MECHANICAL PUDDLING IN SWEDEN.

The accompanying engravings which we take from *Iron*, give plan and section of the puddling apparatus invented by Mr. Oestlund, as used at the Finspong Ironworks. The gas generator, A, is of the common Swedish type, as used for charcoal. The tube, *k*, conducts the gases into the refining pot, *a*. This pot has a lining of refinery slag, which is melted, as the apparatus revolves, to get it to adhere to the sides. The revolution of the pot, *a*, on its axis, *d*, is effected by the action of the beveled wheels, *b* and *b'*, and the pulley, *c*, which takes from an iron chain the power given off by a turbine. The spindle, *d*, is supported in the bearings *e* and *e'*, *c* carrying a pair of trunnions which form the axis of oscillation, and allow the apparatus to rise or fall, the whole of this mechanism being supported on the plummer blocks, *f f*. One of the trunnions, *e''*, is prolonged so as to form the axis of the beveled wheel, *b*, and the pulley, *c*, the latter sliding along the trunnion so as to put *b* in or out of gear. The bush, *e*, is tied by means of the stay, *g'*, to the upper end of the toothed segment, *g*, the lower extremity of which is connected with the second bush at the end of the spindle. By means of the pinion, *h*, revolving on standards, *i i*, and the segmental rack, *g*, the pot can be raised or lowered without interfering with the action of the beveled wheels.

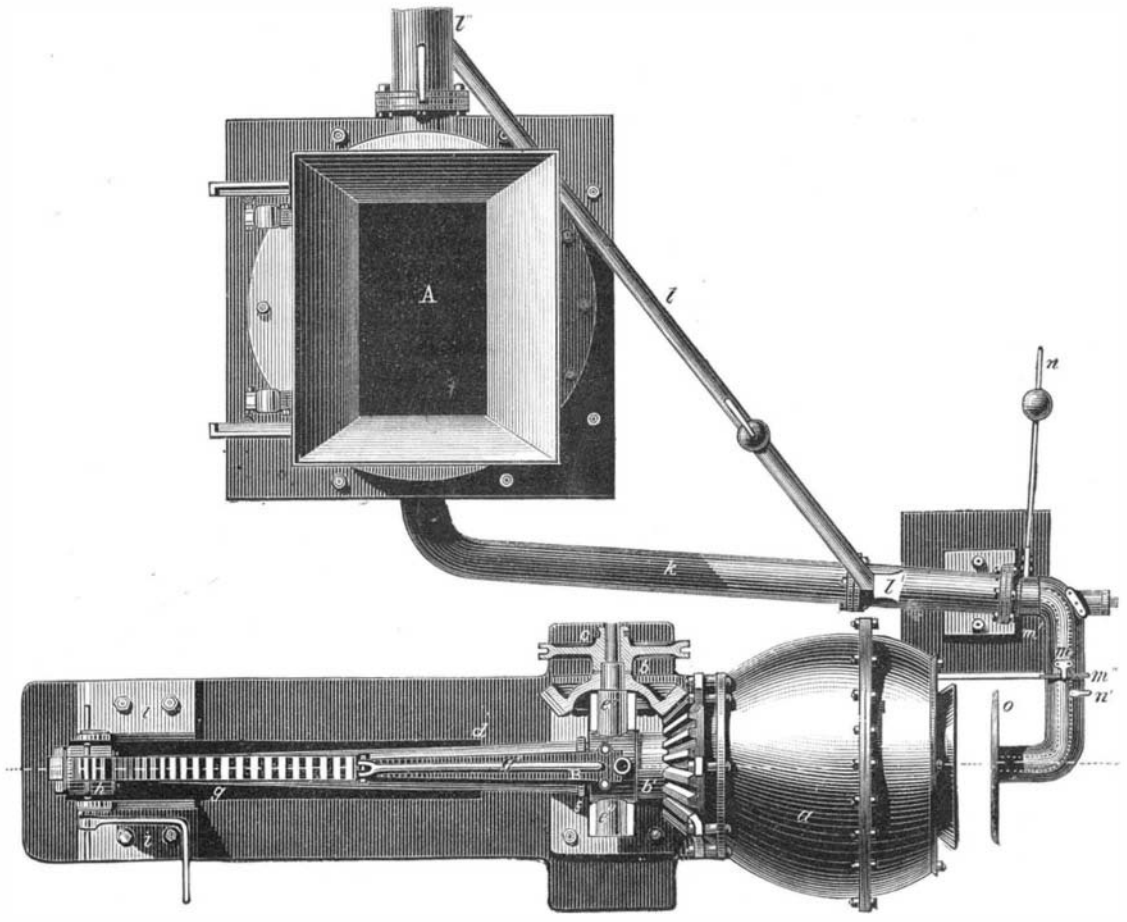
The gas from the generator is brought to the mouth of the pot by the tubes, *k* and *m*. The air necessary for the combustion of the gas is brought in by a tube, *l*, branching from the air main, *l''*. The air tube, *l*, passes into the gas tube and is continued concentrically within the latter. The gas and air tubes both have joints at *m'* and *m''*. By means of the bar, *n*, which has a counterpoise to keep the moving parts in position, the tubes can be brought from or toward the mouth of the pot, so as to make it free of access to the workman. With a key fitting on the stem, *n'*, the tubes can be turned in *m'*, so as to give the currents of gas and air a more or less oblique direction. To screen the workmen from the heat of the pot a disk of iron, *o*, lined with fire clay on the side next the pot, is fitted to the end of the tubes.

