M. B. CRIST.

GOVERNING OIL RELAY.

APPLICATION FILED DEC. 29, 1909.

1,046,443.

Patented Dec. 10, 1912.

3 SHEETS—SHEET 1.

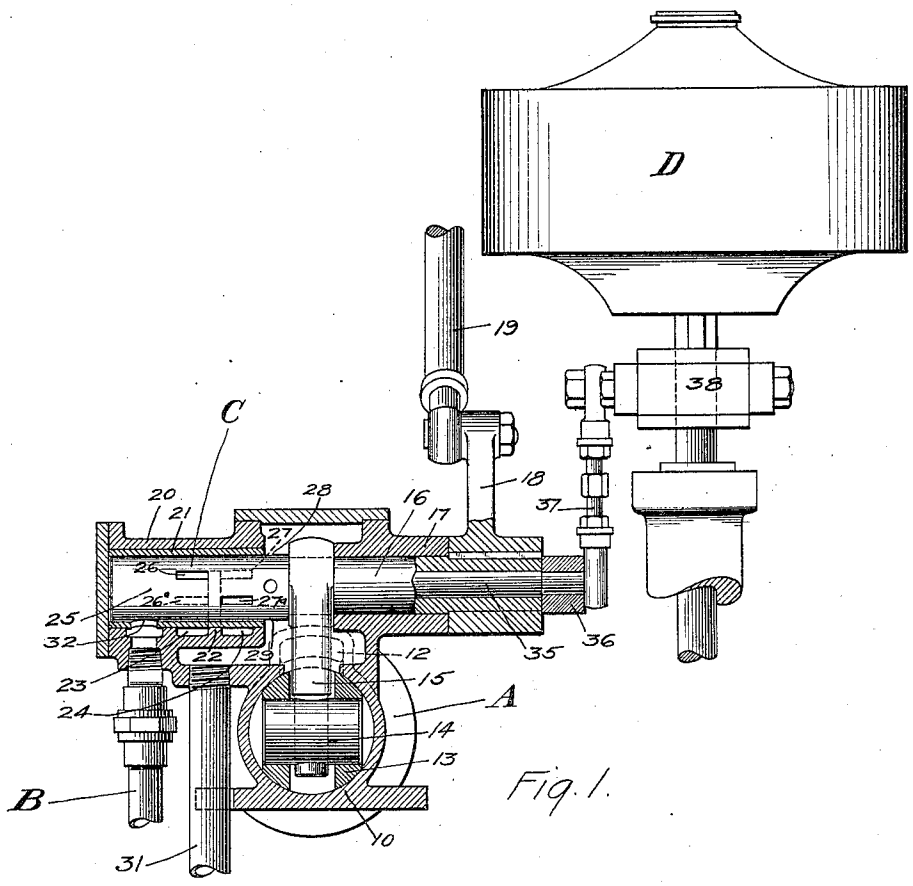

Fig. 1.

WITNESSES:

INVENTOR.

Mark B. Crist

BY

HIS ATTORNEY IN FACT.

