(No Model.) 2 Sheets—Sheet 1.

H. LECOUTEUX & E. GARNIER.

STEAM ENGINE.

No. 382,479. Patented May 8, 1888.

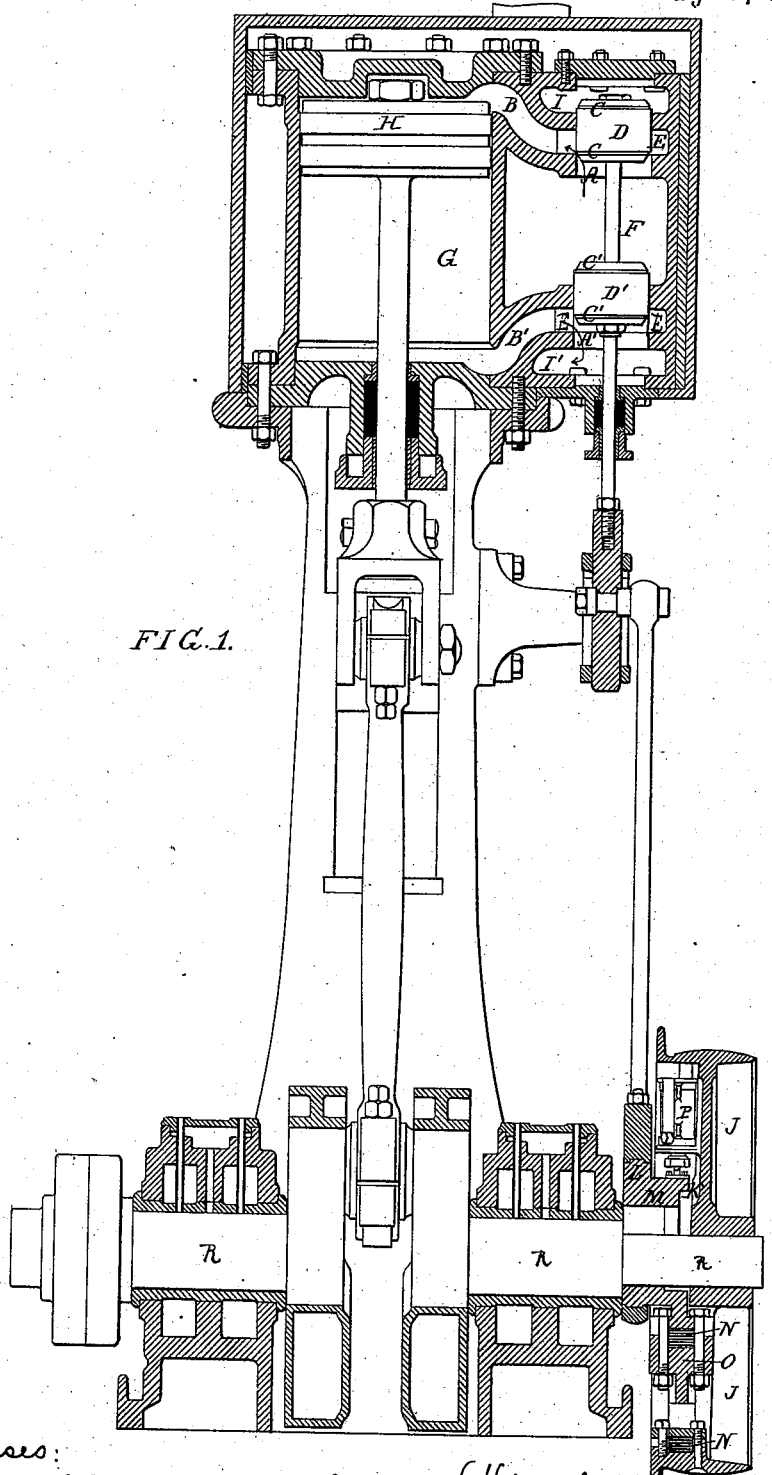

FIG. 1.

