No. 744,182. PATENTED NOV. 17, 1903.

C. D. FENELON & J. B. ERWIN.

STEAM CONTROLLING VALVE FOR ROTARY ENGINES.

APPLICATION FILED JAN. 13, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

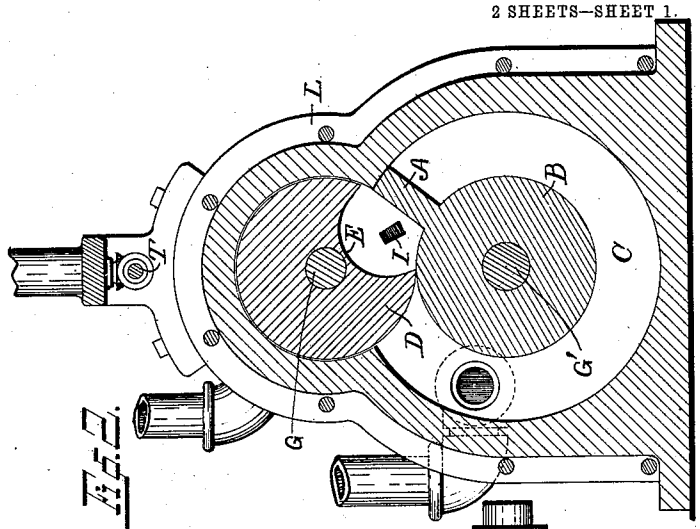

Fig. 2.

