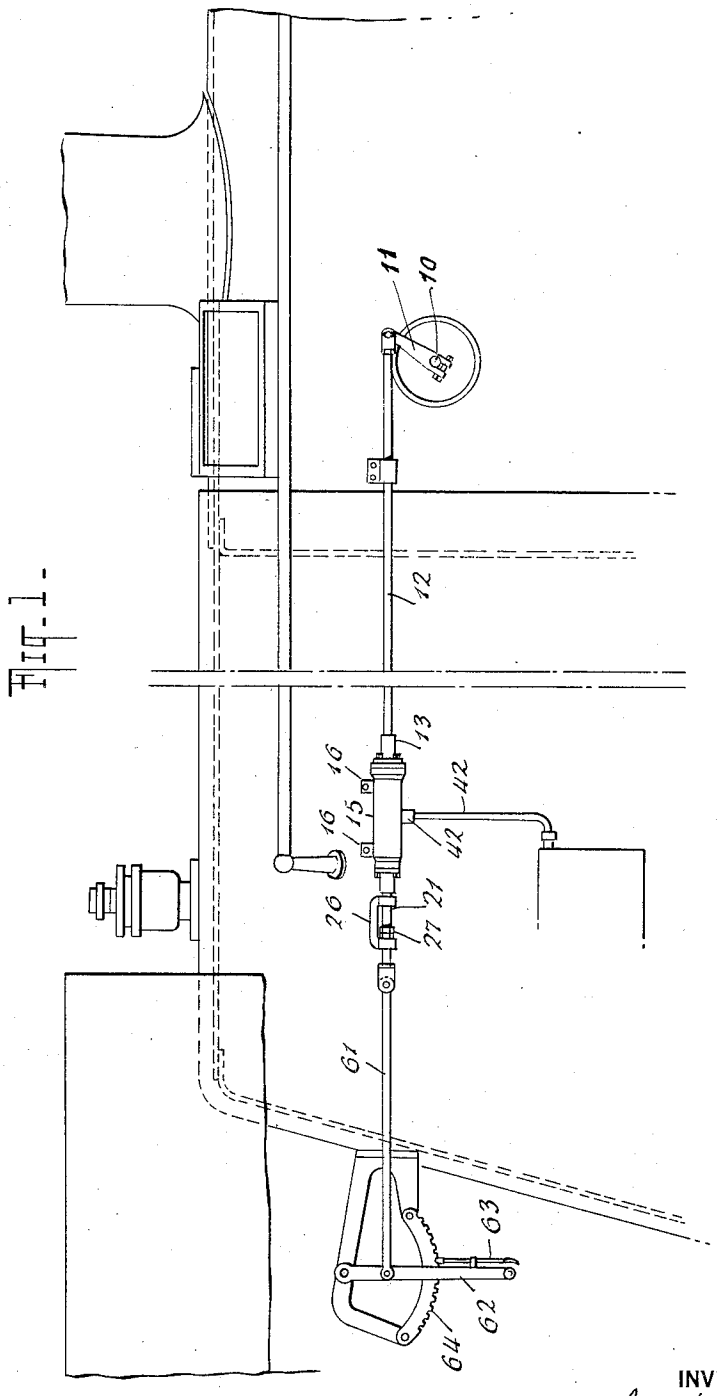
June 21, 1932. A. WILLIAMS 1,864,225

THROTTLE VALVE OPERATING MEANS

Filed Oct. 4, 1928 2 Sheets-Sheet 1

Fig. 1.



