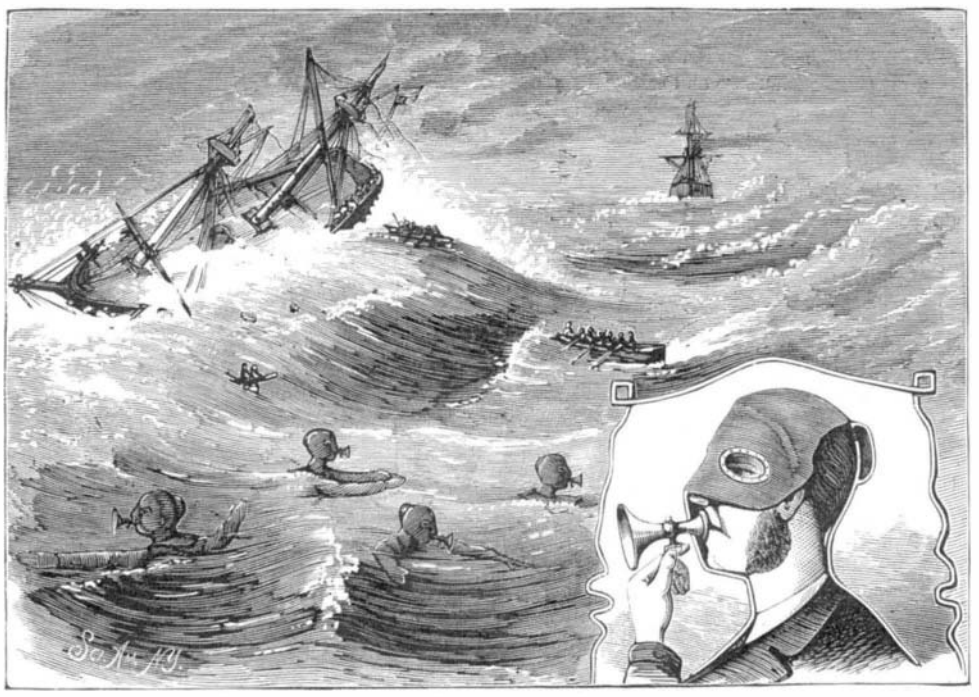
A NEW HEAD PROTECTOR.

In view of the great amount of travel upon both land and water, and of the dangers accompanying the present means of locomotion, it is a source of wonder to us that inventors have not given greater attention to the matter of life saving apparatus. The accompanying engraving represents a recently patented life saving device, to be applied to the heads of shipwrecked persons, or to persons exposed to the smoke and heat of a fire. It consists of a rubber helmet that closes tightly at the neck, but fits loosely on the head, and has at the upper part a device for ventilation. The helmet is made of a single continuous piece of rubber or of several pieces cemented together. The lower part of the helmet is made narrow so as to fit tightly around the neck and over the shoulders.

The ventilating device at the back of the head near the top of the apparatus consists of two layers of rubber, the inner layer being perforated at the bottom and the outer layer at the top, so that any water that might enter the air space will naturally run out without entering the interior of the helmet. There are eye apertures at the front of the helmet which are closed by glass eye pieces, and the helmet has a mouth piece which is provided with a stop cock for excluding water. The mouth piece is used in case it is necessary for the wearer to communicate with his companions. The device may be used as a protection against rain, sleet, snow, and spray, while on the deck of a vessel in storms; or it may be used when made of suitable material by firemen; or when it is made of lighter material it may be used by ladies as a bathing cap. This invention is represented in detail in the smaller engraving, and in actual use in the larger engraving.



CUMMERFORD'S HEAD PROTECTOR.

Further particulars may be obtained by addressing Mr. Francis P. Cummerford, 609 North 7th st., Wilmington, Del.

THE POLYSCOPE.

