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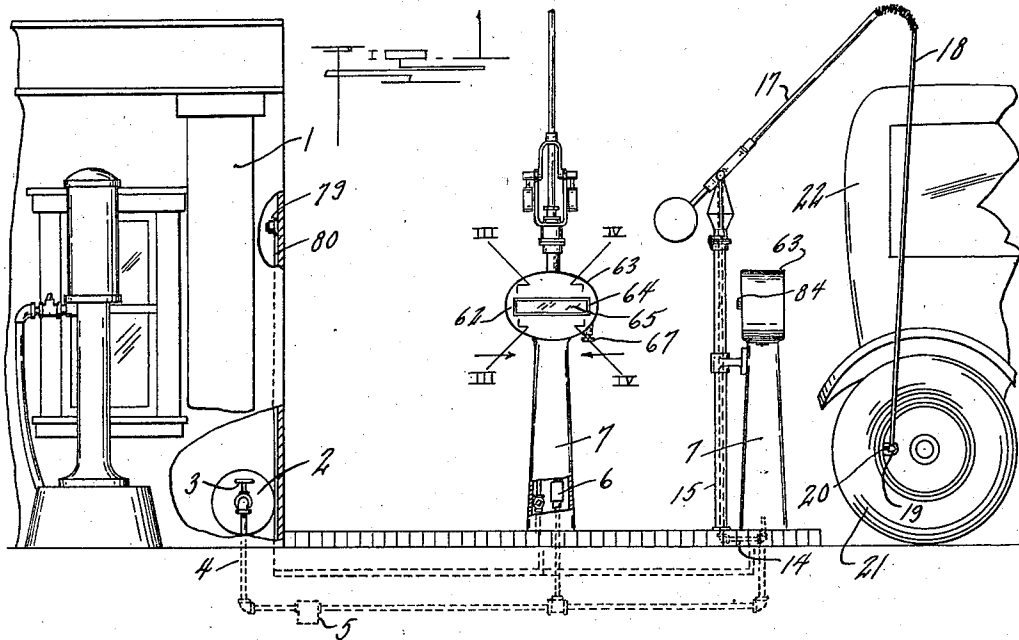
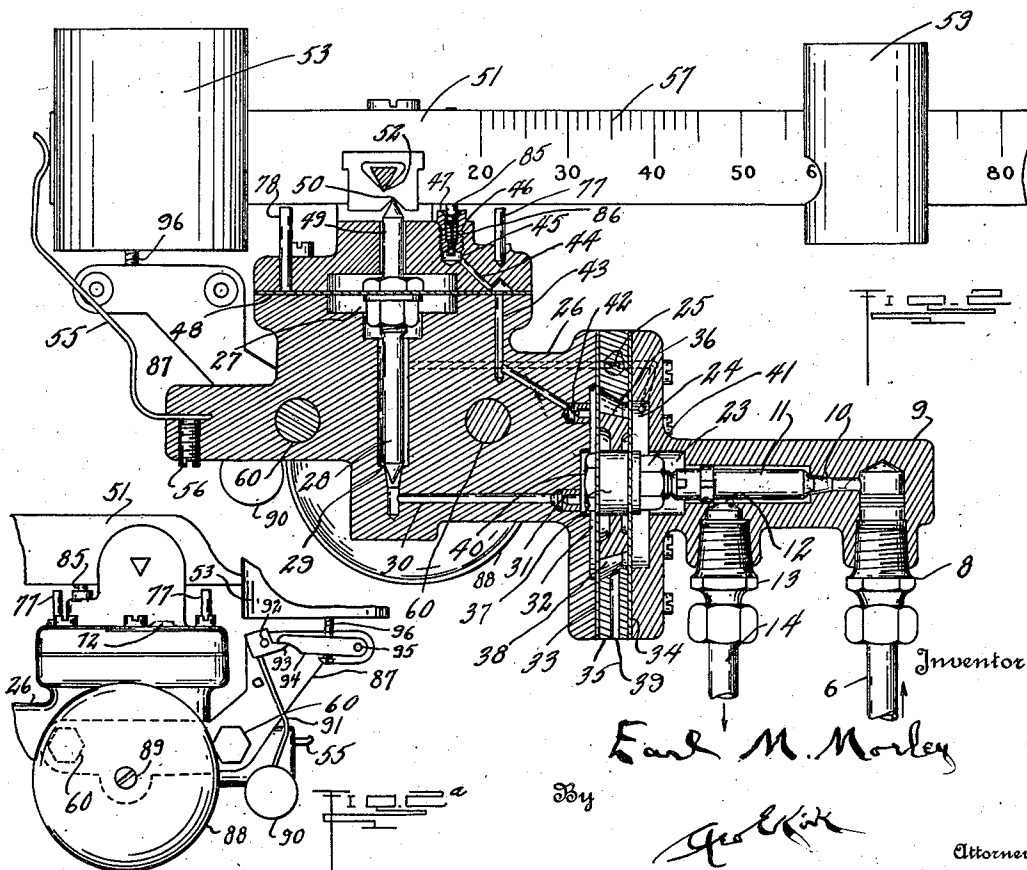
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TIRE INFLATING APPARATUS

