(No Model.)

T. DELVILLE.

VALVE GEAR.

No. 574,400. Patented Jan. 5, 1897.

Fig. 1.

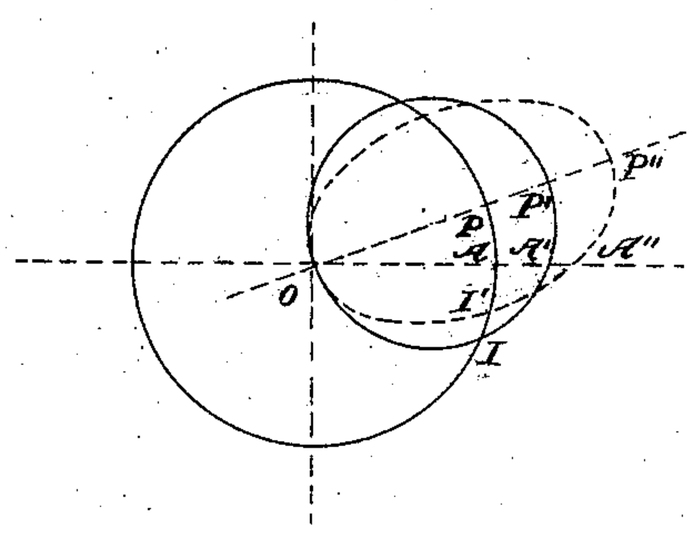


Fig. 2.

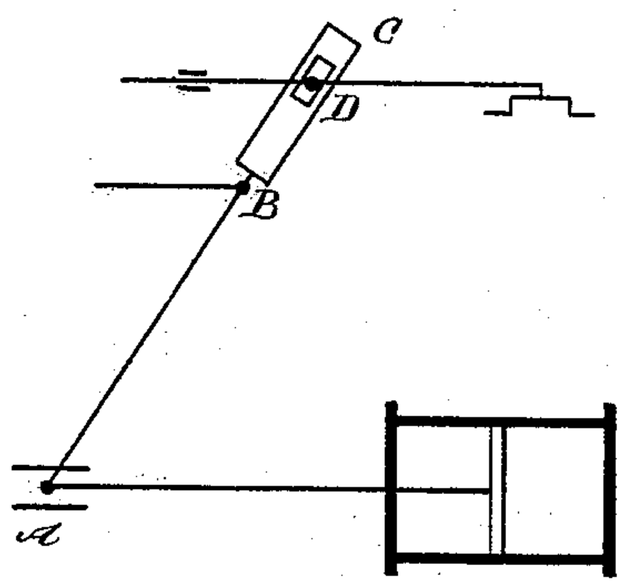


Fig. 4.

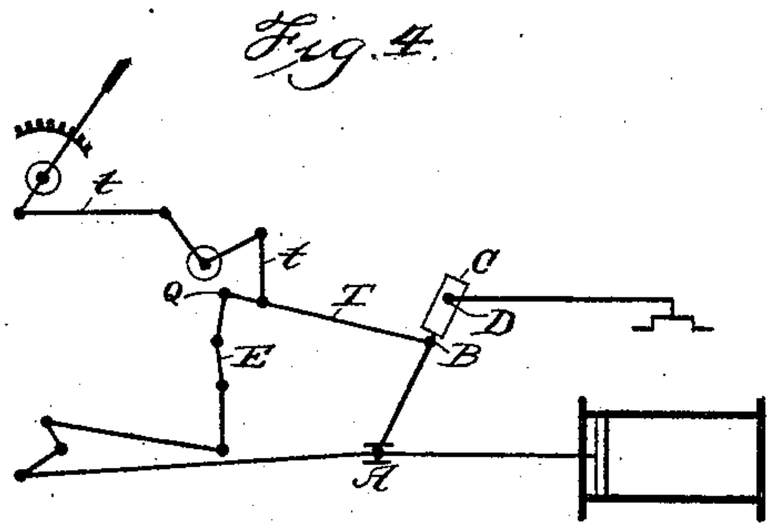


Fig. 5.

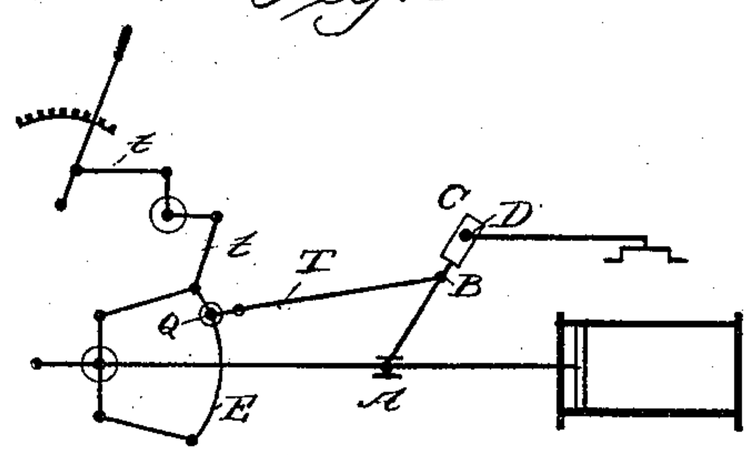


Fig. 3.

