A NOVEL CUTTING OFF MACHINE.

This is a band cut-off saw manufactured by Butterworth & Lowe, of Grand Rapids, Mich., who have improved on the construction and details, making the entire frame of iron and steel, and giving especial care to the counterbalancing and to reducing the friction to a minimum. The backbone of the machine, as well as the posts that carry the guide rollers, are of steel tubing; the yoke that carries the backbone is supported on trunnions that are cast solid with the base. The saw is maintained at a uniform tension by an adjustable coil spring, another sensitive adjustment controlling the position of the saw on the out end wheel. The guide rollers (between which the saw blade runs) can be adjusted to line the saw as desired, also to keep the saw teeth a proper distance from the edge of the rollers. Other adjustments also permit the use of saws two or even three feet shorter than commonly used on the machine. The frame is accurately balanced, and the use of a compensating sheave allows the saw and frame to be worked up or down at one point with the same force that is required at any other point. This force is very little, as the rope sheaves are fitted with roller bearings. The machine does not require a strong or special foundation, but can be bolted to the floor of the building. The log does not need dogging or holding while being cut. The machine can be operated entirely by hand, requires no friction or other mechanical hoists to raise the saw and has positive adjustments at all points.

For wood pulp work it is especially adapted, as the cut leaves the sawed ends smooth and clean, the saw teeth traveling in straight and parallel lines and in only one direction. In using the ordinary circular cut-off devices, or coarse tooth drag saws, small flakes of sawdust loosen in grinding and work into the pulp. The violent jarring of ordinary drag saws is obviated by the use of this machine, which works smoothly and rapidly. The machines are at present made to carry wheels 28, 36, and 48 inches diameter, the size of wheels limiting the machine to about that diameter of log.

A NOVEL CUTTING OFF MACHINE.

THE LAC INDUSTRY.

Lac, improperly called "gum lac," is produced in two very different ways: (1) through the puncture of various plants by certain insects (such as the lac of India, Persia and Madagascar), and (2) by an incision made in certain resinous trees (such as the lac of China and Japan).

Lac of India.—The Indian lac is collected from trees of very different genera—sacred fig, banyan, jujube, acacia, croton, etc. It forms under the influence of the sting of a hemipterous insect, the Carteria lacca or Coccus lacca. It is a gall insect of the cochineal kind, resembling a red louse, which, at the time of oviposition, fixes itself in great numbers upon the young branches of the above-named plants. These insects secrete a resinous and waxy substance which solidifies, in imprisoning the insects, and forms a thick crust that covers the epidermis of the branch attacked. The oviposition is effected during this transformation. The female dies, and her body becomes a vesicle filled with a reddish liquid designed as food for the larvæ. Each female lays twenty eggs, which become larvæ and perfect insects and escape from the resinous stratum.

The collecting of the lac is done by gathering the branches upon which it is found before the transformation of the larvæ into perfect insects. The lac is delivered to commerce in sticks, grains, scales and threads. "Stick lac" is the natural product. This lac still adheres to the branch upon which it was produced.

"Seed lac" is merely the preceding broken into fragments and separated from the branch. Sometimes it consists of pieces that have fallen from the branch and been carefully collected. "Shellac" results from the fusion of the first. It is prepared as follows: The stick lac is broken in order to free it from the impurities that it contains (fragments of bark, wood, etc.) It is then put into tubs of water, in which the Indians bray it with their feet in order to wash it well. The water is renewed until it finally comes off clear (Fig. 3). The washed lac is then boiled with alkaline water in order to dissolve the color that it contains. The softened and melted resin rises to the surface of the bath, while the color, called "lac dye," is collected by decantation and is used for dyeing morocco leather and cashmere wools. The lac in paste is put into a long and narrow cotton bag that two Indians hold by the ends and twist in exposing it to a quick fire burning in an open grate (Fig. 4). The lac passes through the fabric and falls into a wooden trough, from which it is ladled by an Indian and poured in the form of a thin stratum over copper cylinders. Before the lac is completely dry, it is broken into irregular scales that are submitted to a moderate pressure. These scales are very thin, transparent, brittle, and of a golden reflection. Lac in threads is merely lac drawn out while it is melted to a pasty consistence. In commerce there are distinguished brown, red and yellow lac. The difference between these is due merely to their degree of coloration by the alkaline liquor, as we have just said.