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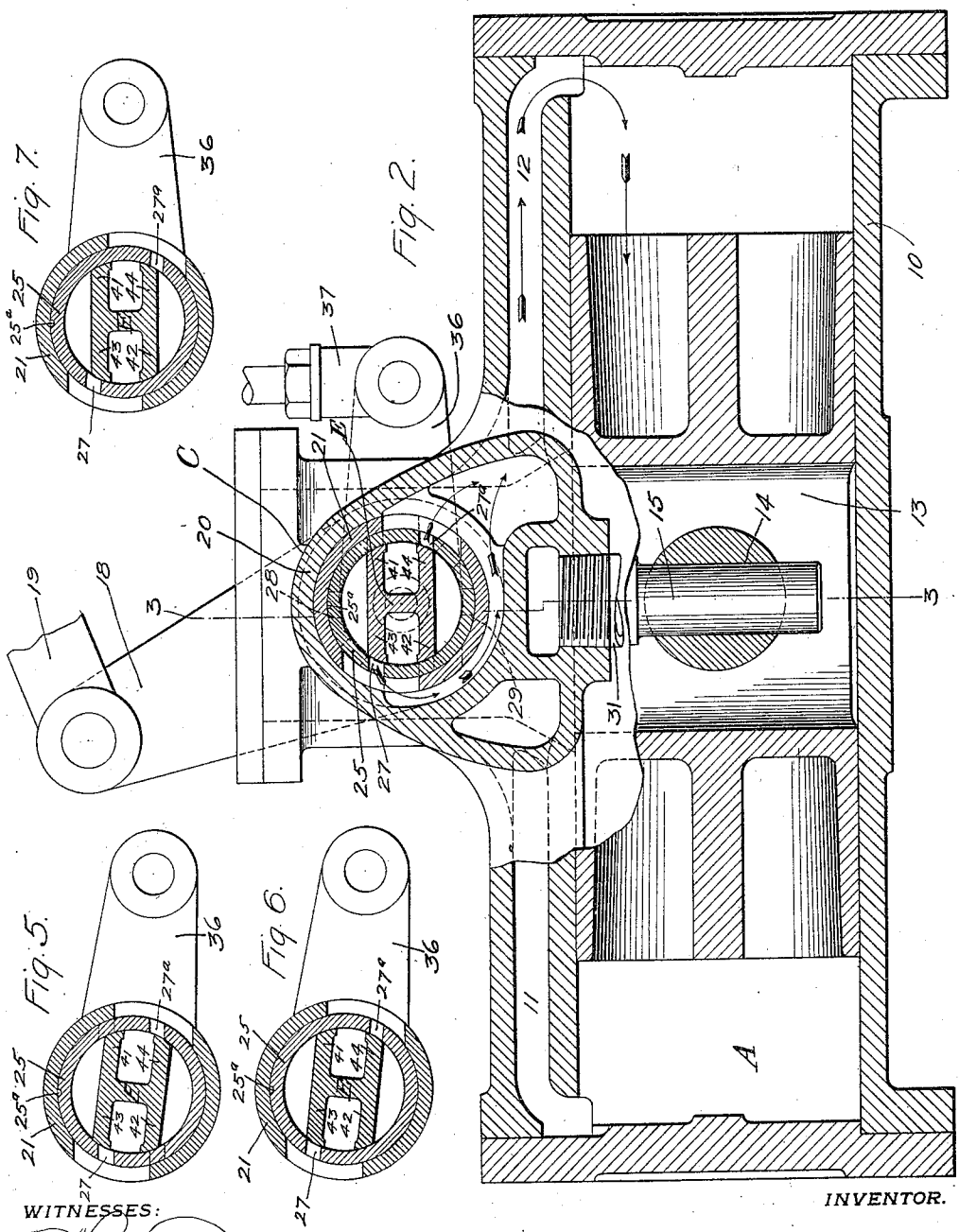

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3 SHEETS—SHEET 3.

Fig. 3.

