

No. 683,395.

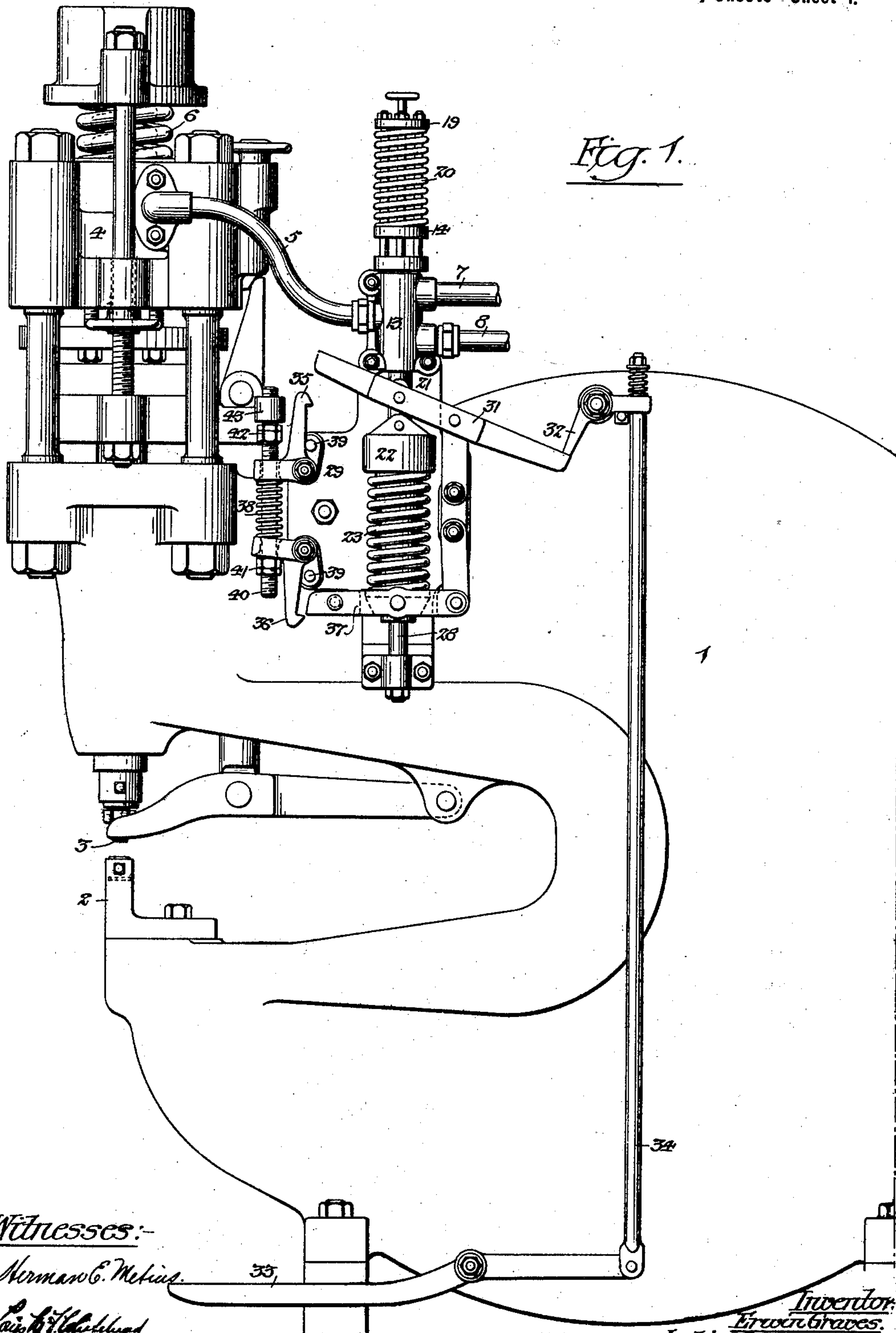
Patented Sept. 24, 1901.

E. GRAVES.
HYDRAULIC PUNCH OR LIKE TOOL.

(Application filed Oct. 27, 1900.)

(No Model.)

7 Sheets—Sheet 1.



Witnesses:-

Norman C. Melius.

