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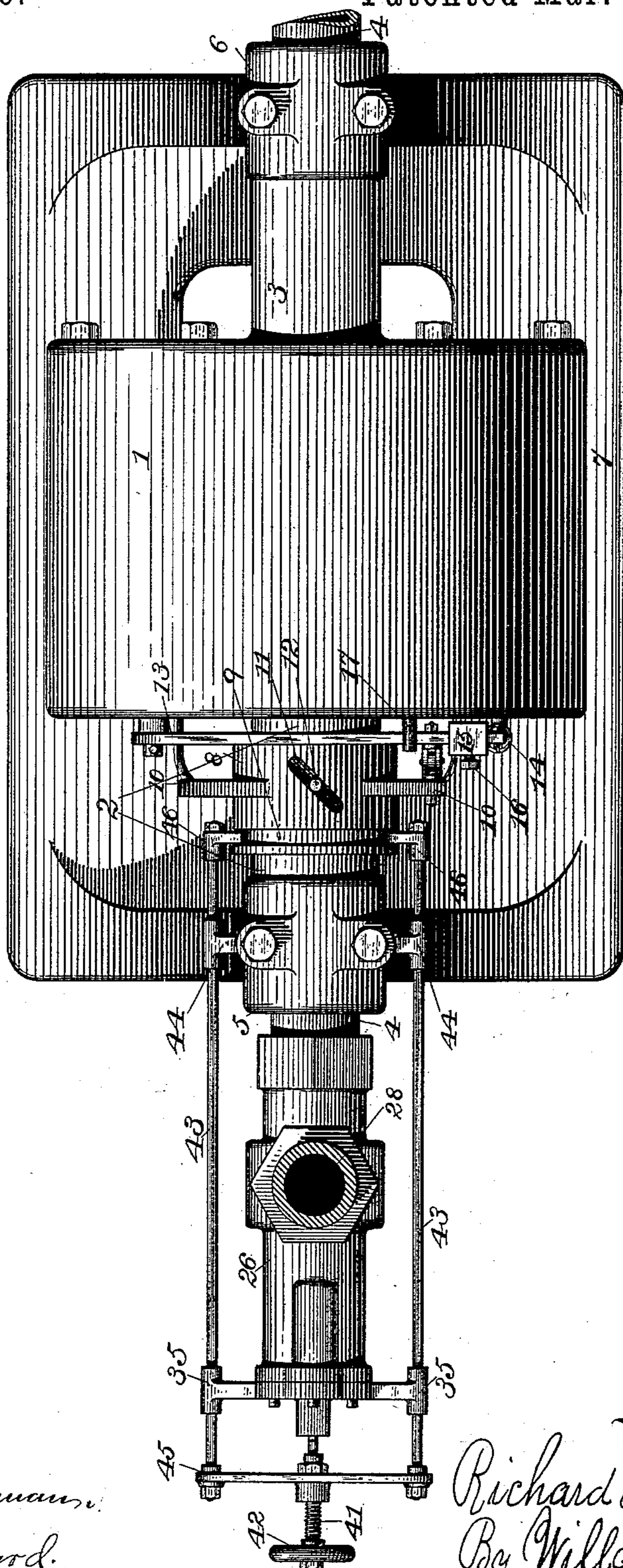
R. H. MATHER.

THROTTLE AND GOVERNOR VALVE.

No. 379,280.

Patented Mar. 13, 1888.

Fig. 1.



Witnesses:

Wm. Borkman.
H. L. Rickard.

Inventor:

Richard H. Mather.
By Willard Eddy,
Atty.

(No Model.)