Before running the metal into the pot, the latter must be heated, to such a degree that the slag lining is pasty or semi-fluid at its surface. Generally an hour and a half will be spent in heating with gas to this point. There should be sufficient live coal in the pot when the gas is first let in to keep up its combustion; should it be extinguished by excess of air or gas, it must be relit. As soon as the pot begins to get red hot the full heat can be put on.

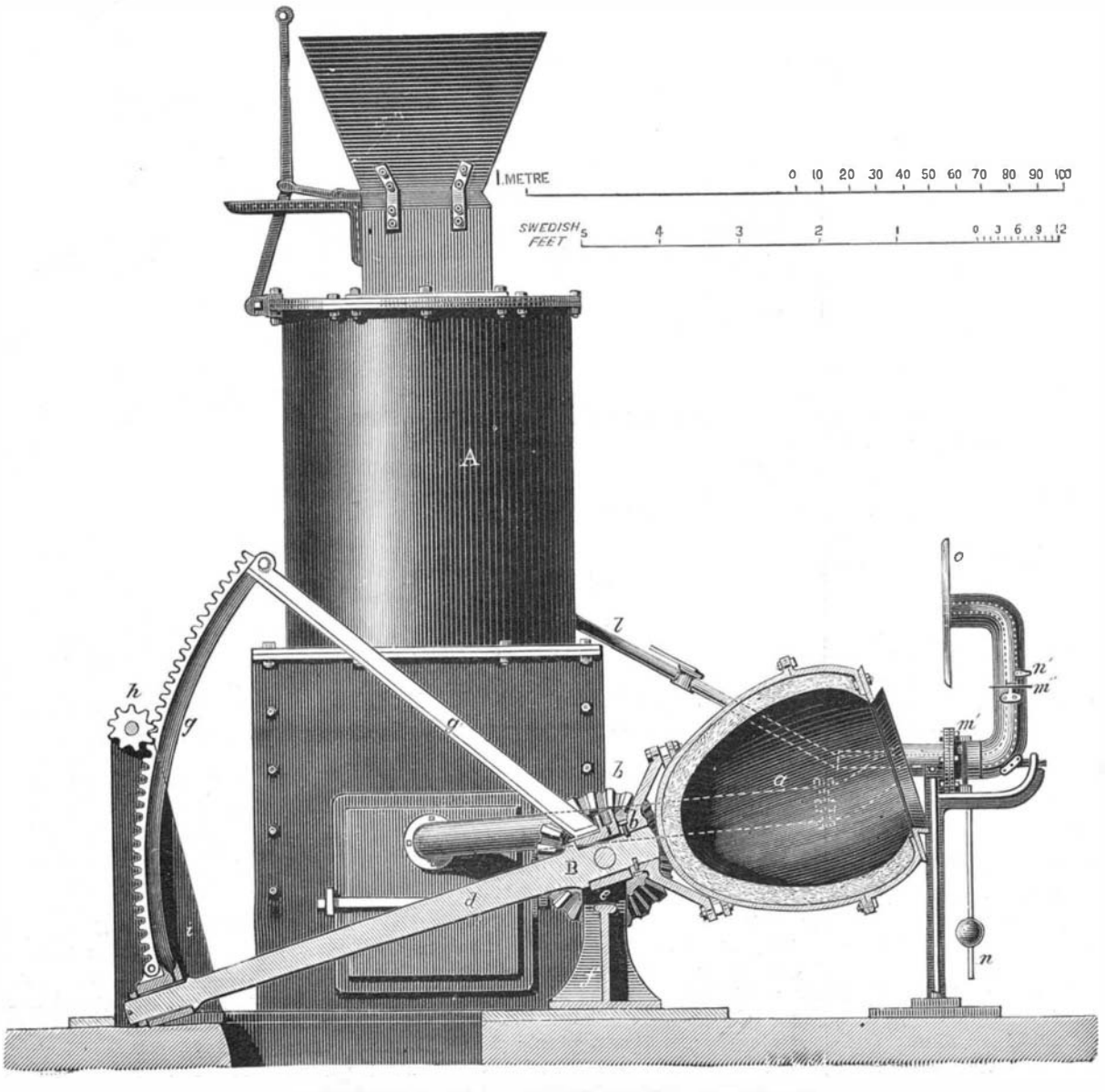
The gas generator is tended in the usual way with the ordinary precautions. To keep ashes and dust out of the gas tube, lumps of charcoal are heaped up to the height of the top of the flue. The wind pressure for the generator was 33 to 41 millimeters of mercury, that of the wind for the combustion of the gas (at Finspong the blast is not heated) being only 16½ millimeters. The pressure of the gas in the tube near the pot was 6·2 millimeters of mercury. The method of working, viewed chemically, does not sensibly differ from puddling; although giving as good, perhaps better, results at a much less cost. There are three principal periods in the operation: 1. The period before boiling. 2. The boiling itself. 3. The end of the boiling, and the formation of balls. When cast metal is poured into the pot a shovelful or two of refinery slag is added. The temperature of the bath is thus brought down; it thickens and boils, the pot revolving at the rate of 30 or 40 revolutions a minute. The metal is worked with a rabble, either to cool it or to get the slag to incorporate with it, as is done in puddling. Note must be taken of the temperature of the melted metal and that of the pot, at the moment of charging, the heat during working being regulated accordingly by increasing or diminishing the inflow of air and gas. When circumstances are favorable, boiling begins five minutes after the metal is run into the pot, and it lasts about ten minutes.