In order to obtain white lac, it is necessary to have recourse to a chemical treatment by alkalies and to bleaching by pure alkaline hypochlorites, to which are added weak acids or oxygenated water.

The origin of Guatemala lac is identical with that of the lac of the Indies. The Madagascar lac is produced by the Gascardia Madagascariensis, which lives upon a tree of the order Lauraceæ. This lac is in spherical or ovoid masses (Fig. 2) traversed by a branch in the direction of the longer axis. The size of these reaches that of a pigeon's egg. The color of this lac is a grayish yellow. Its composition is similar to that of the Indian lac.

The Lac of China and Japan.—The lac of China and Japan is produced by incisions made in the trunk of the lac tree or varnish sumac (Rhus vernicifera), called "wrushi" by the Japanese. This tree is reproduced either by seeds or cuttings. It does not yield lac until it is eight or ten years old. The collecting is done as follows:

At about 30 cm. from the ground, the upper part of the bark is scratched with a knife (Fig 1, No. 2) for a width of 3 cm. and a length of 6. With the instrument shown in No. 1 of Fig. 1, incisions 12 mm. in width are made in a horizontal direction in the bark, other incisions are made with the point found on the

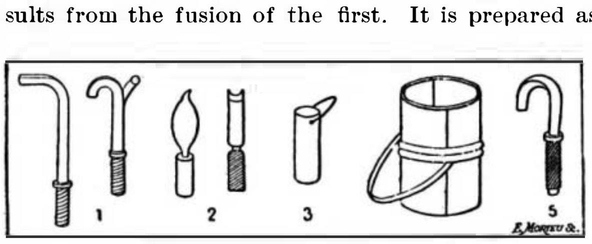


Fig. 1.—TOOLS AND APPARATUS USED IN THE WORKING OF LAC.

1. Rounded knives. 2. Knives. 3. Bamboo tube. 4. Bucket for lac. 5. Rounded knife.

Fig. 5.—PREPARATION OF COLORED LACS.

1. Bowl. 2. Mixing tool. 3. Method of operating. 4. Branch of sumac, showing incisions.

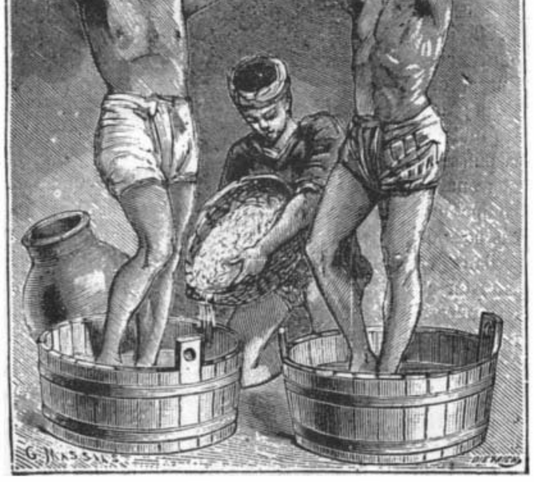


Fig. 3.—METHOD OF WASHING LAC.

Fig. 4 PURIFICATION OF LAC.

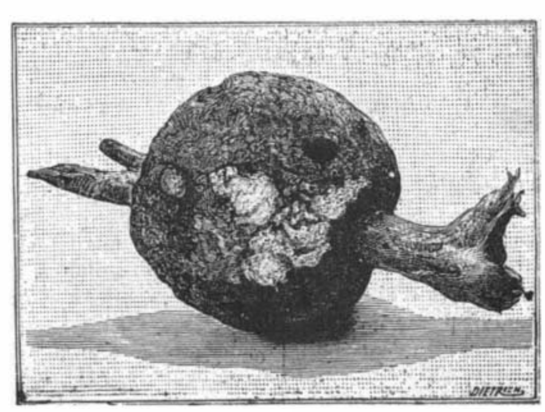


Fig. 2.—MADAGASCAR LAC.

back of the knife. Four days after the incisions have been made, the lac begins to flow from the tree and is collected with a strip of wood and put into a bamboo tube (Fig 1, No. 3). After the lac has been removed from five or six trees, the collector returns to the first tree and makes an incision therein over the others, and so on with the remaining trees. It is necessary to remove the lac as soon as possible after it begins to flow, otherwise it would become brown, and even black in the air.

