

W. O. THOMAS.

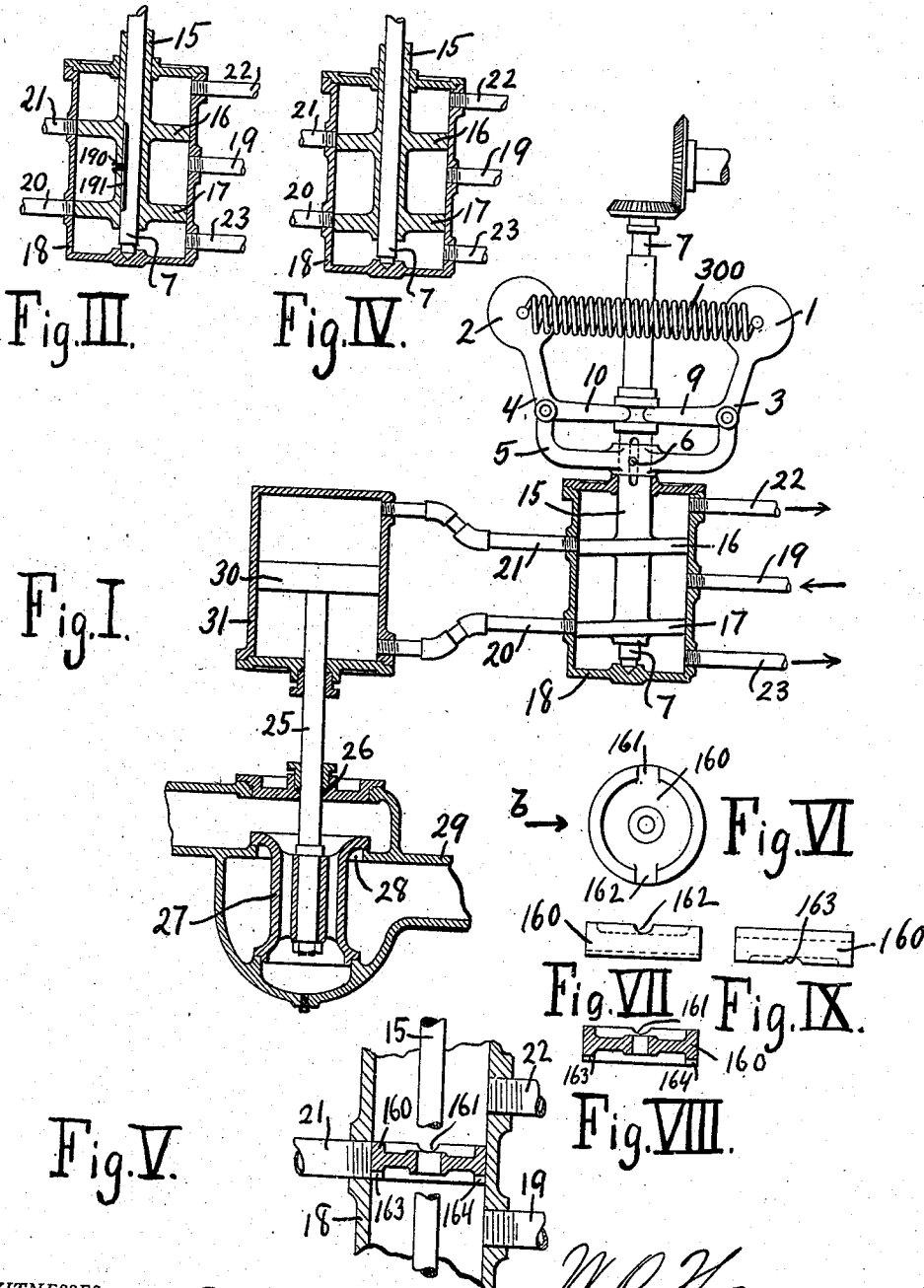
GOVERNOR.

APPLICATION FILED APR. 17, 1907.

900,045.

Patented Sept. 29, 1908.

2 SHEETS—SHEET 1.



WITNESSES:

Frank E. Dennett
John C. Pennie

W. O. Thomas
INVENTOR

BY
G. J. DeWitt
ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIE OWEN THOMAS, OF RIVERSIDE, ILLINOIS.

GOVERNOR.

No. 900,045.

Specification of Letters Patent.

Patented Sept. 29, 1908.

Application filed April 17, 1907. Serial No. 368,642.

To all whom it may concern:

Be it known that I, WILLIE OWEN THOMAS, a subject of the King of Great Britain, residing at Riverside, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Governors, of which the following is a specification.

