INEXTINGUISHABLE FIRE FOR LIFE BUOYS.

In order to provide a prompt means of support for men who may happen to fall overboard at sea, all vessels in the United States navy are provided with life buoys. These, usually two in number, are hung directly over the stern, so as to fall well clear of the ship when they are let go. The apparatus consists of two hollow copper vessels somewhat elliptical in form, joined together by a horizontal bar, three feet or so in length. The latter is attached at its middle to a vertical standard, on the lower part of which is a cross-piece for the person to rest his feet against while he clings around the standard above the crossbar with his arms. The upper end of the standard carries a square plate of metal, on which is coiled a tube which is always kept filled with portfire composition, of gunpowder or other ingredients, which will burn for twenty minutes or so with quite an intense flame. The buoy is attached to the vessel by a simple tripping apparatus communicating with a pull on or near the taffrail. The plate carrying the portfire fits under another piece on which is placed a lock and hammer which, when sprung, explodes a cap, and so ignites the portfire. For this also there is a pull, generally placed immediately beside the one above mentioned. Night and day at sea, a man is kept stationed at this post, and it is his duty the instant the cry of "man overboard" is raised, to pull first the portfire handle to light the powder, and then to let the buoy drop, while a hand in the mizzen top watches its position and that of the person in the water, and so directs the movements of the rescuing boat.

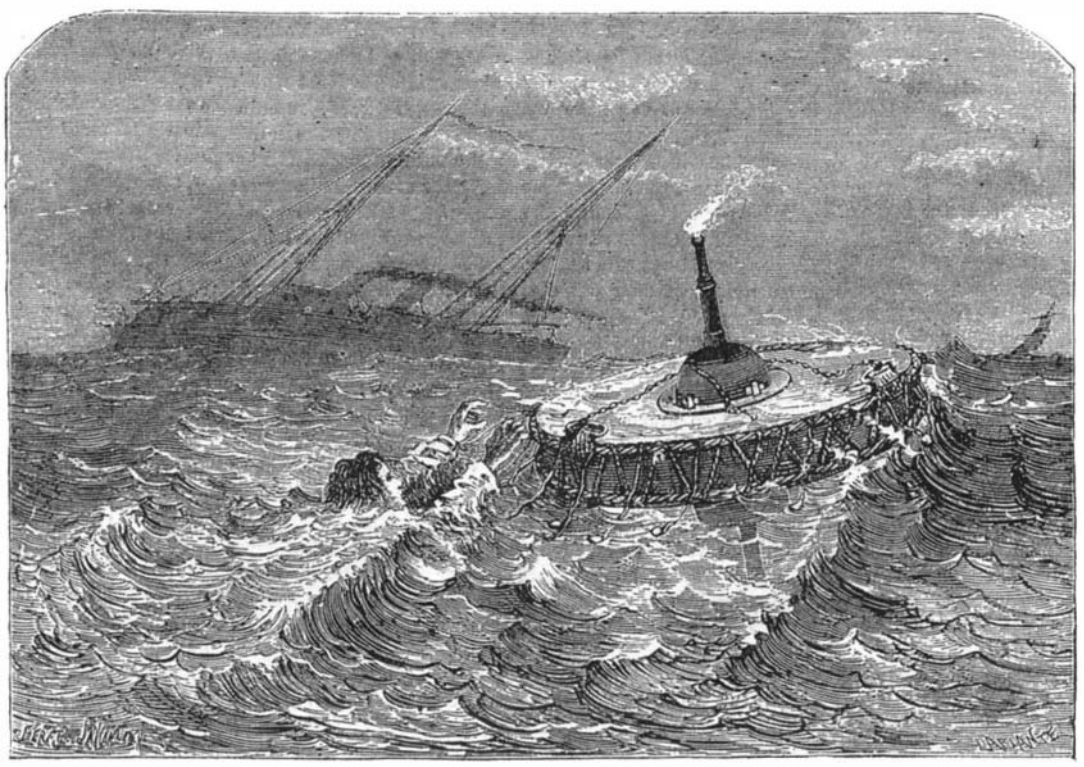
Once afloat, the apparatus remains upright and of sufficient size to be readily discerned by a swimmer during day, while its bright flame directs him toward it at night.

