W. Stephens,

Steam-Engine Valve-Gear.

No. 22,333. Patented Dec. 14, 1858.

Fig. 1.

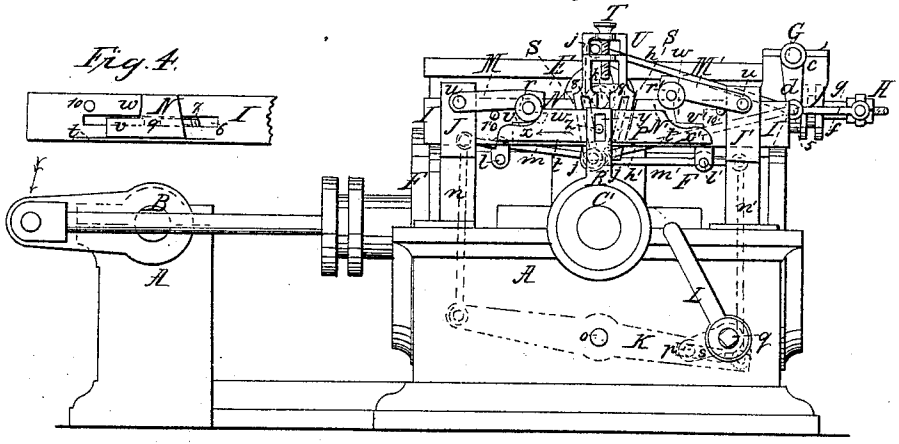


Fig. 4.

Fig. 3.

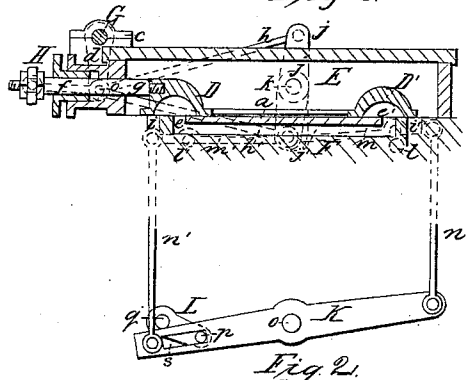
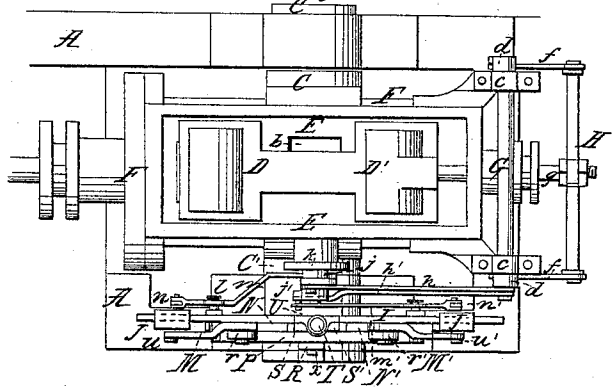


Fig. 2.



AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS.)

UNITED STATES PATENT OFFICE.

WM. STEPHENS, OF OLD FORGE, PENNSYLVANIA, ASSIGNOR TO RICHARD STEPHENS, OF SAME PLACE.

SLIDE-VALVE GEAR FOR OSCILLATING ENGINES.

Specification of Letters Patent No. 22,333, dated December 14, 1858.

To all whom it may concern:

Be it known that I, WILLIAM STEPHENS, of Old Forge, in the county of Luzerne and State of Pennsylvania, have invented a new and useful Improvement in Slide-Valve Gear for Oscillating 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 side elevation of a horizontal oscillating engine with my valve gear complete. Fig. 2, is a plan of the cylinder and valve gear of the same, the cover of the valve chest being omitted to show the valve. Fig. 3, is a central vertical section of the valve chest and valve taken looking in the opposite direction to Fig. 1. Fig. 4, is a side view, corresponding with Fig. 1, of part of the valve gear detached.

Similar letters of reference indicate corresponding parts in the several figures.

This invention consists in a certain combination of sliding bars, levers, stops and rods through whose agency the slide valve is caused to derive the necessary motion to effect the induction and eduction of steam to and from the cylinder.

It further consists in certain means of providing for the adjustment of certain of the aforesaid stops for the purpose of giving the valve more or less lead, as may be desired.

To enable others to make and use my invention I will proceed to describe its construction and operation.