Boiling having begun, the batch swells, the iron forms, granulates, and seems to cling to the rabble and the sides of the pot. The rotation of the pot is continued, as well as the working, to separate out parts which are not yet refined; but no more cold cinder is put in. While boiling goes on the temperature is regulated so that the pig does not cling to the side of the pot during a complete revolution, but so that the particles next the side fall back into the bath when the side comes uppermost in the revolution. The heat is raised a little when the iron can be felt by the rabble to be completely refined, when shining lumps make their appearance in the bath, and the iron begins to cling to the walls. At the moment, therefore, that the temperature is brought to its highest point, and the iron begins to agglutinate, the rotation of the pot should be stopped, and either immediately, or after the delay of a couple of minutes, it is removed. If the iron does not ball well, it is not completely refined, and the pot may be started again. If the iron is firm enough already, the isolated particles are exposed to the hottest flame possible, the blast being carried to its maximum. The refining is thus completely finished, and all the particles are agglomerated. The mobility of the gas tube at *m''* is of advantage in this operation. It is sometimes useful to start the pot again to round up the puddled ball, but it is best if this has been formed with the rabble.

The iron from a charge of 75 kilos. of pig may be divided with advantage into a couple of balls; a third may be made of the iron separated from the walls of the pot. To get out the balls the pot is lowered, and the workmen use tongs, pointed rabble, and hooked bar. If things have gone well the balls ought to come out soft at a welding heat, filled with cinder like puddled balls, but a little more resisting and solid under the hammer. They are forged into bars, and these are at once passed to the rolls. If nothing hinders the balling and shingling, these operations will not consume more than fifteen minutes.



APPARATUS FOR MECHANICAL PUDDLING.



APPARATUS FOR MECHANICAL PUDDLING.

Photographic Engraving.

