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No. 581,223. Patented Apr. 20, 1897.

Fig. 1.

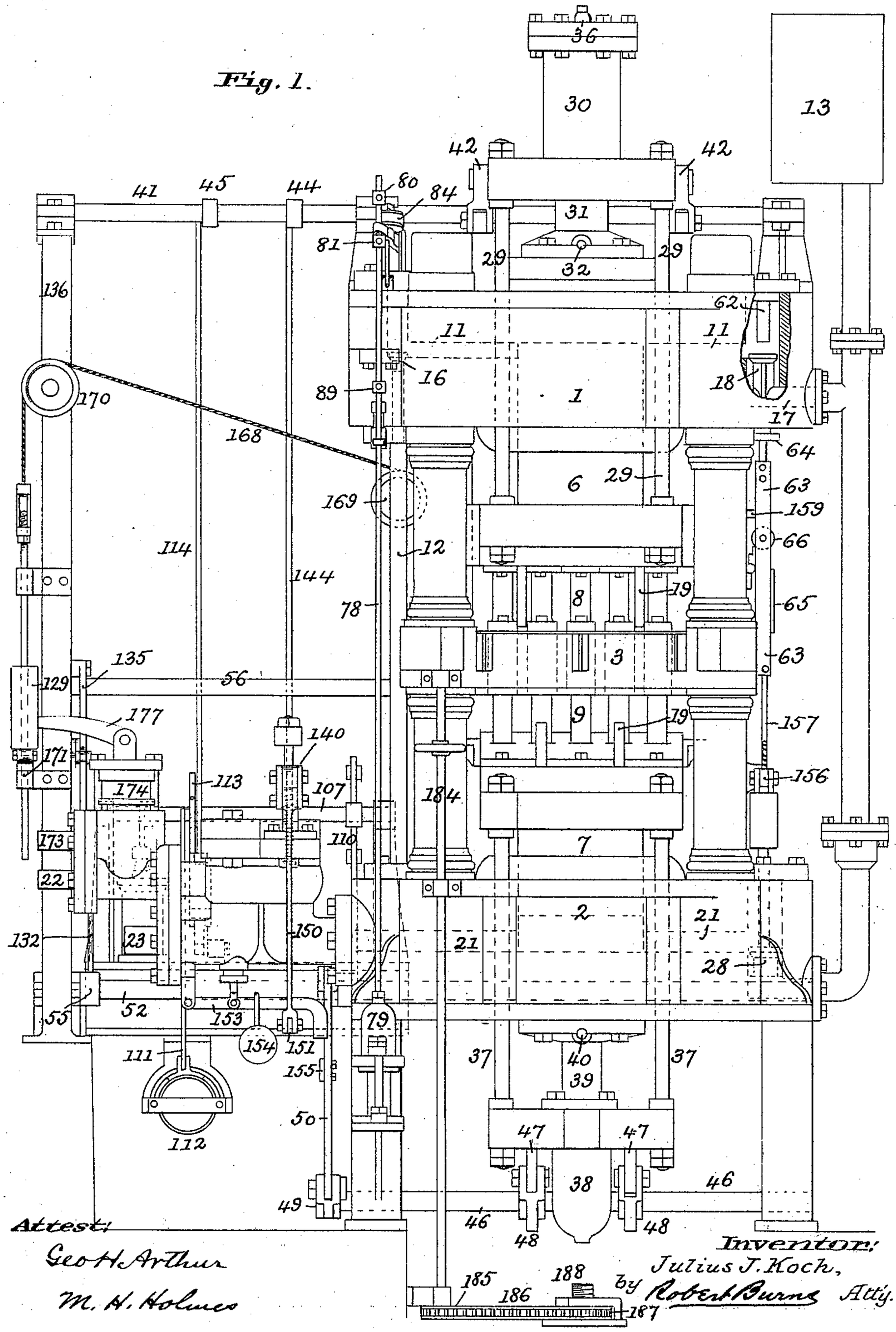

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Fig. 4.