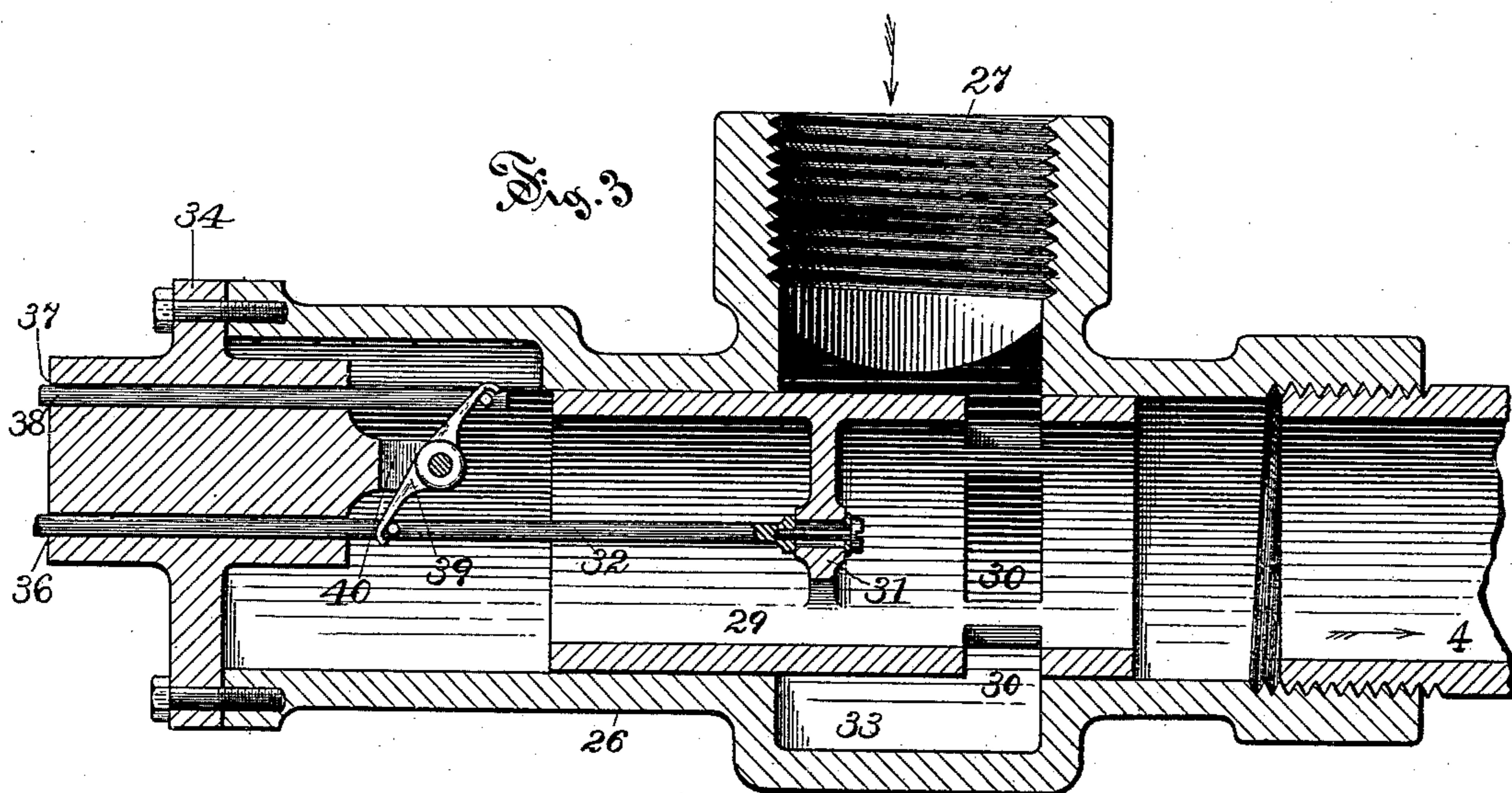
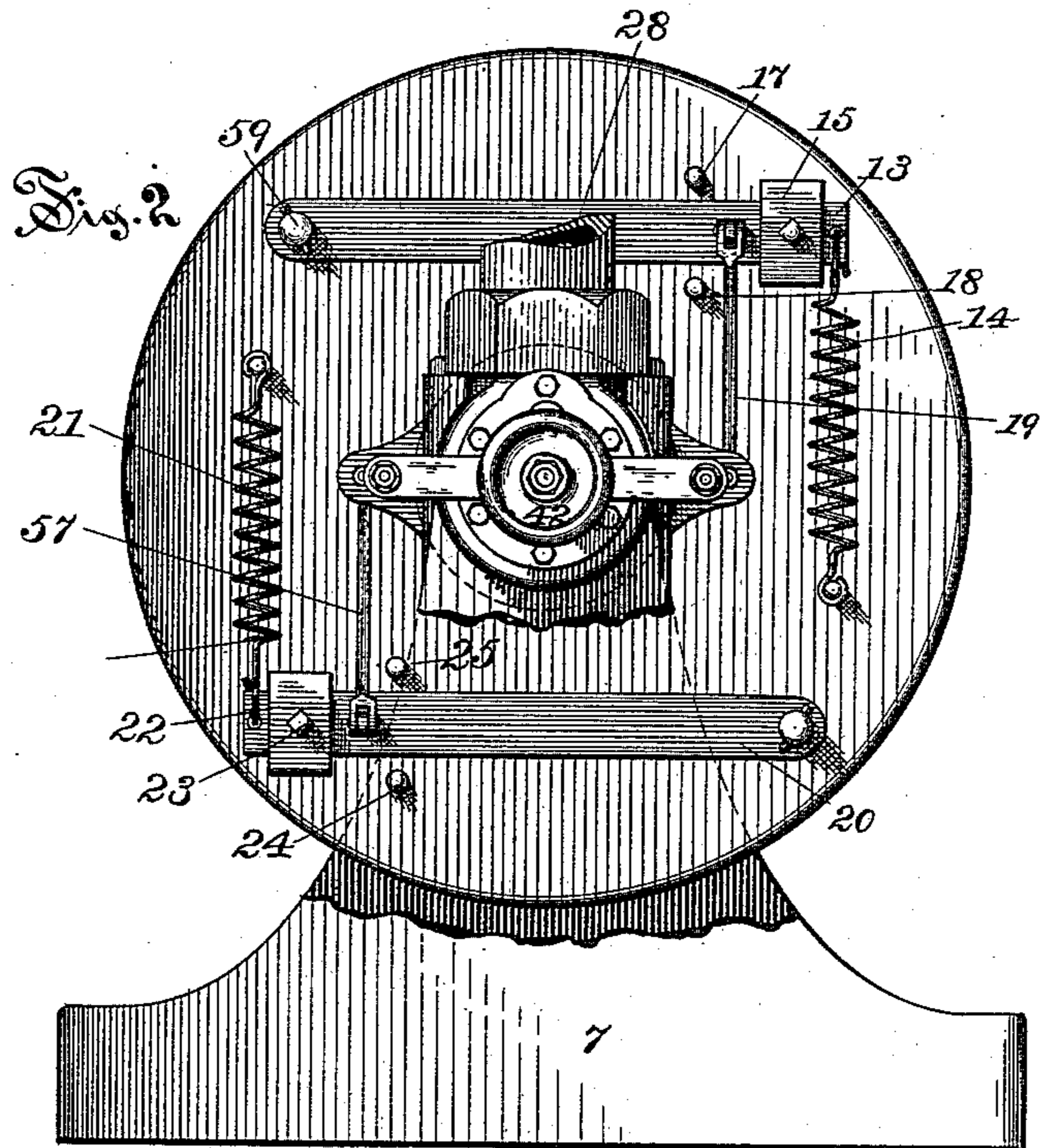
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Patented Mar. 13, 1888.



