THE ROUND-LAP BALE METHOD OF SHIPPING COTTON.

BY D. ALLEN WILLEY.

The preparation of cotton for the market by what is known as the round-bale process is an industry which practically had its inception during the cotton season of 1896–97, when about 4,000 bales of this kind were shipped from the South. During the season of 1897–98 the number was increased to 70,000, while during the calendar year of 1899 it is estimated that 175,000 bales were prepared by this process.

In the main the plan followed is what is known as the Bessonette, invented by an American of this name. The several companies operating in the United States vary but slightly in the mode of forming the bale. What is known as the Standard circular press is in operation in some parts of the Southwest. The press the total pressure exerted being 7,500 pounds to the bale at the finish. When the roll has reached the required dimensions, the covering, which is suspended in a wooden framework above the press, is released, and descending, is formed mechanically around the bale. The metal ties which have been adjusted to the cover before it enters the machine are fastened by what might be termed metallic fingers. The operator then lets down the front of the press, and the bale, ready for shipment, is rolled out. This press can be operated by 6 horse power when connected directly with a line shaft and will take the product of six cotton gins when operated at its maximum speed.

The Standard press is quite similar in appearance to the one used principally in the Southeastern and Gulf States, which turns out what is known as the American round-lap bale. Like the Standard, it is attached cess the bat is wound several times around the core by the belt before encountering pressure from the rolls. But one roll is adjustable, moving back and forth. It is regulated by a valve connected with a compressed air chamber and cylinder, allowing the pressman to exert whatever pressure is desired upon the exterior of the bale. The air in the chamber is compressed by hydraulic power, varying from 325 to 275 pounds per square inch in the smaller presses, and from 250 to 200 pounds per square inch in the larger size.

The winding continues until the bale is of the proper diameter, when a signal bell is rung automatically and the bat is shifted to the opposite side of the press and a new bale begun. The completed bale is lifted from the bed of the press by the attendants, the core knocked out with a mallet, and its covering stitched on. It is then ready for the market, with the excep-

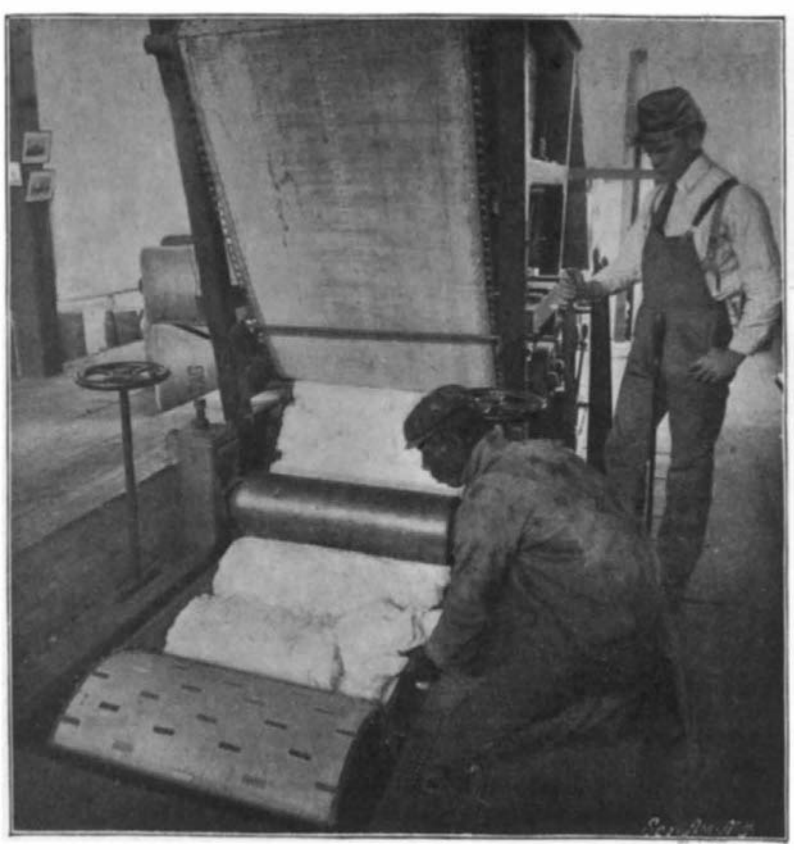
PLANTATION TEAMS UNLOADING COTTON AT THE PRESS.

COTTON SHIPPED IN THE SQUARE BALE.

