June 23, 1925. 1,543,552

W. COULSON

PUMP CONTROL VALVE FOR LOCOMOTIVE TRAIN LINES

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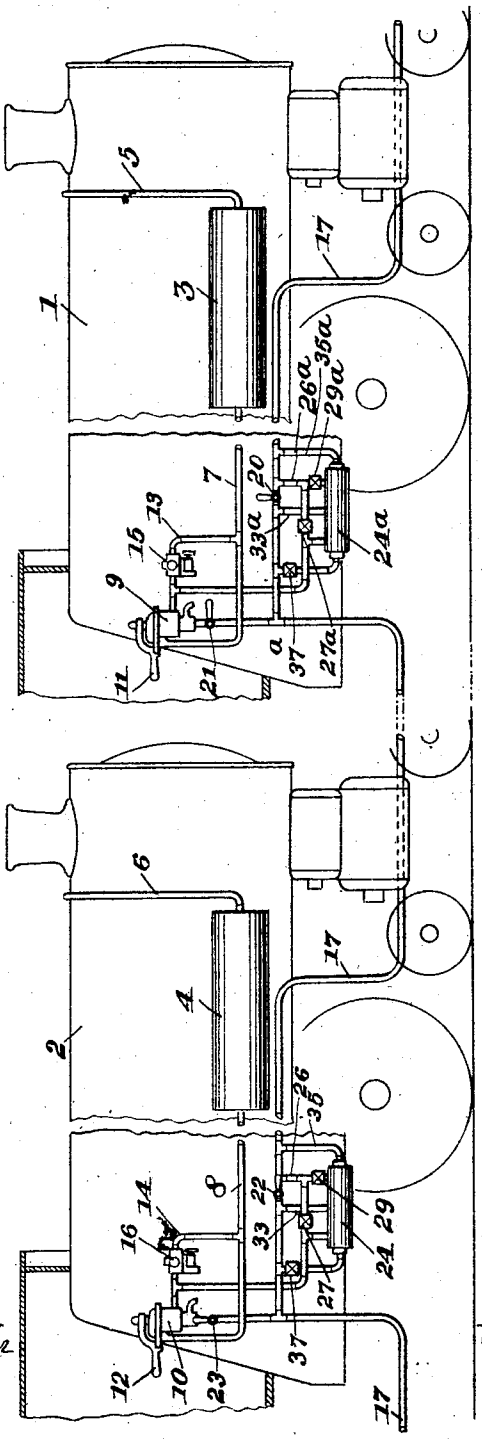


Fig. 1.

WITNESSES

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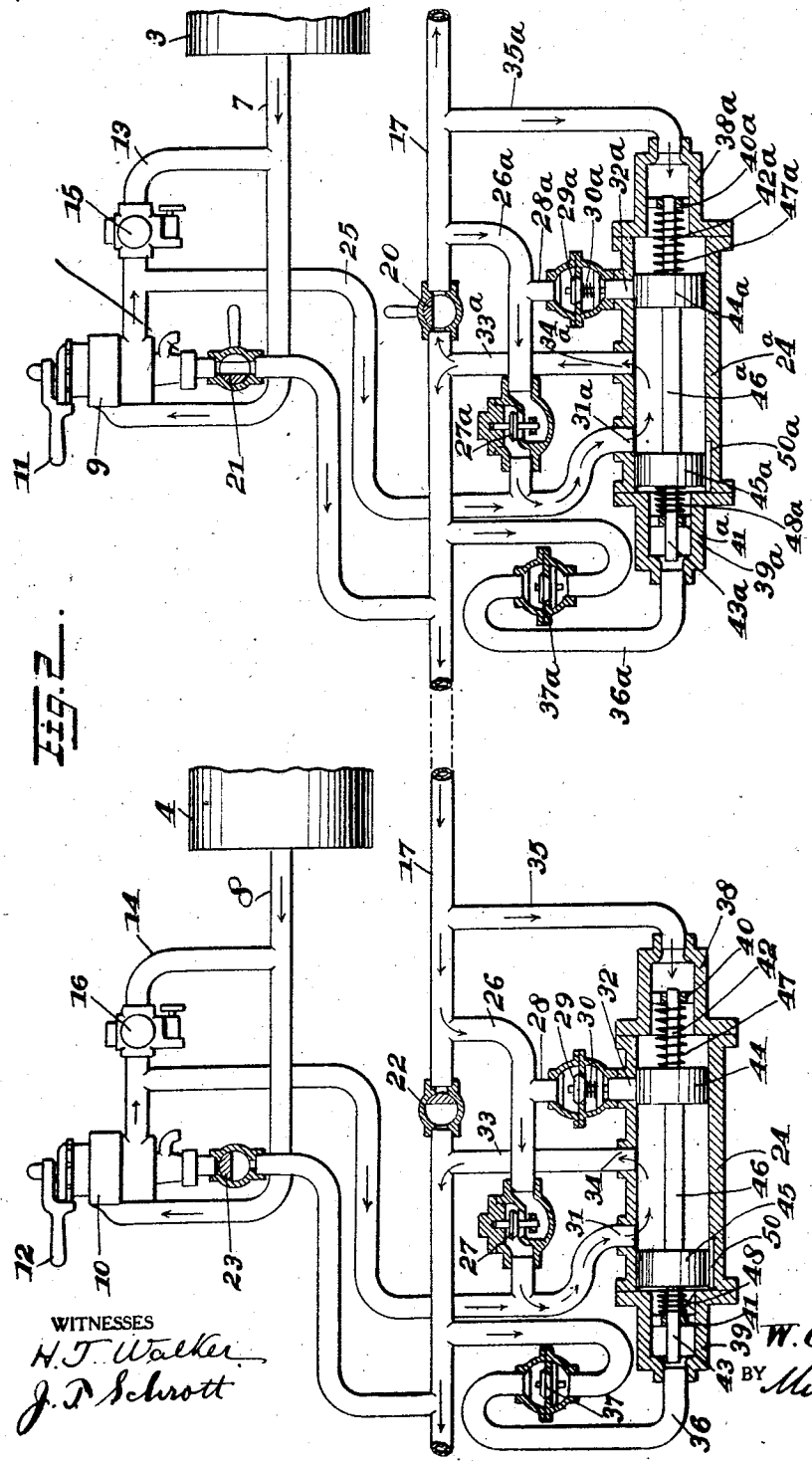