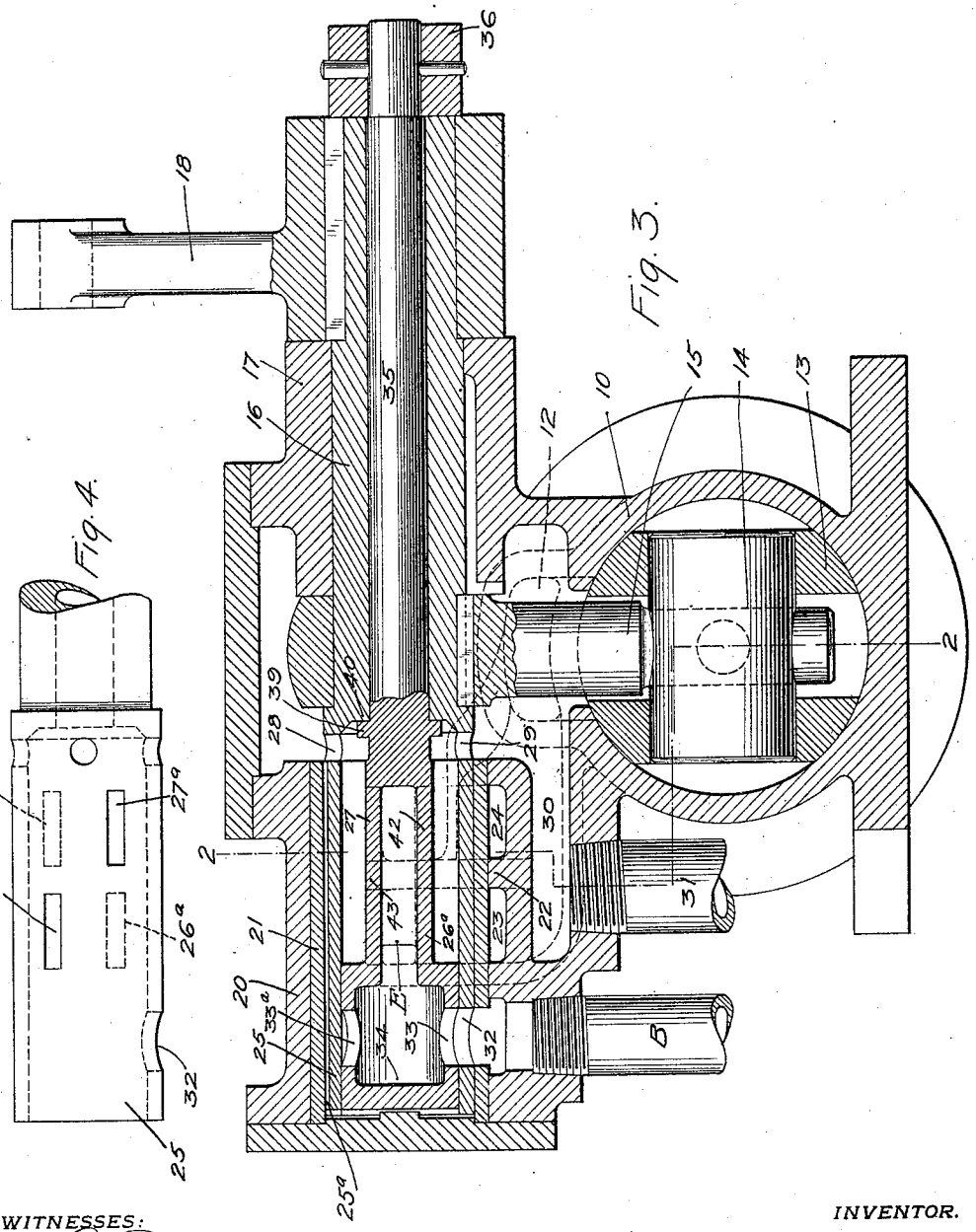

Fig. 4.

WITNESSES:

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UNITED STATES PATENT OFFICE.

MARK B. CRIST, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

GOVERNING OIL-RELAY.

1,046,443. Specification of Letters Patent. Patented Dec. 10, 1912.

Application filed December 29, 1909. Serial No. 535,435.

To all whom it may concern:

Be it known that I, MARK B. CRIST, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Governing Oil-Relays, of which the following is a specification.

This invention relates to an oil relay and particularly to one for governing the admission valve of an explosion motor.

The primary object of the invention is to provide means whereby the admission valve of the motor may be easily controlled by a speed responsive device.

Another object of the invention is to provide a balanced relay so as to reduce friction of the moving parts thereof and so as to provide a more sensitive control than would be possible where the moving parts were subjected to undue end and side thrusts.

Other objects and advantages will be referred to hereinafter, it being understood that changes in form, proportion and minor details of construction may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings, Figure 1 is a sectional view through a relay and a portion of the valve operating mechanism, the connecting link from the valve operating mechanism or motor and the governor or speed responsive device being shown in elevation. Fig. 2 is a sectional view on the line 2—2 of Fig. 3. Fig. 3 is a sectional view on the line 3—3 of Fig. 2. Fig. 4 is a fragmentary view of a portion of a rotatable bush to which the valve operating motor is connected. Fig. 5 is a sectional view through a multi-ported valve showing the position of the valve parts and the surrounding bush when the motor is operating under heavy load. Fig. 6 is a view showing the position of the valve parts after the inlet valve of the motor has moved to the desired position to accommodate the then existing load carried by the motor, and Fig. 7 is a similar view showing the positions of the parts when one side of the valve operating motor is exhausting.

By reference to Fig. 1 it would be observed that the invention is illustrated as comprising a valve actuated motor A receiving its actuating fluid from a pipe B through an oil or fluid relay C which is controlled by suitable mechanism from a speed responsive device D. The admission valve operating motor may consist of a cylinder 10 having inlet ports at its respective ends which are designated by the reference numerals 11 and 12. These ports may alternately become inlet and exhaust ports and when fluid is entering the cylinder 10 from one of the ports 11 or 12, the remaining port will be exhausting fluid.

Within the cylinder 10 is a piston 13 adapted to reciprocate under the action of the fluid, and said piston is provided with an articulated connection 14 with a link 15 which is keyed in turn to a hollow shaft 16 in a bearing sleeve 17 preferably supported by casting of which the cylinder 10 forms a part. The shaft 16 has keyed to it an arm 18 which operates the admission valve of the motor through the medium of a link 19. The relay device is illustrated as comprising a case 20 in which is a cylindrical lining bush 21 coöperating with the web 22 in the case 20 to provide ports 23 and 24 which lead to the respective ports 11 and 12 in the cylinder 10. Within the bush 21 is a rotating bush 25 which is here shown as forming a part of the rotatable shaft 16, said bush 25 having radially disposed ports 26, 26^a, 27, and 27^a. The port 25^a is to permit the escape of oil into the exhaust ports should any leak past the bush port 32 into the end of the casing. The ports 26 and 26^a are diametrically opposite each other as are also the ports 27 and 27^a. Those designated by the numerals 26 and 26^a supply the port 11, while those designated by the numerals 27 and 27^a supply the port 12. The bush 25 is also provided with diametrically opposite exhaust ports 28 and 29 which permit oil to pass into the exhaust chamber 30 of the relay device and exhaust through the pipe 31 to a suitable source, as for example, the intake of the pump which may have its outlet connected with the pipe

B. The bush 25 is also provided with an inlet port 32 which permits the admission of fluid into the inlet port 33 of a chamber 34 in said bush 25 and which forms part of the valve mechanism best shown in Figs. 2, 5, 6, and 7.