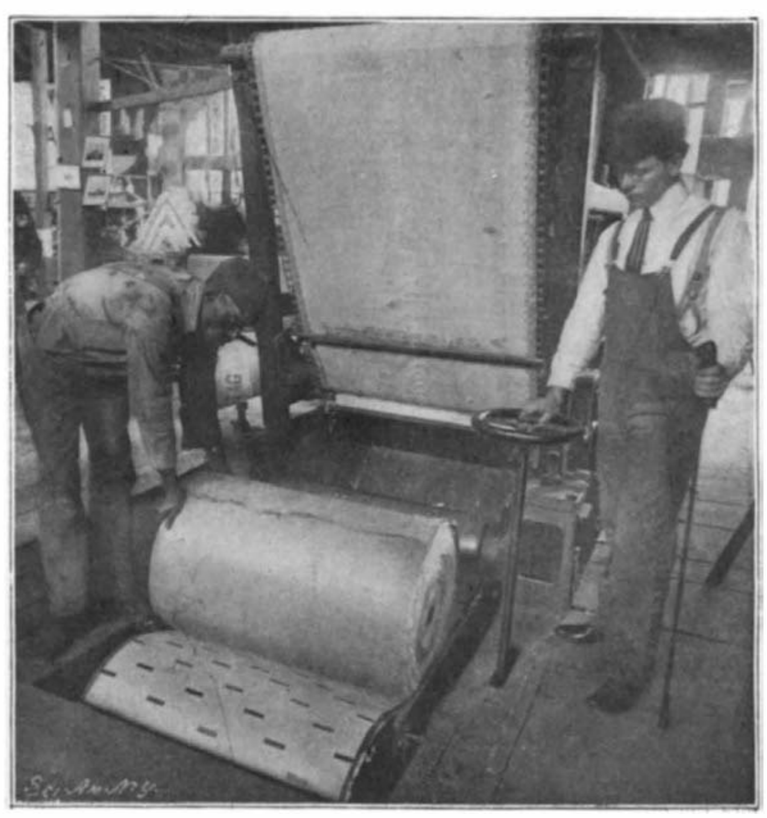
machinery proper weighs 6 tons and occupies a floor space 4½ feet square, with an arm supporting the screw shaft extending laterally about six feet from the press proper. In general a roller-press is operated by the baling-roll and endless-belt process. It is intended to be placed in a ginhouse and about twelve feet distant from the gin or gins. The cotton enters the top of the machine, passing between two belts operated on wooden rolls. The rolls and belts form a figure similar to the upper half of the letter Y, the lower ends of the trough formed by them gradually contracting until but a few inches of space are left for the cotton to pass through. By a movement somewhat similar to the carding machine in a spinning mill it is carried up into the bale former, as it might be termed, which revolves around an adjustable steel core. The endless belt of heavy metallic links, which is 25 feet long and 24 inches wide, operates two steel baling rolls which travel on carriages 7 inches long. These rolls, revolved by the belt, act in connection with the bale former, holding the cotton in place, gradually moving backward on their carriages as the size of the bale increases. As the baling winds around the core, the operator exerts more pressure on the rolls by means of the chain. When the mass of cotton is 10 inches in diameter, the pressure is 13 pounds to the square inch of its surface, to a condenser and bat former which take the place of the original condenser in the square bale press. The plant is attached directly to a series of from two to six or more gins, the condenser being connected with what is known as the lint flue, delivering the cotton as it comes from the gin to the bat former beneath it. The former comprises two endless aprons mounted in V shape, 2 inches apart at the bottom and 5 feet at the top, their inner surfaces traveling downward. The space between these is closed at both ends by boards, forming a hopper which receives the loose cotton directly from the condenser, converting it into a bat of 10 to 12 inches in thickness and averaging 2¾ pounds in weight to the square yard. In a continuous roll the bat passes beneath the first compression roll, which excludes most of the air, while the compressed material is round around a steel core, which is $2\frac{7}{16}$ inches at the larger end, tapering to $1\frac{1}{8}$, so that it can be easily removed. The core constitutes the temporary center of the bale, which is formed by the revolution of two baling or compression rolls and the baling-belt which passes beneath the rolls and under the bat. The belt acts as a guide in keeping the bat of the proper dimensions, while it also keeps it from sagging down and rolling unevenly. The baling rolls are located 5½ inches apart in this press, so that in the pro- tion of stenciling the weight, the press from which it came, and the address.