A, is the bedplate of the engine containing or supporting the bearings for the crankshaft B, and the cylinder trunnions C, C.

F, is the cylinder having the valve chest E, on the top and the valve seat *a*, *a*, parallel with the bore of the cylinder and having the trunnions opposite the middle of its length.

D, D, are two connected slide valves of well known construction or may be considered as one double valve.

i, *i'*, are the induction ports and *e*, *e'*, the eduction ports.

b, is a passage always open for supplying the valve chest with steam from the trunnion C, with which the steam pipe is intended to connect.

The eduction ports *e*, *e'*, communicate with the trunnion C', with which the exhaust pipe is intended to connect.

G, is a rockshaft for operating the slide valve working above the cylinder in bearings *c*, *c*, attached to the cylinder near one end, said rockshaft carrying two arms *d*, *d*, which are connected by rods *f*, *f*, with a cross-head H, on the valve stem *g*. One of the arms *d*, *d*, of the rockshaft G, is connected at 5 by a rod *h*, with the upper arm of a two armed lever *j*, working loosely on a stud *k*, secured to the outside of the valve chest, and is connected at the same point by a rod *h'*, with a single armed lever *j'*, working on the same stud *k*. The axis of this stud occupies a position in a plane passing through the axis of the trunnions in a direction perpendicular to the axis of the cylinder.

I, is a straight bar of iron fitted to slide horizontally, or in a direction which is parallel with the axis of the cylinder when the engine is on its center, in two standards J, J', erected upon the bedplate A. This bar carried two studs *l*, *l'*, one of which is intended to be connected by a rod *m*, with the lower arm of the lever *j*, and the other by a rod *m'*, with the lever *j*, but only one stud is intended to be in connection at a time, *l'*, requiring to be in connection to work the engine in the direction of the arrow shown near the crank in Fig. 1 and *l*, to work in the opposite direction. To facilitate the connection and disconnection of their respective rods *m*, *m'*, with and from the said studs *l*, *l'*, the said rods are made with hooks or gabs as shown in Figs. 1 and 3, to take hold of the said studs; and to enable either rod to be connected and the other one disconnected simultaneously or by one movement of the valve gear—one is connected by a rod *n*, with one end and the other by a rod *n'*, with the opposite end of a lever K which is arranged on a fixed fulcrums *o*, below the cylinder trunnions, and the said lever is connected by a slot and pin connection *s*, *p*, with a hand lever L, which works on a fixed fulcrum *q*, outside the bed-plate and which when its handle is in an upright position holds both rods *m*, *m'*, out of connection and thus stops the operation of the engine but when moved to the

left as shown in Fig. 1, throws in the rod m', and when moved in the opposite direction throws in the rod m. N, N′, are two stop pieces attached to the sliding bar I, to operate in combination with two levers M, M′, attached by fulcrum pins u, u', to the standards J, J′, for the purpose of stopping the said bar as the cylinder oscillates and thereby causing the said stud l, or l' that is in connection to act through the rod m, or m', lever j or j', and rod h or h', on the arm d, of the rock-shaft to produce the necessary movement of the valve. The ends of the said levers carry antifriction rollers r, r', which rest on the curved wedge like extremities x, x' of a sliding bar P, which is caused to slide independently of the sliding bar I, on a ledge t, formed on the said bar I, by its (the said sliding bar P's) attachment by a slot and pin connection y, z, to an arm R, fast on the trunnion C′.

The levers M, M′, are caused by their own weight aided by the weight of their attached rollers r, r', to rest on the tops or lower ledges v, v', of the stop pieces N, N′, except while the said levers are in the act of rising and falling over the ends w, w', of the said stops, under the control of the antifriction rollers r, r', and the curved wedge like extremities x, x', of the sliding bar. The stop pieces N, N′, are not rigidly attached to the sliding bar I, but provided with projections g, fitted into slots 6 as shown in Fig. 4, to permit them to slide a short distance on the said bar, and they are capable of being adjusted nearer to or farther from each other by means of a double wedge S, S′, which is fitted between them and connected to them by a projection 7, on each stop piece and two slots 8, 8, in the wedge which slots have an inclination parallel with the two faces of the wedge. The wedge is adjusted higher or lower, to bring the stop pieces nearer together or farther apart by means of a screw T, which works in a female screw in the top of the wedge and twins in a fixed bearing in the top of a projection V, on the top of the sliding bar I. The adjustment of the stop pieces by the wedge S, S′, serves to vary the lead of the valve as will be hereinafter described. The bar I, is provided in addition to the adjustable stop pieces N, N′, with two stop pins or projections 10, 10′, firmly secured to it, said pins acting between the standards J, J′, to limit the sliding movement of the said bar.