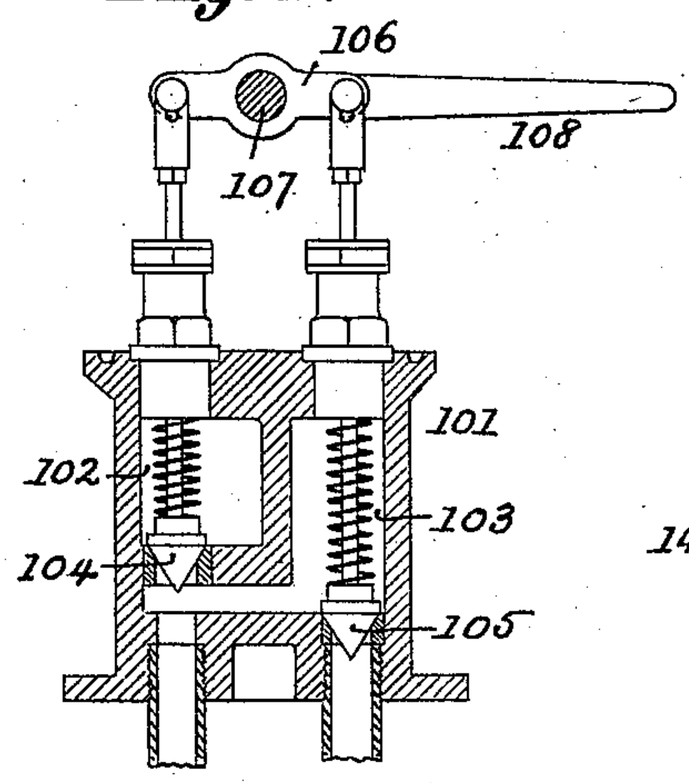

Fig. 2.

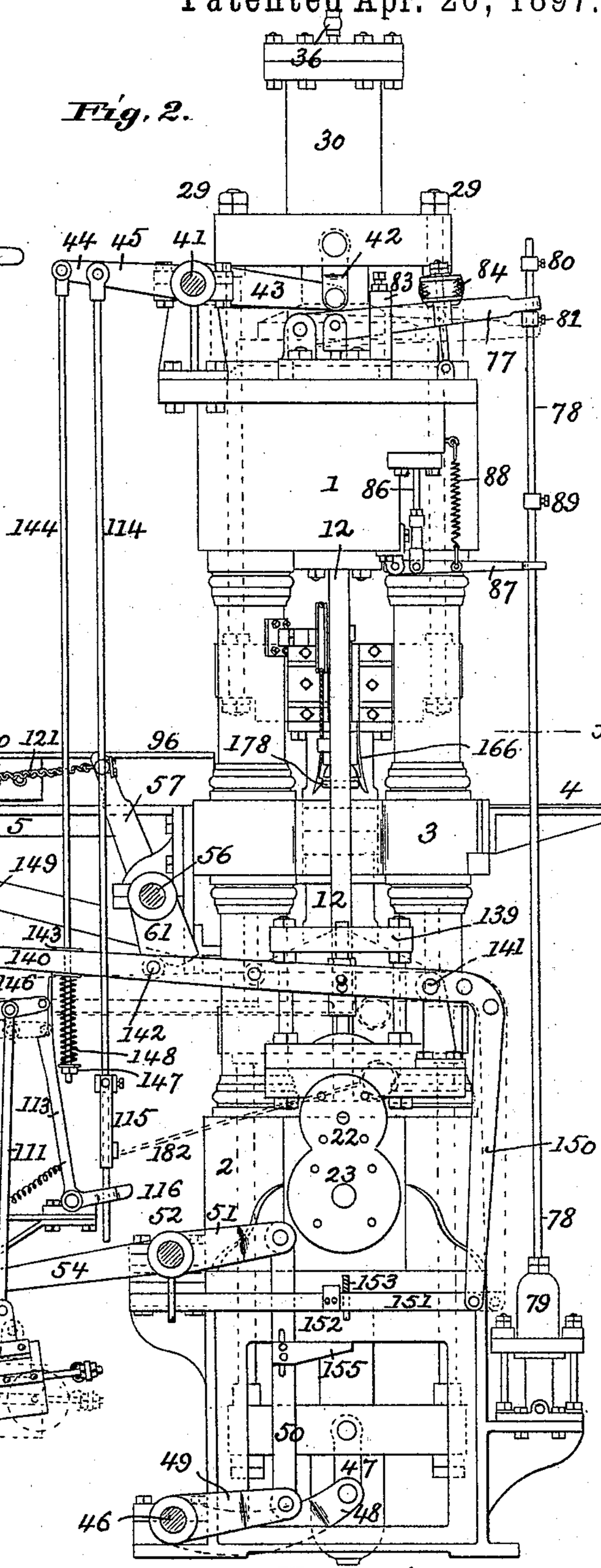

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Fig. 3.