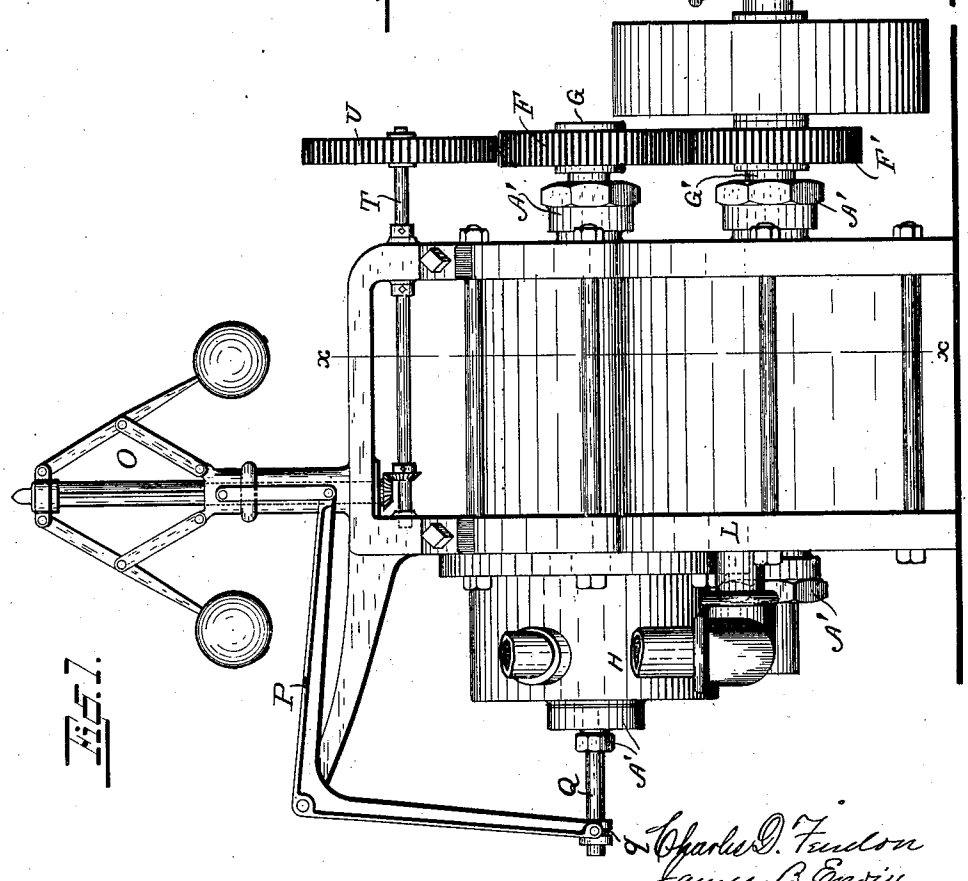

Fig. 1.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

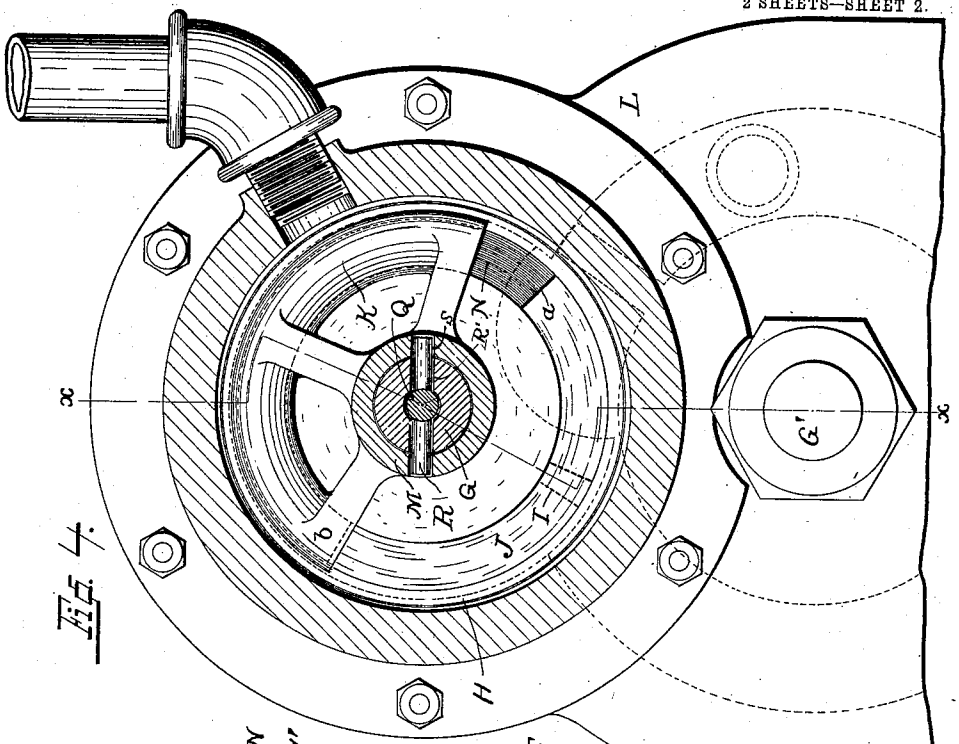
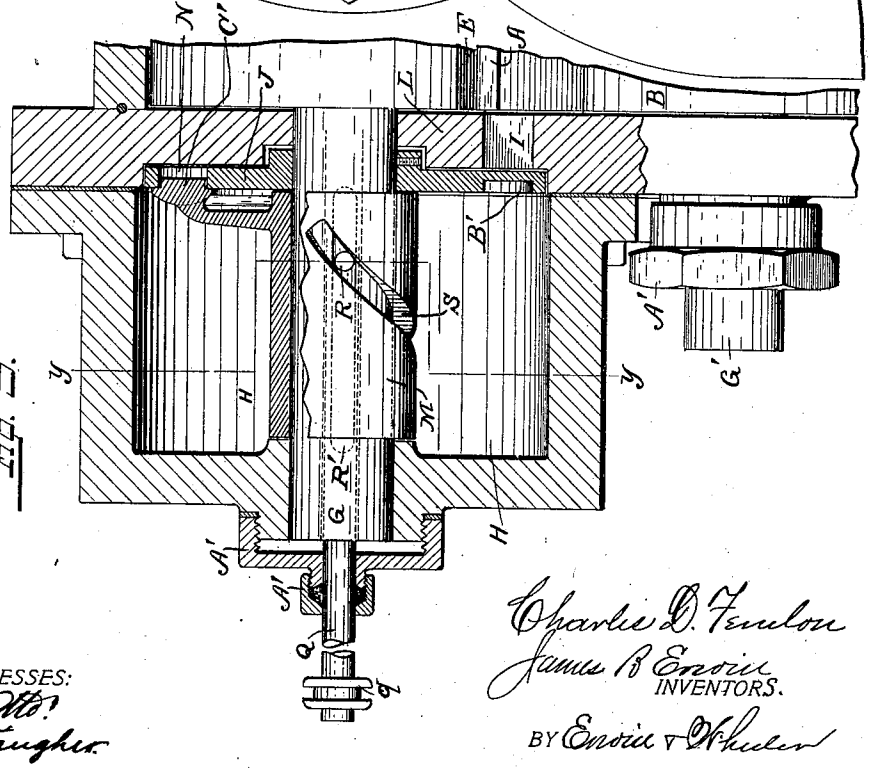