M. Trouvé has recently presented to the Physical Society of France a new apparatus—the polyscope—designed for

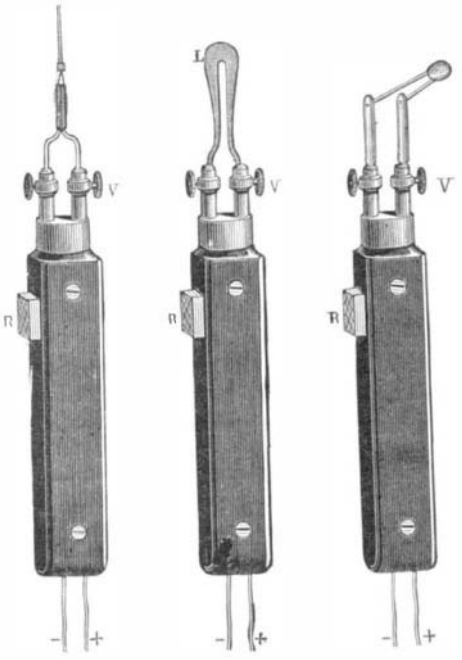


Fig. 2. CAUTER. Fig. 3. CAUTER. Fig. 4. MOUTH REFLECTOR.

lighting up cavities in the human body, the interior of mines, powder mills, deep waters, etc. This device is based on the property possessed by a voltaic current of giving out heat in a short circuit, and the law of which Joule has given as follows: The quantity of heat given out in a unit of time, in a metallic wire traversed by a voltaic current, is proportional—1st, to the resistance that the wire opposes to the passage of the electricity; 2d, to the square of the intensity of the current.

This property of the voltaic current of making metallic resistant conductors red hot in traversing them was made use of in surgery by John Marschall about 1851; by Leroy d'Etoiles, in 1853; by Mideldorpf, in 1854; by Broca, in 1856, etc. The production of illumination was not tried till later.

In 1867 Dr. Bruck, a dentist of Breslau, brought out an apparatus called the "Stomatoscope," designed for lighting up the mouth cavities. A little later still, in France, Dr. Millot made numerous experiments in lighting up the stomachs of animals at the Ecole Pratique of Paris. These trials were not followed by success, owing to the inconstancy of the electric source (Bunsen and Grove couples), which necessitated at that time the use of thick platinum wires to prevent constant volatilization. Many luminous effects were obtained, but the calorific effects which accompanied them were too intense to allow any practical application of the method. Recourse was then had to a circulation of water to destroy the heat as fast as produced, but this made the apparatus too bulky, and it became also difficult of management, and was consequently abandoned.

M. Trouvé, convinced of the practical importance of such a system of lighting, has given himself up since 1870 to indefatigable studies in this direction. That his experiments have been crowned with complete success is due, he asserts, to the judicious selection and use of the secondary pile of M. Gaston Planté.

The illuminating apparatus, or polyscope, of M. Trouvé is composed of a reservoir, A (Fig. 1), storing up dynamic electricity, or, in other words, secondary pile of Planté. By means of a special rheostat, AC, of great simplicity, in conjunction with a galvanometer, B, of two circuits, in

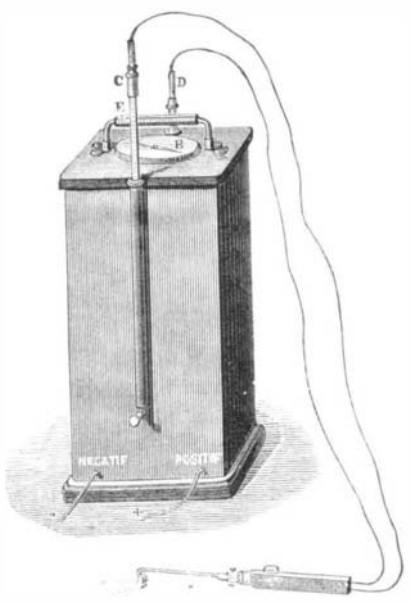


Fig. 1.—THE POLYSCOPE.

which the electro-motive force of the reservoir and that of the Trouvé-Callaud pile designed for charging it are in opposition, M. Trouvé is able to regulate the flow of the stored-up electricity at will. By the ingenious combination of these devices the practitioner can always regulate, according to his pleasure, the flow of the fluid, and always know by means of the galvanometer how much of a charge there is in the secondary pile. We use the word "flow" because those who are acquainted with the secondary pile know that it may be likened to a hydrostatic reservoir. The rheostat in the secondary pile is analogous to the stop-cock in the latter, both serving to modify the outflow of fluids.

M. Trouvé's apparatus is so regular in its action that it allows a platinum wire from 1-15 to 1½ millimeter in diameter to be brought up to the point of fusion and kept there for several consecutive hours without ever going beyond it. This is readily conceived, however, when we reflect on the constancy of the electro-motive force of the secondary pile and the minute degree to which the regulator is graduated. The point of fusion of the wires determined once for all, further trouble is ever after avoided.

