2 Sheets. Sheet 1.

C. Rumley,

Rotary Steam Engine.

No. 11,908. Patented Nov. 7, 1854.

Fig: 2.

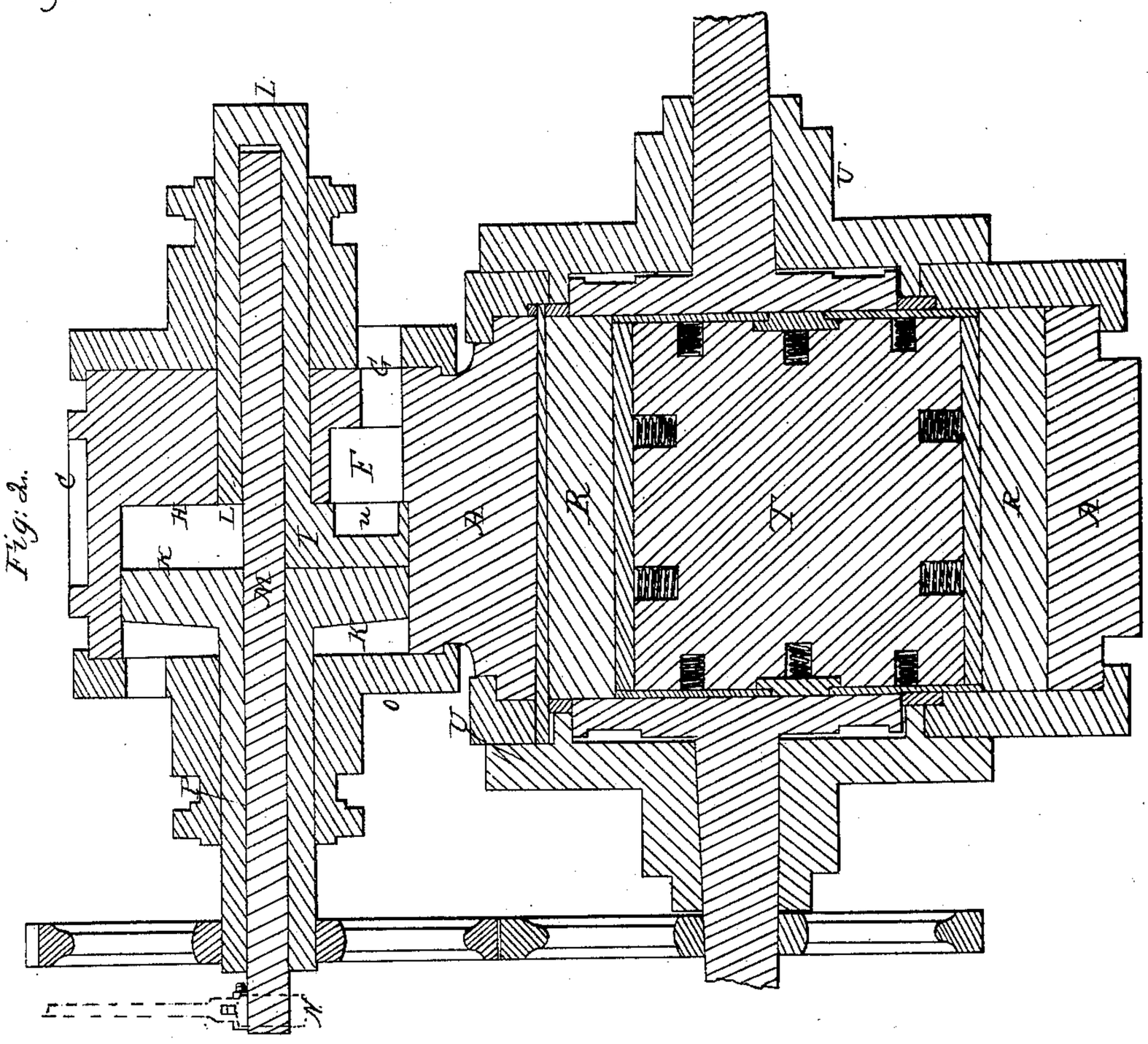
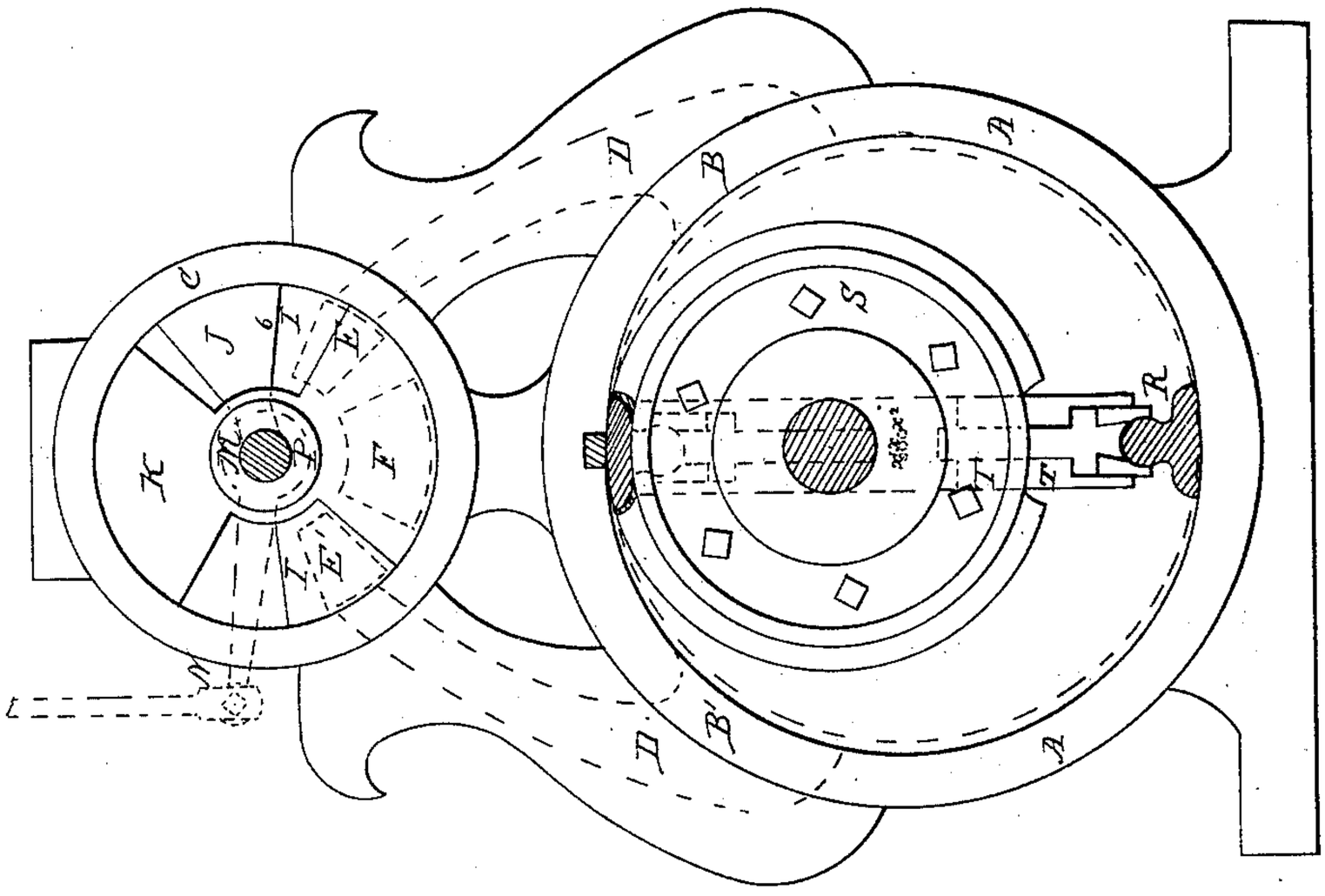


