Jan. 1, 1929. 1,697,684

E. H. GOLD ET AL

END TRAIN PIPE VALVE

Filed Dec. 5, 1927 2 Sheets-Sheet 1

Fig. 1.

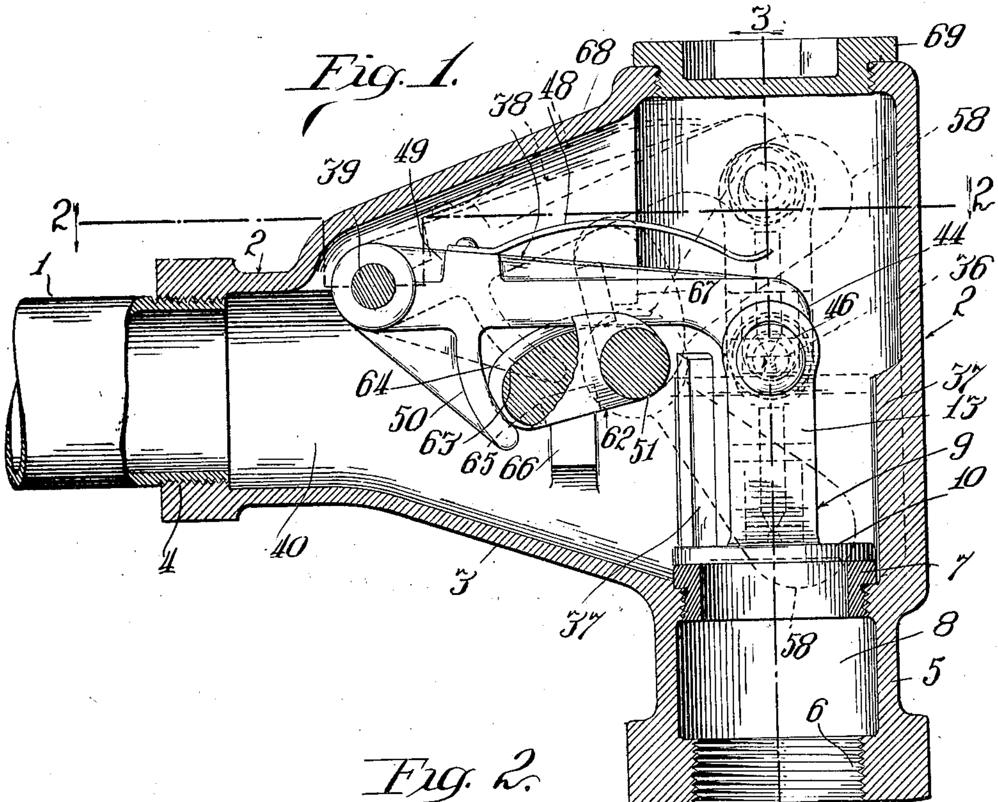
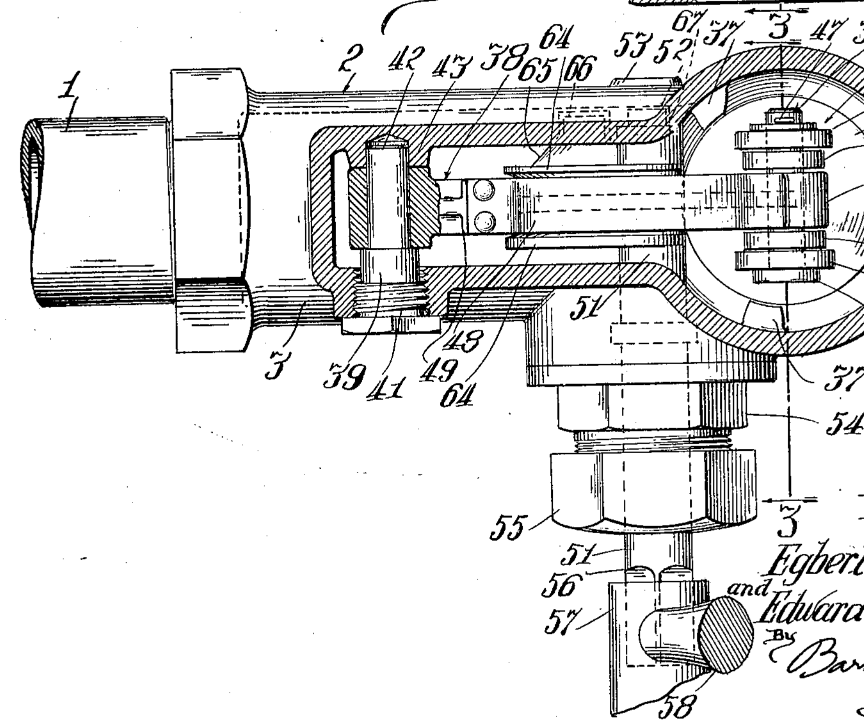


Fig. 2.



