V. P. McVOY.

ENGINE DRIFTING VALVE.

APPLICATION FILED NOV. 20, 1919.

1,361,737. Patented Dec. 7, 1920.

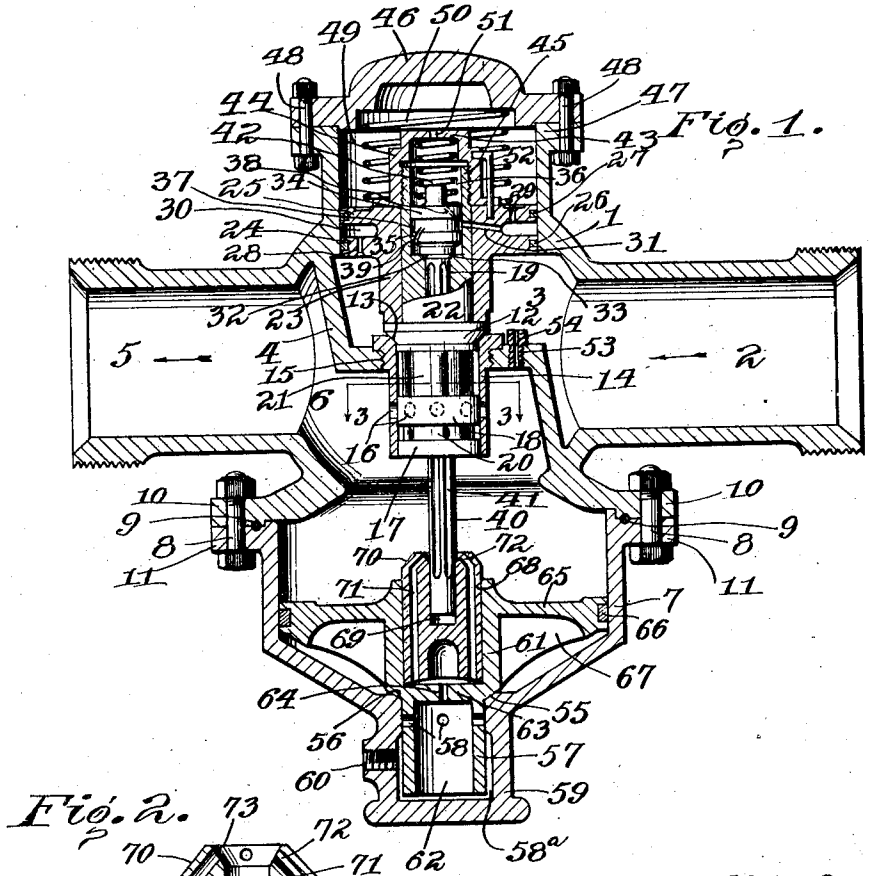


Fig. 1.

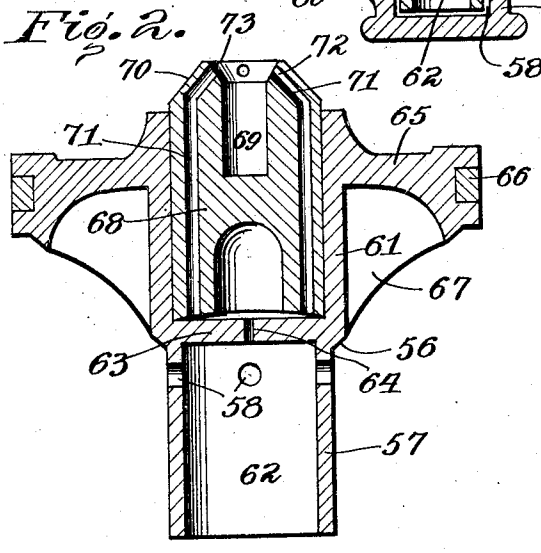


Fig. 2.

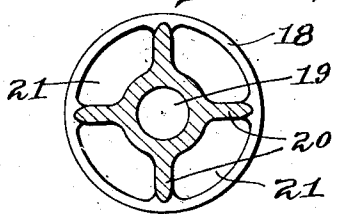


Fig. 3.

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ENGINE DRIFTING-VALVE.

1,361,737. Specification of Letters Patent. Patented Dec. 7, 1920.

Application filed November 20, 1919. Serial No. 339,523.

To all whom it may concern:

Be it known that I, VINCEN P. McVOY, a citizen of the United States, residing at Mobile, in the county of Mobile and State of Alabama, have invented certain new and useful Improvements in Engine Drifting-Valves, of which the following is a specification.

