

MAN'S PATENT AUTOMATIC CUT-OFF VALVE.

It is now many years since the mechanical world was astir through the introduction of the Corliss cut-off valve, which, modified and improved, has maintained its position as a first-class cut-off valve actuated by "trip" motion. It marked an era in the construction and economy of the steam-engine, through the application of a principle that would indeed seem difficult to improve upon; but we lay before our readers drawings and description of a new cut-off valve, the invention of Mr. James H. Man, of Denver, Colo., that is actuated on an entirely new principle, and which, through various and severe tests, has proved itself to possess advantages beyond the expectations of its inventor and advocates.

To describe the principle of its action, we can not do better than quote from the preamble to the patent specification No. 308,181, dated November 18th, 1884, which runs thus:

"When steam (or gas) at any pressure passes through an orifice into any lower pressure, its velocity is due to and varies approximately as the square root of the difference of pressures. When this difference is small, if then the orifice be that of a valve free to close, but kept open by its own weight or a spring, it is evident the valve will not remain open, when the difference of pressures on either side of itself produces a force greater than that tending to keep it open. The valve is in equilibrium when these forces are equal and opposite, and the velocity of the steam at the moment of equilibrium is therefore definable.

"By introducing such a valve between the slide-case and the cylinder, so that the velocity of the steam shall just produce equilibrium about the valve at the moment of maximum piston speed, the valve will close and give an instantaneous cut-off at about half-stroke. To effect the cut-off earlier than half-stroke, the phenomenon of equilibrium has merely to take place at some previous moment, which may be accomplished, 1st, by an increase in the speed of the engine; 2d, a decrease in the area of the valve; and 3d, a decrease in the load on the valve.

"From a study of the first of these causes, it appears the valve, when once adjusted, should be an automatic regulator of speed, and this is actually the case to a certain extent; but in practice it will be found necessary to adopt one of the other causes.

"Locomotive, marine, and other engines that require regulation of power at varying speeds can be fitted with mechanism by which the area of the valve or the load on it can be altered at pleasure, and so vary the point of cut-off to suit circumstances. In other engines requiring regulation of speed, any governor can be applied to actuate the cut-off valve or its load."

The particular design of valve preferred is shown in section in the accompanying cut. It is constructed on the differential principle, for the double purpose of increasing the area for the passage of steam and decreasing the weight of the valve. It is simply a hollow bobbin of steel or other suitable material, that slides on a pipe arranged so that the steam for the supply of the upper seating passes through the valve itself. This week we illustrate a horizontal engine with sectional views, showing its application to a pair of vertical balanced piston-valves, arranged and driven in a somewhat novel manner, and for which application has been filed for letters patent. The principle is, however, precisely the same, whether the application be to flat or cylindrical valves, working either horizontally or vertically, namely, the steam, in passing toward the cylinder, passes through the top and bottom seatings of the valve; and if the area presented for the passage of the steam be not large enough for the maintenance of initial pressure within the cylinder, the steam will become throttled at some point in the stroke. In other words, there will be a slightly reduced pressure within the valve chamber, the excess of external pressure tending to raise the valve.

It will thus be seen, if the weight of the valve on its effective area (the difference between the areas of its two disks) represents a pressure downward less than the excess of external pressure upward, the valve will be closed by the steam at a velocity approximately equal to the influx of steam, thus producing an instantaneous cut-off.

