No. 624,428. Patented May 2, 1899.

J. BRADY.

ENGINE STOP.

(Application filed June 18, 1898.)

(No Model.) 5 Sheets—Sheet 1.

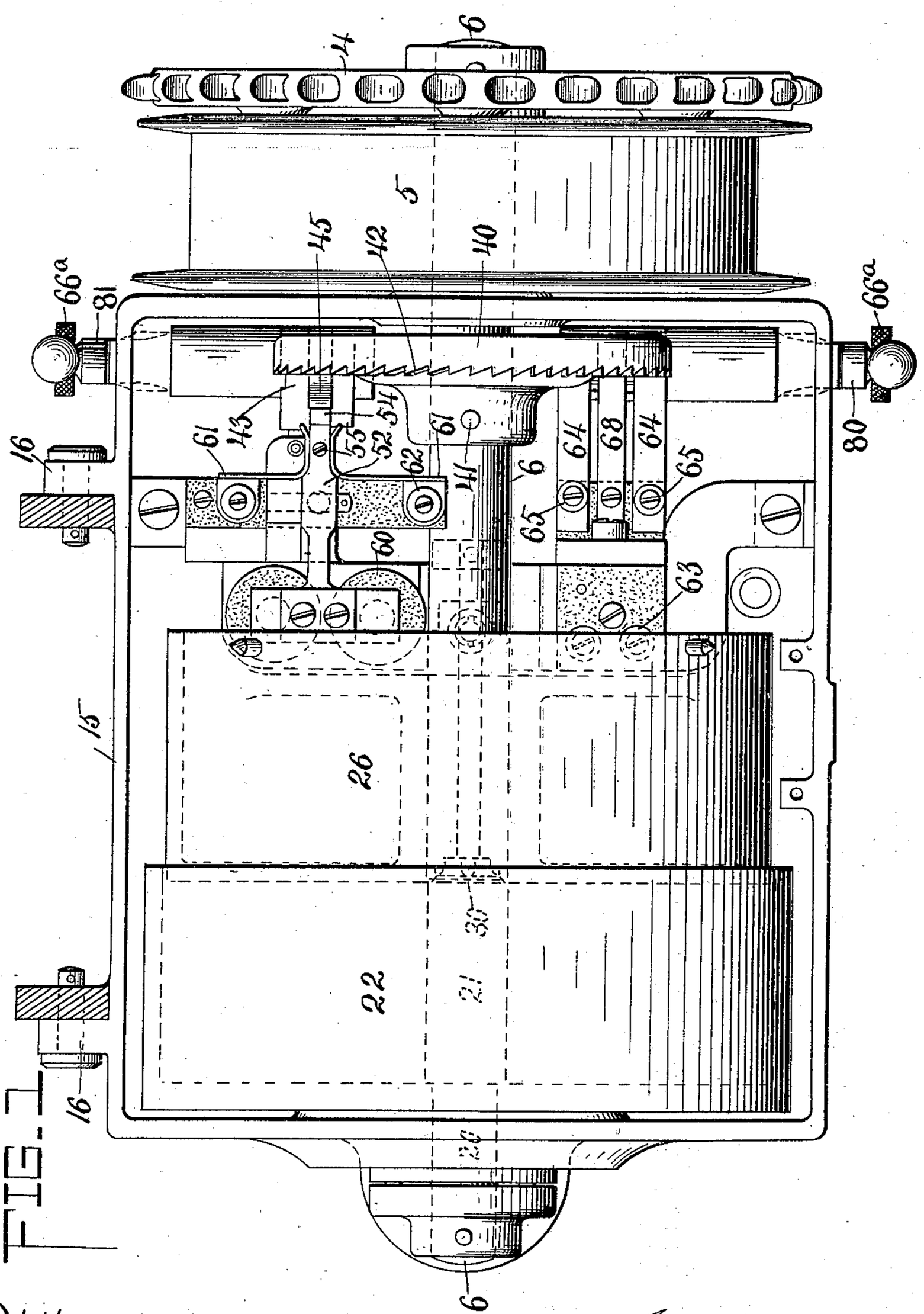

FIG. 1.