This invention relates to certain new and useful improvements in what are known as drifting valves for locomotives, and while the present invention is designed primarily as an improvement upon the valve shown in my Patent No. 1,229,993, dated June 12, 1917, it is to be understood that the novel features hereinafter disclosed are not necessarily confined to their association with the exact features of construction disclosed in said patent, but are applicable to other forms of drifting valves with which they may be associated.

The present invention has for its objects among others to provide an improved drifting valve of the general character disclosed in my said patent whereby I provide against fluctuation of the valve during drifting and thus add greatly to the life of the device and prevent wear and, at the same time, reduce the necessity for overhauling and repairs.

I aim further to improve the construction of the check valve, dispensing with the radial openings of the prior construction and insuring an unobstructed annular opening for better coöperation with the openings in the bushing and, at the same time, providing a much stronger valve and better guide for the stem of the pilot valve.

I further improve the differential piston, enabling me to employ different metals, best suited for the purposes which they have to subserve and facilitating the manufacture and assemblage thereof.

I provide means for taking care of the water of condensation to prevent its accumulation in the steam line, thus maintaining steam pressure against the check valve and equalizing the steam pressure on both sides of the piston, doing away with the detrimental presence of water at this point.

I provide a piston on the head of the pilot valve for breaking the flow of steam between the pistons and serving to close the openings between said pistons when the valve is seated to prevent its seating too suddenly and hammering. This piston carried by the pilot valve, serves further to balance the pressures after the pilot valve is once opened.

I also improve upon the vacuum or pressure piston by providing it with a supplemental vacuum and pressure piston, the latter holding its seated position within the piston proper until the latter has performed its duty by its movement upward and then the exhaust from the pilot valve passing, that is a portion thereof, down through the passages in said supplemental piston, causing pressure underneath the same, forces the latter to hold its position while the piston proper returns to its normal position. This supplemental piston is provided with a seat or socket for the lower end of the stem of the pilot valve. The piston proper is provided with a bleed opening which prevents accumulation of water beneath the supplemental piston and prevents accumulation of water on the upper surface of the piston proper to such an extent as to prevent freezing.

Other objects and advantages of the invention will hereinafter appear and the novel features thereof will be particularly pointed out in the appended claims.

The invention is clearly illustrated in the accompanying drawings, which, with the numerals of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a substantially central vertical section through my improved valve.

Fig. 2 is an enlarged central vertical section through the vacuum or pressure piston removed.

Fig. 3 is an enlarged cross section on the line 3—3 of Fig. 1, looking in the direction of the arrow.

Like numerals of reference indicate like parts throughout the different views.

Referring to the drawings,

1 designates the body portion of the valve having at one side an extension or inlet 2 for a union coupling or the like for the connection thereof with the boiler to conduct steam from such boiler to the chamber 3 upon one side of the division or partition 4, 5 being an outlet from the chamber 6 upon the opposite side of said partition to the engine or engines through suitable connection with said outlet or extension 5. These parts are of ordinary construction.

The lower portion 7 of the body is made separate from the upper portion 1 thereof and is detachably secured thereto by any suitable means as, for instance, the bolt 8, as seen in Fig. 1. Any suitable packing means, as the copper ring 9, may be employed betwen the flanges 10 and 11 of the upper and lower portions respectively, for an obvious purpose.

12 is a check valve adapted to a seat 13 on a bushing 14 screw-threaded, as at 15, into an opening in the horizontal portion of the partition 4, as seen clearly in Fig. 1, the depending or skirt portion of said bushing being provided with openings 16, as seen in said Fig. 1, said openings extending circumferentially around the said skirt portion of the bushing, for a purpose soon to be described.

The check valve 12 is provided with a depending portion comprising a bottom member 17 and a ring portion 18 separated therefrom, the said depending portion having an axial bore 19 for the passage of the stem of the pilot valve soon to be described. This depending portion is formed with radial ribs 20, as seen in Figs. 1 and 3, providing the vertical passageways 21 which extend from the bottom member 17 but not through the same, to the bottom face of the valve portion 12, as seen best in Fig. 1.

Integral or rigid with the check valve 12 is the tubular member 22, shown broken away in Fig. 1 to better illustrate other parts, and this is made a driving or forced fit within the portion 23 of the differential piston. This differential piston has the separated pistons 24 and 25 provided with a suitable or well-known packing 26 and 27, for the usual purpose, and the one piston 24 is provided with an equalizing opening 28, while the other is provided with a similar equalizing hole 29, all as clearly shown in Fig. 1, both of these openings communicating with the annular recess or chamber 30 between the said pistons.

