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C. E. KEMP.

OPERATING MECHANISM FOR CYLINDER RELIEF VALVES OF ENGINES.

(Application filed Mar. 17, 1900.)

(No Model.)

Fig. 1.

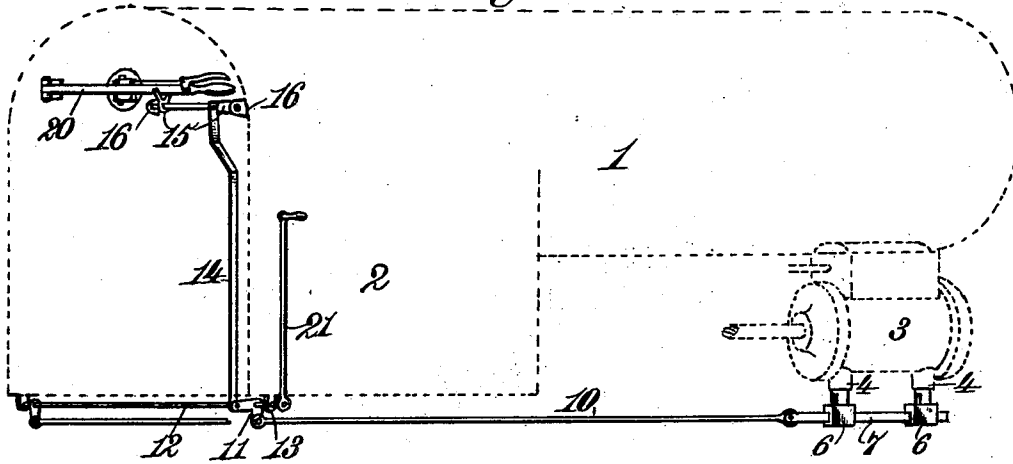


Fig. 2.

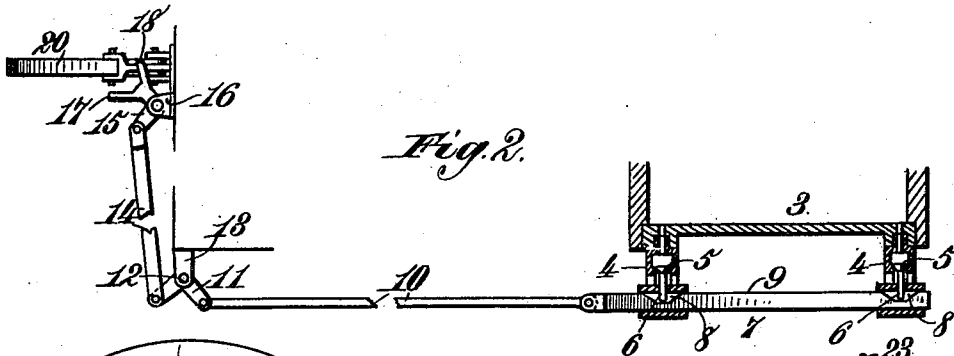


Fig. 3.

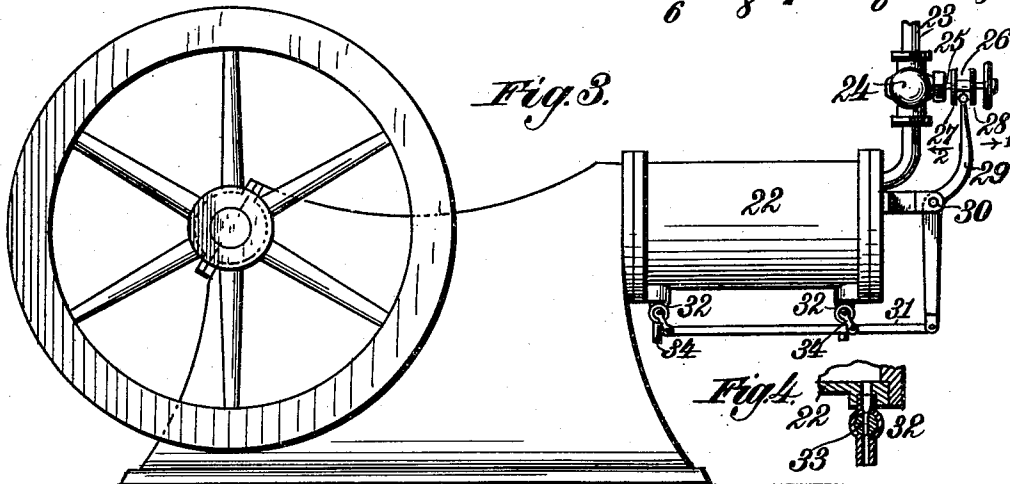


Fig. 4.

Witnesses.
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UNITED STATES PATENT OFFICE.

CHARLES E. KEMP, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-HALF
TO CLARENCE M. KEMP, OF SAME PLACE.