Scamoni's process is as follows: The original drawings are carefully touched up, so that the whites are as pure and the blacks as intense as possible, and then the negative is taken in the ordinary way, the plate being backed in the camera with damp red blotting paper, to prevent reflection from the camera or back of the plate. The negative is developed in the ordinary manner, intensified by mercuric chloride, and varnished. A positive picture is taken in the camera, the negative being carefully screened from any light coming between it and the lens. This is intensified by pyrogallic acid, and afterward washed with a pure water to which a little ammonia has been added. It is then immersed in mercuric chloride for half an hour, and again intensified with pyrogallic acid. This is re-

peated several times. When the intensity of the lines is considerable, the plate is well washed, treated with potassium iodide, and finally with ammonia, the image successively appearing yellow, green, brown, and then violet brown. The plate is then thoroughly drained, and the image is treated successively with a solution of platinic chloride, auric chloride, ferrous sulphate, and finally by pyrogallic acid, which has the property of solidifying the metallic deposits. The metallic relief thus obtained is dried over a spirit lamp, and covered with an excessively thin varnish. This varnish, which is evidently a special preparation, retains sufficient tackiness to hold powdered graphite on its surface (the bronze powder now used may be employed instead), which is dusted on in the usual manner. After giving the plate a border of wax, it is placed in an electrotyping bath, and a perfect facsimile in intaglio is obtained, from which prints may be taken in a printing press.

A NEW DEEP SEA THERMOMETER.

Perhaps some of our readers may have seen a description of a form of thermometer devised by MM. Negretti and Zambra for the purpose of ascertaining the temperature of the ocean at great depths. This consisted of a tube bent into the shape of a siphon, which when it had reached the desired depth was made, by means of an ingenious arrangement, to pour all the mercury found above a certain point near the reservoir into the second arm of the siphon. This second arm, which, like the other, was a capillary tube, carried a scale of divisions on which might be read the temperature of the depths to which the instrument had been lowered. This thermometer gave all the results that might have been expected. The ship Challenger during its polar expedition had on board a certain number of these instruments. The report of Capt. G. S. Nares made to the English Admiralty describes all the benefits that we may hope to reap from a serious study of the temperature of the ocean at different depths, and not the least of these are those that pertain to the fishery interest. Notwithstanding the good results given by this instrument, its inventors have endeavored to render it still more practical and more within the reach of all by diminishing the cost of construction, and increasing its compactness.

Fig. 1 represents the thermometer isolated from its case. It is an ordinary thermometer furnished at A with a little device that M. Negretti has already made use of in the construction of his larger instrument, and which allows the liquid to run from the reservoir into the capillary tube when the temperature rises, without letting it flow back when it lowers, if moreover the precaution has been taken to incline the tube slightly, reservoir upward. At B there is a bulge in the tube in which a certain quantity of mercury may lodge; this bulge is placed in such a way that the mercury resulting from the dilatation of the reservoir may come to it and continue its ascension in the capillary tube when the reservoir is down (the thermometer being vertical), but cannot get out when the reservoir is upward.

We should add that these thermometers are constructed so as to give the variations of temperature within determined limits.

