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GOVERNOR CONTROL

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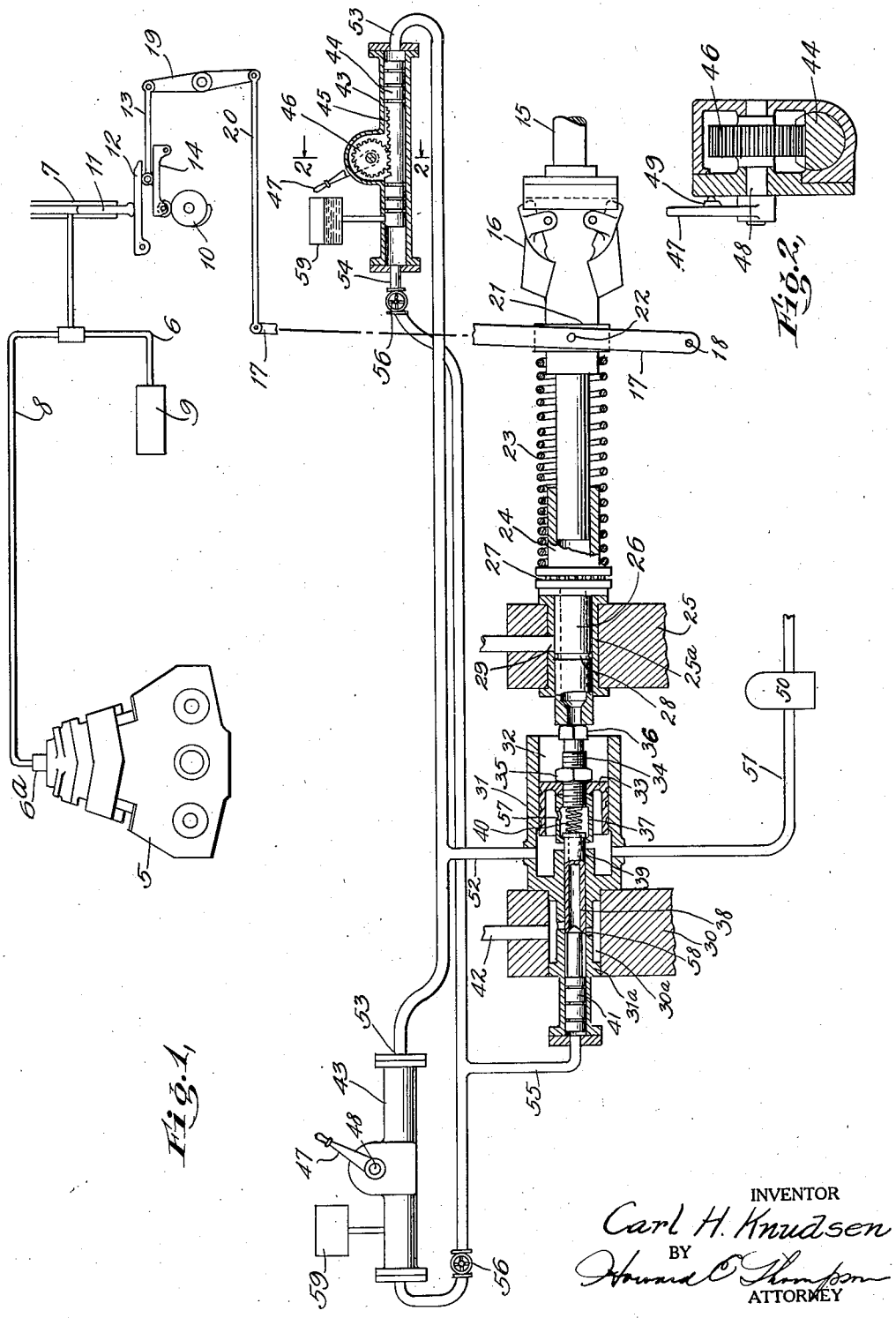

Fig. 1.

Fig. 2.

