

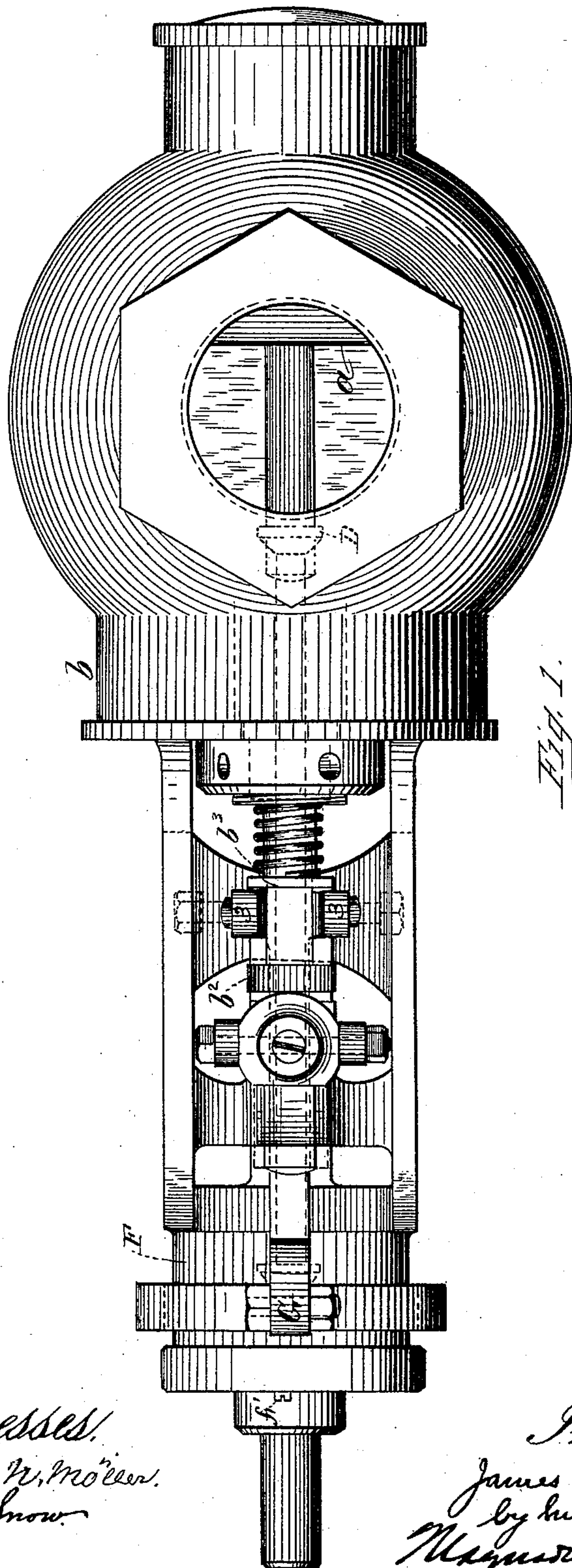
(No Model.)

3 Sheets—Sheet 1.

J. H. CROSBY.
ELECTRO STEAM VALVE ATTACHMENT.

No. 489,464.

Patented Jan. 10, 1893.



Witnesses:
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John R. Snow.