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Wm. D. Yorkman,
H. L. Rickard.

Inventor:

Richard H. Mather
By Willard Eddy, Atty.

(No Model.)

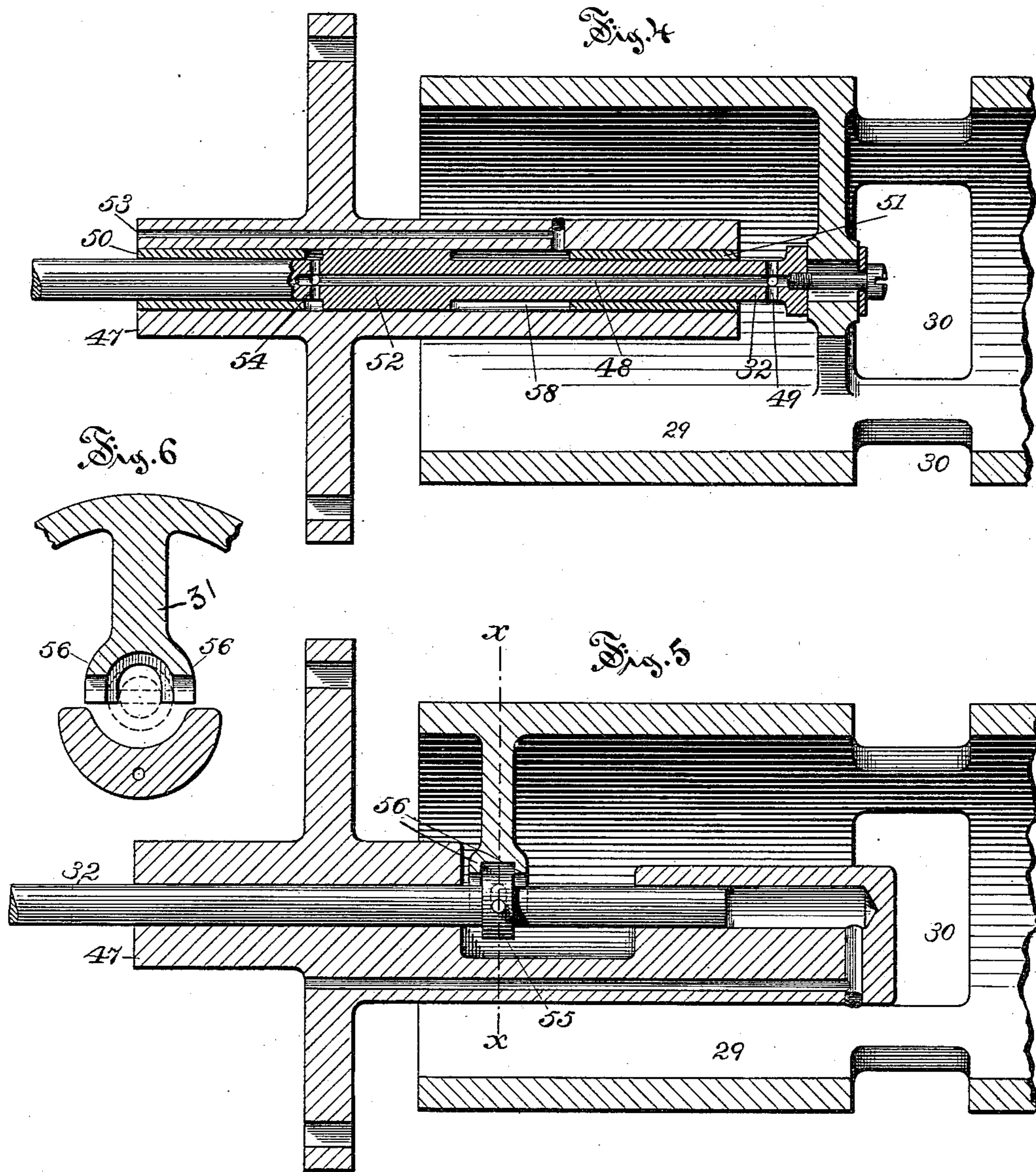
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Wm. Byorkman

H. L. Rickard

Inventor:

Richard H. Mather,

By Willard Eddy,
Atty.

UNITED STATES PATENT OFFICE.

RICHARD H. MATHER, OF WINDSOR, CONNECTICUT.

THROTTLE AND GOVERNOR VALVE.

SPECIFICATION forming part of Letters Patent No. 379,280, dated March 13, 1888.

Application filed September 4, 1886. Serial No. 212,687. (No model.)

To all whom it may concern:

Be it known that I, RICHARD H. MATHER, of Windsor, Hartford county, Connecticut, have invented a new and useful Throttle and Governor Valve for Steam-Engines, of which the following is a specification, illustrated by the accompanying drawings.

This invention is a throttle-valve and a governor-valve combined, and is designed for the purpose of automatically regulating the flow of steam from the boiler to the engine, and for the purpose of shutting off steam by hand by means of a single valve.

The best mode in which I have contemplated the application of my invention is illustrated in the drawings, in which—

Figure 1 is a plan view of my invention as applied to a rotating or revolving engine. Fig. 2 is an end view of the same. Fig. 3 is a central longitudinal vertical section of the valve and valve-seat, with portions of the supply-pipe and steam-pipe of the engine. Fig. 4 is a like section of the valve and valve-stem in a modified form. Fig. 5 is a like section of the valve and valve-stem in a different modified form, and Fig. 6 is a cross-section on *xx* of Fig. 5.