This invention relates to that class of governing apparatus in which a member responsive to variations of speeds of an engine controls mechanism by which the main valve of the engine is operated. It is customary in this class of devices to provide a piston connected with said main valve for actuating the same, said piston being contained within a cylinder to which a fluid under pressure is admitted or from which it is released by some kind of valve controlling means, said valve controlling means in turn being actuated by a centrifugal governor in accordance with variations in the speeds of the engine.

It often occurs in modern engine practice that the load upon an engine remains substantially constant for a considerable period of time and the main valve is kept in a constant position during this period, with the result that, on account of corrosion; gummed oil and accumulated dirt, it is uncertain whether the governing apparatus will move the main valve when the load upon the engine varies and the speed changes as a consequence thereof.

It is the purpose of this invention to provide an apparatus for controlling the main valve of an engine according to variations of speeds of the engine, and, when the speed of the engine is normal, to provide for moving the main valve slightly to and fro in order that the valve stem may be kept clean and free for movement at any time when the speed of the engine might vary.

In the drawings which accompany this specification and form a part thereof and which illustrate an embodiment of this invention and on which the same reference characters indicate the same elements in each of the several views,—Figure 1 represents an elevation partly in section of an apparatus embodying this invention. Fig. 2 represents an elevation partly in section of a preferred form of apparatus embodying this invention. Fig. 3 represents a vertical section of the primary valve and its cylinder when the valve has turned through an angle of 90 degrees from the position shown by Figs. 1, 2 and 4. Fig. 4 represents a vertical

section of the primary valve and its cylinder in the same position as the parts are shown by Figs. 1 and 2. Fig. 5 represents in vertical section a fragment of the primary valve and its cylinder illustrating a modification of the valve disks proper. Fig. 6 is a plan view of the modified form of valve disk. Fig. 7 is an elevation of the modified form of valve disk shown by Figs. 5 and 6. Fig. 8 is a vertical section through the modified form of valve disk in the position as shown by Fig. 5. Fig. 9 is an elevation of the modified form of valve disk as seen when looking in the direction of the arrow *b* on Fig. 6. Fig. 10 represents a vertical section through the primary valve and its cylinder illustrating a further modification of the valve disks proper. Fig. 11 represents a vertical section of a fragment of the primary valve and its cylinder taken on the line S—S on Fig. 10 looking in the direction indicated by the arrow. Fig. 12 represents a plan view of the modified form of valve disk shown by Figs. 10 and 11.

Referring to the drawings, the numerals 1 and 2 represent the weights of an ordinary centrifugal governor which are carried by the bell-crank arms 3 and 4, supported from the standard 5 which is secured by the pin 6 to the shaft 7 which is adapted to be revolved by means of the mechanism shown, the motion being taken from any suitable part of the engine in the ordinary way.

Referring to Fig. 2, the reference character 8 represents a sleeve vertically movable upon the shaft 7 and engaged by the arms 9 and 10 of the bell crank levers 3 and 4, and also by the lever 11 which is secured by the pin 12 to some immovable object, as the bracket 120. Pivoted to the lever 11 by the pin 13 is the lever 14 which pivotally engages a collar 150 mounted upon a sleeve 15, which latter embraces the shaft 7 and is splined thereto, and to which sleeve are connected the valve disks 16 and 17. These valve disks and sleeve 15 compose the primary valve and the disks are contained within a cylinder 18 which is in communication with a pipe 19 leading from a supply of fluid under pressure, the entrance of said pipe being located between said two disks, the pipes 20 and 21 which are adapted to communicate with a valve operating cylinder, and the pipes 22 and 23 which are adapted to serve as exhaust pipes.

The disks 16 and 17 are adapted to control the passage of the operating fluid through

pipes 21 and 20 either into said pipes from pipe 19, or outwardly from said pipes to pipes 22 and 23.

The lever 14 is pivotally connected by the pin 24 to an extension of a piston rod 25 which passes through a stuffing box 26 and is secured to a valve 27 by which the port 28 for the operating fluid for the engine, which is conducted by the conduit 29, is controlled.

The piston rod 25 carries a piston 30 which is inclosed by a cylinder 31, to which cylinder above the piston an operating fluid may be supplied through pipe 21 to cause the valve 27 to close the port 28, or fluid may be admitted under the piston 30, through the pipe 20 to open said valve, the fluid above the piston being exhausted through pipes 21 and 22.

In Fig. 1 of the drawings is shown the same general construction of apparatus as shown by Fig. 2, with the exception that the sleeve 15 is actuated directly by the arms 9 and 10 of the bell crank levers 3 and 4, the levers 11 and 14 being omitted.

