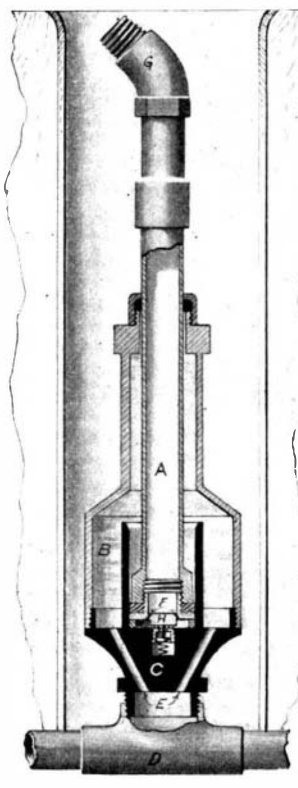
NON-FREEZING HYDRANT.

A hydrant embodying a number of important improvements is described in a patent recently granted to Mr. Charles L. Burkhart, of Dayton, Wash. The hydrant is provided with a tubular piston, which may be raised to permit the water to flow, and when lowered will stop this flow, at the same time opening a valve to drain out the water in the piston, thus rendering the hydrant nonfreezing. The entire device is situated in a casing which is sunk into the ground. The tubular piston, which is marked *A* in our illustration, projects from the hydrant proper. The hydrant proper consists of two sections, *B* and *C*, which are screwed together and form a chamber. Section *B* has formed on its upper end a nut, above which is a packing fitted snugly against the piston, *A*. The section, *C*, is connected with the water-supply pipe, *D*. Two channels, *E*, lead up through the section, *C*, to the hydrant chamber. Projecting upward from the section, *C*, is a cylinder formed thereon, into which the lower end or head of the piston, *A*, rests when the hydrant is not in use. The piston head is provided with a rubber gasket, which snugly fits against the walls of this cylinder. The gasket is held in place by a cap piece, *H*. When in its lowest position the cap piece depresses the stem of a valve in section *C*, opening the valve and permitting all water in the piston to be drained out through an outlet channel. With the parts in the position illustrated, the pressure of the water in the hydrant chamber acts on the piston to hold the same in its lowest position. If it is desired to use the hydrant, the piston is raised until the piston head clears the top of the cylinder. The drainage valve then closes, and the water passes up through the openings in the cap piece, *H*, and out through the tubular piston. A hose may be connected to the elbow, *G*, and since the piston is revoluble, it will follow the movement of the hose, preventing kinking of the hose and consequent interruption in the flow of water. Since the piston must be lowered in order to cut off the flow of water, it normally assumes a position which will not interfere with a lawn mower. If it be desired to remove the hydrant from connection with the water supply without injuring the casing, it is simply necessary to remove the elbow, *G*. and slip a suitable tool down over the piston to an engagement with the nut on the upper portion of the section, *B*, and upon turning this the hydrant will be unscrewed from the coupling *D*.


NON-FREEZING HYDRANT.

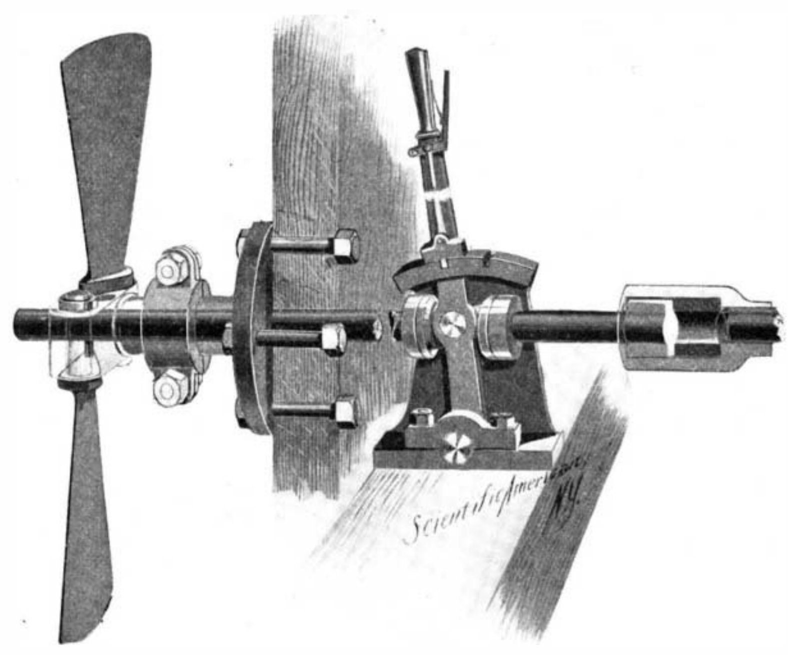
A few weeks ago the last train over the "baby gage"—a 22-inch railroad—was run from Longfellow to Metcalf, Ariz. According to the Copper Era, a new 36-inch narrow-gage road takes the place of the old. The "baby gage" was built in the early seventies. It was the first railroad ever built in Arizona. The engine was hauled overland from Sargent, Kans., then the nearest railroad station, to Clifton and set up by Dad Arbuckle, who is still in the employ of the company. At first the road was built and operated only to the Longfellow mine, but was afterward extended to Metcalf. The old "baby gage" was considered quite an engineering feat in its time, and justly, too, because it was built at a distance of more than one thousand miles from the nearest railroad points.