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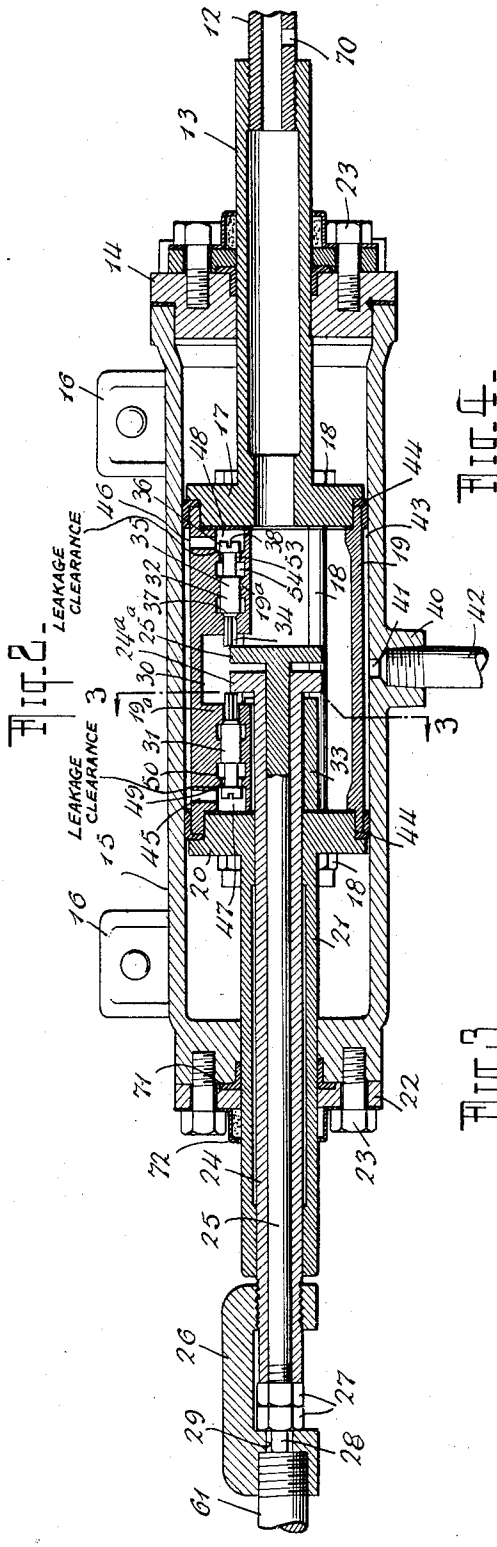


Fig. 2.

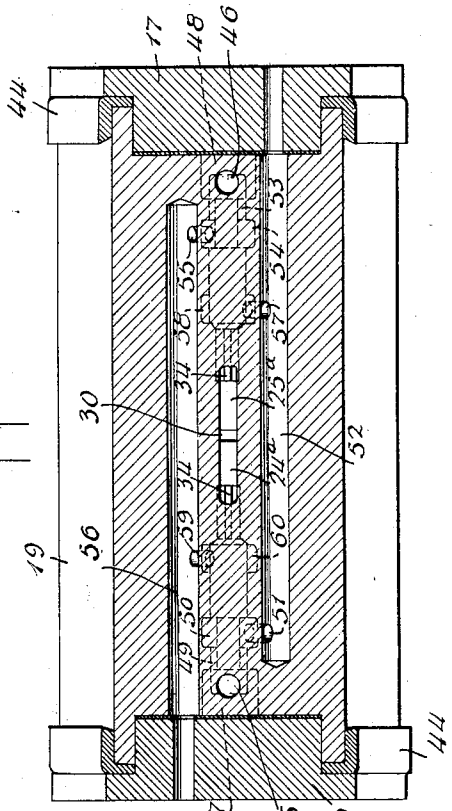


Fig. 4.

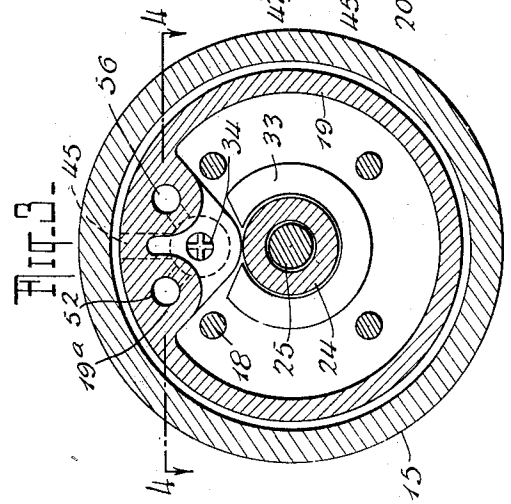


Fig. 3.

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THROTTLE VALVE OPERATING MEANS

Application filed October 4, 1928. Serial No. 310,284.

This invention relates to throttle valve operating means for locomotives and has for its principal object to provide a new and improved construction for such operating means which will be normally operable by a power device but which may be manually actuated should the power device fail to function.