OPERATING MECHANISM FOR CYLINDER RELIEF-VALVES OF ENGINES.

SPECIFICATION forming part of Letters Patent No. 665,640, dated January 8, 1901.

Application filed March 17, 1900. Serial No. 9,012. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. KEMP, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Operating Mechanism for Cylinder Relief-Valves of Engines, of which the following is a specification.

This invention relates to means for automatically operating the drain-cocks of engines, and has for one object to provide means so arranged that when the throttle-valve of the engine is closed to shut off the steam from the cylinders the drain-cocks will be automatically opened and the water of condensation be drained or drawn off from the cylinder and, conversely, when the throttle-valve is opened to admit steam to the cylinders at a working pressure the drain-cocks will be automatically closed and prevent the escape of steam therethrough.

It has for a further object to provide in such an arrangement means whereby the throttle-valve in the initial portion of its opening movement will not close the drain-cocks, thus permitting the steam to assist the drainage of the water by blowing it out through the drain-cocks.

It has for its still further object to provide means whereby when the throttle is open to admit steam to the cylinders at a working pressure the drain-cocks may be opened by hand independently of the throttle-actuating mechanism.

To these several ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a perspective view of a locomotive type of engine, showing one form of mechanism for carrying out my invention. Fig. 2 is a detail view of the operative mechanism shown on a larger scale than in Fig. 1. Fig. 3 is a side elevation of an engine, showing another form of mechanism for carrying my invention into effect; and Fig. 4 is a detail view showing one of the drain-cock valves.

Heretofore it has been customary in engines of all kinds to provide drain-cocks for drain-

ing off the water of condensation from the engine cylinder or cylinders when the engine has been brought to a state of rest; but such drain-cocks had to be operated by hand. Frequently the engineer through inadvertence, forgetfulness, or carelessness neglects to open the drain-cocks and draw off the water from the engine cylinder or cylinders when the engine is stopped, thereby impairing the operation of the engine when it is again started up and in cold weather frequently causing the water to freeze in the cylinders. By means of my invention such results are entirely and effectually avoided, for when the steam is cut off from the engine cylinder or cylinders the drain-cocks are automatically opened and the water drawn off from the cylinder or cylinders.

For the sake of fully describing my invention I have shown the same applied to both a locomotive and a stationary engine; but it will be understood that it may be applied to every known type of steam engine or motor.

Referring to Fig. 1 of the drawings, wherein I have shown my invention applied to a locomotive type of engine, the numeral 1 indicates the boiler, 2 the fire-box or furnace, and 3 one of the engine-cylinders. Fitted in the under side of the opposite ends of the cylinder 3 are drain-cocks 4, which communicate with the interior of the cylinder and are normally closed by the valves 5, which seat by gravity, and by the pressure of the steam when the engine is running. Said drain-cocks and their valves are of ordinary and well-known construction and need not, therefore, be described in detail. Arranged to reciprocate in suitable bearings 6 is a duplex cam consisting of a bar 7, in the upper side of which are formed two inclined recesses 8. The stems of the valves 5 rest on the upper side of said bar, the arrangement being such that when the valve-stems rest in the inclined recesses the valves will drop by gravity to their seats and the drain-cocks will be closed; but when the valve-stems rest on the straight upper edge 9 of said bar the valves will be raised and the drain-cocks opened, thus permitting the water to drain off from the cylinder. Pivotally connected at one end to the bar or cam 7 is a connecting-rod 10, the other end of which is pivoted

to one end of a bell-crank 11, rigidly fixed on a rock-shaft 12, journaled in suitable bearings 13. The other end of said bell-crank is pivoted to one end of a link 14, the opposite end of which is pivoted to one arm of a bell-crank 15, journaled in a bracket 16. The other arm of said bell-crank is bifurcated or forked to form a yoke having two yoke-arms 17 and 18. The numeral 20 indicates the throttle-valve-operating lever, the said valve being of ordinary and well-known construction and not constituting a part of my invention is not illustrated herein. The outer or free end of the throttle-valve lever is adapted to rest between the yoke-arms 17 and 18 and is arranged to have a certain amount of play or lost motion between said yoke-arms for the purpose hereinafter explained.

Fixed on the rock-shaft 12 is a hand-lever 21, by means of which the drain-cocks may be operated by hand in the manner and for the purpose hereinafter described.

I have shown and described but one cylinder and its drain-cocks and mechanism for opening and closing the latter; but it will be understood that in this type of engine the arrangement of cylinder, drain-cocks, the connecting-rod 10, and the crank 11 will be duplicated on the other side of the engine, and both of said mechanisms will be operated from the single rock-shaft 12.