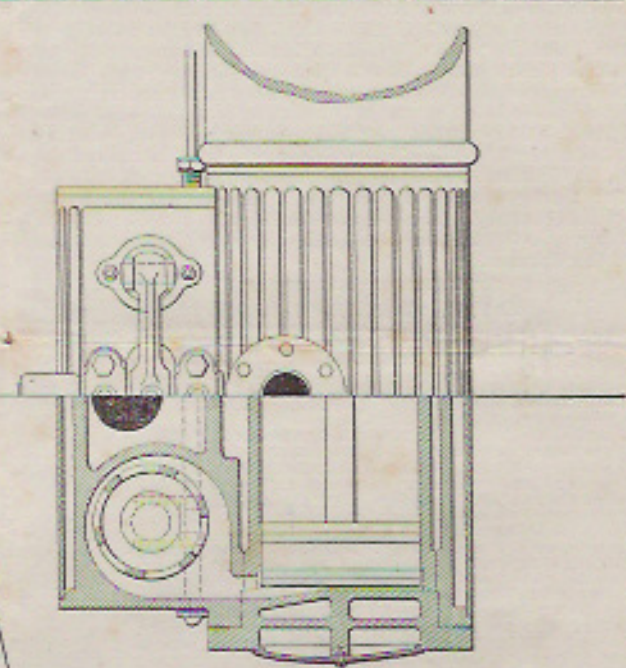
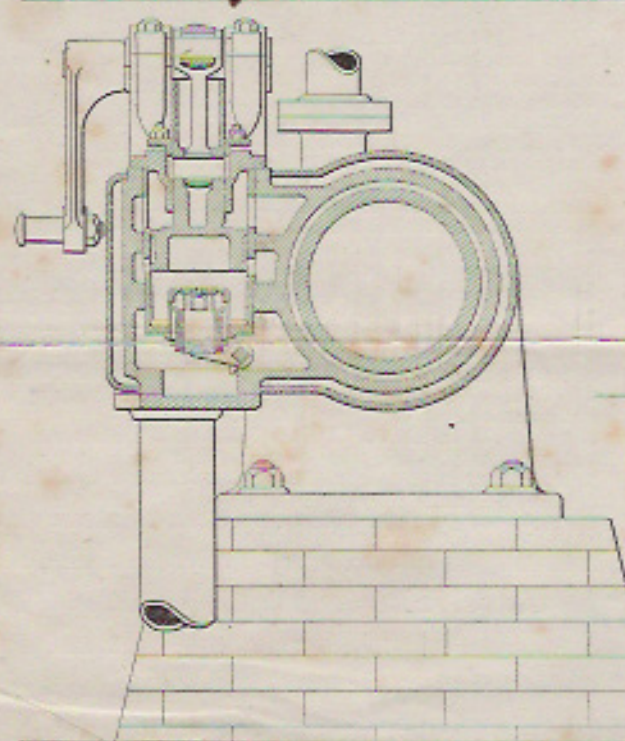
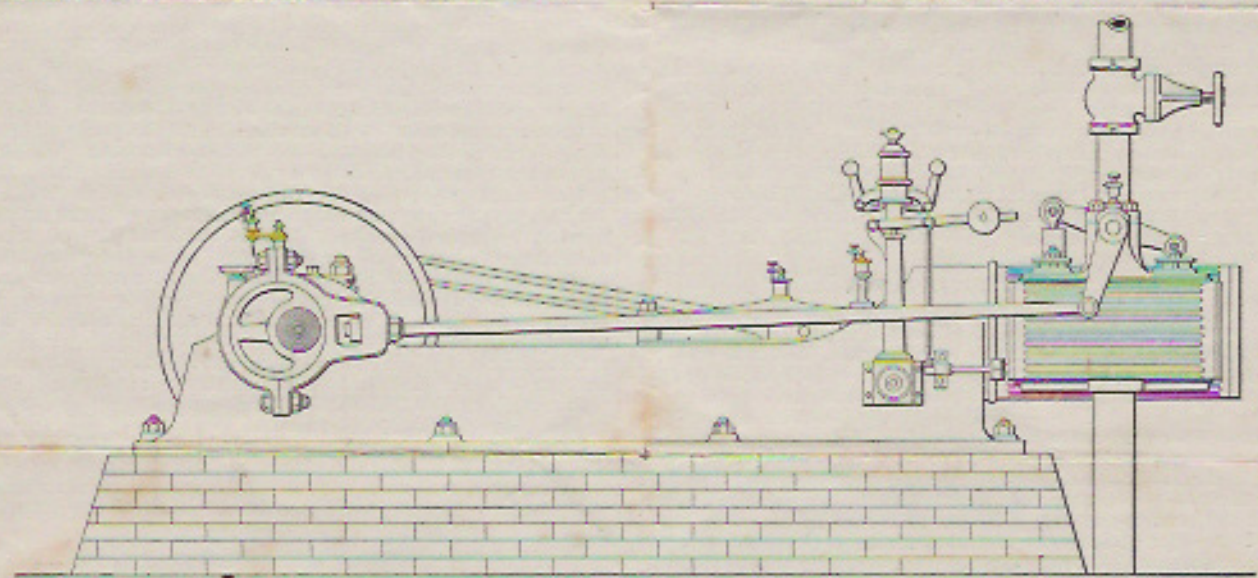
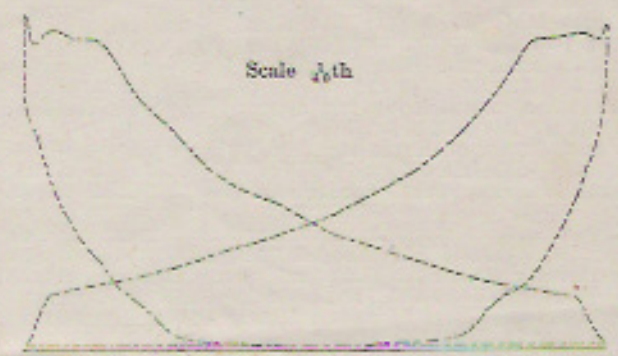
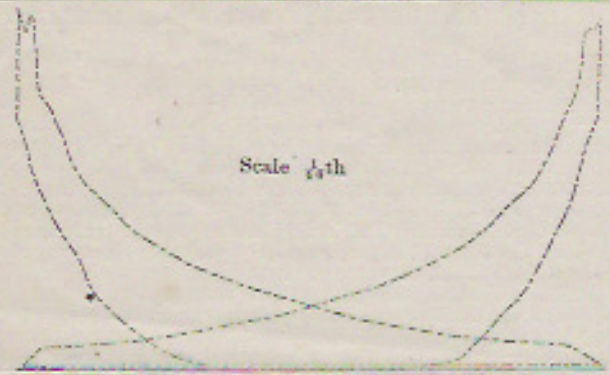
The exact point of cut-off is determined solely by the position of the valve (the amount of opening) in relation to the speed of the engine, and it is merely necessary to raise or lower the stop on which the valve rests (normally) to effect earlier or later cut-offs.