The engine, which is shown in the drawings and is indicated by the numeral 1, has the external form of a closed cylinder or drum, is provided with terminal hubs 2 and 3, and is rotatably mounted upon a hollow shaft, 4, which serves as a steam-pipe and exhaust-pipe. This engine is preferably constructed in the manner which is set forth in an application for a patent on steam engines filed by me April 19, 1886, under Serial No. 199,323. This pipe is supported in a fixed position by standards 5 and 6, which rise in a convenient form from base 7. Upon hub 2 is a metallic sleeve, 8, which is movable lengthwise between engine 1 and standard 5. This sleeve is formed with a circumferential channel or surrounding groove, 9, and is provided with ears 10 and 10, which extend radially therefrom in opposite directions. Through the cylindrical wall of sleeve 8, in any convenient part thereof, is a spiral slot, 11, whose length and pitch depend upon the end-play which is to be imparted to the valve, hereinafter described. In this slot is a pin, 12, which sticks out radially from hub 2.

Upon that end of engine 1 which is adjacent to sleeve 8 and is shown in Fig. 2 is mounted a centrifugal weighted lever, 13. By pin 59 one end of this lever is pivoted to the engine at a distance from hub 2. The other end of lever 13 is provided with a spring, 14, which tends to draw that lever toward hub 2. A movable weight, 15, is fastened by set-screw 16 to lever 13, near the free end of the latter, and stop-pins 17 and 18 upon opposite sides of lever 13 prevent the same from oscillating toward hub 2 or away from it to a greater extent than is required in the due operation of the valve, as hereinafter explained. This lever and the adjacent ear 10 of sleeve 8 are connected by a link, 19. A second weighted lever, 20, provided with a like spring, 21, movable weight 22, set-screw 23, and stop-pins 24 and 25, is similarly pivoted to the same end of engine 1 upon the opposite side of hub 2, and is similarly connected with the remaining ear 10 of sleeve 8 by link 57.

As but a single weighted lever is shown in Fig. 1, while two such levers are shown in Fig. 2, these figures may be considered, in respect of the number of levers employed, as representing two different modes of construction, each of which is a modification of the other.

The end of steam-pipe 4 is screwed into the end of an iron casting, 26, which is of irregular cylindrical form, and has a port, 27, (shown in Fig. 3,) into which is screwed the end of the supply-pipe 28. Within this casting is formed the seat of a balanced piston-valve, 29. This valve is a hollow cylinder open at both ends and having lateral steam-ports 30, whose aggregate area is as great as the area of supply-pipe 28 or steam-port 27. Valve 29 is also provided with an internal hub, 31, to which the valve-stem 32 is loosely connected. Casting 26 is enlarged about steam-ports 30 in such a manner as to form a ring-shaped internal cavity, 33, around valve 29, continuous with steam-port 27. The end of casting 26 remote from engine 1 is closed by means of a cap, 34, which is fastened thereto by screws. This cap, which is of general circular form, has two ears, 35 and 35, which radiate therefrom in opposite directions. Through the middle of cap 34 is a hole, 36, in which valve-stem 32 may reciprocate. At a little distance from hole 36, and parallel thereto,

through cap 34, is another hole, 37, in which a false valve-stem, 38, of the same size as stem 32, may reciprocate. These two stems are connected by a lever, 39, which is pivoted in the middle to a projection, 40, upon the inside of cap 34. This cap is considerably thickened where stems 32 and 38 pass through, in order to prevent the escape of steam. At the outer end of stem 32, and continuous therewith beyond cap 34, is a screw, 41, which is pivoted with a hand-wheel, 42, for the manipulation of the same. On opposite sides of casting 26 are two like and parallel rods, 43 and 43, each of which passes loosely through a hole in the end of one ear, 35, and through a hole in the end of bracket 44, which projects from the upper part of standard 45. These rods are rigidly connected together at one end by means of a yoke, 45, which has a central hub and a female screw for the accommodation of screw 41. Each of these rods is provided at the other end with a tongue or finger, 46, which projects therefrom, and is adapted to travel in groove 9 during the revolution of sleeve 8.