The operation of the device as above described is as follows: Let it be assumed that the throttle-valve lever has been pulled out and that the throttle-valve (not shown) is open, thus admitting steam to the cylinders and actuating the engine. All the various parts described will then be in the position shown in Fig. 2, the stems of valves 5 resting in the inclined recesses 8 of the bar or cam 7, whereby the valves are seated and the drain-cocks closed, thus preventing the escape of steam through the latter. If the throttle-valve lever 20 be pushed in to close the throttle-valve and cut off the steam from the cylinders, it will strike the yoke-arm 18 and oscillate the bell-crank 15, thus raising the link 14, oscillating the bell-crank 11, and giving a partial rotation to the rock-shaft 12. The latter in turn will draw the connecting-rods 10 rearward and with them the cam-bars 7. As the cam-bars are moved rearward the stems of the valves ride up the inclined faces of the recesses 8 onto the straight faces 9 of the cam-bars, whereby the valves 5 are lifted from their seats and the drain-cocks are opened and held open to permit the water to drain off from the cylinders. When the throttle-lever is again pulled out to open the throttle-valve to admit steam to the cylinders and start the engine, it should be pulled out slowly. During the initial movement of the throttle-valve lever the latter will have a certain amount of lost motion between the two yoke-arms 17 and 18 and will not move the bell-crank 15. Hence the drain-cocks will remain temporarily open, and the steam will forcibly

blow out any slight amount of water that may have failed to be completely drained off, and the cylinders will be warmed up. As the throttle-valve lever is pulled farther out to admit an effective pressure of steam to the cylinders it will engage the yoke-arm 17 and oscillate the bell-crank 15 and through the described mechanism will move the cam-bar into position to again allow the stems of the valves 5 to drop into the inclined recesses 8, thus closing the drain-cocks. As the throttle-valve lever is pulled out to throw open the throttle-valve it rides over and by the yoke-arm 17, and the hand-lever 21 may then be oscillated by hand to open and close the drain-cocks independently of the throttle-valve lever and drain off water that may have effected an entrance to the cylinders through the priming of the boiler or other causes. When the throttle-lever is again pushed in to close the throttle-valve, the said lever will engage the yoke-arm 18 and open the drain-cocks in the manner before described.

Referring to Fig. 3 of the drawings, wherein is shown a type of single-cylinder stationary engine, the numeral 22 indicates the cylinder, 23 the steam-feed pipe, and 24 the casing, in which is located the throttle-valve for controlling the admission of steam to the cylinder, all being of ordinary and well-known construction. The throttle-valve in the present instance is conventionally shown as being of the well-known compression type, and on its stem 25 is fixed a sleeve 26, provided at its opposite ends with flanges 27 and 28. Disposed between said flanges is the upper end of a lever 29, that is pivoted intermediate its ends to a fixed support 30, and to the lower end of said lever is pivotally connected one end of a connecting-rod 31. The numeral 32 indicates the drain-cocks communicating with the opposite ends of the cylinder, said drain-cocks being provided with rotary valves 33, of ordinary and well-known construction, and the stems of said valves have fixed thereon links 34, which are pivotally connected to the connecting-rod 31. In practice the flanges 27 and 28 on the sleeve 26 are arranged at such distance apart that the end of the lever 29 will have a certain amount of lost motion or play therein without being moved by said flanges as the throttle-valve is moved in and out. The operation of this arrangement of my invention is as follows: Let it be assumed that the throttle-valve is closed, shutting off the steam from the cylinder. The valves 33 will then be open, permitting the water to drain off from the cylinder through the drain-cocks. In starting up the engine the stem 25 of the throttle-valve is turned but slightly, thus admitting but a small volume of steam to the cylinder, which operates to blow out any water that may remain in the cylinder or the drain-cocks and also operates to warm up the cylinder, as the play or lost motion which the upper end of the lever 29 has between the flanges 27 and 28 of the sleeve 26

will permit said sleeve to move outward with the throttle-valve stem a certain distance without moving said lever, and hence without turning the drain-cock valves. As the valve-

5 stem is moved farther outward, however, to open the throttle-valve wider and admit an effective working pressure of steam to the cylinder the flange 27 will engage the upper end of the lever 29 and move it in the direction of the arrow 1, thus throwing the opposite end of said lever, and with it the connecting-rod 31, in the opposite direction and through the medium of the links 34 turning the valves 33 in a direction to close the drain-cocks 32. The drain-cocks will remain closed as long as the throttle-valve remains open; but when the throttle-valve stem is turned in the proper direction to close the throttle-valve and shut off the steam the flange 28 will engage the upper end of the lever 29 and move it in the direction of the arrow 2 and through the medium of the described connections will turn the valves 33 in a direction to open the drain-cocks and permit the water to drain off from the cylinder.

I have shown my invention embodied in two of its simplest forms; but I do not wish to be understood as confining myself to the mechanism shown and described for actuating the drain-cock valves, as other mechanism may be employed which will be actuated by the throttle-valve for opening and closing the drain-cocks. Neither do I wish it to be understood that I confine the invention to the two types of engines shown, as I purpose to apply it to every known type of steam-engine wherein its employment may prove useful or desirable.

