human element is never for one instant lost sight of. Never in the history of the International Harvester Company has an employe lost life or limb from fire, so I heard them vouch.

This day in the twine mill, where a large proportion of the employes are non-English speaking people, witnessing the exactness

The Fire Department at Osborne Twine Mill

with which they obey instructions, shows that the lack of a common tongue is no bar to a thorough understanding of rules for safety.

Back from the fire drill I came to my truck of bobbins and was pushed by a boy to the balling machines. Here the girls are watching the spindles that unwind from the bobbins and reel round and round into a well shaped ball. Now, I have met my last girl worker today, I thought, as Rosa snipped off my head with a curved safety knife hanging from her belt by a cord, and balanced me on the scales to see if I was right weight. But another busy girl was waiting to inspect me after I had been polished off in a sort of bucket into which she slipped me and it was my luck to be picked out to go to the front to be tested. Another girl was standing before a wonderful machine that counted and weighed too, I think, and before I knew that I was "in court to be tried," she was whirling a few yards of my outside coat around a long frame, making believe I was working at my future job with the binder in the harvest field.

A Weighing and Testing Room

That girl knew I was a good ball and she put a mark on my side, and I was passed to still another girl to be refinished or covered on account of my outside coat being damaged in this medical examination by the tester.

Back again to my neighbors on the truck. Another girl gave us a label and a girl by the window stenciled a name on a sack. I don't read English, being only a ball, and I don't know what city I am in, but it said "Deering" or "McCormick," or maybe "Osborne," with a funny little mark, ⊕, and "Manila," "Pure Manila," "Sisal," or "Standard" — and then a big boy crowded me into the sack.

I'd like to know if there are any girls who work better than these I met today in my journey through the twine mill. I wouldn't know

where to look for them. Although, just being a ball, I haven't seen all work shops, I feel rather proud to come from a place that is sanitary and safe, and where those who work for a living may also play for the fun of it when work is over.

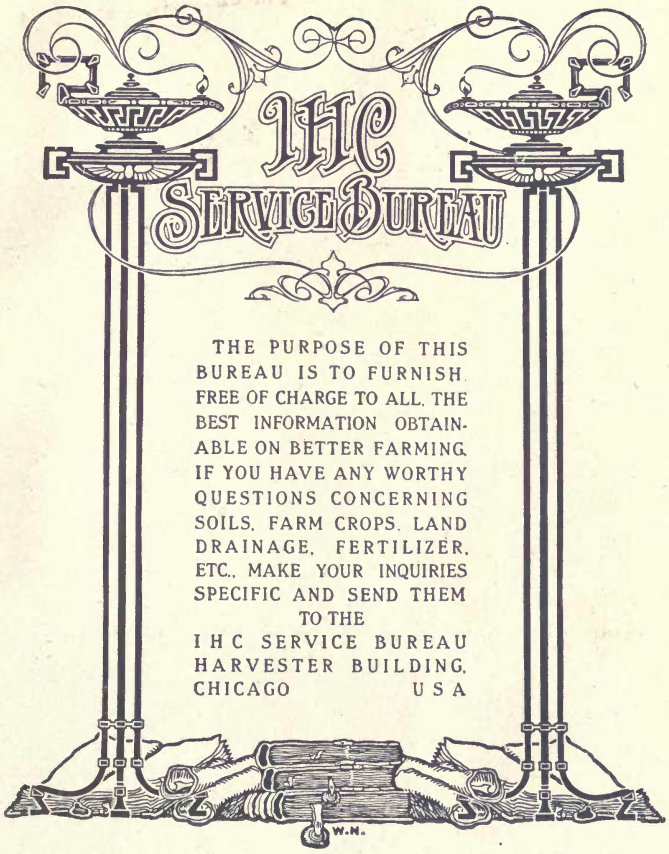
The Court at the International Twine Plant at St. Paul

Just being a ball, I have only one chance to spend a day in a twine mill, and I have seen only a few of the four hundred girls who belong to the International family in this one Works, but you may see three times that number or more, if you can spend several days and go to all the Works.

I heard something about a visiting nurse, and the doctor, and a library, but I didn't see them. There is a mysterious place called "the office," but I didn't go there. If a man is to be promoted or discharged he goes there, and if a girl leaves to get married at Easter, she goes to the office before pay day to get her money. The office people give orders and hear about troubles, and I think from what I heard today that there is what you call "heart" in this office as well as some power to make the whole machinery go.

Some one else may tell how many bales of fibre have been worked up and how many miles of twine manufactured—the figures are beyond me to understand. I remember only the faces and the hands of many girls who have helped this day to perfect me, the strong arms of men who have carried me and my kindred from place to place in that marvelous work shop, and the steady pulse that beats from "the office."

Now I must go on to those other people, the Dealers who help me on my way, and the Ultimate Consumer. I am especially interested in these last, because it was to help out in the grain fields that I started on my long journey.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