

UNITED STATES PATENT OFFICE.

H. UHRY AND H. A. LUTTGENS, OF PATERSON, NEW JERSEY.

IMPROVEMENT IN OPERATING VALVES OF STEAM-ENGINES.

Specification forming part of Letters Patent No. 21,455, dated September 7, 1858.

To all whom it may concern:

Be it known that we, H. UHRY and H. A. LUTTGENS, of the city of Paterson, in the county of Passaic and State of New Jersey, have invented a new and Improved Mode of Operating the Valves of Steam-Engines; and we do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Figure VIII is a section and end elevation showing the eccentrics and the mechanism applied for moving the valve-rod. Fig. IX is a front elevation; Fig. X, a plan of the same; Fig. XI, an elevation of a modification of the same motion. Fig. XII is a separate end elevation of the rockers as connected with the ordinary link; Fig. XIII, a front elevation of the latter; Figs. XIV and XV, elevation and section of the cam drawn separately.

The same letters of reference refer to the same parts in all the figures.

The nature of our invention consists in operating a single slide-valve by one cam and two eccentrics, which are connected to a link and differential rocker.

The eccentric-rods are connected to the upper and lower part of a slotted arc called the "link," which is held in its position and vibrates upon a hanger supported by the end of a reversing-lever. The link is provided with a sliding block which is connected by a pin to a differential rocker or to a lever of the first or third degree, as occasion may require, having its fulcrum in the center of the above-named sliding block and operating either the valve-rod directly or connecting with the latter through the intervention of a common rocker, as now commonly used on locomotive-engines, the extremity of the differential rocker being operated by a cam-rod and the cam arranged upon the shaft with the eccentrics operating the link. It is found necessary for the proper adjustment of the forward motion to set the center line of the crank some fifteen degrees (more or less) in advance of the center line of the cam, a circumstance, however, which does not favor the back motion, which defect is overcome by making the cam to fit loose upon the shaft, its key fitting into a broad key-seat, wider than the key itself, cut into the circumference

of the shaft. The key is pressed by a spiral spring which is adjusted by a set-screw fitting into the hub of the cam. The back motion becomes sufficiently correct if the cam falls back in the reverse or back motion, so that its center line lies in one plane with the center line of the crank.

To enable others skilled in the art to make and use our invention, we will proceed to describe its construction and operation.

A represents the main axle or shaft of an engine.

S' is the crank fitted and keyed upon the end of the shaft.

B⁴ is a cam with three corners constructed to fill the yoke B⁵, which latter has facings of steel plates as wide as the cam itself and is connected top and bottom by screw-bolts, the upper one of which is supported by a hanger supported and secured to some part of the framing of the engine, allowing it to vibrate horizontally without materially changing its vertical position.

D and C are the forward and back eccentrics, which, with the cam B⁴, are fitted and secured to the shaft. The cam is either permanently fixed by a set-screw d⁶ or a key f⁶, or the key-seat upon the shaft is lengthened, as shown at f⁶, Fig. XIV, the key being pressed by the spiral spring e⁶ and set-screw d⁶. The center line of the crank in the direction of motion of the engine is set some fifteen degrees (more or less) in advance of the center line of the cam, and after the cam is fixed the lead of the valve is adjusted by the eccentrics without changing the position of the cam.

The ends of the eccentric-rods R'' and Q'' are connected to the link by pins, and the cam-rod P³ is connected in the same manner to the lower end of the differential rocker G, of which in this case the central joint m' is formed in connection with the lower arm of the rocker O, being secured together by a pin, while the upper arm of the differential rocker G is provided with a pin carrying the block g, which fits into and slides within the link E.

The lower arm of rocker O is slotted, as shown at c⁶, to give room for the vibrations of the bolt and nut m², securing the pin holding the block g to the extremity of the differential rocker G. If the latter should form a lever of the first degree, the slot within the

rocker O may be dispensed with and the lower rocker-arm made of the same shape as the upper arm. To the saddle *c* of the link E is secured by a pin the hanger *e*, the lower end *f* of which is carried by the reversing-lever H, being secured to it by a pin. The bearing of the reversing-shaft T is fitted to a part of the framing of the engine, and the upper end of the reversing-lever K is connected by a pin to the extremity of the reversing-rod M. The rocker O is fitted in a bearing secured to the engine-frame, and its upper end connects by a pin to the valve-rod end *p*.

The modification as represented in Fig. XI dispenses with the rocker O, and the motion is communicated directly to the valve-rod *p*. The connection *m*⁴ between the link and valve-rod is fitted on one end by a pin to the block *g* of the link E, and at the other end it is connected in the same manner to the valve-rod *p*, while it is itself supported by a hanger *m*³, the upper end of which is connected by a pin to some part of the framing of the engine. The pins and bearings of rockers are fitted to turn freely.

The operation is as follows: As with the common link-motion, the two eccentrics C D give motion to the extremities of the link E in opposite directions, only that the eccentrics are not set upon the shaft in advance to the amount of the entire lap and lead, as the cam provides for this requisite. The motion thus produced by the link in its different positions as adjusted by the hanger *e*, reversing-levers H K, and reversing-rod M is transmitted by the differential rocker G, the lower end of which is moved by the cam-rod P³. Thus the combined motion of the link E and cam-rod P³ operates either the valve-rod *p* directly, as shown in Fig. XI, or one end of a lever or rocker O, which communicates motion to the valve through valve-rod *p*. When the valve is worked with its largest throw, the block *g* being adjusted so as to work near the ends of the link E, the cam B⁴ affects the valve motion in a manner so as to decrease its throw; but when the link E is raised or lowered so as to

bring the block *g* nearer to the center of the link E, the same as with the common link, decreasing the motion of the valve, the effect of the cam motion is to increase the throw of the valve, which latter in that case acquires more fully in its movements the peculiarities of the cam motion, thus giving at the higher grades of expansion, as compared with the common link-motion, (both valve-gears giving the same amount of motion at their largest throw and an equal amount of cut-off at that point,) an average of near a double opening of the steam-port, a later opening of the communication of the steam-passage with the exhaust-port, and a considerable decrease of preadmission of lead. Where a larger opening of the steam-port is desirable, it may be obtained by slotting the lower end of the differential rocker G and providing it with a block, the same as the link. It is operated by the end of the cam-rod P³. It remains then by a mode of adjustment the same as that of the link E to raise the end of the cam-rod P³, while the block *g* within the link E is lowered or raised toward its center, and again to lower the former, while the block *g* within the link E is brought near the ends of the latter.

In the usual practice where the slide-valve is unbalanced it is found of advantage to provide the end of the differential rocker, instead of with a slot, with several holes by either of which the pin securing the end of the cam-rod P³ may be held, thus giving power of adjustment while the engine is at rest only.

We do not claim the connection of the differential rocker G with the link-motion or substitute, as this device is secured by us in a patent dated March 20, 1855; but

We claim—

The cam B⁴ or equivalent, in combination with the valve-gear adapted to operate a single slide-valve, substantially as described.

H. UHRY. [L. S.]

H. A. LUTTGENS. [L. S.]

Witnesses:

JOHN E. MANSON,
GEORGE BEESLEY.