Inventor:
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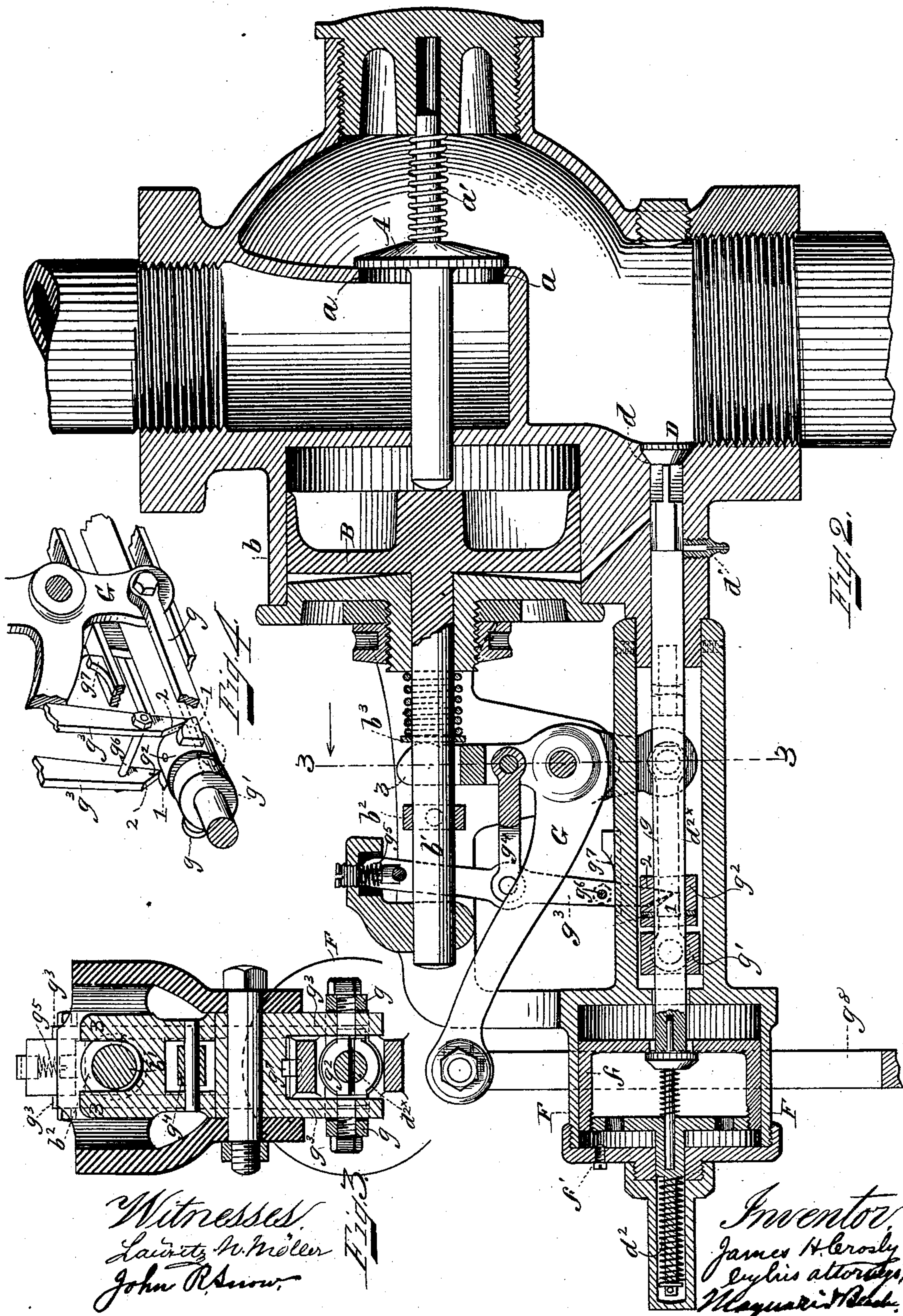
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3 Sheets—Sheet 2.

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3 Sheets—Sheet 3.

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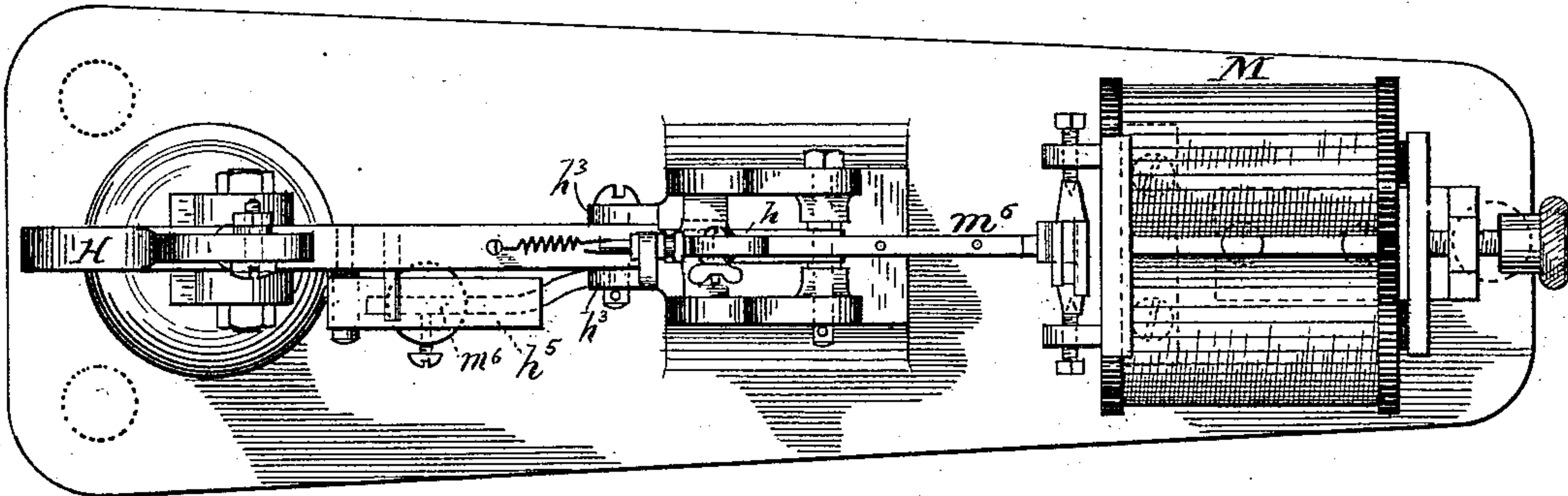