The modifications shown in Figs. 4, 5, and 6 require additional explanation.

In Fig. 4 valve-stem 32, being attached, as before described, to hub 31 within valve 29, reciprocates through the central portion of cap 34, which is extended as a sleeve, 47. Stem 32 is in this instance hollow through a considerable portion of its length, and contains a tubular cavity, 48, which at one end intercommunicates by ports 49 with the hollow interior of valve 29. Within sleeve 47 are two separate bushings, 50 and 51, which are fitted closely and immovably thereto. Within bushings 50 and 51 valve-stem 32 is of uniform size, but in the space between them is enlarged in a head, 52, which is movable endwise within sleeve 47. The interior cross-section of sleeve 47 is twice as great as the cross-section of stem 32. Between bushing 51 and head 52 is a cylindrical chamber, 58, which communicates with the external atmosphere by passage 53 in sleeve 47, while between bushing 50 and head 52 is also a cylindrical chamber, which communicates with cavity 48 by ports 54.

In the modification which is shown in Figs. 5 and 6 the valve-stem 32 is of uniform size, and is attached to a standard or partial hub, 31, within valve 29, by means of a fixed collar, 55, which is placed between two arms, 56 and 56, branching from standard 31. In this instance stem 32 is adapted to reciprocate in sleeve 47, which, being cut away in the middle, lies partly on each side of collar 55. That portion of sleeve 47 which receives the end of stem 32 is open to the external atmosphere through a passage, 53, within that sleeve.

The invention whose construction has now been described with modifications further presents all other features and particulars of construction which are involved in the mode of operation which is illustrated in the drawings and is now to be explained.

When the engine is at rest, the springs 14 and 21 draw levers 13 and 20 to positions of contact with stop-pins 18 and 25, respectively, and said levers, acting through links 19 and 57, turn sleeve 8 upon hub 2 to such a position that pin 12 stands in that end of slot 11 which is next to engine 1. Sleeve 8 accordingly stands at a little distance away from the engine, and the rods 43, being pressed endwise away from engine 8 through the agency of tongues 46, carry yoke 45 in the same direction, and thereby draw out stem 32 and uncover ports 30 within chamber 33 in casting 26. This is upon the assumption that stem 32 has been so far drawn out by the manipulation of screw 41 that ports 30 can be removed from the cover of the contiguous valve-seat in the manner described. When it is desired to close ports 30 in such a manner as to prevent the passage of steam through this valve, that result is accomplished by turning in screw 41 by wheel 42 until those ports are covered by the close-fitting wall of the valve-seat.

When the engine is to be brought into action, the valve is opened by the use of wheel 42. The steam which is admitted from the supply-pipe 28 then fills chamber 33, and passes through ports 30 into the interior of valve 29, whence it passes to the engine through pipe 4. Valve 29 is balanced between the pressure of steam behind and before it by the aid of the pressure which, being exerted upon the inner end of stem 38, is transmitted to stem 32 by lever 39, as shown in Fig. 3, or by the aid of the pressure which is exerted upon head 52 in chamber 58, as shown in Fig. 4, or by the exposure of both ends of stem 32 to the external air, as shown in Figs. 5 and 6.

As the engine revolves, the weighted levers 13 and 20 tend to separate from their respective positions, which are above described, and to move toward positions of contact with stop-pins 17 and 24, respectively. As soon as any such motion occurs, sleeve 8 is turned upon hub 2 in such a manner as to be moved by pin 12 bodily upon that hub toward engine 1. This motion is communicated to valve 29 through tongues 46, rods 43, yoke 45, and stem 32. In this manner any increase in the speed of the engine, above the normal speed for which it is designated to regulate, causes a corresponding diminution of the steam which is admitted thereto. By a reverse mode of operation any diminution in the speed of the engine below the same normal speed causes a corresponding increase of steam-supply, so that the speed of the engine regulates itself automatically within the limits imposed by the sensitiveness of the automatic regulating mechanism, which has been described. The normal speed of the engine may be increased or diminished by setting the weights 15 and 22 nearer or farther away from the free ends of their respective levers 13 and 20.