Fig. 3.



WITNESSES:
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UNITED STATES PATENT OFFICE.

CHARLES D. FENELON, OF PHILLIPS, AND JAMES B. ERWIN, OF MILWAUKEE, WISCONSIN.

STEAM-CONTROLLING VALVE FOR ROTARY ENGINES.

SPECIFICATION forming part of Letters Patent No. 744,182, dated November 17, 1903.

Application filed January 13, 1903. Serial No. 138,854. (No model.)

To all whom it may concern:

Be it known that we, CHARLES D. FENELON, residing at Phillips, in the county of Price, and JAMES B. ERWIN, residing at Milwaukee, county of Milwaukee, State of Wisconsin, citizens of the United States, have invented new and useful Improvements in Steam-Controlling Valve Mechanism for Rotary Engines, of which the following is a specification.

Our invention relates to improvements in variable steam-controlling valve mechanism for rotary engines.

The object of our invention is to provide a device which will automatically vary the point of closing the steam-controlling valve and of stopping the admission of steam to the piston as the variation in the load of the engine may require, whereby the steam admitted acts expansively and is used with the greatest economy.

The construction of our invention is explained by reference to the accompanying drawings, in which—

Figure 1 represents a side view. Fig. 2 is a vertical section drawn on line X X of Fig. 1. Fig. 3 is a vertical section drawn on line X X of Fig. 4. Fig. 4 is a vertical section drawn on line Y Y of Fig. 3.

Like parts are identified by the same reference-letters throughout the several views.

While our steam-controlling mechanism is adapted to be used with a great variety of rotary engines, I have illustrated the same in connection with that class of engines in which a revoluble piston A is supported radially from the periphery of the cylinder B within a cylindrical chamber C, while the back pressure of the steam as it enters the chamber C behind the piston is resisted by the revoluble back-pressure cylinder D. One side of the back-pressure cylinder D is provided with a longitudinal recess E semicircular in cross-section for the reception and passage of the piston A with each revolution of the same upon its axis, and said cylinders are caused to revolve together and said piston and longitudinal recess to register with each other by the gears F F, which gears are respectively affixed to the respective shafts G and G′ of said cylinders. We do not, however, make any special claims to the mechanism thus far described except only as the same is combined with the other parts hereinafter mentioned, our invention being predicated more especially upon the device for automatically controlling the admission of steam from the steam-chest H to the chamber C through the steam-port I. The admission of steam from the steam-chest H through the port I is controlled by two revolving valves—one a so-called "admission-valve" and the other a cut-off valve. The steam-admission valve J is so attached to the shaft G as to revolve with it and is so adjusted as to pass and open the port I at the same point with each revolution of the shaft the instant the piston A passes such port, while the cut-off valve K is also supported upon said shaft and revolves with it, passing said port with each revolution of the shaft, and is adapted to be so adjusted on said shaft while revolving as to cover said port earlier or later with each revolution, and consequently to cut off the steam earlier or later with each revolution, as the load of the engine may require. While the valve J is secured to the shaft by a set-screw, it may, if desired, be secured thereto by a longitudinal key, which will permit said valve to move longitudinally on said shaft so as to take up the wear of its contiguous moving surface with that of the opposing partition-wall. The cut-off K is adjustably supported from the shaft G by the loosely-fitting sleeve M, and said valve is automatically adjusted in its relation to the valve J so as to uncover a greater or less area of the opening in said valve by the partial revolution of said sleeve N on its supporting-shaft.

