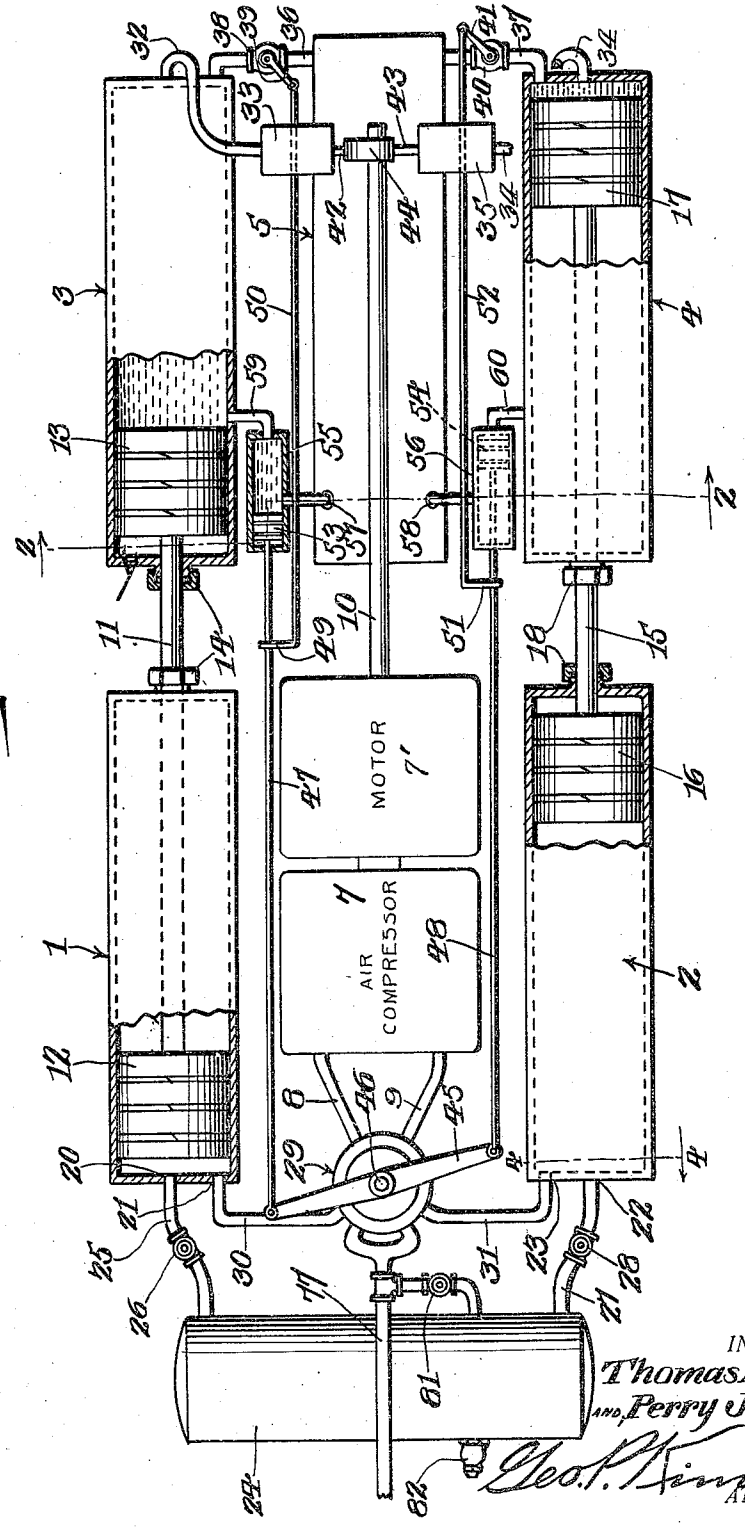
Aug. 19, 1930. T. McLAUGHLIN ET AL 1,773,593

