

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

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.

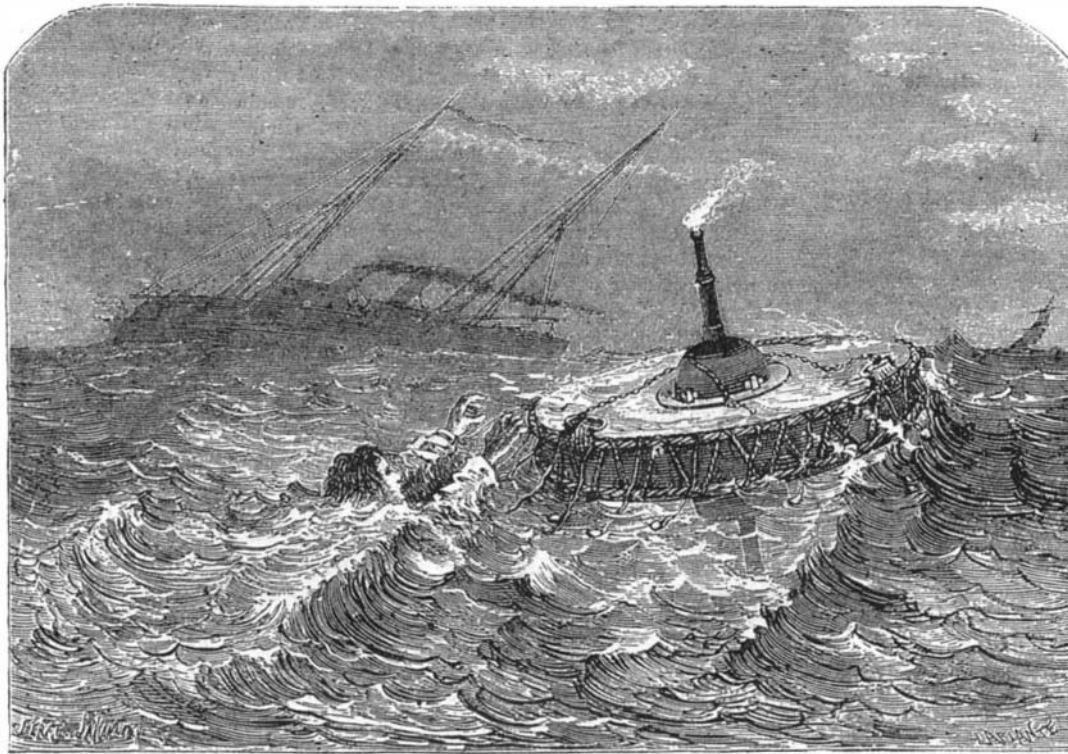
Ditching by Steam Power'

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 ren-

dered 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.

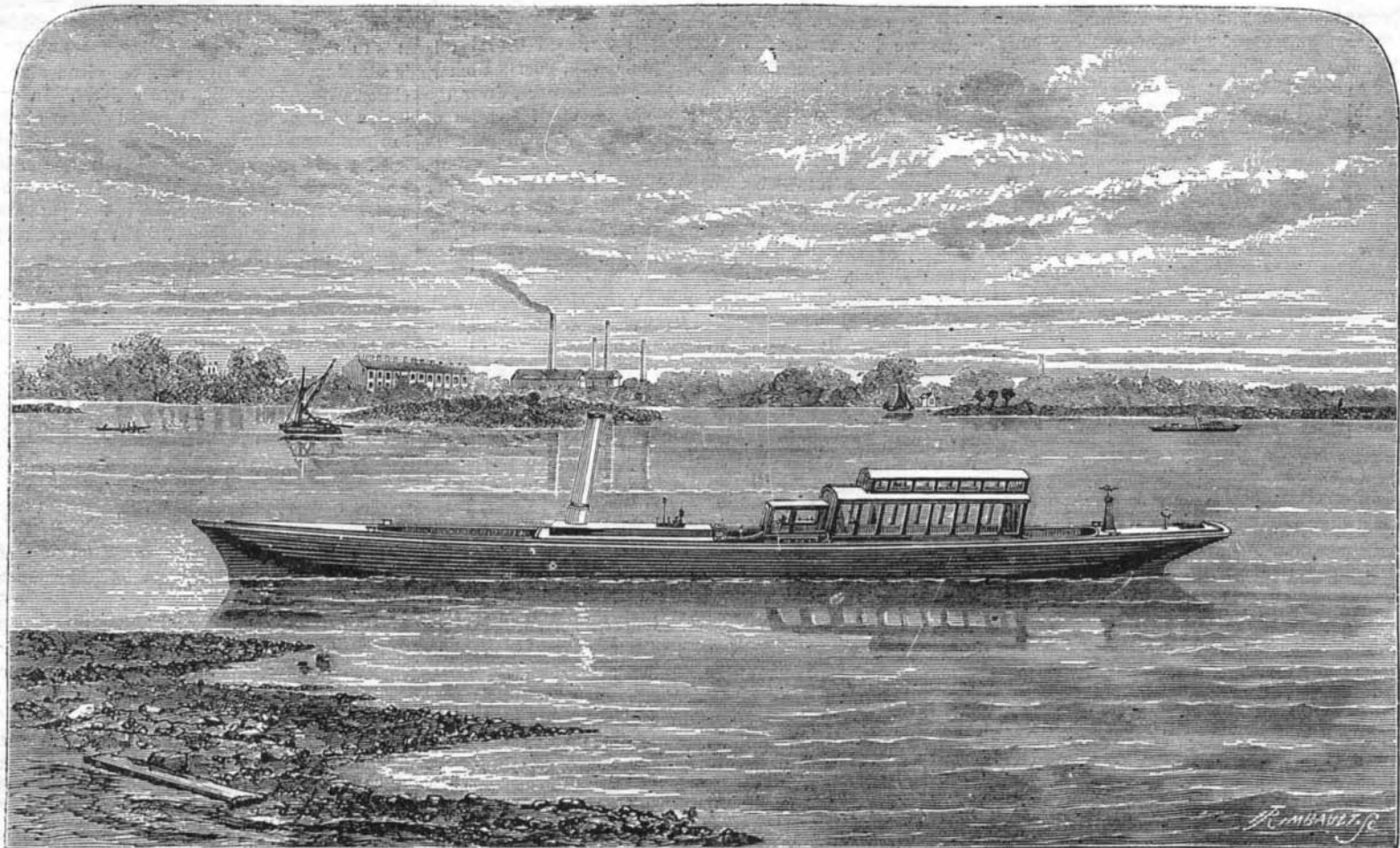
THE ENGLISH STEAM LAUNCH FIREFLY.

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. Thornycroft 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. Thornycroft; and it was

**INEXTINGUISHABLE FIRE FOR LIFE BUOYS.**

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

**THE ENGLISH STEAM LAUNCH FIREFLY**