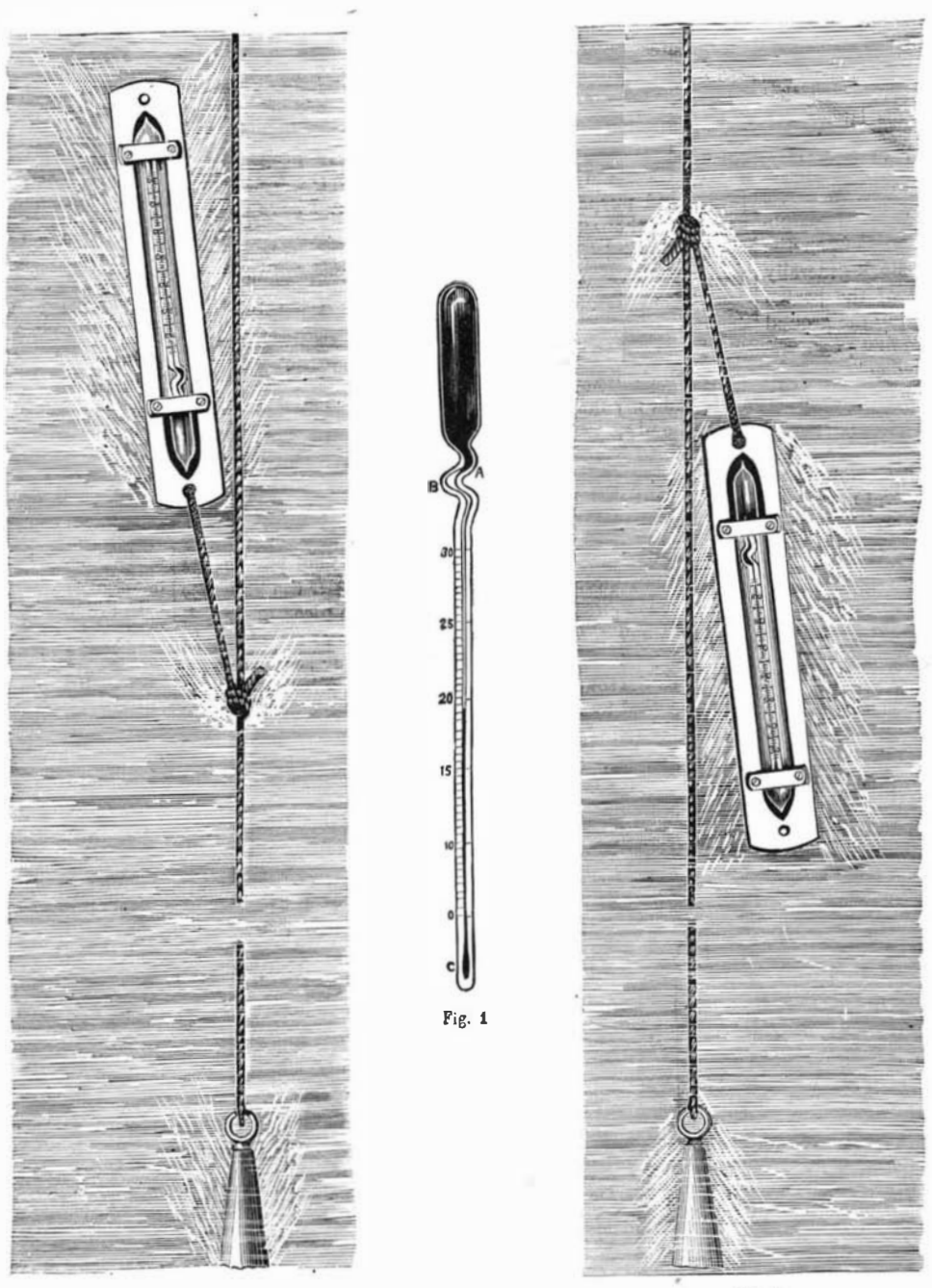


Fig. 1

Fig. 2.

Fig. 3.

NEW THERMOMETER FOR OBTAINING THE TEMPERATURE OF THE OCEAN AT GREAT DEPTHS.

The small reservoir, B, is indispensable to the well working of the apparatus; for in seeking the temperature at a certain depth the instrument may, on being drawn up, pass through warmer strata, and it is necessary, therefore, to provide the reservoir with a means of diffusing the small quantity of mercury resulting from this excess of temperature. The tube has also a small bulge at its upper extremity at C.

The thermometer is placed in a small wooden case having a double bottom throughout its length. In this double bottom are placed a certain number of lead balls that can run from one end of the case to the other, and of sufficient weight to render the instrument buoyant in sea water. To use the apparatus, one end of a cord is passed through a hole in the case under the reservoir of the thermometer, and the other end is tied to the sounding line at a certain distance from the lead (Fig. 2). While the line is descending the thermometer will remain reservoir downward (Fig. 2); but when it is again drawn up the thermometer case will take the position indicated in Fig. 3, and the column of mercury breaking at A will fall into the capillary tube, the divisions of which, as will be seen at Fig. 1, are reversed.

As to the thermometer itself, it is important to protect it against the pressure which becomes so considerable at great depths; to do this the reservoir is surrounded by an envelope of thick glass about three quarters full of mercury. The mercury serves to transmit the temperature to the reservoir, and should the exterior envelope yield to the effects of pressure, the reservoir proper would not be affected, the mercury not exactly filling the annular part which surrounds it.

New Inventions.

George E. Palmer, of Cedar Rapids, Iowa, has patented an improved Ironing Board, on which the garments may be held in stretched state while being smoothed with the irons, and readily adjusted thereon to any required degree of tension by a simple attachment.

William B. Rutherford and Joel T. Hawkins, of Rockdale, Texas, have patented an improved Bale Tie, which is formed of the plate provided with a longitudinal groove and cross ribs or loops, and having projections or keys to adapt it to receive and hold the notched ends of the bale band.

An improvement in Composition Pavements has been patented by John C. Russell, of Kensington, Eng. This invention relates to the treatment of peat and spent tan for the manufacture of an improved product or material suitable for paving roads and other places and for roofing, etc. The most important steps in making the composition consist in drying bruised or finely ground peat or spent tan, heating the same *in vacuo* to degree of 150° Fah., and adding sulphur and gas tar, gas pitch, and stearine pitch in the proportions specified, then kneading the mixture while heated and adding carbonate of lime and furnace slag.