As the valve is carefully balanced and moves with little friction, and as the weights 15 and

22, being of considerable size, are very sensitive to changes of speed, the above-described mechanism secures an exceedingly prompt and close regulation of speed.

5 I claim as my invention—

1. A steam-engine revolving upon a stationary shaft, and a sleeve upon the rotary hub of said engine, said hub being provided with a projecting pin and said sleeve having a slot
10 for the accommodation of said pin, in combination with mechanism which is adapted to change the relative position of rotation of said hub and sleeve according to the speed of the engine, a piston-valve, and a yoke which receives the longitudinal motion of said sleeve
15 and communicates the same to the stem of said valve without change of direction, substantially as and for the purpose specified.

2. A steam-engine revolving upon a hollow
20 shaft, a rotary sleeve upon a hub of said engine, a pin and slot whereby said hub and sleeve engage each other, and a centrifugal governor which is mounted upon a head of said engine and is adapted to vary the relative
25 positions of said sleeve and hub according to the varying speed of the engine, in combination with a piston-valve which is located in a prolongation of said hollow shaft, and mechanism which is adapted to communicate the
30 resulting reciprocating motion of said sleeve to the stem of said valve, substantially as and for the purpose specified.

3. A rotary hub of a steam-engine and a rotary sleeve upon said hub, said hub and
35 sleeve being provided with an engagement pin and slot, in combination with mechanism which is adapted to vary the relative position of said sleeve and hub according to the speed of the engine, a cradle engaging said sleeve
40 and moving longitudinally therewith, and a valve which is provided with a valve-stem having an adjustable screw-connection with said cradle, substantially as and for the purpose specified.

4. A movable sleeve upon the hub of a
45 steam-engine, a valve controlling said engine, and a cradle whereby the longitudinal motion of said sleeve is communicated to the valve-stem, in combination with a screw-connection
50 between said stem and cradle, whereby said valve may be operated independently, substantially as and for the purpose specified.

5. A steam-engine having a valve-stem, a
55 movable sleeve upon the hub of said engine, and an automatic governor actuating said sleeve, in combination with a cradle whereby motion may be transmitted from said sleeve to said valve-stem, and a screw-connection be-

tween said cradle and valve-stem, whereby said valve may be operated by hand independently
60 of said governor, substantially as and for the purpose specified.

6. In combination with a movable sleeve upon the hub of a revolving steam-engine and with the stem of a piston-valve controlling
65 said engine, an intermediate cradle consisting of two parallel rods which are movable lengthwise in suitable supports and are rigidly connected with each other by means of a yoke, to which said stem is attached, substantially as
70 and for the purpose specified.

7. For the purpose of transmitting motion from a grooved sleeve upon the hub of a revolving steam-engine to the stem of a piston by which said engine is regulated, two parallel
75 rods which are movable endwise in suitable bearings, are armed at one end with tongues or fingers for engagement with said sleeve, and are connected with each other at the other end by means of a yoke, to which said stem is at-
80 tached, substantially as and for the purpose specified.

8. A balanced piston-valve provided with a valve-stem and a false valve-stem, which are balanced against each other by means of a lever,
85 substantially as and for the purpose specified.

9. A valve-casing having a head which is provided with an interior chamber and an outlet therefrom to the external air, a balanced valve-piston within said casing, and a valve-
90 stem which works through said head, in combination with a false valve-stem which works in said chamber, substantially as and for the purpose specified.

10. A centrifugal governor, a sleeve for
95 transmitting motion from said governor, two parallel rods, and an intermediate yoke for transmitting motion from said sleeve, in combination with a balanced piston-valve whose stem terminates in a screw which passes
100 through a bushing in said yoke and is armed with a hand-wheel, substantially as and for the purpose specified.

11. Two parallel rods adapted to move lengthwise in suitable supports and attached
105 to each other by means of a rigid yoke, in combination with a valve-stem which is provided with a screw-thread working through said yoke and with a terminal hand-wheel, substantially as and for the purpose specified.
110

In testimony whereof I have hereunto set my name in the presence of two witnesses.

RICHARD H. MATHER.

Witnesses:

WILLARD EDDY,
ALBERT H. WALKER.