As may be imagined, there is an objection to the use of any combustible liable to be extinguished by water or wind, as, if portfire or other composition be not directly put out by spray or rain, its flame may be so weakened as to render its light too faint for the discernment of objects in its neighborhood. Messrs. Silas and Seyferth, in order to obviate this objection, have suggested the use of phosphide of calcium. This substance is prepared by distilling phosphorus over lime heated to a low redness. An anhydrous mass of a dull red color is obtained, hard enough to strike fire from steel, which experiences no change in dry air nor in oxygen at the ordinary temperature. In a moist atmosphere it slakes, emits phosphuretted hydrogen, mixed, however, with free hydrogen, and not self-lighting; but if it be thrown directly into water, phosphuretted hydrogen gas only is evolved, and this, as is well known, takes fire spontaneously in atmospheric air. The form of apparatus proposed is represented in our engraving, for which we are indebted to *La Nature*. The buoy is of wood or cork, analogous in form to that ordinarily employed in the French navy, and has in its center a hollow space in which is arranged the lighting arrangement. The latter is composed of a metallic box containing the phosphide of calcium, through which passes a tube which extends beyond it a short distance both above and below. This tube, in the portion which traverses the box, is pierced with a number of holes so as to admit the water necessary for the decomposition of the phosphide. Two cocks, arranged one at the upper part of the tube and the other below the metallic reservoir, are rigidly connected together by a rod. These are worked by the traction of a cord attached to the upper cock, which is protected against shocks by a metallic cup, through which the line passes. The latter arrangement is connected to the tube with a screw, so that it may be removed and the box lifted out to renew the phosphide when exhausted. There is also provision made for hermetically sealing the contents by a little melted rosin in a suitably placed cavity.

The entire device is suspended by a single cord, which is cut by the operator. A slight line is connected with the cocks, and also with a staple on a pulley through which the suspending cord of the buoy passes, so that when the latter falls its weight is sufficient to cause the thread first to open the cocks and then to break. The apparatus adrift, the water enters the bottom of the tube and, rising up, enters the phosphide through the perforations. The reaction set up disengages gas, which escapes at the upper orifice of the tube, giving a flame of intense brightness and, during the first five minutes, of some 11 inches in length. On the occasion of experiments recently made at Toulon, with a charge of 7,084 grains of phosphorus and a tube with an opening of 0·1 inch in diameter, the flame lasted for one hour and ten minutes.

It is suggested that phosphide of calcium might be arranged with ordinary life preservers so as to float in a suitable vessel at some distance from the swimmer, and thus mark his position. It would also be useful, in cases of wreck, to enable a vessel, over which seas are continually breaking, to communicate with the shore, or it might be employed on railroad trains in distress as a signal inextinguishable by wind or rain.

We learn that the apparatus, as above described, has been distributed throughout the French navy, for experiment in different parts of the world, in order to determine not only the operation in cases of necessity, but also whether the phosphide will keep perfectly when submitted to variable atmospheric conditions.