Fig. 6.

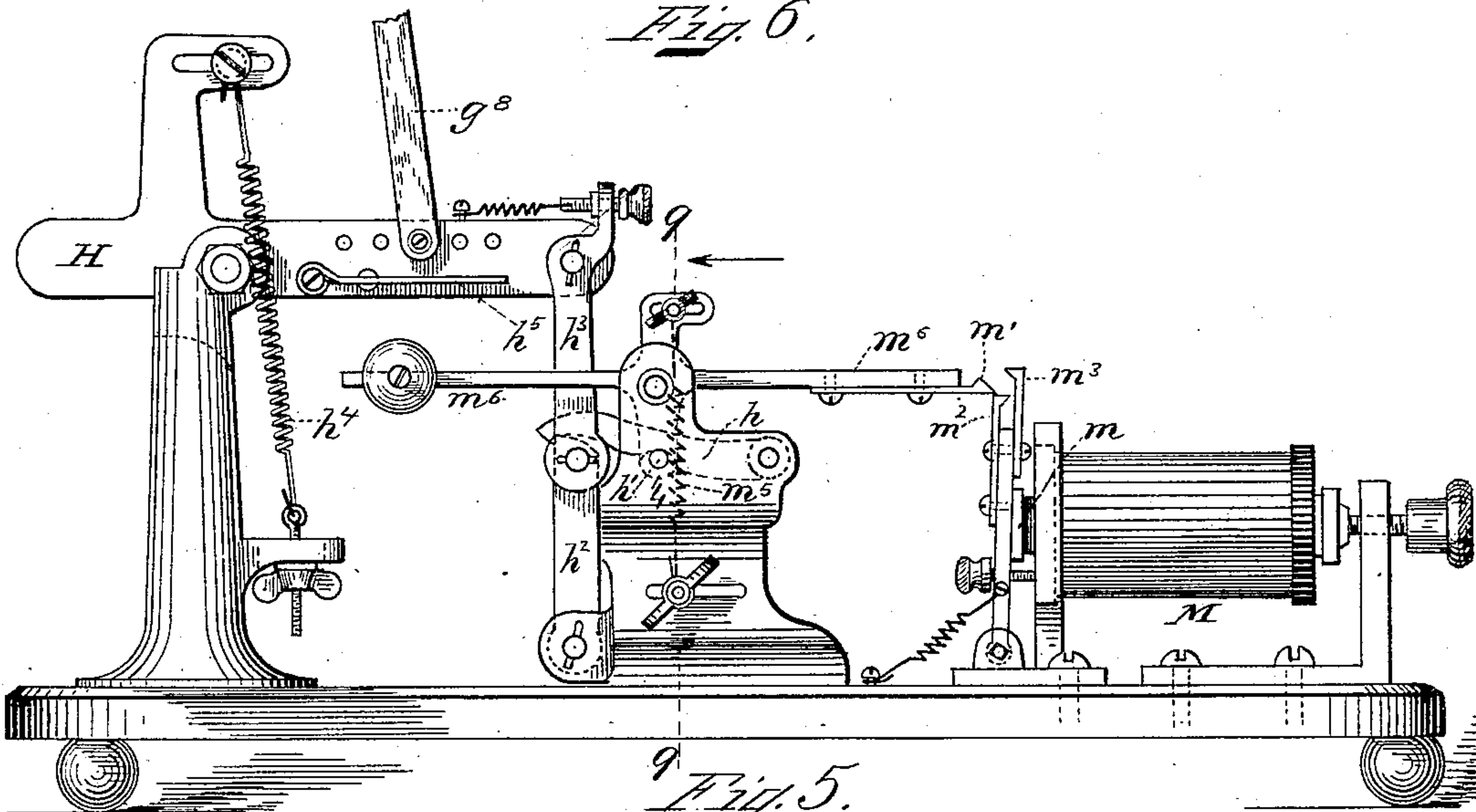