Another object is to provide a power actuated throttle operating means having relatively few moving parts and which is of simple and sturdy construction, whereby the manufacturing and maintenance costs will be comparatively low.

A further object is to provide a device of the character described which will be certain and positive in operation and in which when the usual manually operated cab lever is set in adjusted position, the throttle valve will be maintained at the desired throttle opening without variation.

The above and other objects will appear more fully from the following more detailed description and by reference to the accompanying drawings forming a part hereof, wherein Fig. 1 is a partial diagrammatic side elevation of a locomotive equipped with a throttle operating means embodying the principles of the present invention; Fig. 2 is an enlarged longitudinal section through the power device of the present invention; Fig. 3 is an enlarged section on the line 3—3 of Fig. 2 and Fig. 4 is a section through the piston taken on the line 4—4 of Fig. 3.

As shown in the drawings, the numeral 10 indicates the throttle valve actuating shaft of a locomotive. For the purpose of the present disclosure the invention has been illustrated as installed upon a locomotive of the type employing superheated steam and in which a plurality of throttle valves, not shown, are actuated by a number of cams, or the like, secured to the shaft 10. The constructional details of the throttle valves of this particular type are well known in the art and, as such details form no part of the present invention, they are not illustrated in the drawings. It will be sufficient to state that when the throttle valve shaft 10 is rotated, cams, or other means carried thereby, are caused to become operative to open successively the plurality of throttle valves. The shaft 10, as shown, projects through the side wall of the boiler and has secured to its outer end a lever or arm 11. Secured to the free end of the arm 11 is one end of a tubular connecting link or reach rod 12, the other end of which is suitably connected to a piston rod 13. The piston rod 13 passes through the central bore of a cylinder head 14 secured to the end of a cylinder 15. The latter is provided with a pair of lugs 16 by means of which the cylinder may be secured to any stationary support such as the side wall of the locomotive boiler. At its inner end the piston rod 13 terminates in an enlarged head or extension 17 which is secured, as by the bolts 18, to a hollow piston 19. Secured to the other end of the piston 19 is a similar extension 20 of a second piston rod 21. The latter passes through the central bore of a second cylinder head 22. The cylinder heads 14 and 22 are secured to the cylinder 15 by any suitable means such as the bolts 23.

Slidably mounted within the bore of the hollow piston rod 21 is a sleeve 24 the bore of which has also slidably mounted therein a rod 25. The sleeve 24 and rod 25 form a pair of relatively adjustable members as will presently be more fully described. Both the sleeve 24 and rod 25 project outwardly beyond the outer end of the piston rod 21. The outer projecting end of the sleeve 24 immediately adjacent to the end of the piston rod 21 is screwthreaded and is secured within one of a pair of screwthreaded bosses provided on a connecting member 26. The sleeve 24 extends beyond the threaded portion just referred to and the end of the sleeve serves as a seat or abutment for one of a pair of adjusting nuts 27. These nuts are screwed upon the outer end of the rod 25 and are received within the space between the end of the sleeve 24 and the inner face of the other screw threaded boss of the member 26. In order to prevent the rod 25 from turning when the nuts 27 are adjusted, the end of the rod 25 is preferably made of non-circular cross sectional configuration, as indicated by the reference character 28, and is received within a recess 29

formed in the member 26 of similar cross-sectional configuration.

At their inner ends, the sleeve 24 and rod 25 are formed with the enlarged heads 24ª and 25ª respectively. These heads project into a recess or space 30 defined between a pair of enlargements 19ª in the bore of the hollow piston 19 and said heads are adapted to engage respectively with the ends of a pair of valves 31, 32. Located between the inner face of the enlargement 20 of the piston 21 and the opposed face of the enlarged head 24ª of the sleeve 24, is a stop collar 33, the function of which will presently appear.

Each of the valves 31, 32 is of similar construction and is slidably mounted within a valve chamber or bore formed in the respective enlargements 19ª of the piston 19. Each valve, as shown, has a stem portion 34 which projects beyond the end of the enlargement 19ª and into the space 30 above referred to, the end of the stem 34 of the valve 31 being adapted to engage with the head 24ª of the sleeve 24 and the similar stem of the valve 32 engaging with the head 25ª of the rod 25. Each of the valves 31, 32 has a central sleeve portion 35 and a terminal sleeve portion 36. At the point where the central sleeve portion 35 of each valve merges with the stem 33 thereof, a poppet valve type, valve seating surface 37 is provided, which surface is adapted to co-operate with a similar surface formed in the enlargement 19ª. For convenience in grinding the poppet valve surfaces, each terminal sleeve portion 36 is preferably formed with a slot 38 in which a screwdriver or similar tool may be engaged for rotating the valve and pressing the surface 37 during the grinding operation against its valve seat.