Filed April 25, 1927

2 Sheets-Sheet 1



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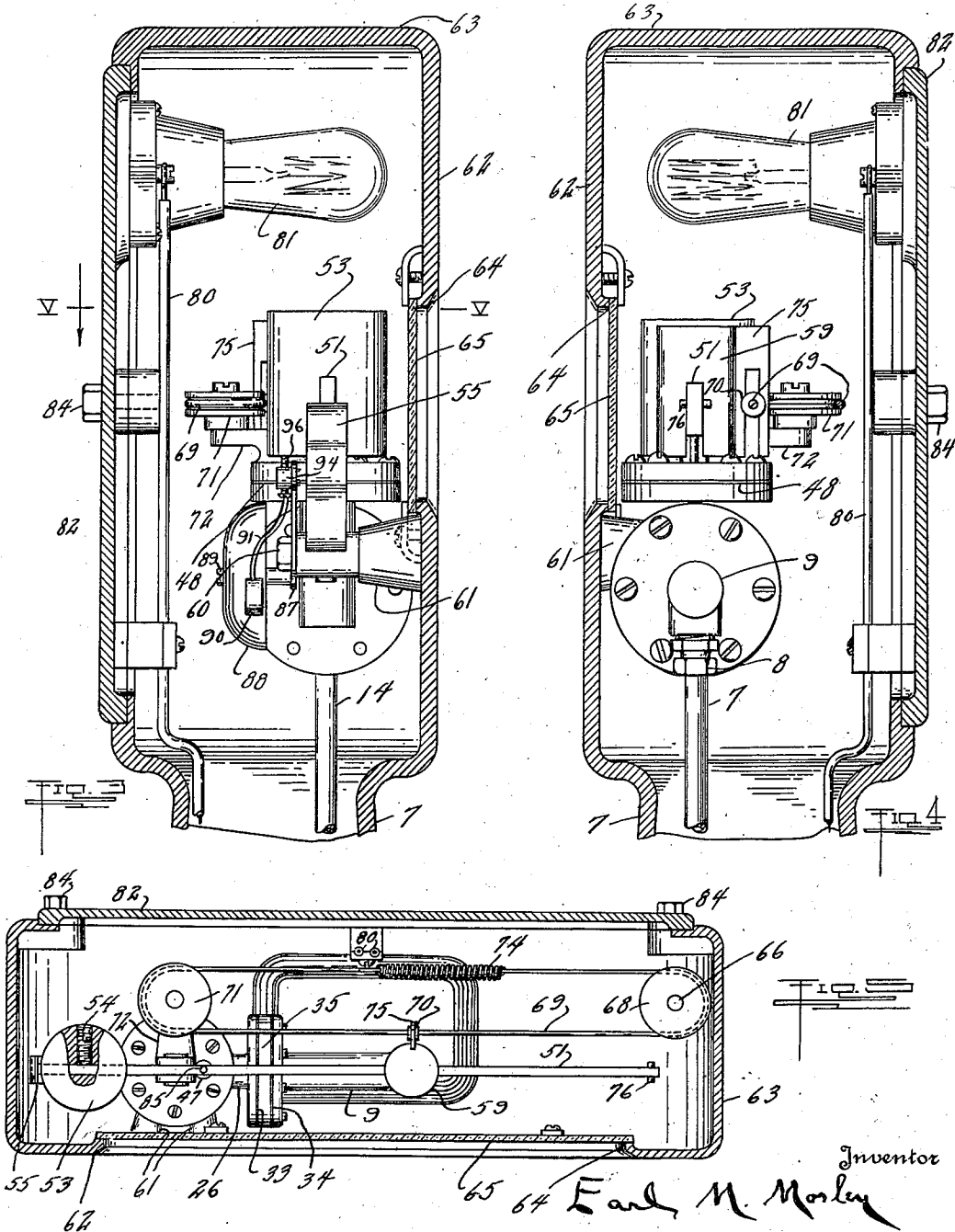
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2 Sheets-Sheet 2