Witnesses:
James F Johns
John M. Clayton

Inventors: Hippolyte Lecouteux and Emile Garnier. by their Attys. Howson & Howson

(No Model.) 2 Sheets—Sheet 2.

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STEAM ENGINE.

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FIG. 2.

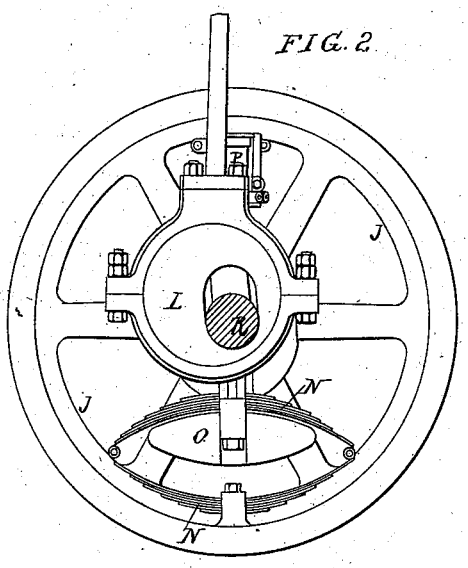


FIG. 3.

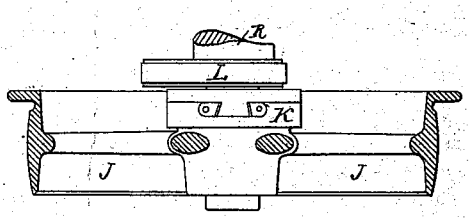


FIG. 4

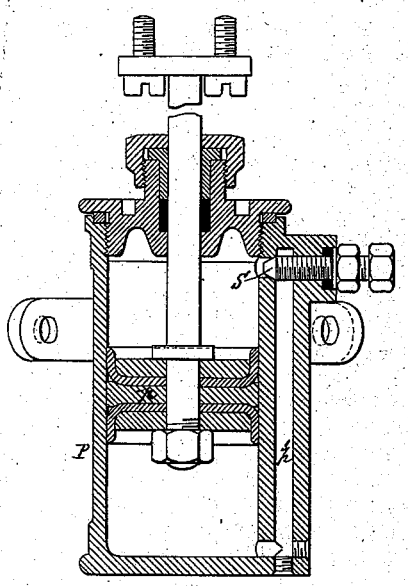
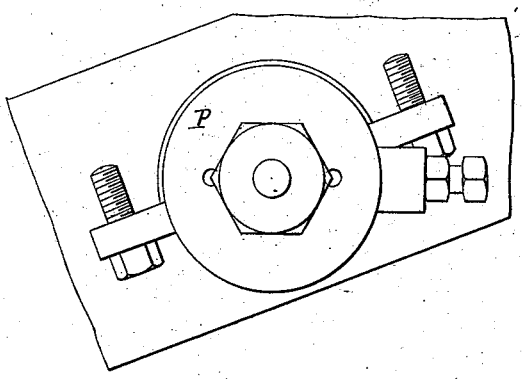


FIG. 5.



Witnesses:
James F. Jobin
John M. Clayton

Inventors.
Hippolyte Lecouteux.
and
Emile Garnier.
by their Attys.
Howson and Sons

UNITED STATES PATENT OFFICE.

HIPPOLYTE LECOUTEUX AND EMILE GARNIER, OF PARIS, FRANCE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 382,479, dated May 8, 1888.

Application filed July 21, 1884. Serial No. 138,323. (No model.) Patented in France January 10, 1884, No. 159,640; in Belgium November 13, 1884, No. 66,872; in England November 15, 1884, No. 15,079, and in Germany November 29, 1884, No. 32,330.

To all whom it may concern:

Be it known that we, HIPPOLYTE LECOUTEUX and EMILE GARNIER, both engineers, of Paris, in the Republic of France, have invented Improvements in Steam-Engines, (for which French patent, No. 159,640, dated January 10, 1884; Belgian patent, No. 66,872, dated November 13, 1884; British patent, No. 15,079, dated November 15, 1884, and German patent, No. 32,330, dated November 29, 1884, have been obtained,) of which the following is a specification.

