

G. F. Blake, Steam Engine,

No. 42,327,

Patented Apr. 12, 1864

Fig. 4.

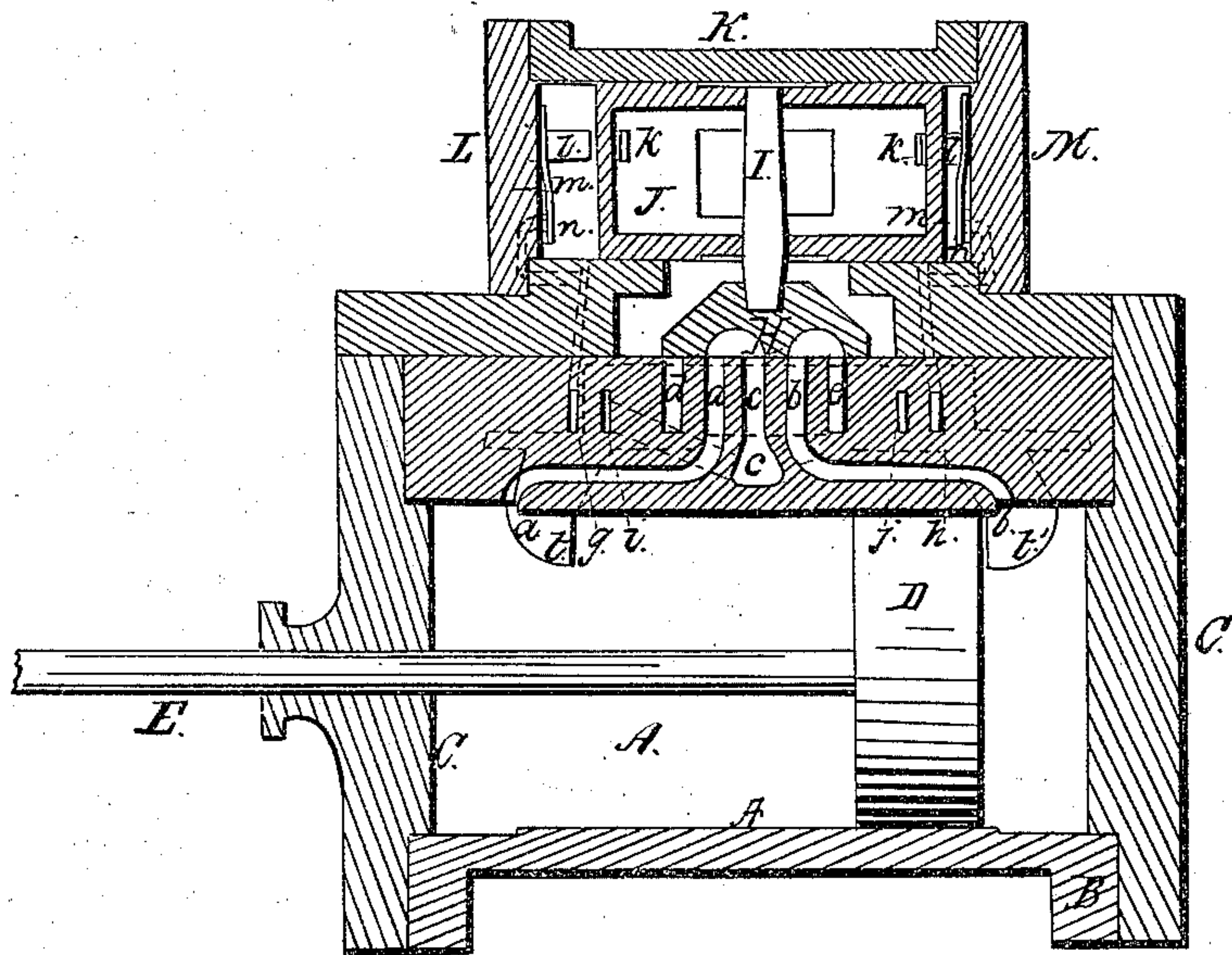


Fig. 6.