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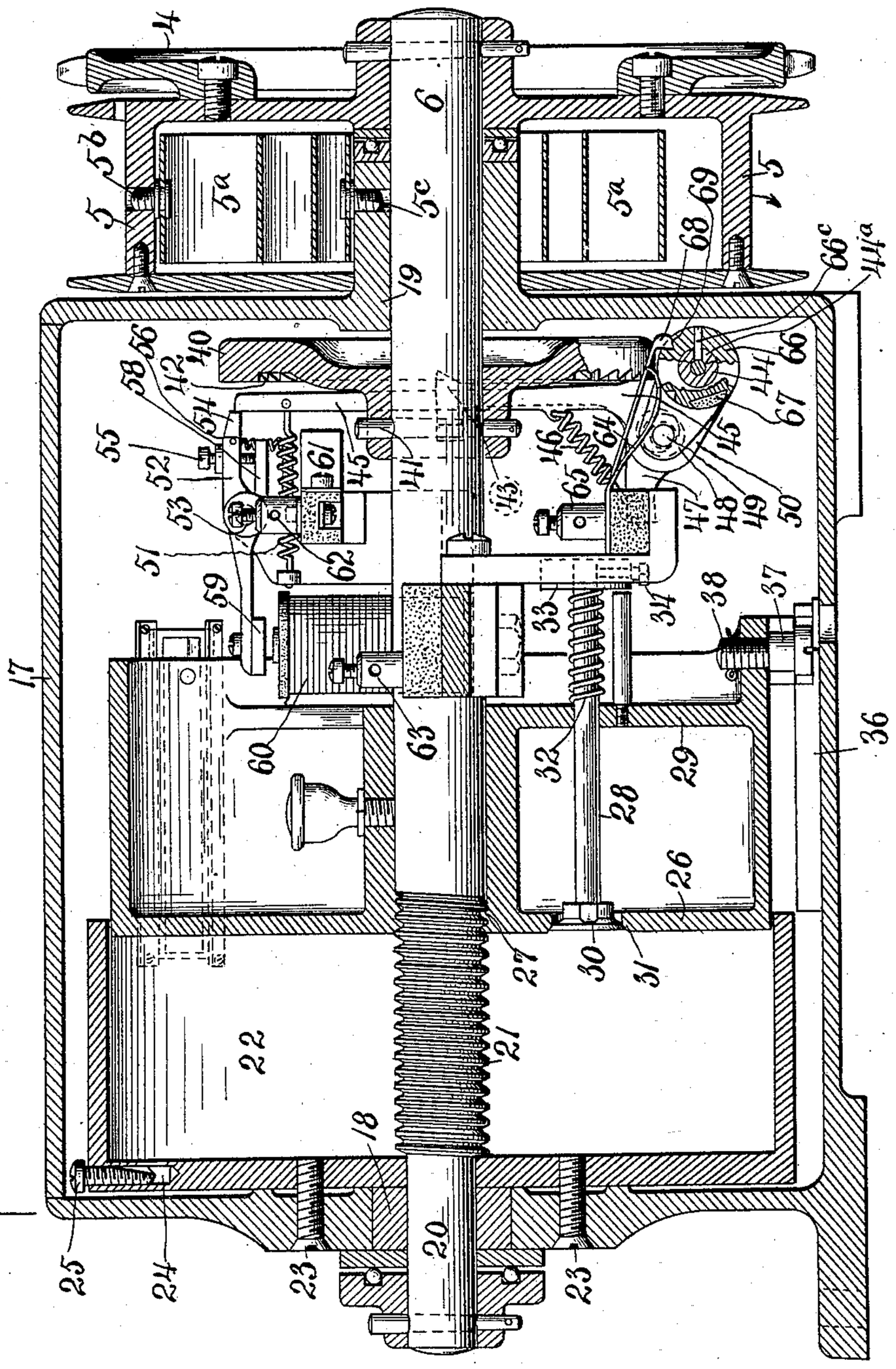

FIG. 2.

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(No Model.) 5 Sheets—Sheet 3.

FIG. 5.

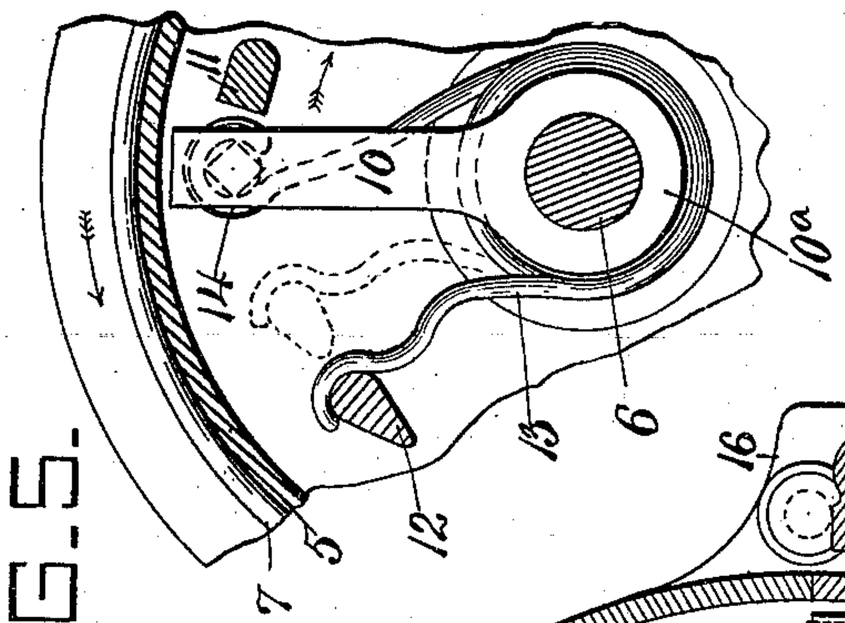

FIG. 4.