Fig. 2.

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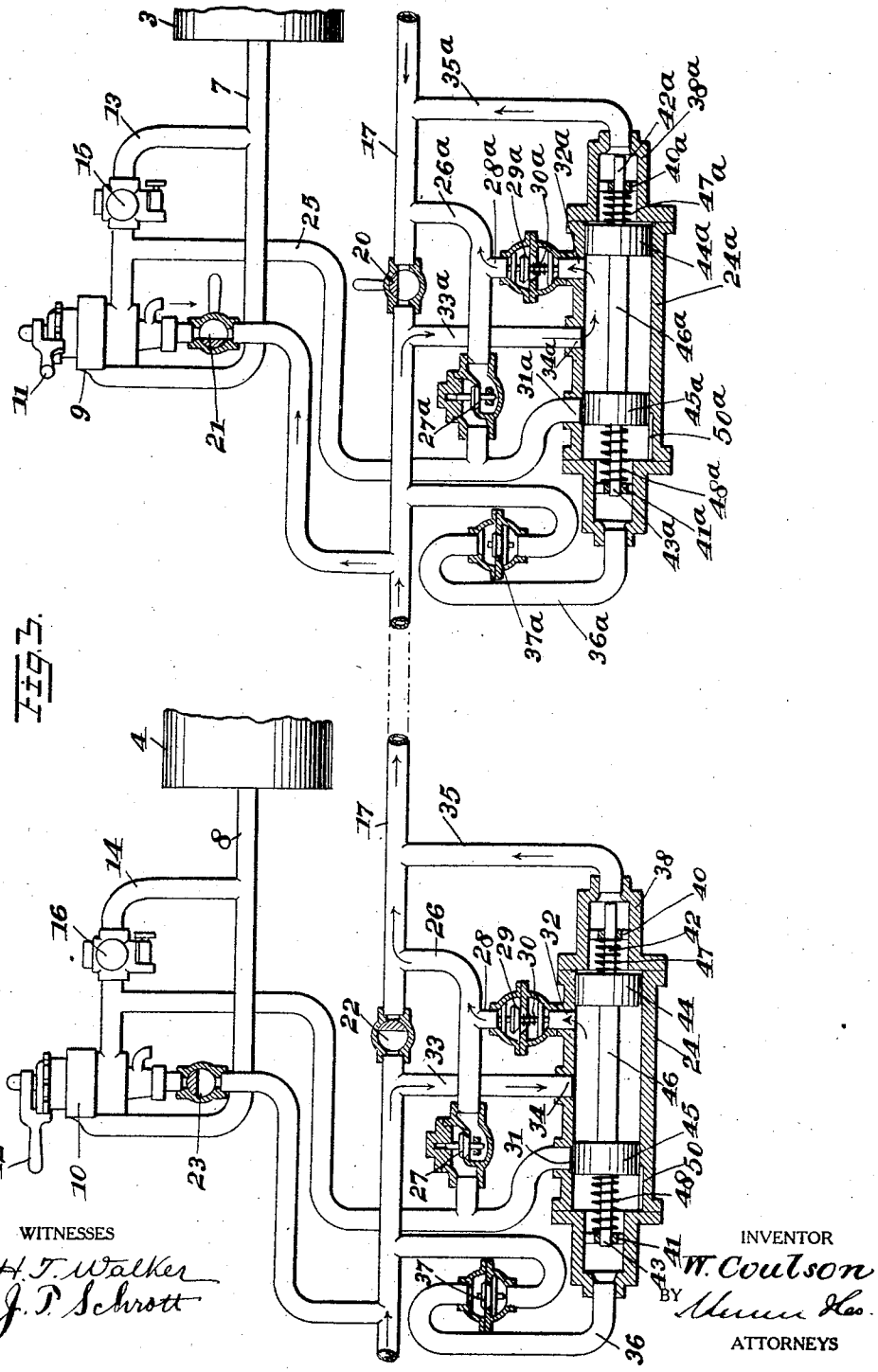


Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM COULSON, OF MECHANICVILLE, NEW YORK.

PUMP-CONTROL VALVE FOR LOCOMOTIVE TRAIN LINES.

Application filed October 3, 1924. Serial No. 741,485.

To all whom it may concern:

Be it known that I, WILLIAM COULSON, a subject of the King of Great Britain, who has secured his first citizen papers, and a resident of Mechanicville, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Pump-Control Valves for Locomotive Train Lines, of which the following is a specification.

This invention relates to improvements in locomotives, particularly to the air brake system, and it consists of the constructions, combinations and arrangements herein described and claimed.

An object of the invention is to provide a double-piston valve which functions in such a manner as to give the engineer of a leading locomotive control of the pumps of the second locomotive in the case of a so-called "double header", obviating the present necessity of the leading locomotive pumping all of the air for the whole train line.

Other objects and advantages appear in the following specification, reference being had to the accompanying drawings, in which:

Figure 1 is a diagrammatic side elevation of a so-called "double header" illustrating the valve mechanism involved, the locomotives being shown fragmentarily,

Figure 2 is a diagrammatic section of the valve mechanism in the running position,

Figure 3 is a similar view of the valve mechanism in the stopping position, i. e., when the engineer's valve has been turned to make a service application of the brakes.

When a long train of cars must be drawn, it is necessary to use two locomotives, commonly called a double-header. According to existing practice it is the air pump or pumps of the leading locomotive upon which the burden is placed of supplying the whole train line with air. This is because the engineer of the second locomotive customarily cuts out the train line, so far as the main reservoir on his locomotive is concerned, by use of the usual cut-out valve under the brake valve, merely keeping pressure in his main reservoir for use in case of an emergency.

It is usually the case that a train line is leaky, thereby increasing the demand upon the active pumps to such an extent that they may run hot. If they then fail to keep up the required pressure the brakes will stick, obviously making it hard to pull the train and sometimes resulting in causing the wheels to slide. The flat wheels have to be changed when arriving at the terminal. It is the purpose of the invention to provide means by which the pumps of the second locomotive are made to share in the work of pumping air for charging and recharging the train line and helping to maintain the pressure.

Figure 1 shows locomotives 1 and 2 intended to be considered as coupled to constitute a double-header for drawing a long train as stated before. The locomotives carry main reservoirs 3 and 4 which are supplied with air through pipe 5 and 6 by pumps not shown. The main reservoir pipes 7 and 8 connect the main reservoirs with the engineer's brake valves 9 and 10. These valves usually have six positions for the valve levers 11 and 12 of which "full release", "running position", and "service application" are the ones referred to herein.

Branch pipes 13 and 14 connect from the main reservoir pipes to the brake valves under the rotary valve members of the latter, and have feed valves 15 and 16 by means of which the customary reservoir air pressure of 110 lbs. is reduced to 80 lbs. train line pressure. The brake valves are in connection with and control the air in the train pipe commonly designated 17, the continuity of which is readily followed in the drawings. The branch pipes 13 and 14 and the train pipe are fitted with cut-out valves 20, 21, 22 and 23.