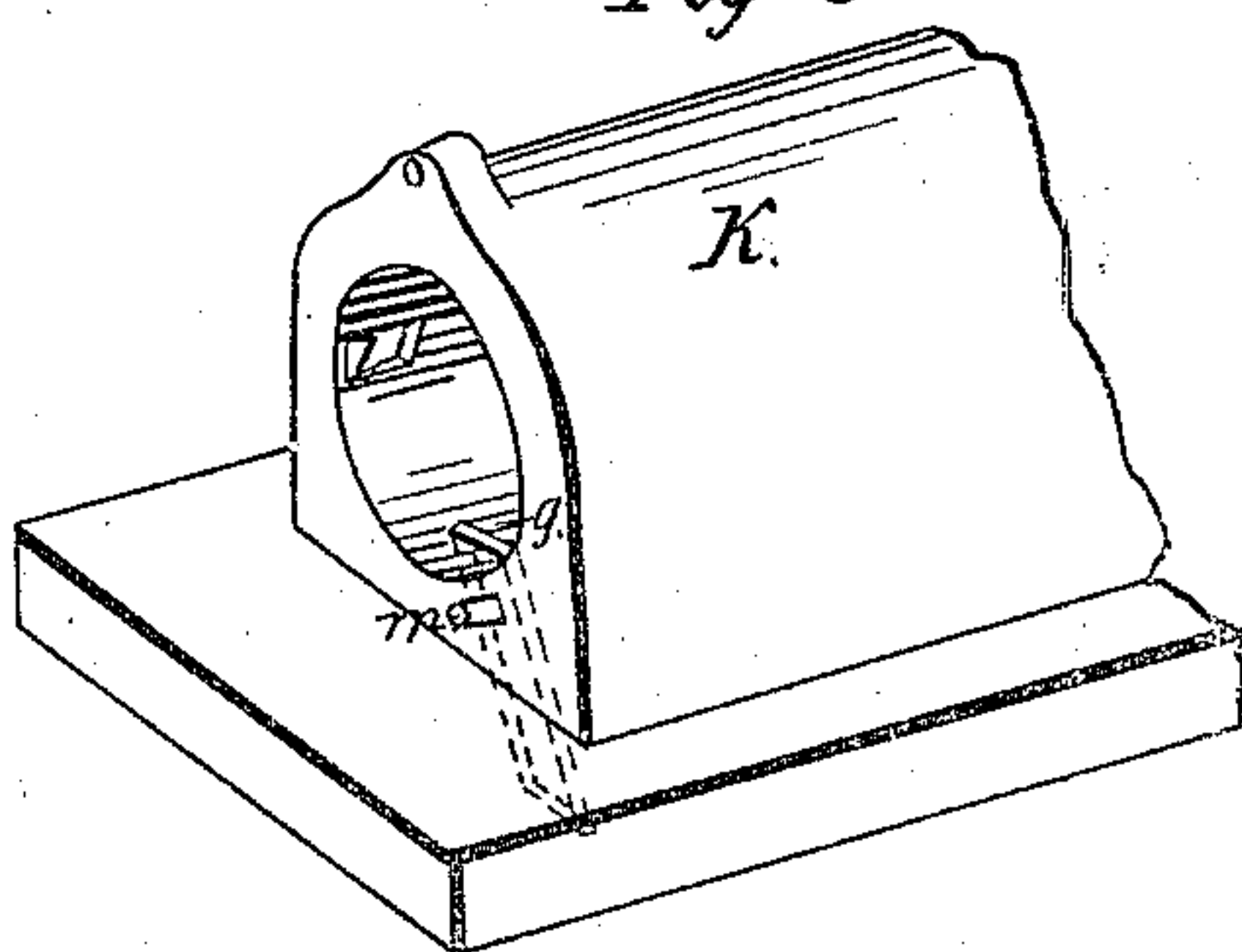


Fig. 5.