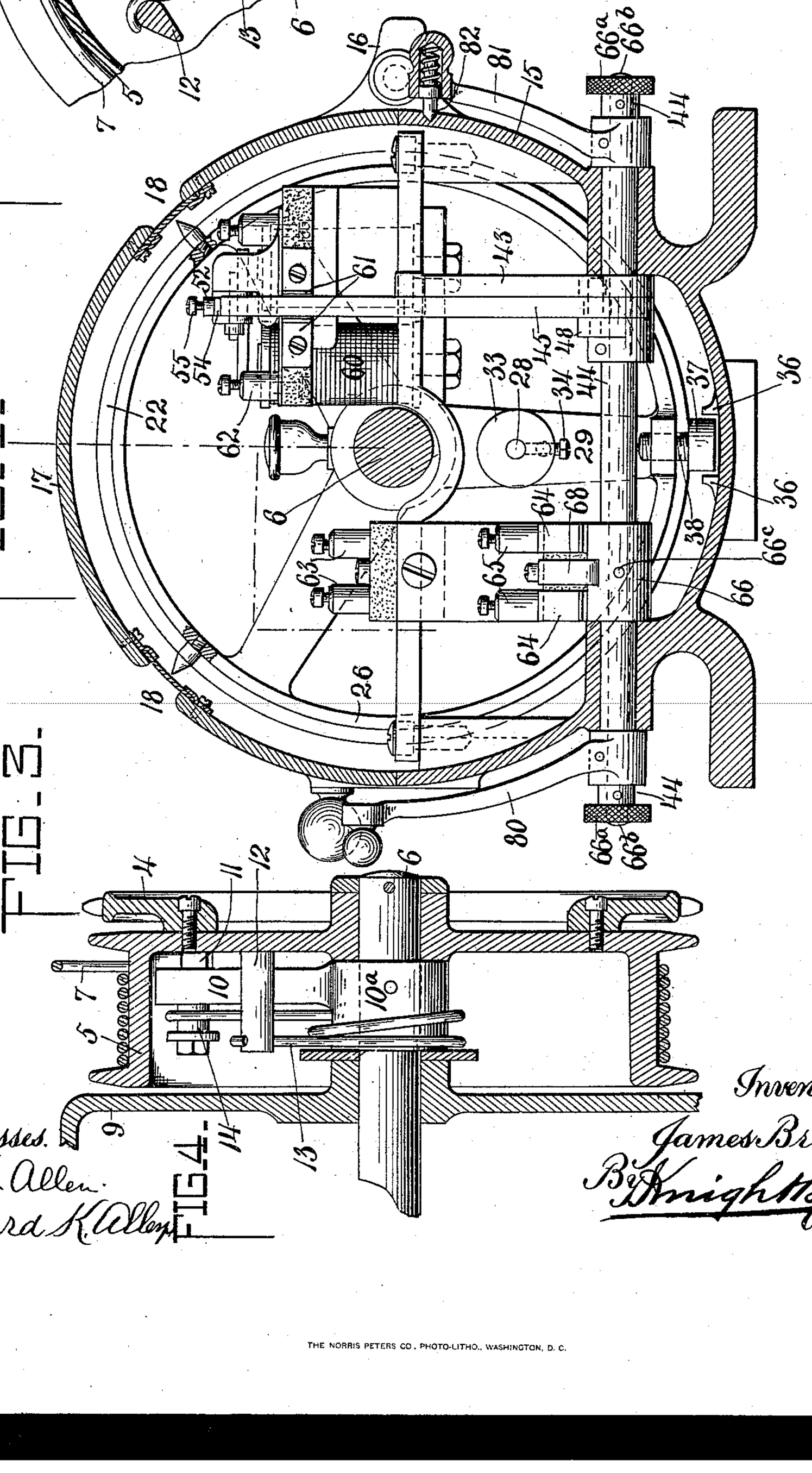

FIG. 3.

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(No Model.) 5 Sheets—Sheet 4.

FIG. 6.

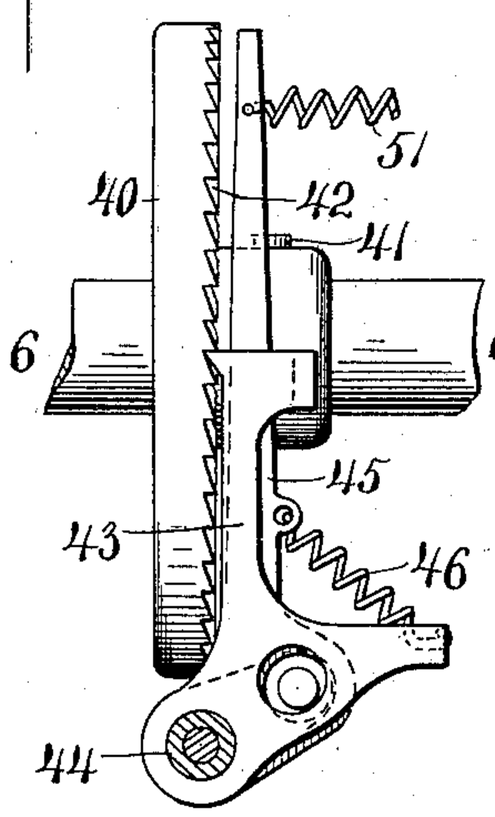


FIG. 7.

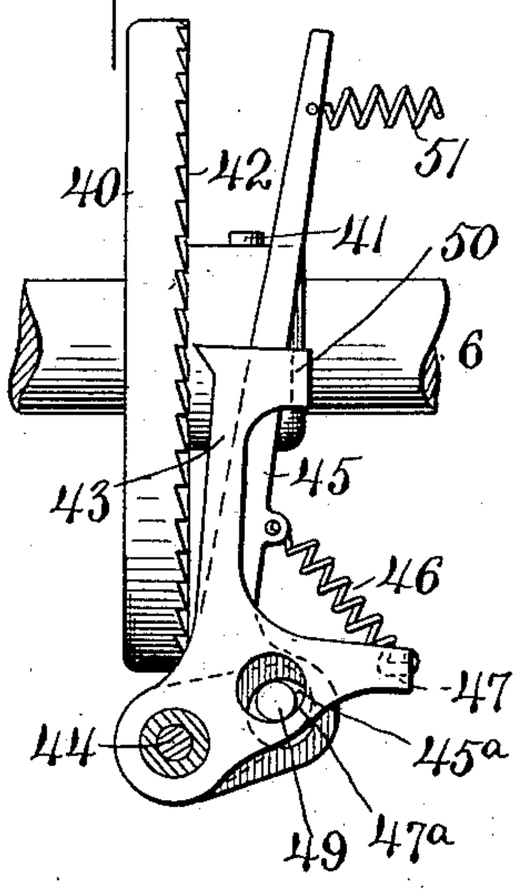
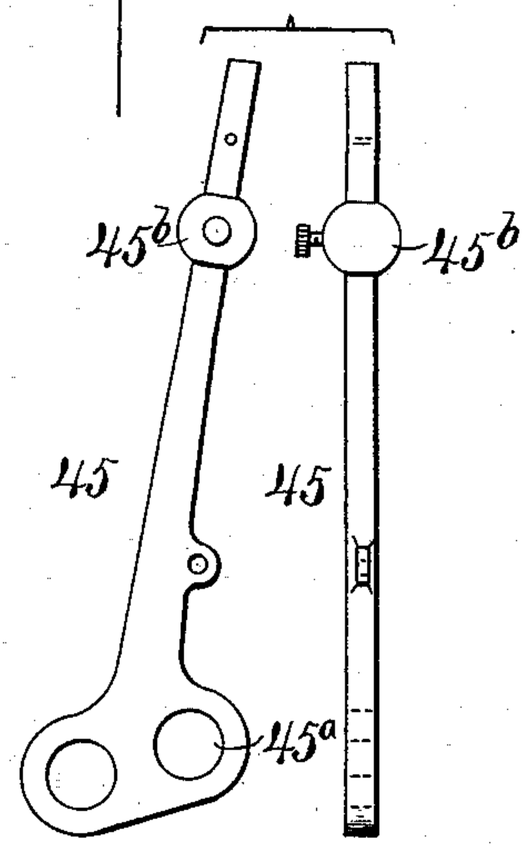


FIG. 8.