The majority of the round-bale presses in use in the South have bale formers on each side, and are so arranged that two bales can be prepared at once, the condenser being large enough to supply the necessary double bat. They are of two sizes, one turning out bales 22 inches in diameter and 35 inches in width, for export demand, and the other 25 inches in diameter and 48 inches in width, for American mills. The time required for the operation varies from 8 to 20 minutes, according to the rate of speed of the machinery. When running at maximum speed, 10 minutes will cover all of the work, including the wrapping and labeling.

A plant established in Weldon, N. C., in 1898, is a fair sample of the presses which are installed in the smaller communities of the South. This consists of a double press with the condenser and bat former connected with four Munger gins, each of 70 saws capacity. The machinery is housed in a wooden building 50 by 25 feet in dimensions and is operated by water power generated from one turbine wheel. The cotton loosely piled on wagons is driven under an open shed from which are suspended suction pipes of tin 12 inches in diameter. Exhaust fans suck the cotton into the gins, which remove the seed and a portion of the dirt and



ROUND-BALE PRESS—COMMENCING A BALE.



ROUND-BALE PRESS—THE FINISHED BALE.

other foreign matter. From the gins the cotton is forced, also by air suction, to the condenser and press, where the bales are completed at the rate of 12 per hour. To operate this plant, 60 horse power is required, of which 35 is taken by the ginning machinery and 25 by the baling machinery. The manual labor required consists of a boy feeder, who merely directs the cotton into the suction pipes, a gin tender for the series of four, one pressman and two attendants, who

STITCHING THE BALE.

remove the bales from the press and stand by in case a belt should slip or something occur which would require the readjustment of any part of the machinery. In connection with the Weldon press is a cotton-seed oil mill, which converts the seed into liquid, hulls, and meal on the spot. The hydraulic power is applied by means of valves in the usual manner, while the press is controlled by a lever as shown in the illustration.

The advantages claimed for the round-baled cotton are that it economizes space; it is less liable to ignition; it is more readily handled in transportation and at the mill, as the covering is less liable to be damaged and the loss in this respect reduced to a minimum. The density of the American square bale is from 20 to 25 pounds to the cubic foot. A car loaded with square bales 54 inches long, 27 inches wide, and 16 inches in thickness will carry between 24,000 and 25,000 pounds. A cargo of bales pressed but once at the plantation will average about 13,000 pounds. The same size cars loaded with round-bale cotton have carried from 52,000 to 79,256 pounds. A carload containing the greatest weight has recently been received at Galveston, Tex. This is the largest quantity of the staple ever placed in one car. The density in the round bale ranges from 35 to 45 pounds per cubic foot, which is the same density as Egyptian cotton, considered the best square bale in the world. It is calculated that the round bale can be stowed on board vessels with a loss of but 9¾ per cent in waste space, while the expense of screwing, which is necessary in loading square bales, is done away with, saving from 30 to 40 cents per bale. The internal pressure in making the round bale reduces the quantity of air to such a small amount that it is claimed that the danger from "cotton fires" is reduced to a minimum, thus lowering insurance rates to cotton shipper and vessel owner. The size and form of the round bale allow it to be much more easily carried. As samples are taken of the cotton during the baling process, it is not necessary to open the completed package, as is the case with the square bale, to ascertain the quality, and the loss from the exposure is avoided. Other advantages claimed for the round-lap bale are that it can be fed directly at the mills without the necessity for rehandling, and that on the plantation and in the local market the time and labor necessary to sample, press, and compress it are entirely avoided, as well as the extra expense for metal bands or ties.

An objection urged against the round bale is that the pressure exerted to each roll is liable to crush the fiber and lessen its value at the mills. It is asserted that carelessness of the pressman may cause too much power to be applied. It has also been urged that grease and oil on the machinery will soil it unless the apparatus is kept properly cleaned, as the lubrication required includes portions of the press which are in proximity to the cotton.

Action of Lime in Arable Lands.

The Consulting Committee of Agricultural Stations and Laboratories has made the following communication, says Le Phosphate, concerning the action of lime in soils:

The requisite quantity of lime must be considered from two points of view:

1. As a fertilizer.

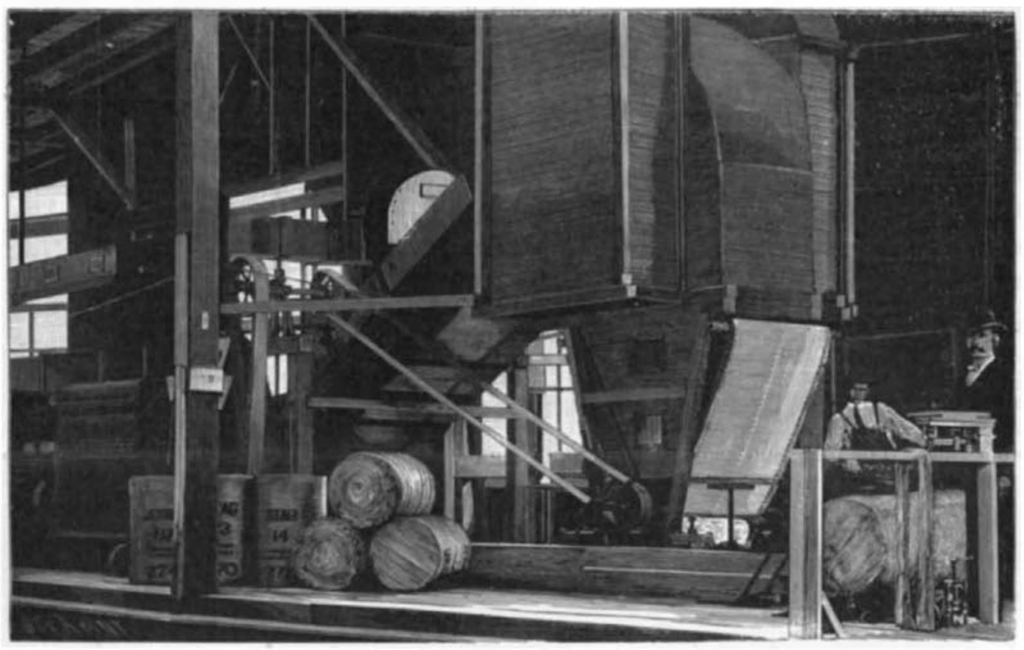
2. As a constituent part of the soil, modifying its physical and chemical properties.

From the view-point of the alimentation of plants, comparatively small quantities of lime may suffice, not materially exceeding the amounts of potash and phosphoric acid. Like potash, lime is a part of the vegetable products serving for forage and litter, and is thus returned to the soil with the manure. Slight dressings are sufficient to keep up the quantity of lime necessary for an average yield.

From the view-point of the chemical reactions of the soil, it is needful that there should be a considerable quantity of lime to thoroughly permeate the organic matter. The chemical reactions are especially the combustion of the organic matter and the nitrification and double composition with the salts of ammonia and potash, facilitating the absorption of these fertilizers by the soil. These various functions constantly transforming the lime to the state of bicarbonate, nitrate, sulphate, and chloride, require considerable quantities of calcareous matter in the soil in order that the proportion should not be materially reduced. The quantity cannot be stated definitely, but it ought to be the greater the more organic manures are used. Several hundreds of kilogrammes of calcareous matter disappear yearly from the surface of a hectare when the soil is moderately manured.

From the view-point of the mellowing of the soil, the rôle of the lime is not less important. It is known that there is an action on clays which reduces their plasticity and adapts them for acquiring the properties of arable lands. If the proportion is too small, special properties will predominate in the clay, and the lands will be stiff, less permeable, less fitted for utilizing the organic matter, and less easy to work. The proportion of calcareous matter which soils ought to contain is very variable, not only according to the proportion of the clay, but also to the fineness of the carbonate; less quantities are requisite if the division is extreme. The presence of sandy matter, which in itself tends to increase the permeability, may render more efficacious the action of a less proportion of lime. In soils containing a marked quantity of clay several hundreds of kilogrammes are needful. Heavy lands are often seen with considerable quantities of lime without the compactness of the clay being sufficiently effected.

For light lands this is not the case. In these the lime ought not to increase the permeability, since it is already too great. The lime should serve for giving them body, combining with the organic matter which they contain and forming calcium humate, whose agglutinating properties are well known. In such soils it is sufficient, having in view their physical properties, to supply a less proportion of lime. With the same quantities of calcium carbonate light lands are more calcareous than stiff lands; and when deficient it is not necessary to supply as much by liming or marling in the first as in the second.



INTERIOR VIEW, SHOWING ROUND-BALE PRESS FED DIRECT FROM THE GINS.