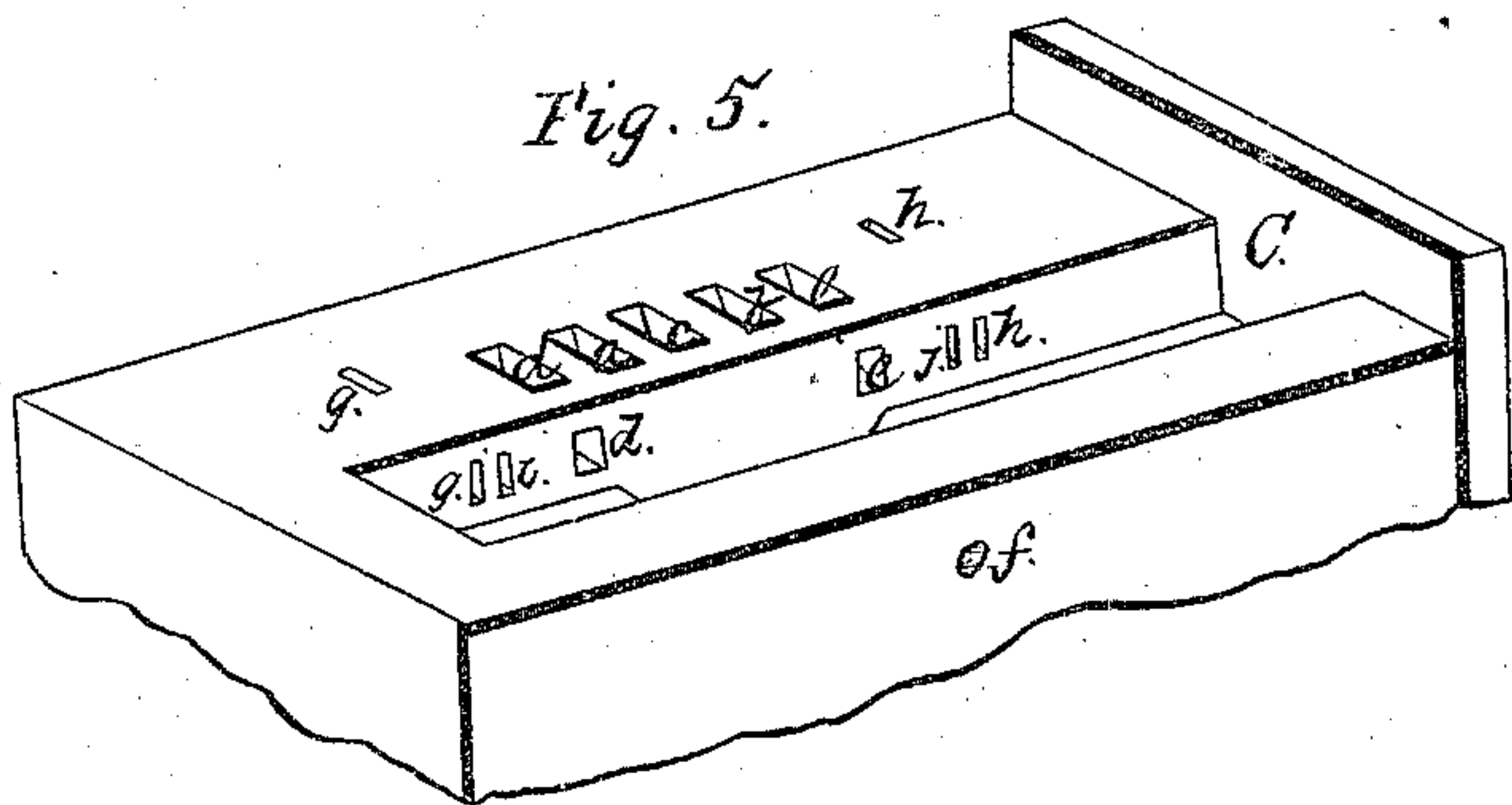


Fig. 7.

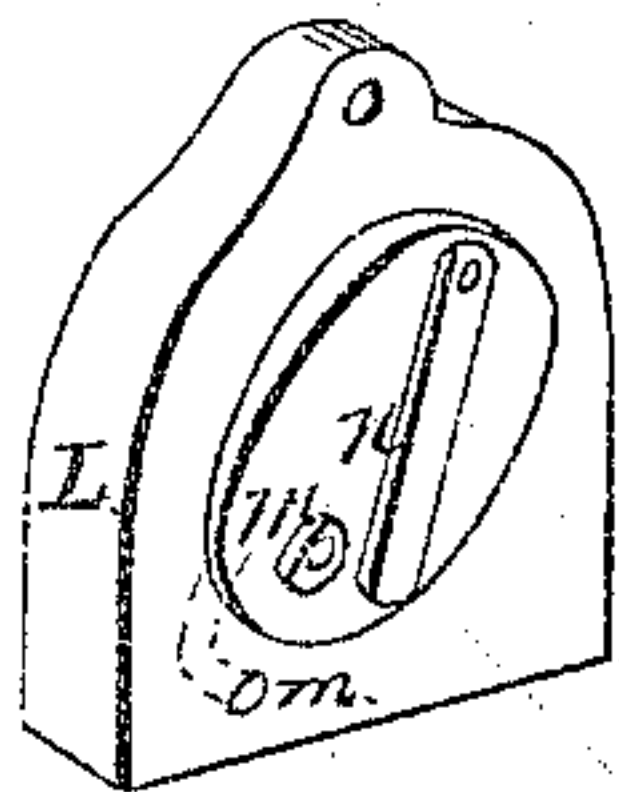


Fig. 8.

