A NOVEL AIR COMPRESSOR.

The air compressor is now so universally used for mining and braking purposes, that it would seem as if it had reached the stage of completeness for economical work. It appears, however, improvements have been invented whereby it is thought the efficiency of the compressor as compared with the steam pressure employed is considerably increased.

The compressor shown in the accompanying illustration is constructed upon an entirely different principle from those in ordinary use, that is, the steam power is transmitted from the crank of the steam engine through what is termed a floating beam and toggle joints to two direct single-acting air-compressing cylinders.

In this way it is possible to extend the stroke and to combine the energy exerted through both sets of toggles in their straightening and deflecting motions.

Thus the whole force developed through the toggles up to their exhaustion is available for the work of compression nearly the first nine-tenths of the stroke, hence the compression is continued by the deflecting set through the agency of the floating beam. The large illustration, taken from a photograph, gives an excellent idea of the general appearance of the machine. The diagram in the upper left-hand corner shows the plan of construction. The operating horizontal connecting bar *B* is reciprocated to and fro by the revolution of the steam engine crank, and is connected at each end to the knees of the toggles *D* and *C*. These are stationarily pivoted at their lower ends to the base of the compressor, while their upper ends are pivoted to the floating beam *A*; from the extreme ends of this beam rise the air compressor piston connecting rods, to the pistons shown in the compression cylinders *G* and *H*.

The beam *A* is supported at its center on a vertically movable support to allow for the variations in the movements of the toggles. One form of this variable support is a weight placed on a lever at *F*, the other end supporting the pivot rod *E*, on which the beam *A* rests. It is obvious other means for allowing for this variation can be used.

In the position shown, the toggle lever *C* has been straightened by the movement of the connecting bar *B* to the left, which has forced the beam *A* upward, and made a compression in the cylinder, while in the cylinder *G* the piston has been drawn down by the bending of the knee of the toggle *D*, and is in a position to begin compression on the movement of the bar *B* to the right.

As the beam *A* overhangs the toggles by one-fourth of its length, it becomes a simple lever, with each toggle set alternately acting as a fulcrum. The motion on the joints is very slight, an arc of only one-eighth of a circle representing the frictional travel on the pins.

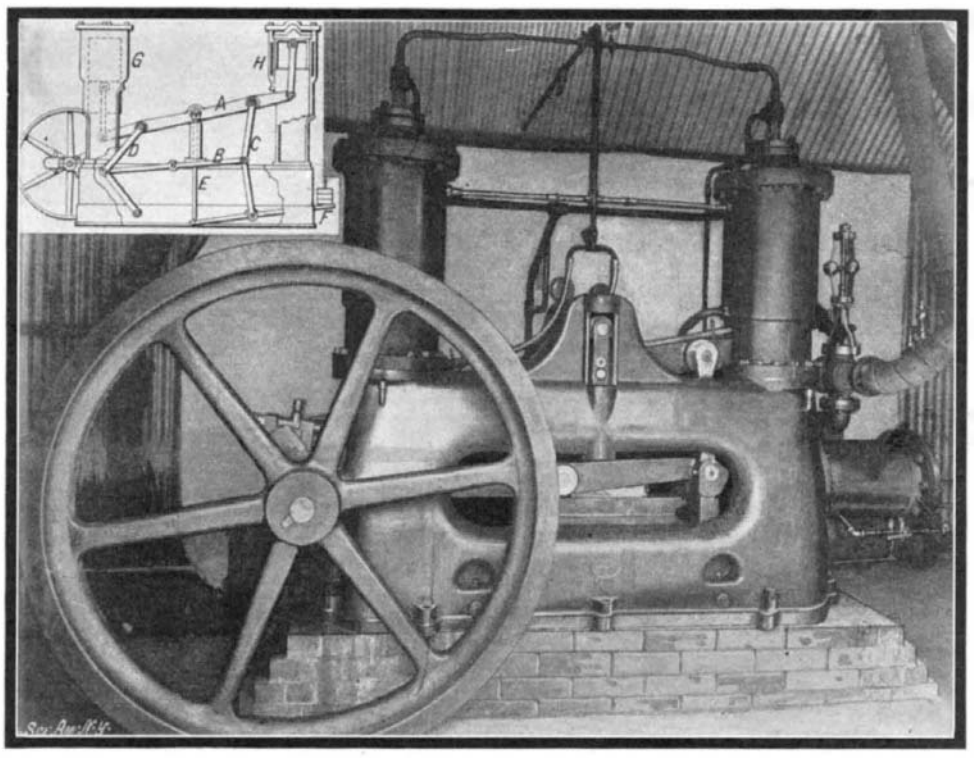
The size of the cylinders of the compressor, actually experimented with, is 12 inches in diameter by 16 inches stroke for the steam, and also 12 inches by 16 inches for the air cylinders, which are single-acting. The inventor states that the mechanical efficiency of the compressor is 90 per cent.