REVERSIBLE SCREW-PROPELLER.

The accompanying engraving illustrates a screw-propeller of a construction which enables it to be reversed by a sliding movement of the propeller shaft. It does not require the use of a hollow or tubular shaft usually employed, and therefore requires the use of only one stuffing box and other features incident to the two shafts. Further, it enables several reversible propellers to be mounted in tandem on the same shaft, thus securing great efficiency and at the same time preserving the advantage of reversible propellers.

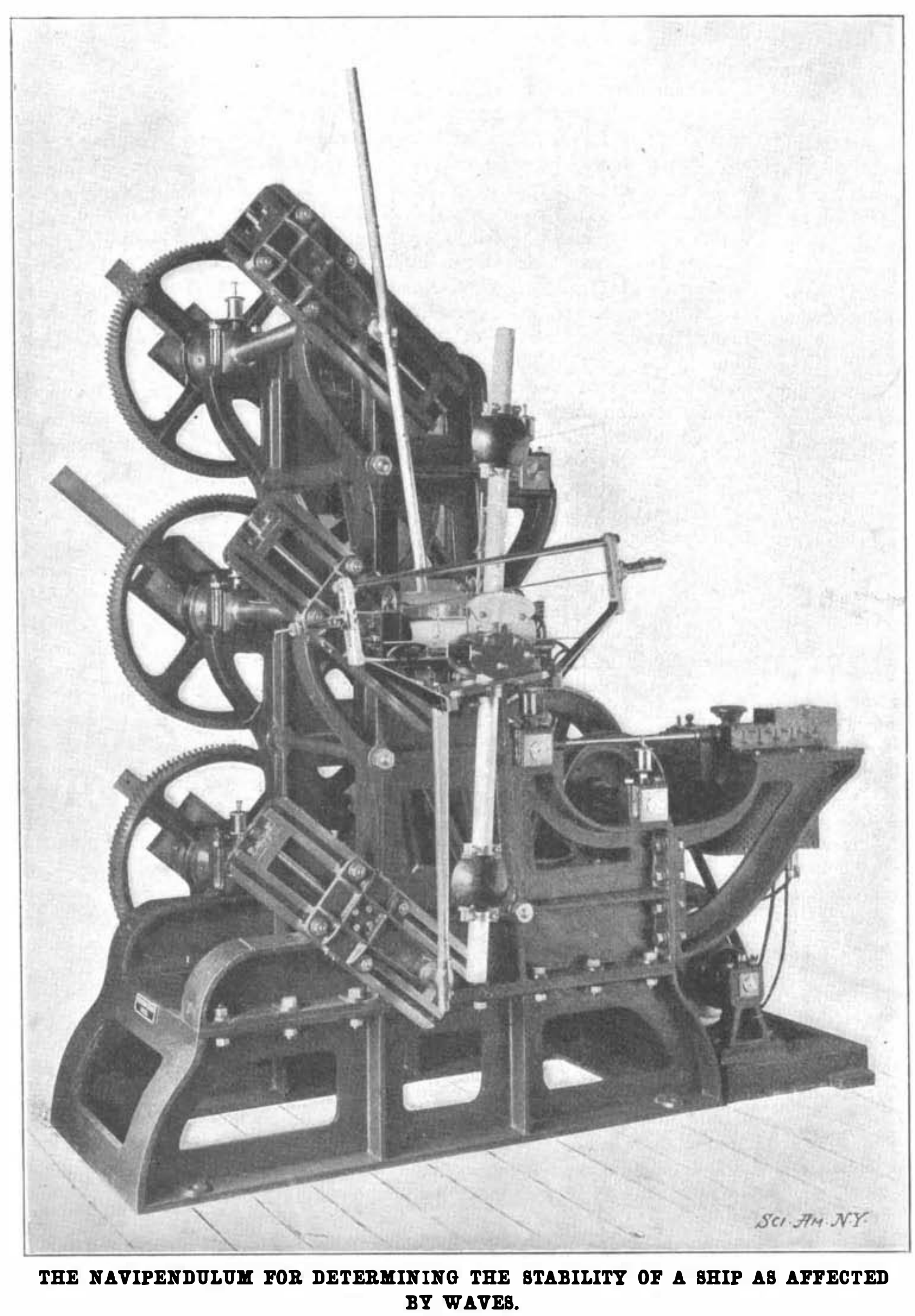
The propeller shaft is connected at its inner end to the engine shaft by a coupling which allows longitudinal sliding movement. At its opposite end the propeller shaft passes through a box secured to the sternpost of the vessel. The propeller blades are carried on a hub mounted on the outer end of the propeller shaft. This hub is held against sliding movement with the shaft by a coupling which connects it with the box on the sternpost. This coupling, however, is of such design as to permit free rotary motion of the hub. Each blade of the propeller is provided with a crank-shaped base which is rockably mounted at one end on the hub, and at the other is held in place by a pin driven into the proper shaft and extending through slots formed in opposite sides of the hub. At a convenient point in the vessel a hand lever is mounted, which is suitably connected to the propeller shaft and may be actuated to slide the same longitudinally. Our illustration shows this shaft in its outer position. By drawing the shaft inwardly the propeller blades will be reversed, their crank-shaped bases, by reason of their connection with the pin on the propeller shaft, being swung on the pivot pins, which secure them to the hub.