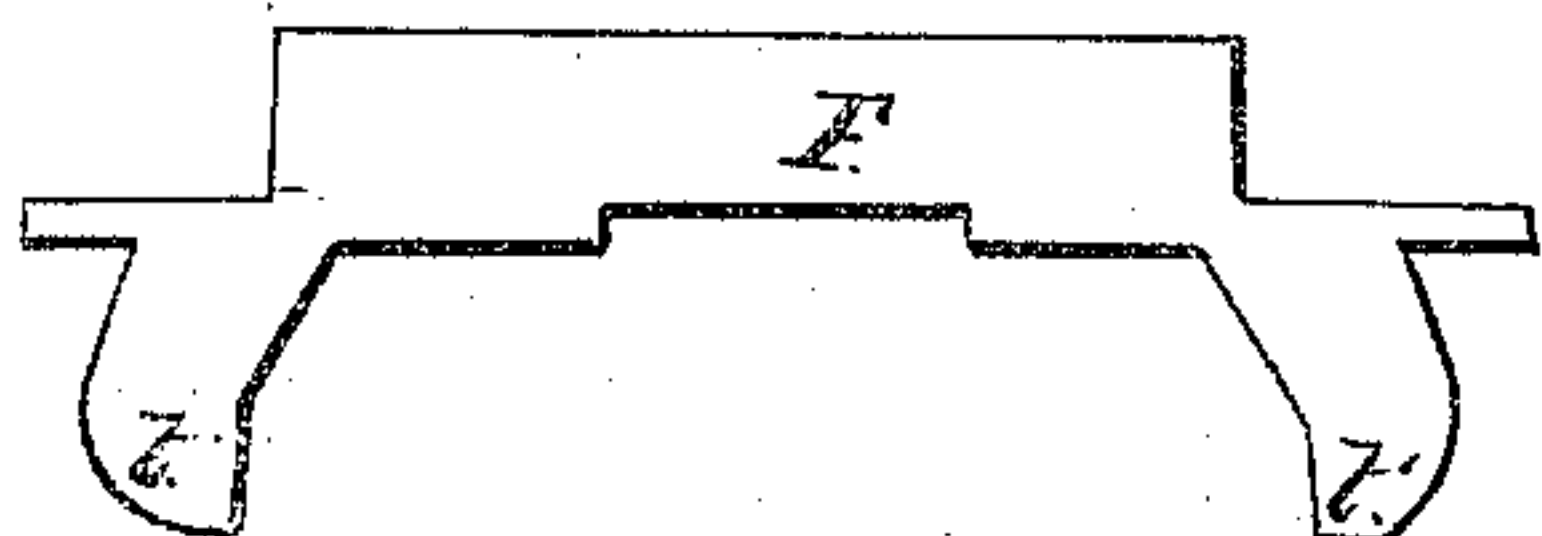


Fig. 9.