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by his Attorneys:-

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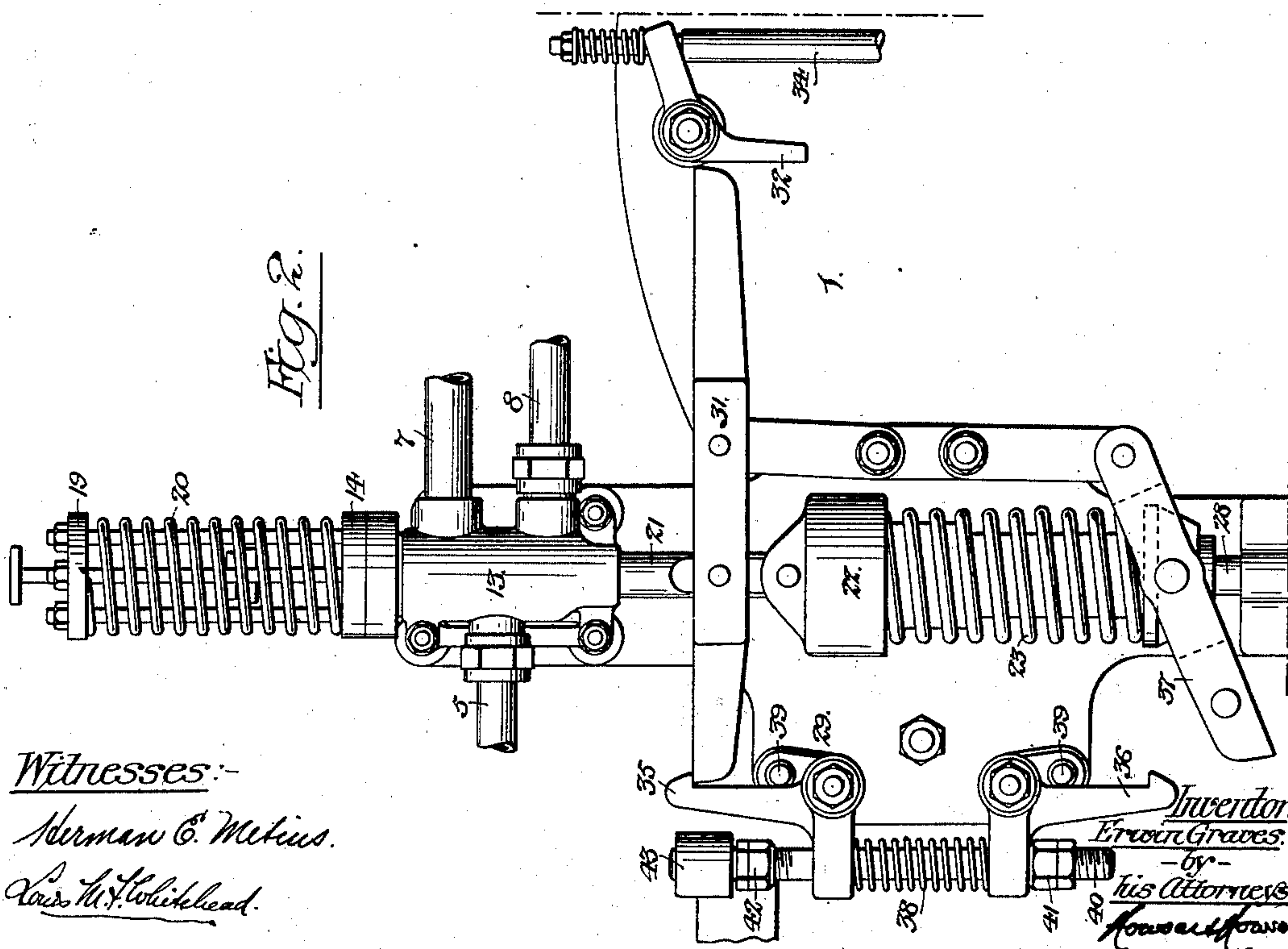
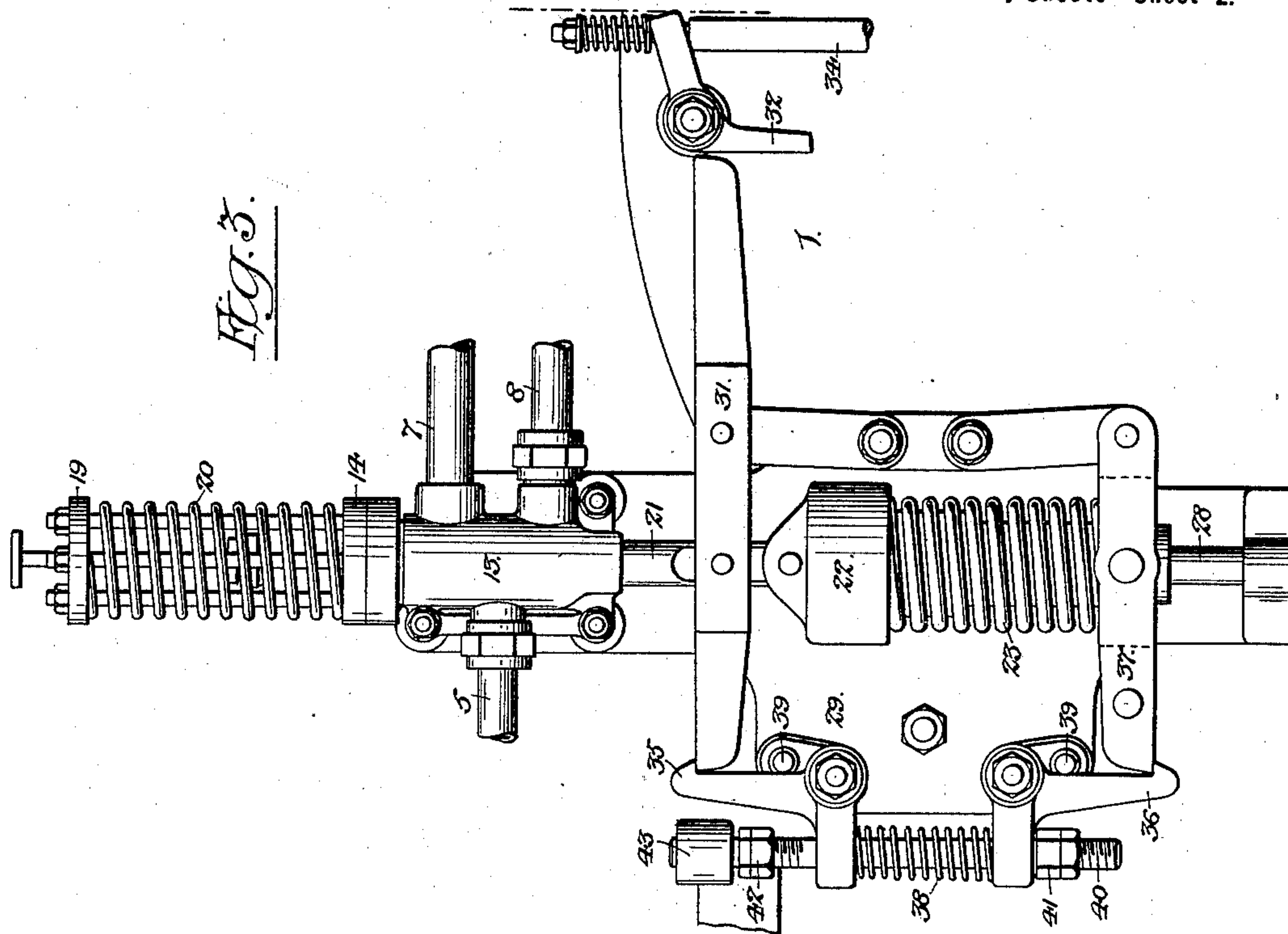
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7 Sheets—Sheet 2.