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TIRE-INFLATING APPARATUS

Application filed April 25, 1927. Serial No. 186,277.

This invention relates to automatically controlled adjustable delivery valves.

This invention has utility for delivering air to pneumatic tires at different adjusted pressures for total charging thereof.

Referring to the drawings:

Fig. 1 is a fragmentary side elevation of an embodiment of the invention as service station equipment for inflating tires;

Fig. 2 is a fragmentary view, partially in vertical section, of the control and regulator valve as shown in Fig. 1;

Fig. 2^a is a fragmentary detail view of the alarm;

Fig. 3 is a section on the line III—III, Fig. 1, looking in the direction of the arrow;

Fig. 4 is a section on the line IV—IV, Fig. 1, looking in the direction of the arrow; and

Fig. 5 is a section on the line V—V, Fig. 3, looking in the direction of the arrow.

Service station 1 is shown as having high pressure air supply tank 2 say for pressure running 150 to 200 pounds, which may be maintained by compressor or other equipment. From this tank 2 as source of pressure air, flow is controlled by valve 3 to line 4 extending past water trap 5, filter 6, into standard 7 terminating in pressure air supply fitting 8 as entering housing section 9 provided with pressure air supply port 10 which may be normally closed by plunger valve 11 laterally of which is outlet port 12 with which coacts delivery line fitting 13 for pipe 14 extending to enter supplemental standard 15 having counter weighted arm 17 from which extends flexible duct 18 having check valve terminus 19 to be unseated by locating against tire check valve 20 of pneumatic tire 21 on motor vehicle 22.

This valve 11 is in chamber 23 as a primary valve chamber for this primary valve 11. From chamber 23, besides the intake port 10 and the delivery port 12, there is an auxiliary duct 24 having restricted opening 25 and thence extending into secondary housing section 26 to secondary valve chamber 27. Secondary valve 28 in chamber 27 may seat to close port 29 thus to shut off communication through duct 30, restricted opening 31, and

chamber 32 of the pressure control device. Chamber 32 is concentric with an enlarged portion of chamber 23 and spaced therefrom by intermediate flexible chamber wall device comprising major diaphragm 33 at the chamber 32 and parallel minor diaphragm 34 at the chamber 23. These diaphragms are mounted between the housing primary section 9 and the housing secondary section 26, with a spacing fitting 35 sealed therebetween. Loose ring 36 is between the diaphragms on washer 37 in intermediate chamber 38 from which there is vent opening 39 to permit equalization of pressure due to atmospheric conditions, between these differential diaphragms 33, 34, concentrically anchored by bolt 40 having thereon nut 41.

This bolt 40, in the flexing of the diaphragms, may, in movement toward the port 10, act upon the primary valve 11 to shift such valve in the chamber 23 to close the port 10 against the air pressure in the supply line thereto. As such pressure in the supply line exceeds the holding action of the diaphragms from the pressure in the chamber 32, the differential diaphragms 33, 34, may be reversely flexed to enlarge the chamber 23 and reduce the capacity of the chamber 32. From this chamber 32 by restricted opening 42 extends duct 43, 44, to chamber 45 having outlet port 46 normally closed by check valve 47.