To afford communication between the channel 30 and an annular recess in the pilot valve, soon to be described, I provide one or more channels 31, as seen in Fig. 1. This pilot valve comprises the valve member 32 adapted to a seat 33 formed in the member 22 of the check valve, hereinbefore described, and integral with this pilot valve are the separated pistons 34 and 35 adapted to reciprocate within the chamber 36 and having between them the annular recess 37, hereinbefore referred to, which communicates with the chamber 30 through the channal 31, as seen clearly in Fig. 1. The pistons 34 and 35 are provided with by-pass channels 38 and 39, respectively, as clearly shown in Fig. 1.

40 is the stem of the pilot valve. It is adapted to reciprocate through the bore 19 of the lower portion of the check valve and a corresponding bore in the member 22, as seen in Fig. 1, and this pilot valve stem is provided with longitudinal flutes or channels 41, as shown clearly in Fig. 1, for a purpose soon to be described.

42 is a spring interposed between the outer face of the piston 34 and the end portion 43 of a nut member 44 to assist in keeping the pilot valve to its seat. This spring, however, is not absolutely necessary and in some instances may be omitted. This nut member is screw-threaded on the screw-threaded extension 45 of the tubular member 22, serving to bind the differential piston member and holding it in close contact with the check valve.

46 is a cap to the extension 47 of the body portion 1, being secured thereto in any suitable manner, as by bolts or the like 48, and within the bore or chamber 49 is a spring 50 interposed between said cap and the outer face of the outer piston 25 and tending to keep the check valve 12 to its seat under normal conditions.

As seen in Fig. 1, the cap or nut member 44 is provided with an opening 51 in its end portion 43, the object of which will be described later on.

The nut member 44 may be locked in position by suitable means and in Fig. 1 I have shown the dowel or pin 52 engaging an opening in the piston 25 and a lateral opening in the nut. This, however, is but one of the many ways in which this nut may be locked in position.

In a screw-threaded opening in the horizontal portion of the partition 4 of the body member 1 there is removably placed a nozzle 53 having a small bore 54 and affording communication between the chambers 3 and 6 of such body portion for the purpose of preventing or of taking care of the water of condensation in the steam line.

This bleed 54 serves to permit of a constant flow of live steam from the boiler through the inlet 2, bleed 54 and chamber 6 and outlet 5 to the engine which is either consumed by the moving engine or relieved by the relief valves when the engine is standing. This prevents any accumulation of water in the connections between the boiler and engine due to the temperature of the steam keeping the drifting valve at a temperature above that of the boiling point of water, which would cause any accumulation of water to evaporate and pass out through the bore 54.

The lower portion 7 of the valve body is provided with a valve seat 55, as seen in Fig. 1, upon which is adapted to seat the check valve 56. This check valve is provided with a tubular depending portion 57 having near its upper end the lateral open-

ings 58. This depending portion reciprocates within the chamber or bore 58ª of the depending portion 59 of the lower member of the body of the valve. This depending portion 59 is provided with a lateral opening 60 for connection of a pipe or the like for conducting the water of condensation away from said chamber 58.

This valve 56, above its seat, is provided with a portion 61 separated from the chamber 62 in the portion 57 by a partition 63 in which is an opening 64, all as shown clearly in Fig. 1 as well as in Fig. 2.

The member 61 has integral therewith the vacuum or steam piston 65 provided with a suitable packing 66 and strengthened by the ribs or webs 67.

Within the bore of the portion 61 there is mounted to reciprocate a supplemental piston 68, as shown clearly in Figs. 1 and 2, having at its outer end a pocket or socket 69 in which the lower end of the pilot valve stem 40 is seated and guided in its reciprocation. The outer end of this member 68 is made conical, as at 70, in order to reduce the area for the pressure of the exhaust steam from the pilot valve and this supplemental piston 68 is provided with a plurality of longitudinal passages 71, the upper ends of which incline, as at 72, and communicate with the conical or funnel shaped portion 73 at the outer end of the said supplemental piston.