The platinum wires, instead of being spirally bent, as is usually the case, are here simply flattened in the middle, so as to form a small incandescent disk. This device gives an illuminating power fully double that by the spiral method—a statement which has been confirmed by Captain Manceron in his experiments in lighting the interior of cannons at Saint-Thomas d'Aquin. By means of the polyscope this distinguished officer has been enabled not only to illuminate the interior of cannons and howitzers, but also to throw on a screen the minutest defects found in any piece of ordnance.

The polyscope is provided with a series of concavo-spherical or parabolic reflectors (Figs. 5, 6, 7,) with or without mirrors, for giving certain effects of light. A handle and conductors connect these reflectors with the reservoir at C and D

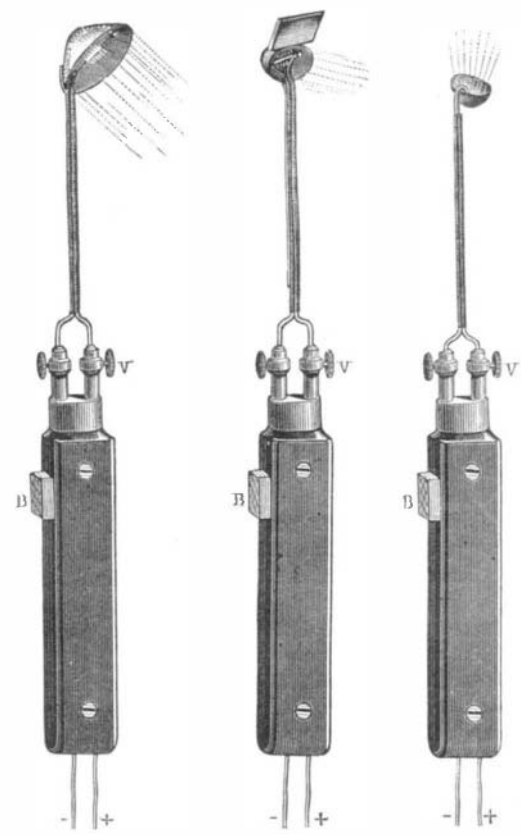
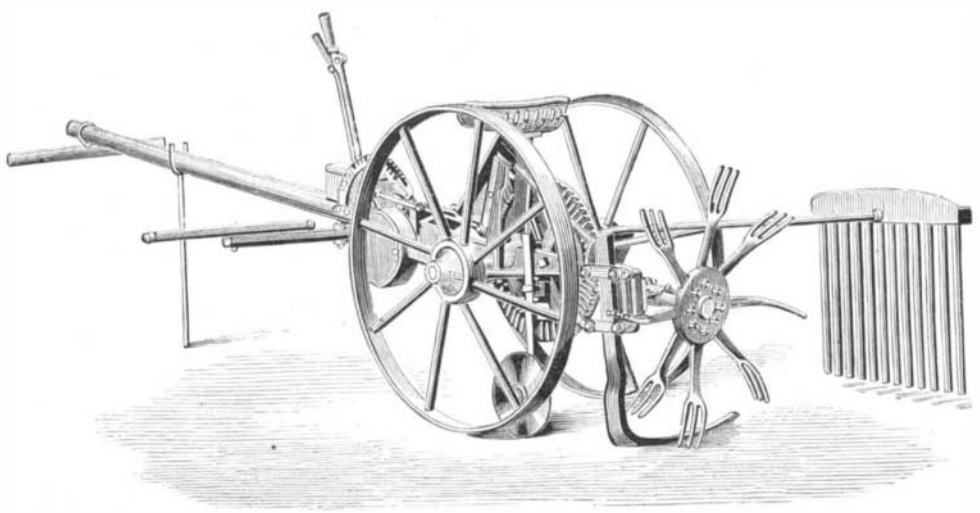


Fig. 5. Fig. 6. Fig. 7.
VARIOUS FORMS OF REFLECTORS.

(Fig. 1). Figs. 2 and 3 represent cauters for physicians. Fig. 4 is a mouth reflector for the use of dentists.

POTATO DIGGER.