The secondary valve 28 is connected to flexible diaphragm 48 having, oppositely extending from the valve 28, stem 49 providing knife edge bearing coaction 50 with lever 51 engaged by knife edge bearing downwardly directed fulcrum 52. This lever 51 is provided with counter weight 53 having adjustable anchor set screw 54 (Fig. 5) and equipped with retarding spring 55 mounted by set screw 56 (Fig. 2) in the housing section 26 tending to hold the lever 51 against freely rocking.

The lever 51 is provided with indication scale 57 which may be graduated say in pounds avoirdupois for indicating the pressure per square inch it is desired to use in charging a pneumatic tire with air. Indicator weight 59, as shiftable along this lever 51 in the range of indications 57, may de-

termine the adjustment for this control through the action of this lever on the stem 49.

This housing section 26 is mounted by bolts 60 on bosses 61 fixed with front wall 62 of head 63 for the standard 7. This head 63 is shown as having opening 64 with transparency 65 therein as a window for convenient observance therethrough of the indicating portion 57 of this lever 51.

Protruding from this head 63 is stem 66 having hand wheel 67 (Figs. 1, 5). This stem 66, as upwardly extending into the head 63, carries pulley 68 about which extends cable 69 carrying flight 70. This cable 69 extends about additional pulley 71 mounted by bracket 72 with the housing section 26 back of the lever 51 as to the window 65. This cable 69 has its termini connected by extensible means or helical spring 74 as a slack take up thereby maintaining the cable taut. This flight 70 coacts with slotted wing 75 as downwardly open and carried by indicator 59. Accordingly the hand wheel 67, as exterior of the head 63, serves as a ready means for adjusting the indicator weight 59 to desired locations either way along the lever 51. Stop pin 76 precludes shifting the weight 59 clear of the lever 51. Stop pins 77, 78, limit the range of oscillation of the lever 51 as to the housing.

Switch 79 in the service station 1 has line connection 80 to electric bulb 81 in the head 63 as an illumination means for checking the location of the weight 59 even at night time, if the delivery device be used at such periods. This head 63 is shown as having removable back plate 82 mounted with the head 63 by bolt 84. This plate is shown as carrying the electric bulb 81. Removal of the plate 82 permits access to the head interior for convenience in assembly, replacement of the bulb and in the event of upkeep requirements. However in the design hereunder, such upkeep problems are reduced to a minimum.

The lever 51 is shown as having projecting stem 85 which, in the swinging of the lever 51 away from stop 78 toward the stop 77, thrusts check valve plunger 47 against the resistance of spring 86 to unseat such plunger, which thereby opens the outlet port 46. However, as the pressure in the chamber 27 is sufficient as acting through the stem 49 to rock the lever 51 clear of the stop 77, the spring 86 holds the check valve plunger 47 seated for maintaining this bleed or leakage port 46 closed.

The operation hereof is one simply performed by even the casual user of service station equipment and the run of station customers. All that it is necessary for the one desiring tire inflation to do is to remove the cap from the tire valve 30, and then operate the hand wheel 67 at the head 63 to locate the indicator 59 at the desired pressure, say 57 pounds. By pressing the valve stem fitting

19 over the valve terminus 20 of the tire, the check valves open, and air supply may be had through the flexible duct 18. This reduction of the pressure in the chamber 23 is responsible for operating the device.

