

H.O. Lathrop Steam Engine

No. 75034

Patented Mar. 3. 1868

Fig. 2.

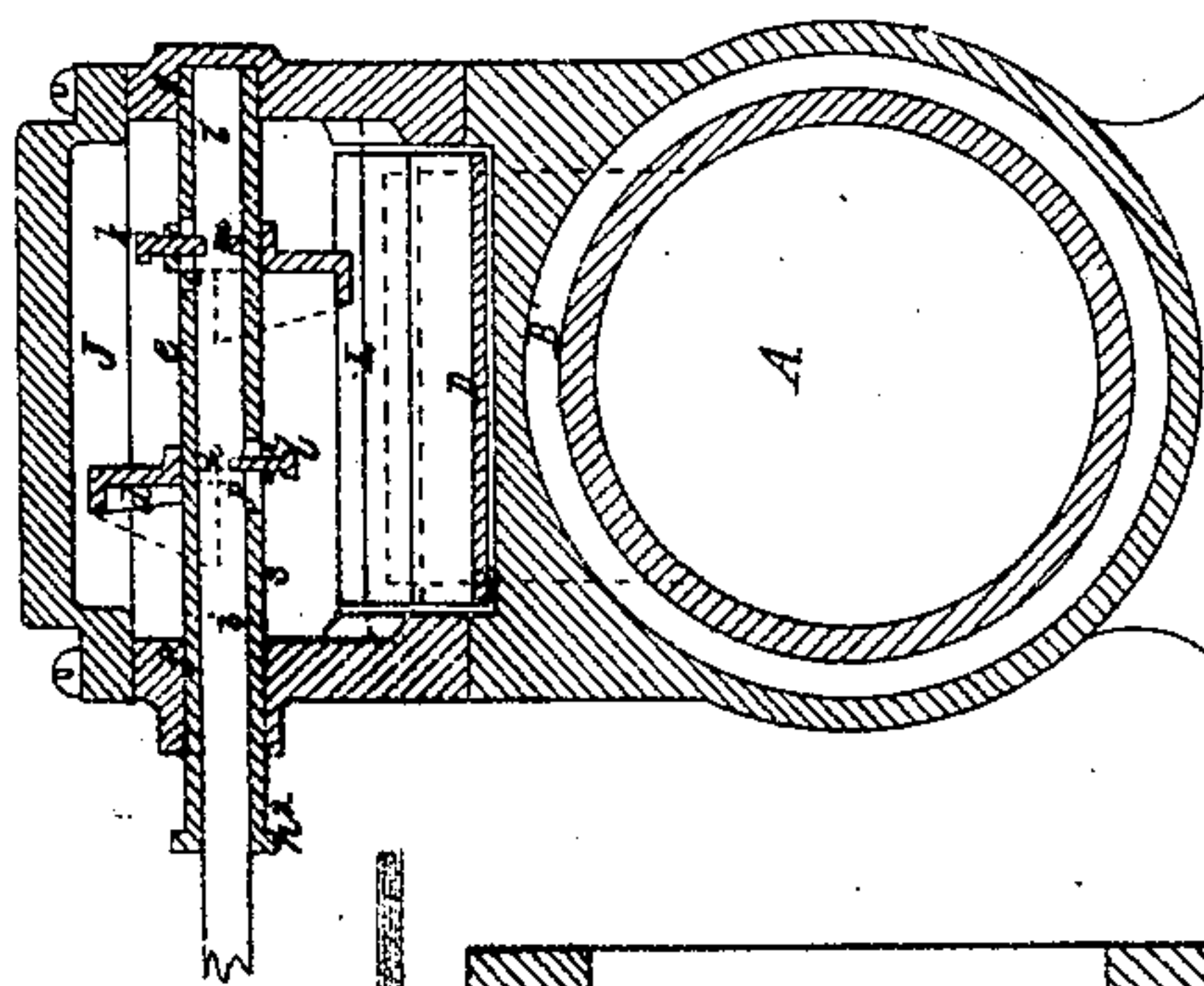


Fig. 1.