DEVICE FOR CONTROLLING THE DELIVERY OF COMPRESSED AIR

Filed Sept. 16, 1929 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

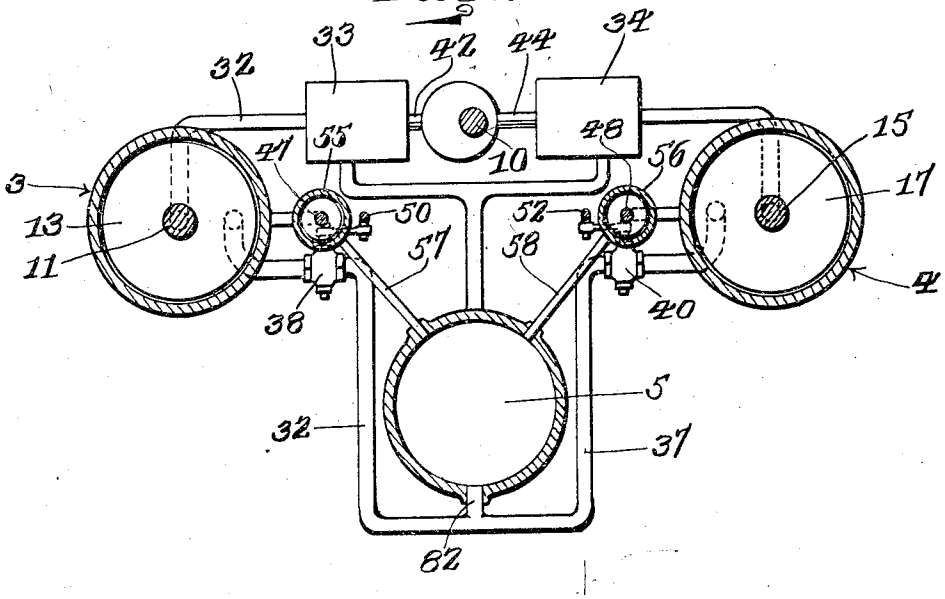


Fig. 3.

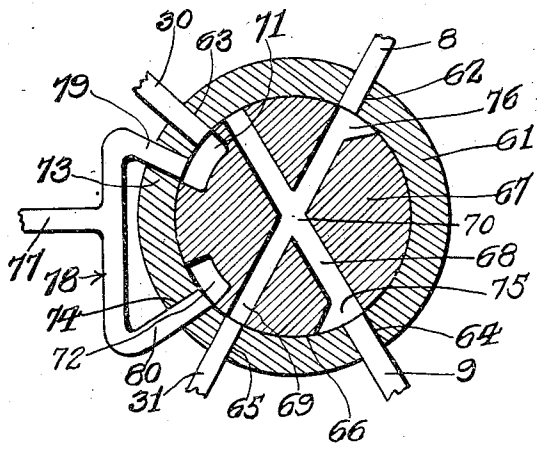
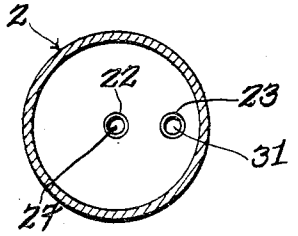


Fig. 4.



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UNITED STATES PATENT OFFICE

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DEVICE FOR CONTROLLING THE DELIVERY OF COMPRESSED AIR

Application filed September 16, 1929. Serial No. 393,009.

This invention relates to a controlling device for the application of compressed air for driving purposes, and has for its object to provide, in a manner as hereinafter set forth, a device of the class referred to for regulating and equalizing the air pressure to be delivered for driving air operated devices or machines.

A further object of the invention is to provide, in a manner as hereinafter set forth, a device of the class referred to including automatically controlled means for alternately delivering the compressed air for driving purposes from two sources.

A further object of the invention is to provide, in a manner as hereinafter set forth, a device of the class referred to including a pair of compressed air receivers each having operating therein a compressed air, fluid operated dispelling element, and with the device further including means to provide for the alternate operation of said elements for alternately expelling the air from the receivers for the purpose of driving air operated devices or machines.

Further objects of the invention are to provide, in a manner as hereinafter set forth, a device of the class referred to which is comparatively simple in its construction and arrangement, strong, durable, thoroughly efficient in its use, readily assembled and comparatively inexpensive to set up.

With the foregoing and other objects in view the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:—

Figure 1 is a top plan, partly in section of a controlling device in accordance with this invention and for the purpose set forth.

Figure 2 is a section on line 2—2, Figure 1.

Figure 3 is a sectional plan of the controlling valve mechanism.

Figure 4 is a section on line 4—4, Figure 1.

The device includes a pair of compressed air receivers arranged in parallel spaced relation and generally indicated at 1, 2, and a pair of liquid containers arranged in parallel spaced relation and referred to generally at 3, 4. The receivers and containers are of cylindrical form and the container 3 is arranged in lengthwise alignment with respect to the receiver 1 and spaced therefrom. The container 4 is arranged in lengthwise alignment with respect to the container 2 and spaced therefrom. The arrangement of the receivers with respect to the containers is that the inner ends of the receivers oppose in spaced relation the inner ends of the containers.