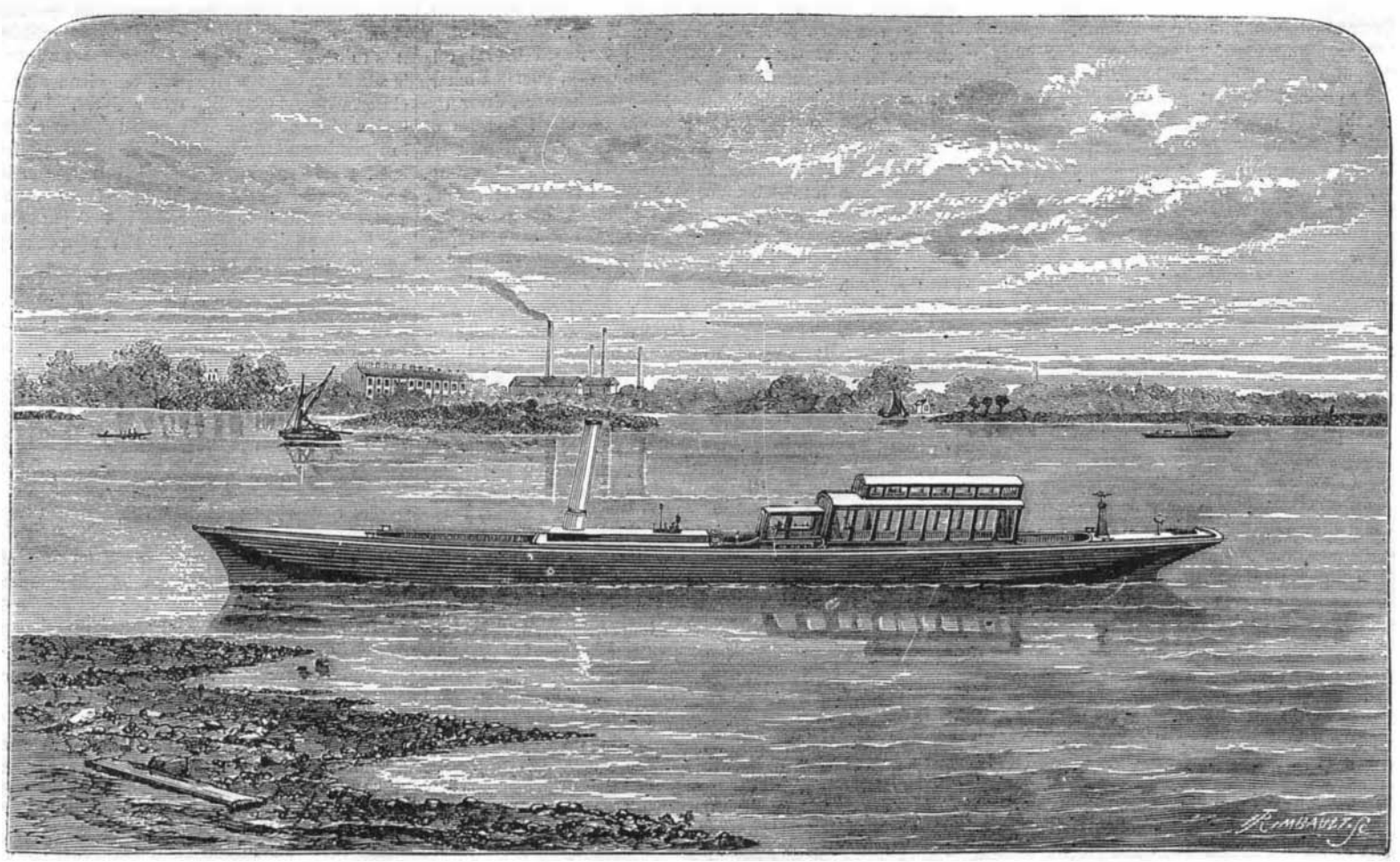
INEXTINGUISHABLE FIRE FOR LIFE BUOYS.

Ditching by Steam Power.

In North Germany the reclamation of the extensive low lands, that have heretofore remained uncultivated for lack of drainage, is now proceeding with vigor under the auspices of a company employing a large capital and effective steam ditching machines. Each machine cuts a canal 20 feet wide and 6 feet deep, and from 100 to 120 feet in length, every 10 hours. The peat is delivered on the surface of the ground alongside the canal, where it is dried, cut into bricks, and sent to market. It is an excellent fuel. In Holland and Friesland there are 1,000 square miles of this bog land now worthless, which will be rendered habitable and profitable as fast as the canals are cut, to say nothing of the immense quantities of fuel that will be obtained by the ditching operation.

THE ENGLISH STEAM LAUNCH FIREFLY.

Some time ago we gave an account of the trial of the steam launch Firefly, one of those wonderful little high speed vessels for which Messrs. John I. Thorneycroft and Co., of Chiswick, England, have gained such a reputation. Of this craft we now publish a sketch, from *Engineering*, which will serve to show her general character. Although only 53 feet long over all, 6 feet 6 inches beam, and 2 feet 6 inches draft of water, the little vessel made, on her trial the speed of 18·94 miles per hour, the observations of the runs being made with a care and accuracy which admits of no question. The Firefly is driven by a pair of engines of the inverted direct acting type, with 6 inch cylinders and 8 inch stroke, also made by Messrs. Thorneycroft; and it was



THE ENGLISH STEAM LAUNCH FIREFLY

built for Mr. Henry Morel, of the *Société de la Lys*, of Ghent.