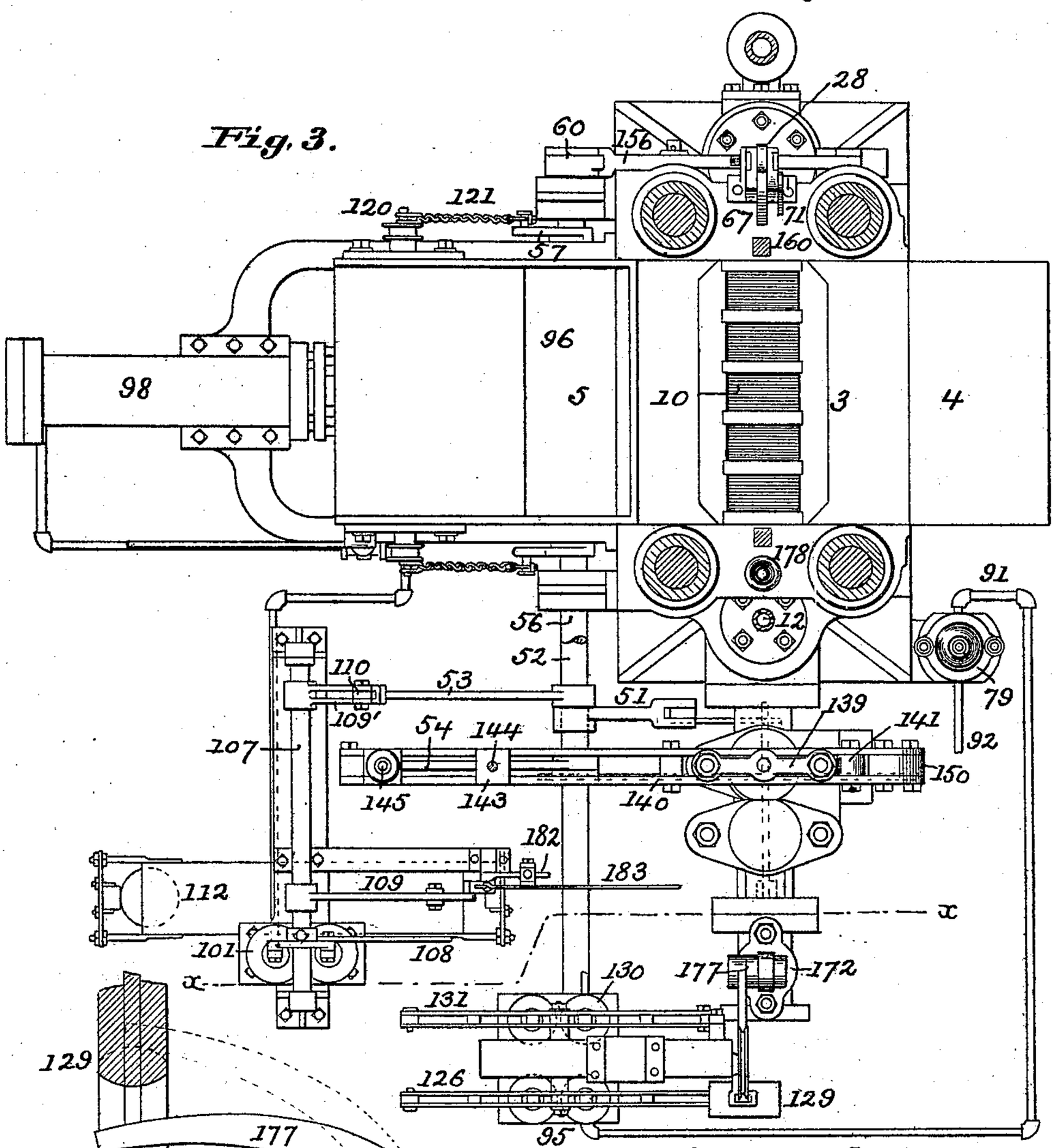

Fig. 6.