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GOVERNOR CONTROL

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This invention relates to governor controls for internal combustion engines and particularly fuel oil engines; and the object of the invention is to provide an apparatus cooperating with a governor of the class specified to control and regulate the governor operation whereby the speed of the engine is controlled; a further object being to provide a hydraulically operated apparatus of the class specified in direct cooperation with the governor or governor shaft; a further object being to provide means in the apparatus consisting of two independently controlled valve devices mounted at spaced intervals for controlling and regulating the operation of the apparatus and to increase and decrease the engine speed; and with these and other objects in view, the invention consists in an apparatus of the class and for the purpose specified, which is simple in construction, efficient in use, and which is constructed and operated as hereinafter described and claimed.

The invention described and claimed herein is an improvement on that shown and described in a prior application filed by me March 5, 1925, and bearing Serial No. 13,191, and is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of my improvement are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a diagrammatic view of my improved apparatus and the associate parts cooperating therewith; and,

Fig. 2 is a section on the line 2—2 of Fig. 1 on an enlarged scale.

In the drawing, I have diagrammatically illustrated at 5 an internal combustion fuel oil engine, the fuel injecting nozzle 6^a of which is in communication with a fuel pump 7 through pipes 8, the fuel oil being supplied to the pump from a storage tank 9 through the pipe 6. At 10, I have indicated a cam, driven by the engine 5 which actuates the plunger 11 of the pump through a plurality of levers 12, 13 and 14.

At 15, I have shown a governor shaft which is also in operative connection with the engine in the usual or any desired manner. Mounted on said shaft is a governor device 16 adapted to actuate a lever 17 pivoted as indicated at 18. The lever 17 is coupled with a rocker arm 19 through a coupling rod 20 and the lever 13 of the pump device is also coupled with said rocker arm whereby the governor action is transmitted to the lever 13 to control and regulate the stroke of the pump plunger 11, it being understood that the lever 13 is slidable longitudinally of and between the levers 12 and 14 and relative to the pivots of the second named levers, thereby increasing or decreasing the stroke of the plunger 11.

The movable collar 21 of the governor device 16 with which the lever 17 is coupled as seen at 22 engages a coil spring 23 encircling the governor shaft and also engaging a thrust collar 24 in connection with which my improved control apparatus, operates.

Mounted in a suitable bearing 25 is a spacing sleeve 26 which engages the sleeve 24 through a thrust bearing 27, the periphery of the sleeve 26 having an oil groove 28 whereby lubricating oil may be directed to both ends of said sleeve from a port 29 in the bearing 25 and the bushing 25^a thereof.

In axial alinement with the bearing 25 is another bearing 30 in which is mounted a cylinder 31, the enlarged end of which projects from the bearing 30 in the direction of the bearing 25. In the bore 32 of said cylinder is mounted a piston 33, and a screw 34 is mounted in the head of the piston 33 and held in position by a lock nut 35, the head 36 of the screw 34 being adapted to engage the projecting end of the sleeve 26. Mounted upon the screw 34 within the piston 33 is a coupling sleeve 37 whereby a tubular rod 38 may be retained against displacement from the piston 33 and movable relatively thereto, said rod having a head 39 movable in and retained in the bore of the coupling sleeve 37. A spring 40 is preferably employed between the head 39 and the screw 34 to normally retain the tubular rod 38 in the position shown in Fig. 1 of the drawing. The rod 38 is mounted in the reduced por-

tion 31^a of the cylinder 31, and the end of said tubular rod is adapted to be closed by a plunger valve member 41. That part of the reduced end 31^a of the cylinder 31 within the bearing 30, is cut out to form a chamber 30^a within said bearing, and a discharge pipe 42 is mounted in the bearing 30 and communicates with the chamber 30^a for the purpose later stated.

In Fig. 1 of the drawing, I have diagrammatically illustrated two control valves 43 which are of similar construction and are preferably mounted in spaced relation, for example at the opposite ends of a locomotive in connection with which the engine 5 is employed. One of these valves 43 is shown in section and consists of a casing in which is mounted a manually controlled plunger 44 which, in the construction shown, has on the central portion thereof, rack teeth 45 with which a gear 46 operates for adjusting the plunger 44 forwardly and backwardly in the valve casing and toward and from the opposite ends of said casing. The gear 46 may be rotated or operated in any desired manner and for illustrative purposes I have shown a lever 47 on the shaft 48 of said gears and any means such as indicated at 49 may be employed for holding the lever 47 in different positions of adjustment.