Fig. 5.

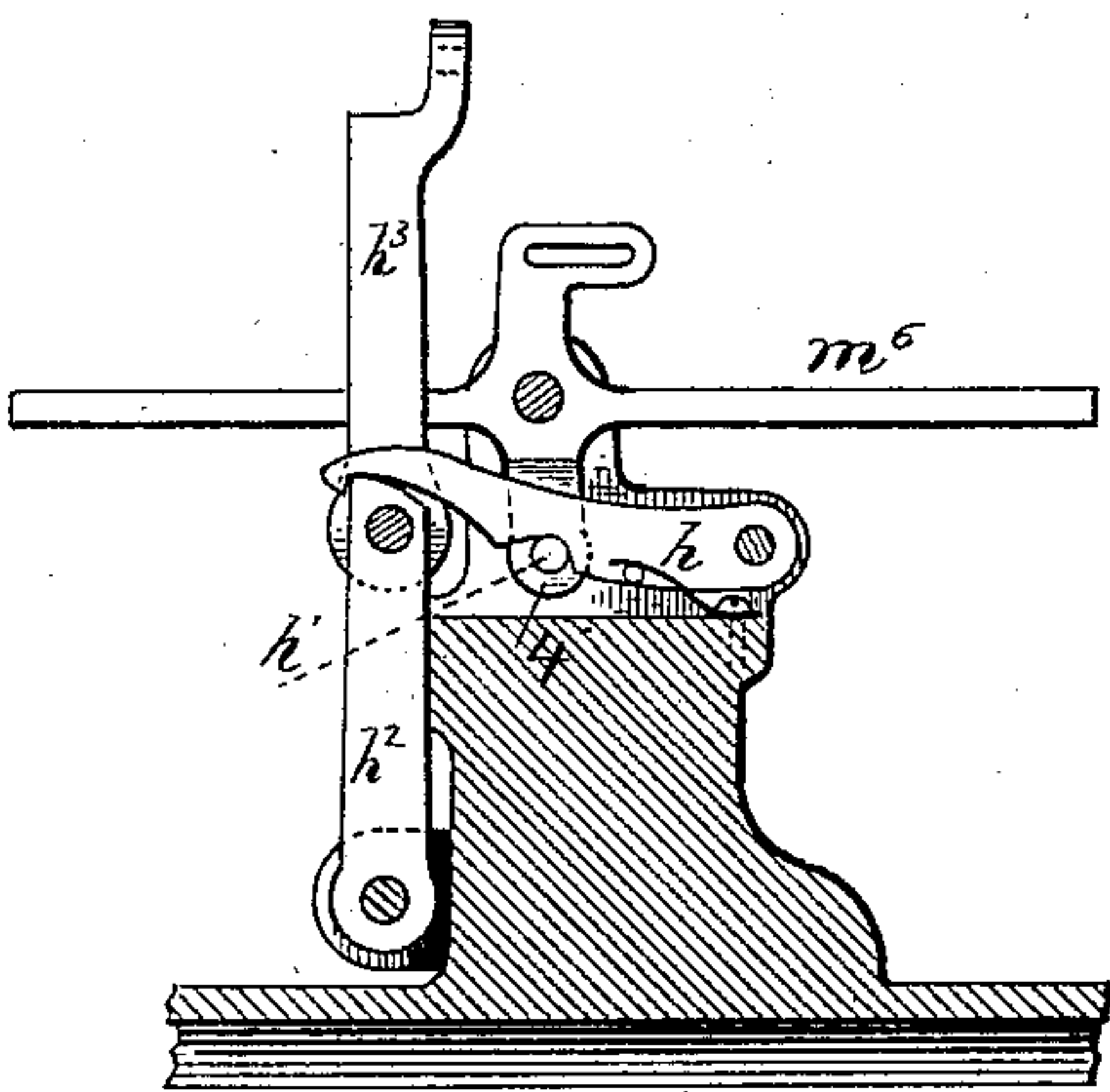


Fig. 7.

