

April 20, 1937.

J. C. G. COSSEY

2,077,988

STEAM REGULATOR VALVE AND THE LIKE

Filed May 1, 1936

2 Sheets-Sheet 1

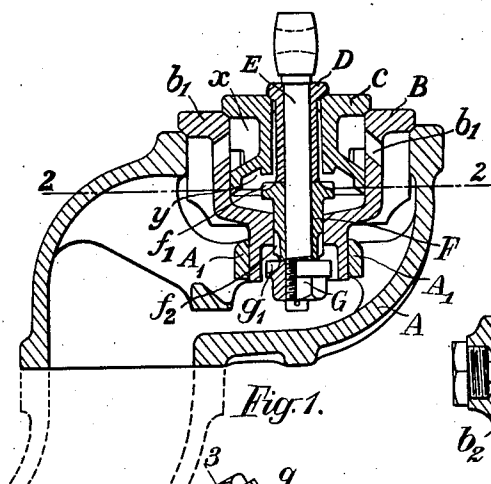


Fig. 1.

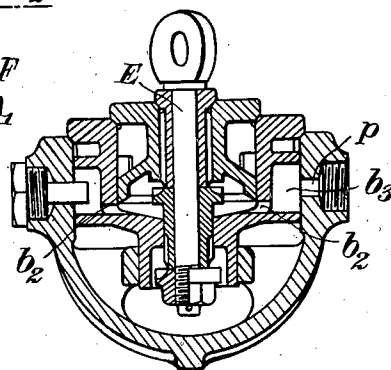


Fig. 3.

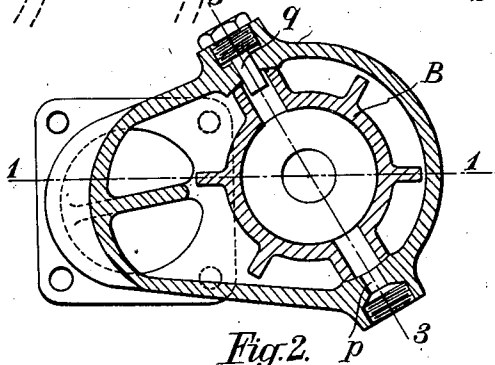


Fig. 2.

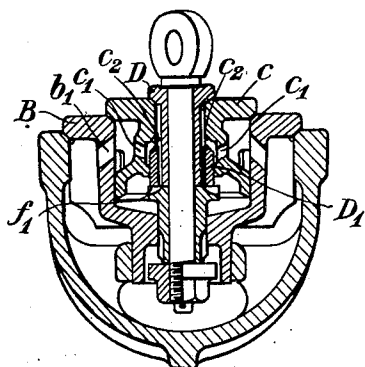


Fig. 6.

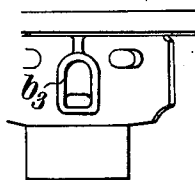


Fig. 4.

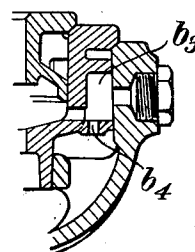


Fig. 5.

