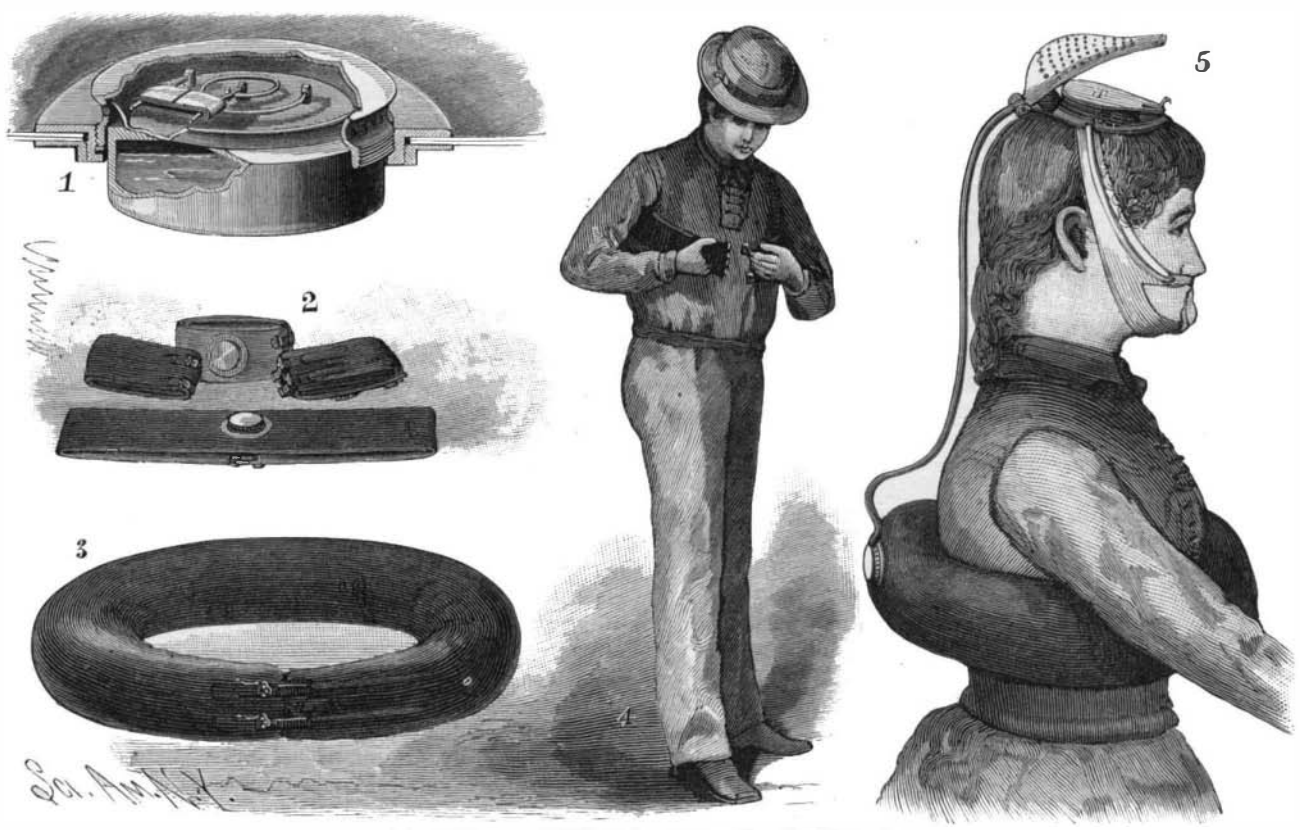
AN IMPROVED LIFE PRESERVER.

The life preserver proper consists of a long and narrow bag made of suitable waterproof material, and provided at the ends with catches, so that it may be passed around the body just below the arms, and the ends united. Secured in one side of the bag is a capsule containing a liquefied gas, such as ammonia. The mechanism for automatically liberating this gas to inflate the bag is held in check by a strip of soluble paper or its equivalent; the wetting of this paper releases the mechanism, which allows the gas from the capsule to fill the bag.

The capsule is cylindrical in form, and has a surrounding flange by which it is held in place by means of a screw cap around the side of which is a row of holes through which the gas escapes. The upper part of a rod passing through a hole in the center of the top is bent to form an arm, which is acted upon by a spiral spring, as shown in Fig. 1. The arm is held against the tension of the spring by a piece of soluble paper. When the capsule is immersed, the water flows through the side holes, wets the paper, when the spring is released and turns the rod to shift a suitable valve upon the interior, which allows the gas to fill the bag. To reach the paper, the entering water has to pass upward and over a curved brim, the object of which is to prevent the band from being moistened, should any drops of water enter the holes at any time when it is not desired to have the apparatus operate.