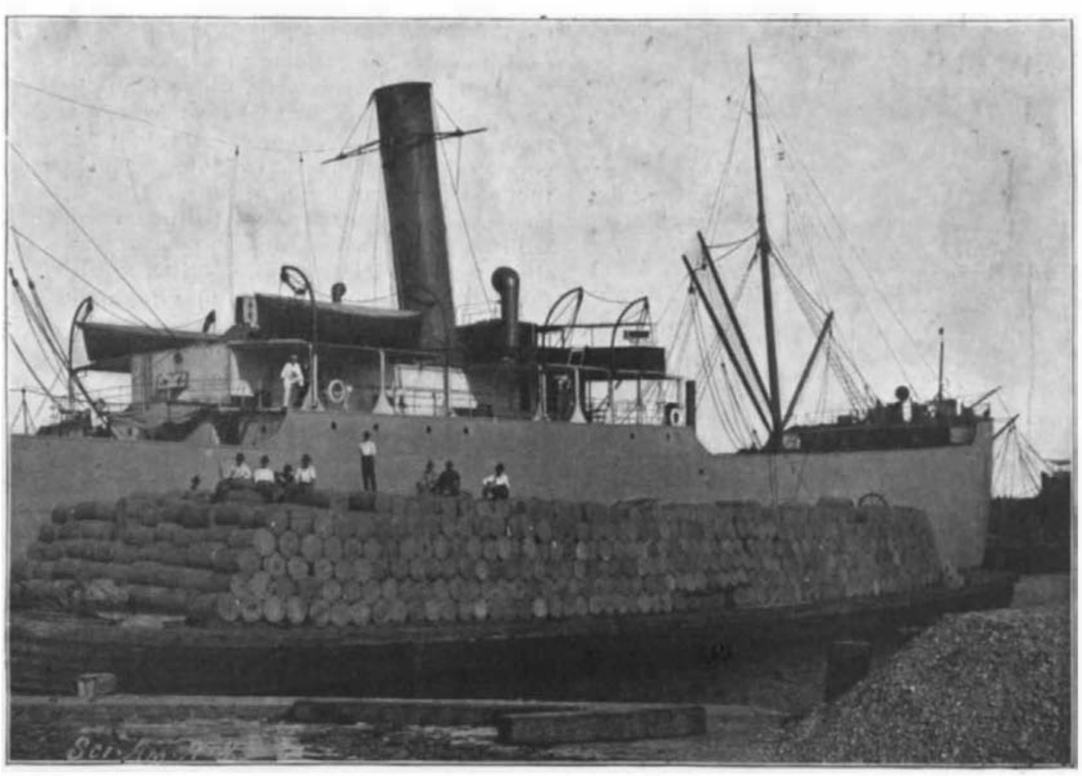
In lands rich in organic matter it is requisite that they should contain sufficient quantities of lime to thoroughly saturate the humic matter, otherwise the lands would be moors and heaths, which in their natural state cannot be considered as arable.

From what has been said it may be understood that it is difficult to fix the limit to which the quantity of lime may be reduced, since the limit varies with the proportions of the other matters.

For light lands less than one per cent of calcareous matter is sufficient, while three or four per cent may be too little for stiff lands.

Chemical analysis is, therefore, insufficient to determine whether a soil has need of the application of lime. It is only in the case where it is absent or in very small proportion that this method of research may give reliable indications. But for soils containing nearly but not quite enough, it is practice and direct experimentation which must supplement the data furnished by analysis.

LANDSCAPE architecture is to be taught at the Lawrence Scientific School in a four years' course. The subjects taken up will include architecture, landscape design, surveying, study of plants in relation to landscape gardening, the construction of roads, water supply, drainage, geology, horticulture, drawing of contracts, etc. The subject is a very attractive one, and the results will be looked for with interest. The country, however, cannot support a very large number of graduates, though landscape gardening is a delightful profession.



BARGE LOAD OF COTTON IN THE ROUND BALE.

India Rubber in South America.