Special arrangements are provided for the cooling of the air during compression, so that the results are practically isothermal, the air being discharged dry.

The compressor is the invention of Mr. Henry Bland, of Sydney, Australia, and is being introduced by the Bland Compressor Company, Limited.

We are informed that the representative in the United States is Mr. T. B. Reynolds, Whitehall Building, No. 17 Battery Place, this city. The compressor is protected by patents in several countries.

As to the efficiency of the compressor, the inventor states that at a steam pressure of 50 pounds G. P., with the engine making from 100 to 120 revolutions per minute, a pressure of 250 pounds to the square inch (receiver pressure) is easily maintained. On occasions this has been increased to 300 pounds or more, the engine governing freely meanwhile. Air taken in at 72 deg. F. is delivered under 250 pounds pressure at 90 deg. F., as actually determined by a thermometer test. The volumetric tests show an efficiency of 97 per cent. The amount of horse-power required to compress a given quantity of air to a given pressure is in the proportion of six horse-power to one hundred cubic feet of free air compressed to 75 pounds pressure.



THE BLAND AIR COMPRESSOR.

Various tests under the direction of Mr. Herbert E. Ross, C. E., have been made in different ways, showing a higher efficiency—from thirty to fifty per cent—than is ordinarily the case under a stated steam pressure.

The utilization of the lever and toggle principle in securing greater compression is quite unique and novel in an air compressor, and one that is shown by actual trial to be more economical in relation to the initial steam pressure than is usual.

AN APPARATUS FOR PREVENTING SEASICKNESS.

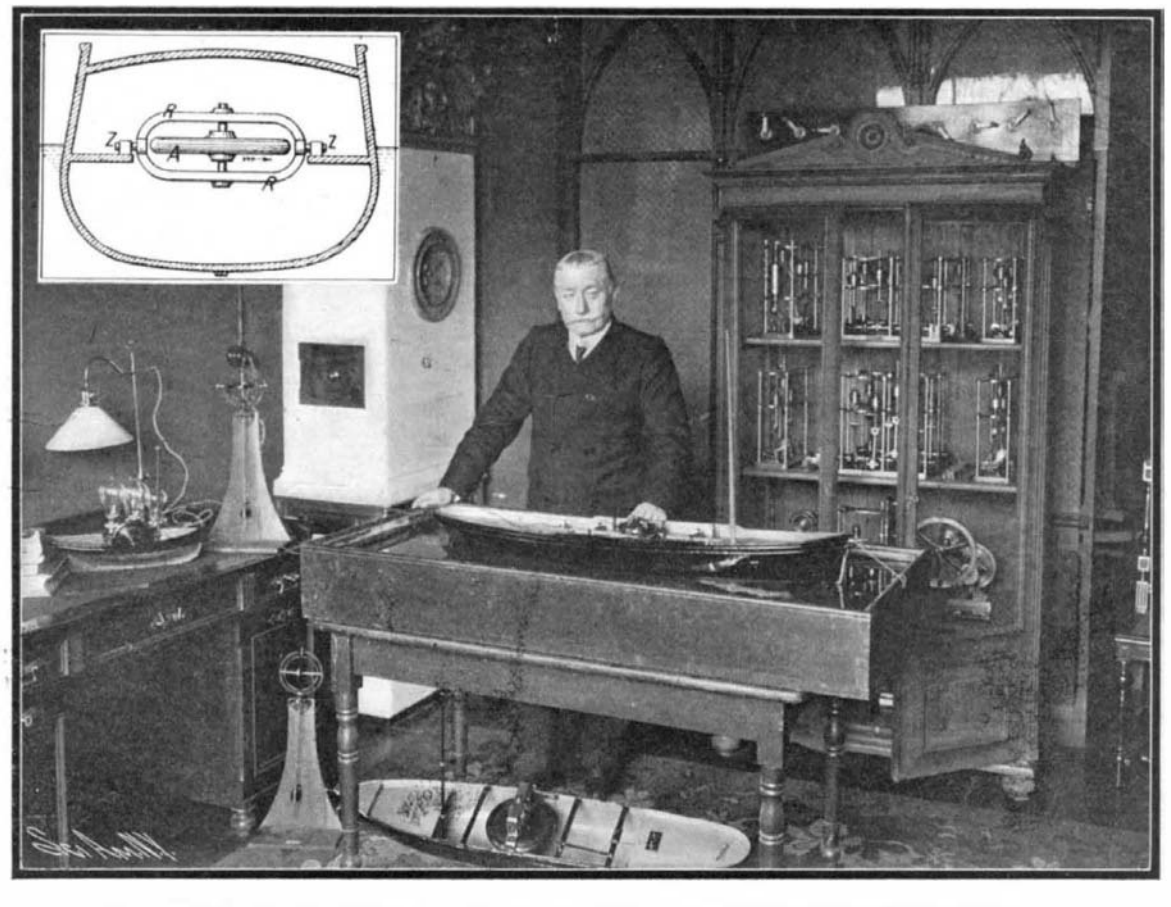
BY DR. ALFRED GRADENWITZ.