The device further includes an air compressor 7 and a motor or engine 7′ for driving the air compressor and which are conventionally shown. The air compressor is of the known type, that is to say of the type formed with a pair of discharge pipes 8, 9. The motor or engine which drives the compressor is of any suitable form but includes a rotatable shaft 10 operated thereby. The discharge pipes 8, 9 are arranged between the receivers 1, 2 whereas the shaft 10 is positioned over a liquid reservoir 5 which is arranged in alignment with the combined compressing means and engine 7 and further positioned in parallel spaced relation with respect to the containers 3, 4.

Operating in the receiver 1 and container 3 is a piston rod 11 provided at one end with a piston head 12 and at its other end with a piston head 13. The head 12 operates in the receiver 1 and the head 13 in the container 3. Suitable packing means, as indicated at 14 is provided at the inner ends of the receiver and container 1, 3 respectively. The packing means is employed for the piston rod 11.

Operating in the receiver 2 and container 4 is a piston rod 15 provided at one end with a piston head 16 and at its other end with a piston head 17. The head 16 operates in the receiver 1 and the head 17 in the container 4. A suitable packing means, for the piston rod 15 is provided at the inner ends of the re-

ceiver and container 2, 4 respectively, and such means is indicated at 18. The heads 12, 13 operates in alternate directions with respect to the heads 16, 17.

The outer end of the receiver 1 is formed with an opening 20 and also with an opening 21. The outer end of the receiver 2 is provided with an opening 22 and also with an opening 23. The openings 20, 22 are disposed axially of the outer ends of the receivers 1, 2. The openings 21, 23 are positioned in close proximity to the inner sides of the receivers 1, 2.

Arranged adjacent the outer ends of the receivers 1, 2 as well as arranged in spaced relation with respect thereto is a tank 24 for the storage of surplus air to be used in starting. The air is supplied to tank 24 from the receivers 1, 2 and also from the delivery pipe to be presently referred to. Leading from the receiver 1 to the tank 24 is a compressed air conducting pipe 25 provided with a cut-off 26 for closing tank 24 to receiver 1 during the operation of the device. The pipe 25 is secured in the opening 20. Leading from the receiver 2 to the tank 24 is a compressed air conducting pipe 27 provided with a cut-off 28 for closing tank 24 to receiver 2 during the operation of the device. The pipe 27 is connected in the opening 22.

The device further includes a controlling valve mechanism referred to generally at 29 and leading therefrom from the receiver 1 is a combined intake and discharge pipe 30 for compressed air. Leading from the receiver 2 to the controlling valve mechanism 29 is a combined compressed air intake and discharge pipe 31. The discharge pipe 8 from the compressor opens into the controlling valve mechanism 29. The compressed air discharge pipe from the compressor opens into the controlling valve mechanism 29.

Opening into the outer end of the container 3 is a pipe 32 which leads from a pump 33 and the latter acts to create pressure on the oil within the container 3.

Opening into the outer end of the container 4 is a pipe 34 which leads from a pump 35 and the latter acts to create pressure on the oil within the container 4. Extending from the reservoir 5 to the container 3 is a pipe 36 for supplying oil from the reservoir 5 to the container 3, and said pipe 36 also acts as a means for conducting oil from the container 3 to the reservoir 5. Opening into the container 4, at the outer end thereof is a pipe 37 which leads from the reservoir 5. The pipe 37 functions to supply oil to the container 4 and to conduct the oil from the container 4 to the reservoir 5.

Interposed in pipe 36 is a valve 38 having its stem formed with a crank arm 39. Interposed in the pipe 37 is a valve 40 having its stem provided with a crank arm 41.

The piston rods for the pumps 33, 34 project therefrom as at 42, 43 respectively, and which are alternately operated by an eccentric 44 carried by the shaft 10.

The controlling valve mechanism 29 includes an operating lever 45 therefor and which is fixed at its center to the stem 46 of the valvular element of the mechanism 29. Connected to one end of the lever 45 is one end of a piston rod 47 and connected to the other end of the lever 45 is one end of a piston rod 48. Fixed to the rod 47 is the angle-shaped end 49 of an operating rod 50 for the crank arm 39. Fixed to the piston rod 48 is an angle-shaped end 51 of an operating rod 52 for the crank arm 41.

The piston rods 47, 48 carry piston heads 53, 54 respectively, which operate in fluid containing cylinders 55, 56 respectively, communicating with the reservoir 5 as at 57, 58 respectively. Leading from the receivers 3, 4 to the cylinders 55, 56 are pipes 59, 60 respectively, for establishing communication between the containers 3, 4 and the cylinders 55, 56.