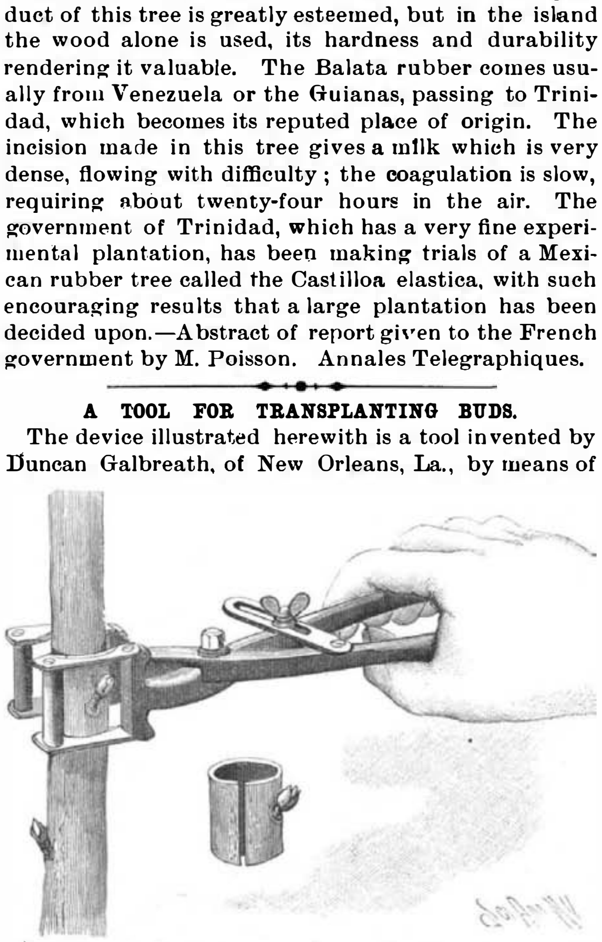
M. Eugene Poisson, who was sent by the French government to South America to examine into the India rubber question, has lately returned, and the official report which he gives presents many points of interest. The principal object of the expedition was to obtain information as well as seeds and plants, with a view of propagation in the French colonies. The city of Para, Brazil, was first visited; this is one of the great centers of the rubber industry, and the product found in the region is one of the most highly esteemed by the trade. To give an idea of the extent of the traffic in the region called Amazonia, it may be remarked that for the year preceding June 30, 1897, the fifteen principal houses have exported 22,300,000 kilogrammes of rubber, whose total value is estimated at $23,000,000. The Para rubber is taken from a tree belonging to the Euphorbiaceæ, genus Hevea, which grows in the damp earth on the borders of the numerous affluents of the Amazon. Divers species of this tree exist in different regions, giving different qualities of rubber; thus in lower Amazonia is found the H. Braziliensis, in the environs of Manao the H. discolor, and in the regions of the Rio Negro and Rio Naupes the H. pauciflora and H. lutea. In spite of efforts which have been made to determine the value of each of these species, this has been difficult, if not impossible, as it demands a prolonged sojourn in the humid forests which is not without peril for a European, as examples have shown. M. Poisson visited the forests near Para to observe the collection of the rubber. It appears that the natives distinguish two kinds of trees, which they call the white and the black Hevea, from the difference in the color of the leaves, the black giving the better quality of milk, but the mixture of the two seems to be superior to either taken separately. The hevea generally grows singly, and the seringueros, or sap-collectors, sometimes cover several miles in collecting the product. M. Coudreau, the explorer, has seen groups of trees on the banks of certain rivers, but very far from the main stream, generally in localities where it is impossible to stay on account of the clouds of mosquitoes found there. M. Poisson was able, after some difficulty, to secure samples of the milk for analysis, in well-corked bottles, but under the influence of the tropical heat fermentation often takes place. In the Amazon region the rubber is extracted by making a shallow incision in the bark of the tree with a small hatchet; below the cut is placed a small tin vessel held in place by its sharp rim, which is forced lightly into the bark. The contents of the buckets are emptied into a calabash and taken to the carbet, a small installation where the operation of "smoking" is carried out. This consists in dipping a blade of wood with a long handle into the milk, then exposing above a terra-cotta furnace in which burn small pieces of wood and the fruit of a certain palm called the attalea; the operation is repeated until a mass of sufficient size has been obtained, when it is detached by slitting one side. It is in this form that the rubber is delivered to commerce. The aim of this treatment is not only to evaporate the water and avoid putrefaction of the rubber, but the nut of the attalea possesses specific properties; analysis of the smoke shows the presence of acetic acid, which causes the milk to coagulate instantly, the creosote acting as an antiseptic.

The province of Ceara was next visited; here the rubber is obtained from a tree also of the family of Euphorbiaceæ, the Manihot glaziovi, which grows in dry soil; it is a tree of medium height—10 to 12 meters at most. Its milk is thicker than that of the Hevea, and it coagulates more rapidly. For this reason it is usually collected by allowing it to run down the side of the tree, where it dries in one or two days; it sometimes reaches the ground, becoming mixed with impurities. It is exported in several forms, either in balls or cakes more or less mixed with sand and debris, in globules formed by making light incisions in the bark, or in cakes prepared, like the Para rubber, by the fuming process, which is coming more and more into practice. As to the production of rubber in Ceara, no exact figure could be obtained; but according to the dealers, 400 tons had been produced in 1897. The governments of these two regions have endeavored to organize plantations by offering prizes, but with little success; the growth of the manihot is, however, very rapid, plants of five months attaining a height of 7 to 8 feet, and in one year, 12 feet. A third variety of rubber tree which merits attention is the Hancornia speciosa and its varieties, which give the rubber known as Pernambuco. It is a small tree bearing an edible fruit, which is sold in the markets. At Ceara, where samples of this rubber were seen, it was learned that it is nearly all exported to Liverpool; the quantity produced is, however, relatively small. M. Poisson had some difficulty in obtaining seeds; those of the hevea keep but a short time; the ceara varieties are more satisfactory. These seeds are greatly sought for by Americans, Englishmen, and Germans, but their collection must be carefully watched over, as the natives, suspicious of foreigners, will try to destroy their value, either by boiling or otherwise; 100,000 seeds of the hevea and 320,000 of the manihot were secured, with a loss of 30 per cent on the former, which should always be counted upon.