With the parts constructed and arranged substantially as hereinbefore described, the operation, briefly stated, is as follows:—The member 2, being connected up with the boiler or source of steam, and the member 5 by suitable connection with the engine or engines, and steam admitted to the inlet 2 into the chamber 3, and the parts being in the position in which they are shown in Fig. 1, the steam entering the chamber 3 passes, in sufficient quantity for equalization of pressure, through the opening 28 in the piston 24 and through the channel 30 and then through the opening 29 in the piston 25 into the space between the last-named piston and the cap or closure of the extension 47, thus equalizing pressure on both sides of the differential piston and holding the check valve 12 to its seat. At the same time, steam enters from the annular recess or chamber 30 through the channels 31 into the annular recess 37 between the pistons 34 and 35, and thence through the by-pass channels 38 and 39 into the spaces above and below these pistons, thus equalizing the pressure upon opposite sides thereof and holding the pilot valve against its seat. The throttle of the engine being open, the pressure in the steam pipe from the engine backing up through the passage 5, acting upon the vacuum and steam piston 65, forces the valve 56 against its seat 55, thus preventing any leakage and avoiding the necessity of the employment of packing rings. The other parts remain in the position in which they are shown, as the back pressure from the throttle never exceeds the equalized pressure upon the opposite side. The throttle now being closed with the engine moving, at a high or low rate of speed, for the purpose of drifting, the displacement caused by the reciprocation of the pistons of the engine removes the pressure from the chamber 6 upon the upper side of the piston 65, and the steam above the said piston 65 is expelled through the passage 5, and this displacement and the vacuum created in the chamber 6 raises the piston 65, carrying with it the supplemental piston 68 and the pilot valve stem 40, lifting the pilot valve 32 from its seat, exhausting the pressure from the chamber in the extension 47 through the opening 29, the annular chamber 30, the channels 31 and into the bore of the member 22 and through the flukes or channels 41 of the pilot valve stem 40 and the major portion escapes through the member 5 to the engine. The other portion of this exhaust steam passes through the funnel 73 and passages 72 and 71 into the space beneath the supplemental piston 68. This causes the check valve 12 to be unseated, due to the pressure on the underside of the differential piston being greater than that on the other side, thus moving the differential piston outward against its spring, carrying with it the check valve 12. When the check valve 12 is unseated, the pressure within the chamber 3 is exhausted through the passages 21 and out through the openings 16 in the skirt portion of the bushing into the chamber 6. This pressure forces the piston 65 downward until it is seated, the supplemental piston 68 being held in its raised position due to the pressure of the steam which has passed downward through the channels or flukes 41 of the stem of the pilot valve and the passages 72 and 71 to the underside of said supplemental piston. The supplemental piston remains in its elevated position until the engine refuses to take steam from the boiler, when pressure accumulates in the chamber 6, forcing the supplemental piston 68 to its normal position, when the pilot valve returns to its seat as does the check valve 12 and pressure is again equalized upon opposite sides of the differential piston. By reason of this supplemental piston being held up by a part of the exhaust when the pilot valve is open, which exhaust passes down through the channels 41 and the passages 71 and acting upon the underside of the piston 68, serves to hold said piston 68 and consequently the pilot valve in their raised position while the vacuum piston 61 returns to its lowermost position. This tends to

permit the flow of steam to the engine to destroy the vacuum that is constantly being produced in the cylinder which the engine is moving by momentum, or "drifting," the said supplemental piston afterward gradually returning to its lowermost position as the space or chamber 6 becomes more or less filled with steam.

Modifications in details, proportions of parts, etc., may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

What is claimed as new is:—

1. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston, and a supplemental piston carried thereby and operatively connected with said relieving means.

2. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston, a supplemental piston movable with relation thereto and operatively connected with said relieving means, and means for holding the supplemental piston against movement with said vacuum or pressure piston at a certain stage of the operation.

3. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston having a supplemental piston and a pilot valve operatively connected with said relieving means and having a stem guided by said supplemental piston.

4. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston having a supplemental piston and a pilot valve operatively connected with said relieving means and having a stem guided by said supplemental piston, said pressure and supplemental pistons being movable together on one movement and later independently of each other.

5. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston having a supplemental piston and a pilot valve operatively connected with said relieving means and having a stem guided by said supplemental piston, said supplemental piston having longitudinal exhaust passages extending therethrough to the space beneath the said supplemental piston.

6. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston provided with a supplemental piston, said means embodying a pilot valve operable to relieve said pressure and operatively connected with the supplemental piston and means whereby the supplemental piston is movable with or independently of the vacuum or pressure piston.

7. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston provided with a supplemental piston, said means embodying a pilot valve operable to relieve said pressure and operatively connected with the supplemental piston, and means whereby the supplemental piston is movable with or independently of the vacuum or pressure piston and guided thereby.

