

(No Model.)

E. DUGAR.

VALVE GEAR FOR STEAM ENGINES.

No. 252,651.

Patented Jan. 24, 1882.

Fig:1.

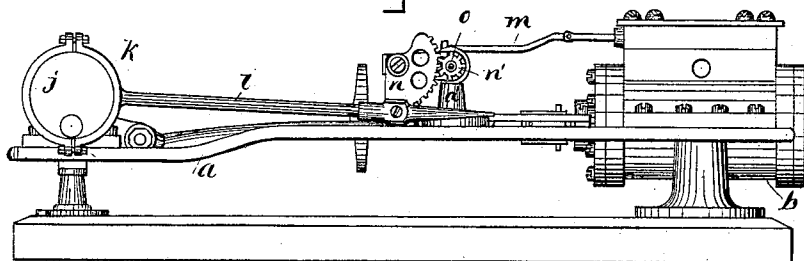


Fig:2.

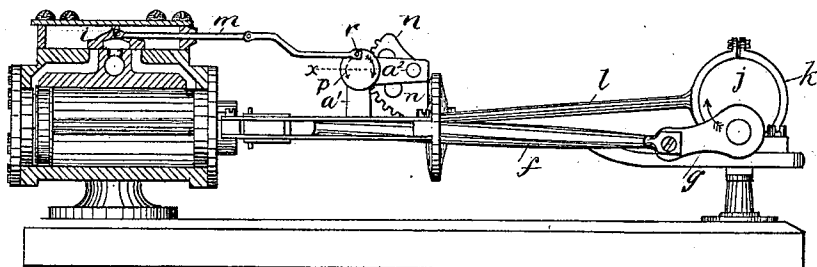
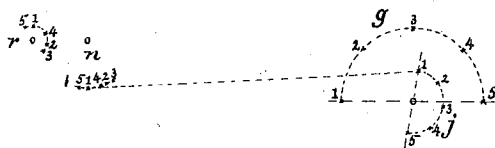
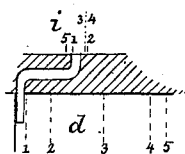


Fig:3.



WITNESSES-

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VALVE-GEAR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 252,651, dated January 24, 1882.

Application filed November 23, 1881. (No model.)

To all whom it may concern :

Be it known that I, EDELBERT DUGAR, of Somerville, county of Middlesex, State of Massachusetts, have invented an Improvement in
5 Valve-Gear for Steam-Engines, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to a valve-gear for steam-engines; and has for its object to cause
10 the valve to be opened more rapidly with relation to the movement of the piston than is the case with the valve-gears now commonly in use.

The invention is shown embodied in an engine provided with an ordinary slide valve; and it consists essentially in the employment of multiplying gearing between the valve-operating crank or eccentric and the valve-stem, so arranged that when the said eccentric is
20 having its most rapid effective movement, as when the piston is near the end of its stroke, the movement of the valve is still more rapid, it opening the port very quickly, while in the further movement of the said eccentric the valve
25 has no further effective movement relative to the port until the piston nearly reaches the end of its stroke, when the valve is again quickly thrown across its seat, closing one part and opening the other. As herein shown, the valve-stem
30 is connected to a wrist-pin mounted on a rocking shaft, provided with a pinion meshing with a segmental gear of larger diameter connected with and oscillated by the eccentric-rod, the said gear and pinion being so proportioned that the latter and the wrist-pin connected with the valve-stem oscillate back and forth for about three-quarters of a revolution, passing and repassing the dead-center relative to the valve-stem at the end of each oscillation, it then producing no effective movement
40 of the valve, which is thrown across its seat in the movement of the said wrist-pin between the said dead-centers. The time occupied by the entire oscillation of the wrist-pin is the same as that occupied in ordinary valve-gears
45 by the valve in shifting from one to the other position, while in the present arrangement the said valve is shifted by about one-third of the said oscillating movement, the said shifting
50 taking place at the most rapid portion of the said movement, so that the rapidity of the effective movement of the valve relative to the

stroke of the piston is greatly increased and wire-drawing of the steam at the first part of the stroke is wholly obviated.

Figure 1 is a side elevation of a steam-engine provided with my invention; Fig. 2, an elevation thereof viewed from the other side, the cylinder and steam-chest being in vertical section; and Fig. 3, a diagram showing the
60 relative positions of the parts at different points in the stroke of the piston.

The main frame-work *a*, cylinder *b*, and steam-chest *c*, the piston *d*, piston-rod *e*, connecting-rod *f*, and crank *g* upon the main shaft *h* may
65 be of any usual construction, the said steam-chest being shown as provided with the usual live-steam ports leading to either end of the cylinder, and an exhaust-port between them, controlled by a slide-valve, *i*, such as commonly used.