When the device is applied to a boat, raft, or other large vessel, to give it additional buoyancy in case of accident, the capsule is formed with two compartments, one containing a liquefied gas and the other a combustible powder and a frictionally ignitible preparation for lighting it. The combustion of the powder is an expedient for both liberating the gases and for generating additional gas and sufficient heat to prevent the freezing of the liquefied gases upon the pressure being removed. The liberating mechanism is changed to suit the altered conditions, but the paper band is employed as in the life preserver. When one capsule has been used, another is substituted for it, as is done in charging firearms with cartridges, and the empty capsule is recharged.



BADIA'S IMPROVED LIFE PRESERVER.

The empty preserver is much longer than the breast circumference of the wearer, to allow for the decrease in length when inflated. By means of a suitably arranged rubber strip, the bag is held with a slight tension snugly around the wearer, preventing it from slipping down; but when the bag begins to inflate, the elastic strip, now free, but held by the buckle, moves back toward the end of the preserver, both ends of which meet when the bag is full of gas.

When the preserver is to be worn by a swimmer, its construction is modified so that its action is null except in the event of actual danger. The upper of two thin spoon-shaped plates hinged together is pierced with holes, as shown in Fig. 5, for the passage of water, and is so formed as to leave a space between it and the lower plate for a bellows-like chamber when the plates are fastened together. A band of very elastic and thin rubber passes around the face of the wearer, being fastened on either side of the lower plate. A piece secured to this band is situated under the nose, and connected to pipes communicating with the interior of the bellows. The nose piece is hollow and has two nipples, which enter the nostrils, and in its lower part is a slit through which the air is forced to pass in breathing through the nose. The mouth is uncovered by the band, but when submerged it is covered by a thin rubber piece serving as an automatic valve. From a hollow rubber ring surrounding the capsule, extends a tube to a close elastic ball held at the hinge between the two plates. When the cover plate is brought down to engage with a catch, the ball is compressed, and the air in it is forced through the pipe and made to fill the ring, which closes all the holes in the capsule, thereby preventing the entrance of water.

If the bather should attempt to breathe while the head is submerged, the first inspiration would tend to produce a vacuum in the bellows. This would withdraw the catch to release the top plate, which would rise, when the ball would assume a spherical form, withdrawing the air from the ring, thereby allowing the water to enter the capsule through the holes. The apparatus is automatic, and its action depends only on the very acts a person would instinctively perform in case of danger.

This invention has been patented by Mr. Joseph S. Badia, of 327 Pine Street, Philadelphia, Pa.

This device may be used with advantage to save a drowning person who cannot be quickly reached by a boat, since it may be thrown to a considerable distance. The fact that the preserver does not expand or fill until it has been submerged enables it to be put into a very small compass and thrown by hand, by a sling, or a catapult almost any distance.

A SUBSCRIBER writing from Orlando, Fla., describes a magnificent lunar rainbow which he observed there not very long ago. It was seen at 3 o'clock A.M., in the east. The arch is described as being very perfect and the spectacle magnificent.

IMPROVED AIR ENGINE.

This engine derives its power from an alternate pressure of air contained below the working piston for the out stroke, and a partial vacuum for the return stroke. These different conditions are produced by changing the temperature of the air above and below a certain average temperature, which at any given time corresponds to the atmospheric pressure. When the temperature rises above this point, it gives a pressure correspondingly above that of the atmosphere, whereby the piston is forced up, and when the temperature falls below this average point, then the pressure within the engine falls below the atmospheric pressure, and the piston is forced down. The method of bringing about these conditions in an efficient and rapid manner, and at the proper time, and of controlling the same as to speed and regularity, constitutes the novel features of the engine, which are shown in the vertical section, Fig. 2.