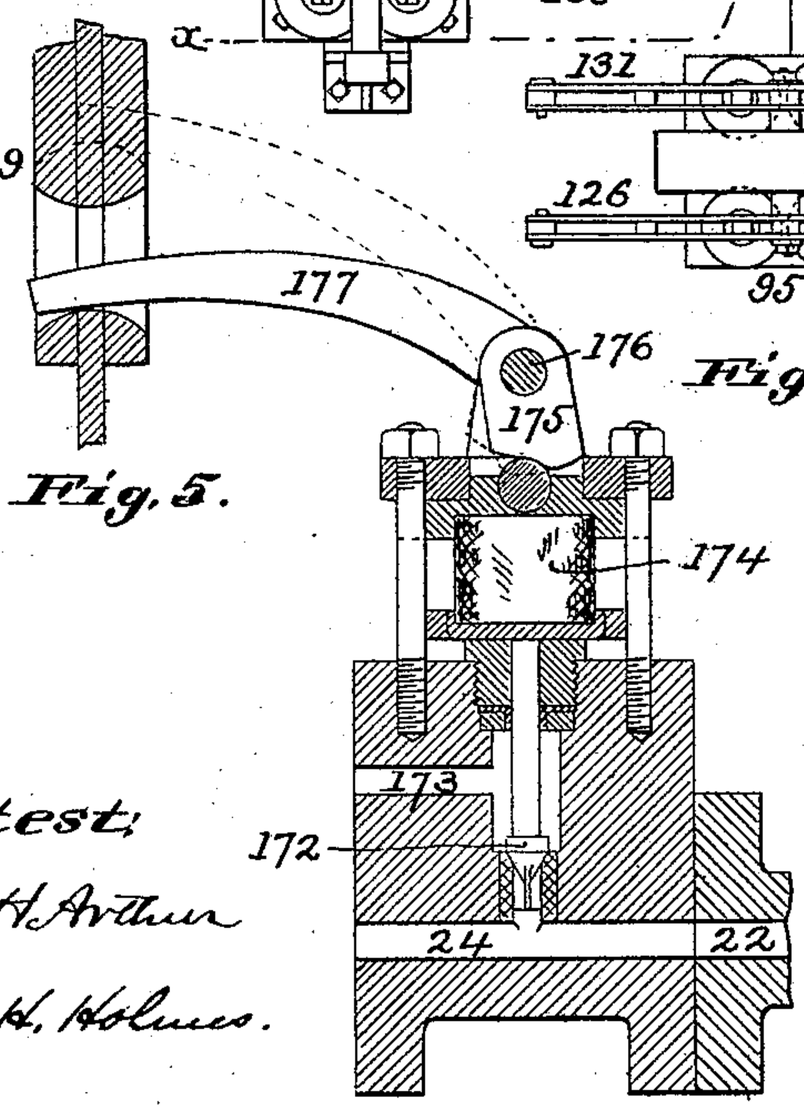

Fig. 5.

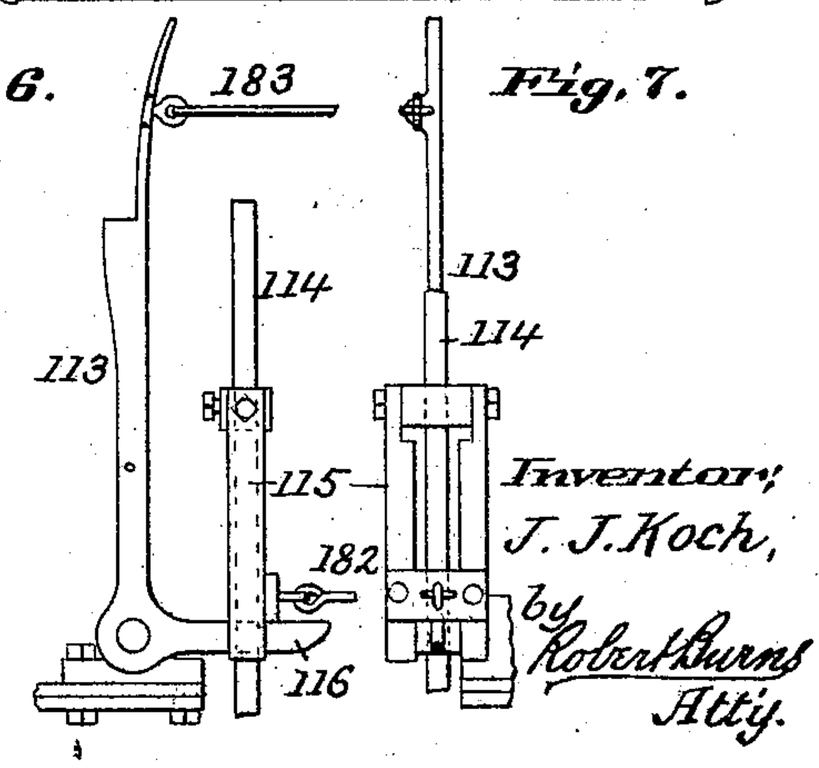

Fig. 7.

