May 7, 1929. G. F. BLYSTON 1,712,245

LOCOMOTIVE THROTTLE VALVE

Filed Jan. 26, 1928

Fig. 1

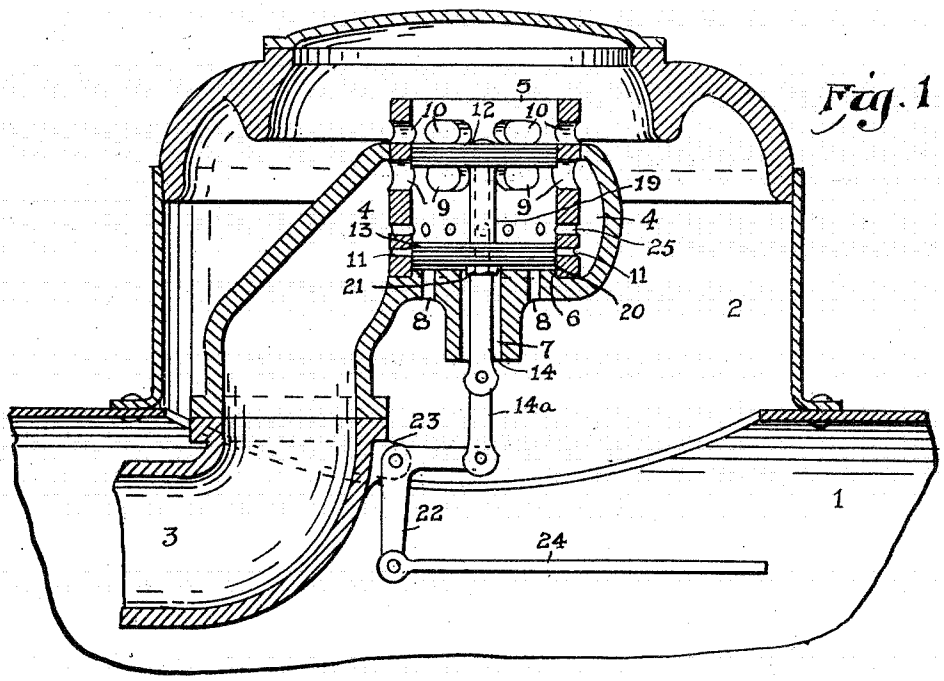
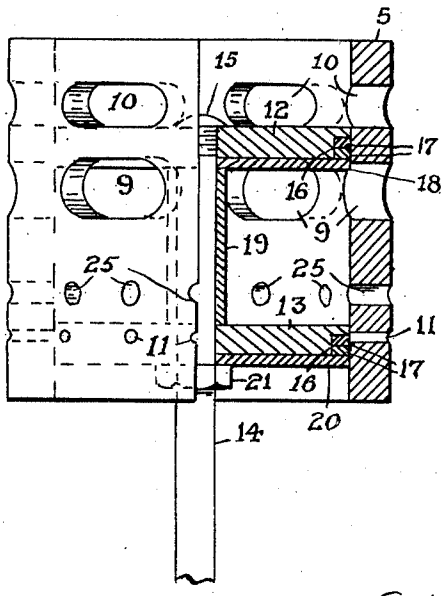


Fig 2.



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LOCOMOTIVE THROTTLE VALVE.

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The objects which I have in view are, inter alia, as follows.

The provision of a throttle-valve which will admit steam to the locomotive cylinders in such a manner that the locomotive will start smoothly and without jerking.

The provision of a throttle-valve which is properly balanced so as to easily operate either in opening or closing.

The provision of a throttle-valve without valves and valve-seats which require frequent grinding but which employs inexpensive and easily and quickly replaceable piston rings.

The provision of an improved throttle-valve structure which may be easily and cheaply installed in connection with the present type of standard throttle-valve chambers.

In the accompanying drawings, wherein I have illustrated the best embodiment of the principles of my invention now known to me, Fig. 1 is a view in vertical section showing the upper portion of a locomotive boiler, the steam dome and the throttle valve, and Fig. 2 is a view on larger scale showing the throttle-valve bushing and twin-pistons partially in elevation and partially in section.

Referring to the drawings, 1 represents the locomotive boiler; 2 the steam dome; 3 the live steam pipe which leads to the locomotive cylinders, and 4 the throttle-valve chamber which is connected to the steam pipe 3 and is shown as of the ordinary type now in general use in railway practice.

Instead of the usual valves and valve seats now in general use I seat in the chamber 4 a vertically disposed and cylindrical bushing 5 whose upper end protrudes slightly above the top of the chamber 4 and fits snugly in the upper end thereof while the lower end of the bushing rests on the floor of the chamber and about the circular shoulder 6 thereon.

Steam is admitted to the lower end of the bushing 5 through the bore 7 for the piston rod and also, preferably, through ports 8 in the bottom of the chamber 4.

The bushing 5 is provided with ports 9 of relatively large capacity arranged in annular series in the wall of the bushing just below the top of the chamber 4 and with similar ports 10 just above the top of the chamber. These are the full pressure ports and when the two series of ports are in full communication the cylinders are receiving the full head of steam.