The great importance attached to the successful cultivation of the potato has led agricultural engineers to pay much attention to the manufacture of machines required for cheapening and improving the successive manipulations of this root. The implement which we illustrate this week was invented by Mr. Winton, and is being manufactured by Messrs. Penney & Co., of Lincoln. As will be seen from the engraving, which we take from *Iron*, the machine is drawn by a couple of horses, and is carried (together with the driver) on a pair of large wheels, which take the weight of the whole of the gear, and by their rotation impart the required motion to it. The loosening of the ground is effected by a powerful and broad knife, bent to the required shape so as to pass completely beneath and partly lift up even the deepest roots,



WINTON'S POTATO DIGGER.

Behind the knife is a wheel with eight prong-shaped arms, which is revolved by a simple bevel gear, the "pinion" being secured to the same shaft as the eight-pronged wheel, and the bevel "wheel" being mounted on the main axle and driven from the road wheels. A small thin wheel or disk in front of the large knife, as clearly shown, assists in dividing the ground vertically and thereby lessens the work on the knife. The prongs of the revolving wheel cut off the tops and strew the potatoes on the ground ready for collection and bagging, a screen suspended from the main framing preventing them from being thrown too far, and separating them from the loosened mould. By a lever within easy reach of the driver, the knife, disk, and the prongs can be raised clear of the ground for traveling, or adjusted to any required depth to suit the crop under operation. By a suitable clutch the bevel wheels can be thrown out of gear with the road wheels, and the prongs thereby prevented from revolving. The machine is highly ingenious, and, although it has been before the public less than two years, has already been widely applied, and has met with general approval. It is capable of digging three to four acres of tubers per diem.

Evaporation of Saline Water.

A correspondent suggests the following method of evaporating saline water: Let the water be forced upward to a great height into a highly heated apartment, through numerous pipes whose mouthpieces shall reduce it to the finest possible spray. Much of the water will in this process be immediately evaporated, and may pass upward out of the roof of the building. Let the spray fall on to an inclined plane, to flow out into a reservoir, whence it may be again ejected through nozzles with coarser openings, again to fall; and let this process be repeated until the water becomes so much filled with solid particles of salt that it can no more be sent upward to fall in the form of spray. The operation of evaporating the water in the usual way after such a course of treatment might be comparatively simple and inexpensive.

Coming Prosperity.

The work of the Custom House Investigating Committee in connection with the various industries of the country has led its chairman, the Hon. Fernando Wood, to the opinion that the United States are "on the eve of the greatest prosperity the American people have seen, from the Revolution down. It will not be fictitious, and based on the stimulant of champagne and speculation, as after the war, but on the strength of our native constitution and enforced sobriety. The reaction in 1873 gave us a terrible headache, for we had been running riot and were intoxicated. Those who survived feel to-day better and stronger than ever before. We have been taught a good lesson in enforced economy, and the precept of economy is now practiced by even our millionaires. It permeates the whole social fabric."

GATHERING THE SAP OF THE MAGUEY.

The *Agave Americana*, American aloe, is called the *maguey* in South America. It has a short cylindrical stem terminating in a circular cluster of hard, fleshy, spiny, sharp pointed, bluish green leaves, each of which lives for many years, so that but few have withered away when the plant has arrived at its maturity. It is a popular error that this only occurs at the expiration of a hundred years. when the tree flowers, and again lies dormant, so far as its efflorescence is concerned, for another century. The American aloe varies in the period of its coming to maturity, according to the region in which it grows, from 10 to 70 years. So soon as it matures, it sends forth a stem 40 feet in height, which puts out numerous branches, forming a symmetrical cone. Each branch bears a cluster of greenish yellow flowers, which continue in perfect bloom for several months.

The American aloe is applied to many uses. From its sap, drawn from incisions in its stem, is made *pulque*, a fermented liquor highly esteemed by the natives of the countries in which the plant is indigenous. Our engraving represents a native in the act of gathering the sap. A coarse sort of thread is made from the fibers of the leaves, known as pita flax. The dried flower stems constitute a thatch which is perfectly impervious to the heaviest rain. From an extract of the leaves balls are made which can be made to lather with water like soap; and from the center of the stem split longitudinally a substance is obtained for a hone or razor strop, which, owing to the particles of silica which form one of its constituents, has the property of speedily bringing steel to a fine edge.

Americans in Turkey.

In his speech at the grand dinner given to the British plenipotentiaries in the London Mansion House, on their return from Berlin, the Earl of Beaconsfield referred to the American missionaries in Turkey as a body of men "of the highest principle, of even a sublime character—men who devoted their lives for the benefit of their fellow creatures, and sought no reward but the convictions of their own consciences." And their report with regard to the social and educational improvements that had taken place in Turkey since the Treaty of Paris was relied upon by the Earl as of more value than the dispatches of either Russian or English consuls.