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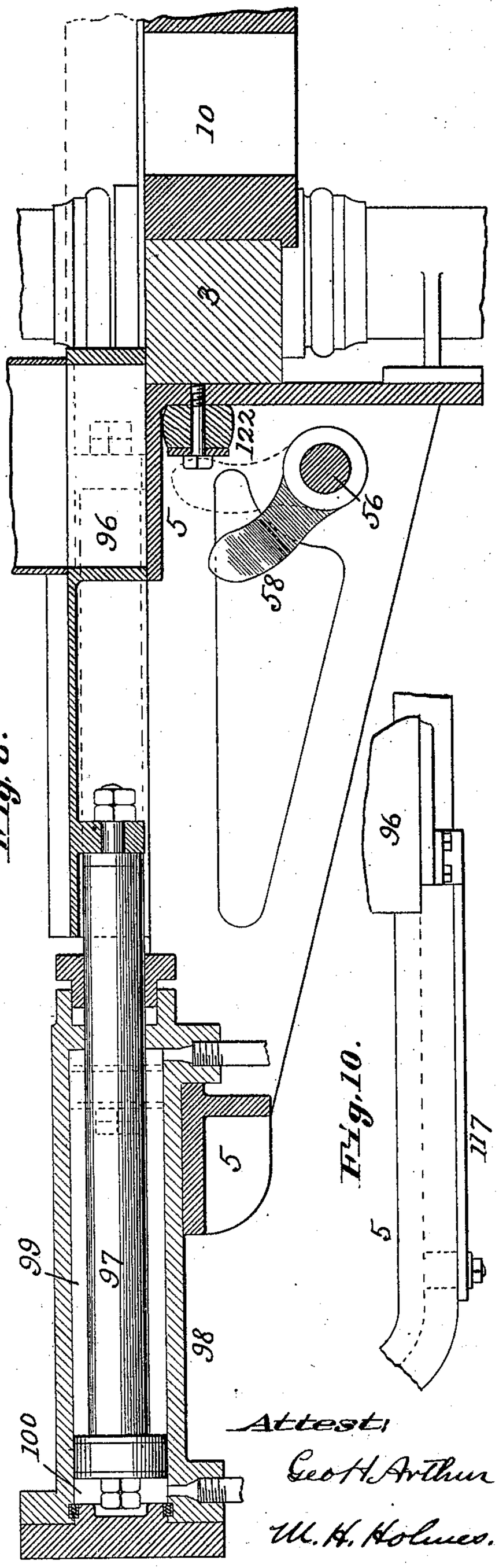

Fig. 8.

Fig. 10.