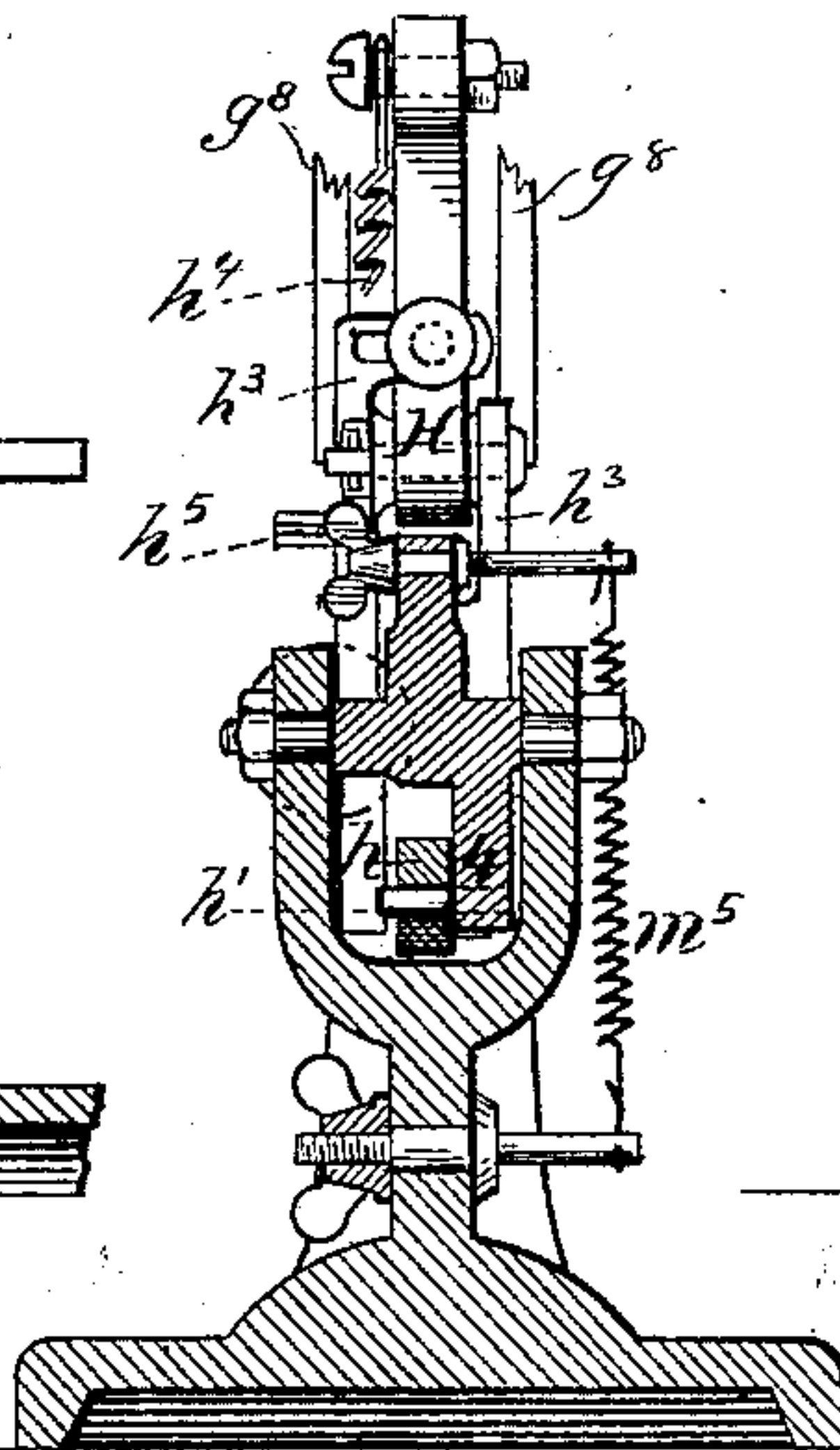


Fig. 9.