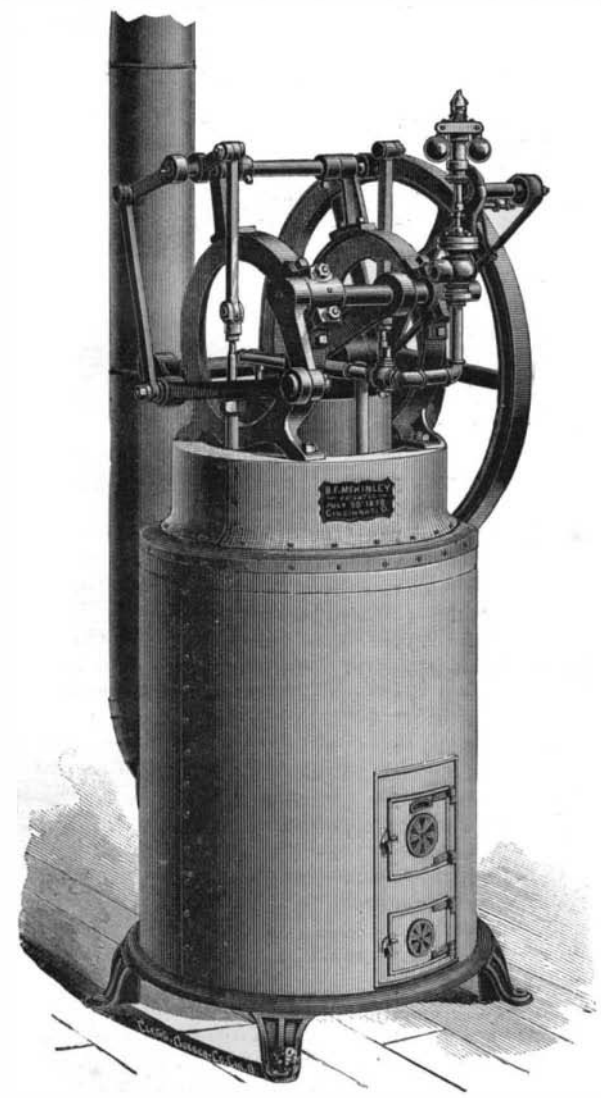


Fig. 1.—THE McKINLEY AIR ENGINE.

In open communication with the cylinder, B, in which works the piston, D, is a chamber formed by the two concentrically corrugated plates, A A′, and a ring, A″, all firmly bolted together. Within this chamber is a diaphragm, E, composed of two plates, between which is a non-conducting material. Attached to the upper and lower surfaces of the diaphragm are concentric flanges, adapted to enter the inside corrugations in the plates, A A′. This diaphragm has a reciprocating movement, alternately with the working piston, by means of which the air inside is transferred back and forth between the upper and lower parts of the chamber, which is called the regenerator. Arranged around the periphery of the diaphragm, and between the plates, A A′, and within the ring, A″, are a great many strips of wire gauze, F, through which the air passes in its way back and forth within the regenerator. The upper working parts of the engine are secured to the plate or ring, N, which is bolted to lugs upon the plate, A, thus making the engine self-contained. The lower plate, A′, rests upon the upper edge of the drum, G, which in turn rests upon the base plate; these parts are firmly bolted together.

Within this case is the furnace, which is a drum lined with fire brick, J, having the grate, C, and a deflecting plate formed with flanges, H, that guide the products of combustion in close contact with the plate, A′, into the annular flue, S, whence they escape into the chimney through the opening, M. The lower edge

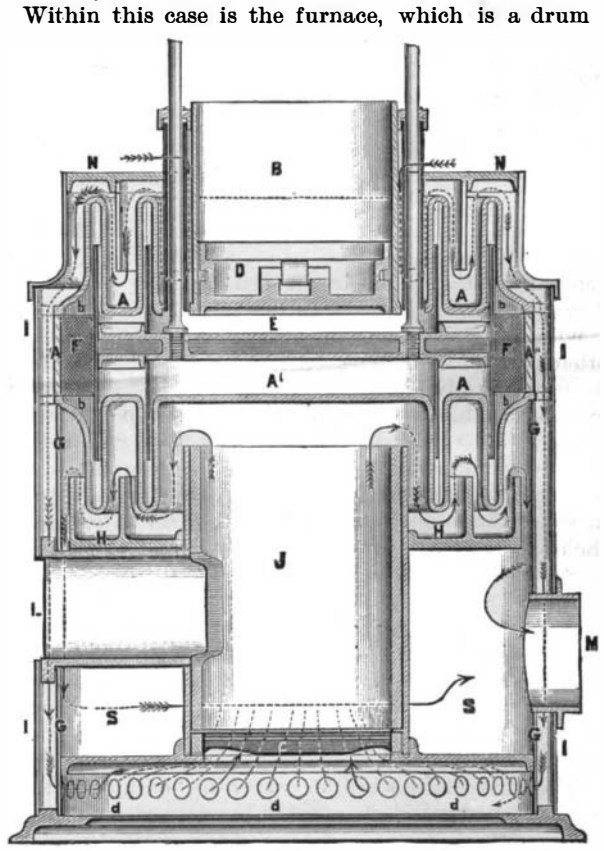


Fig. 2.—McKINLEY AIR ENGINE—VERTICAL SECTION.