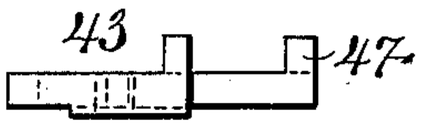
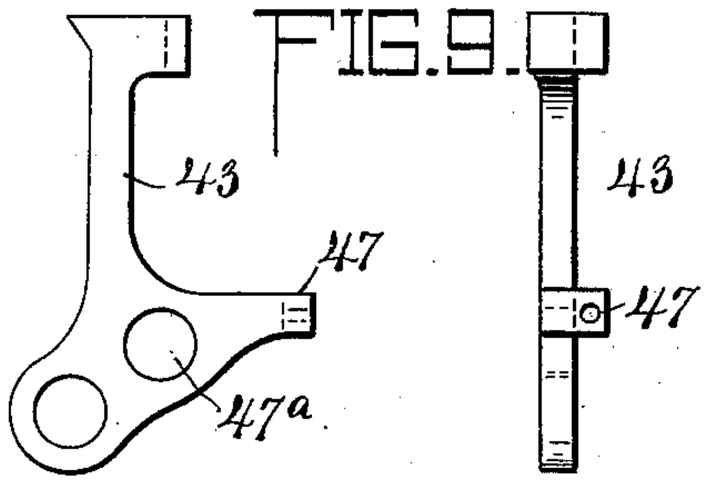


FIG. 9.



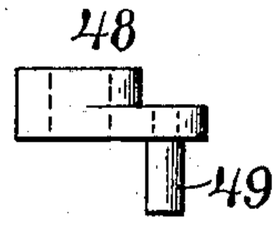
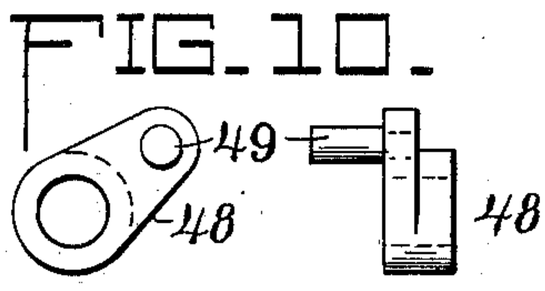


FIG. 10.



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(No Model.) 5 Sheets—Sheet 5.

Fig. 12.