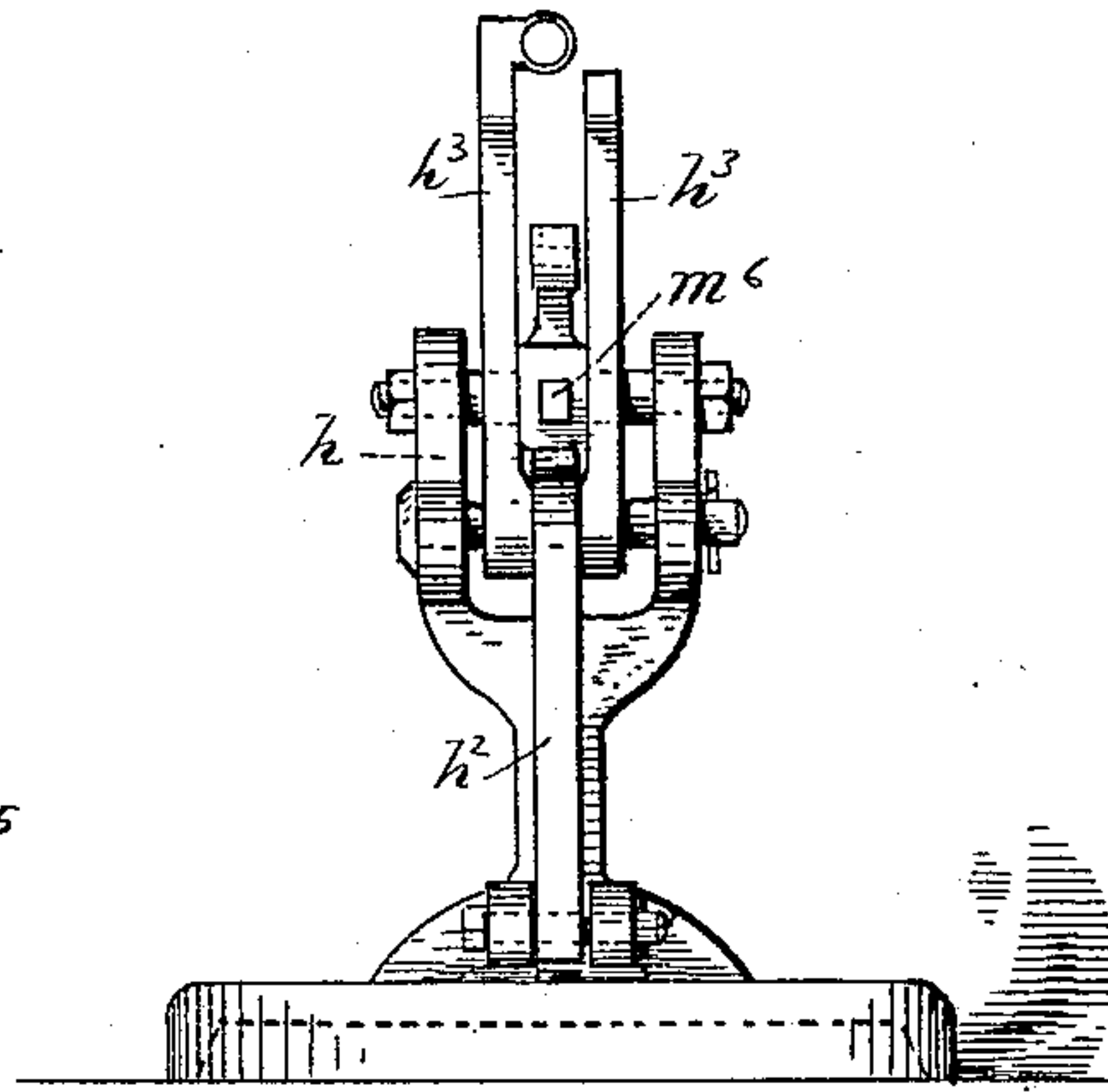


Fig. 8.

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UNITED STATES PATENT OFFICE.