We shall also give at some future date its application to that class of engines known as the single-acting trunk piston engine. It is, however, equally applicable to beam-engines or inverted cylinder-engines. The principle is applicable to a valve of any design.

The use of a piston-valve and eccentric with an independent cut-off that requires no mechanism for its action will present to the engineer points for careful study that will soon convince him that they are a simple and good means for obtaining the conditions necessary for the successful working of an economical high-speed engine. By means of a piston-valve, the lead, the exhaust, and the amount of compression can be adjusted to suit the exigencies of any particular engine without considering the point of cut-off of the main valve.

By a correct proportioning of ports and port-openings, we can arrive at the finest possible admission and back-pressure lines, and at the same time, by the instantaneous action of the cut-off valve, we have a perfect cut-off and expansion line. Further than this, whereas Professor Thurston, in his recent treatise on *Stationary Steam-Engines*, has recorded "the reintroduction of the positive motion classes of valve gear and expansion gear" for high-speed engines, to which the "drop cut-off" was no longer applicable, we are now recording exactly the reverse, namely, the introduction of a non-positive and automatic cut-off valve that is applicable to low, but especially to high-speed engines.

The Hendey & Meyer Engineering Company of Denver, Colo., has taken up the manufacture of these engines, one of which is now successfully running its works. It is a horizontal 10-inch by 15-inch, making 225 revolutions a minute, from which the indicator cards appended were taken.



MAN'S PATENT AUTOMATIC CUP-OFF VALVE.