So far as this description has progressed, it is that of an existing structural arrangement, and agreeable with a statement previously made the engineer of the second locomotive 2 shuts the reservoir 4 from the train line 17 by closing the cut-outs 22 and 23. The engineer of the leading locomotive opens all of his cut-outs. The closed position of the cut-out valves occur when the valve handles are parallel with the pipes in which the valves are situated.

The invention comprises a relatively simple mechanism which is identical on every locomotive, and as this is also true of the locomotives 1 and 2 herein shown, the plan is to describe the mechanism on the second locomotive 2 in that this is the one concerned, and use reference characters for similar parts of the mechanism on locomotive 1, but distinguish the latter by merely

adding the exponent letter "a" without specific description. The valve mechanism of the leading locomotive responds similarly as does that of the second, the purpose and advantage of this being that a normal air supply may be insured ahead of the leader in case one or more cars be coupled ahead.

Extending from the branch pipe 13 to the valve cylinder 24 near one end is the feed pipe 25 which is joined by a by-pass 26 from the train line 17. A check valve 27 is situated in the by-pass ahead of its connection to the feed pipe. A connection 28 joins the by-pass with the valve cylinder near the other end. This connection has a check valve 29 having a spring 30, tending to unseat it. The purpose of the spring is to hold the valve 29 off its seat when the brakes are set to insure an equalization of air pressure in both sides of the train line so that the air gauge reading will be correct.

The places where the feed pipe 25 and connection 28 join the valve cylinder 24 are hereinafter termed ports 31 and 32. A mid pipe 33 extends from the train line 17 to a port 34 in the cylinder 24 at a point substantially midway of the ports 31 and 32. A high pressure pipe 35 connects the train line with the right end of the valve cylinder, and an equalizing pipe 36 connects the train line with the left end of the cylinder. This pipe contains a check valve 37 which figures in an equalizing function of the pipe 36.

In reference to the valve cylinder 24, the ends are flanged to provide for the attachment of the heads 38 and 39 into which the pipes 35 and 36 open. These heads are hereinafter referred to as right and left chambers. They also have webs 40 and 41 in which the stems 42 and 43 of the valve pistons 44 and 45 are guided. These pistons are fixedly connected by a rod 46 so that they move together.

Springs 47 and 48 upon the stems 42 and 43 between the respective pistons and webs prevent the pistons from striking the adjacent heads 38 and 39 when moved to the extremities in those directions. The piston 44 is a fraction larger in diameter than the piston 45 so that the piston valves will "stick" or stay in place when moved. The cylinder has a groove 50 through which communication occurs between the pipe 36 and the interior of the cylinder 24. It is through this groove that the pressures in the pipe 36 and cylinder 24 equalize when the pistons are restored to the normal running position upon re-establishment of the train line pressure.

The operation is now described, and the functions of the foregoing mechanisms will become apparent. The train line cut-offs 20, 21 and 22, 23 are respectively opened and closed. The closed cut-out 22 in effect divides the train line. The engineer of the leading locomotive is first assumed as desiring to charge or recharge the train line 17. This is done by moving the lever 11 of the brake valve 9 to "full release" position. The 110 lb. pressure of the reservoir 3 is thus let into the train line 17 of the leading locomotive 1, passing onto the second locomotive 2, down the high pressure pipe 35, into the right chamber 38 pushing the pistons 44 and 45 back to cover the port 32 and open the port 31.

Air at the same time enters the by pass 26, seating valve 29 and unseating valve 27 so that the air from the leading locomotive enters the feed pipe 25. Inasmuch as the port 31 is opened, air from the second reservoir 4 also enters the pipe 25 and the mixture passes into the central chamber of the cylinder 24, thence passes through the port 34 into the mid-pipe 33 and discharges into the continuation of the train line which extends the full length of the train. Air is thus contributed by the reservoir 4 of the second locomotive as well as by the reservoir 3, and together they charge the line and maintain the pressure.

It is next assumed that the train is on the way. The reservoirs 3 and 4 contain air at the normal 110 lbs. pressure, and the train line pressure is at 80 lbs. A stop is desired. The engineer of the leading locomotive makes a service application of his brake valve 9 causing a train line pressure reduction of approximately 10 lbs.

There is a response to this pressure drop in the train line 17, pipe 35, chamber 38, by pass 26, and mid pipe 33. The check valve 37 seats itself upon the drop of pressure in the train line to the right of it, thereby trapping air in the left chamber 39 at a pressure of 10 lbs. higher than in chamber 38. This preponderance of pressure pushes the valve pistons to the right (Fig. 3) closing the port 31 and cutting off the air from feed pipe 25 into the cylinder 24, and also insures that the valve pistons will not move again until normal pressure is restored and the brakes are released.