Fig: 1.



2 Sheets. Sheet 2.

C. Rumley,

Rotary Steam Engine.

No. 11,908 Patented Nov. 7, 1854.

Fig. 7.

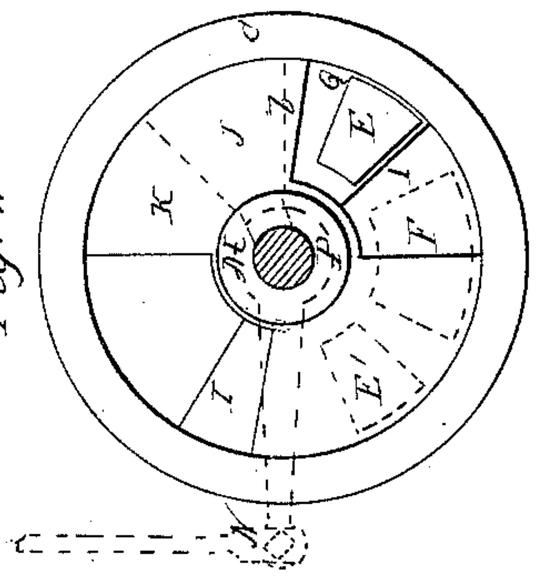


Fig. 8.

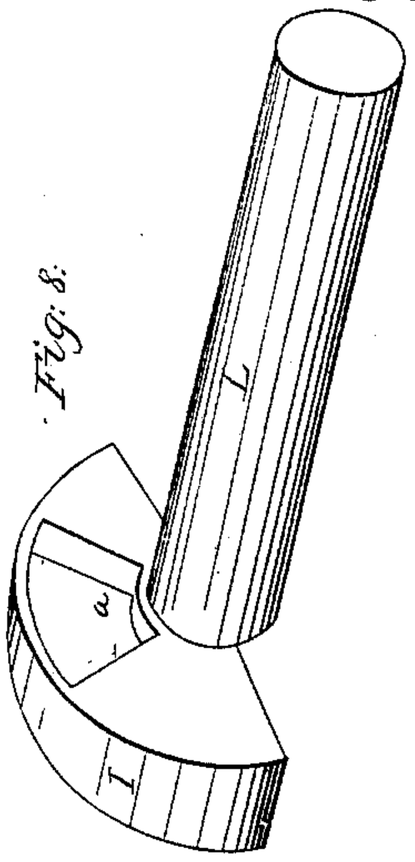


Fig. 5.

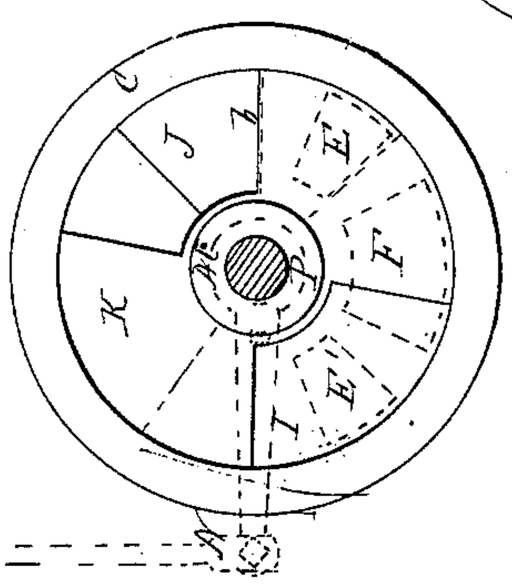


Fig. 6.

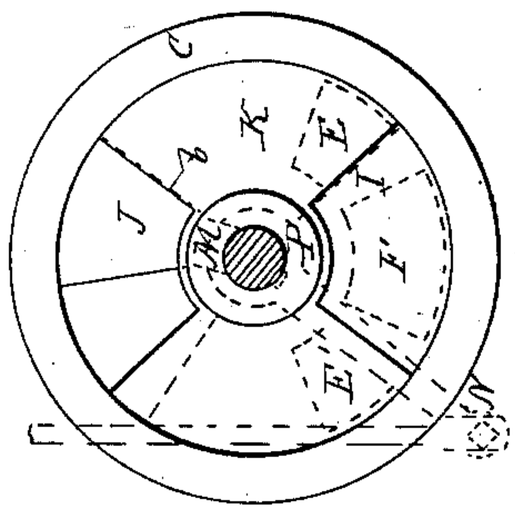


Fig. 3.