Louis Blanck, of New York city, has patented an improved Safety Brake or attachment for locomotives and railroad cars, by which the entire train, either by a collision with another train or by contact with any obstruction, is first raised from the rails, and then moved in backward direction for the distance of a few feet, so that all danger of accident is avoided, and no other sensation than that of a slight rocking motion exerted. The attachment is constructed so as to admit of being worked by the engineer from the cab of the locomotive, or, if desired, from any car of the train.

An improved Evaporating Pan has been patented by Andrew D. Martin, of Abbeville, La. This invention consists in a tapering sheet metal tank having transverse partitions and longitudinal tapering flues that extend through all of the partitions and terminate at the ends of the tank.

Lloyd Arnold, of Galveston, Texas, has patented an improved Bale Tie, which is formed of a block of iron, with a space or opening running longitudinally through its breadth from one end nearly to the other, and having the alternate edges of the two plates thus formed notched, the notch of the lower plate being square and of a width equal to or a little greater than the bale band, and the notch of the upper plate being narrower at its bottom than the bale band, and with its sides inclined and beveled to an edge, to adapt it to receive and hold the bale band.

An improved Tie for Letter Packages has been patented by John Mersellis, of Knowersville, N. Y. The object of this invention is to provide a tie by means of which letter packages may be quickly and securely fastened or tied. It consists in a plate apertured to receive one end of the string and also to receive the hook upon which the tie is hung when not in use, and having a button and clasp spring for engaging the string in the process of tying.

Fred P. Hammond, of Aurora, Ill., has patented an improved Inking Pad, which consists in a novel arrangement of layers of cloth or felt, chamois skin, oiled silk, and printing roller composition, which enables a clean impression of the stamp to be made. The pad retains the desired rounded surface and proper degree of softness, and is easily manipulated when necessary to replenish the supply of ink.

William J. Clark and Thomas W. Roberts, of Coffeeville, Miss., have patented an improved Trap for Catching Fish in streams, which will allow the fish to be conveniently taken out without taking up the trap.

John W. Cooper, of Salem, Ind., is the inventor of an improved Alcohol Lamp for soldering and similar purposes; and it consists in a reservoir pivoted in a supporting frame, and provided with two wick tubes, and an extinguisher secured to a spring support, and capable of closing the larger wick tube when it is in a vertical position. It has an ndependent extinguisher for the smaller wick tube, and is provided with a novel device for projecting the wick from the larger tube as it is moved out of a vertical position.

Benjamin Slater, of Attica, N. Y., has invented a simple and effective device for Renovating Feathers by the combined action of steam and hot air. It consists of a cylindrical receptacle, partly surrounded by a steam jacket, and having a hot air box, a perforated bottom, a cover or damper for the same, and an aperture in the top, to which is fitted a perforated cover and a close cover.

An improved Blind Fastening has been patented by George Runton and John Runton, of Hoboken, N. J. This fastening is so constructed as to fasten the blind or shutter automatically when swung open, and in such a way as to prevent all rattling or shaking of the blind or shutter from the action of the wind.

David R. Nichols, of Alexandria Bay, N. Y., has patented an improved Animal Trap, which is so constructed as to set itself after each animal has been caught, and leave no trace of the trapped animal to frighten away those that may come afterward.

William A. Doherty, of Fall River, Mass., has patented an improved Loom Shuttle Attachment, by which the weaving of bad cloth is prevented, and in case any false shed is made by any irregularities in the warp, and that part of the shed carried lower than usual, the attachment is released and thrown over the spindle point, so as to render it impossible to draw out the filling from the shuttle, and thus break it and stop the loom.

Jonas Bowman, of Somerset, O., has patented an improved Vehicle Spring, which permits of dispensing with side bars, thus taking less space to turn on, and by which the tilting and pitching motion usual with springs as heretofore constructed is avoided.

Hiram Unger, of Germantown, O., is the inventor of an improved Gate Latch, which is so constructed that the gate cannot be opened accidentally by being lifted or by rebounding of the catch or latch.

Madison Calhoun, of Ocate, Ter. of New Mex., has patented an improved Hame Fastening, which is not liable to become accidentally unfastened, and is easily and quickly fastened and unfastened, even with cold or gloved hands.

THE Downer well at Corry, Pa., is now down over 1,300 feet, and an oil bearing sand has been struck of about five feet thickness.