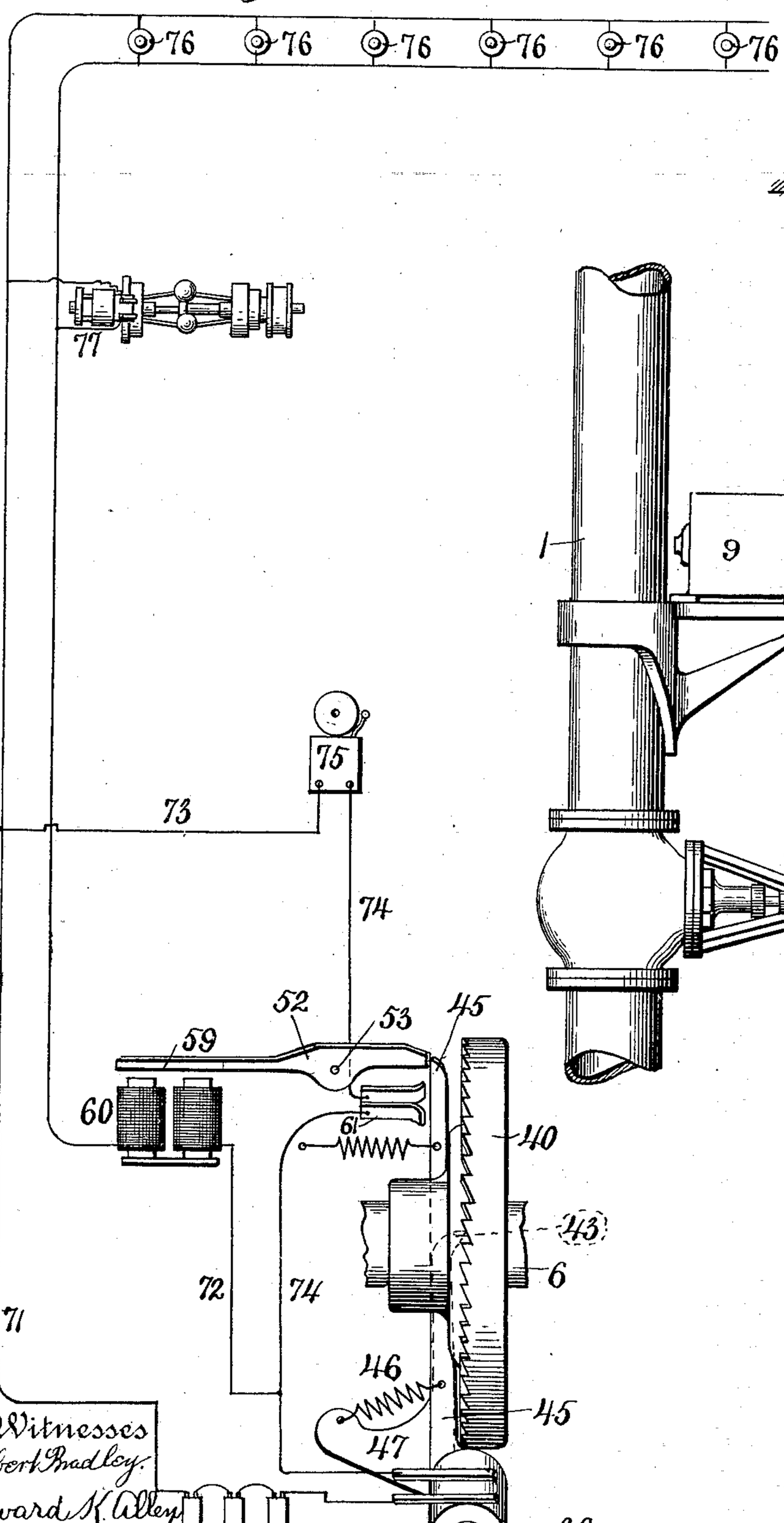
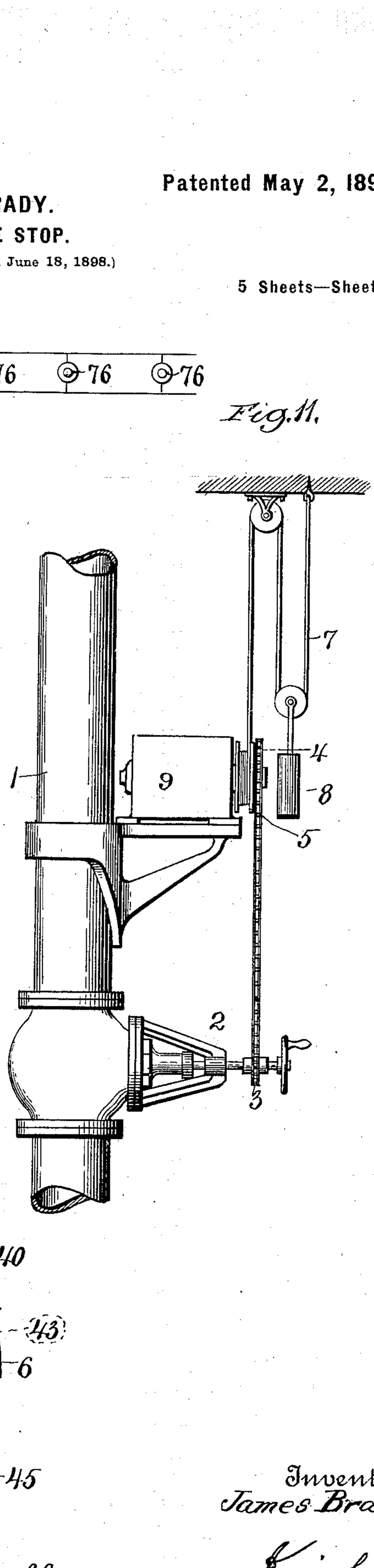


Fig. 11.



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Edward K. Alley

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Attorneys

UNITED STATES PATENT OFFICE.

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ENGINE-STOP.

SPECIFICATION forming part of Letters Patent No. 624,428, dated May 2, 1899.

Application filed June 18, 1898. Serial No. 683,879. (No model.)

To all whom it may concern:

Be it known that I, JAMES BRADY, a citizen of the United States, and a resident of New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in Engine-Stops, of which the following is a specification.

My invention relates to improvements in those devices which are designed for emergency use in cutting off the supply of power to a steam-engine or other motor through the medium of electric circuits extending to one or more distant points—such, for example, as disclosed in United States Letters Patent No. 552,464, granted December 31, 1895, to my assignee, Leonard W. Sweet.

The objects of my present invention are to provide an improved construction of the weight-motor for actuating the cut-off mechanism in order to render its operation more promptly responsive upon release of the detent, to improve the detent and render it more easily released, to provide improved means for checking the operation of the device as it reaches the limit of its movement, and to adapt the mechanism for convenient resetting.

The feature of my invention relating to the weight-motor consists in combining therewith a starting-spring, which will impart an initial movement to the device, and thereby avoid the loss of time incident to overcoming the inertia of the weight when setting the parts in motion, also to so combine said spring with the parts that it will not only perform the function of initiating the movement of the mechanism, but will act as a cushion to arrest the rotation of the drum when the mechanism reaches the limit of its movement.

The features of novelty relating to the detent consist in combining with the usual ratchet-disk a dog and lever loosely fitted on a setting-shaft having elastic connection between them, so that the dog is held into engagement with the ratchet-disk by the lever through a yielding connection, while the lever is retained in position by the armature of a releasing-magnet and a crank-hub keyed to the setting-shaft and having a pin projecting through openings in the dog and lever, so as to provide for moving one of said parts through another. The pin on the crank-hub thus becomes the means for moving the dog by the lever in the direction of throwing said dog out of engagement with the ratchet, as well as the means whereby the setting-lever is reset by the shaft. The openings through the lever and dog are enlarged for the double purpose of permitting the dog to vibrate over the ratchet-teeth in winding the drum and permitting a lost motion between the lever and dog in retraction, so that the lever, when released by the armature, will gain momentum before striking the dog and act more efficiently in overcoming friction of the latter with the ratchet-tooth with which it is in engagement.

A further feature consists in utilizing a portion of said setting-shaft to complete an alarm-circuit when the mechanism is called into action and providing said setting-shaft with a block of insulating material, which is brought beneath brushes to open the circuit and stop the alarm when the device is reset, the operation of these parts being such that the alarm will continue to sound until the device is reset, and as the valve or cut-off cannot be held open until said device is reset no opportunity is offered for again starting the engine until the safety appliance is in proper condition.

Further features relate to details of construction of the dash-pot, which serves to retard the operation of the device and avoid shock, but which offers no resistance to the resetting device.