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Filed Dec. 5, 1927 2 Sheets-Sheet 2

Fig. 3.

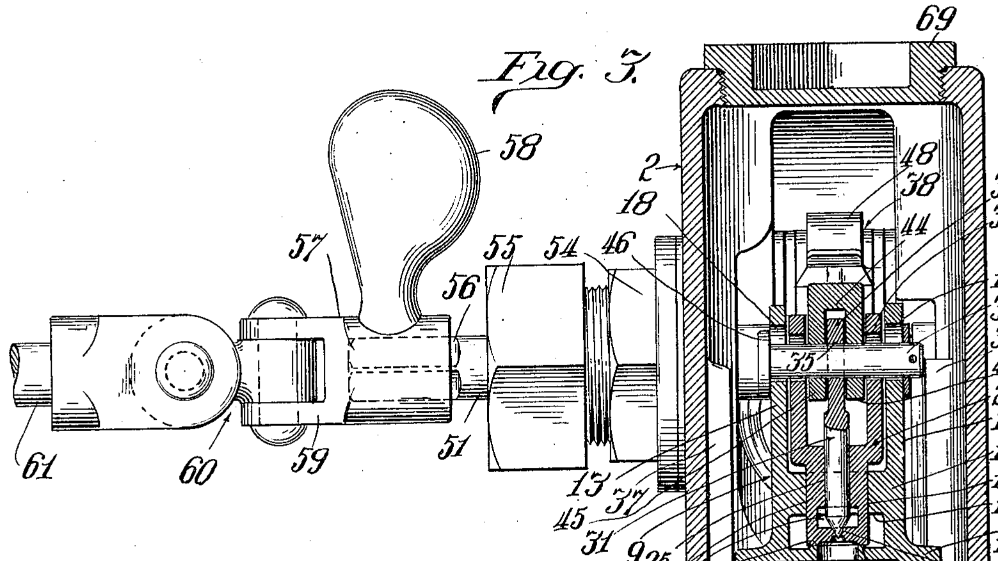
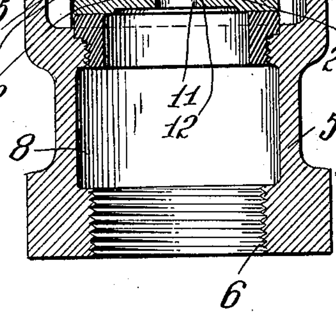



Fig. 4.

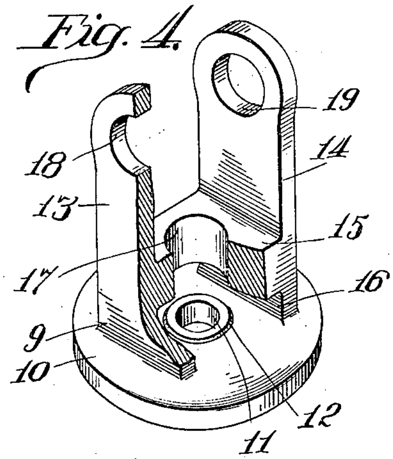


Fig. 5.

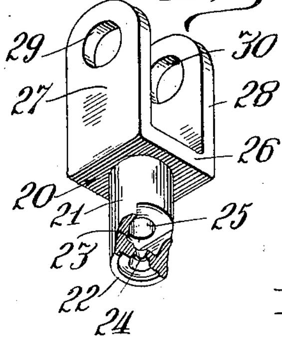
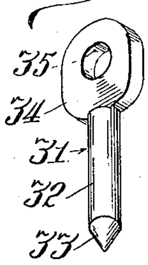


Fig. 6.



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UNITED STATES PATENT OFFICE.

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END TRAIN-PIPE VALVE.

Application filed December 5, 1927. Serial No. 237,773.