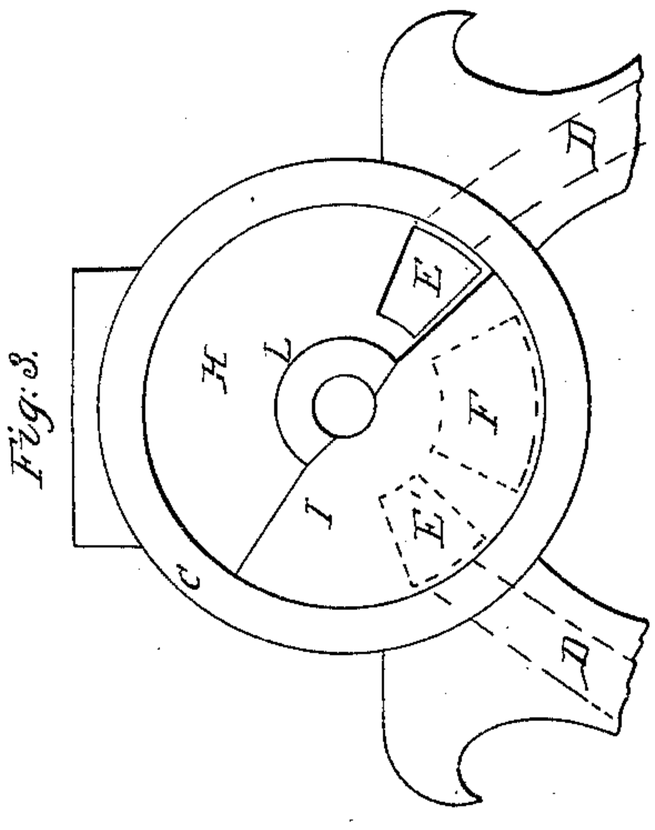
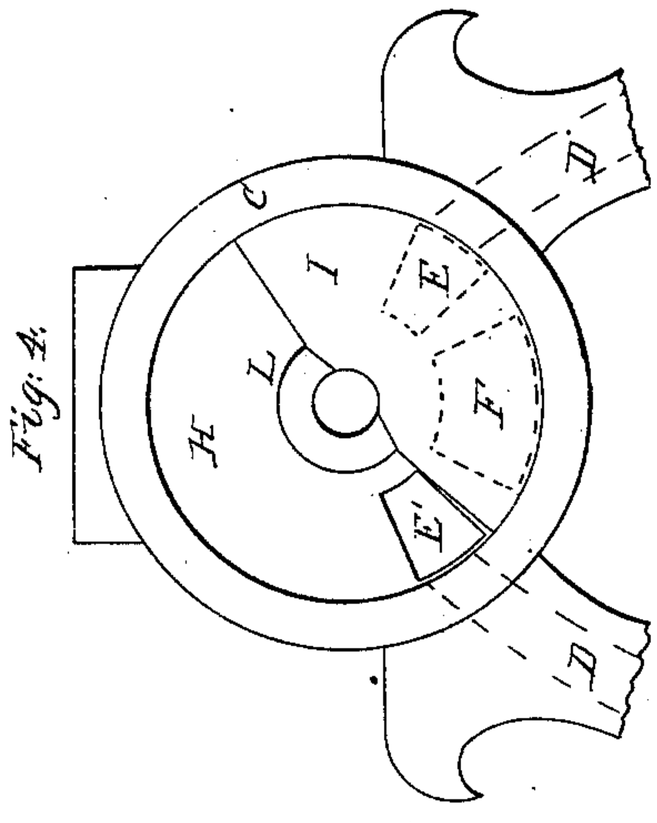


Fig. 4.



UNITED STATES PATENT OFFICE.

CHARLES RUMLEY, OF ROCHESTER, NEW YORK.

STEAM-ENGINE VALVE.

Specification of Letters Patent No. 11,908, dated November 7, 1854.