My invention will be fully understood upon reference to the accompanying drawings, in which—

Figure 1 is a plan of my improved device with the upper portion of the casing removed. Fig. 2 is a vertical longitudinal section of the device. Fig. 3 is a vertical transverse section of the same in the plane of the setting-shaft. Figs. 4 and 5 are respectively an axial and a transverse section of the preferred form of drum which contains the starting and cushioning spring. Figs. 6 to 10 are detail views representing the parts of the detent both assembled and segregated. Fig. 11 represents

the device in use. Fig. 12 is a diagram showing the manner of connecting up the circuits with the electrical portion of the mechanism.

Referring to Fig. 11, 1 represents, for purposes of illustration, a steam-pipe or other conductor for supplying power to a steam-engine or motor which it is desired to control. 2 represents the cut-off, illustrated as the valve-stem by which the valve in said pipe may be controlled. Upon said stem 2 I mount a sprocket-wheel 3 or equivalent machine element, which is connected through chain 3ª to a corresponding driving member 4, carried by the drum 5 of the device which forms the subject-matter of my invention. The drum 5 is mounted on the shaft 6 of the device and under control of said shaft, and is provided with a winding-cord 7, connected with a weight 8, which weight when gravitating imparts rotary movement to the drum 5, which will be transmitted through the connections 3 and 4 to the valve-stem 2 in a direction which will cut off the supply of power. As will be presently described, the rotation of the drum 5 is normally opposed by controlling mechanism, which is contained in a casing 9 and under the control of an electric circuit extending to one or more distant points and containing a number of push-buttons or other circuit-closers. When the circuit is closed at any point, the mechanism is released, the drum 5 is free to rotate, and the supply of power will be cut off.

One of the difficulties which I have experienced in the use of a weight for driving the drum 5 is the delay which occurs in overcoming the inertia of the weight and parts to be set in motion. In order to avoid this objection, the drum 5 is mounted loosely on the shaft 6, and controlling connection between them is made through the means shown in Figs. 3 and 5, comprising an arm 10 fixed to the shaft 6, a lug 11 carried by the drum and engaging arm 10 in one direction, another projection 12 on the drum, and a spring 13 engaged at one end by projection 12, having its other end connected to a pin 14 on the arm 10 and with its intermediate portion coiled about the hub 10ª of the arm 10. The movement necessary to wind up the cord 7 on the drum 5 results from turning the valve-stem 2 in the act of opening the valve. This same movement is imparted from said drum through pin 11, arm 10, and shaft 6 to controlling mechanism within the casing 9, which is by that movement moved to its "set" position, and retained in that position by retaining means (a pawl and ratchet) to be presently described. The parts being thus set and the retaining device opposing the rotation of the shaft, the drum 5 will turn under the influence of the weight 8 just as far as the weight can compress the spring 13, and the spring remains in this compressed condition when the throttle-valve is open, and the engine-stop as a whole is in condition to respond to the electric impulse (or to be tripped by hand) to close the valve. The moment the retaining device is tripped and shaft 6 is free to turn the spring 13 (already compressed by the unwinding tendency of the weight) starts the shaft instanter and much quicker than it would take to overcome the inertia of the weight by gravity, thus permitting a heavy weight to be used. In other words, the weight has stored up in the spring energy which the spring gives back instantly, and by the time the ends of the spring are separated to the full extent of the spring's power over the shaft the weight will have come into full action, and from then on the pulley-arm and shafting will turn together, driven by the weight. As the piston of the dash-pot meets with resistance from the air by the latter becoming more and more compressed, it will begin to retard the speed at which the shaft rotates and eventually stop the shaft. The spring will now again come into play and act as a cushion and relieve the sudden stop of the weight.

While I prefer the arrangement of winding-drum just described, employing the starting-spring, it will be observed that I may use with the remaining parts of my present invention a spring-drum 5, having driving-spring 5ª, with one end attached at 5ᵇ to the drum and the other end fixed at 5ᶜ to a stationary part of the device.

15, Figs. 1 and 4, represents the lower part of a casing having integral lugs 16, to which is hinged a cover 17, provided with peep-holes 17, properly located and to be hereinafter referred to. The ends of the casing 15 have suitable bearings 18 19, in which is journaled the shaft 6. This shaft 6 has at one rear end a reduced portion 20, which works in the bearing 18 in the rear of the casing and has a screw-thread 21 formed upon it, connecting at the reduced portion and continuing a suitable distance toward the forward end of the shaft.

22 is a dash-pot secured in the rear end of the casing by means of the screws 23, and in one corner of this dash-pot is formed a relief-valve 24, regulated by means of a screw-plug 25.

26 is a plunger provided with screw-threads 27 in its hub, which when the parts are assembled are engaged by the screw-thread 21 on the shaft 6, so that when said shaft turns the plunger will work in the dash-pot to retard the rotation of the shaft.

28 is a valve-stem working in cross-arm 29 and on which is secured the valve 30, held against its seat 31 in the forward face of the plunger 26 by means of spring 32.

33 is a head adjustably secured to the rear end of the valve-stem 28 by means of set-screw 34 and affording an abutment for spring 32 and at the same time adapted to be arrested by a stop 35, secured to the said arm 29 to limit the opening of the valve 30.

36 is a guide formed integral with the bottom of the casing 1, and 37 is a guide-roller secured to the plunger 26 by a screw 38 and

adapted to work in the groove 36 to prevent the plunger turning, while permitting it to move longitudinally.

39 is a thrust-bearing on the shaft 6.

40 is a ratchet-wheel fixed to the shaft 6 within the casing by means of a pin 41, and having a ratchet-face 42, engaged by a pawl 43, which is loosely mounted upon a shaft 44. 45 represents a controlling-lever which is also loosely mounted upon the shaft 44, and which holds the pawl 43 into engagement with the teeth 42 through the medium of a spring 46, which extends from the lever 45 to a horn 47 on said pawl 43.