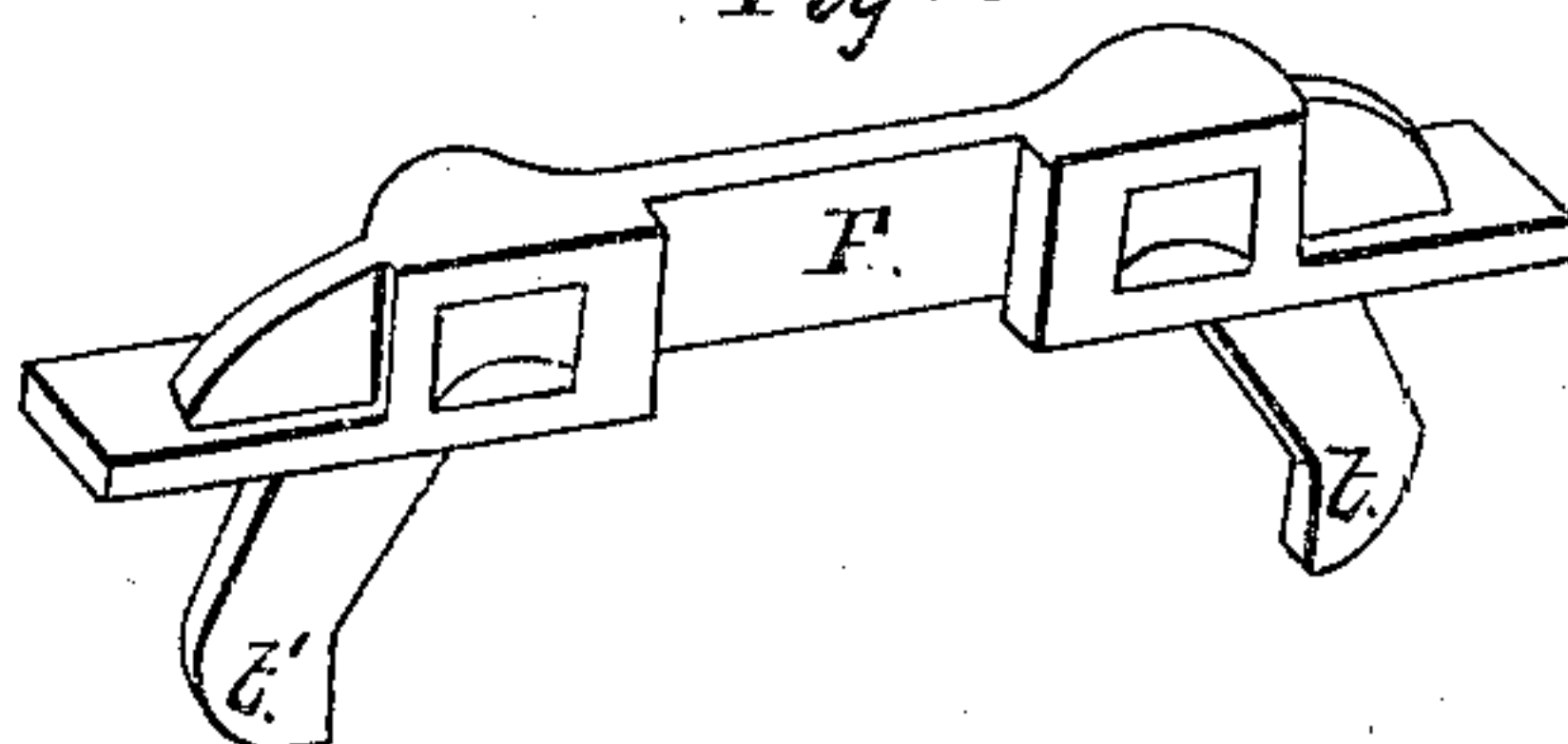
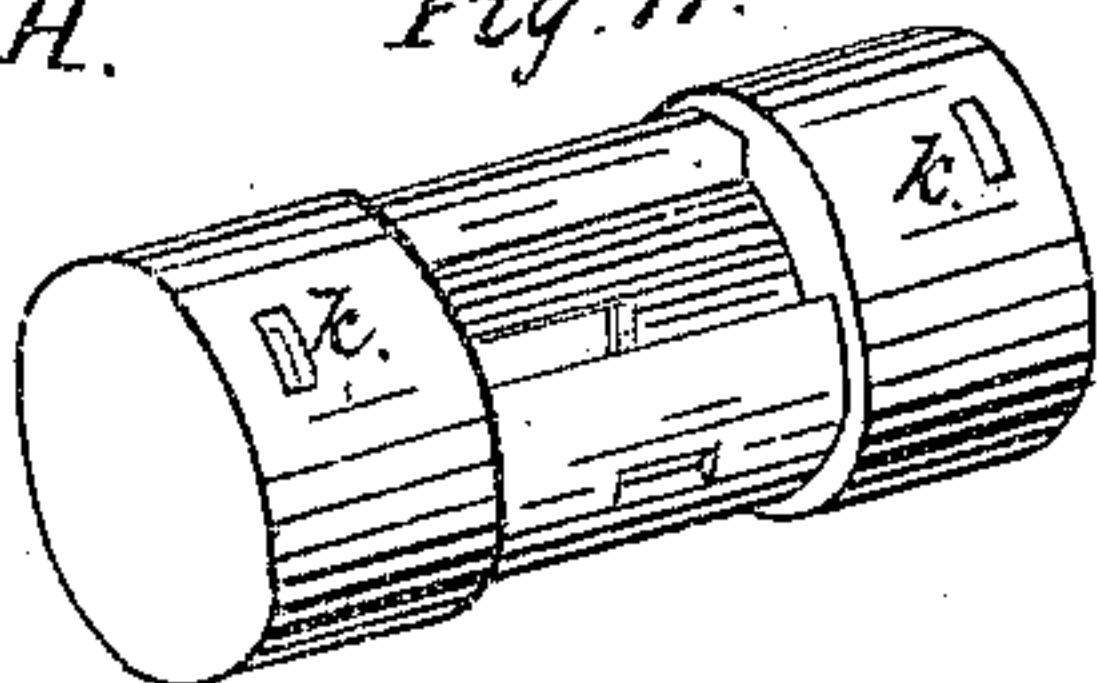


Fig. 10.



Fig. 11.



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Fig. 2.