Having described my invention, what I claim is—

1. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve lever, and means operated by the movement of said lever for automatically opening the drain-cocks when the throttle-valve is closed and for closing the drain-cocks when the throttle-valve is opened, substantially as described.

2. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve lever, and means positively operated by the movement of said lever for automatically controlling both the drain-cocks simultaneously, substantially as described.

3. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve-operating lever, means actuated by the said lever for automatically opening and closing the drain-cocks, and means for delaying the closing movement of the drain-cocks during the initial opening movement of the throttle-valve lever, substantially as described.

4. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve lever, means positively actuated by the movement of said lever for auto-

matically opening and closing the drain-cocks, and means for operating the drain-cocks by hand independently of the throttle-valve when the latter is open, substantially as described.

5. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve lever, means operated by the said lever for automatically opening and closing the drain-cocks, and means for establishing lost motion between the throttle-valve lever and the drain-cock-actuating mechanism during the initial opening movement of the throttle-valve lever, substantially as described and for the purpose specified.

6. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve-actuating mechanism, and lever connections between the valve-operating mechanism and the drain-cocks so constructed and arranged that when the throttle-valve-operating mechanism is actuated to open the throttle-valve the drain-cocks will be closed, and when the throttle-valve-operating mechanism is operated to close the throttle-valve the drain-cocks will be open, substantially as described.

7. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve-operating lever, a reciprocating bar having cam-faces arranged to engage the stems of the drain-cock valves, and mechanism operated by the throttle-valve lever for raising and lowering the drain-cock valves and thereby opening and closing the drain-cocks, substantially as described.

8. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve-operating lever, means for operating the drain-cocks, pivoted yoke-arms arranged to engage the opposite sides of said throttle-valve lever, and mechanism actuated by the oscillating movement of said yoke-arms for actuating the said drain-cock-operating means, substantially as described.

9. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve-operating lever, a reciprocating bar having cam-faces arranged to engage the stems of the drain-cock valves, pivoted yoke-arms arranged to engage the opposite sides of said throttle-valve lever, said lever having a limited play or lost motion between said yoke-arms, and mechanism actuated by the oscillating movement of said yoke-arms for reciprocating the said bar to raise and lower the drain-cock valves, substantially as described and for the purpose specified.

10. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve-operating lever, a reciprocating bar having cam-faces arranged to engage the stems of the drain-cock valves, pivoted yoke-arms arranged to engage the opposite sides of said throttle-valve lever, a rock-shaft, a crank on said rock-shaft, a rod connecting said crank to the reciprocating cam-

bar, and means actuated by the oscillating movement of the pivoted yoke-arms for rocking said rock-shaft, substantially as described.

11. In a steam-engine, the combination with
5 the engine-cylinders and their drain-cocks, of the throttle-valve-operating lever, reciprocating bars each having two inclined recesses formed in its upper edge adapted to be engaged by the stems of the drain-cock valves,
10 pivoted yoke-arms arranged to engage the opposite sides of said throttle-valve lever, a rock-shaft, cranks on said rock-shaft, rods connecting the cranks to the reciprocating bars, and means actuated by the oscillating
15 movement of the pivoted yoke-arms for rocking said rock-shaft, substantially as described.

12. In a steam-engine, the combination with the engine-cylinder and its drain-cock, of the throttle-valve-operating lever, a reciprocating
20 bar having two inclined recesses formed in its upper edge adapted to be engaged by the stems of the drain-cock valves, pivoted yoke-arms arranged to engage the opposite sides of said throttle-valve lever, said lever
25 having a limited play or lost motion between the yoke-arms, a rock-shaft, cranks on the rock-shaft, rods connecting said cranks with the reciprocating bars, means actuated by

the oscillating movement of the pivoted yoke-arms for rocking said rock-shaft, and a hand- 30 lever fixed on the rock-shaft, substantially as described and for the purpose specified.

13. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, and means for actuating the latter, of the throttle-valve lever, and mechanism lying in the
35 path of movement of said lever so as to be engaged and actuated by the opening and closing movement thereof, and a connection between said drain-cock-actuating means, and
40 said mechanism, substantially as described.

14. In a steam-engine, the combination with the engine-cylinder and its drain-cocks, of the throttle-valve lever, and means for positively actuating said drain-cocks by the move-
45 ment of said lever, a part of said means being arranged in the path of movement of the throttle-valve lever so as to be engaged and moved thereby, for the purpose specified.

In testimony whereof I have hereunto set 50 my hand in presence of two subscribing witnesses.

CHAS. E. KEMP.

Witnesses:

CLARENCE M. KEMP,
WM. H. VAN HORN.