This invention relates to improvements in end train pipe valves for steam car-heating systems, and more particularly to certain improvements in the type of valve disclosed in the copending application of Russell, Serial No. 208,721, filed July 27, 1927, now Patent No. 1,656,393, dated January 17, 1928.

Systems of car heating using steam from the engine are constructed with a train line or main supply pipe extending from the boiler head in the engine cab to the rear of the train. This train line is connected by steam couplers between the cars and is provided with branch steam connections to the heating pipes in each car. Each end of the train pipe on each car is provided with an end train pipe valve, these valves at the adjacent ends of the two cars being normally open when the cars are included in a train and the steam couplings are connected in place. Only the end train pipe valve at the rear end of the train will be closed.

As the entire train line and connections are exposed to the weather, it naturally follows that considerable condensation takes place therein, and most of this condensate can only escape at the rear of the train line. This condensation, if it is not allowed to discharge at the rear as fast as it collects, will quickly freeze up and cause very serious trouble in cold weather. However, if the steam pressure is maintained on the train line all the way to the rear and the rear train pipe valve allowed to "bleed" a little steam through the rear hose coupling, that is, allow a small stream of steam to continuously escape, this trouble will be avoided.

When the steam couplings between adjacent cars are connected, the workmen standing adjacent the valves may move them to open position. However, it is sometimes desirable to open these valves from the platform above, for example, when steam is to be cut off from the entire train line, at which time the rear train pipe valve is opened wide to blow out the train line and allow steam to escape.

The general object of this invention is to provide an improved form of end train pipe valve adapted to perform in a more satisfactory manner the functions noted hereinabove.

More specifically, this improvement involves the use of a plurality of separate valves, housed one within the other, and adapted to be separately and successively opened or closed and locked in open position, by a continuous movement of the same operating means.

Other objects and advantages of the invention will be apparent from the following detailed description of one approved form of the apparatus.

In the accompanying drawings:

Fig. 1 is a central longitudinal vertical section through the assembled valve.

Fig. 2 is a horizontal section taken substantially on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section taken substantially on the line 3—3 of Figs. 1 and 2.

Fig. 4 is a perspective view, partially broken away, of the main movable valve member.

Fig. 5 is a perspective view of the intermediate or auxiliary valve member, also partially broken away.

Fig. 6 is a perspective view of the bleeding valve.

Referring now to the drawings, at 1 is shown the end of the train steam pipe, supported in the usual manner beneath the car. The main casing 2 of the end train pipe valve is formed at the rear with an extension 3 which is internally threaded at 4 to receive the end of the train pipe 1, from which it is supported. Valve casing 2 is also provided with a downwardly projecting extension 5, which is internally threaded at 6 to receive the end of the flexible pipe coupling, by means of which connection is made with the adjacent car.

The main valve seat 7, preferably in the form of a removable annular member screwed into the casing 2, is located at the upper end of the outlet passage 8 in vertical extension 5 of the casing. The main valve member 9 (shown in perspective in Fig. 4) is formed at its lower end with a valve plate 10 adapted to cooperate with the valve seat 7 to close the outlet passage 8. Valve plate 10 is formed centrally with a vertical steam passage 11, at the upper end of which is an auxiliary or intermediate valve seat 12. A pair of similar spaced apart vertical arms 13 and 14 arise from plate 10 at opposite sides of the auxiliary valve seat, these arms being joined by a horizontal web 15, spaced above the plate 10 so as to leave a horizontal steam passage 16 between the arms 13 and 14 and between the web 15 and plate 10. Web 15 is formed with a central vertical cylindrical passage 17, coaxial with the steam passage 11 in plate 10, but of greater diameter than the passage 11. Vertical passage 17 serves as a guide for the auxiliary valve member, hereinafter described. The upper portions of the arms 13 and 14 form a yoke, the upper ends of this yoke being formed with the aligned circular openings 18 and 19.