The cylinder 15 is provided with a threaded boss 40 which communicates with the interior of the cylinder through a port 41. This boss 40 serves for the connection to the cylinder of one end of a pipe 42, the other end of which is preferably connected to the main air tank of the locomotive, or to any other suitable source of fluid under pressure. Such fluid entering the cylinder passes around the annular space 43 defined between the periphery of the piston 19 and the inner wall of the cylinder. The ends of this annular space are sealed by the cup-shaped gaskets 44, which gaskets are secured to the piston by the enlarged heads 17 and 20 of the piston rods 13 and 21 respectively. This annular space communicates by means of a pair of conduits 45, 46 with the chambers 47, 48, in which the heads 36 of the valves 31, 32 respectively are mounted. A passageway 49 is in communication, at such time as the terminal sleeve portion 36 of the valve 31 is unseated, with a chamber 50, for such valve. This chamber 50 communicates through a lateral branch 51 with a conduit 52 extending longitudinally of the piston and opening to the space of the right hand end of the cylinder 15 between the enlargement 17 of the piston rod 13 and the cylinder head 14. The chamber 48 of the valve 32 communicates through a similar annular passageway 53, chamber 54, lateral branch conduit 55 and longitudinal conduit 56 with the left hand end of the cylinder 15.

The longitudinally extending conduit 52 communicates through a branch conduit 57 with a chamber 58 for the valve 32, while the longitudinally extending conduit 56 communicates through a similar branch 59 with a similar chamber 60 for the valve 31 for a purpose presently to be described.

Connected to the other threaded boss of the member 26, hereinbefore referred to, is the front end of a reach rod 61, the rear end of which is connected to the usual throttle lever 62, said lever being provided with customary spring pressed pawl 63 adapted to engage with a toothed quadrant 64; it being understood that the throttle lever and quadrant are located in the usual manner in the cab of the locomotive.

The manner in which the device operates is as follows: Compressed air or other fluid is admitted to the cylinder 15 and is confined within the annular space 43. When the parts, as shown in Fig. 2 of the drawings, are in their normally inactive positions it will be noted that the terminal sleeve portions 36 of the valves 31, 32 just close the passages 49, 53 respectively. The joints between the inner ends of these terminal sleeve portions and the walls which define the passages 49, 53 are not however sufficiently tight to prevent leakage of the fluid into such passages. Such fluid will therefore flow from the passages 49, 53 to the chambers 50 and 54 respectively. From these, fluid will flow through the branches 51 and 55 to the longitudinal conduits 52 and 56 respectively to both the right and left hand end of the cylinder. Pressure will therefore be maintained against both ends of the piston 19 and will build up evenly upon each end. The movement of the piston, in effect, is accomplished by exhausting the pressure from either end of the cylinder according to the movement of the piston and throttle desired, fluid under pressure at the same time being admitted freely to the other end of the cylinder. Assuming the conditions to be as above described, that is, the leakage of fluid into the cylinder and the building up of pressure on each side of the piston, if now the engineman wishes to open the throttle, the spring pressed pawl 63 is released and the throttle lever 62 is pulled rearwardly in the usual manner. This movement of the throttle lever is communicated through the reach rod 61 and member 26 to the two part structure formed by the sleeve 24 and operating rod 25. The engagement of the enlarged head