Referring to Fig. 4, it will be understood that the opening N in the valve J extends upwardly beneath the valve K in a circular direction, as indicated by dotted lines from *a* to *b*, and that the length of time steam is admitted with each revolution depends upon the area of said opening N which is uncovered. As shown in Fig. 4, about one-eighth ($\frac{1}{8}$) of the opening in the valve J is uncovered, and consequently the steam will be automatically cut off at about one-eighth ($\frac{1}{8}$) of the revolution of the piston, thus permitting the

steam to work expansively to the end of such revolution. When, however, the load of the engine is such as to require more steam, the valve K is revolved farther toward the left, (reference being made to Fig. 4,) so as to uncover a larger area of the opening N. Thus it is obvious that steam may be admitted to the piston a greater or less portion of its revolution, according to the relative position of the steam-controlling valves J and K to each other. The relative position of the valves J and K to each other is automatically changed by the action of a governor O of ordinary construction. Motion is communicated from the governor O to the adjustable valve K through the elbow crank-lever P, longitudinally-reciprocating rod Q, cross-pin R, and valve-supporting sleeve M. It will be understood as the speed of the engine is accelerated the governor, acting through the parts named, will cause the rod Q to be forced inward, whereby the cross-pin R, which is affixed to said rod, acting in the spiral-shaped channel S of said sleeve, causes said sleeve to turn on its supporting-shaft, thereby causing the valve K to turn forward and cover a larger area of the steam passage or opening in the valve J, thus checking the admission of steam and retarding the speed of the engine. When, however, the load of the engine is increased and its speed retarded, the action of the governor will be such as to reverse the movement of the connecting parts between it and said steam-controlling valve, whereby the steam-passage will be enlarged and the engine caused, as stated, to take steam longer with each revolution of the piston. The protruding end of the rod Q is provided with a bearing-sleeve q of ordinary construction, by which a longitudinal movement is communicated to said rod from the bifurcated end of the elbow crank-lever connected therewith. Motion may be communicated to the governor from any of the revolving shafts of the engine in the ordinary way. A preferred form of device for driving the governor is shown in Fig. 1, by which motion is communicated to the governor-shaft T from the gear F through the pinion U.

V is the steam-inlet, and W the steam-exhaust pipe, of the engine.

The protruding ends of the shafts Q, G, and G′ are preferably provided with ordinary stuffing-boxes A′ to prevent the escape of steam.

It will be understood that the steam-controlling valve J is retained in contact with its opposing bearings and the valve K is retained against the opposing bearings of the valve J by the pressure of the steam against them; also, that by providing an annular channel B′ in the valve J for the reception of the annular bearing C′ of the valve K a closely-fitting joint is formed between such parts, which prevents the escape of steam. A longitudinal recess R′ is provided in its shaft G for the reception of the cross-pin R.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, a device for automatically varying the point of cut-off of the steam between the steam-chest and the cylinder, comprising an annular valve having a single annular steam-channel communicating between the steam-chest and the port leading to the steam-cylinder; means actuated by the engine for revolving said valve against the division-wall of said steam-chest and the face of said steam-port; a second variable cut-off valve adapted to close a portion of the channel in said first-named valve and to extend through said channel and against the bearing-wall of said first-named valve and the face of said steam-port, and means operated by the engine for automatically changing the relation of said first and second valves to each other, whereby the point of cut-off of the steam is changed as said valves are revolved.