A workman can tap two hundred trees in a day. A tree of a circumference of from 15 to 20 cm. will yield from 90 to 95 grammes of varnish per season. Varnish of the first quality is collected from May to October. During the month of October the lac is of second quality. The varnish that comes from the branches is collected with a special knife (Fig. 1, No. 5). From the bamboo tubes the varnish is poured into a pail capable of holding 9 kilogrammes. The lac is stored in a similar vessel, but of a capacity of 30 kilogrammes.

When the tree ceases to yield varnish, the branches are lopped off and cut into pieces one meter in length, which are tied up in packages. After these have been dried for three or four days in the sun, they are immersed for five or six days in cold water, and are then incised with a knife in the form of a corkscrew. The juice that exudes is collected in a pail. This is lac of the third quality. The lac is preserved in a vessel which is hermetically closed. A hundred varieties of lac are known in China and Japan. Lac is mixed with iron or steel filings to form a paint that is used for covering wood and imitating slate. One variety of lac is prepared thus: Three hundred and seventy-five grammes of lac and 75 of oil are mixed and passed through cloth and 50 grammes of iron filings are added. Red lac is obtained by mixing lac with oil, vermilion and extract of Gardenia florida.

Colored lacs are obtained by mixing colored powders with ordinary lac. Black lac is obtained by exposing ordinary lac to the sun in a wooden bowl (Fig. 5, No. 1), which is placed in an oblique position (Fig. 5, No. 3). During this time a workman stirs the lac with a spatula in taking care to add a little iron filings to it. The Chinese lac is the product of the same tree (Fig. 5, No. 4). Lac is employed in the toy trade, marquetry, cabinet making, etc.—La Nature.

Engineering Tools at Pompeii.

Under the title of "Things of Engineering Interest Found at Pompeii," Professor Goodman lately gave his inaugural lecture in the engineering department of the Yorkshire College, Leeds. The lecturer remarked that he had recently visited Pompeii, and was not only charmed by the great beauty of the works of the ancient Romans, but also by their extreme ingenuity as mechanics—in fact, it was a marvel how some of the instruments and tools they were in the habit of using could possibly have been made without such machinery as we now possess.

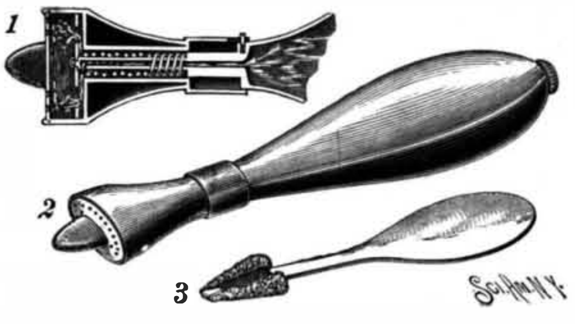
After explaining the situation and destruction of Pompeii by showers of ashes and mud, not lava, as is usually supposed, in the year 79 A.D., Professor Goodman showed a series of about fifty lantern slides, prepared from photographs taken by himself in Pompeii last Easter. The streets, he explained, were used as waterways to carry off the surface water, and probably sewage, from the houses. The pavements were raised about a foot above the streets, and stepping stones were provided at intervals for foot passengers.

The horses and chariot wheels had to pass between, and in many places deep ruts have been worn by the chariot wheels in the stone paved streets. The water supply of Pompeii was distributed by means of lead pipes laid under the streets. There were many public drinking fountains, and most of the large houses were provided with fountains, many of most beautiful design. The amphitheater, although a fine structure, capable of seating 15,500 people, was small compared with many in Italy. The bronzes found at Pompeii reveal great skill and artistic talent. The bronze brazier and kitchener were provided with] boilers at the side and taps for running off the hot water. Ewers and urns have been discovered with internal tubes and furnaces precisely similar to the arrangement now used in modern steam boilers. Several very strong metal safes, provided with substantial locks, have been found. The locks and keys were most ingenious, and some very complex. On looking at the iron tools found in Pompeii, one could almost imagine he was gazing into a modern tool shop, except for the fact that the ancient representatives have suffered severely from rust.