24ª of the sleeve 24 with the stem 34 of the valve 31 will cause said valve 31 to be moved from right to left, thus raising its poppet valve surface 37 off its seat and at the same time moving the terminal sleeve portion 36 of said valve away from the end of the passage 49. The poppet valve surface 37 being raised from its seat, the fluid under pressure from the left hand end of the cylinder will flow through the longitudinal conduit 56, branch 59 and chamber 60, past the valve steam 34 of the valve 31 and will enter the space 30. From this space the air will pass through the bore of the piston 19 to the bore of the piston rod 13 from whence it will flow freely to atmosphere through the hole 70 provided in tubular connecting rod 12. The moving of the terminal sleeve portion 36 away from the end of the passage 49 will permit a free passage of the fluid from the annular space 43 through the conduit 45, chamber 47, passage 49, chamber 50 to the lateral branch conduit 51, from whence it will flow through the longitudinal conduit 52 to the right hand end of the cylinder. Fom the above it will thus be seen that the piston will move from right to left and that the connection of the piston rod 13 through the connecting link 12 and lever 11 of the throttle actuating shaft 10 will cause the latter to be rotated. It will be understood that this movement of the parts above referred to will cause the shaft 10 to be rotated in a direction such that the throttle valve will be opened. As the piston moves from right to left the engineman will exert merely sufficient force to cause the valve 31 to remain unseated and to maintain the left hand face of the head 24ª in engagement with the stop collar 33, the movement of the piston being followed by the engineman until the desired throttle valve opening is secured. When the latter condition is reached the pawl 63 is again engaged with the toothed quadrant 64 to lock the throttle lever in adjusted position. After the lever has been locked in position there will be a slight movement of the piston in the direction above described until the poppet valve surface 37 of the valve 31 has again become seated.

The seating of the valve 31 is readily effected by the difference in pressures present in the apparatus without resort to the use of springs. It will be noted that during the time the valve 31 is unseated, as above described, the right hand end of the valve is under atmospheric pressure only. The left hand end of the valve is however subjected to the full fluid pressure existing in the annular space 43 and chamber 47. The full fluid pressure being exerted on the left hand end of the valve and the right hand end thereof being only under atmospheric pressure, it will be obvious that the poppet valve surface 37 will be quickly returned to its seat and held in engagement therewith as soon as the piston performs but a slight movement after the throttle lever is latched in position.

When it is desired to close the throttle, the throttle lever 62 is moved forwardly in the usual manner. This will cause the valve 32 to be raised from its seat, fluid being exhausted from the right hand end of the cylinder through the longitudinal conduit 52, branch conduit 57 and chamber 58 about the valve stem to the space 30, from whence it will pass through the bore of the piston rod 13 to atmosphere as described above. At the same time free admission of fluid will take place through the conduit 46, chamber 48, passage 53, chamber 54, branch conduit 55 and longitudinal conduit 56 to the left hand end of the cylinder, the piston 19 then moving from left to right and causing the throttle valve actuating shaft 10 to be moved in a reverse direction to that previously described. When the throttle valve is closed to the desired extent, the engineman will again latch the throttle lever in position. During the closing movement, the movement of the piston 19 will be followed up by a movement of the throttle lever 62 in a manner similar to that described in connection with the opening of the throttle. After the throttle lever has been set in any of its latched positions, and with the parts in the position shown in Fig. 2, the leakage of the fluid past the terminal sleeve portions 36 of the valves 31 and 32 and the building up of the pressure on each side of the piston as hereinbefore described, will bring about a condition in which a cushioning effect is performed by the fluid under pressure between each end of the piston and the adjacent cylinder head so that shocks tending to produce longitudinal movement of the piston are absorbed by the air pressure built up at each end of the piston. It will be noted that when the device is in its normal inactive position, the heads 24ª and 25ª just contact with the ends of the valve stems of the valves 31, 32 so that but a slight amount of relative movement between the piston and the manually operable member formed by the operating rod 25 and sleeve 24 will bring about an opening of either valve 31 or 32, according to the direction of such movement, consequently creeping of the parts is effectively prevented. In order that any tendency of the apparatus to creep may be quickly and readily corrected, the two part construction consisting of the sleeve 24 and rod 25 is preferred, it being obvious that the distance between the outer faces of the heads 24ª, 25ª may be adjusted with great precision by means of the adjusting nuts 27. It will, of course, however, be understood that the invention is not limited to the use of the two part adjustable member described and shown

but that if desired a valve controlling member of integral construction may be used in place of the two part member shown.