Witnesses:-

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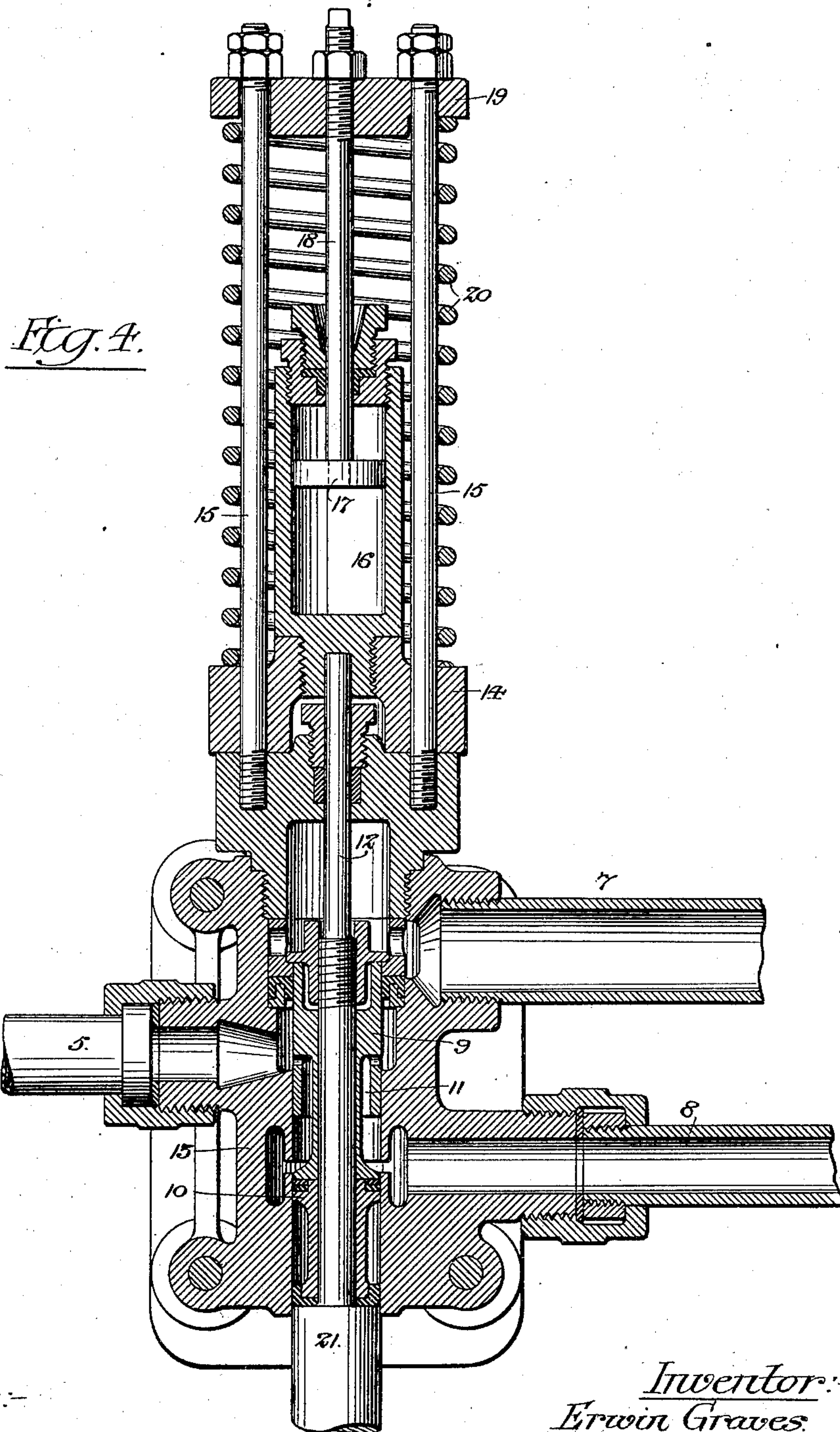
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(No Model.)

7 Sheets—Sheet 3.



Witnesses:—

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No. 683,395.

Patented Sept. 24, 1901.

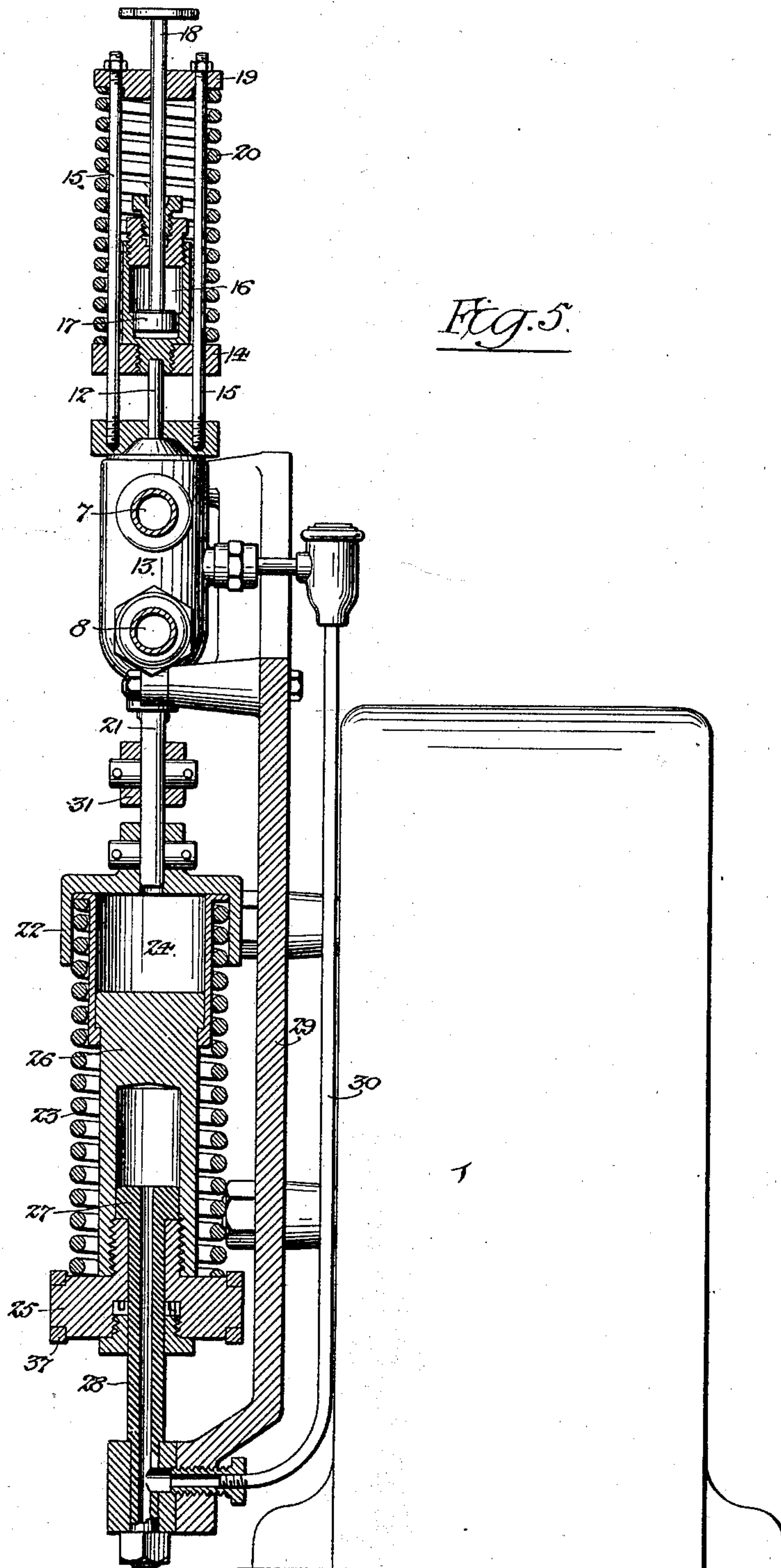
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(Application filed Oct. 27, 1900.)

(No Model.)

7 Sheets—Sheet 4.



Witnesses:-

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No. 683,395.