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ELECTRO-STEAM-VALVE ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 489,464, dated January 10, 1893.

Application filed September 1, 1890. Serial No. 363,632. (No model.)

To all whom it may concern:

Be it known that I, JAMES HORACE CROSBY, of Somerville, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Electro-Steam-Valve Attachments, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a plan showing one form of valve and of mechanism for opening the valve and keeping it open for a definite length of time. Fig. 2 is a central longitudinal section of the parts shown in Fig. 1. Fig. 3 is a section on line 3—3 of Fig 2; Fig. 4 is a perspective view of certain parts broken away from the rest of the attachment. Fig. 5 is an elevation, and Fig. 6 a plan view of one form of electrical apparatus for relieving a detent which controls a spring, or the like, for setting the valve mechanism in operation. Fig. 7 is a partial side elevation, partly in section; Fig. 8 an end elevation; and Fig. 9 a section on line 9—9 of Fig. 6.

The object of my invention is to control a steam or other valve by means of an auxiliary valve, which is opened by a spring or other source of power, when a detent controlling that spring is released by making, or breaking, a circuit; and one feature of my invention consists in a novel combination of the main and auxiliary valves by which the opening of the main valve insures the proper opening of the auxiliary valve.

A second feature of my invention is the combination of the auxiliary valve with a regulating piston so that the time during which the auxiliary valve remains open is determined by the escape of air from a cylinder.

A third feature of my invention consists in an electrical apparatus comprising a detent, and a spring, or its equivalent, which is prevented from operating so long as the detent is set, but which is put under strain automatically by the operation of the main valve, thereby resetting the detent; that is the detent is released by making a circuit, (or in the case of a closed circuit apparatus by breaking a circuit) and the release of that detent allows the spring or other source of power to act to open the auxiliary valve, and thereby set in motion the main valve, and the power ex-

erted to open the main valve, acts to reset the spring and also to reset the detent.

In the drawings A is the main valve, which is normally kept upon its seat *a* by the pressure of the steam, aided by the light spring *a'*; but when the valve A is raised from its seat the steam or other fluid passes by it, and sounds a whistle, or does other duty as may be desired. The main valve A is controlled by the piston B, and this piston is actuated by the steam or other fluid which escapes past the auxiliary valve D, so that when the valve D is off its seat *d* far enough to clear the exhaust *d'* pressure accumulates under piston B forcing it forward and opening valve A; but valve D is then left free to close and closes gradually as the air escapes from cylinder F, and as soon as valve D is closed the steam escapes from cylinder *b* through exhaust *d'*, and piston B and valve A make their back strokes.

Valve D is connected by its stem to piston *f*, so that spring *d²* is compressed when valve D is opened and piston *f* moved to the right in Fig. 2, and spring *d²* draws valve D back to its seat, and piston *f* to the left. The first motion of valve D from its seat *d*, and of piston *f* in cylinder F, is given by the lever G, which is connected by the rods *g* with the collar *g'* which slides on stem *d^{2*}* of valve D, and sticks collar *g²* fast to stem *d^{2*}*, thereby opening valve D slightly. But the motion of lever G also swings levers *g³* over the ears 1 on collar *g²*, lever G being connected with levers *g³* by the rod *g⁴*, and levers *g³* rising slightly against spring *g⁵* as the ears in collar *g²* pass under the lower ends *r* of levers *g³*, and those ends of levers *g³* pass over those ears; for the motion of collar *g²* toward the right in Fig. 2 takes place while the lower ends of levers swing toward the left, both motions being caused by the lever G. In this way the lower ends of levers *g³* are brought on the left of the ears on collar *g²*, instead of on the right as shown in Fig. 2. This slight opening of the valve D closes exhaust *d'* and also admits steam to cylinder *b*; forcing piston B forward and opening valve A wide. But the collar *b²* fast to stem *b'* strikes the third arm 3 of lever G and moves that lever on its fulcrum; the result of this return motion of lever G, is to swing the lower ends of levers *g³* to the right

these levers carrying with them the collar g^2 , and insuring the proper opening of the valve D. As soon as the levers g^3 have been moving far enough to the right the cross bar g^6 engages with cam g^7 thus moving levers g^3 against spring g^5 , and freeing the ears on collar g^2 from levers g^3 ; which allows valve D and piston f to move toward the left in Fig. 2. This motion of valve D is retarded by the piston f , and the time occupied depends upon the adjustment of the vent screw f' . The levers g^3 remain with their cross bar g^6 resting upon the flat upper surface of cam g^7 while the valve A is open and the valve D returning to its seat; but as the valve A and piston B make their return stroke the spring collar b^3 engaging the third arm of lever G brings it into the position shown in Fig. 2, ready for the next operation.