To explain the operation of this valve gear; I will first suppose the engine in the condition and position represented in Figs. 1 and 2 that is to say with the stud l', in connection and the crank in the act of passing the left hand center in the direction of the arrow shown in Fig. 1. In Fig. 3, the position will appear at first sight to be the reverse but that is not the case, as that view is supposed to be seen looking in the opposite direction to Fig. 1. The oscillation of the cylinder acting through the valve rock-shaft, G, arm d, rod x', lever j', rod m', and stud l', is pressing the bar I, toward the left of Fig. 1 and pressing the face w of the stop piece N, against the end of the lever M, and causing the valve to move to the left of that figure or to the right of Fig. 3, and the valve gear being set to give a lead is causing the valve to have opened the port 2′, a short distance. The continued movement of the cylinder causes the aforesaid movement of the valve to be continued till the wedge-shaped extremity x, of the bar P,—which is moving to the left as indicated by the arrow upon it in Fig. 1—by its action on the roller r, lifts the lever M out of the way of the bar I, and leaves the latter free to be moved by its connections with the rockshaft H, without giving the valve any movement and the bar I thus carries the stop piece N′, to a position for the lever M′, which has been resting upon it as shown in Fig. 1, to drop over its face w'. This stoppage of the movement of the valve only lasts till the lever M′, has dropped as aforesaid and by that time the pin 10, comes into contact with the standard J, which, by stopping the movement of the bar I causes the valve to have a further movement to some extent. This latter movement, however is only to insure the valve always moving making its full stroke, as its stroke would become variable with variations of the lead were its movement derived entirely through the action of the adjustable stop pieces N, N′, on the levers M, M′. As the crank passes the position at right angles to the piston rod and the cylinder commences oscillating in the reverse direction, the bar I, is pressed toward the right of Fig. 1, so that the stop piece N′, is pressed against the lever M′ and the movement of the valve is thus reversed. This movement continues till the wedge like extremity x', of the sliding bar P, lifts the lever M′ out of the way of the stop piece N′, and permits the bar I, to move far enough for the lever M to drop in behind the stop piece M again and for the pin 10′, to come in contact with the standard J′, to stop the bar I, and complete the movement of the valve. It must be remembered however that the pins 10, 10′, are not intended to produce any considerable portion of the stroke of the valve but only to complete it, as before stated for it is desirable that the parts should be fully opened if possible by the action of the stop pieces N, N′, and levers M, M′, as their action on the valve takes place during a comparatively small portion of the revolution of the

engine and is completed early in the stroke of the piston.

When the lever L, is shifted to throw the rod m', out of connection with the stud l' and the rod m, into connection with the stud l, the action of the valve will be produced by the arm h, lever j, rod m, and stud l, and the motion of the engine will be the reverse. When one lever j, or j', is in connection and in operation the other oscillates on the fulcrum k, without any effect.

The lead of the valve is increased by forcing down the wedge S, S′, and thus forcing apart the stop pieces N, N′, and diminished by drawing up the wedge and thus drawing the said stop pieces nearer together as will be readily understood. Were it not for the desirableness of a provision for varying the lead of the valve, the stop pieces N, N′, might consist of fixed projections on the bar I, arranged to produce permanently any degree of lead and in that case the stops 10, 10′, would be unnecessary.

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

1. The combination of the two independently operating sliding bars I and P and the levers M, M′, the former sliding bar being connected with the valve rockshaft and furnished with fixed or adjustable stop pieces N, N′, and the latter being connected by an arm with the cylinder trunnion and the whole operating substantially as described to produce the motion of the valve or valves.

2. Combining the stop pieces N, N′, with the sliding bar I by fitting them to slide in slots 6, in the said bar and attaching them to a double slotted wedge S, S′, applied to the said bar substantially as described for the purpose of adjusting or varying the lead of the valve or valves.

WILLIAM STEPHENS.

Witnesses:
JOHN MERRITT,
WM. B. THOMPSON.