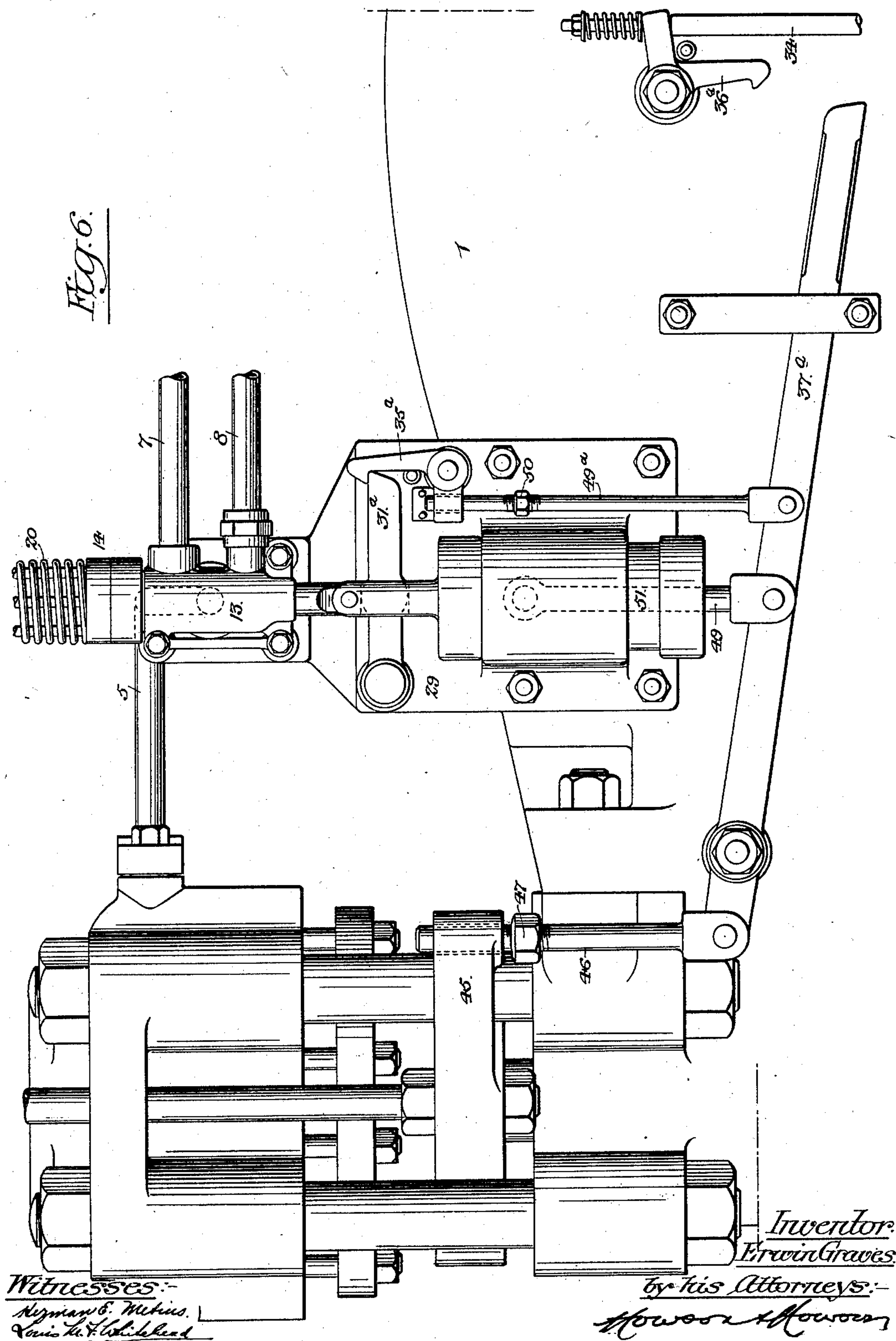
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(No Model.)

7 Sheets—Sheet 5.



No. 683,395.

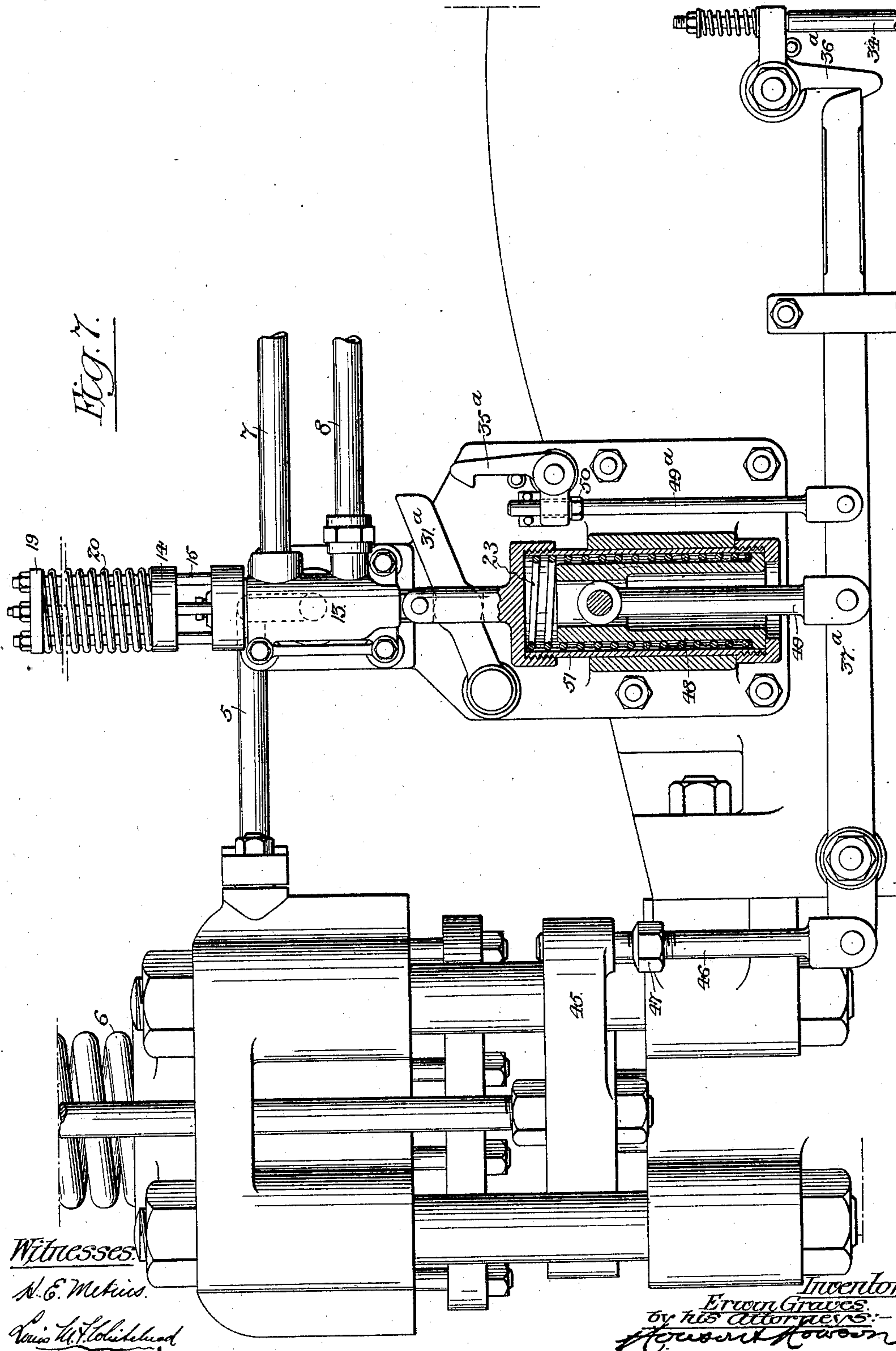
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7 Sheets—Sheet 6.