In Fig. 1 of the drawing, I have diagrammatically illustrated at 50, an oil pump whereby oil may be pumped from a suitable source into a pipe 51 which is in communication with the inner end of the bore 32 of the cylinder 31. Also in communication with the bore of the cylinder is a discharge pipe 52 which opens into one end of each of the valves 43 as seen at 53. Communicating with the other end of said valves is a pipe 54 which opens into and communicates with the reduced end portion 31^a of the cylinder 31 as shown at 55. Valves 56 are preferably employed in the pipe 54 adjacent each control valve 43 whereby when one of the control valves 43 is operated, the valve 56 adjacent the other control valve 43 is closed.

A coupling sleeve 37 is provided with one or more apertures 57 whereby the oil or other hydraulic fluid entering the inner end of the bore 32 of the cylinder 31 may pass into said coupling sleeve and through the bore of the tubular rod 38, out through the end of said rod by pressure against the valve member 41 to unseat said valve member, and thus into the chamber 30^a through ports 58 in the reduced end 31^a of the cylinder 31 and out through the exhaust pipe 42.

The operation of my improved governor control device will be readily understood from the foregoing description when taken in connection with the accompanying drawing and the following statement. It will be understood that the position of the parts illustrated in Fig. 1 of the drawing is a normal position and the parts are not in operation, and the engine is idle. Now, and if it be desired to start the engine in the usual manner, the pump 50 is put in operation through such engine directly or indirectly and the oil or other liquid is forced into the bore 32 of the cylinder 31, and the piston 33 is advanced to the right, thus correspondingly advancing the coupling sleeve 26 and sleeve 24 to place the spring 23 under predetermined tension. In the above operation, the tubular pin 38 has also been advanced to momentarily unseat itself from the valve member 41, and the oil also passes out through the pipe 52 and enters both of the valves 43, it being understood that oil is contained in the pipe 54 and both ends of the plunger 44 are exposed to the oil in each valve 43 as is also the valve member 41, this oil being kept in constant supply through supply tanks 59 on each valve casing 43. Assuming the valve 56 at the left of the drawing is closed and the valve 56 at the right of the drawing open, the corresponding control valve 43 will then be operated to move the plunger 44 into position to control and regulate a predetermined engine speed, it being understood that the advancement of the plunger 44 to the left, by means of the lever 47, will operate to advance the valve member 41 in the reduced end 31^a of the cylinder 31 to the right. The aforenamed plunger 44 is exposed to the oil under pressure through the pipe 52–53 on the right hand side of the valve, as seen in the drawing, to produce a balanced pressure on said plunger 44, and this is also true of the valve member 41 pressure being exposed to the right hand side thereof by the passage of oil through the port 57 and the port of the tubular rod 38, it being understood that when the engine is in operation, the rod 38 is unseated with respect to the valve member 41, allowing the oil to discharge out from the ports 58 and discharge pipe 42, it being understood however, that the prevailing pressure of the hydraulic element acts upon the piston 33 to control and regulate the tension of the governor spring 23 to automatically control the action of the governor 16 in the automatic control and regulation of the fuel supply to the engine through the fuel pump 7 in the usual manner.

With the construction herein shown and described, I provide a simple and yet effective, automatic control and regulating means for maintaining the proper fuel supply to the engine at different engine speeds controlled and regulated by either one of the valves 43. While I have shown and described my improved device as used in connection with an engine of one type, it will be understood that I am not necessarily limited in this respect, and various other changes in and modifications of the construction herein shown and described may be made within the scope of

the appended claims without departing from the spirit of my invention or sacrificing its advantages.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A governor control including a governor spring comprising a hydraulically actuated piston in operative connection with the governor spring, means for directing liquid to said piston, a control and regulating device having a manually operated plunger, a valve member in operative connection with said piston, means for exposing one end of the plunger to the liquid directed to said piston, and the other end of said plunger being exposed to said valve member through a liquid having a source of supply controlled by said plunger.