The pressure drop in the chamber 23 is effective, through the duct 24, past the restriction 25 to lower the pressure in the secondary valve chamber 27. This reduction in the sustaining action of the diaphragm 48 allows the lever 51 to depress the stem 49 and simultaneously unseat the valve 47. The restrictions 25, 31, and 42 may be determined for various flow rates and capacity of the apparatus desired in connection with the pressure under which operating. In the instance that the supply reservoir carries a pressure of say 150 pounds per square inch and the restriction is one to be used in filling a tire for pleasure vehicles, say in a range of from 30 to 70 pounds per square inch, a cross sectional diameter working out efficiently in this range is one wherein the restricted opening 25 may be of .02 inches in diameter, the restriction 31, .01 inches in diameter, and the restriction 42, .008 inches in diameter. There is in this sequence a greater flow volume permitted by the restriction 25 than through either of the other two. This means that the flow of air into the chamber 27 is at a greater rate than the discharge flow therefrom. Furthermore it means that the flow into the chamber 32 is greater than the discharge flow therefrom even with the valve 47 open. In the described instance, whenever there is a drop of the pressure in the chamber 23 transmitted to the chamber 27, the rocking of the lever 51 in the depression of the diaphragm 48 to open the valve 47 reduces the pressure in the chamber 32, which chamber is cut off from replenishment from the chamber 27 due to the secondary valve 28 closing the port 29. This drop in pressure in the chamber 32 is quickly responsive to permit the pressure air at the inlet port 10 to unseat the primary valve 11 and allow flow of pressure air into the chamber 23 and by the delivery duct 14 into the pneumatic tire 21. The outlet port 12 is of very considerable area compared to the duct 24, or the restriction 25 therein. Accordingly the puff of air from the inlet port 10 may have a duration interval into the line 14 while the pressure as built up in the chamber 23 is transmitted through the duct 24 past the restriction 25 for acting in the chamber 27 to lift the diaphragm 48 thereby rocking the lever 51 to permit the check valve 47 to close and shut off leakage or bleeding. This means that there is no direct pressure flow in any leakage for this shut off of leakage from the chamber 32 occurs with the opening of the valve 28 allowing the replenishment by way of duct 30 of the pressure in the chamber 32. As this pres-

sure is built up past the restriction 31, there is differential diaphragm control of this pneumatically responsive device shifting the valve 11 to close the port 10.

5 If the pressure in the tire 21 be below that for which the indicator 59 is set, there may be reduction of pressure in the chamber 23 after the valve 11 is closed thus allowing the lever 51 as acted upon by the indicator 59 to effect a re-leakage opening of the valve 47 and a repetition of this puff or intermittent flow cycle of operations until the pressure in the tire 21, as reflected back to the chamber 23, is one holding the pressure so that the lever 51 does not depress to open the leakage valve. At this condition, the one filling the tire may take the fitting 19 away from the tire valve stem 20 and apply such to another tire or leave the station as may be desired. Accordingly the control valve apparatus herein disclosed is shut off against leakage by the lever 51 being clear of the check valve plunger 47. There is no leakage in the normal operation of this equipment. However, the proportioning of these restrictions may be such that there is a considerable flow interval into the tire between oscillations of the lever 51 with the oscillations of the lever 51 of a definite character against any floating of valve 11. This means that as the pressure is built up to the desired point, there is a sufficient differential action between the diaphragms 33, 34, to effect a definite and positive closing of the valve 11 and likewise as there may be reduction in pressure, this differential action is effective for a quick opening. The period of opening is one which may be controlled as indicated by the sequence for building up of pressure as controlled by the restrictions in the ports or ducts. It is accordingly possible hereunder to have a rapid filling of the tires with the pulsations for checking back and closing the apparatus with only minute leakage. The apparatus is thus in position for filling a subsequent tire. In the bringing of a subsequent tire into position there may be a leaving of the indicator 59 at the point 57, if such be the pressure desired, while if the operator desires a different pressure, it is only necessary to operate the hand wheel 67 in shifting, say to 30 pounds, if such be the desired pressure, under which circumstances the lever 51 will be lifted into position until the fitting 19 is applied to the tire valve stem. In the instance the desired pressure be greater, say 65 pounds, and the shifting of the indicator 59 be to such point, there is then at once an oscillation of the lever 51 to bring up the pressure in the chamber 23 accordingly, even before the fitting 19 be applied to the tire.

In those instances wherein an audible alarm is desired in addition to a visible signal, as the rocking lever 51, there may be con-