The operation of the device is as follows: Assuming that the engine is in motion, the shaft 7 is revolving, which in turn revolves the frame 5 (by means of the pin 6), the bell crank levers 3 and 4 and the balls carried thereby, whereby the balls 1 and 2 tend to diverge against the resistance offered by the spring 300. As the balls diverge, the arms 9 and 10 of the bell crank levers 3 and 4 are elevated, elevating (see Fig. 2) the sleeve 8, the lever 11 and the right hand end of the lever 14, and as the sleeve 15 which carries the disks 16 and 17 is secured to the lever 14, said disks will be raised, thereby admitting fluid under pressure from the pipe 19 into the pipe 21 and into the cylinder 31 above the piston 30, while at the same time the disk 18 has opened the lower part of the cylinder 31 under the piston 30 to the exhaust pipe 23, which action can be clearly traced from Fig. 3 of the drawings, and said action results in the partial closing of the valve 27, diminishing the supply of operating fluid which can pass through the port 28. As the lever 14 is, however, fastened by the pin 24 to an extension of the piston rod 25, the downward movement of the piston and rod which is taking place causes also downward movement of the left hand end of lever 14, which now swings about its pivot pin 13 as a fulcrum, whereby the sleeve 15 and the disks 16 and 17 are lowered until they close the passageways to pipes 21 and 20, when the movement of the piston 30 ceases and the parts would remain at rest provided the governor balls maintained the same angle of divergence were it not for the provision of the special construction of apparatus to be described.

In order that the valve 27 and its stem 25 may be continually moved to and fro slightly to prevent said stem from sticking,

as previously stated, the parts of the apparatus are arranged so that each end of the cylinder 31 is placed in communication alternately with the supply or exhaust pipes. This result is accomplished by setting the primary valve disks at an oblique angle to the sleeve 15 instead of at right angles thereto and by splining said sleeve 15 to a movable element as, for example, the governor shaft 7 as shown by Figs. 1, 2, 3 and 4 of the drawings.

The sleeve 15 is freely movable vertically with respect to the shaft 7 but is compelled to rotate with said shaft being splined thereto in any preferred manner, as by the screw 190 which engages with the slot 191 in said shaft.

The operation of the apparatus is as follows: Assuming the engine to be in motion and running at normal speed, the shaft 7 will be revolving and the governor balls will be kept at such a distance therefrom that the disks 16 and 17 will close the ports from the cylinder 18 to pipes 20 and 21 (see Fig. 3), and with the valve disks occupying this position the valve 27, valve stem 25 and piston 30 might retain a fixed position for a considerable period of time, which is the condition which this apparatus is devised to avoid. As shown by the drawings, it is preferred to have the thickness of the valve disks 16 and 17 substantially equal to the ports from the cylinder 18 to the pipes 20 and 21 so that the valve 27 will be opened or closed upon a very slight motion in a vertical direction of the valve disks 16 and 17 under the action of the governor balls. Under the conditions just stated, the sleeve 15 and the valve disks 16 and 17 will be revolving in unison with shaft 7, and when said disks have revolved through an angle of 90 degrees from the position shown by Fig. 3, they will then occupy the position shown by Fig. 4, with the upper part of the cylinder 31 slightly open to the exhaust pipe 22 and the lower part of the cylinder slightly open to the fluid under pressure which is supplied through the pipe 19. On a further continued revolution of the valve disks through an angle of 90 degrees, the position of the parts would again become the same as in Fig. 3; and on a further revolution of the valve disks through an angle of 90 degrees, the position of the parts would be the reverse of that shown by Fig. 4, that is to say, the upper part of the cylinder 31 would be in communication with the pipe 19, while the lower part of said cylinder would be in communication with the exhaust pipe 23. Thus during each revolution of the valve disks 16 and 17, the upper part of the cylinder 31 will be placed in communication with the supply pipe 19, while the lower part of said cylinder is in communication with the exhaust pipe 23; and during the other part of the same revolution the lower part of the cylinder 31 will be placed in communication

with the supply pipe 19, while at the same time the upper part of said cylinder is placed in communication with the exhaust pipe 22. As the number of revolutions of the valve disks 16 and 17 per minute is considerable, the piston 30 will not have time to move any considerable distance in either direction due to the pressure of the fluid supplied through pipe 19. In fact, with the construction shown in Fig. 2, if the piston 30 were to move any appreciable distance, the valve disks 16 and 17 would be moved through the medium of the lever 14 in such a direction as to stop the further supply of the actuating fluid, and in this respect this apparatus may be called a self-corrective device as it tends to correct any tendency to movement of the piston 30 which might result from any cause except the two causes which are definitely provided for by this arrangement of apparatus, viz., a change of speed of the engine or the slight movement of said piston due to the arrangement of the valve disks of the primary valve. This arrangement is of special importance in this type of apparatus as the piston 30 will by its own movements correct the causes of such movements, as for example, should the valve disks 16 and 17 permit leakage of fluid between them and the walls of their cylinder. While Figs. 1 to 4 both inclusive illustrate the preferred embodiment of the primary valve structure, modifications may be made which will accomplish the same results and which under some circumstances and conditions of use may become the preferred form to be adopted in the structural arrangement of the apparatus.