Should there be a failure of the piston to operate under fluid pressure from any cause whatsoever, such, for example, as a failure of the air supply, it will be obvious that the piston may be moved entirely by manual force applied to the throttle lever. In such a contingency the force exerted on the throttle for opening the throttle valve lever would be transmitted through the head 24ª to the stop collar 33 and thence through the piston 19, piston rod 13 and connecting rod 12 to the lever 11 and throttle valve shaft 10. As the rod 25 and the head 25ª thereof are constructed of comparatively small diameter and thickness respectively, it is preferable for the manual closing of the throttle to locate the connecting member 26 so that its front face will engage the end of the piston rod 21 before the head 25ª abuts the right hand enlargement 19ª of the piston thus employing the more rigid and sturdy parts for transmitting the thrust required for the manual closing of the throttle, and avoiding the danger of breakage of the rod 25 and its head 25ª.

It will be seen that with a device constructed as herein disclosed but a small number of moving parts are required and that all of the parts of the apparatus are of simple, sturdy construction, the manufacture of which is confined to simple machining operations. Leakage of fluid past the piston is effectively prevented by means of the cup-shaped gaskets 44, while leakage of the fluid past the piston rods is also effectively prevented by means of similar cup-shaped gaskets 71. In order to reduce frictional resistances each of the cylinder heads 14 and 22 is preferably provided with a swab ring 72 which serves to hold a supply of absorbent material saturated with oil, or other suitable lubricant.

The maintenance of the installation will be simple and cheap as none of the parts are subjected to any great amount of wear. Occasional renewal of packing and the grinding in of the valves 31, 32 will be all that is required. This latter can be accomplished readily by the use of a simple tool, such as a screwdriver, without the necessity of moving the parts to the shop. It will be noted that with the construction herein disclosed the power actuated cylinder and piston may be located on the locomotive close to the cab, the piston rod 13 connecting to the reach rod 12 which would extend from a point adjacent the cab to the throttle valve. Therefore any friction between the reach rod and its supports would be overcome by the power actuated piston and as such friction particularly in the case of a large locomotive is considerable the invention thereof possesses marked advantages in this respect.

It will be understood that the invention is not limited to the specific constructional details of any of the parts illustrated but that many changes, variations and modifications may be resorted to without departing from the spirit of the invention.

I claim:

1. An operating motor of the kind described comprising a cylinder, a hollow double ended piston in said cylinder having an annular peripheral recess at an intermediate portion thereof, and provided with an internal space constituting an exhaust chamber, a connection from a source of fluid under pressure to said annular recess, connections in said piston leading from said annular recess to opposite ends of said piston respectively and to said exhaust chamber, means in said connections whereby pressure fluid is supplied to both ends of said cylinder for normally maintaining fluid pressure upon opposite ends of said piston, and valve means of the poppet type located independently of each other in said connections under manual control for selectively directing the pressure fluid from either end of said cylinder to the exhaust chamber and simultaneously directing pressure fluid from said annular recess to the opposite end of said cylinder, said valve means including piston members interposed in the path of the pressure fluid whereby said valve means will be normally urged by said fluid to closed position.

2. An operating motor of the kind described comprising a cylinder, a hollow double ended piston in said cylinder having an annular peripheral recess at an intermediate portion thereof, and provided with an internal space constituting an exhaust chamber, a connection from a source of fluid under pressure to said annular recess, connections in said piston leading from said annular recess to opposite ends of said piston respectively and to said exhaust chamber, means in said connections whereby pressure fluid is supplied to both ends of said cylinder for normally maintaining fluid pressure upon opposite ends of said piston, valve means of the poppet type located independently of each other in said connections for selectively directing the pressure fluid from either end of said cylinder to the exhaust chamber and simultaneously directing pressure fluid from said annular recess to the opposite end of said cylinder, said valve means including piston members interposed in the path of the pressure fluid whereby said valve means will be normally urged by said fluid to closed position, and a manually operable control for actuating said valve means to opened position against the pressure of said fluid.

3. An operating motor of the kind described comprising a hollow double headed

piston having an annular peripheral recess at an intermediate portion thereof and provided with an internal space constituting an exhaust chamber, a cylinder in which said piston is mounted for reciprocation, means for connecting said annular recess and cylinder with a source of fluid under pressure, including conduits in said piston leading to opposite ends of the cylinder and communicating with said exhaust chamber, a pair of separate and independent valves of the poppet type interposed in said conduits, and a manually operable control for selectively actuating said valves to direct the fluid to one end of said cylinder and to simultaneously direct the fluid from the other end of said cylinder to said exhaust chamber whereby said piston is moved lengthwise of said cylinder in one direction or the other.