8. In a drifting valve for locomotives, a differential piston, a check valve movable therewith, means for relieving the pressure from the top of the differential piston, a vacuum or pressure piston provided with a supplemental piston, said means embodying a pilot valve operable to relieve said pressure and operatively connected with the supplemental piston, means whereby the supplemental piston is movable with or independently of the vacuum or pressure piston, said pilot valve having a stem guided at one end in said supplemental piston.

9. In a drifting valve for locomotives, a differential piston, a pilot valve movable therein, a pressure-controlled check valve movable with said piston, means including said pilot valve for relieving the pressure from the top of said piston, a vacuum or pressure piston controlling the pilot valve, said check valve being controlled by the pilot valve, and means movable independently of said vacuum or pressure piston for retarding the return of the pilot valve.

10. In a drifting valve for locomotives, a differential piston, a pilot valve movable therein, a check valve movable with the said piston, a vacuum or pressure piston controlling the pilot valve, means whereby the pilot valve controls the check valve, and a supplemental piston controlling the pilot valve, and constructed to retard the return of the latter to its normal position.

11. In a drifting valve for locomotives, a differential piston, a pilot valve movable therein, a check valve movable with the said piston, a vacuum or pressure piston controlling the pilot valve, means whereby the pilot valve controls the check valve, and a supplemental piston constructed to retard the return of the pilot valve to its normal

position, said pilot valve being movable at predetermined times independent of the vacuum or pressure piston.

12. In a drifting valve for locomotives, a pressure-controlled check valve, a vacuum or pressure piston provided with a supplemental piston and a pressure relieving valve operatively connected with said supplemental piston for relieving the pressure from the top of said check valve.

13. In a drifting valve for locomotives, a pressure-controlled check valve, a vacuum or pressure piston provided with a supplemental piston movable in one direction therewith and in the other direction independently thereof, and a pressure relieving valve operatively connected with said supplemental piston for relieving the pressure from the top of said check valve.

14. In a drifting valve for locomotives, a pressure-controlled check valve, a vacuum or pressure piston provided with a supplemental piston having longitudinal passages therethrough for the escape of the exhaust from above said piston, and a pressure relieving valve operatively connected with said supplemental piston for relieving the pressure from the top of the said check valve.

15. In a drifting valve for locomotives, a vacuum or pressure piston provided with a supplemental piston having longitudinal passages therethrough and a funnel shaped opening communicating therewith for the escape of the exhaust from above said piston, and a pressure relieving valve operatively connected with said supplemental piston.

16. In a drifting valve for locomotives, a vacuum or pressure piston provided with a supplemental piston having longitudinal passages therethrough and a funnel shaped opening communicating therewith for the escape of the exhaust from above said piston, and having a socket to receive and guide the end of the stem of a pilot valve, and a pressure relieving valve operatively connected with said supplemental piston.

17. In a drifting valve for locomotives, a vacuum or pressure piston provided with a supplemental piston having longitudinal passages therethrough and a funnel shaped opening communicating therewith for the escape of the exhaust from above said piston and having a socket to receive and guide the end of the stem of a pilot valve, combined with a pilot valve operatively connected with said supplemental piston and having a stem provided with longitudinal channels.

18. In a drifting valve for locomotives, a check valve having an extension with longitudinal ribs and intermediate steam passages and an annular wall intermediate its ends combined with a bushing having lateral ports, and a pilot valve having a stem movable through said check valve and having longitudinal exhaust channels.

19. In a drifting valve for locomotives, a differential piston and a check valve having a portion extended therethrough and frictionally retained therein, and a balanced pilot valve in said piston.

20. In a drifting valve for locomotives, a differential piston and a check valve having a portion extended therethrough and frictionally retained therein and having a longitudinal bore for the stem of the pilot valve, and a balanced pilot valve in said piston.

21. In a drifting valve for locomotives, a differential piston, a check valve having a tubular portion extended through said piston, a nut on the end of said tubular portion, and a balanced pilot valve in said piston and reciprocable in said tubular portion.

22. In a drifting valve for locomotives, a differential piston, a check valve having a tubular portion extended through said piston, a nut on the end of said tubular portion, and a balanced pilot valve operable to permit the exhaust of the pressure above the said piston, said valve being reciprocable in said tubular portion and provided with separated pistons.

23. In a drifting valve for locomotives, a differential piston, a check valve having a tubular portion extended through said piston, a nut on the end of said tubular portion, and a balanced pilot valve operable to permit the exhaust of the pressure above the said piston, said valve being reciprocable in said tubular portion and provided with separated pistons having by-pass channels.

In testimony whereof I affix my signature.

VINCEN P. McVOY.