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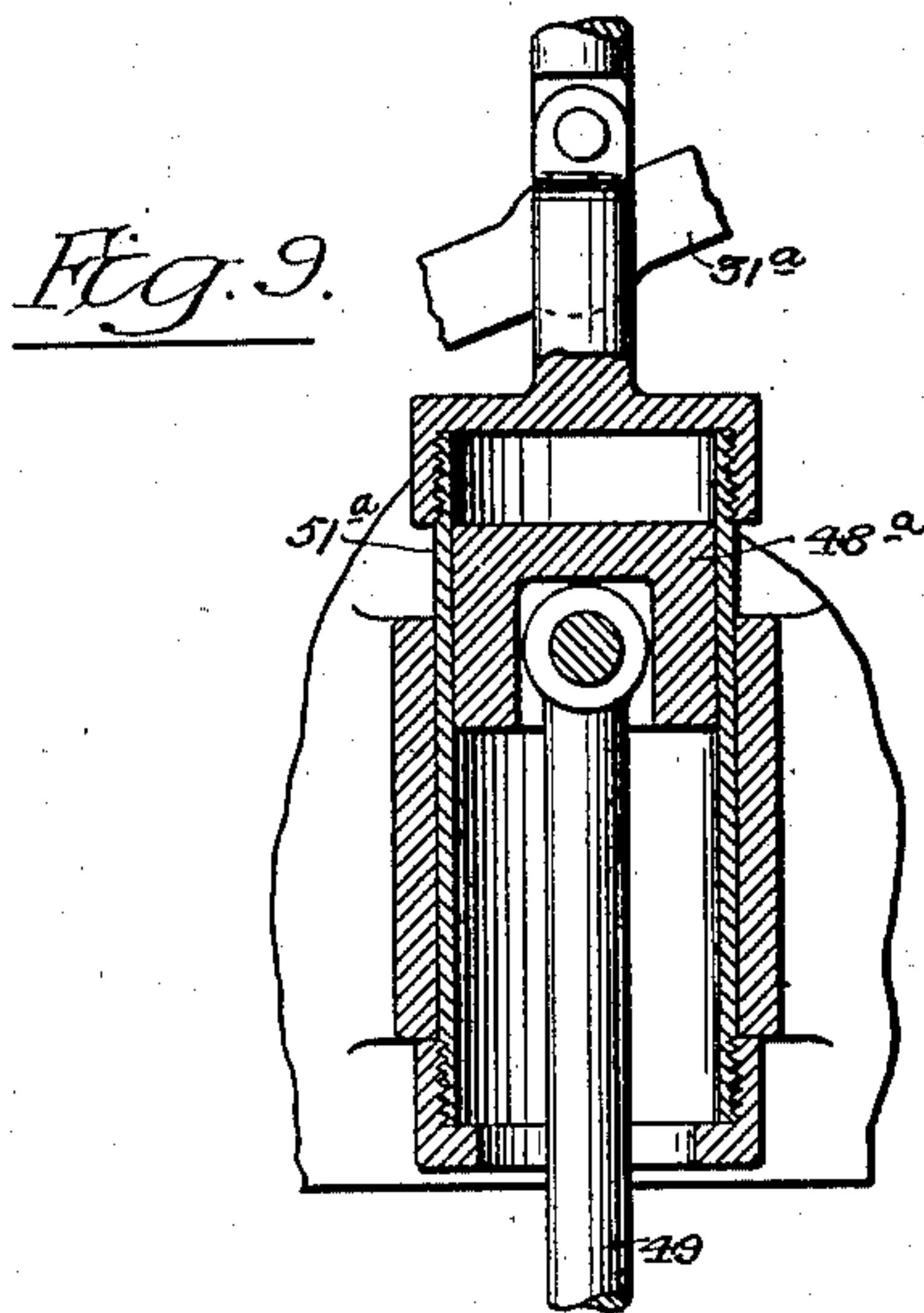
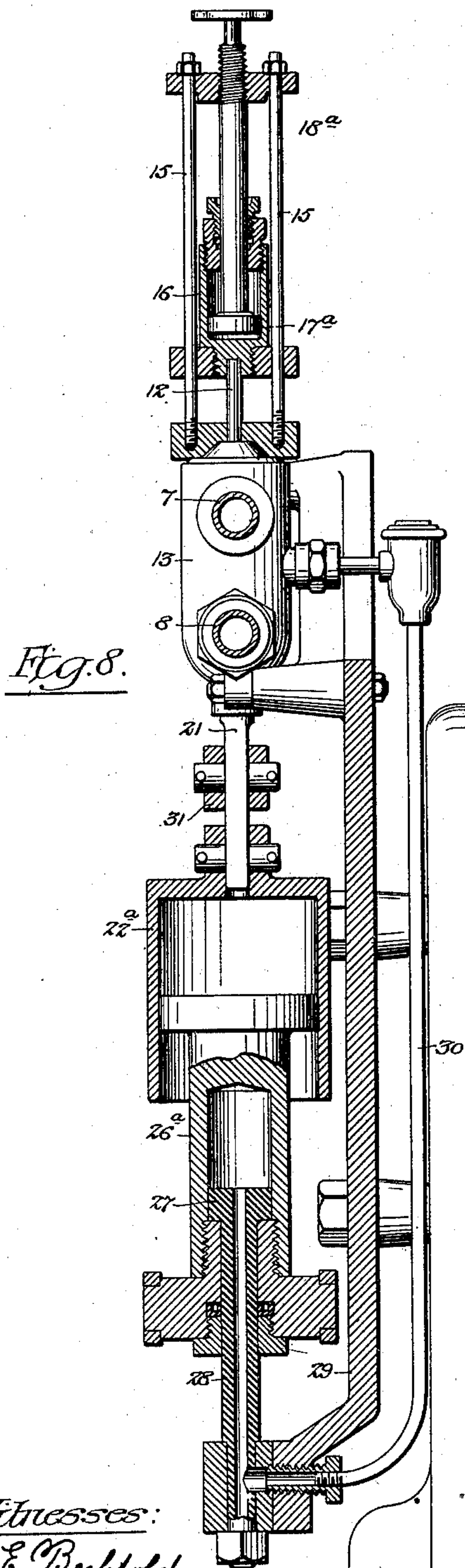
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(No Model)

7 Sheets—Sheet 7.



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UNITED STATES PATENT OFFICE.