Figs. 5 to 9 inclusive represent a modification of the valve disks proper, in which the disks are adapted to be disposed substantially at right angles to the sleeve 15, one of said disks being shown in a fragment of a cylinder 18 by Fig. 5 to show the relation it bears to the pipe 21, for example. The disks of the form here shown are adapted to withstand high pressures without binding in the cylinder as no bending couple exists as is the case with the inclined disks 16 and 17. Each of these disks consists of a web provided with an aperture by which the disk is secured upon the sleeve 15, the web being provided at its periphery with a flange of somewhat greater thickness than the web, the flange being recessed on opposite sides of the web, as shown at 161, 162, 163 and 164, the disk as a whole being designated by the numeral 160.

It will be noticed from an inspection of the disk illustrated by Fig. 5, that when said disk is rotated the port through pipe 21 will be placed alternately in communication with the pipe 19 and the pipe 22.

Figs. 10, 11 and 12 illustrate a second modification of the valve disks to prevent the bending couple that would exist with the type of disks shown by Fig. 1 and which with

high pressures of steam might become a source of annoyance. In these figures, Fig. 10 represents a section of the primary valve and its cylinder similar to that shown by Fig. 4, but with the modified forms of disks 1600 and 1700 shown thereby, the section of the disks being taken on the line $h-h$ of Fig. 12 and looking in the direction of the arrow P. Fig. 11 shows a section of the disk when viewed at right angles to the view as shown by Fig. 10, and is a view taken on the line S-S of Fig. 10 looking in the direction indicated by the arrow. Fig. 12 illustrates a plan view of one of the disks.

What I claim is,—

1. The combination with a valve of a piston connected to said valve, a cylinder for said piston, means for introducing a fluid under pressure into said cylinder and for permitting its exhaust therefrom, a governor, a primary valve adapted to be moved by said governor to admit fluid to said cylinder and to permit said fluid to exhaust therefrom, said primary valve being connected with said piston to compel it to move in unison with said piston, said primary valve being adapted to be moved independently of the movements imparted thereto by either said governor or said piston to alternately admit fluid to said cylinder and permit its exhaust therefrom, and means for effecting such independent movements of said primary valve.

2. The combination with a valve of a piston connected to said valve, the cylinder for said piston, a pipe for introducing fluid under pressure into said cylinder and for permitting its exhaust therefrom, a primary valve cylinder with the interior of which said pipe communicates and with the interior of which a pipe for supplying fluid under pressure and an exhaust pipe also communicate, a rotatable valve disk contained within said cylinder, said valve disk being disposed between said fluid admission and said exhaust pipes and inclined with respect to the axis of said cylinder and being adapted to control the flow of fluid from said primary valve cylinder into said first mentioned cylinder or the exhaust of fluid from said first mentioned cylinder into said primary valve cylinder, a governor, a lever provided with an immovable fulcrum and also connected with said governor, a second lever connected with said first mentioned lever and said piston, said primary valve disk being connected with said second mentioned lever.

3. The combination with a valve of a piston connected to said valve, a cylinder for said piston, pipes for introducing fluid under pressure into said cylinder and for permitting its exhaust therefrom, a primary valve cylinder with the interior of which said pipes communicate and with the interior of which a pipe for supplying fluid under pressure and exhaust pipes also communicate, two rota-

table valve disks contained within said cylinder, each of said valve disks being disposed between said fluid admission and an exhaust pipe and inclined with respect to the axis of said cylinder and being adapted to control the flow of fluid from said primary valve cylinder into said first mentioned cylinder or the exhaust of fluid from said first mentioned cylinder into said primary valve cylinder, a governor, a lever provided with an immovable fulcrum and also connected

with said governor, a second lever connected with said first mentioned lever and said piston, said primary valve disks being connected with said second mentioned lever, and means to rotate said valve disks. 15

In testimony whereof, I affix my signature in the presence of two witnesses.

W. OWEN THOMAS.

Witnesses:

T. R. THOMAS,
J. D. HAZEN.