The controlling valve mechanism 29 includes a housing 61 provided with openings 62, 63, 64 and 65. The housing 61 provides a chamber 66 for the valvular element 67 of the mechanism. The element 67 is formed with a pair of diametrically extending ports 68, 69 which intersect each other at the center, as at 70. The element 67 is furthermore formed with a pair of peripheral pockets 71, 72. The housing 61 is furthermore provided with a pair of openings 73, 74. The port 68 is enlarged at one end as at 75 and the port 69 is enlarged at one end as at 76.

Secured in the openings 62, 64 of the housing 61 are the compressed air discharge pipes 8, 9 respectively which lead from the compressor. Secured in the openings 63, 65 are the pipes 30, 31 respectively which lead from the receivers 1, 2.

The delivery pipe for compressed air is indicated at 77 and has a yoke-shaped end 78 and with the arms of the latter indicated at 79, 80 which are secured in the openings 73, 74 respectively.

The controlling valve mechanism is so arranged that when the valvular element is shifted in a clock-wise direction the pipe 30 and arm 79 will open into the pocket 71 and the pipe 31 will be closed to the pocket 72. When element 67 is shifted in an anti-clockwise direction the pipe 31 and arm 69 will register with pocket 72 and the pipe 30 will be closed to pocket 71. When element 67 is shifted in a clockwise direction the pipe 31 will communicate with ports 68, 69 and ports 68, 69 will communicate with pipes 8, 9. When the element 67 is shifted in an anti-clockwise direction the ports 68, 69 will register with pipe 30 and ports 68, 69 will also register with pipes 8, 9.

The pipe 77 is provided with a valve controlled branch 81 for supplying surplus air from pipe 77 to tank 24. The valve in branch 81 when closed shuts off tank 24 to pipe 77. The valve in the branch 81 is closed during the operation of the device. A pipe nipple or branch 82 is common to the pipes 32, 37 and said nipple or branch merges into pipes 32, 37, and opens into the reservoir or tank 5.

The compressed air being supplied to the receivers 1, 2 will force the pistons 12, 13, 16 and 17 towards the inner ends of the receivers and outer ends of the containers. When compressed air is being supplied to the receiver 1 it is being discharged from the receiver 2. The discharge of compressed air from the receiver 2 is had by the fluid operating on the piston 17. The oil or fluid only operates against the pistons 13, 17 for shifting them to the inner ends of the containers, which in turn will shift the pistons 12, 16 to the outer ends of the receivers. The air from the compressor 7 is supplied to the receiver 1 through pipe 9 and port 68 when the latter registers with pipe 30 and the air is discharged from receiver 1 through pipe 30 when the latter registers with pocket 71. During the foregoing operation the pipe 25 is closed by valve 26. The air from the compressor 7 is supplied to the receiver 2 through pipe 8 and port 69 when the latter registers with pipe 31 and the air is discharged from receiver 2 through pipe 31 when the latter registers with pocket 72. During the operation stated with respect to the receiver 2 the valve 28 is closed. During the operation stated with respect to the receivers 1 and 2 the valve in the pipe 31 is closed.

When piston 12 is being moved towards the outer end of the receiver 1 to discharge compressed air therefrom for the purpose of supplying compressed air to operate a machine or other device, the piston 16 is being moved towards the inner end of the receiver 2 whereby piston 17 moves towards the inner end of container 4 at which time piston 54 will be moved towards the outer end of cylinder 56 carrying the piston rod 48 therewith and shifting the valve 40 to open position so that the oil from the receiver 4 can be forced into the reservoir or tank 5 by the action of piston 17. Piston 12 is moved towards the outer end of the receiver 1 by the pressure of the liquid or oil or fluid against piston 13, and the pressure created is had through the operation of the pump 33. The eccentric 44 will operate the pump 33 when piston 12 moves towards the outer end of the receiver 1 and operates pump 34 when piston 16 moves towards the outer end of receiver 2. The operation of the pump 34 will not be had during the shift of the piston 16 towards the inner end of the receiver 2, nor will the pump 33 be operated on the shift of piston 12 towards the inner end of receiver 1.