2. A governor control including a governor spring comprising a hydraulically actuated piston in operative connection with the governor spring, means for directing liquid to said piston, a control and regulating device having a manually operated plunger, a valve member in operative connection with said piston, means for exposing one end of the plunger to the liquid directed to said piston, and the other end of said plunger being exposed to said valve member through a liquid having a source of supply controlled by said plunger whereby the manually adjusted position of said plunger will control and regulate the tension of the governor spring.

3. A governor control including a governor spring comprising a hydraulically actuated piston in operative connection with the governor spring, means for directing liquid to said piston, a control and regulating device having a manually operated plunger, a valve member in operative connection with said piston, means for exposing one end of the plunger to the liquid directed to said piston, and the other end of said plunger being exposed to said valve member through a liquid having a source of supply controlled by said plunger whereby the manually adjusted position of said plunger will control and regulate the tension of the governor spring, and a tubular rod disposed between the piston and said valve member.

4. A governor control including a governor spring comprising a hydraulically actuated piston in operative connection with the governor spring, means for directing liquid to said piston, a control and regulating device having a manually operated plunger, a valve member in operative connection with said piston, means for exposing one end of the plunger to the liquid directed to said piston, and the other end of said plunger being exposed to said valve member through a liquid having a source of supply controlled by said plunger whereby the manually adjusted position of said plunger will control and regulate the tension of the governor spring, a tubular rod disposed between the piston and said valve member, and means whereby the liquid may be discharged between the valve member and said tubular rod.

5. A governor control including a governor spring comprising a hydraulically actuated piston in operative connection with the governor spring, means for directing liquid to said piston, a control and regulating device having a manually operated plunger, a valve member in operative connection with said piston, means for exposing one end of the plunger to the liquid directed to said piston, and the other end of said plunger being exposed to said valve member through a liquid having a source of supply controlled by said plunger whereby the manually adjusted position of said plunger will control and regulate the tension of the governor spring, a tubular rod disposed between the piston and said valve member, means whereby the liquid may be discharged between the valve member and said tubular rod, and a spacing sleeve positioned between the piston and the spring of the governor.

6. In a governor control of the class described employing a hydraulically actuated piston for increasing and decreasing the tension of the governor spring, a manually operated control and regulating device having a plunger, and means for exposing both ends of said plunger to the pressure of the liquid employed for actuating said piston.

7. In a governor control of the class described employing a hydraulically actuated piston for increasing and decreasing the tension of the governor spring, a manually operated control and regulating device having a plunger, means for exposing both ends of said plunger to the pressure of the liquid employed for actuating said piston, and means whereby the manually adjusted position of said plunger will control and regulate the tension of the governor spring through said hydraulically actuated piston.

8. In a governor controlling and regulating the supply of fuel to a fuel oil engine, a control mechanism comprising a hydraulically actuated piston in operative connection with the governor spring, and a manually actuated plunger device, both ends of which are exposed to the pressure of the liquid whereby the adjusted position of said plunger valve will control and regulate the hydraulic piston operation to increase and decrease the tension of the governor spring.

9. In a governor controlling and regulating the supply of fuel to a fuel oil engine, a control mechanism comprising a hydraulically actuated piston in operative connection with the governor spring, a manually actuated plunger device, both ends of which are exposed to the pressure of the liquid whereby the adjusted position of said plunger valve will control and regulate the hydraulic

piston operation to increase or decrease the tension of the governor spring, one side of said plunger valve being in direct communication with the liquid and the other side of said plunger valve being exposed to the pressure of said liquid through a hydraulic passage and a valve member at the end of said passage and in operative connection with said piston.

10. In a governor controlling and regulating the supply of fuel to a fuel oil engine, a control mechanism comprising a hydraulically actuated piston in operative connection with the governor spring, a manually actuated plunger device, both ends of which are exposed to the pressure of the liquid whereby the adjusted position of said plunger valve will control and regulate the hydraulic piston operation to increase or decrease the tension of the governor spring, one side of said plunger valve being in direct communication with the liquid, and the other side of said plunger device being exposed to the pressure of said liquid through a hydraulic passage, a valve member at the end of said passage, and a tubular rod connecting said member with said piston.