4. An operating motor of the kind described comprising a hollow double headed piston having an annular peripheral recess at an intermediate portion thereof and provided with an internal space constituting an exhaust chamber, a cylinder in which said piston is mounted for reciprocation, means for connecting said annular recess with a source of fluid under pressure, said piston being provided with a pair of valve chambers communicating with said annular recess, conduits in said piston leading from said chambers and communicating with said cylinder at opposite ends of said piston and with said exhaust chamber, and a pair of separate and independent valves of the poppet type under manual control mounted in said chambers for selectively directing the fluid to one end of said cylinder and for simultaneously directing the fluid from the other end of said cylinder to said exhaust chamber whereby said piston is moved lengthwise of said cylinder in one direction or the other.

5. An operating motor of the kind described comprising a hollow double headed piston having an annular peripheral recess at an intermediate portion thereof and provided with an internal space constituting an exhaust chamber, a cylinder in which said piston is mounted for reciprocation, means for connecting said annular recess and cylinder with a source of fluid under pressure, including conduits in said piston leading to opposite ends of the cylinder and communicating with said exhaust chamber, a pair of separate and independent valves of the poppet type interposed in said conduits, and a manually operable control for selectively actuating said valves, said control including a two part member normally operable as an integral structure and adjustable means for moving the two parts of said member relatively to each other to selectively direct the fluid to one end of said cylinder and to simultaneously direct the fluid from the other end of said cylinder to said exhaust chamber whereby said piston is moved lengthwise of said cylinder in one direction or the other.

6. An operating motor of the kind described comprising a hollow double headed piston having an annular peripheral recess at an intermediate portion thereof and provided with an internal space constituting an exhaust chamber, a cylinder in which said piston is mounted for reciprocation, means for connecting said annular recess and cylinder with a source of fluid under pressure, including a pair of separate and independent valves of the poppet type carried by said piston and a manually operable control having a portion thereof interposed between said valves for actuating said valves selectively by movement of said control in either direction to direct the fluid to one end of said cylinder and to simultaneously direct the fluid from the other end of said cylinder to said exhaust chamber whereby said piston is moved lengthwise of said cylinder in one direction or the other.

7. An operating motor of the kind described comprising a hollow double headed piston having an annular peripheral recess at an intermediate portion thereof and provided with an internal space constituting an exhaust chamber, a cylinder in which said piston is mounted for reciprocation, means for connecting said annular recess and cylinder with a source of fluid under pressure, including conduits in said piston leading to opposite ends of said cylinder and communicating with said exhaust chamber, a pair of separate and independent valves of the poppet type carried by said piston, a manually operable control having a portion interposed between said valves for selectively actuating either thereof to direct the fluid to one end of said cylinder and simultaneously direct the fluid from the other end of said cylinder to said exhaust chamber whereby said piston is moved lengthwise of said cylinder in one direction or the other, and means for locking said control in adjusted position, said portion serving to actuate automatically either of said valves upon a movement of said piston in either direction due to leakage or to any other cause.

8. An operating motor of the kind described comprising a hollow double ended piston having an annular peripheral recess at an intermediate portion thereof and having an internal space constituting an exhaust passage for fluid, a cylinder in which said piston is mounted for reciprocation, means for introducing fluid under pressure into said cylinder and annular recess between the ends of said piston, means for preventing the passage of fluid past the ends of said piston, said piston being provided with a pair of conduits which communicate with the space between the ends of the piston and with the spaces between the ends of said piston and the ends

of the cylinder, a pair of separate and independent valves of the poppet type carried by said piston for controlling the passage of fluid through said conduits, a manually operable control having a portion thereof located between said valves for operating either of said valves selectively and means associated with said control for actuating said hollow double headed piston manually whenever the fluid pressure fails.

9. An operating motor of the kind described comprising a hollow double ended piston having an annular peripheral recess at an intermediate portion thereof and having an internal space constituting an exhaust passage for fluid, a cylinder in which said piston is mounted for reciprocation, means for introducing fluid under pressure into said cylinder and annular recess between the ends of said piston, means for preventing the passage of fluid past the ends of said piston, said piston being provided with a pair of conduits which communicate with the space between the ends of the piston and with the spaces between the ends of said piston and the ends of the cylinder, a pair of separate and independent valves of the poppet type carried by said piston for controlling the passage of fluid through said conduits, and a manually operable control having a portion thereof located between said valves for operating either of said valves selectively, said control including a two part member, and means for adjustably moving the parts of said member relatively to each other.