Our invention consists of certain improvements in the construction of fly-wheel governors for steam-engines, the object of our invention being to provide a governor of this character which will be both effective in operation, direct in its action, and durable in its construction. This object we attain in the manner which we will now proceed to describe.

In the accompanying drawings, Figure 1 is a vertical section of an upright steam-engine provided with our improvements. Fig. 2 is a section through the crank-shaft and showing the fly-wheel and governing devices in elevation. Fig. 3 is a sectional view through the fly-wheel. Fig. 4 is a sectional view drawn to an enlarged scale of the dash-pot, and Fig. 5 is a plan view of the same.

Our improved fly-wheel governor may be applied to various constructions of steam-engines; but in Fig. 1 we have illustrated a form of engine to which it is especially adapted, and which has a construction of valve we prefer to use on the steam-cylinder G in connection with the governing devices. The valve-box is composed of a cylindrical part, A, communicating with steam-ports B B′, leading to the cylinder G, and the valve itself is composed of two pistons, C C′, each of which is provided with a single packing-ring, D D′, of suitable length to insure the proper closing of the ports. In order to insure the efficient action of the slide-valve, bars or webs E are carried across from one edge to the other of the ports or orifices B B′ and guide the piston-valve rings throughout the whole of their stroke. The steam enters the chamber F and passes alternately through the ports B B′ into the cylinder G, where it acts upon the piston H. The steam leaves the cylinder through the same ports B B′ and is discharged through passages I I′ at each end of the cylinder.

The valves C C′ are controlled in their movement by the eccentric L on the crank-shaft R of the engine. On the end of this shaft is keyed the pulley, drum, or fly-wheel J, the hub or boss of which is provided on the side toward the engine with a plate, K, Figs. 2 and 3, having a dovetailed groove or slot for the reception and guidance of a projection, M, on the adjustable eccentric L. Opposite the groove K and inside the periphery of the pulley there is provided an elliptic or blade spring N, connected on the one hand to the periphery of the wheel and on the other hand to the adjustable eccentric L. Between the blade of this spring and on the side nearest to the eccentric is placed a measured weight, O, rigidly attached to that part of the spring N. The tension of the spring is regulated according to the force it is required to exert.

When the engine is started, it immediately acquires a certain velocity, which goes on increasing until the centrifugal force acting on the weight O equals the resistance of the spring N. Any further increase of speed compresses the spring N and causes the eccentric to slide along the groove or slot in the plate K. The eccentric being thus shifted by the action of the centrifugal force acting on the weight O, the length of stroke of the valve is shortened as well as the duration of the period of admission, and at the same time the period of compression is increased. The apparatus is so arranged that the angle of the eccentric with the crank is changed at the same time as the stroke in such a manner that the lead for admission is constant and does not alter. It is thus rendered possible for the engine to pass from the maximum to the minimum introduction with the smallest required difference in the number of revolutions performed in a given time.

The weight O acts directly upon the eccentric L without the intervention of any intermediate device, and it will be understood that the force exerted will be considerable, as it is dependent entirely on the amount of the weight O and the strength or dimensions of the spring N. The amount of this weight and the tension

of the spring are in direct relation with one another and are regulated and balanced according to the rate of speed at which the engine is intended to work.

We combine with the adjustable eccentric a dash-pot, to prevent the too sudden movement thereof. The dash-pot cylinder has a passage, *p'*, connecting the opposite ends, and a regulating screw-plug, *s*, to regulate the size of the opening for the passage of the fluid when the piston *p* moves in the cylinder. The piston is preferably connected to the eccentric and the cylinder to the wheel; but this arrangement may be reversed.

We claim as our invention—

The combination of the crank-shaft, fly-wheel, and eccentric free to move transversely across the fly-wheel, with a spring, N, secured at one end directly to the wheel and at the other to the eccentric, and a weight also secured to the eccentric, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HIPPOLYTE LECOUTEUX.
EMILE GARNIER.

Witnesses:
ALFRED COINY,
ROBT. M. HOOPER.