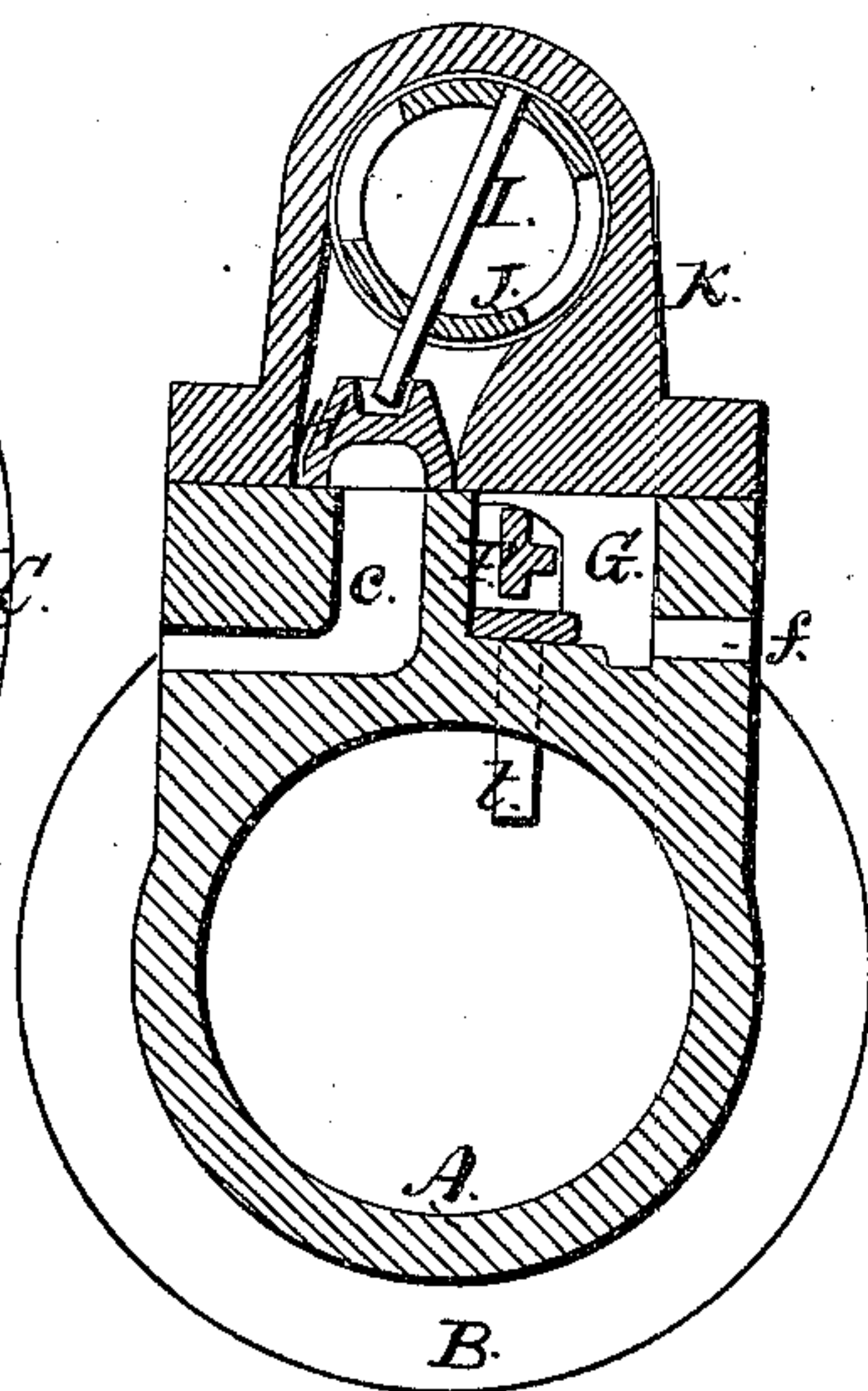
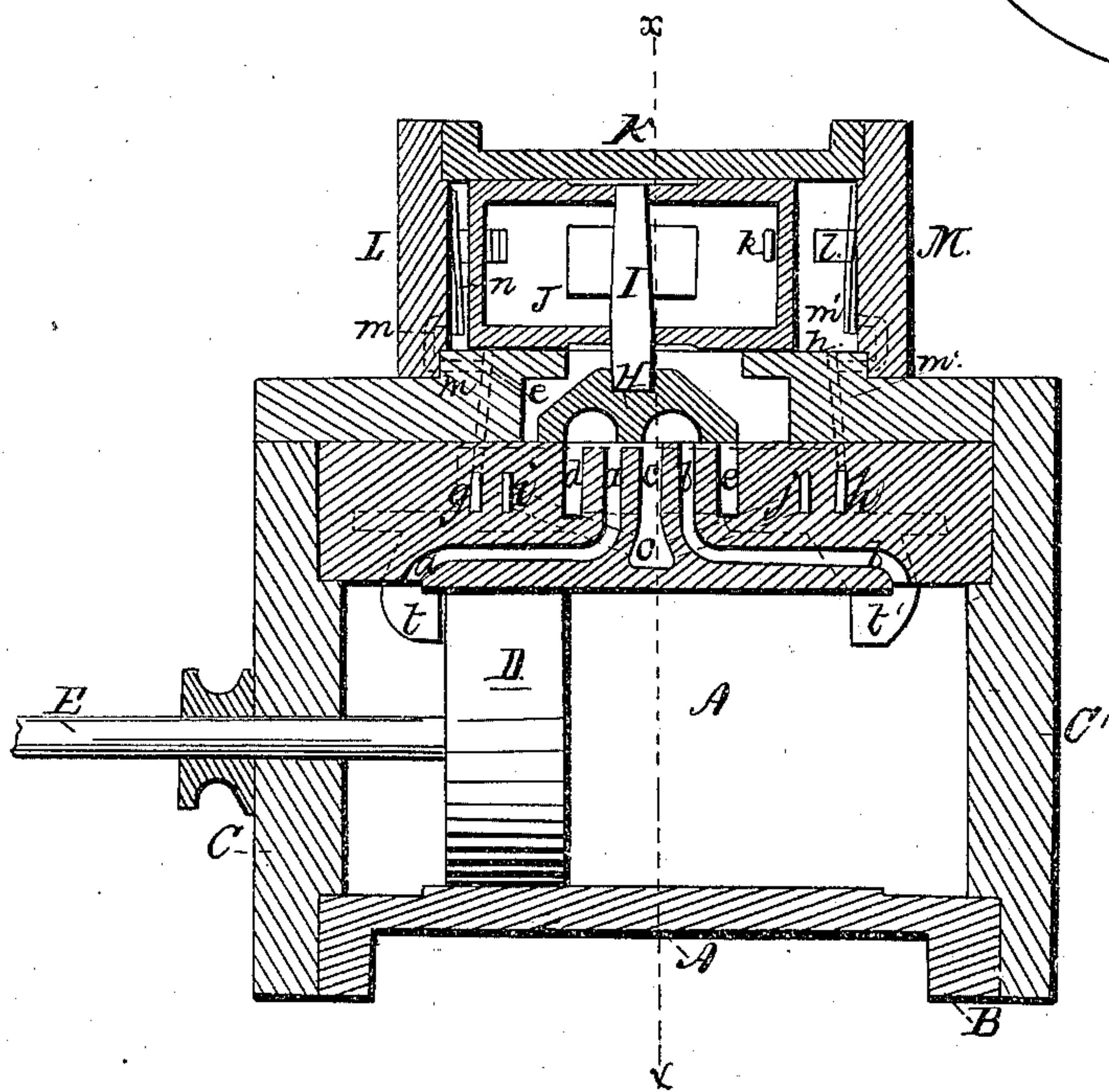