veniently mounted on the bolts 60 in the housing 63, plate 87 for carrying gong or bell 88 as anchored therewith by screw 89. Clapper 90 upon flexible arm 91 may have fixed pivotal mounting 92 on this plate 87 of this alarm unit. This clapper arm 91 is shown as an angle lever having short arm 93 to be engaged by lever 94 mounted on fulcrum 95 fixed with this plate 87. This lever 94 is shown of the third class with adjustable screw 96 to be struck by the counter weight 53 as the lever 51 is away from horizontal or balanced condition and is approximately in the rest position as approaching the pin 78. The oscillations of the lever 51, in the pulsating delivering of air, are of a degree of quickness so that the weight 53 as striking the bolt 76 may so swing the clapper weight 90 that such weight, as normally maintained clear of the gong 88 by pin 97, may have such arm 91 flex for a quick striking of the gong 88. There is thus evidenced an audible signal for the one inflating a tire in addition to the visible signal through the window 65 of the housing. Accordingly, the operator while filling the tire need not look at the window 65 but may determine as the oscillations of the lever 51 become less frequent as signaled by the gong 88, that the tire has reached the desired inflation region for which the indicator 59 has been set. Because of the delay in closing the valve, due to the time interval necessary for pressure in chamber 23 to be transmitted through passage 25 to chamber 27, pressure continuous to rise in chamber 23 and pipe 14 after it has reached the pressure at which the weight 59 is set. Air from pipe 14 is forced into the tire, therefore, by a pressure in the pipe 14 higher than that at which weight 59 is set, during this period of delay in closing the valve and thereafter until the pressure in pipe 14 and chamber 23 is lowered to that at which the weight is set. This period of filling under pressure in the pipe 14 higher than the final pressure in the tire results in a more rapid filling operation than would filling governed by a device that would limit the pressure in the pipe 14 so as to prevent it from ever rising above the final pressure desired in the tire.

For common subject matter this case is a continuation in part of my co-pending applications S. N. 691,419, and S. N. 27,414, filed February 8, 1924, and May 2, 1925, and resulting in Patents 1,632,618, and 1,632,619, respectively.

What is claimed and it is desired to secure by Letters Patent is:

1. A housing comprising a primary flow section, a secondary flow section, a valve chamber in the primary flow section, a valve in the chamber, said primary section having an intake port to be normally closed by the valve, a discharge port for controlling delivery of flow from the chamber as supplied

through said intake port, a normally closed discharge valve for said discharge port, said secondary flow section having a valve chamber provided with a restricted by-pass connection with the primary flow section chamber, a secondary valve in said secondary chamber, said secondary section having a delivery duct from its chamber normally closed by said secondary valve, a pressure responsive device for the primary chamber valve to which device said secondary chamber delivery duct extends, said secondary section providing an outlet port from said delivery duct, and a controller for the secondary section valve normally closing said outlet port for maintaining gaseous pressure in said delivery duct while the primary valve is closed.

2. Fluid delivery apparatus embodying a primary valve, a secondary valve, duct means including a normally closed leakage cutoff maintaining above atmospheric pressure for the secondary valve, a duct between said valves, and a restricted section for retarding the secondary valve operation.

3. Fluid delivery apparatus embodying a primary valve, a secondary valve, duct means including a normally closed leakage cutoff maintaining above atmospheric pressure for the secondary valve, and a duct from the secondary valve having a restricted section for effecting control operations of the valves.

4. Fluid delivery apparatus embodying a primary valve, a secondary valve, duct means including a normally closed leakage cutoff, said cutoff having an outlet port, and a check valve normally closing said port for maintaining above atmospheric pressure for the valves, there being a restricted duct from the control to said check valve.

5. Tire inflating apparatus comprising a casing, a housing, a valve in the housing, a lever mounted in the housing and rockable in response to valve operation, adjustable means on the lever for determining valve action thereupon, a mounting for assembling the housing in the casing including a bolt directly engaging between the housing and casing, and an audible signal operable by said lever and assembled by the bolt with the casing and housing.

6. Tire inflating apparatus comprising a casing, a housing, a valve stem in the housing, a diaphragm, a lever mounted on the housing and rockable upon stem operation and flexing of said diaphragm, a mounting for assembling the housing in the casing including a bolt directly engaging with each thereof, and an audible signal operable by said lever and assembled by the bolt with the casing and housing.

7. Tire inflating apparatus comprising a casing, a housing, each having an opening for a mounting bolt, a valve stem in the housing, a diaphragm, a lever mounted on the

housing and rockable upon stem operation and flexing of said diaphragm, a gong, a mounting including a bolt through said openings in the casing and housing for assembling the housing, casing and gong, and an arm operable by said lever to strike said gong.