But the port 32 is opened permitting air at 80 lbs. pressure to flow from the train line at the left of cut-off 22, through the cylinder 24, port 32, connection 28 and by-pass 26 into the train line 17, at the right of cut-off 22 and on to the brake valve 9 of the leading locomotive until the pressure in the entire line has equalized at 70 lbs. The check valve 29 becomes unseated by the spring 30 beneath it, thereby producing a correct gauge reading in the leading locomotive.

As soon as the first drop in pressure occurred in the by-pass 26, the check valve 27 closed, thereby preventing air from the reservoir 4 entering the train line. The auto-

matic closing of the check valve 27 cuts off the pressure of the second locomotive reservoir from the train line. In further reference to the check valve 29; there are usually enough leaks in the train line to cause a further reduction of air pressure so that the valve would be likely to seat upon a reduction of pressure under it. The spring 30 lifts the valve upon this happening, and thus permits an equalization of air pressure.

When the need for brake application is over the engineer restores the brake valve lever 11 to the "full release" position. The former 80 lbs. air pressure is thus reestablished and the valve pistons 44 and 45 restored to the original positions in Fig. 2. The purpose of the groove 50 now is to permit the pressure in the left chamber 39 to equalize with the train line pressure. The reason for the necessity of this equalization is this: if, upon releasing the brakes and recharging the train line, the brake valve of the leading locomotive is placed in "running" position before the train line pressure has been pumped up to 80 lbs. there would be less pressure in chamber 38 than in chamber 39 whereupon the valve pistons would be pushed ahead again (Fig. 3), closing the port 31, cutting off the supply of the train line by the reservoir 4 and causing the brakes to stick.

As described before, the piston 44 is made to fit its bore a little tighter than does the piston 45, or just enough to make the pistons remain stationary when the control valve is in the running position after air is pumped up to full pressure. When a brake application is made there will always be an 80 lb. pressure in the left chamber 39, and that will be enough to overcome the slight difference in size of the pistons.

It is not essential that the two locomotives be coupled as herein disclosed in order for the control valve to function. The practice of coupling fifteen (more or less) of cars between locomotives of a double-header train is sometimes carried out. It also happens sometimes that three or four locomotives are coupled together in a train. In either event the control valves will function to cause each locomotive to do its share of the pumping.

While the construction and arrangement of the improved control valve is that of a generally preferred form, obviously modifications and changes may be made without departing from the spirit of the invention or the scope of the claims.

I claim:—

1. A plurality of locomotives each having a compressed air reservoir, a brake valve, and a common train line; the combination of a cylinder on each locomotive, a high pressure pipe connecting the cylinder to the train line, a feed pipe connecting the respective reservoir to the cylinder, a mid-pipe connecting the cylinder to the train pipe, and means operable in each cylinder by air initially supplied to the feed pipes by the leading locomotive reservoir to place the feed and mid-pipes in communication thus causing the respective reservoirs to contribute to the train line air supply.

2. In combination with a compressed air reservoir and a train line; a cylinder connected between the reservoir and train line, means constituting a valve shiftable in the cylinder by an influx of compressed air into the train line and cylinder to place said reservoir into communication with the train line to supplement the air present therein, and means in which air is trapped at train line pressure upon shifting of said valve means for reversely shifting said valve means and cutting off said reservoir upon a pressure reduction in the train line.

3. In combination with a compressed air reservoir and a train line having a closed cut-out; a cylinder connecting the reservoir to the train line at both sides of the cut-out, means constituting a valve shiftable in the cylinder by an influx of compressed air into the train line and cylinder from one side of the cut-out to establish communication of the reservoir through the cylinder to the train line at the other side of the cut-out and thereby contribute to the train line pressure, and trap means situated between the train line at said other side of the cut-out and the cylinder at the other side of said valve means to trap air at train line pressure for reversely shifting the valve means to close off the reservoir upon a pressure reduction in the train line.

4. A train line having a cut-out intended to be closed, a compressed air reservoir, a cylinder receiving compressed air into one end from the train line at one side of the cut-out, a double-piston valve in the cylinder moved in one direction by said compressed air, and ports leading into the cylinder then so controlled by said valve to admit compressed air from both the reservoir to commingle with train line air and pass to the train line at the other side of said cut-out.

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