THE TUFTED COQUETTE.

This rare and beautiful humming bird seems to be entirely a continental bird, not being found in any of the West Indian Islands, and its principal residence seems to be in Northern Brazil and along the banks of the Amazon as far as Peru. It may be readily known from the other species of coquettes by the colors of its head, crest, and neck plumes. The crest and top of the head are a rich ruddy chestnut,

THE TUFTED COQUETTE.

and the upper surface of the body is bronze green, excepting the wings, which are purple black, and a broad band of white which crosses the lower part of the back. From the white band to the insertion of the tail is bright chestnut. The tail is also chestnut, except the two central feathers, which are green at the latter half of their length. The forehead and throat are emerald green, and the neck plumes are snowy white tipped with resplendent metallic green.

The female has no crest nor neck plumes, and the band of white across the back is very narrow. The total length of the bird is about 2½ inches.

We take our engraving from Wood's "Natural History."

New Mechanical Inventions.

Mr. William J. Henderson, of Valdosta, Ga., has patented an improved Machine for Transmitting Motion from a Driving-power to Mortars and other implements.

An improved Automatic Wagon Brake has been patented by Mr. Stephen S. Miller, of Claverack, N. Y. The object of this invention is to furnish an improved brake for attachment to wagons, which shall be so constructed as to be applied to the wheels by the forward movement of the wagon against the horses in going down an incline.

An improvement in Work Supports for Metal Turning Lathes has been patented by Mr. Hans Reiss, of Jersey City, N. J. The object of this invention is to furnish an improved bushing for screw and pin machines, for holding the stock against the pressure of the tool. It is so constructed as to hold stock of different sizes, and is simple, convenient, and effective.

Mr. Patrick H. Childress, of Waynesboro, Va., has patented an improvement in Millstone Drivers which consists in arranging about the spindle, and between the spindle and the forks of the jointed driver, a ring or collar, which affords a bearing for the inner ends or forks of the driver sections, and, by allowing said inner ends to swivel about it, secures an equal and more direct movement between the sections of the driver, obviates lost motion, and yet does not require the forks to touch the spindle.

Mr. Lowry B. Rowland, of Monmouth, Oregon, has devised an improved Horse-power Equalizer for applying the draught to the machine in such a way that the draught may be equalized among the teams. It will enable a weaker team to be favored, and will enable a team to have a solid pull when necessary. It will also hold the master wheel in a perfect level.

An improvement in Chain Links for Horse Powers has been patented by Edward A. Smith, of St. Albans, Vt. This invention consists in a novel construction and form of a cast metal rack or bar provided with gear teeth, and a steel trap provided with bearings for pivots or bolts; and also in a novel mode or process of attaching and combining said bar and strap to form a link, whereby simplicity and economy of construction are obtained, and a strong, durable, and reliable link is produced.

An improved Sewing Machine has been patented by Mr. Daniel Williamson, of Sunbury, Pa. This invention has reference to such improvements in sewing machines that a new and improved motion for the shuttle driver, and also a simple cam motion for operating the presser foot, feed bar, and needle bar, are obtained.

Mr. John S. Gifford, of Fairfield, Me., has patented an improved Axle Nut Wrench, which may be used to take off the nut from a wagon or carriage axle, to allow of the removal of the wheel, and to screw the nut on again, without any necessity of handling the nut, thereby avoiding the danger of getting sand in the bearing of the wheel or grease upon the hands of the person using the wrench.