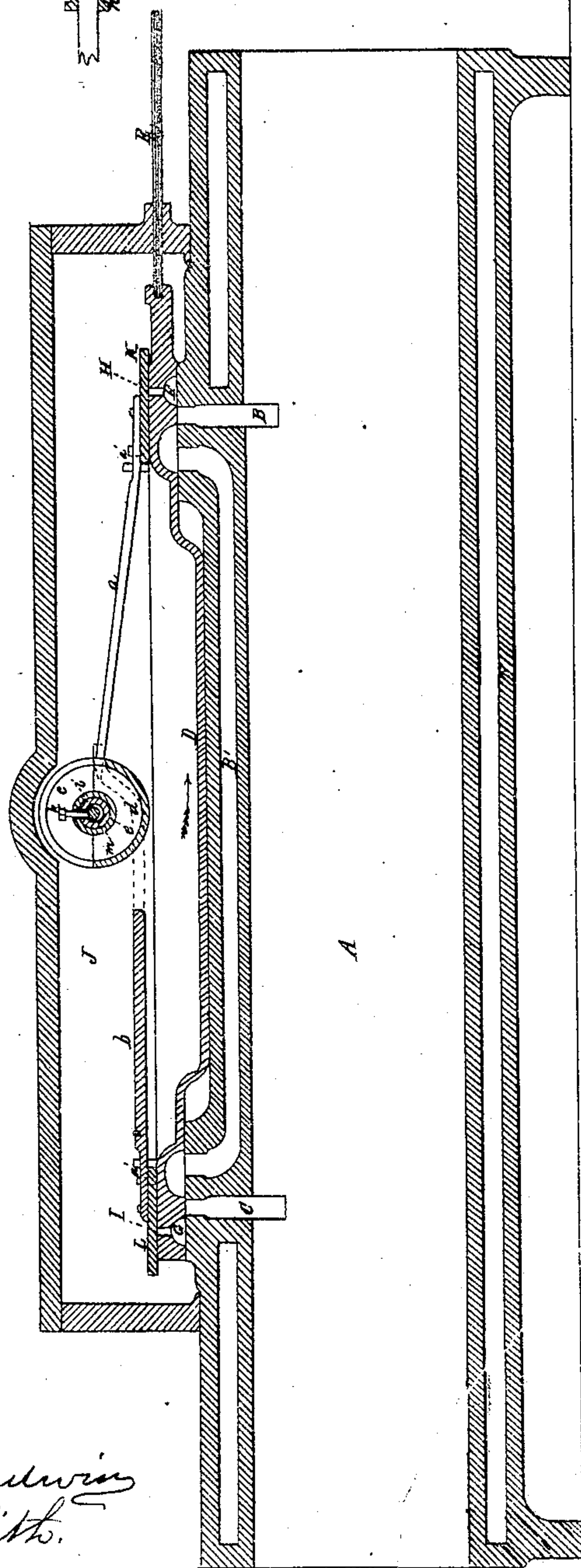
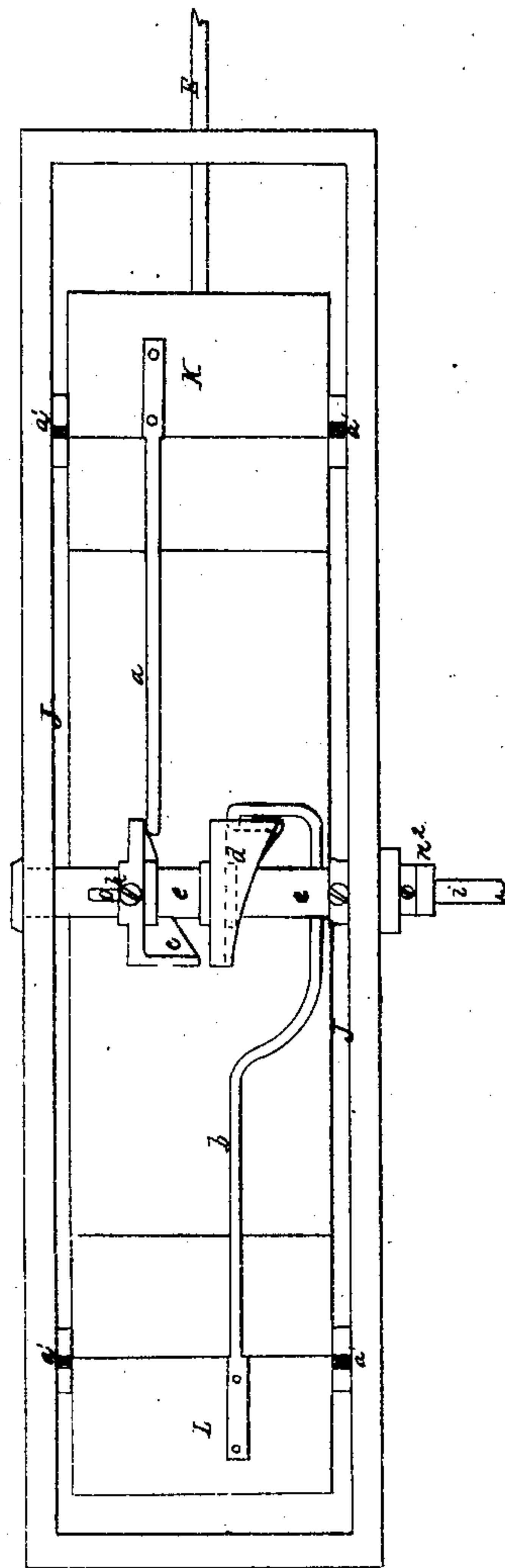