ERWIN GRAVES, OF CAMDEN, NEW JERSEY, ASSIGNOR TO THE CAMDEN
IRON WORKS, OF SAME PLACE.

HYDRAULIC PUNCH OR LIKE TOOL.

SPECIFICATION forming part of Letters Patent No. 683,395, dated September 24, 1901.

Application filed October 27, 1900. Serial No. 34,573. (No model.)

To all whom it may concern:

Be it known that I, ERWIN GRAVES, a citizen of the United States, and a resident of Camden, New Jersey, have invented certain
5 Improvements in Hydraulic Punches or Like Tools, of which the following is a specification.

In the operation of hydraulically-actuated punches and like machinery wherein the action is accomplished by the opening and closing of a governing valve or valves at the will of the attendant it is the common practice for such attendant to move the valve or valves by hand-power applied through the medium
10 of levers arranged for the purpose. The energy required to overcome the resistance of the valve or valves, however, is frequently sufficient to severely tax the power of the attendant, and where the operations require
15 frequent repetition the effectiveness of the machine is much reduced.

The object of my invention is to provide such hydraulically-operated machinery with an automatic valve-actuating device, whereby
25 the operation of the machine may be effected at the will of the attendant and by a small expenditure of power, or whereby the machine may, if desired, be made to operate continuously.

In the accompanying drawings the device is shown as applied to a hydraulic punching-machine, Figure 1 being a side elevation of sufficient of the machine to illustrate my improved automatic valve-operating mechanism
35 in conjunction therewith. Figs. 2 and 3 are side elevations, on a larger scale, of the valve-operating devices, showing the parts in positions different from those represented in Fig. 1. Fig. 4 is a sectional view, on a still larger
40 scale, of the valve-chest, the valve, and its appurtenances. Fig. 5 is a view, partly in side elevation and partly in transverse section, of the valve-operating mechanism. Fig. 6 is a side elevation of another form of valve-
45 operating mechanism embodying my invention. Fig. 7 is a similar view, partly in section and illustrating some of the parts in a different position; and Figs. 8 and 9 are views illustrating certain modifications of the in-
50 vention.

In Fig. 1 the fixed frame of a hydraulic

punch is shown at 1, this frame having the usual jaws and having the die 2 mounted upon the lower jaw, while the upper jaw carries the usual hydraulic cylinder with recip-
55 rocating plunger for operating the punch 3. This plunger may be operated in any of the ways usual in this class of machinery, the construction of this portion of the tool forming no part of my invention and being sus-
60 ceptible of modification in any way desired so long as it involves the flow of motive fluid to and from the cylinder through a pipe or passage controlled by a valve.

In the present instance the motive fluid is
65 admitted to the upper portion of the cylinder 4 through a pipe 5 in order to depress the plunger, and the latter is, when the motive fluid is exhausted from the cylinder, raised by the action of a spring 6. The valve which
70 is employed may also be similar to any ordinary hydraulic pressure-valve adapted to direct the motive fluid from a pressure-supply pipe to the pipe 5 or from the latter to an exhaust-pipe.

In the present instance the valve-chest 13
75 has at one side upper and lower branches communicating, respectively, with the exhaust-pipe 7 and pressure-supply pipe 8, and at the other side an intermediate branch
80 communicating with the pipe 5, and the valve has an upper disk 9 and a lower disk 10, the upper disk being provided with passages 11, so that when in the depressed position (shown in Fig. 4) motive fluid under pressure will be
85 directed from the pipe 8, through these passages 11, to the pipe 5; but if the valve is raised to its elevated position the lower disk 10 will cut off communication between the pipe 8 and the pipe 5 and communication will
90 be opened through the passages 11 in the upper disk 9 between said pipe 5 and the exhaust-pipe 7.

The upper end of the valve-stem 12 projects through a stuffing-box at the top of the
95 valve-chest 13 and is provided with a cross-head 14, suitably guided upon vertical rods 15, projecting upwardly from the said valve-chest, the cross-head carrying a cylinder 16, with loosely-fitting piston 17, having a pro-
100 jecting rod 18, which is connected to a cross-bar 19 at the upper end of the rods 15, a coiled

spring 20 being interposed between said cross-bar 19 and the cross-head 14 of the valve-stem, as clearly shown in Fig. 4. The valve has another stem 21, projecting from the bottom of the chest 13 and carrying an inverted cup 22, upon which bears the upper end of a coiled spring 23, confined, as to said upper end, between a flange of the cup 22 and an internal sleeve 24, and bearing at its lower end against a cross-head 25 at the lower end of a cylinder 26, which receives a fixed piston 27 at the upper end of a hollow rod 28, the latter being secured at its lower end in a projection of the plate 29, which carries the valve mechanism and is suitably mounted upon the fixed frame of the punch. The hollow rod 28 is in constant communication, through a pipe 30, with that chamber of the valve-chest 13 which is in constant communication with the pipe 5. Hence when motive fluid is admitted to the cylinder of the punch it is likewise admitted to the cylinder 26, and both cylinders are likewise simultaneously opened to the exhaust.

Hung to a suitable bracket on the plate 29 is a lever 31, which is connected to the lower stem 21 of the valve and which can be retained in the position shown in Fig. 1 by engagement with a locking-lever 32, which is under control of a treadle 33 and rod 34, and hence can be conveniently operated by the attendant having charge of the machine. The lever 31 can also be engaged and held by a trigger 35, hung to a bracket on the plate 29, and another trigger 36 on said plate is adapted to engage and hold a lever 37, which is in connection with the cross-head 25 of the cylinder 26.

A spring 38 is interposed between the levers 35 and 36 and tends to move each of said levers into locking position, this position being determined in each case by contact of the lever with a suitable stop 39, and both levers are perforated for the passage of a stem 40, threaded for the reception of nuts 41 and 42, which can therefore be adjusted longitudinally on the stem, the lower nuts 41 being adapted to act upon the lower trigger 36 and the upper nuts 42 being adapted to act upon the upper trigger 35.

The stem 40 is carried by and moves with a lug 43, which is in connection with the plunger or other reciprocating portion of the punch. Hence by proper adjustment of the nuts 41 and 42 upon the stem 40 the upper trigger 35 can be drawn back from its locking position by contact of the nuts 42 therewith when the plunger has reached the limit of its downward movement, and the lower trigger 36 can be drawn back from its locking position by contact of the nuts 41 therewith when the plunger has reached the limit of its upward movement.