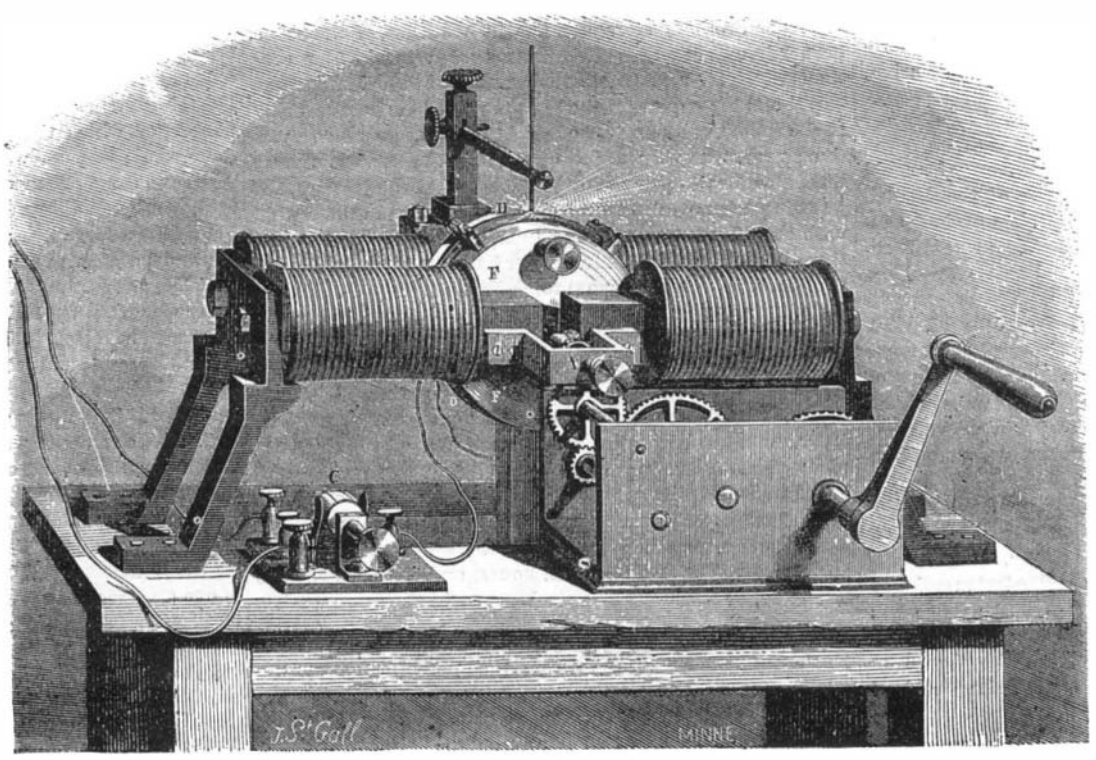
Messrs. Thorneycroft and Co. have made a specialty of these high speed boats, and there appears to be constantly increasing demand for them. The firm are now constructing some of these launches with compound engines.

PERIPOLAR INDUCTION.

Those of our readers who have attended the very interesting lectures delivered by Professor Mayer, of the Stevens Institute, Hoboken, N. J., on the subject of magnetism, will remember the striking experiments which he performs with the aid of the huge electro-magnet belonging to that institution and a disk of copper suspended so as to freely swing between its poles. When the magnet is uncharged, the plate vibrates, like a pendulum, from side to side with perfect readiness, retaining its motion for some little time after the impelling force is removed. If, however, a current is established, converting the masses of iron into actual magnets, the vibration of the plate is almost instantly stopped; an invisible resisting medium appears to have been formed between the poles, through which the disk is unable to pass, or, if forced through, acts, as Professor Mayer expresses it, "as if it were penetrating cheese."

On conducting an experiment somewhat similar to this, Faraday was led to the conclusion that the arrest of the copper plate was due to induced currents produced therein. In other experiments, which we will not here describe, the existence of these currents was demonstrated by the direct exploration of a disk of copper turning before a magnet, an operation which defined the paths of the currents with certainty. Foucault modified Faraday's mode of investigation by arranging his plate of red copper on a horizontal axis, and revolving it by suitable mechanism at the rate of 10,000 turns per minute. The disk passed between the two extremities of the soft iron core of an electro-magnet, in which a current could be established at will. As long as the the latter remained broken, the plate, when swiftly rotated, would retain its motion for some time; but as in the case already cited, a prompt stoppage followed the establishment of the electrical flow. Foucault intended not simply to reproduce Faraday's experiment, but he wished to study the results incident to the application of a force sufficient to continue the rotation of the disk in spite of the obstruction. It was found that, to accomplish this, considerable mechanical energy must be expended, which could be calculated and which reached quite large figures. What became of the excess of work over and above that necessary to ensure the rotation of the disk, maintaining a given velocity (or, in other words, that rendered necessary by the effect of the current), was the question, and Foucault determined it to be transformed into heat. This conclusion was soon justified by experiment, as it was found that the temperature of the disk became elevated to a degree appreciable by the hand; and when the rotation was prolonged for two minutes and the current produced by six Bunsen elements employed, the melting point of wax could be attained.