Fig. 3.



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GEORGE F. BLAKE, OF MEDFORD, ASSIGNOR TO HIMSELF AND PETER HUBBELL, OF CHARLESTOWN, MASSACHUSETTS.

IMPROVEMENT IN THE VALVES OF STEAM-ENGINES.

Specification forming part of Letters Patent No. 42,327, dated April 12, 1864.

To all whom it may concern:

Be it known that I, GEORGE F. BLAKE, of Medford, in the county of Middlesex and State of Massachusetts, have invented an Improved Steam-Engine; and I do hereby declare the following to be a full and correct description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of the lower or main cylinder with one of its heads removed, showing the steam-chest, tappet-valve, and a portion of the ports. Fig. 2 is a vertical transverse section of the engine through line *x x* of Fig. 3. Fig. 3 is a longitudinal vertical section of the engine, showing the position of the parts when the piston is at the end of the forward stroke. Fig. 4 is a similar section, showing the position of the parts when the piston is at the end of its rearward stroke. Fig. 5 is a perspective view of the steam-chest, the tappet-valve being removed and all the ports shown. Fig. 6 is a perspective view of one end of the upper cylinder with its head removed. Fig. 7 is a view of one head of the upper cylinder; Figs. 8 and 9, back and front views of the tappet-valve; Fig. 10, a view of the slide-valve; Fig. 11, a perspective view of the plunger that works in the upper cylinder.

The nature of this invention consists in the arrangement and construction, hereinafter particularly described, of a steam-engine, in which an auxiliary cylinder is employed to operate the valves of the main cylinder, the valves of said auxiliary cylinders being operated directly by the piston of the main cylinder. By this construction an engine is obtained which is compact, simple, little liable to get out of order, easily taken apart for repair, and admirably adapted for pumping or other purpose, where it is desirable to have but a small space between the engine and the machinery which it is to operate, all as herein-after more fully set forth.

To enable others skilled in the art to make and use my improved engine, I will proceed to describe its construction and operation, referring to the drawings, wherein the same part is marked by the same letter of reference wherever it occurs.

A marks the main cylinder, which is of the usual form, having flanges B on its ends, to

which the cylinder-heads C C' are secured by bolts in the ordinary way.

D is the piston, and E the piston-rod. The piston D, as it approaches the end either of its forward or backward stroke comes in contact with the tappets *t t'* of the tappet-valve F, which project down into the cylinder A through slots made for that purpose. These slots are of the proper length to allow of the reciprocating movement of the tappet-valve F. The form of the tappet-valve F is clearly shown in Figs. 8 and 9, and its position in the steam-chest G is shown in Fig. 1 in view, and in Figs. 2, 3, and 4, in section. This valve controls the steam-ports *g h i j*, which regulate the supply and exhaust of the upper cylinder. The ports *g* and *h* convey steam to and from the ends of the cylinder K to the valve. The ports *i* and *j* communicate with the exhaust. The tappet-valve is operated by the piston D, which strikes one of its tappets at the end of each stroke.