In the island of Trinidad was found the Miumsops balata, a magnificent tree of great height, and a diameter which sometimes exceeds 1⅛ meters. The product of this tree is greatly esteemed, but in the island the wood alone is used, its hardness and durability rendering it valuable. The Balata rubber comes usually from Venezuela or the Guianas, passing to Trinidad, which becomes its reputed place of origin. The incision made in this tree gives a milk which is very dense, flowing with difficulty; the coagulation is slow, requiring about twenty-four hours in the air. The government of Trinidad, which has a very fine experimental plantation, has been making trials of a Mexican rubber tree called the Castilloa elastica, with such encouraging results that a large plantation has been decided upon.—Abstract of report given to the French government by M. Poisson. Annales Telegraphiques.

A TOOL FOR TRANSPLANTING BUDS.

The device illustrated herewith is a tool invented by Duncan Galbreath, of New Orleans, La., by means of

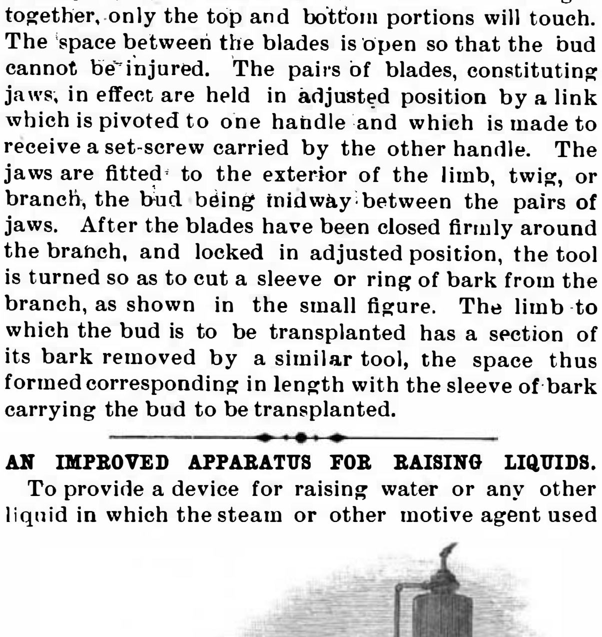


GALBREATH'S TOOL FOR TRANSPLANTING BUDS.

which buds may be transplanted without injury. The tool consists of two pivoted levers or handles, each having a cross-head upon one end. To each cross-head a pair of blades is screwed, formed with concave cutting-edges, so that when the handles are brought together, only the top and bottom portions will touch. The space between the blades is open so that the bud cannot be injured. The pairs of blades, constituting jaws, in effect are held in adjusted position by a link which is pivoted to one handle and which is made to receive a set-screw carried by the other handle. The jaws are fitted to the exterior of the limb, twig, or branch, the bud being midway between the pairs of jaws. After the blades have been closed firmly around the branch, and locked in adjusted position, the tool is turned so as to cut a sleeve or ring of bark from the branch, as shown in the small figure. The limb to which the bud is to be transplanted has a section of its bark removed by a similar tool, the space thus formed corresponding in length with the sleeve of bark carrying the bud to be transplanted.

AN IMPROVED APPARATUS FOR RAISING LIQUIDS.