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2 Sheets-Sheet 2

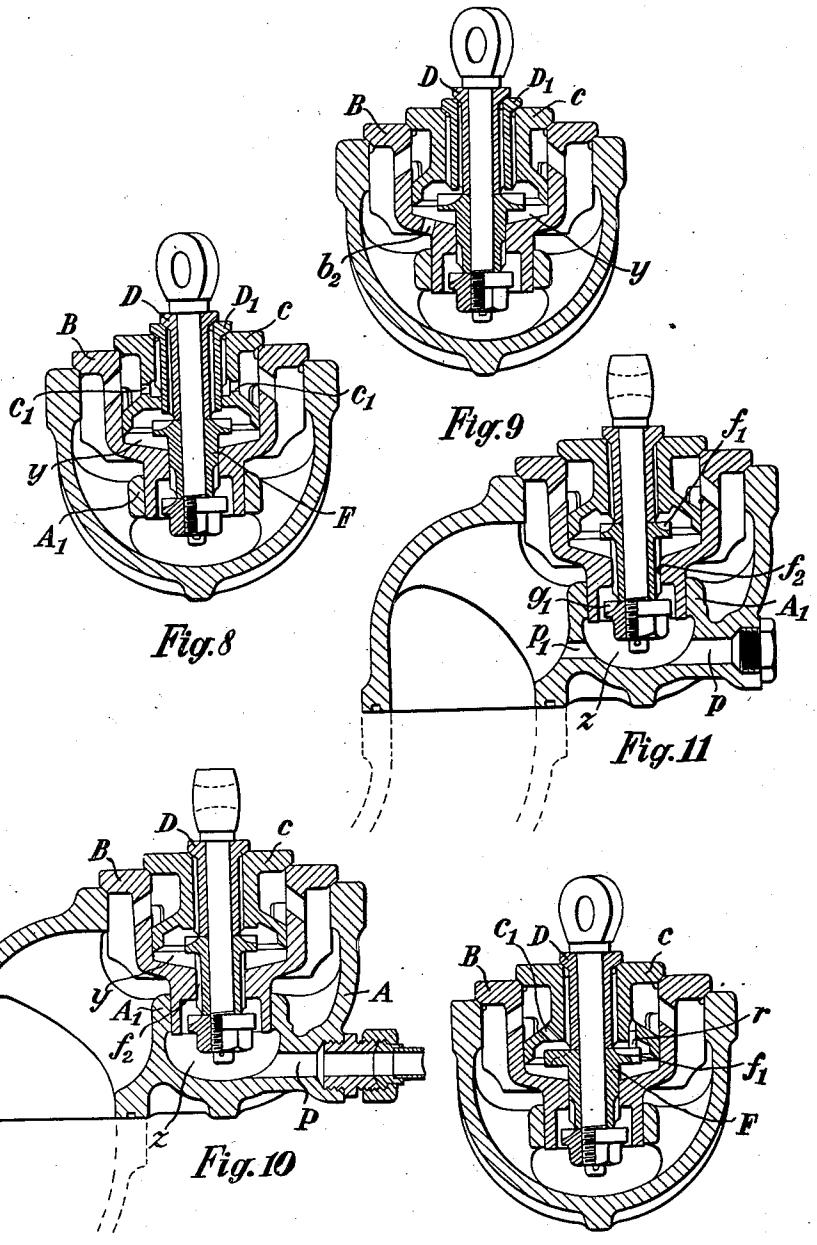


Fig. 7
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UNITED STATES PATENT OFFICE

2,077,988

STEAM REGULATOR VALVE AND THE LIKE

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5 Claims. (Cl. 277—44)

This invention relates to valves of the multiple beat type such as are used for steam regulation and of the type wherein a plurality of valves or valve members arranged or nested concentrically one within the other are operated by a single central spindle, a steam space being provided between one valve and another in the concentric series for the general purpose of putting one or more of the valves into equilibrium under steam pressure.

The object of the present invention is to overcome difficulties and/or shortcomings of valves of the aforesaid kind as at present constructed, and thereby to obtain better control and regulation, for instance, in conditions such as are met with in the operation of locomotive engines and are referred to hereinafter.

The invention generally consists in a multiple beat valve of the kind referred to incorporating in its structure port and like means enabling passage of steam to auxiliary devices and/or for other purposes in relatively small amounts before and/or while the valve is operated to function in its full capacity as a main steam supply control.

The invention also consists in a multiple beat valve as indicated, comprising port means through one or more of a plurality of concentric nested valves, admitting steam directly or indirectly to the cathed or valve body from the innermost or smallest valve.

The invention also consists in a multiple beat valve as indicated in the preceding paragraph including a ported valve co-operating with a lateral port from the interior to the exterior of the valve body.

The invention also consists in a multiple beat valve as indicated in the paragraph next but one preceding, including a valve ported for admission of steam from its interior into the main steam pipe as for "drifting".