33ª is a balance port opposite the port 33.

Connected to the chamber 34 is a stem or shank 35 which constitutes a rock shaft in hollow shaft 16 and carries at one end a crank arm 36 connected to a link 37 and to a reciprocating part 38 of the governor D. The shank 35 is provided with an end-thrust collar 39, which bears against the shoulder 40 on the shaft 16. The shank 35 is provided with a plurality of flanges designated by the reference numerals 41, 42, 43, 44 and partition E. The flanges 41 and 42 provide a passage or port from the chamber 34, as do also the flanges 43 and 44, and these passages or ports are adapted to register either with the ports 26 and 26ª or with the ports 27 and 27ª, dependent upon the direction of rotation of the shaft or shank 35. The inner wall of the bush 25 in conjunction with the flanges 41 to 44 inclusive form exhaust ports from which the oil may exhaust from the exhausing end of the cylinder 10 and pass into the exhaust chamber 30 and thence through the pipe 31. The ports formed by the flanges are so disposed that whenever there is a movement of the arm 18 in one direction the exhaust of the oil from the proper end of the cylinder 10 will be free and unimpeded.

In Fig. 5 I have shown the position of the valve made up of the flanges 41 to 44 inclusive in such position that they will assume when the engine is operating under heavy load. In this case the oil is being admitted through the ports 27 and 27ª, so the piston 13 will be moved according to Fig. 2 from right to left and thereby move the arm 18 clockwise. No movement of the bush 25 takes place until after the valves have uncovered the ports either 26 and 26ª or 27 and 27ª, but immediately after the ports are opened movement of the bush takes place and the ports are moved up to the valves so that they close and further movement of the arm 18 ceases. The inlet-valve to the engine will remain in the position which it was caused to assume by the movement of the arm 18 until there is a change in load, in which event it will have a further movement clockwise, or if the engine begins to carry a light load the arm 18 will be caused to move counter-clockwise, owing to the reversal of movement of the valves which are actuated by the shaft 35.

It will be observed that oil is admitted on diametrically opposite sides of the central diaphragm or partition E of the valve mechanism for the relay, so that said valve will be absolutely balanced and all liability of side-thrust will be avoided. When the oil is exhausting it exhausts through diametrically opposite ports so as to avoid side-thrust. Therefore the relay device will be extremely sensitive and quickly respond to variations in the speed responsive device, so as to make the engine more flexible than it would be possble if the valve actuating mechanism were sluggish in its movement.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim is:

1. In a device of the class described, a valve case having an inlet port and an outlet port, a bush in the case having an outlet port, a rotatable valve in the bush having an outlet port, said outlet ports being adapted to communicate, a motor having a normally closed inlet port adapted to communicate with the outlet port in the case, a speed responsive device to rotate the valve to establish communication between the several ports, and means connected to the motor to rotate the bush to close communication between the several ports.

2. In a device of the class described, a valve case having an inlet port and an outlet port, a bush in the case having an outlet port, a rotatable valve in the bush having an outlet port, said outlet ports being adapted to communicate, an admission valve actuating motor comprising a piston, and means conected to the piston to actuate the bush to open and close communication between the several ports.

3. In a device of the class described, a valve case having an inlet port and an outlet port, a bush in the case having an outlet port, a rotatable valve in the bush having an outlet port, said outlet ports being adapted to communicate, an admission valve actuating motor, receiving fluid from the rotatable valve and comprising a piston and cylinder, a link connected to the piston and bush whereby the movement of the piston will actuate the bush to open and close communication between the several ports.

4. In a device of the class described, a valve case having an inlet and an outlet port, a rotatable bush in the case in communication with the inlet port, means connected to the bush to actuate an admission valve, a rotatable valve in the bush, a speed responsive device for actuating it, a motor receiving fluid from ports in the bush and valve, an inlet connection between the motor and bush whereby a movement of the impulse re-

ceiving element of the motor will rotate the bush to permit and cut off communication between the motor and the valve.

5. In an oil relay, a case having an inlet port and an outlet port, rotatable elements in the case, and means in one of these to relieve oil pressure caused by leakage.

In testimony whereof, I have hereunto subscribed my name this 22nd day of December, 1909.

MARK B. CRIST.

Witnesses:
C. W. McGHEE,
C. H. McCONNELL.