8. Tire inflation apparatus comprising a valve stem, a diaphragm, a first lever rockable upon stem operation and flexing of said diaphragm, a gong, a clapper for the gong normally clear of the gong, a second lever operable by the first lever for swinging the clapper into gong contacted position, and an adjustable stem carried by one of the levers for determining the clearance between the levers.

9. Apparatus for supplying air under pressure including a source of air under pressure; an expansible chamber; a valve having a port serving to establish communication between said chamber and source and which valve is constrained to close said port, there being a channel through which air may be supplied to a receiver and to which air is also supplied through said port, said channel also having communication with said chamber; mechanism in controlling relation to said valve and operable by a movable wall portion of said chamber when this wall portion is moved by the pressure of air within the chamber and serving, when operated, to enable closure of said valve; a relief valve having a port serving to establish communication between said chamber and external air, this valve being constrained to close this port; and mechanism also controlled by a movable wall portion of said chamber and constrained to operate upon reduction of the air pressure in said chamber and, in thus operating, causing the relief valve to open and subsequently being in releasing relation to this valve to permit its closure.

10. Apparatus for supplying air under pressure including a source of air under pressure; an expansible chamber; a valve having a port serving to establish communication between said chamber and source and which said valve comprising a member is constrained to close said port, there being a channel through which air may be supplied to a receiver and to which air is also supplied through said port, said channel also having communication with said chamber; mechanism in controlling relation to said valve and operable by a movable wall portion of said chamber when this wall portion is moved by the pressure of air within the chamber and serving, when operated, to enable closure of said valve member; a relief valve having a port serving to establish communication between said chamber and external air, this valve being constrained to close this port; and mechanism also controlled by a movable wall portion of said chamber and constrained to operate upon

reduction of the air pressure in said chamber and, in thus operating, causing the relief valve to open.

11. The method of filling a tire to a predetermined limit of pressure which consists in delivering through a passage to the tire a succession of charges of compressed air, at least a portion of each charge being forced into the tire by a pressure materially higher than said limit, and utilizing pressure of air in said passage automatically to stop the delivery of said succession of charges when the pressure in the tire reaches said limit.

12. The method of filling a tire which comprises conducting air to a tire through a passage from a source of air under pressure materially higher than that desired in the tire, admitting air to said passage more rapidly than it passes into the tire so as to quickly raise the pressure in said passage, utilizing pressure of air from said passage to control the admission of air to said passage so as to allow said admission for a limited period after pressure rises in said passage above a predetermined limit and thereafter to again initiate admission as often as pressure in the passage falls below said predetermined limit.

13. The method of filling a tire which comprises conducting air to a tire through a passage from a source of air under pressure materially higher than that desired in the tire, admitting air to said passage more rapidly than it passes into the tire so as to quickly raise the pressure in said passage, utilizing pressure of air from said passage to control the admission of air to said passage so as to stop admission as often as pressure in the passage rises above a predetermined limit and to initiate admission as often as pressure in the passage falls below said limit, and in each instance delaying the stopping of admission for a material period after pressure in the passage has risen above said predetermined amount, thereby filling the tire by intermittent charges and at least a portion of each charge being forced into the tire by pressure materially above said limit.

14. Tire filling apparatus embodying a check valve to be opened upon application to a tire valve stem, a source of pressure air, foreign particle removing means from the air, automatic valve mechanism for said air from the means, and a duct from the source past said means and mechanism to the check valve, said mechanism comprising a primary valve, a valve chamber therefor, a secondary valve, a chamber for the secondary valve in communication with the primary valve chamber, a pressure delivery adjustable control for the secondary valve, and a valve device, when not operated by the control, coacting between said primary and secondary valves for maintaining pressure in said secondary chamber when said check valve is closed and

thereby normally maintaining the primary valve closed.

15. In a device for charging a receiver with compressed air, the combination of a source of compressed air, adjustable means for limiting the ultimate pressure to which said receiver is to be charged, a conduit connecting the source of compressed air with the receiver, a valve in said conduit, means tending to close said valve, means opening said valve when the pressure in the conduit falls to that at which the device is adjusted, and means timing the open interval of said valve, whereby said valve intermittently opens, dwells in open position, and closes, this cycle continuing until pressure in the receiver reaches that to which the device is adjusted.