It being understood that the spring 23 is considerably stronger than the spring 20 the operation of the valve mechanism will be understood from the following description. As

shown in Fig. 1, the punch-operating plunger is supposed to be at the top of its stroke and the valve in the chest 13 is likewise at the top of its stroke, so that the pipe 5 and tube 30 are both open to the exhaust through the pipe 7, the spring 20 being compressed and the parts being held in this position by reason of the engagement of the locking-lever 32 with the lever 31. When it is desired to make a stroke with the punch, the attendant presses upon the treadle 33, thereby withdrawing the locking-lever 32 from engagement with the lever 31 and permitting of the descent of the valve in the chest 13 under the action of the low-pressure spring 20, the high-pressure spring 23 offering no resistance to this movement, owing to the fact that the cylinder 26 and its cross-head 25 are free to descend as the inverted cup 22 is pushed downwardly by the lower valve-stem 21, said spring 23 being therefore practically inert, and hence carried bodily downward without any compression. As soon as this movement has been completed the parts are in the position shown in Fig. 2, the lever 37 having been depressed by reason of its connection with the cross-head 25, and the lever 31 having also been depressed and having been caught and held in such depressed position by the trigger 35. Motive fluid under pressure is now simultaneously admitted to the plunger-cylinder of the punch and to the cylinder 26, and consequently the punch descends and the cylinder 26 rises, so as to compress the spring 23 against the inverted cup 22, the latter being prevented from rising by reason of the fact that the lever 31 is locked by the trigger 35. As soon as the lower lever 37 reaches the limit of its upward movement it will be locked by engagement with the trigger 36, as shown in Fig. 3, the descent of the plunger of the punch having been meantime sufficient to release said trigger 35 from contact with the nuts 41. The parts remain in this position until the plunger is approaching the limit of its downward movement, whereupon the nuts 42 strike the upper trigger 35 and withdraw the same from engagement with the lever 31. The spring 23 being under tension or "loaded" and being rigidly supported by the lever 37, now exercises its force to push upward the inverted cup 22, and thereby raise the valve in the chest 13, overcoming the tension of the low-pressure spring 20, which acts upon the upper stem of said valve. Both the plunger-cylinder of the punch and the cylinder 26 are now open to the exhaust. Hence the punch rises, and as it nears the limit of its upward movement the trigger 36 is struck by the nuts 41 of the rod 40, so as to withdraw said trigger 36 from locking engagement with the lever 37, the spring 23 being thereby unloaded and again rendered inert. The upward movement of the valve-stem under the action of the spring 23 restores the lever 31 to the position shown in Fig. 1, so that it

can be again locked by engagement with the lever 32. Hence the parts are now in the position originally described preparatory to a repetition of the operation. If it is desired to effect a continuous reciprocation of the punch, the treadle 33 is held in the depressed position by the attendant, so as to prevent engagement of the locking-lever 32 with the lever 31. Hence as soon as the lever 37 has been released by the trigger 36 on the rise of the punch and the high-pressure spring 23 is thus rendered inert the low-pressure spring 20 exercises its power to depress the valve in the chest 13, and the operations which I have before described will thus go on continuously until the pressure is removed from the treadle 33 and the locking-lever 32 is thereby restored to locking position.

In that embodiment of my invention shown in Figs. 6 and 7 I have dispensed with a special power-cylinder for the purpose of compressing the high-pressure spring 23 and effect such compression by the action of the cross-head of the punch-plunger or other reciprocating portion of the punch mechanism. Such plunger-head is represented at 45 and is perforated for the reception and guidance of the upper end of a rod 46, which is hung to the short arm of the lever 37^a and is provided with an adjustable nut 47, so that said lever 37^a may be acted upon by the cross-head 45 at any desired point in the descent of the latter. In place of the spring-compressing cylinder 26 this embodiment of the invention employs a spring-supported cylinder 51, the spring 23 being mounted upon a flanged plunger 48, connected by a rod 49 to the lever 37^a, and the locking-trigger 36^a, which acts in conjunction with said lever 37^a, is under control of the treadle-rod 34. The trigger 35^a, which locks the lever 31^a, is actuated by the cross-head 45 of the punch-plunger through the medium of the lever 37^a, a rod 49^a, and a nut 50, said nut being so disposed upon the rod that the plunger 48 will be fully raised and the spring 23 fully compressed before the nut comes into contact with the trigger 35^a and releases the lever 31^a, this operation occurring simultaneously with the engagement of the lever 37^a by the trigger 36^a. The cylinder 16 and piston 17 constitute a dash-pot and insure steadiness in the movement of the valve in either direction.

It will be evident that in carrying out my invention other forms of pressure device than the springs 20 and 23 may be employed. For instance, instead of the spring 20 motive fluid introduced through a hollow rod 18^a and the piston 17^a, Fig. 8, may be maintained constantly in the lower portion of the cylinder 16 for the purpose of depressing the latter and the valve in the chest 13, and a fluid-pressure device may also take the place of the spring 23. For instance, the plunger 48^a instead of compressing a spring in the cylinder 51^a may fit snugly to said cylinder and may compress air in the upper portion of the

same, as shown in Fig. 9, or, in like manner, the upper end of the cylinder 26^a may constitute a plunger for compressing air in the inverted cup 22^a, as shown in Fig. 8.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination of the plunger-cylinder of a punch or like tool, a valve-chest with valve and passages for controlling the flow of motive fluid under pressure into and from said plunger-cylinder, a constantly-acting pressure device tending to move said valve in one direction, an intermittently-acting pressure device of greater power tending to move it in the opposite direction, a valve-locking device whereby said second pressure device is prevented from acting upon the valve, and means whereby a moving part of the punch or tool is caused to release said locking device, substantially as specified.

2. The combination of the plunger-cylinder of a punch or like tool, a valve-chest with valve and passages for controlling the flow of motive fluid under pressure into and from said plunger-cylinder, a constantly-acting pressure device tending to move said valve in one direction, an intermittently-acting pressure device of greater power tending to move it in the opposite direction, a valve-locking device whereby said second pressure device is prevented from acting upon the valve, means whereby a moving part of the punch or tool is caused to release said locking device, and a dash-pot for steadying the movement of the valve, substantially as specified.

3. The combination of the plunger-cylinder of a punch or like tool, a valve-chest having a valve and passages whereby motive fluid under pressure may be directed to or from said plunger-cylinder, a pressure device tending to move said valve in one direction, another pressure device of greater power tending to move the valve in the opposite direction, means for energizing said second pressure device, provision for retaining it in the loaded condition, a trip for releasing said retainer, a valve-locking device whereby the second pressure device is prevented from moving the valve, and means operated by a reciprocating portion of the punch or other tool for releasing said locking device, substantially as specified.