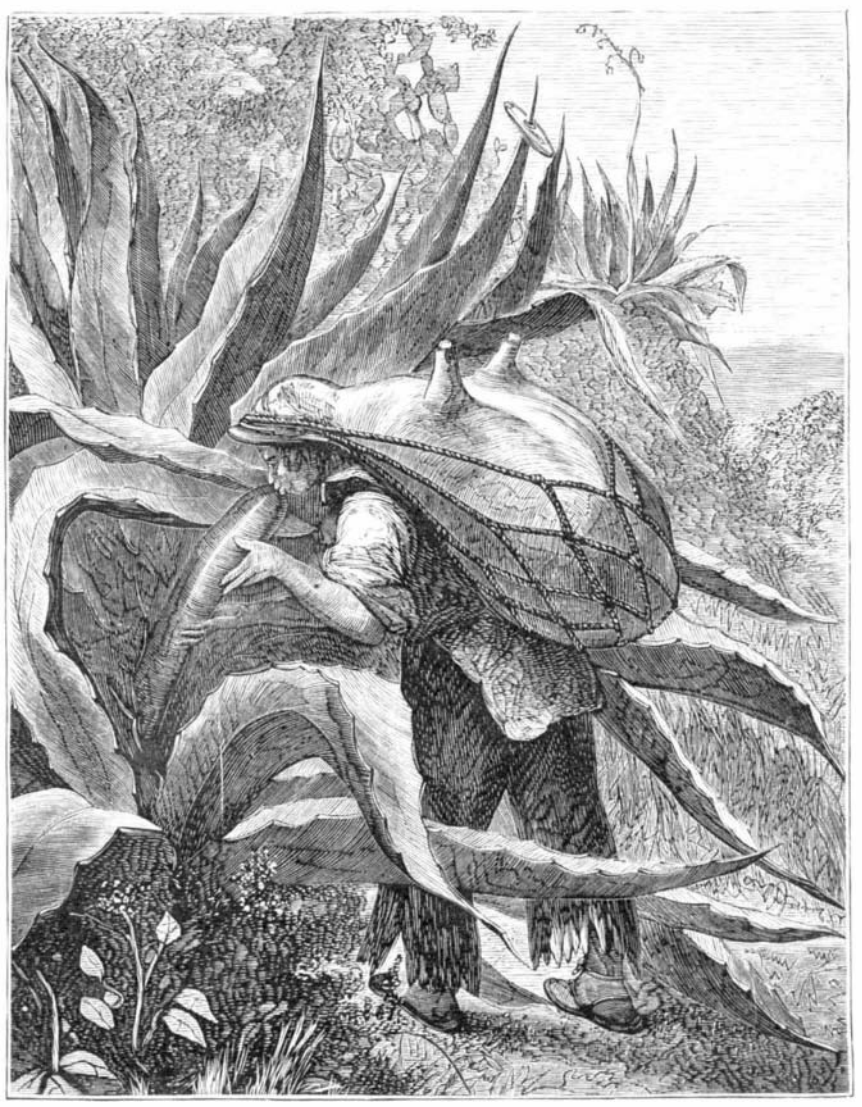
Mr. David H. Hatlee, of Clifton Park, N. Y., has patented an improved Machine for Making Horseshoes. This machine has a horizontal bed, of which a portion is movable and carries dies, around which the shoe is formed (from a bar of suitable length) by means of devices attached to the fixed portion of the bed or frame of the machine, all of said devices being connected with and operated by the movable part of the bed.

Mr. William F. Lane, of Elgin, Ill., has devised an improved Treadle Movement, whereby the power is applied continuously and evenly in one direction only, without springs and the loss of motion and power necessary to pass dead centers, and by which the operator can control the machine by his feet alone, thus having his hands free to hold or adjust the work.

Messrs. Charles H. Holdredge, of Westerly, R. I., and Charles H. Cowan, of Stonington, Conn., have patented an improved Thill Coupling for connecting the shaft iron of a carriage with the axletree clips, so that they will be firmly connected and wear may be compensated for. It has screw sockets in the clips or ears, forming supports or bearings for a pivot pin connected with the shaft iron. The screw sockets may be adjusted to compensate for wear, and are kept from getting loose by jam nuts. The pivot pin is connected to the shaft iron by a set screw, so that the pin and the shaft iron shall move together.

Mr. John Thorpe, of Fort Miller, N. Y., is the inventor of an improved Rotary Boiler for boiling and steaming paper stock, which consists in a boiler mounted on axles in suitable bearings, and having a steam supply pipe passing through the center of one or both of the axles and into the end of the boiler. Two distributing steam pipes pass from the end of the supply steam pipe and extend lengthwise of the boiler, near its sides, so that as the boiler turns the distributing pipes turn with it, and one or the other of them is in the material at all times.

Messrs. William F. Rosser and Julius L. Briggs, of Marshfield, Mo., have devised a cheap and simple Attachment to Hand Printing Presses for guiding, catching, and holding the frisket when the latter is being raised from the tympan for adjusting the paper, or for any other purpose.



GATHERING THE SAP OF THE MAGUEY.