The auxiliary valve member 20 (shown in perspective in Fig. 5) comprises a lower cylindrical portion 21 adapted to fit slidably within the vertical passage 17 in the main valve member 9. The lower end 22 of this auxiliary valve member is adapted to fit against and cooperate with the valve seat 12 to cut off the flow of steam through steam passage 11 in valve plate 10. Somewhat above the bottom 22, the cylinder 21 is pierced by a horizontal passage 23, which when the parts are assembled, aligns with the horizontal passage 16 in the main valve member 9. A small bleeding port 24, having a tapered or conical upper end, is formed centrally in the bottom portion of the cylindrical valve member 21 so as to form a small steam passage connecting the end of this valve member with the horizontal passage 23. A central vertical cylindrical passage 25 extends upwardly through the top of the cylindrical portion 21 from the horizontal passage 23. This passage is adapted to house and guide the lower portion of the bleeding valve, hereinafter described. At the upper end of cylinder 21 is a yoke formed by the transverse plate 26 and the upwardly extending side arms 27 and 28 these members being so spaced and proportioned that they will fit loosely between the side arms 13 and 14 of the main valve member 9. Near the upper ends of the arms 27 and 28 are the aligned openings 29 and 30. These circular openings are somewhat smaller, that is of less diameter than the openings 18 and 19 in the main valve member, and are so spaced vertically that when the main and auxiliary valve members are assembled, as shown in Fig. 3, the lower edges of these several openings will be in alignment. Of course, at this time, the upper edges of the large openings 18 and 19 will be above the upper edges of the smaller openings 29 and 30.

The bleeding valve 31 (shown in perspective in Fig. 6) comprises a cylindrical post 32 adapted to fit slidably within the vertical passage 25 in the auxiliary valve member, and formed at its bottom with a conical end 33 adapted to seat within the conical bleeding port 24 already described. The upper portion of this bleeding valve is flattened out vertically, as indicated at 34, and provided with a central horizontal circular opening 35 adapted to receive the transverse pivot pin 36, by means of which it is connected with the valve-operating lever.

A plurality of vertical guide members 37, are formed within the casing 2, between which the main valve plate 10 is slidably fitted for vertical movement toward and from the main valve seat 7.

The valve lifting lever 38 is pivoted at one end upon pivot pin 39, mounted within the inlet passage 40 of the valve casing. The pivot pin 39 may conveniently be in the form of a screw bolt having its larger end 41 screwed into one side wall of the casing, and its opposite end 42 supported within a projection or stud 43 formed on the inner side of the opposite side wall of the casing. The opposite end of lever 38 is forked at 44 to form downwardly projecting ends 45 which extend at opposite sides of the flattened upper end 34 of the bleeding valve and between the arms 27 and 28 of the auxiliary valve 20, and are pivoted upon the transverse pin 36, already referred to. This pin 36 forms a pivotal connection, without any appreciable lost motion, between the valve operating lever 38 and the bleeding valve 31, but the end portions of this pin 36 extend loosely through the several circular openings 18, 29, 30 and 19 in the yokes of the main and auxiliary valve members, already described. In a usual manner, one end of pin 36 may be formed with an enlarged head 46, and the other end may receive a cotter pin 47, so as to hold this pin removably in place. A bowed leaf spring 48 is attached at one end to a lug 49 formed on the upper side of lever 38. A curved downwardly projecting finger 50 is formed on the lower side of lever 38 for a purpose hereinafter described.

A rock shaft 51 is pivoted transversely within casing 2 adjacent the vertical path of travel of the assembled valve members. One reduced end 52 of this shaft is adapted to pivot within a stud 53 formed on one inner side wall of the valve casing. The opposite end of rock shaft 51 extends through and is pivoted within a bonnet or plug 54 which is screwed into the opposite side wall of casing 2. A cap 55 screws onto the outer end of bonnet 54 and is adapted to house a suitable packing or stuffing box which forms a suitable steam-tight joint around the rock shaft 51. The outer end of the rock shaft is formed of square or other irregular contour, as indicated at 56, for the attachment of a suitable operating lever or other means by which the rock shaft may be operated from a distance. As here shown, a socket member 57 having an integral counterweight 58 projecting laterally therefrom, is attached to the squared end 56 of the shaft 51. One forked end portion 59 of a universal joint 60 is also formed on the socket member 57, the other forked end of the universal joint being attached to an operating rock shaft 61.