Near the lower end of the bushing the same is provided with an annular series of smaller ports 11 which are the initial steam admission ports which admit steam from the lower end of the bushing when uncovered and are employed to fill the cylinders with steam before the full pressure ports come into operation.

12 the upper piston and 13 the lower piston both work in the bushing 5 and are mounted in fixed relation with each other on the piston rod 14. Thus the upper end of the rod 14 is threaded and screwed through a threaded hole in the center of the piston 12 and its end riveted over as at 15. The perimetral edge of the piston is cut away as at 16 to form an annular seat for the twin piston rings 17 which are held in position by the circular plate 18 which is slid up on the piston rod 14 into place. The plate 18 is held in position by sleeve 19 which is slipped over the piston rod and supported from below by the piston 13 which in turn is slid up on the piston rod 14. The piston 13 is likewise cut away perimetrally to form a seat for the twin piston rings. The piston 13 and its rings are held in place by the plate 20 on the rod 14 and which is in turn held in position by the nut 21 screwed on a threaded portion of the rod 14.

It is evident that by removing the nut 21, the plate 20 may be removed to remove and replace the lower piston rings, and by also removing the piston 13, the sleeve 19 and the plate 18, the upper piston rings may be removed and replaced.

The lower end of the piston rod is connected by a link 14^a to one arm of the bell-crank lever 22 which is pivotally mounted at its angle to a bracket 23 carried by the pipe 3 and whose other arm has pivotally connected thereto the link 24 which extends to the locomotive cab and is attached to the lever by which the engineer opens and closes the throttle-valve.

When the throttle-valve is closed, as illustrated in Fig. 1, the lower piston 13 closes the ports 11 while the upper piston 12 is interposed between the ports 9 and the ports 10, thus interrupting communication between the two series of ports.

When the link 24 is drawn to the right in Fig. 1 to open the throttle, the twin pistons

12 and 13 are moved upwardly in unison, and before the upper piston 12 rises sufficiently to even partially establish communication between the ports 9 and the ports 12, the piston 13 rises above and thus uncovers the ports 11 so that steam will enter through the bore 7 and the ports 8 and into the lower end of the bushing 5 and thence through the relatively small ports 11 into the chamber 4, thus filling the engine cylinders with steam under relatively low pressure before the high pressure ports are operative. As the twin-pistons continue to rise, the upper piston 12 rises above the ports 10 so that the full pressure is admitted through the ports 10 and the ports 9.

Thus the locomotive is not started with a jerk, as would happen were the throttle-valve opened in such a manner as to admit a full head of steam abruptly. The abrupt admission of steam results in jerking the cars which compose the train and frequently pulls out the draw-heads.

I also prefer to provide the bushing 5 with a fourth annular series of ports 25 of somewhat larger capacity than the ports 11 and which are past by the lower piston 13 when the throttle is open wide so as to increase the admission of steam into the chamber 4 through the lower end of the bushing 5.

It is evident that my improved throttle-valve is balanced as there is constant pressure against each piston and these pressures are exerted against each other. This greatly increases the ease of operation of the throttle-valve,

Under the present practice double seated valves are used in the valve chamber and when the boiler is washed out these valves are pulled out, and the valves and their seats are reground. In the case of my improved throttle-valve, all that is necessary is to disconnect the piston rod 14 from the bell-crank lever 22, pull out the twin pistons through the upper end of the bushing 5 and then, if necessary, replace the packing rings.

My improvement may be readily and inexpensively installed in standard throttle-valve chambers by fitting in the bushing 5 and the twin-pistons.

What I desire to claim is:—

1. In a locomotive throttle-valve structure, the combination of the valve chamber, a bushing in said chamber having its end portions in communication with the steam supply, the wall of said bushing near one end having full steam supply ports communicating with said chamber and near its other end with reduced steam supply ports also communicating with said chamber, and twin-pistons working in unison in said bushing and so disposed that as the throttle-valve is opened the reduced supply ports are first brought into operation.

2. In a locomotive throttle-valve structure, the combination of the valve chamber, a bushing in said chamber having its end portions in communication with the steam supply, the wall of said bushing near one end having full steam supply ports communicating with said chamber and near its other end with reduced steam supply ports also communicating with said chamber, twin-pistons working in unison in said bushing and so disposed that as the throttle-valve is opened the reduced supply ports are first brought into operation, and additional ports in the bushing wall and communicating with said chamber which are brought into operation by the further movement of the twin-pistons.

3. In a locomotive throttle-valve structure, the combination of the valve chamber, a bushing in said chamber having its end portions in communication with the steam supply, a series of ports adjacent to each end of the bushing and communicating with said chamber, one of said series having the greater capacity than the other series, a pair of pistons working in said bushing and one of the same controlling the supply of steam to each series of ports, and means for operating said pistons in unison, said pistons being relatively disposed to bring the ports of lesser capacity first into operation.

Signed at Pittsburgh, Pa., this 24th day of January, 1928.

GRIFFITH F. BLYSTON.