10. An operating motor of the kind described comprising a cylinder and piston, means for connecting said piston with the throttle valve of the locomotive, said piston being provided with two longitudinally extending conduits, one of said conduits communicating with the space between one end of said piston and the adjacent end of the cylinder, and the other of said conduits communicating with the space between the other end of said piston and the other end of the cylinder, said piston being provided with a pair of spaced valve chambers, a valve mounted in each of said chambers, conduits connecting each of said valve chambers with both of said longitudinally extending conduits, means for admitting fluid under pressure to said cylinder between the ends of said piston, means for confining said fluid between the ends of said piston, and passages controlled by said valves for connecting said longitudinally extending conduits with the space between the ends of said piston and the spaces between the ends of said piston and the ends of said cylinder.

11. An operating motor of the kind described comprising a cylinder and piston, means for connecting said piston with the throttle valve of the locomotive, said piston being provided with two longitudinally extending conduits, one of said conduits communicating with the space between one end of said piston and the adjacent end of the cylinder, and the other of said conduits communicating with the space between the other end of said piston and the other end of the cylinder, said piston being provided with a pair of spaced valve chambers, a valve mounted in each of said chambers, conduits connecting each of said valve chambers with both of said longitudinally extending conduits, means for admitting fluid under pressure to said cylinder between the ends of said piston, means for confining said fluid between the ends of said piston, and passages controlled by said valves for connecting said longitudinally extending conduits with the space between the ends of said piston and the spaces between the ends of said piston and the ends of said cylinder, and a manually operable means for selectively actuating either of said valves.

12. An operating motor of the kind described comprising a cylinder and a hollow double headed piston having an annular peripheral recess at an intermediate portion thereof and having an internal space constituting an exhaust passage for fluid, said piston being mounted for reciprocation therein, means for introducing fluid under pressure to said cylinder between the ends of said piston, means for preventing leakage of said fluid past the ends of said piston and for confining said fluid in an annular space defined between said piston and cylinder, a pair of spaced valve chambers carried by said piston, conduits connecting said valve chambers with said annular space and with the spaces defined between the ends of said piston and the ends of said cylinder, a separate and independent valve of the poppet type mounted in each of said valve chambers and manually operable means for selectively actuating either of said valves.

13. An operating motor of the kind described comprising a cylinder and a piston mounted for reciprocation therein, means for introducing fluid under pressure to said cylinder between the ends of said piston, means for preventing leakage of said fluid past the ends of said piston and for confining said fluid in an annular space defined between said piston and cylinder, a pair of spaced valve chambers carried by said piston, conduits connecting said valve chambers with said annular space and with the spaces defined between the ends of said piston and the ends of said cylinder, a valve mounted in each of said valve chambers, a manually operable control having a portion interposed between said valves so that movement of said control in one direction will actuate one of said valves so as to admit fluid under pressure into the space between one end of said piston and the adjacent end of said cylinder and thereby pro-

duce a movement of said piston in the same direction as the movement of said manual control.

14. An operating motor of the kind described comprising a cylinder and a piston mounted for reciprocation therein, means for introducing fluid under pressure to said cylinder between the ends of said piston, means for preventing leakage of said fluid past the ends of said piston and for confining said fluid in an annular space defined between said piston and cylinder, a pair of spaced valve chambers carried by said piston, conduits connecting said valve chambers with said annular space and with the spaces defined between the ends of said piston and the ends of said cylinder, said valves having a clearance to permit a leakage of fluid from said annular space through said conduits to the spaces between the ends of said piston and the ends of said cylinder, said conduits including branches under the control of said valves for establishing communication to the atmosphere and a manually operable control for selectively actuating either of said valves, each of said valves when actuated by said control permitting the free passage of fluid under pressure from said annular space to the space between one end of said piston and the adjacent end of the cylinder and simultaneously venting to atmosphere the space between the opposite end of said piston and its adjacent cylinder end.

In testimony whereof, I have hereunto set my hand.

ARTHUR WILLIAMS.