Sickles, billhooks, rakes, forks, axes, spades, blacksmith's tongs, hammers, soldering irons, planes, shovels, etc., are remarkably like those used to-day; but certainly the most marvelous instruments found are the surgical instruments, beautifully executed, and of design exactly similar to some recently patented and reinvented. Incredible as it may appear, yet it is a fact, that the Pompeiians had wire ropes of perfect construction.

A BUTTONHOLE MOISTENER.

The illustration represents a simple device adapted to moisten the starched and stiff surface around a buttonhole, especially in collars and cuffs, to facilitate buttoning. It has been patented by Charles Miller, of No. 239 Fourth Avenue, New York City. As shown in perspective and section, Figs. 1 and 2, the body of the device has a projecting wedge-like lip adapted to enter a buttonhole, and there are apertures in the front part of an adjacent portion adapted to hold a sponge or other absorbent material, at the back of which is a spring-pressed perforated plate. An aperture in the handle, closed by a screw plug, provides for supplying water to moisten the sponge. Fig. 3 represents a modification of the device in which a sponge is attached in

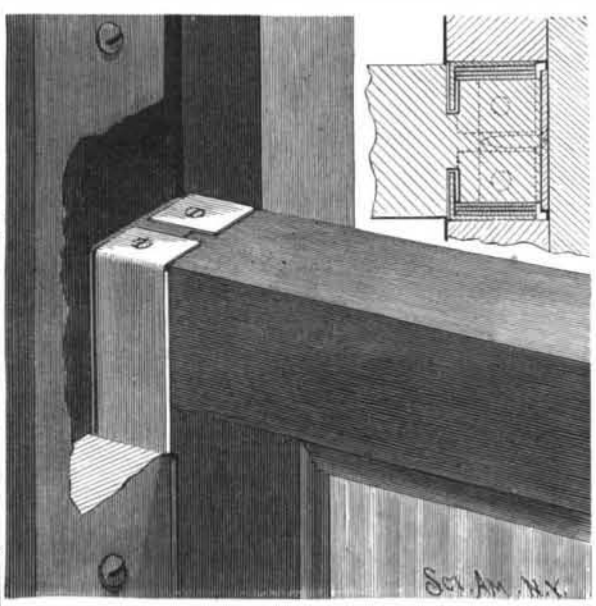


MILLER'S BUTTONHOLE MOISTENER.

pointed wedge shape to a suitable handle, the sponge to be then dipped in water as used.

AN IMPROVED CAR WINDOW SASH.

To enable a car window to be readily moved in its beads or frame, while the sash also fits so closely as to exclude wind or rain, the improvement represented in the accompanying illustration has been devised and patented by Henry V. Herrmann, of No. 97 Water Street, New York City. Near each edge and at each side of the sash is an L-shaped groove comprising a part extending parallel to the sash, and a part extending inwardly and transversely, as indicated in the sectional view, and fitted in each of these grooves is a movable metallic strip, interposed soft rubber strips serving to push the metallic strips outwardly to cause them to bind against the window beads, while making an easy and frictionless connection between the parts. The ends of the strips have flanges seated in recesses in the upper and lower edges of the sash. Secured to each vertical edge of the sash is also a metallic strip whose vertical edges project sufficiently to engage the edges of the rubber strips at the sides when the latter are spread by compression, thus preventing contact of the rubber with the wood of the window frame. This construction is designed to compensate for all shrinking and swelling of the wood of car windows,



HERRMANN'S SASH FOR CAR WINDOWS.

enabling them to be readily moved up and down at all times, while at the same time a tight and weatherproof joint is secured.

A New Waterwheel.