We have now given, of the salient points of this study, enough to show its progress up to the present; for since Foucault's experiments, no particularly notable investigations have been made into the action of magnets on copper in motion. M. Le Roux, however, has recently devised the apparatus represented in our engraving, and, besides, investigated that which he calls "peripolar induction."



Supported by iron feet on a solidly constructed table are four coils of isolated copper wire, so arranged as to be connected with a battery by means of the commutator, C, by which the current is interrupted or established at pleasure. Within these coils are cores of soft iron, the extremities of which extend beyond the wire and form the poles of the magnet when the current passes. A disk of red copper, DD′, is placed symmetrically in the center of the apparatus and parallel to the axes of the coils, and turns on a horizontal axis which extends between the opposite extremities of the iron, as at A. At this point is shown the pinion which, with other gearing, transmits the motion of the handle to the disk, so as to cause it to rotate 180 times per second, or about 10,000 times per minute. To the ends of the cores of the opposite coils and below are fixed two pieces of soft iron, F′, between which passes, though without touching either, the copper disk, D.

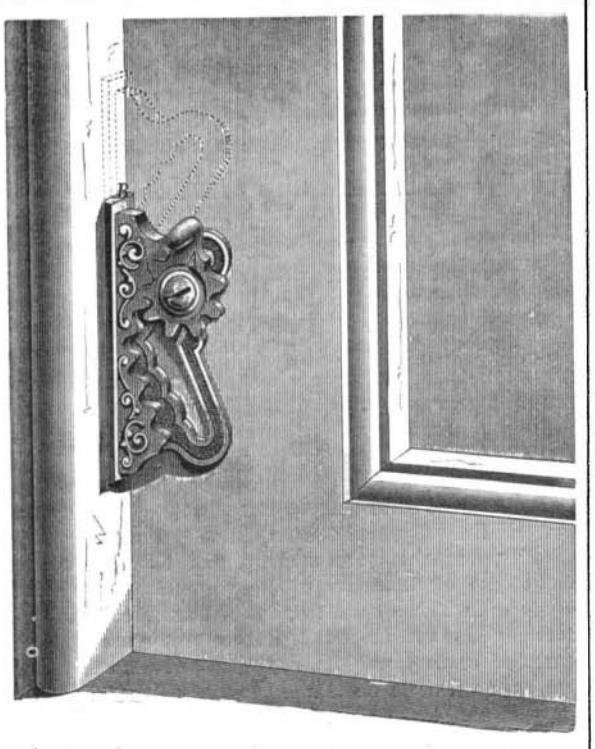
Thus arranged, the machine forms a powerful Foucault apparatus, with which the experiments above indicated can be repeated. But above the cores of the magnets are placed other pieces of soft iron, F, arranged similarly to those marked F″, which, we have stated, are fixed below. When this portion of the device is in position, all the pieces become magnetized by contact with the electro-magnets; and as is evident, the disk, D, in its entire extent, is submitted to the action of a magnetic field presenting the greatest symmetry in every direction. Here, however, the contrary of that which has been heretofore observed takes place; the rotation of the disk is as easily accomplished when the current passes as when the circuit is interrupted; and that the same resistance experienced in the Foucault apparatus is not here encountered is proved by the fact that the copper does not become sensibly warmed.

The current nevertheless passes, and zinc is dissolved in the battery. Here then is expended energy which should manifest itself somewhere. The study of the effects which should be produced by reason of the induction led M. Le Roux to admit the existence of a current running from the center of the disk to the circumference; and he proceeded to verify his conclusions. To this end, a vertical metal support is placed in contact with the axis of the disk, and a horizontal rod fixed to this support terminates in a copper wire, the end of which rests on the periphery of the disk. When the latter is turned, with no current passing, no especial effect is observed, except the slight warming of the copper wire by the friction. If, however, the flow of electricity be established, at that instant a continuous series of sparks leaps from the point of contact of wire and disk, thus denoting the existence of a very energetic current in the circuit formed by the disk, its axis, and the various pieces already described as arranged in connection therewith.