Fig. 4.



Fig. 3.



WITNESSES.

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HENRY O. LOTHROP, OF MILFORD, MASSACHUSETTS.

Letters Patent No. 75,034, dated March 3, 1868.

IMPROVEMENT IN STEAM-ENGINE CUT-OFFS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Be it known that I, HENRY O. LOTHROP, of Milford, in the county of Worcester, and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Steam-Engines, or in the mode of operating the "cut-off" of the same; and do hereby declare the following to be a full, clear, and exact description thereof, due reference being had to the accompanying drawings, making part of this specification, and in which—

Figure 1 is a vertical and longitudinal section, and

Figure 2 a vertical and transverse section of the cylinder, steam-chest, and valve of a steam-engine with my invention or improvement applied thereto.

Figure 3 is a plan of the same, with the top plate of the steam-chest removed.

Figure 4 is a plane development of one of the actuating-cams, to be hereinafter described.

The object of this invention is to enable the "regulator" of the engine to so operate the "cut-off" as to increase or diminish the supply of steam to the cylinder according to the wants of the engine, the invention being intended principally for application to an engine constructed in accordance with the plan shown in an application for a patent now pending before the Patent Office, and also to that class of steam-engines in which two sets of cylinders of different capacities are employed, and in which the steam from the smaller is exhausted into and employed in the larger, although the invention possesses merits which render its application valuable to an engine of ordinary construction.

The invention consists in the combination, with the ordinary valve of a steam-engine, of two drop-plates or auxiliary valves, one at each end of the primary valve, and operating in connection with ports made through such ends of the primary valve, the auxiliary valves being operated by cams applied to a revolving shaft suitably within the steam-chest, and operated with one unchanging motion by the driving-shafts of the engine, a suitable lateral motion being imparted to the said cams by the agency of a sliding rod which extends into the cam-shaft, and is actuated by the regulator, substantially as hereinafter explained.

In the accompanying drawings, which represent a steam-engine cylinder constructed in accordance with my application before referred to, A denotes the cylinder of the engine, B C being the steam-ports leading from the steam-chest to such cylinder, and B' the exhaust-port. The primary valve is shown at D, its eccentric-rod being shown at E. A chamber, F or G, is formed in the lower part of the valve D, and near each end thereof, ports H I being cut through the valve, and opening communication from the chambers F and G to the interior of the steam-chest, which is shown at J. The object of making this chamber and port in each end of the valve is to enable the device to work more directly and freely, and more particularly to facilitate the mechanical construction of it. The drop auxiliary valves K L are disposed within the steam-chest J, and over the ports H I, and are hinged (as shown at *a' a'*) at their inner edges to the opposite side walls of the steam-chest, and between the extreme movements of such ports, in such manner as to form, with the upper surface of the primary valve and surrounding ports H I, a tight joint or seat when lowered to their lowest extent, and to be capable of being raised off such seats at a proper time and allow steam from the steam-chest to pass through said ports and into the cylinder. The auxiliary valves K L are provided at their inner edges with tripping-levers or fingers, *a b*, such fingers bearing against the peripheries of two cams, *c d*, which slide upon a revolving tubular shaft or sleeve, *e*, which is suitably supported in bearings, *f g*, made in the walls of the steam-chest. One end of such shaft, which extends through the side of the steam-chest, and is provided at its outer extremity with a crank, *n*², is connected with the driving-shaft of the engine by bevel-gears in such manner that the revolutions of such shaft shall cause a corresponding number of revolutions of the shaft *e*. The bearing-surfaces of the cams *c d* are semicircular in vertical section, and are placed opposite each other upon the shaft *e*, in order that when one of such cams has depressed its valve-lever, the other cam shall be out of contact with its valve-finger or tripping-lever of such valve, one tripping-lever, viz, that marked *b* in the drawings, being extended underneath and bearing against the inner side of its cam, in order to allow of a rotary motion of the cams in one direction. A rod, *i*, slides freely within the tubular shaft *e*, and at its outer end is connected with the "governor" of the engine in such manner that the rising and falling or fluctuations of such governor shall cause corresponding lateral movements of the rod *i*. The cams *c* and *d* are connected to this rod in such manner as to be moved laterally by it, and slide upon the tubular shaft *e* during the fluctuations of the governor, while at