2. In a rotary engine, the combination of a steam-cylinder; a revoluble piston located in said cylinder; a steam-chest; a revoluble shaft communicating from the piston in said steam-cylinder through the division-wall between said steam-cylinder and said steam-chest, said division-wall being provided with a steam-port communicating from the steam-chest to said steam-cylinder; an annular disk provided with an annular steam-channel centrally supported from said shaft, adapted to bear against the face of said steam-port and division-wall; a second annular valve mounted upon and adapted to revolve with, and independently of, said shaft against the face of said first-named valve; said second valve being adapted to close a portion of the channel in said first-named valve and to extend through said channel and bear against the bearing-wall of said first-named valve; means operated by the engine for automatically changing the relation of said first and second valves to each other upon their common supporting-shaft, thereby changing the point of cut-off of the steam, substantially as, and for the purpose specified.

3. In that class of rotary engines in which the back pressure of steam behind the piston is resisted by a revoluble back-pressure cylinder, provided with a recess for the passage of the piston as it revolves; the combination with the shaft of said back-pressure cylinder of a circular disk valve keyed to the periphery of its supporting-shaft, and adapted to revolve in fixed relations thereto against the face of the division-wall between the cylinder and steam-chest of the engine in front of the steam-inlet port, said valve being provided with a single annular steam-channel communicating between the steam-chest and the port leading to the steam-cylinder; a second circular disk valve adjustably supported from the same shaft in front of, and against said first-named valve, and adapted to close a portion of the channel in said first-named

valve and to extend through said channel and bear against said division-wall and the face of said steam-port, said valves together, being adapted, as they revolve, to close said steam-admission port at variable distances and lengths of time after it has been opened by said first-named valve; and means operated by the governor of the engine for changing the relation of said fixed adjustable valves to each other, substantially as set forth.

4. In a rotary engine, the combination of a steam-cylinder; a revoluble piston located in said cylinder; a steam-chest; a revoluble shaft communicating from the piston in said steam-cylinder through the division-wall between said steam-cylinder and said steam-chest, said division-wall being provided with a steam-port communicating from the steam-chest to said steam-cylinder, a circular disk valve keyed to the periphery of its supporting-shaft, and adapted to revolve in fixed relations thereto against the face of the division-wall between the cylinder and steam-chest of the engine in front of the steam-inlet port, said valve being provided with an annular channel; a second circular disk valve adjustably supported from the same shaft in front of, and against said fixed valve, and adapted to close the port after it has been opened by said fixed valve; a valve-supporting sleeve M provided with a spirally-formed recess S for the reception of the cross-pin R; cross-pin R; centrally supported within the valve-supporting shaft G from the rod Q, said rod Q being adapted to be moved longitudinally in said shaft G by the action of the governor; said shaft G being provided with a longitudinal recess R′ to permit of the longitudinal movement of said cross-pin R therein; said cross-pin R, being adapted, as it is moved forward in said spiral channel S, to turn said sleeve and adjustable valve in one direction and when moved rearwardly to turn said sleeve and valve in the opposite direction, whereby the relation of said fixed and adjustable valves to each other is changed, substantially as, and for the purpose specified.

5. In that class of rotary engines in which the cylinder-supporting shafts G, and G′ are connected together by gears F, and F′ the combination with the protruding end of the shaft G, of an inclosing steam-chest H, revoluble disk valve J, keyed to revolve with its supporting-shaft G in contact with the dividing-wall L between said steam-chest and the cylinder of the engine; adjustable disk valve K having bearings extending through said channel and against said division-wall, and being revolubly supported from said shaft G, upon sleeve M; sleeve M provided with the spiral channel S, for the reception of an actuating cross-pin R; cross-pin R centrally supported in said shaft G from the central rod Q; said shaft G being provided with a longitudinal recess R′ for the longitudinal movement of said cross-pin R, therein; governor O; means for communicating a longitudinal reciprocating movement to said rod Q from said governor as the speed of the engine is varied, all substantially as, and for the purpose specified.

In testimony whereof we affix our signatures in the presence of two witnesses.

CHARLES D. FENELON.
JAMES B. ERWIN.

Witnesses as to Charles D. Fenelon:
JOHN S. BARRY,
M. BARRY.
Witnesses as to James B. Erwin:
N. Z. TAUGHER,
LEVERETT C. WHEELER.