Formed on the inner portion of rock shaft 51, so that it will be positioned directly under the valve lifting lever 38, is a cam 62 which projects substantially radially from shaft 51. The upper side of this cam is curved at 63 to engage the under surface of lever 38 and lift the same and the valves when the cam is rotated in a clockwise direction (Fig. 1) about the axis of rock shaft 51. Cam 62 is provided with side flanges 64 adapted to engage the side edges of the lever 38 and thus guide the engaging parts for vertical movement. A stop lug 65 formed on one side of cam 62 is adapted to engage a stop lug 66 formed on the inner face of valve casing 2 when the valves are in completely closed position. Similarly the lug 65 engages a fixed lug 67 in the casing to limit the upward swinging movement of the cam when the valve-lifting lever is completely elevated. This will stop the cam in such a position that it will extend substantially at right angles to the lever 38 and positively lock this lever against downward movement. At this time the leaf-spring 48 will be compressed against the upper wall 68 of the valve casing (as shown in dotted lines, Fig. 1), thereby holding the lever 38 firmly against the upper end of cam 62 and assisting in locking the parts firmly in this open position. The counter-weight 58 projects from the shaft 51 at such an angle relative to the cam 62 that when the cam is in its raised lever-lifting position, as shown in Fig. 1 in dotted lines, practically the entire mass of the counter-weight will be effective to hold the cam in its raised position. When the rock shaft 51 is rotated in a counter-clockwise direction, the spring 48 will throw the lever 38 downwardly to assist gravity in moving the valves to closed position. If for any reason the parts should stick, the cam 62 will engage the downwardly projecting finger 50 on lever 38 and positively swing the lever downwardly.

A cap 69 screwed into the upper end of valve casing 2 permits access to the valves and valve-operating parts for assembling or disassembling the apparatus.

It will be noted, as shown in full lines in Figs. 1 and 3, that when in closed positions, all of the movable valve members 9, 20 and 31 will be held against their respective seats by gravity, assisted by the steam pressure within the casing 2. The weight of the valve-operating lever 38 also assists in holding the valves closed. When it is desired to permit a small quantity of steam to "bleed" through the valve, the rock shaft 51 is rotated slightly in a clockwise direction (Fig. 1) so that the cam surface 63 will engage the under surface of lever 38 and swing it slightly upwardly. This upward movement of lever 38 will lift the bleeding valve 31, raising its tapered lower end 33 off from the conical valve seat 24 and opening the bleeding port. Neither the main nor auxiliary valves will be moved, since the pin 36 will simply move upwardly within the larger circular openings 18, 19, 29 and 30 in the respective yokes of these valve members. The amount of opening of the bleeding valve 31 may be regulated to some extent by varying the distance through which the cam is rotated. The friction of the valve-operating connections, and of the rock shaft 51 in its bearings, will ordinarily be sufficient to hold the bleeding valve in its adjusted position, since these operating parts are counterbalanced by the weighted arm 58. If it is desired to permit a somewhat greater volume of steam to flow through the valve, a further clockwise movement of the operating cam 62 will cause the pin 36 to engage the upper ends of the circular openings 29 and 30 in the yoke of the auxiliary valve member 20 and raise this valve from its seat 12. If the valve is to be completely opened, this movement of the operating cam is continued so that the ends of transverse pin 36 will engage the upper portion of the openings 18 and 19 in the yoke of the main valve member 9 and lift the main valve plate 10 from its seat 7. Further movement of the valve operating parts will cause the three movable valve members to travel upwardly as a unit between the guides 37. As the operating cam nears the upper limit of its travel, the spring 48 will engage the under surface of the upper wall 68 of the casing and be compressed so that when the cam has reached its final position at right angles to the operating lever 38, the spring 48 will hold the parts tightly in this engaged position. This position of the parts is indicated in dotted lines in Fig. 1. All of these end train pipe valves, with the exception of the one at the extreme rear end of the train, will normally be in this open position when in service, and it will be noted that these valves are effectually locked in open position so that it will be practically impossible for the jolting of the cars to cause the gravity actuated valve members to fall to their lowered positions and close the valve openings. When it is desired to close the valves, the rock shaft 51 is rotated in a counter-clockwise direction until the lug 65 on the cam engages the stop lug 66. This will permit the valves to fall to closed positions, they being assisted in this movement by the weight of the lever 38 and the expansion of the spring 48. If necessary, this movement will be assisted by the engagement of cam 62 with the downwardly curved finger 50 on operating lever 38.