To provide a device for raising water or any other liquid in which the steam or other motive agent used



ELLIOTT'S APPARATUS FOR RAISING LIQUIDS.

is automatically controlled, Mr. Ralph W. Elliott, of Oakley, Cal., has invented the apparatus represented in our illustrations. Fig. 1 is a partial section of the apparatus; Fig. 2 a detail. The apparatus consists of a vessel submerged in the water to be raised, and provided at its bottom with a self-closing and opening inlet-valve. The water admitted by the valve is discharged by a central pipe connected with the next vessel above, and provided at its lower end with a self-opening and closing inlet valve. The discharge pipe, as shown in Figs. 1 and 2, passes up through a cylinder superposed on the vessel and forming part of the valve for controlling the steam. The steam is led into the cylinder by a pipe connected with an annular chamber having openings leading to the outside of the cylinder. A second set of openings above the first serves to connect the cylinder and vessel with the atmosphere. A ring-shaped valve, alternately closing the two sets of openings, is provided with downwardly-extending rods, having collars guided on the central discharge-pipe. Between the collars a float is mounted on the rods.

When the valves are in the position shown in Fig. 1, the steam or compressed air is cut off, and the water will flow into the vessel through the open inlet-valve at the bottom, causing the float to rise. As the float comes into contact with the upper collar, the ring-shaped valve is raised, closing the air-inlet openings, opening the steam-pipe, as shown in Fig. 2, and permitting the steam to flow through the annular chamber into the vessel to force the water up through the discharge pipe. As the water falls within the vessel the float sinks, finally touches the lower collar, thereby pulling the ring-shaped valve down, shutting off the steam, and opening the air-inlets. The steam under pressure passes out into the atmosphere; water again rises within the vessel; and the cycle begins anew.

The perfect automaticity of the operation constitutes the most striking feature of the invention.

A Gelatino Citrate of Silver Emulsion for Photographic Paper.

At a recent session of the Union Nationale des Sociétés Photographiques de France, M. A. Blanc brings out the fact that the formulæ for preparing the photographic papers of the citrate of silver type are little known, and he proposes to give a formula which he has found very good in practice, giving very clear whites with a great facility in toning. Before proceeding to prepare the emulsion proper, a preservative emulsion is first prepared according to the formula:

Alcohol, 90°	15 c. c.
White shellac	5 grammes.

Dissolve hot and pour rapidly into 100 c. c. of boiling water; filter through absorbent cotton. The yellowish-white emulsion thus formed will keep for a considerable time. To prepare the sensitive emulsion, he proceeds as follows:

SOLUTION A.

Gelatine, best quality	9	grammes.
Chloride of cobalt, 5 per cent solution	6	c. c.
Neutral tartrate of ammonia	2	grammes.
Citrate of ammonia	½	gramme.
Water	70	c. c.

This is to be placed in a porcelain receptacle of about 150 c. c. capacity; in a smaller vessel is placed—

SOLUTION B.

Nitric acid	2·3	grammes.
Distilled water	20	c. c.

After mixing, add 2½ grammes crystallized nitrate of silver.

The vessels A and B are placed in a water-bath and the temperature kept between 70° and 80° C. Each solution having been well mixed, B is poured rapidly into A, and to the emulsion which forms is added:

Alcohol, 90°	10 c. c.
Preservative emulsion	5 c. c.

Mix and filter through absorbent cotton: the emulsion is then ready to be applied to the paper. It should be used as soon as possible after preparation, as it will not keep longer than a few days. The paper, of course, may be kept for a long time without deterioration.

Copper Iodide Reactions.

M. Pozzi-Escot has lately given an account to the Academy of Sciences of a series of reactions which he has carried on with the iodides of copper; he has succeeded in obtaining two new compounds. These take the form of minute crystals, whose formation may be observed to advantage under the microscope. It is already known that if iodide of potassium is added to a cupric salt, a precipitate is obtained which is a mixture of iodine and cuprous iodide, Cu_2I_2. The experimenter has obtained the cupric iodide, in combination with ammonia, in two different forms. The first of these is the iodide, $CuI_2,4NH_3,H_2O$, which takes the form of small tetrahedral crystals of a fine blue color; it is obtained by treating an ammoniacal solution of copper by ammonium or sodium iodide. A second and rather unstable compound has also been obtained, which the experimenter supposes to be $CuI_4.4NH_3$. Its formation gives a fine reaction when viewed by the microscope. To a solution of a cupric salt is added a slight excess of ammonia; this is heated to 40° C., and a solution of ammonium or sodium iodide added. Under these conditions the liquid becomes yellow green and deposits fine rhomboidal crystals of a blackish-brown color, and sometimes orthorhombic crystals of an orange tint. These preparations, seen under the microscope, resemble the iodoplatinate of potassium, but the distinction is easy to make, and besides the crystals change their form and color rapidly. In 10 to 40 minutes, according to the conditions of the experiment, one finds only flat and short prisms and irregular crystals, whose color has changed to a light yellow-green.