A waterwheel of remarkable construction has been introduced in the North Star mine, Grass Valley, Cal. It is eighteen feet in diameter, weighs 10,500 pounds and develops 250 horse power, running under 750 feet head, at 110 revolutions, and is directly connected to the shaft of a duplex compressor, compound tandem type, of same capacity. The design of this wheel is novel. From a cast-iron hub radiate twenty-four steel spokes, which are connected to a rim made up of angle iron properly shaped, having a slat for the buckets, which are bolted to the periphery, the strain being taken by four heavy steel truss rods. The large diameter of the wheel is for the purpose of giving proper speed to the compressor under the high head available; and the water is applied to the wheel through a variable nozzle controlled by an automatic regulator, the latter maintaining a uniform speed on the wheel, with a variation from full load down to twenty-five per cent of the same—a great economy of water.

Doctor of Machinery.

Among the multitudinous trades and professions in New York there are many which are entirely unknown, even by name, to the general public. One of the least known and most interesting is that of the expert in machinery. The work of a machinery specialist is far higher than that of a skilled engineer, and many years of experience and special training are necessary to fit the expert for his duties. There are only about half a dozen of these men in the country, one in every large city. When anything goes wrong with a machinery plant of whatever nature, the cause of which the engineer in charge, frequently the builder of the engines, cannot discover, the machinery doctor is called in. Every chief engineer of a big plant may be called a specialist so far as the machinery under his charge is concerned, but the specialist in machinery is an expert in engines of every description.

Though he has never seen the engine before, he rapidly diagnoses the case and prescribes a remedy, just as a doctor does for a sick patient. The instrument most used by him is a dentophone, which consists of a thin steel rod about a foot long, which he holds between his teeth and applies to the head of the cylinder. To the practiced ear of the expert every sound transmitted from the cylinder tells a story. The working of the piston in the cylinder, and, indeed, of the whole engine, can be heard distinctly in this manner by anybody, but it takes an expert to tell just what those sounds mean.

In the case of a mysterious knocking which was heard in the cylinder of the big driving engine in a large spinning factory not long ago, an expert was called in to determine the cause. Every method had been tried to discover where the trouble was, but without avail. Bearings were examined, the cylinder was taken apart, and every part well oiled, all to no purpose. When the expert came he traced the mysterious knocking from the cylinder, along the piston rod, crank shaft, and through the main shaft, away off among the looms, where one of the looms was found to be the cause of the trouble.

Often an expert's services are required in the case of synchronizing looms. If all the looms in a big spinning factory happen to beat together, as sometimes happens, the vibration is strong enough to bring the building down. For the same reason soldiers always break step when going over a suspension bridge, for otherwise the measured tramp of the many feet all striking the ground at the same time would seriously endanger the structure. The power of sound is also enormous when exerted in a particular way. Every substance in nature has a keynote, and when a sound of the same pitch is caused near it, a considerable amount of vibration is produced. When the great tubular bridge was being built across the Menai Straits, which divide England from the island of Anglesea, a traveling violinist nearly caused the collapse of the whole structure. He happened, while playing, to hold for a considerable time a note which chanced to be the keynote of the huge bridge structure. The sound echoed along the vast tube and reechoed with ever-increasing force until the whole bridge vibrated as if an earthquake were taking place. The bridge engineer, who was near by, instantly divined the cause, and stopped the playing of the violinist.

Part of the business of the machinery doctor consists in so arranging the distribution of looms and other machinery that their working will not endanger the stability of the factory. Defects in a boiler can also be instantly determined by the practiced ear of the specialist. A plate in the boiler is selected which is known to be in good condition, and he takes mental note of the pitch of the sound made when the plate is struck with a hammer. All the other plates are struck in the same way, and any one which does not ring true and conform to the correct pitch is examined and replaced. A case is on record where a machinery specialist was crossing the ocean and detected crystallization in the center of the shaft, thereby averting what might have been a serious accident in midocean. Measures were taken to strengthen the shaft in the place where the quick ear of the expert detected weakness, and when the vessel was docked his suspicions proved correct.

Few men even with the most exhaustive training can become experts at this business, as it requires a marvelous quickness of ear and delicate perception of sound with which few men are blessed. Technical knowledge is of little avail of itself, and a fine engineer might be a poor machinery doctor, just as a great musician might make an indifferent piano tuner. Whenever a big mill is erected, a specialist is always consulted as to the placing of the machinery, and his fee is generally well worth the expense and trouble which an injudicious distribution of machines may cause.—N. Y. Tribune.