To all whom it may concern:

Be it known that I, CHARLES RUMLEY, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Steam-Engine Valves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings of the same, which make part of this specification, and in which—

Figure 1 represents a side elevation of a rotary steam engine, having the heads of the cylinder and steam chest removed to show more clearly the interior parts; Fig. 2 represents a vertical section taken through the axis of the cylinder, and steam chest, and Figs. 3, 4, 5, 6, 7 and 8 represent the valve, and its movable part in various positions.

The cylinder (A) as represented in the accompanying drawings is of the usual diameter and length, and is fitted with two ports (B and B′) either of which will admit steam to, or exhaust it from the cylinder, but when one is used to admit the steam, the other is invariably used to exhaust it. The conversion of the ports at will from admission to exhaust, and vice versa, admits of the motion of the engine being reversed. This change is readily effected by a simple adjustment of the valve.

The steam chest (C) which contains the valves, is placed on the side of the cylinder and connects with the ports by the side pipes (D). Two passages (E E′) connect the valve chamber with the side pipes, and another passage (F) connects this chamber with the exhaust pipe (G). The side (H) of the chamber through which these passages enter is made perfectly plain, and smooth, and is fitted with an adjustable plate (I) and a self adjusting plate (J) which together form a seat for the revolving valve (K) to slide against, to admit and cut off the steam.

The adjustable element of the valve seat, consists of a plate (I) with both sides perfectly plain and parallel. This plate is nearly a semi circle, and is mounted upon the inner end of a tubular spindle (L) which passes to the outside of the valve chest, where it has a hand lever attached to it, by which it can be turned to the right or left far enough to uncover one of the passages to the side pipe and cover the other, as the engine is required to turn to the right or left; by turning the hand lever to a point half way between these two extremes, the plate will cover both the passages to the steam pipes, and shut off the steam from the cylinder. The side of this plate next the side (H) of the chamber, in which the steam and exhaust passages are, has a cavity (*a*) in it like that in the ordinary **D** slide valve to connect the passage which communicates with the exhaust side pipe with the passage which conducts the exhaust steam into the atmosphere. When the engine is stopped, this adjustable plate occupies the position shown in Fig. 1; when the engine is required to turn in one direction, it occupies the position shown in Fig. 3, and when it is required to turn in the reverse direction, the plate is set as represented in Fig. 4. This plate with its hollow axle, are shown in perspective in Fig. 8.

The self adjusting plate (J) is smaller than the adjustable plate, being only about 45° of a circle. It is the same thickness as the other plate, and finished in like manner. It is mounted upon the middle of a solid spindle (M) which extends through the axis of the hollow spindle (L) on which the other plate is mounted at one end, and through the hollow axis of a rotating valve (K) at the other end. The end of this spindle is fitted with an arm (N) which connects through the medium of a link rod, with the slide of a governor, so that when the speed of the engine decreases, the arm will be raised, and when the speed increases, the arm will descend. The effect of this operation of the governor upon the arm, will be to cause the edge (*b*) of the self adjusting plate to approach that of the adjustable plate when the speed increases, and to recede therefrom as the speed diminishes. This self adjusting plate is seen at its extreme point of recession in Fig. 6, and at an intermediate point in Fig. 5. Those variations in the position of this self adjusting plate are designed to affect in a corresponding manner, the point at which the steam is cut off, and the proportion in which it is allowed to expand, and this is effected in a manner which will be presently explained.

Between the adjustable and self adjusting parts of the valve seat, and the head (O) of the steam chest, a plate valve (K) with two wings, each about 60° of a circle, is arranged to rotate. The side of this valve which slides against the seat plates (I and J) is perfectly plain and smooth, and at right an-

gles to its axis of rotation. This valve is mounted upon a hub (P) that turns upon the spindle (M) which carries the self adjusting seat plate (J). This hub also passes through a stuffed joint in the head (O) of the chest. Motion is communicated by gear from the axis of the piston to this hub, so that the valve (K) and the piston will revolve isochronally.

From an inspection of the relative position of the several parts of the valve and chest, already described, it is plain that the steam can only pass into the aperture communicating with the side pipe, by entering the space (Q) Fig. 7 between the adjustable and self adjusting plates of the valve seat; now, as the valve rotates in the contrary direction from the piston and in equal time, and its wings will cover about 100° of a circle, and the back edge of the wing admits the steam, and the front cuts it off, the steam can be readily cut off when the piston has made a greater or less proportion of the stroke.