It will be noted that for the initial opening of the valves, when the steam pressure upon the upper surfaces of the valves must be overcome, a very effective leverage is obtained since the lowest portion of the cam is at this time in engagement with the lifting lever 38. After the valves have been broken loose from their seats, much less power is needed to complete the opening movement of the valves, and the higher portions of the cam comes into play to quickly swing lever 38 to its completely elevated position. This opening of the valve is also facilitated by the fact that the graduated valves are successively opened, the smallest and hence most easily opened valve being moved first, then the intermediate valve, and lastly the largest main valve, so that the difference in pressure on the two sides of these valves will be gradually adjusted, thus decreasing the power necessary to break the valves loose from their seats.

Due to the limitations of the space in which these end train pipe valves must be mounted in certain installations, it is necessary that the operating shaft 51 be mounted in the casing closely adjacent the vertical path of travel of the valve members. The present construction permits the desired arrangement of the parts and at the same time provides an effective leverage system for giving the necessary vertical movement to the valve members and also effectively locking the valves in open position.

We claim:

1. An end train pipe valve comprising a hollow casing having an inlet passage and a substantially vertical outlet passage, a valve seat surrounding the outlet passage, a plurality of valve members housed within one another and relatively movable vertically within the passage, the outer valve member adapted to engage the valve seat in the outlet passage, and each inner valve member adapted to engage a valve seat formed in the member in which it is housed, a pin engaged with the innermost valve member and having lost-motion connections with each of the other valve members, and means mounted in the casing for lifting the pin whereby the several valve members will be successively lifted from their seats.

2. An end train pipe valve comprising a hollow casing having an inlet passage and a substantially vertical outlet passage, a valve seat surrounding the outlet passage, a plurality of valve members housed within one another and relatively movable vertically within the passage, the outer valve member adapted to engage the valve seat in the outlet passage, and each inner valve member adapted to engage a valve seat formed in the member in which it is housed, a pin engaged with the innermost valve member and having lost-motion connections with each of the other valve members, a lever pivoted within the casing at one end and pivotally connected with the pin at the other end, and means for swinging the lever.

3. An end train pipe valve comprising a hollow casing having an inlet passage and a substantially vertical outlet passage, a valve seat surrounding the outlet passage, a plurality of valve members housed within one another and relatively movable vertically within the passage, the outer valve member adapted to engage the valve seat in the outlet passage, and each inner valve member adapted to engage a valve seat formed in the member in which it is housed, a pin engaged with the innermost valve member and having projecting end portions, each of the other valve members being formed with yokes at the top, the arms of which have openings in which the ends of the pin are loosely engaged, these openings being so graduated in size that as the pin is lifted the valve members will be successively raised from their seats and means mounted within the casing for lifting the pin.

4. An end train pipe valve comprising a hollow casing formed with an inlet passage and a substantially vertical outlet passage, a valve seat surrounding the outlet passage, a main valve member guided for vertical movement within the casing toward or from this seat, this valve member being hollow and formed with a valve opening at its lower end surrounded by an auxiliary valve seat, and formed with a yoke at its upper end, a similar hollow auxiliary valve member guided for vertical movement within the main valve and formed with a yoke at its upper end, its lower end being adapted to engage the auxiliary valve seat and formed with a bleeding port, a bleeding valve guided for vertical movement within the auxiliary valve and adapted to close the bleeding port, a cross pin mounted in the upper portion of the bleeding valve, there being openings in the arms of the yokes in which the ends of the pin are loosely engaged, and means mounted in the casing and engaging the pin for elevating same, whereby the bleeding valve will first be lifted and then the auxiliary valve and main valve will be successively elevated as the pin engages the upper ends of the openings in the respective yokes.

5. An end train pipe valve comprising a hollow casing formed with an inlet passage and a substantially vertical outlet passage, a valve seat surrounding the outlet passage, a main valve member guided for vertical movement within the casing toward or from this seat, this valve member being hollow and formed with a valve opening at its lower

end surrounded by an auxiliary valve seat, and formed with a yoke at its upper end, a similar hollow auxiliary valve member guided for vertical movement within the main valve and formed with a yoke at its upper end, its lower end being adapted to engage the auxiliary valve seat and formed with a bleeding port, a bleeding valve guided for vertical movement within the auxiliary valve and adapted to close the bleeding port, a cross pin mounted in the upper portion of the bleeding valve, there being openings in the arms of the yokes in which the ends of the pin are loosely engaged, a lever pivoted in the casing at one end and engaging the pin at the other end, a rock shaft pivoted in the casing adjacent the valve members, and a cam on the rock shaft adapted to engage an intermedite portion of the lever and successively lift the several movable valve members.

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