

UNITED STATES PATENT OFFICE.

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IMPROVED DEVICE FOR OPERATING VALVES OF STEAM-ENGINES.

Specification forming part of Letters Patent No. 34,822, dated April 1, 1862.

To all whom it may concern:

Be it known that I, LEWIS EIKENBERRY, of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Mode of Operating Valves of Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section of the improvement. Fig. 2 is a side elevation of the same. Fig. 3 is an end view of the same. Figs. 4, 5, and 6 are modifications of the valve-mover. Figs. 7, 8, and 9 are sections showing different positions of the valve during the stroke of the piston. Figs. 10 and 11 are diagrams showing some good-proportioned valves for use with the valve-mover.

The nature of my invention consists in the combination, with the valve or valves of a steam-engine, of a valve-mover no part of which has a longitudinal motion, and which has but one axis and is of such configuration that the valves are moved by it in such manner that they remain still or have but a slight movement for a portion or the whole of the effective stroke of the piston after the steam has been admitted and cut off, and at the same time the exhaust at the opposite end of the cylinder remains open during any portion or the whole of the effective stroke of the piston, as circumstances may require.

The object of my invention is to work steam expansively to the best advantage.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation with reference to the drawings.

A represents the cylinder of an engine; B, the piston; C, the piston-rod; D, the connecting-rod; E, the main shaft; F, the crank; G, the slide-valve; H, the valve-rod thereof; I, the rock-shaft; J J', the arms thereof, the arm J being slotted; K, the connecting-rod of the valve-mover L, and M M the links which connect the governor N with the connecting-rod K.

The valve G is represented as made with its jaws so extended with reference to the ports of the cylinder that it serves for admitting, cutting off, and exhausting the steam;

but I do not limit myself to a single valve for performing said functions, as an ordinary valve with an independent exhaust may be so arranged and operated by my invention as to perform the results that a single valve of the construction represented will perform.

The valve-mover L is fitted fast on the main shaft and arranged to revolve in a yoke O on the end of the connecting-rod K, said yoke having a friction-roller *a* at its forward end and another *b* at its rear end for the operating portions of the valve-mover to play against. Any other construction of device from that of the yoke and friction-rollers may be employed, so long as a rear and front obstruction is presented by it to the revolution of the valve-mover.

The circumferential configuration of the valve-mover is represented in Figs. 1, 2, 3, 4, and 5. This configuration will be better understood and defined by a description of the operation of the valve-mover upon the yoke and through the yoke upon the valve, and therefore I will so proceed to describe it.

In Fig. 1 the valve is shown relatively to the ports of the cylinder as on the eve of admitting steam at the rear end of the cylinder, and the piston is at the rear end of the cylinder, and the crank is on a dead-point, and the rear port is closed and the front port open.

To move the valve from the position shown in Fig. 1 to the position shown in Fig. 7, so as to admit a full pressure of steam when the piston has made but a portion of its stroke, the valve-mover must be so shaped between the points *y*² and *w* as to impinge in a gradually-increasing manner on the friction-roller *b*. To move the valve back to the position shown in Fig. 8, so as to cut off the steam while the piston has yet made but a portion of its stroke, the valve-mover must be so shaped between the points *x* and *y*' as to act with a gradually-increasing impingement on the friction-roller *a* and then cease or nearly cease acting on the valve.

To maintain a quiet or nearly quiet state of the valve after the steam is cut off, so that the exhaust at the opposite end of the cylinder shall remain open during the remainder or a portion of the remainder of the effective stroke of the piston, as may be desired, the

valve-mover is shaped between the points y' and y^2 , so as not to impinge upon the yoke; but if it does impinge between these points its effect should be uniform and almost, if not quite, imperceptible. The impingement, however, at this stage must depend upon the necessities of the case, and therefore I do not limit myself to any precise form.

The remaining portion $c c c$ of the circumferential configuration of the valve-mover may be of such a character as to fill the space between the rollers a and b , and thus serve to prevent sudden concussion of the parts when the valve changes its motion; but as the portion $c c c$ is not depended upon for the production of the result I have accomplished it may be cut off, as indicated by the curved red line d in Fig. 4, if deemed desirable.

To close the exhaust at the rear end of the cylinder and open it at the front end thereof while a further rotation of the valve-mover is occurring, the valve-mover from the points y^2 to z must be shaped so as to impinge to the same or about the same extent on the friction-roller b as it does between the points z and w .

It is obvious that a continuation of the rotation of the valve-mover causes the valve to perform similar functions at the opposite end of the cylinder or on its return movement.

To make the valve-mover described capable of varying the point of cut-off relatively to the extent of the stroke of the piston, a movable piece P , Fig. 4, may be combined with it, so as to adjust the working portion between x and y' or y^2 of the circumferential configu-

ration of the valve-mover, so that it shall impinge on the obstructions at the ends of the yoke at a sooner or later period, accordingly as circumstances may require.

To make the valve-mover described capable of operating the valve so as to produce the same results as set forth, whether the engine is reversed or not, I make both half portions of the circumferential configuration exactly alike, as illustrated in Fig. 5.

Instead of using a valve-mover whose surface or circumferential configuration is such as shown, a cylinder with a cam-groove (see Fig. 6) of such form as will produce the specified movements of the valve might be used.

The gist of my invention lies in effecting a rest or a sufficiently slow movement of the valve after the steam is cut off, and at the same time keeping the exhaust at the opposite end of the cylinder open during any portion or the whole of the effective stroke of the piston by means substantially such as specified. Therefore, whether these results be accomplished with one or more valves, or with a combination of a slide-valve and an independent exhaust-valve, or with an oscillating valve or valves, my invention will not be departed from.

What I claim as my invention, and desire to secure by Letters Patent, is—

The devices, substantially as herein specified, for producing the results set forth.

LEWIS EIKENBERRY.

Witnesses:

ROBT. W. FENWICK,
DE WITT C. LAWRENCE.