11. A governor control involving a governor spring comprising a cylinder, a piston in said cylinder, means for directing a liquid to the cylinder for actuating said piston, a control device comprising a manually adjustable plunger, means for directing the liquid from said cylinder to one end of said plunger, a valve member mounted in said cylinder, and a hydraulic passage exposed to the other end of said plunger and to said valve member whereby the operation of said piston by said liquid is controlled and regulated by the adjusted position of the plunger of the control device.

12. A governor control involving a governor spring comprising a cylinder, a piston in said cylinder, means for directing a liquid to the cylinder for actuating said piston, a control device comprising a manually adjustable plunger, means for directing the liquid from said cylinder to one end of said plunger, a valve member mounted in said cylinder, a hydraulic passage exposed to the other end of said plunger and to said valve member whereby the operation of said piston by said liquid is controlled and regulated by the adjusted position of the plunger of the control device, and said piston being in operative connection with the spring of the governor.

13. A governor control involving a governor spring comprising a cylinder, a piston in said cylinder, means for directing a liquid to the cylinder for actuating said piston, a control device comprising a manually adjustable plunger, means for directing the liquid from said cylinder to one end of said plunger, a valve member mounted in said cylinder, a hydraulic passage exposed to the other end of said plunger and to said valve member whereby the operation of said piston by said liquid is controlled and regulated by the adjusted position of the plunger of the control device, said piston being in operative connection with the spring of the governor and a tubular rod mounted in connection with said piston and in connection with which said valve member operates.

14. A governor control involving a governor spring comprising a cylinder, a piston in said cylinder, means for directing a liquid to the cylinder for actuating said piston, a control device comprising a manually adjustable plunger, means for directing the liquid from said cylinder to one end of said plunger, a valve member mounted in said cylinder, a hydraulic passage exposed to the other end of said plunger and to said valve member whereby the operation of said piston by said liquid is controlled and regulated by the adjusted position of the plunger of the control device, said piston being in operative connection with the spring of the governor, a tubular rod mounted in connection with said piston and in connection with which said valve member operates and means whereby the exhaust of the liquid may be directed through and between said tubular rod and said member.

15. A governor control involving a governor spring comprising a cylinder, a piston in said cylinder, means for directing a liquid to the cylinder for actuating said piston, a control device comprising a manually adjustable plunger, means for directing the liquid from said cylinder to one end of said plunger, a valve member mounted in said cylinder, a hydraulic passage exposed to the other end of said plunger and to said valve member whereby the operation of said piston by said liquid is controlled and regulated by the adjusted position of the plunger of the control device, said piston being in operative connection with the spring of the governor, a tubular rod mounted in connection with said piston and in connection with which said valve member operates, means whereby the exhaust of the liquid may be directed through and between said tubular rod and said member, and another control device similar to said first named device, and means in the hydraulic passage of both of said control devices for controlling the operation of said devices.

16. A governor control involving a spring and a shaft, comprising a hydraulically actuated piston in axial alinement with said shaft and in operative connection with said spring, means for directing liquid to said piston to increase and decrease the spring tension, and a manually operated control valve balanced in the exposure of both ends thereof to the prevailing hydraulic pressure for determining and regulating the action of the hydraulic piston on the governor spring.

17. A governor control involving a spring and a shaft, comprising a hydraulically actuated piston in axial alinement with said shaft and in operative connection with said spring, means for directing liquid to said piston to increase and decrease the spring tension, a manually operated control valve balanced in the exposure of both ends thereof to the prevailing hydraulic pressure for determining and regulating the action of the hydraulic piston on the governor spring and means in operative connection with said control valve and coupled with said piston for controlling the discharge of the liquid.

18. A governor control involving a spring and a shaft, comprising a hydraulically actuated piston in axial alinement with said shaft and in operative connection with said spring, means for directing liquid to said piston to increase and decrease the spring tension, a manually operated control valve balanced in the exposure of both ends thereof to the prevailing hydraulic pressure for determining and regulating the action of the hydraulic piston on the governor spring, means in operative connection with said control valve and coupled with said piston for controlling the discharge of the liquid, another control valve similar to the first named valve, and means whereby one only of said valves may be operated to control the governor action.

In testimony that I claim the foregoing as my invention I have signed my name this 16th day of February, 1926.

CARL H. KNUDSEN.