The pitching of a ship in a rough sea is certainly a serious drawback both to the physical welfare of passengers and crew and to the expedition of any work made on board. While any endeavors made to prevent or to diminish pitching have so far been in vain, the rolling may be acted against efficiently by increasing on the one hand the period of the lateral oscillations as far as possible, and decreasing on the other the amplitude of oscillation after an inclination has been produced by an impinging wave. No apparatus has, however, been so far designed for obtaining both of these actions at the same time. A high period of oscillation may be obtained by increasing the moment of inertia and diminishing the metacentric height. As, however, this means can be resorted to only within narrow limits, the results obtained are rather poor.

The principal means of limiting the oscillation amplitude, on the other hand, is the use of drift-keels and water chambers. A very clever device presented by Mr. Thornycroft to the Institution of Naval Architects in the spring of 1892 should be mentioned in this connection.

Now, Mr. O. Schlick, a well-known naval engineer of Hamburg, Germany, has brought out an ingenious apparatus designed at the same time to increase considerably the period of oscillation of the rolling movements and to diminish the amplitude of oscillation. This apparatus is based on the gyroscopic effect of a flywheel mounted in a peculiar manner on board a steamer, and caused to rotate rapidly. The vertical axis of the apparatus is so located as to be able to move pendulum-like in the central plane of the ship. The permanent and rapid oscillations of the wheel will result in rendering the ship insensible to the effect of the wave motion, the rolling movements being practically eliminated. As the device will exert an energetic effect even with the smallest lateral oscillations of the ship, a propagation of the motion, resulting in a strong oscillating movement, will be impossible, whereas any drift-keels so far used do not act before the rolling movement has become marked.

The underlying principle of the apparatus is the fact that a rotating body will oppose to any inclination of its axis a resistance the higher as its rotation is more rapid and its weight more considerable. The diagram shows a flywheel. In a large frame, *RR*, rotating on a horizontal axis at right angles to the longitudinal direction of the ship by means of two pivots, *zz*, there is mounted the vertical axis of the flywheel *A*, caused to rotate rapidly by an electric motor. As the forces producing the rolling movement of a ship are by no means excessive (in fact, twenty to twenty-five men running in proper time from one side of the deck of a large steamer to the other are known to cause the latter to perform considerable rolling movements) the weight of the flywheel in a ship 6,000 tons in weight need not be higher than 10 tons with a diameter of 4 meters (13.12 feet). The apparatus will therefore be specially available for use on steamers of moderate dimensions.



MR. SCHLICK AND HIS MODEL OF AN APPARATUS FOR REDUCING THE ROLLING OF A SHIP.

A new machine for producing belting and textile fabrics has been invented by Mr. J. W. Hyatt, of London. The apparatus is a combination of the loom and the sewing machine. The belting it turns out is a first-class article, double-selvedged and of great strength and durability. The most prominent feature of this belting is its small amount of elasticity, and imperviousness to water, oil, and chemicals. It has a stretching strain of only three per cent, and its breaking strain is 30,000 pounds, as compared with the 7,000-pound breaking strain of the best leather belting, while it can be produced about fifty per cent cheaper. Demonstrations with this new production have proved such a high standard of strength and durability, that a motor-tire manufacturing firm has decided to utilize the fabric for the foundation of tires instead of canvas.