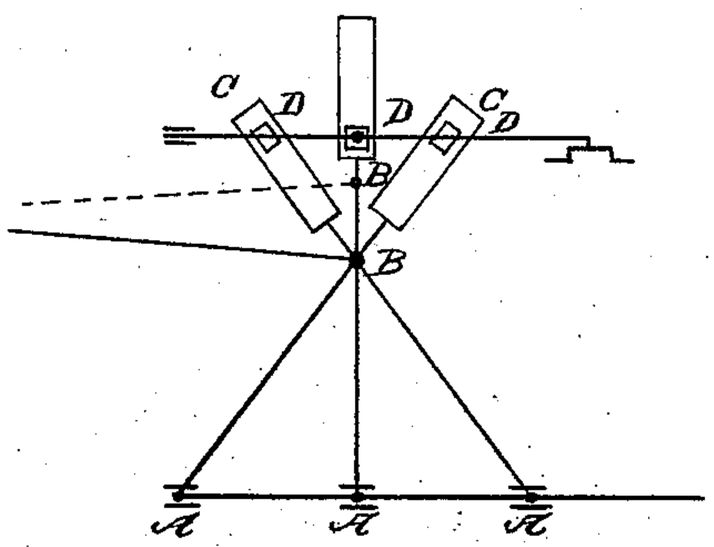
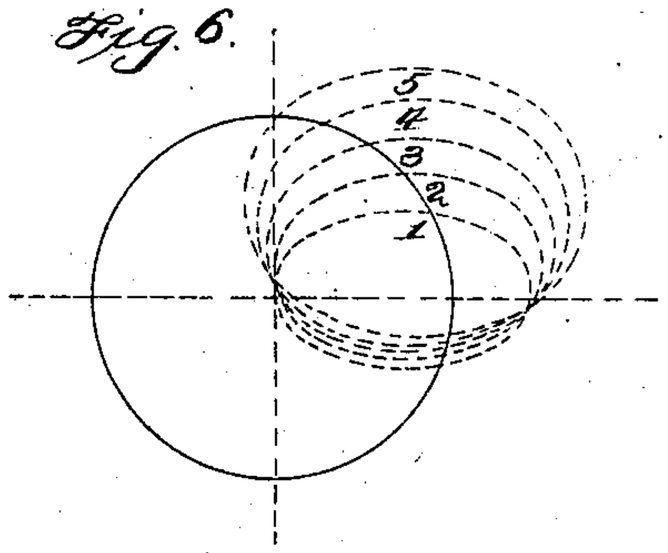


Fig. 6.



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UNITED STATES PATENT OFFICE.

TROPHIME DELVILLE, OF BRUSSELS, BELGIUM.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 574,400, dated January 5, 1897.

Application filed October 24, 1893. Serial No. 489,062. (No model.) Patented in Belgium April 26, 1892, No. 99,442; in Germany July 22, 1892, No. 5,285; in France October 24, 1892, No. 225,149, and in England May 26, 1893, No. 10,388.

To all whom it may concern:

Be it known that I, TROPHIME DELVILLE, engineer, a subject of the King of Belgium, residing at Brussels, Belgium, have invented new and useful Improvements Connected with the Valve-Gear of Steam-Engines, (for which patents have been obtained in Belgium April 26, 1892, No. 99,442; in Germany July 22, 1892, No. D 5,285; in France October 24, 1892, No. 225,149, and in Great Britain May 26, 1893, No. 10,388,) of which the following is a full, clear, and exact description.

This invention has for its object to enable the admission of steam to and the discharge of the same from the cylinders of steam-engines having distributing slide-gear to take place as easily as possible, in order to avoid the resulting over or back pressure, which is opposed to the advantageous utilization of the steam, such back pressure being an unavoidable drawback in the lead imparted to a slide-valve by means of a suitable connection with the eccentric.

This invention has for its object to provide an arrangement for operating the free-running slide-valve in such a way that thereby, first, a very large opening of the inlet and outlet passages is brought about; secondly, a large linear lead of the inlet and outlet, and, thirdly, however, only a small angular lead for the inlet and outlet.

In order that my invention may be fully understood, I will proceed to describe the same with reference to the accompanying drawings, in which—

Figure 1 is a view graphically representing the course of the sliding block which is connected to the stem of the slide-valve. Figs. 2 and 3 are views showing the simplest arrangement of the levers for producing the desired results. Figs. 4 and 5 are modifications of the arrangement of the levers, and Fig. 6 is a diagrammatic view showing the various courses of the lead-lever.