The lever G is connected by the rod g^8 with the lever H of the apparatus which is set in motion by making, or breaking, a circuit through the magnet M. This magnet, its armature m , the detents m' m^2 m^3 and springs m^4 m^5 are of a familiar construction, too well known to need description and are arranged in the well known way, and so that when the armature is moved the detent m' is released allowing lever m^6 to be pulled down by spring m^5 . This motion of lever m^6 lifts latch h , by reason of pin h' riding under latch h , and the lower end of the depending arm 4 of lever m^6 strikes the toggle h^2 h^3 ; causing it to yield sufficiently to allow spring h^4 to depress lever H, and thereby also pull down lever G, which operates the valves as above described. The spring h^5 on lever H comes into contact with the weight or lever m^6 , and returns that lever to the position shown in Fig. 5, when it is caught and held in the usual way. But the motion of piston B, and valve A, operates the lever G, as above described, and the upward motion of the long arm of lever G pulls lever H up with it against the force of the spring h^4 , and this upward motion of lever H straightens toggle h^2 h^3 which is caught by latch h , so that all the parts are brought back to the position shown in Fig. 5.

In operation the armature m is moved, by making or breaking the circuit, releasing detent m' , and allowing lever m^6 to be pulled down by spring m^5 ; this motion of lever m^6 unlatches the toggle h^2 h^3 and moves its middle joint past the center, so that spring h^4 pulls down lever H, and with it lever G. This motion of lever G, opens valve D slightly, and connects the stem of valve D with the stem of piston B, (by means of levers g^3 and collar g^2 as above described.) But the opening of valve D causes piston B to make its forward stroke, carrying with it valve A, and also valve D until the levers g^3 are disengaged from collar g^2 ; and the forward stroke of piston B

causes collar b^4 to move lever G in the same direction, carrying with it lever H, and straightening and latching toggle h^2 h^3 . As soon as armature m is moved the lever m^6 swings rapidly down under force of spring m^5 and the levers H and G are also pulled rapidly down by spring h^4 , the downward motion of lever H causing lever m^6 to swing back to place where it is held by detent m' . The piston B almost instantly moves forward, and the collar b^2 strikes lever G and restores both levers G and H to place. Then valve D, having been released from levers g^3 , begins to close, and closes in one, two or more seconds according to the adjustment of vent f' . The steam or other fluid escapes past valve A, as long as valve D is open, sounding a whistle or doing other duty; but as soon as valve D closes, cylinder b is freed from pressure by exhaust d' , and piston B makes its back stroke, valve A seating itself. The collar b^3 is always in spring contact with one arm of lever G.

The first feature of my invention, the connection of the main valve and auxiliary valves with a piston which opens both positively, and then allows the auxiliary valve to close, is applicable to other uses than these shown, but is especially advantageous in apparatus of the class shown where the detent controlled by the armature or its equivalent releases a spring or other source of power, and this spring opens an auxiliary valve, which sets a piston in motion, the motion of this piston resetting the releasing apparatus.

So far as I am aware I am the first to combine a main valve and piston with an auxiliary valve and a piston and cylinder and an adjustable vent to time the closing of the auxiliary valve, and this feature of my invention may obviously be used with a variety of apparatuses for opening the auxiliary valve.

What I claim as my invention is:

1. In combination the main valve its piston, cylinder and stem, with the auxiliary valve, and its stem, and mechanism, consisting of the levers g^3 , collar g^2 , and cam g^7 , connecting the two stems for a portion of the forward stroke of the piston; all substantially as and for the purpose specified.

2. In combination the main valve its piston, cylinder, and stem; the auxiliary valve and its stem; and a spring controlled detent apparatus; with a lever which is pulled in one direction by the detent apparatus to open the auxiliary valve, and pulled in the other direction to reset the detent apparatus by the motion of the piston of the main valve.

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