The invention also consists in a valve as indicated including means co-operating with port means in one of the nested valves to close said port means in sequence to the opening of the innermost or other initially-opened valve.

The invention also consists in a valve according to the preceding paragraph in which said means comprises an annular element having a mitred end co-operating with a seat in one of the other valves.

The invention also consists in a valve as indicated in the paragraph next but two preceding including means co-operating with said ported valve and with another valve to admit steam to

the interior of the former and effect substantial equilibrium of said other valve prior to opening thereof.

The invention also consists in the improvements to valves of the kind referred to, and substantially as hereinafter indicated.

In the case of an engine having poppet valves in the cylinder steam chests for distributing steam to the cylinders the improved valve can conveniently be used to admit steam through an auxiliary steam pipe to the back of the poppet valves or their spindles to close them before the main supply of steam reaches the cylinders.

Where an engine has a boiler supplying superheated steam the valve can be arranged to cause a small quantity of steam to flow through the superheater elements when the main steam supply is shut off, preventing overheating and burning of the elements.

Valves in accordance with the invention are eminently suitable for locomotives as these are now usually fitted with superheated boilers and large numbers have valve gears of the poppet valve type. Further, the valve can be used to supply a small amount of steam to the valve chests and/or cylinders of a locomotive when it is drifting, i. e. when the locomotive is running with the main steam supply shut off from its cylinders. If a certain amount of steam is not then passing through the valve chests and cylinders the lubricating oil oxidizes and carbonization will occur in the valve chest and cylinder ports.

A separate drifting valve has in some cases been provided on a locomotive, and operated at the driver's discretion, but where such a valve is not employed drivers have sometimes obtained the desired effect by slightly opening the regulator valve. This partial opening of the usual types of regulator valve, however, is unsatisfactory as the valves of these regulator valves are of such an area that the lift required to give the requisite amount of steam is very small; it is difficult to regulate the quantity of steam passing.

The invention can also be used in connection with the supply of steam either through the main steam pipe or through separate pipes to operate by-pass valves, relief valves, blow-off cocks and other fittings and auxiliaries.

With the objects set out above we may utilize a valve of the aforementioned multiple beat type (in connection with which reference may be had to British specification No. 285,589) and so provide that when the innermost concentric valve or valves are open the steam passing under the

mitres of such valves flows through ports in one or more of the outer concentric valves and/or valve body or cathead.

In the accompanying drawings:—

5 Figure 1 is a vertical section through one construction of valve according to this invention;

Figure 2 is a sectional plan on the line 2—2 of Figure 1;

10 Figure 3 is a transverse section on the line 3—3 of Figure 2;

Figure 4 is a side elevation of one of the component valves of the above construction;

Figure 5 is a fragmental view corresponding to Figure 3, but showing a modification;

15 Figures 6, 7, 8 and 9 are views of further modifications, taken in similar planes to Figure 3; and

Figures 10 and 11 are vertical sectional views of other constructions.

20 In carrying the invention into effect in one specific form shown by way of example in Figures 1, 2 and 3 and describing thus a construction of valve generally resembling that illustrated in the aforesaid patent specification, radial ports 25 b_2b_2 are provided through the walls of the outer valve B, leading from a steam space y provided between the outer valve and middle valve. One of the said ports communicates through a short channel b_3 , shown in Figure 4, with a port p 30 in the cathead A, while the diametrically opposite port is provided to secure lateral balance of the valve and provides as by receiving a pin q passed through the wall of the cathead a ready means of preventing rotation of the outer valve in the 35 cathead.

In these, and subsequent drawings herein, E is the valve spindle, operatable as by a lifting fork and bridle, F is a distance piece, G is a 40 securing nut, A₁ is a guide bearing, b_1b_1 are ports through the valve B, $f_1f_2g_1$ are scouring ports.