In order to graphically represent the course of the slide-valves suitable for producing the desired action, the Zeuner's circular polar diagram must be drawn as an extended, flattened, or oval curve, as shown in Fig. 1 of the accompanying drawings, and it then appears from the comparison of the figures that in the case of the dotted curve the maximum opening of the inlet-passages P P″ is considerably greater than that produced by means of the circular course P P′, that the linear lead to the inlet A A″ is much greater than A A′, but that the angular lead A I′ is considerably smaller than A I, from which the conclusion is drawn that in the dotted oval course of the slide-valve the commencement of the inlet, which in the circular diagram with the same maximum openings takes place too soon, is suitably delayed. In order, then, to carry out this movement of the slide-valves theoretically exactly, that is to say, to suitably accelerate or retard toward both sides the stroke of the valve, and that in a suitable proportion for producing an even piston speed, in other words, to describe the theoretically correct line of curve corresponding to the desired object, the slide-valve operated from the eccentric must be influenced in such a way that it only has the normal speed at the moment when it is in a middle position, and from this moment, however, must be progressively accelerated toward both sides in order to again resume the middle position with an equal progressive retardation, so that at each stroke of the piston the slide makes one half of its course with a progressive retardation and the other half of its course with a progressive acceleration. If these alterations of speed are to take place by means of lever transmission in an exactly correct progression to the even strokes of the piston, there is only one possible mode of connecting the lead-lever with the remaining parts of the engine in order to produce an absolutely correct maintenance of the proportions, and this is characterized by one end of the lever making a straight back-and-forward movement corresponding to the piston-stroke, while the other end appears as a longer or shorter lever-arm opposite the point of engagement of the slide-rod, according to the position of the slide, for which purpose the point of engagement of the eccentric-rod which operates the lever must always lie between the point of engagement of the slide-rods and the straight end of the lever. These indispensable conditions for producing the desired result are obtained in the simplest manner by the arrangement of lead-levers

shown as a sketch in Figs. 2 and 3. In these the lower end A of the lever is compulsorily moved backward and forward in a straight line, like the piston, by being connected with a cross-head, while the lever oscillates on the point of engagement B of the eccentric-rod and ends above as a suitably-formed connecting-link C, which embraces the slide-block D, attached to the straight slide-rod, so that then at each to-and-fro movement of the lever-arm B, D is shortened or lengthened in alternate progression in proportion to the movement of the piston, and thus the slide-valve undergoes in its course the above-named retardation or acceleration. These progressive proportions of lead can, however, only be correctly maintained, in other words, the pure oval dotted course describing this travel of the slide-valve can only be obtained, by the alterations of the proportions of the lead-lever being made to exactly correspond to the length of stroke of the piston. If, in fact, the course of the lower lever were shorter than the stroke of the piston, or even equal to zero, the acceleration, and consequently also the proportion of lead, would also be less, while the same would also be diminished to the same extent if the duration of the course were longer, as, for instance, would be the case if the lower end of the lead-lever moved from one point to another on a curved instead of a straight line, so the necessary increase of the levers B D in both cases would no longer take place in correct proportion to the position of the piston, whereby the slide-diagram would then undergo inflections, and thus the theoretic transformation of the circular track of the Zeuner polar diagram become an extended curve of pure regular course, that is to say, the solution of the problem is excluded. This extremely simple mode of construction also allows of the further arrangements usual in slide-valves for varying the degree of filling, &c., being used. Thus, for instance, the point B, instead of being directly influenced from the eccentric-rod, may be connected with a rod attached to the slide-block of an ordinary connecting-link arrangement, Figs. 4 and 5, and it suffices, in order to alter the degree of filling, to operate the so-called "reversing-lever" by hand or by means of a regulator. In these figures, T is the traction-rod; E, the slide Stephenson link; Q, the block, and *t t* the system of levers for the displacement of the link in one way or the other, the lever B being marked with the same letter as in Figs. 2 and 3. According to the displacement which the operator transfers to the link E by the levers *t t* the block Q will go forward and backward, and will consequently displace the point of conversion B of the advance lever, and with it the slide, as in ordinary slide-valves, so that the admissions of steam are also larger or smaller in proportion to these changing positions.

In non-reversing machines the connecting-link only requires to be half the length, and the suitable oval diagrams shown in Fig. 6 are obtained for the various positions of the distribution of expansion-lever, the largest of these ovals corresponding to the maximum filling and the smaller to the maximum expansion.

I claim--

1. In combination with a valve-gear of a steam-engine, a lever connected at its lower end with the piston-rod, pivoted at an intermediate point to the eccentric-rod and having its upper free end suitably connected to the valve-rod, substantially in the manner herein explained.

2. In combination with the valve-gear of a steam-engine, a lever establishing controlling communication between the eccentric-rod and valve-rod, and having connection with the latter which permits the relative movement between them in a direction transverse to the valve-rod, and means for sliding the lever transversely of the valve-rod in opposite directions simultaneously with the stroke of the latter and thereby varying the amplitude of the movement imparted to the same at opposite ends of its throw, substantially as herein described.

TROPHIME DELVILLE.

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