48 represents a crank-arm keyed to the shaft 44 and having a pin 49, which enters relatively enlarged openings 45^a and 47^a, formed, respectively, in the lever 45 and dog 43. By this means the dog 43 may be withdrawn from the ratchet 40 by rotating the shaft 44, upon which the crank-arm 48 is keyed, when it is desired to release the mechanism by hand to shut the valve independently of the electric releasing mechanism. The openings 45^a and 47^a are of such size that the dog 43 may be moved out of engagement with the ratchet 40 by the turning of the shaft without disturbing the position of lever 45, which may be held in its forward position by the electrically-controlled detent to be described. The crank-arm 48 serves the further purpose of moving the lever 45 to its set position after said lever has been released by the electric trip. If the dog 43 is to be withdrawn through the medium of the lever 45, this effect is produced by the engagement of said lever with a projection 50 on said dog. During this movement the crank-arm 48 remains stationary, but the openings 45^a and 47^a are of sufficient dimension to prevent interference with these movements by the pin 49. The lever 45 is provided with a retracting-spring 51, which tends to draw it away from the ratchet-disk. It will be seen that the proportions of the parts are such that the lever 45 moves a considerable portion of its throw before coming in contact with the dog 43, and by this means said lever may develop sufficient momentum to insure overcoming the friction between said dog and the ratchet-tooth with which it is in engagement. If it should be desired to increase the momentum of the lever, it may be provided with a counterpoise 45^b, as shown in Fig. 8, and said counterpoise may be made adjustable vertically upon said lever for the purpose of varying the striking force of the lever upon the dog. Lever 45 is held normally in position by a detent 52, pivoted at 53 and engaging the said lever at 54, said detent being held in engagement by a spring 56 and limited in its movement by a screw 55, which engages a stop 58. 59 represents an armature carried on the other end of the lever 52, and which is under control of an electromagnet 60, which is to be connected in circuit with suitable circuit-closers, either push-buttons or switches 76 (see Fig. 12) at distant points, or a speed-limit device 77, which closes the circuit in the event that the speed of the engine exceeds a certain limit. When the armature 59 is drawn down, the lever 45 is released and immediately drawn back by its spring 51 a sufficient distance to withdraw the pawl 43 and permit the shaft 6 to rotate freely. When the lever 45 is drawn back, it passes between and closes the circuit through two contact-springs 61, having connection with binding-post 62, that receive the ends of a conductor forming a part of a bell or other alarm circuit. Said lever, therefore, in addition to setting in operation the stop mechanism, rings an alarm, and thus calls attention to the fact that the device has been called into action.

63 represents the binding-posts, by means of which electrical connection may be made with the magnet 60.

64 represents a pair of contact-springs carried by binding-post 65, whereby said springs may also be introduced into the bell-circuit, and these springs bear normally upon a metallic collar 66 on the shaft 44, whereby the circuit is completed through said springs. The alarm will therefore ring only when the mechanism is set in operation through the instrumentality of the electric trip and not when the mechanism is manually operated, as in the ordinary use for opening and closing the throttle-valve.

67 is an insulating-block inserted in the collar 66 in such position that said collar may be turned to bring the insulating-block 67 beneath the spring 64, and thus break the bell-circuit and stop the ringing of the alarm.

68 represents a spring-cap having an end adapted to enter the depression 69 in the collar 66, whereby the latter is held at either end of its movement until released. The collar 66 is turned by means of milled heads 66^a on opposite ends of a small shaft 66^b, which shaft is connected to the collar 66 by means of a pin 66^c, working in a segmental slot 44^a of the main shaft 44.

The circuits which may be employed for carrying out this part of my invention will be understood upon reference to Fig. 12, wherein 70 represents a suitable source of electrical energy, 71 and 72 the main conductors through means of which the device may be controlled from a distance, 73 and 74 conductors of the bell-circuit for actuating a bell or other alarm 75, 76 representing circuit-closers at distant points, and 77 representing an automatic speed-limit by which the main circuit 71 and 72 may be closed if the engine exceeds a certain limit of speed.

In order to manually operate the engine-stop both for ordinary closing of the valve and for resetting after an emergency operation through the electric trip, I provide a controlling-arm 80 on the shaft 44 and on the other end a locking-arm 81, which carries a spring-dog 82, engaging in a depression in the casing of the machine or other fixed part. When the shaft 44 is rotated by turning the arm 80

to the right, as viewed in Fig. 2, the lever 45 will be moved out from between the contact 61 and the detent 52 again allowed to enter behind it and hold it in position. Until this is done the pawl 43 will not be held in engagement with the ratchet 40, and even though the throttle-valve should be opened without first setting the engine-stop it will be immediately closed again, so that there is no possibility of omission to set the device and have everything in readiness for another operation when the engine is again started up. When, however, the dog 43 is withdrawn by turning the shaft 44, it will return to engagement as soon as the shaft is released.

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

1. In an engine-stop, the combination of an actuating-weight, controlling mechanism, and a spring interposed between the actuating-weight and controlling mechanism; substantially as set forth.

2. In an engine-stop, the combination of a rotary controlling mechanism having a shaft, a fixed arm projecting from said shaft, a winding-drum having means for rotating it and having projections on opposite sides of said arm for respectively setting the mechanism and rotating it in action, and a spring interposed between the arm and that one of the projections which imparts rotation to the arm in action; substantially as and for the purposes set forth.

3. In an engine-stop, the combination of rotating controlling mechanism having a pawl and ratchet for holding it in set position till released, and having a shaft, a drum loosely mounted on said shaft, a spring interposed between the drum and shaft, a gravitating weight having a winding connection upon said drum and a spring interposed between the drum and shaft and through the medium of which motion is imparted by the weight to the shaft; substantially as and for the purposes set forth.