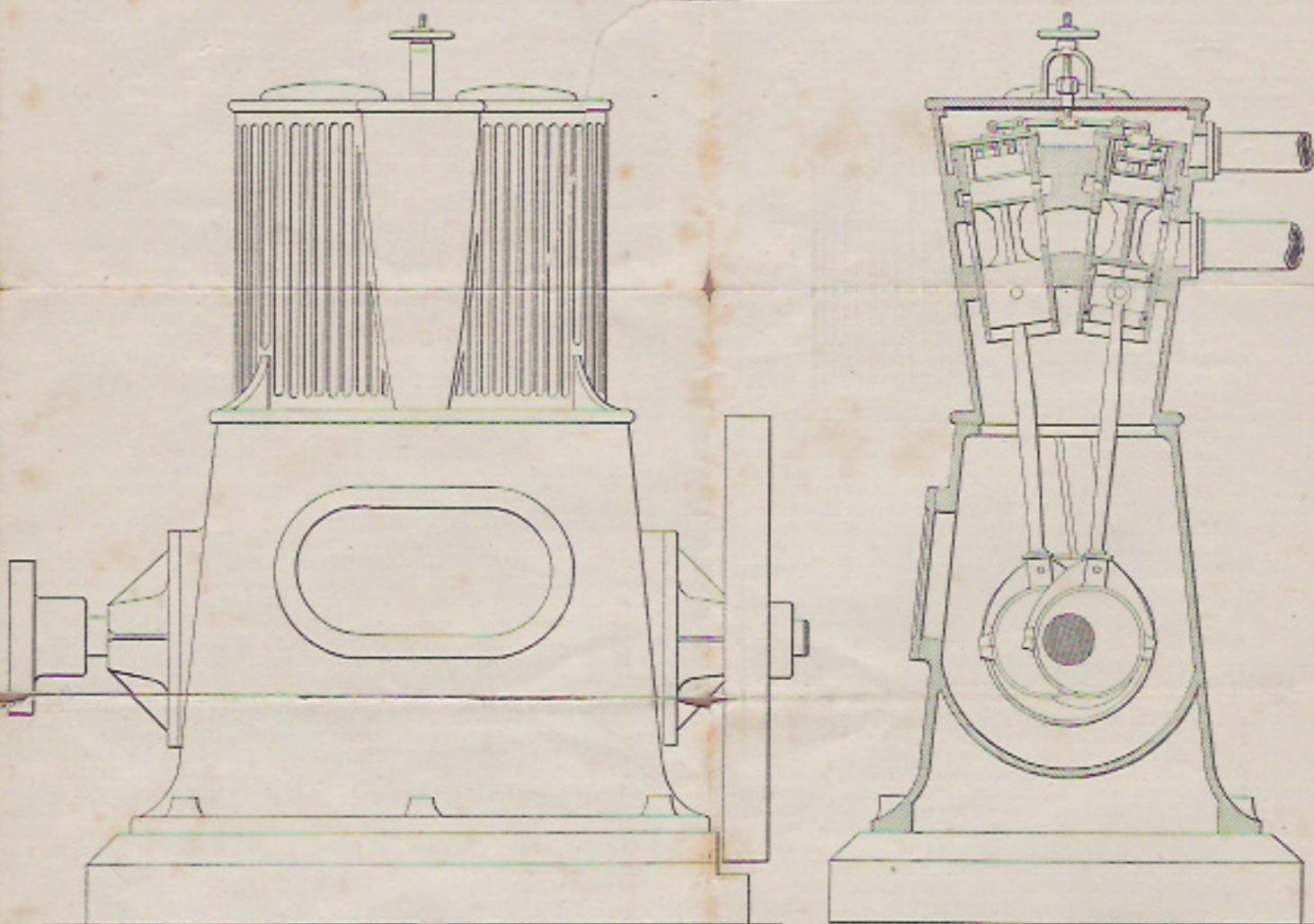
MAN'S AUTOMATIC CUT-OFF VALVE APPLIED TO SINGLE-ACTING TRUNK
PISTON ENGINES.

In our last issue, we gave cuts and description of a horizontal engine fitted with this new cut-off valve, as made by the Hensley & Meyer Engineering Company, of Denver, Colo. This week, we show its application to that class known as the single-acting trunk piston engine. It is, however, equally applicable to beam and inverted cylinder engines.

The engine has two single-acting cylinders with trunk pistons attached directly to two cranks set opposite each other, and between the cylinders are two valve-chambers placed at a slight angle to the vertical line, and arranged one for each cylinder, with piston-valves actuated by separate eccentrics. It will thus be seen that the action is precisely the same as with the horizontal type, the only difference in the arrangement being that the patent valves are placed above the main valves instead of below, the steam for the lower seating being supplied from above through the valve itself.

This type of engine appears to be specially applicable for direct attachment to centrifugal pumps and dynamos for high speeds, and it is thus represented in the cuts, having an arrangement for the regulation of the cut-off by hand; but for automatic regulation of speed, a governor can be applied, if desired.

There seems to be no limit to the speed at which this engine may be



MAN'S AUTOMATIC CUT-OFF VALVE APPLIED TO SINGLE-ACTING TRUNK PISTON ENGINES.

run. The working parts are always kept one way by the pressure of the steam, so that there is no possibility of "knocking."

The advantages of this cut-off were fully set forth in our previous article, to which we refer our readers. We consider this to be an important and valuable invention in connection with the steam-engine.