the same time they, as well as the rod, are revolved by and with such tubular shaft. To accomplish this, set-screws, *k* and *l*, are screwed through each hub of the cams, and extend into grooves, *m n*, cut in the periphery of the rod *i*, two slots, *o p*, being cut in the tubular shaft for the reception of such screws, and to allow of the lateral motion of the cams upon it. The shape of the cams *c d* as developed are trapezoidal, as shown in fig. 4 of the drawings.

As the regulator-balls lower, the rod *i* is moved outwardly, and by moving the cams *c d* in the same direction expose a larger amount of their periphery to actuate the fingers *a b*, and by so doing hold up or keep open the valves for a greater length of time, and allow more steam to enter the cylinder. A reverse movement of the cams will take place upon increased speed of the regulator, and diminish the quantity of steam admitted to the cylinder, it being understood that the valves *K L* drop upon the main valve when either finger passes from contact with the periphery of its cam.

We will suppose the main valve to be in the position at the extreme left of its movement, and with the port *I* beyond and uncovered by the auxiliary valve *L*, such auxiliary valve being raised by the action of the cam *d* upon its finger *b*, and the steam passing from the steam-chest into and supplying the chamber *G* ready for entrance to the cylinder. The main valve, by the action of its eccentric, now moves in the direction of the arrow thereon, until it arrives at the position (be it five-eighths stroke, more or less,) in which the requirements of the engine cause the governor to bring the cam *d* into such a position as to close the auxiliary valve *L*, or let it drop down upon the upper surface of the main valve and close the port *I*, thus cutting off steam from the cylinder at this end, and allowing the valve *D* to complete the remainder of its movement in this direction without the admission of more steam, it being understood that the area of the auxiliary valve *L* is sufficiently large to cover the port *I* during such movement. As the valve reaches its extreme movement in this direction at the right of the steam-chest, and starts to return, the auxiliary valve *K* is opened by the action of the cam *c* upon the finger *a*, and the steam allowed to enter the chamber *F* through the port *H*, ready for admission to the cylinder. As the action of the valve when moving in this direction is the same relatively as in the movement last described, its operation will be readily understood.

Should the engine be increasing in speed at too rapid a rate, the governor will move the rod *i* inwards, and by bringing a shorter or less bearing-surface of the cams *c d* to act upon the fingers *a b*, cause the valves alternately to drop down upon and close the ports *H* and *I* quicker, and consequently cut off the steam at a less length of stroke of the piston. Should the speed of the engine be decreasing at too great an extent, the lowering of the balls of the governor will cause the rod *i* to move in an opposite direction, and bring a larger portion of the periphery of the cams *c d* to bear upon the fingers *a b*, and by keeping the ports *H I* open for a greater length of time, allowing a larger amount of steam to enter the cylinder.

It will be seen that while one cam is in contact with and operating one finger, the blank space of its fellow-cam is passing by the other finger without actuating it.

I claim the improved "cut-off" regulating-mechanism herein described, consisting of the auxiliary valves *K L*, operated by the cams *c* and *d*, applied to the shaft *e* and slides *i*, the whole operating in combination with the main valve *D* and cylinder-ports *B* and *C*, to produce the results before set forth and explained.

HENRY O. LOTHROP.

Witnesses:

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E. C. GRIFFITH.