G is the steam-chest, which receives steam from the engine through the inlet-port *f*. The supply and exhaust of the main cylinder are controlled by the slide-valve H, which is operated by the plunger J of the upper cylinder, K, to which it is connected by the stem I. The ports *a* and *b* lead from the valve H to either end of the cylinder A. The ports *d* and *e* lead from the steam-chest G to the valve H. The port *c* is the common exhaust for both ends of cylinder A. The plunger J is a hollow cylinder with solid ends, and is clearly represented in perspective view in Fig. 11 and in transverse and longitudinal section in Figs. 2, 3, and 4. It has large openings in its sides, as shown, and two ports, *k k'*, which open into cavities *l* near the ends, and on the interior of cylinder K. (See Figs. 3, 4 and 6.) The heads L M of the cylinder K have small steamways *m m* (see Figs. 3, 4, and 7) communicating with steam-ways *g* and *h*, and each covered by a spring-valve, *n*. This valve is shown in Fig. 7 pushed to one side to uncover the opening of the passage. The object of the passages *k l* is to admit steam beyond the ends of the plunger J in order to arrest its motion. These ports *k l* do not take steam until the plunger J has passed and cut off the exhaust. The cutting off of the ex-

haust by the plunger forms a dead-point, to overcome which I admit steam from the ways *g* and *h* through the passage *m*, controlled by the spring-valve *n*, which closes when its end of the cylinder exhausts and opens when the supply-port is again opened.

The operation has been partly indicated in the foregoing description of the construction of the engine. The position of the parts when the piston is at the forward end of its stroke is shown in Fig. 3. The slide-valve *H* is driven forward to the end of its stroke in that direction, and the rearward end of the cylinder is then open to the exhaust through ways *b* and *c*, and steam passes from the steam-chest through ways *d* and *a* into the forward end of the cylinder and drives back the piston *D* to the position shown in Fig. 4, which exhibits the relations of the parts when the piston has reached the end of its rearward stroke. The slide-valve *H* is then driven back to the end of its stroke in that direction, and the way to the exhaust is open from the forward end of the cylinder through passages *a* and *c* while steam enters the rear end of the cylinder through ways *e* and *b*. The slide-valve *H* is operated by the plunger *J*, the ports which control the movements of said plunger being operated by the tappet-valve *F*. When the piston *D* approaches the end of its forward stroke, it strikes the tappet *t* of the valve *F* and drives that valve forward to the end of its stroke in that direction. When the valve *F* is in that position, the forward end of the upper cylinder, *K*, exhausts through ways *g* and *i*, while the rearward end takes steam through *h*. When piston *D* reaches the rearward end of its stroke, it strikes the tappet *t'* of valve *F*, and drives that valve to the rearward end of its stroke, when the rearward end of cylinder *K* exhausts through ways *h* and *j* and the forward end takes steam through *g*. The plunger *J* being driven backward, carries with it the valve *H*, which so arranges the ports of cylinder *A* as to drive the piston *D* forward again for a repetition of the operation. When the plunger *J* passes the exhaust at either end of the cylinder, steam is admitted into that

end toward which it is traveling through ports *kl*, for the purpose of cushioning the end of the plunger. The passage of the plunger beyond the exhaust would form, as before mentioned, a dead-point; but when steam is again admitted to the way leading to that end of the cylinder it passes round through passage *m* and opens spring-valve *n* and starts the plunger on its return-stroke. The spring-valve *n* closes during the exhaust by the force of its own elasticity.

Having thus fully described my invention, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The combination and arrangement of the cylinder *A*, tappet-valve *F*, slide-valve *H*, with their seats in the steam-chest *G*, plunger *J*, and cylinder *K*, in the manner and for the purpose described.

2. Controlling the ports of the auxiliary cylinder by means of a tappet-valve which receives its motion from the direct action of the piston of the main cylinder without the intervention of intermediate parts, when the ports of the main cylinder are controlled by means of a slide-valve attached to and operated by the plunger of the auxiliary cylinder, substantially in the manner set forth.

3. The arrangement of the steam-ports on valve seats placed at right angles to each other, so as to allow of the working of two independent valves within the steam-chest, in the manner and for the purpose specified.

4. The combination of the ports *kl'* with the ways *l'l'*, for the purpose of cushioning the plunger *J* after it has cut off the exhaust, in the manner described.

5. The steamways *m m*, in combination with the spring-valves *n n*, arranged and operating in the manner and for the purpose specified.

The above specification of my said invention signed and witnessed, at Boston, this 6th day of February, A. D. 1864

GEORGE F. BLAKE.

Witnesses:

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SUMNER ALBEE.