When the innermost valve D is open, steam passing under its mitre flows to the steam space y between the outer and middle valve, through 45 one of the ports b_2 in the outer valve to the port p in the cathead, through the wall of the cathead and is then led conveniently say to the valves of a poppet valve gear to close such valves before the main steam supply reaches the cylinders; or the steam may be led to some other part of the 50 engine for such purpose or purposes as may be required.

In the above construction, steam is not admitted to the main steam pipe leading to the cylinders until the mitre of the middle valve is 55 lifted from its seating on top of the outer valve.

A modification of this arrangement may, as in Figure 5, consist in omitting the port p in the cathead or closing it by suitable means and providing another port b_4 in the outer valve B so 60 that steam may now pass through said port and from the inside of the cathead through the main steam pipe to the cylinders and thus provide a small flow of steam for such purposes as eliminating overheating of the superheater elements, preventing carbonization of valve chests and cylinder 65 ports, and for drifting.

In the alternative construction shown in Figure 6 a concentric annular valve D₁ is mounted 70 over the guide ribs or flutes provided on the innermost valve. One of the valves, e. g. the middle one C, has ports c_1c_1 formed in its walls and provides in addition to a seating for the mitre of the innermost valve D, a seating c_2 for the mitre of the annular valve. In this construction when 75 the valve D is opened, steam passes under its

mitre, through the ports c_1c_1 provided in the valve C on which the first is seated, through ports b_1b_1 in the outer valve B to the main steam pipe, such steam being available for drifting or other 5 purposes: at this stage steam also passes between the innermost and annular valve D, D₁ to the steam space y between the two outer valves C, B. On further opening of the regulator valve the mitre on top of the annular valve D₁ which is 10 also lifted closes against its seating c_2 and no further steam is allowed to pass to the steam pipe through the ports b_1b_1 in the outer valve. Steam, however, still has free access to the steam space y . Further lifting of the central spindle E with 15 valves D and D₁ opens in series the two valves C and B admitting the main supply of steam to the steam pipe in the known way.

In the further modification shown in Figure 7 the distance piece F concentrically mounted 20 on the spindle under the innermost valve primarily for lifting the same also directly closes ports c_1c_1 formed in the lower part of the middle valve, after a predetermined lift. The pin 25 r co-operating with a hole in the valve C prevents relative rotation of the latter and the distance piece F so as to avoid coincidence of the ports f_1 in the upper part of the member F with the ports c_1 to be closed thereby. This construction at first functions in much the same 30 way as the construction above described using an annular valve, steam being available for drifting when the valve spindle is raised to a position in which the valve D and the ports c_1 in the middle valve are admitting steam. At 35 the end of the drifting period, when the spindle is raised further, the distance piece F closes the ports c_1 in the middle valve; and further lift, the valve D being already open, opens the middle and then the outer valve, admitting the 40 main steam supply to the cylinders.

In a further modification shown in Figure 8 two inner concentric valves D, D₁, both comparatively small, are arranged one within the 45 other in the inner one C of two outer valves (hitherto referred to as the middle valve), this latter valve having ports c_1 formed in its walls. In this arrangement the valve D, the lower end of which is engaged by the operating distance 50 piece F, opens first, admitting steam to the steam space y between the outer and other valves. This admitted steam places the valve D₁ on top of which the mitre of valve D has its seating, and also the next larger valve C, substantially into equilibrium under steam 55 pressure. As the spindle E is raised the second smallest valve D₁ is next engaged by the distance piece F and opened to pass a predetermined small amount of steam through the ports c_1c_1 in the aforesaid "middle" valve to the 60 steam pipe and thence to the cylinders. This is the drifting position of the regulator, and when the locomotive is no longer drifting and steam is required in larger quantities the regulator handle is moved from its drifting position 65 and the outer valves C and B are lifted in series in the known way to admit the main supply of steam for instance to the cylinders.

If this last construction and that first described herein are combined, the resulting regulator valve may be such that at one position of 70 opening two auxiliary steam supplies become available, one passing through ports as c_1 in the inner of the two outer valves to the main steam pipe, and the other in series through the port b_2 in the outer valve and the port p in the 75

cathead to a smaller separate pipe for some other purpose.