4. The combination of the plunger-cylinder of a punch or like tool, a valve-chest having a valve and passages whereby motive fluid under pressure may be directed to or from said plunger-cylinder, a pressure device tending to move said valve in one direction, another pressure device of greater power tending to move the valve in the opposite direction, means for energizing said second pressure device, provision for retaining it in the loaded condition, a trip for releasing said retainer, a valve-locking device whereby the second pressure device is prevented from moving the valve, means operated by a recip-

rocating portion of the punch or other tool for releasing said locking device, and a dash-pot for steadying the movement of the valve, substantially as specified.

5 5. The combination of the plunger-cylinder of a punch or other tool, a valve-chest having a valve and passages whereby motive fluid under pressure may be directed to or from
10 said plunger-cylinder, a pressure device for moving said valve in one direction, a pressure device of greater power for moving it in the opposite direction, means for energizing said
15 second pressure device, a retainer for maintaining it in the loaded condition, valve-locking mechanism for preventing the high-pressure device from moving the valve and means whereby a moving portion of the punch or
20 other tool releases the high-pressure retainer when at one extreme of its movement and releases the valve-locking device when at the other extreme of its movement, substantially as specified.

6. The combination of the plunger-cylinder of a punch or other tool, a valve-chest having
25 a valve and passages whereby motive fluid under pressure may be directed to or from said plunger-cylinder, a pressure device for moving said valve in one direction, a pressure device of greater power for moving it in
30 the opposite direction, means for energizing said second pressure device, a retainer for maintaining it in the loaded condition, valve-locking mechanism for preventing the high-pressure device from moving the valve, means
35 whereby a moving portion of the punch or other tool releases the high-pressure retainer when at one extreme of its movement and releases the valve-locking device when at the other extreme of its movement, and a dash-
40 pot for steadying the movement of the valve, substantially as specified.

7. The combination of the plunger-cylinder of a punch or other tool, a valve-chest having
45 a valve and passages whereby motive fluid under pressure may be directed to or from said plunger-cylinder, a pressure device for moving said valve in one direction, a pressure device of greater power for moving it in the opposite direction, means for energizing said
50 second pressure device, a retainer for maintaining it in the loaded condition, valve-locking mechanism for preventing the high-pressure device from moving the valve, means whereby the moving portion of the punch or
55 other tool releases the high-pressure retainer when at one extreme of its movement, and releases the valve-locking device when at the other extreme of its movement, and a locking device under control of the attendant for
60 holding the valve in inoperative position, substantially as specified.

8. The combination of the plunger-cylinder of a punch or other tool, a valve-chest having
65 a valve and passages whereby motive fluid under pressure may be directed to or from said plunger-cylinder, a pressure device for moving said valve in one direction, a pres-

sure device of greater power for moving it in the opposite direction, means for energizing said second pressure device, a retainer for
70 maintaining it in the loaded condition, valve-locking mechanism for preventing the high-pressure device from moving the valve, means whereby the moving portion of the punch or other tool releases the high-pressure retainer
75 when at one extreme of its movement, and releases the valve-locking device when at the other extreme of its movement, a locking device under control of the attendant for holding the valve in inoperative position, and a
80 dash-pot for steadying the movement of the valve, substantially as specified.

9. The combination of the plunger-cylinder of a punch or other tool, a valve-chest having
85 a valve and passages whereby motive fluid under pressure may be directed to and from said plunger-cylinder, a pressure device for moving said valve in one direction, a pressure device of higher power for moving it in the opposite direction, fluid-actuated mech-
90 anism controlled by the valve for energizing said second pressure device, locking means for retaining said pressure device in the loaded condition, a valve-locking device whereby the movement of the valve by said high-pres-
95 sure device is prevented and means for releasing said high-pressure retainer and valve-locking device, substantially as specified.

10. The combination of the plunger-cylinder of a punch or other tool, a valve-chest
100 having a valve and passages whereby motive fluid under pressure may be directed to and from said plunger-cylinder, a pressure device for moving said valve in one direction, a pressure device of higher power for moving it in
105 the opposite direction, fluid-actuated mechanism controlled by the valve for energizing said second pressure device, locking means for retaining said pressure device in the loaded condition, a valve-locking device whereby
110 the movement of the valve by said high-pressure device is prevented, means for releasing said high-pressure retainer and valve-locking device, and a dash-pot for steadying the movement of the valve, substantially as speci-
115 fied.

11. The combination of the plunger-cylinder of a punch or other tool, a valve-chest
120 having a valve and passages whereby motive fluid under pressure may be directed to or from said plunger-cylinder, a pressure device for moving the valve in one direction, a second pressure device of higher power for moving it in the opposite direction, fluid-pressure
125 mechanism controlled by the valve for energizing said high-pressure device, means for retaining said high-pressure device in the loaded condition, means for locking the valve against movement by said high-pressure de-
130 vice, and automatic trips for said high-pressure retainer and valve-locking device operated by a reciprocating portion of the punch at the extremes of its movement, substantially as specified.

12. The combination of the plunger-cylinder of a punch or other tool, a valve-chest having a valve and passages whereby motive fluid under pressure may be directed to or from said plunger-cylinder, a pressure device for moving the valve in one direction, a second pressure device of higher power for moving it in the opposite direction, fluid-pressure mechanism controlled by the valve for energizing said high-pressure device, means for retaining said high-pressure device in the loaded condition, means for locking the valve against movement by said high-pressure device, automatic trips for said high-pressure retainer and valve-locking device operated by a reciprocating portion of the punch at the extremes of its movement, and a dash-pot for steadying the movement of the valve, substantially as specified.

13. The combination of the plunger-cylinder of a punch or like tool, a valve-chest having a valve and passages whereby motive fluid under pressure may be directed to and from said plunger-cylinder, a pressure device for moving said valve in one direction, a second pressure device of greater power for moving the valve in the opposite direction, fluid-pressure mechanism under control of the valve for energizing said high-pressure device, a retainer for holding said high-pressure device in a loaded condition, locking mechanism for preventing movement of the valve by said high-pressure device, automatic trips for said high-pressure retainer and valve-

locking device operated by a reciprocating portion of the punch at its extremes of movement, and a locking device under control of the attendant for retaining the valve in inoperative condition, substantially as specified.

14. The combination of the plunger-cylinder of a punch or like tool, a valve-chest having a valve and passages whereby motive fluid under pressure may be directed to and from said plunger-cylinder, a pressure device for moving said valve in one direction, a second pressure device of greater power for moving the valve in the opposite direction, fluid-pressure mechanism under control of the valve for energizing said high-pressure device, a retainer for holding said high-pressure device in a loaded condition, locking mechanism for preventing movement of the valve by said high-pressure device, automatic trips for said high-pressure retainer and valve-locking device operated by a reciprocating portion of the punch at its extremes of movement, a locking device under control of the attendant for retaining the valve in inoperative condition, and a dash-pot for steadying the movement of the valve, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERWIN GRAVES.

Witnesses:

WM. J. HAMLIN,
E. F. MILLER.