16. The combination with a source of air under pressure; of piping through which air is conveyed from said source to a receiver; a valve between said source and piping; and mechanism in controlling relation to the valve and constrained to effect an opening adjustment of the valve and connected with said piping and operable when the valve is closing to accumulate air admitted to the mechanism from the piping to give duration to the open valve effect of said mechanism, said mechanism effecting opening adjustment of the valve upon sufficient reduction of the pressure of the air admitted thereto.

17. The combination with a source of air under pressure; of piping through which air is conveyed from said source to a receiver; a valve between said source and piping; and mechanism in controlling relation to the valve and constrained to effect an opening adjustment of the valve and connected with said piping and operable when the valve is closing to accumulate air admitted thereto from the piping to oppose the valve opening effect of said mechanism, said mechanism effecting opening adjustment of the valve upon sufficient reduction of the pressure of the air admitted thereto and having its connection with the piping constricted to retard the passage of air therefrom to give duration to the open valve effect of the mechanism.

18. The combination with a source of air under pressure; of piping through which air is conveyed from said source to a receiver; a valve between said source and piping, and mechanism in controlling relation to the valve and constrained to effect an opening adjustment of the valve and connected with said piping and operable when the valve is closing to accumulate air admitted thereto from the piping to oppose the valve opening effect of said mechanism, said mechanism effecting opening adjustment of the valve upon sufficient reduction of the pressure of the air admitted thereto and being provided with means for giving duration to the open valve effect of the mechanism.

19. The combination with a source of air

under pressure; of piping through which air is conveyed from said source to a receiver; a valve between said source and piping; and mechanism in controlling relation to the valve and inclusive of a diaphragm chamber and a diaphragm, within the chamber, constrained and related to effect an opening adjustment of the valve, said chamber being connected with said piping on one side of the diaphragm to render the diaphragm operable when the valve is closing to accumulate air admitted to said chamber from the piping to give duration to the open valve effect of said mechanism, said diaphragm effecting opening adjustment of the valve upon sufficient reduction of the pressure of the air admitted to said chamber.

20. The combination with a source of air under pressure; of piping through which air is conveyed from said source to a receiver; a valve between said source and piping; and mechanism in controlling relation to the valve and inclusive of a diaphragm chamber and a diaphragm, within the chamber, constrained and related to effect an opening adjustment of the valve, said chamber being connected with said piping on one side of the diaphragm to render the diaphragm operable when the valve is closing to accumulate air admitted to said chamber from the piping to oppose the valve opening effect of said mechanism, said diaphragm effecting opening adjustment of the pressure of the air admitted to said chamber, said chamber having its connection with the piping constricted to retard the passage of air therefrom to give duration to the open valve effect of the mechanism.

21. The combination with a source of air under pressure; of piping through which air is conveyed from said source to a receiver; a valve between said source and piping; and mechanism in controlling relation to the valve and inclusive of a diaphragm chamber and a diaphragm, within the chamber, constrained and related to effect an opening adjustment of the valve, said chamber being connected with said piping on one side of the diaphragm to render the diaphragm operable when the valve is closing to accumulate air admitted to said chamber from the piping to oppose the valve opening effect of said mechanism, said diaphragm effecting opening adjustment of the valve upon sufficient reduction of the pressure of the air admitted to said chamber, said diaphragm being effected by means for giving duration to the open valve effect of the mechanism.

22. The combination with a source of air under pressure; of piping through which air is conveyed from said source to a receiver; a valve between said source and piping, and mechanism in controlling relation to the valve and constrained to effect an opening adjustment of the valve and connected with said piping and reversely operable by air admitted

thereto from the piping, said mechanism effecting opening adjustment of the valve upon sufficient reduction of the pressure of the air admitted thereto and having its connection with the piping constricted to throttle the flow of air both into and from the valve controlling mechanism, whereby the closure of the valve is retarded and the open valve effect of said valve-controlling mechanism is given a duration to permit the air to flow.

In witness whereof I affix my signature.

EARL M. MORLEY.