When arranged to cut off at two thirds stroke the self adjusting portion of the valve seat (J) is shown in the position at which this takes place in Fig. 5, and in that in which it cuts off at full stroke in Fig. 6. When the velocity increases, indicating an excess of steam, the arm (N) raises by the action of the governor, and depresses the part of the seat (J) connected with it, which causes the steam to be cut off sooner; and when the speed decreases, indicating a deficiency of steam, the arm (N) descends, the plate (J) rises, more steam is admitted into the cylinder, and the speed thereby accelerated. From this method of operation it is obvious, the velocity of the engine cannot be much varied with any ordinary variation of duty. As the governor as well as the steam chest are constructed in the ordinary manner, I do not deem a particular description of them necessary.

The cylinder is not bored out truly cylindrical, but its inner periphery is composed of a little more than 180° of each of two intersecting circles, whose radii are equal, and whose centers are at a distance corresponding to the difference between the extreme radii of the curves in which the segmental periphery (R) of the piston works, in the different parts of its revolution.

The piston consists of a cylindrical hub (*s*) which equals in length the interior of the cylinder, and its diameter equals two thirds or thereabouts that of the cylinder; and a radial slide (T) which moves freely across the axis of this hub, each end of the slide being fitted with a hinged foot (R) whose outside is of the same curvature as the interior of the cylinder. This hub is fitted at each end with a gudgeon which passes through stuffed bearings in the head (U) of the cylinder. The bearings of these gudgeons are eccentric to the axis of the cylinder so far as to bring the periphery of the hub in contact with one side of the cylinder. The joints between the slide and hub, and between the ends of the hub, and heads of the cylinder, are well packed in the usual or in any convenient and approved manner. The side of the cylinder, too, against which the hub bears should be fitted with a removable stave of gun metal, which can be adjusted to compensate for wear.

The bore of the cylinder as represented in the drawing, does not conform strictly in its shape to the geometrical definition of the term cylinder, as it is in strictness an ellipse approximating very nearly to a cylinder. Its long diameter is $5\frac{5}{24}$ inches, and its short diameter is 5 inches, and the radii of the curves of every part of it are equal, its configuration being produced by sweeping it with equal radii from three centers (x x^1 x^2) in a line with the long axis, the outer centers (x^1 x^2) or foci being each $\frac{5}{48}$ inch from the inner center (x.). A cylinder of this form and proportions is adapted to a piston constructed, jointed, and arranged in the manner represented in the drawing.

If the joints were placed at a greater or less distance from the ends of the piston, the maximum deflection from the ends from the line of the slide of the piston would be greater or less, and this would involve a corresponding change in the foci of the curves of the cylinder, as the various lines which the radii of the end of the piston assumed must all converge to a common focus, since these piston ends always stand perpendicular to the curves swept from the foci, while sliding over the same.

In practice, the cylinders are constructed by boring them on two centers in succession which coincide with the two foci of the ends. To perfect the cylinder according to theory, it should be bored on a third center equidistant from, and in a line with the two foci; but as the foci are so near together, this is unnecessary, and for all practical purposes double boring is sufficient. The precise positions of these reciprocally eccentric centers on which the cylinder is bored will be varied by the position of the joints in the slide, and can only be determined by careful calculation when the structure, and all the dimensions of the different parts are known. But by the rule above given, these calculations can be made with great facility and certainty. When the cylinder has been bored in one center, that gives the proper shape to one side, then the axis of the boring instrument is made to coincide with the other center, and the other side is bored of the proper shape.

In Fig. 1, the black lines show the finished

cylinder as bored on two centers, and the red lines the interior of the cylinder previous to boring.

Having thus described my invention what I claim therein as new and desire to secure by Letters Patent is—

The combination of the compound valve-seat consisting of an adjustable, and a self adjusting segment, with a rotating wing valve, revolving isochronally with the piston substantially as herein set forth.

In testimony whereof, I have hereunto subscribed my name.

CHARLES RUMLEY.

Witnesses:
A. B. CHILDS,
P. H. WATSON.