In a modification, shown in Figure 9, of the four-valved arrangement above described, ports are not provided in the inner of the two outer valves, i. e. the "middle" valve. Both inner valves D, D₁ admit steam to the steam space *y* between the outer and other valves, but in this case one or more ports as *b*₂ is or are formed in the bottom of the outer valve B, leading from the steam space *y* directly to the inside of the cathead A. The two inner valves in this construction pass sufficient steam substantially to put into steam equilibrium the next largest valve as well as to pass that required at the cylinders for drifting.

In the further construction shown in Figure 10, a chamber *z* is provided inside the cathead A, this chamber being formed by extending the guide or bearing A₁ for the bottom of the outer valve to the bottom of the cathead; and a port *p* in the wall of the cathead communicates with this chamber.

When in this construction the innermost valve D is open, steam passing under its mitre flows to the steam space *y* between the outer and middle valve, and thence via the guide fluting at *f*₂ and the chamber *z* to the port *p* in the cathead wall, and is then led, by means of a pipe, e. g. to some other part of the engine, for such purpose as may be required. The steam is not admitted to the main steam pipe leading to the cylinders until the mitre of the middle valve C is lifted from its seating on the top of the outer valve B.

A modification of this arrangement, shown in Figure 11, consists in omitting the port in the lower part of the cathead wall or closing it as by means of a screwed plug, and providing another port *p*₁ in the wall of the steam chamber *z*, so that steam passing through this port may pass to the inside of the cathead and through the main steam pipe to the cylinders.

The construction shown in Figures 10 and 11 can be arranged with two inner concentric valves D, D₁, instead of a single inner valve, D.

As the innermost valve or valves in the foregoing constructions are used for admitting steam for the purposes described and as these valves are relatively small, a proportionately larger lift is required to obtain the necessary area for the passage of the steam. The lift of these valves is such that an appreciable movement of the regulator operating handle is necessary. This is of particular importance in the case of locomotives as the driver will have no difficulty in putting the regulator into the drifting position, and, moreover, the quadrant usually found on the regulator rod stuffing box can be provided with a mark indicating the drift position. Such quadrants are at

present usually marked merely "Open" and "Shut"; an intermediate position may be marked "Drift". Alternatively or in addition, the quadrant may be provided with movable stop means against which, for instance, a tail or arm on the operating handle can abut when the regulator valve is closed to the drifting position; such stop being moved out of the path of the tail, arm or the like when it is desired to shut off the relatively small amount of steam used for drifting.

I claim:

1. A multiple beat steam regulator valve comprising a plurality of concentrically nested valves operable in sequence including one operating as a piston within another to define therewith an internal chamber and an initially operable third valve for admitting steam into said chamber for balancing said one valve, said chamber communicating through radiating port means with the exterior of the nest of valves whilst one of the latter remains in seated position.

2. In a multiple beat steam regulator valve comprising a plurality of concentrically nested valves operable in sequence and including one of said valves operating pistonwise within another to define therewith a closed balancing chamber in the interior of the nest of valves, into which chamber live steam is admitted with the opening of one of said valves, the combination therewith of port means radiating from said chamber to the exterior of the nested valves and means adapted to render said port means inoperative when the initially operated valve has achieved a predetermined position of lift.

3. A valve in accordance with claim 2 including an element movable with said one valve and between two of said valves and a seat interposed between said port means and said chamber co-operating with said movable element to close the communication between them at the maximum position of lift of said one valve.

4. In a multiple beat steam regulator valve comprising a plurality of concentrically nested valves operable in sequence and defining within their interior a chamber into which live steam is admissible with the opening of one of said valves for balancing one of the other valves to be opened subsequently, the combination therewith of means providing a chamber situated to the outside of the nest of valves and port means permanently connecting said chambers and means for leading off steam from said outside chamber while controlled solely by said one valve.

5. A valve according to claim 4 wherein said outside chamber is associated with the outlet side of the nest of valves and said connecting port means run axially through one of said other valves.

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