When piston 16 shifts towards the inner end of the receiver 2 piston 17 is carried towards the outer end of the container 4 and forces the oil or fluid to the reservoir. When piston 12 is operated to discharge air from the receiver 1 piston 53 will be moved to the position shown in Figure 1, under such conditions closing the valve 39 and arresting any further supply of liquid or oil into the container 3. The pump 33 operating on the liquid will provide for the forcing of pistons 13 and 12 in a manner whereby the former will be shifted towards the inner end of the container 3 and the latter will be shifted towards the outer end of receiver 4. The pistons 53, 54 alternately operate to shift the valvular element 67 in a clockwise and an anti-clockwise direction to provide for a substantially continuous discharge of compressed air from the receiver.

By this arrangement when receiver 2 is taking in air, receiver 1 is having the air expelled therefrom and when receiver 1 is taking in air, receiver 2 is having the air expelled therefrom. The pistons 53 and 54 not only function to provide for the shift of the lever arm 45 but also for alternately operating the rods 50, 52 in opposite directions and alternately open and close the valves 39, 40.

The tank 24 is provided with a pressure release valve 82. The valves 26 and 28 are check valves. The pipes 36 and 81 may be termed power lines for transmitting compressed air to the motor or other device to be operated by compressed air supplied through the medium of the controlling valve mechanism 29, the compressor and receivers 1, 2 in connection with the containers 3, 4 and the other elements of the apparatus.

The construction and arrangement of the device provides for the regulating and equalizing of the air pressure which is delivered for driving air operated devices or machines and further provides means which is automatically controlled for alternately delivering the application of compressed air for driving purposes from two receivers and by this arrangement the delivery is not intermittent but continuous, therefore, it is thought the many advantages of a controlling device for the purpose set forth and in accordance with this invention can be readily understood, and although the preferred embodiment of the invention is as illustrated and described, yet it is to be understood that changes in the details of construction can be had which fall within the scope of the invention as claimed.

What we claim is:—

1. In a controlling device for the purpose set forth, the combination of a pair of compressed air receivers, an air expelling element operating in each receiver, fluid pressure operated means for alternately operating said elements to alternately expel the

compressed air from said receivers, fluid pressure operated means common to said receivers to alternately control the intake of compressed air to one and the discharge of compressed air from the other, said controlling means provided with a common outlet for compressed air expelled from the receivers.

2. In a controlling device for the purpose set forth, the combination of a pair of compressed air receivers, an air expelling element operating in each receiver, a pair of fluid containers, a fluid operated element operating in each container and connected to an air expelling element, fluid controlled pressure applying means providing for the alternate operation of the said fluid operated elements thereby alternately operating the air expelling elements to alternately expel the compressed air from said receivers, and fluid operated means common to said receivers for alternately controlling the intake of compressed air to one and the discharge of compressed air from the other and provided with a common outlet for the compressed air expelled from the receivers.

3. In a controlling device for the purpose set forth, the combination of a pair of compressed air receivers, a pneumatically and hydraulically operated expelling element operating in each receiver, means for alternately operating said elements pneumatically and hydraulically to alternately expel compressed air from said receivers, a controlling valve mechanism common to said receivers for alternately controlling the intake of compressed air to one and the discharge of compressed air to the other, said controlling means provided with a common outlet for the compressed air expelled from the receivers, and hydraulically operated means for alternately operating said controlling valve mechanism clockwise and anti-clockwise to provide for the alternate intake and discharge of compressed air to and from each receiver.

4. In a controlling device for the purpose set forth, the combination of a pair of compressed air receivers, a pair of liquid containers, an expelling element operating in each receiver, a hydraulically operated element operating in each container and connected to an expelling element, means for alternately controlling the operation of said hydraulically operated elements, a controlling valve mechanism common to said receivers for alternately controlling the intake of compressed air from one and the discharge of compressed air from the other whereby on the intake of the compressed air to a receiver the expelling element therein will be shifted in a non-expelling direction and carrying the hydraulically operated element therewith, and hydraulic means for alternately operating said controlling valve mechanism, and means coacting with said controlling means to provide a common outlet for the compressed air expelled from said receivers.

5. In a controlling device for the purpose set forth, the combination of a pair of compressed air receivers, an air expelling element operating in each receiver, a liquid pressure operated means for alternately operating said elements to alternately expel the compressed air from said receivers, a controlling valve mechanism common to said receivers to alternately control the intake of compressed air to one and the discharge of compressed air from the other, and hydraulically operated means for controlling the operation of said mechanism to provide for alternately controlling the intake of compressed air to one and the discharge of compressed air from the other receiver, and means coacting with said controlling valve mechanism to provide a common outlet for the compressed air expelled from said receivers.

In testimony whereof, we affix our signatures hereto.

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PERRY J. STONE.