The main shaft *h* is provided with a valve-operating eccentric, *j*, having the usual eccentric-strap *k* and rod *l*; but instead of connecting the said rod with the valve-stem directly,
75 or through the intervention of a simple lever, the said rod is connected with a segmental gear, *n*, mounted upon an arm, *a'*, of a bracket, *a'*, on the frame *a*, which meshes with a pinion, *n'*, on a shaft, *o*, mounted on the bracket *a'*,
80 and provided with a wrist-plate, *p*, having a wrist-pin, *r*, connected with the valve-steam *m* in any usual manner.

It will be readily understood that the segmental gear *n* will be oscillated backward and
85 forward by the eccentric *j*, its movements being in precisely the same relation to those of the piston *d* in its stroke as those of the ordinary slide-valve when having direct connection with the eccentric, which is mounted with its throw
90 in such relation to the crank *g* that the eccentric produces the most rapid movement of the gear *n* while the crank *g* is passing the dead-center, the piston *d* being at the end of its stroke and almost stationary in the position
95 shown in Figs. 1 and 2. The pinion *n'* is so proportioned relative to the gear *n* that in the oscillating movement of the said gear the wrist-plate *p* rotates backward and forward for considerably over half a revolution, the movement
100 of the wrist-pin *r* being that shown by the dotted arc, Fig. 2, limited by the arrow-heads shown at the ends of the said arc. All that portion of the movement of the wrist-pin *r* over the

half-revolution, or that shown below the horizontal dotted line x , Fig. 2, produces no effective movement of the valve relative to that part, the edge of the valve thus lying wholly beyond the port-opening, and it is not until after the wrist-pin has moved an equal distance above the said line x that the edge of the valve reaches the edge of the port-opening and begins to travel over it, the whole effective movement of the valve being made while the wrist-pin r is traveling from a point above the line x on the one side to a corresponding point above the line x on the other side of the wrist-plate, it being shown in Fig. 2 at the middle of its effective movement.

In the diagram, Fig. 3, the arc g represents the path of the crank-pin during one stroke of the piston, the said arc being divided into four equal parts, the points of division being marked 1 to 5, respectively. The arc j represents the path of the center of the eccentric, it being divided and marked to correspond with the arc g .

The numbered points at n represent the positions assumed by the pivotal connection of the eccentric-rod l with the gear n , and the arc at r represents the corresponding position of the wrist-pin r , while the positions of the edge of the valve and piston are marked off at i and d .

It will be seen, referring to the diagram, that in the first quarter of the movement of the crank—viz., from 1 to 2—the valve is wholly opened and carried beyond the port-opening, which was in reality fully opened during about the first half of the movement from 1 to 2; that in the next two fourths of the movement of the crank—viz., from 2 to 4—the valve merely plays back and forth slightly upon its seat, without, however, at all covering the port-opening or affecting the flow of steam therethrough, and that during the last fourth of the revolution, or from 4 to 5, the valve wholly closes the port that has been receiving steam and opens the port leading to the other end of the cylinder.

It will be seen that the points 3 4 of the position of the valve coincide, or, in other words, while the crank is passing from 2 to 4 the valve moves back a little toward 1 to the point marked 3, then forward again as far as 2, when it begins its continuous backward movement through 4 to 5. In other words, the con-

tinuous movement of the valve from one to the other extreme position, instead of occupying the time of a whole stroke of the piston, as is usually the case, only occupies the time of a portion of the said stroke.

It will be understood that the movement of the valve across its seat in controlling the ports is more rapid relative to the movement of the piston than in the ordinary gearing, where there is a direct connection from valve to its eccentric in the ratio of the gear n to the pinion n' , and that the valve is open to its fullest extent almost at the very beginning of the stroke of the piston, so that the falling of the pressure of the steam in the cylinder during the first part of the stroke by wire-drawing between the edge of the port and that of the valve—a thing which has proved a serious detriment to engines of certain classes using the ordinary gearing—is wholly obviated.

I claim—

1. In a valve-gear for steam-engines, the valve and its stem and actuating eccentric, combined with multiplying connecting mechanism between the said eccentric and valve-stem, arranged as described, whereby the effective movement of the valve across its seat is more rapid than that derived directly from the eccentric, and the valve has no effective movement during a portion of the movement of the said eccentric, substantially as and for the purpose set forth.

2. The combination of the eccentric and rod and gear connected therewith, to be oscillated thereby, with the pinion and wrist-pin and valve-stem connected therewith, the said pinion and gear being properly proportioned to cause the wrist-pin to oscillate in an arc greater than half a circle, whereby the movement of the valve from one to the other extreme position occupies less time than the stroke of the piston, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDELBERT DUGAR.

Witnesses:

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W. H. SIGSTON.