4. In an engine-stop, the combination of means for actuating the cut-off, a shaft driven by said actuating means, a ratchet-disk mounted upon said shaft, a rock-shaft carrying a dog which engages said ratchet, a controlling-lever having an elastic connection with said dog for holding it in engagement with the ratchet and positively engaging said dog in the opposite direction for drawing it away from said ratchet, an armature retaining said lever in position to hold the pawl in engagement with the ratchet, and an electromagnet for withdrawing said armature; substantially as and for the purposes set forth.

5. In an engine-stop, the combination of a suitable motor for cutting off the supply of power, a shaft moving with said motor and carrying a ratchet-disk, a dog engaging said ratchet and having a rearwardly-projecting horn, a controlling-lever, a spring connection between the controlling-lever and the horn of the dog whereby the latter is held in engagement with the ratchet, a positive connection between said lever and dog whereby the lever may withdraw said dog from the ratchet, a spring tending to draw the lever with the dog away from the ratchet, a detent for holding the lever in opposition to said spring, and an electromagnet and armature connected with said detent whereby the latter may be withdrawn from engagement with the lever; substantially as and for the purposes set forth.

6. In an engine-stop, the combination of a suitable motor for cutting off the power, controlling mechanism for said motor, an alarm-circuit, an alarm-circuit closer operated by the release of the controlling mechanism, and a manually-operated alarm-circuit break; substantially as and for the purposes set forth.

7. In an engine-stop, the combination of a suitable motor for actuating the cut-off, suitable controlling mechanism adapted to be released at will, an alarm-circuit, an alarm-circuit closer called into operation by the release of the controlling mechanism, a manually-operated alarm-circuit break, and a spring-catch for the alarm-circuit break; all arranged substantially as and for the purposes set forth.

8. In an engine-stop, the combination of a motor for actuating the cut-off, a controlling mechanism for restraining the operation of said motor until released, a ratchet-disk forming part of said controlling mechanism, a rock-shaft, a dog loosely mounted on said rock-shaft and engaging the ratchet, a controlling-lever on said rock-shaft, a spring extending from the controlling-lever to the dog whereby said dog is yieldingly held in engagement with the ratchet, a crank-arm fixed on the shaft and having a slot-and-pin connection with said lever and dog whereby said crank-arm may withdraw the dog from the ratchet, or move said lever into forward position, and an electrically-controlled detent for retaining the lever in position, which holds the pawl in engagement with the ratchet; substantially as described.

9. In a controlling mechanism for engine-stops, the combination of a ratchet for opposing the operation of the stop until released, a controlling-lever for said ratchet, the detent 52 fulcrumed at 53 and engaging the controlling-lever at 54, the screw 55 and stop 58 for limiting the movement of said detent, spring 56 for holding said detent in engagement with the controlling-lever, armature 59 on the end of the detent opposite to its point of engagement with the controlling-lever, and an electromagnet controlling said armature whereby the mechanism may be brought under control of a circuit-closer at a distant point; substantially as and for the purposes set forth.

10. In an engine-stop, the combination of a controlling mechanism having a ratchet, a controlling-lever for said ratchet, a rock-shaft upon which the dog of the ratchet and the controlling-lever are mounted, a setting-lever 80 on said rock-shaft, and an arm also on said

rock-shaft and having a spring-catch; substantially as and for the purposes set forth.

11. In an engine-stop, the combination of a controlling mechanism having a ratchet, a controlling-lever for said ratchet, an alarm-circuit including a circuit-closer operated by the release of said controlling-lever, a rock-shaft upon which the controlling-lever and the pawl of the ratchet are mounted, a setting-lever on said rock-shaft, a sleeve also mounted on said rock-shaft and carrying a circuit-break for the alarm-circuit, and an independently-turning shaft within the rock-shaft, engaging the circuit-breaking sleeve and having means of turning it independently of the rock-shaft; all substantially as and for the purposes set forth.

12. In an engine-stop, the combination of the controlling mechanism, an alarm-circuit having a circuit-closer operated by the release of said controlling mechanism, a manually-operated rotating sleeve having an insulating-block therein, and a pair of contact-springs 64 suitably introduced in the alarm-circuit and bearing upon said sleeve; substantially as and for the purposes set forth.

13. In a controlling mechanism for engine-stops, the combination of a releasing mechanism, an alarm-circuit including a circuit-closer operated by the releasing mechanism to sound an alarm when the stop is called into action, and a manually-operated circuit-break for said alarm-circuit comprising a rotating metallic sleeve having in its surface a segmental insulating-block and depressions, a pair of contact-springs bearing upon the periphery of the sleeve and suitably introduced into the alarm-circuit so that said circuit is made when the springs bear upon the metallic surface and is broken when they bear upon the insulating-block, and a spring-catch also bearing upon said sleeve and entering the notches therein as it reaches the limits of its movement in opening and closing the alarm-circuit; substantially as and for the purposes set forth.

14. In an engine-stop, the combination of the controlling mechanism, an atmospheric dash-pot for retarding the movement of the stop, comprising a dash-pot having at one corner an air-outlet adapted to be graduated by a screw and piston having threaded connection with the shaft of the controlling mechanism and working in said dash-pot, and a valve in said piston closing under pressure but opening under suction within the dash-pot; substantially as and for the purposes set forth.

15. In an engine-stop, the combination of the shaft and controlling mechanism, a dash-pot having a relief-valve, a piston working in said dash-pot and having threaded connection with the shaft, a valve in said piston closing under pressure and opening under suction within the dash-pot, a stem projecting from said valve, an adjustable head on said valve-stem and a stop for engaging the adjustable head and arresting its movement; substantially as and for the purposes set forth.

16. In an engine-stop, the combination of the shaft of the controlling mechanism, a stationary dash-pot, a piston threaded on said shaft and working in the dash-pot, the guide 36 on the casing, and the guide-roller 37 suitably secured to the plunger and working in said guide; substantially as and for the purposes set forth.

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