It is in the fact of there being this current, as predicted by theory, that M. Le Roux' idea of peripolar induction is based. No practical application of the discovery has been made; but it is very interesting, in that it confirms many theoretical ideas regarding induction. The machine represented was by Rhumkorff, the celebrated manufacturer and inventor of many physical instruments, and has been exhibited before many French scientific societies.

DEMMING'S CROWN SASH FASTENER.

We illustrate herewith a new and quite ornamental form of sash lock and holder, which can be readily attached to



any window without mutilation of the wood work. The device has no spring to wear out and is composed of but two pieces and a fastening screw. The latter serves as a pivot for the small cog wheel, A, the teeth of which engage in projections, formed, as shown, on the casting, B. When the sash is down the apparatus takes the position shown, so that, on attempting to raise the windows, the wheel, acting against the upper part of the casting, presses the face of the latter firmly against the batten and prevents the elevation of the sash. By turning the wheel by means of the small projection formed upon it, its motion through the bent slot raises the piece, B, and at the same time draws the face of the latter away from the casing so that it no longer binds.

When the window is up, it can be held in any desired position by causing the device to place itself as shown in the dotted lines, when the wheel comes to the bottom of the slot and, as is evident, pushes out the bottom of the casting. The apparatus falls readily into the position represented, and thus forms a self-fastener when the sash is down.

The advantages claimed are simplicity, ease of application; the non-marring of either sash or frame, a preventive of sash-rattling in windy weather, a positive lock when the sash is either up or down, a self-fastener when the lower sash is down, the holding away of the lock from the frame by the use of the handle when in the act of raising or lowering (as shown by dotted lines), and a peculiar adaptability to car windows. The lock can be as easily placed on the right side of the sash as on the left, by being turned upside down; and in either case, if the sash is left raised, it cannot be further elevated from the outside.

Patented August 19, 1873. Further information can be had by addressing the patentee and owner, H. C. Demming, Harrisburgh, Pa.

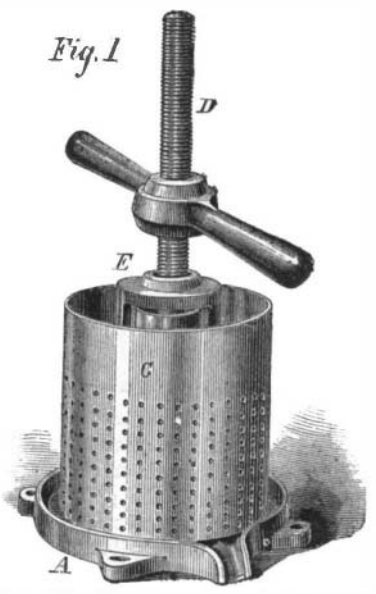
Proposed New Basis for Decimal Measures.

A correspondent, C. A. G., writes to point out that the French basis, the 10,000,000 of one fourth of the earth's circumference, is unsatisfactory as a starting point for the calculation of a system of weights and measures, as the circumference of a circle cannot be exactly ascertained. He proposes to use the secant equal to the radius of the circle, that is, the side of an inscribed hexagon; and he points out many supposed advantages of the change. But as the whole matter is a question of theory, we cannot see that the proposed plan brings us any nearer to absolute accuracy.

IMPROVED PRESS FOR FRUIT, LARD, ETC.

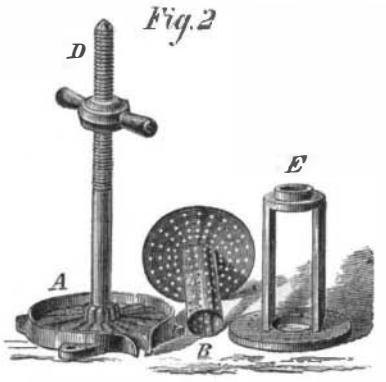
The annexed engravings are views of a new and simple form of fruit or lard press, in which, among other advantages claimed, the usual framework for the screw is rendered unnecessary, and there is a peculiar construction of the press chamber for facilitating the removal of the cake left after pressing.

Fig. 1



A is the base of the apparatus, having radial corrugations raised upon its surface, the channels between which lead the expressed liquid to the spout shown. In the center is a short conical projection, over which fits the lower portion of an inner perforated tube, A. The latter is connected with

Fig. 2



a perforated bottom which, when in position, rests on a flange made by turning the lower edge of the outer perforated wall, C. In the center of the base is a screw, D, on which is a nut provided with suitable handles. This nut