This invention will be found applicable particularly to small vessels, although of course it may be used on larger craft if desired. A patent on the device has recently been secured by Mr. Samuel Irwin, of Lindsay, Ontario, Canada.


REVERSIBLE SCREW-PROPELLER.

THE NAVIPENDULUM METHOD OF EXPERIMENT.

The movements of a ship in a body of still water are not unlike those of a pendulum, the ship, if it be moved from the perpendicular, beginning to oscillate around the vertical and coming to a state of rest after having gone through a series of oscillations of gradually decreasing amplitude. We present an illustration of an invention by Capt. Russo, of the Royal Italian Navy, which was designed to enable us to solve the problem of the rolling of ships. It will be seen that the apparatus contains a kind of pendulum which is composed of a heavy rod and two weights, one near each end. The pendulum rests and rocks through a central block upon a plate. The rocking motion of the pendulum is analogous to that of a rocking-chair or a small rocking-horse, to which the rolling motion of a ship may be roughly compared. In constructing a navipendulum, it is necessary to know certain data regarding the ship to be experimented upon, such as the displacement, form of hull, distribution of weights, metacentric height, the curve of stability, the period of oscillation, the amount of still-water oscillation, etc. All of these elements are involved, so that the instrument, if properly constructed, becomes an exact representative of the ship itself in everything that affects its rolling in still water. If the working of the navipendulum were confined, however, to still-water experiments, it would have but small practical value, as the beautiful tank experiments of the late Mr. Froude have given us all data on this subject. But the usefulness of the navipendulum begins where the tank leaves off, namely, in solving the important problem of the rolling of a ship on waves. After comparing the rolling of the ship in still water to the motion of a rocking-chair on a fixed plane, it is only necessary, in carrying the parallel further, to suppose that the sustaining plane, instead of remaining at rest, be made to oscillate, inclining and displacing itself from one side to the other in a forward and aft direction, and also in a vertical direction. The rocking-chair in this case, while following the plane of the various displacements, will, of course, have a more complicated movement than when the plane is at rest; it will incline from the vertical by angles of variable amplitude to the right and to the left. The oscillatory motion of the chair will, in such a case, be similar to the rolling of ships on waves, since it happens that the element on which the ship is supported continually changes in trim and position to the position of


THE NAVIPENDULUM FOR DETERMINING THE STABILITY OF A SHIP AS AFFECTED BY WAVES.

The bar with weights at each end rocks, by means of the rocker, at its center, on a plate, which changes its inclination in imitation of the changing inclination of the waves.