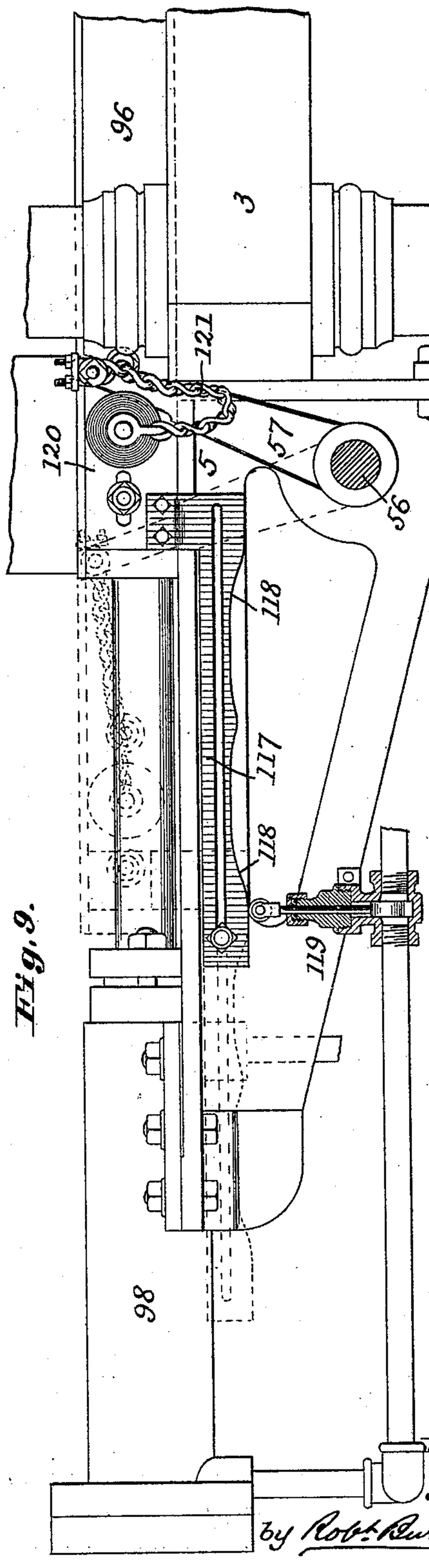

Fig. 9.

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Fig. 12.

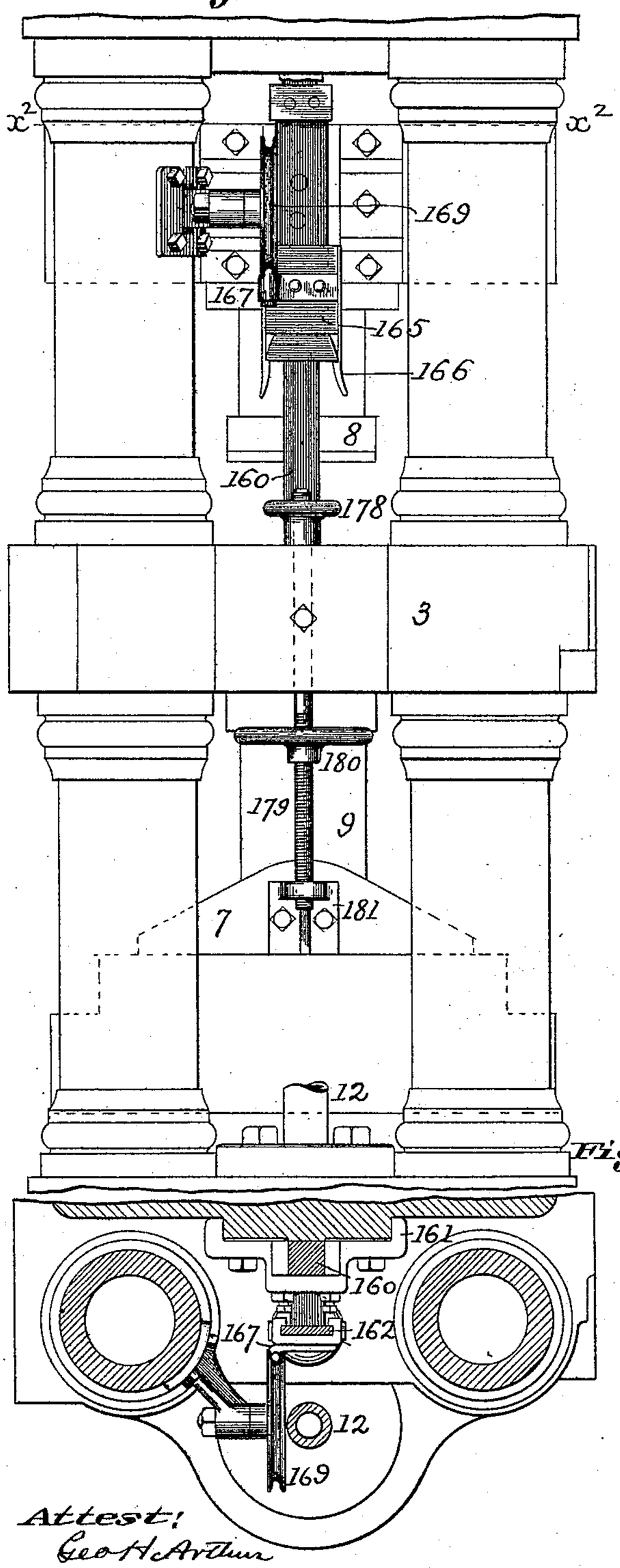

Fig. 11.

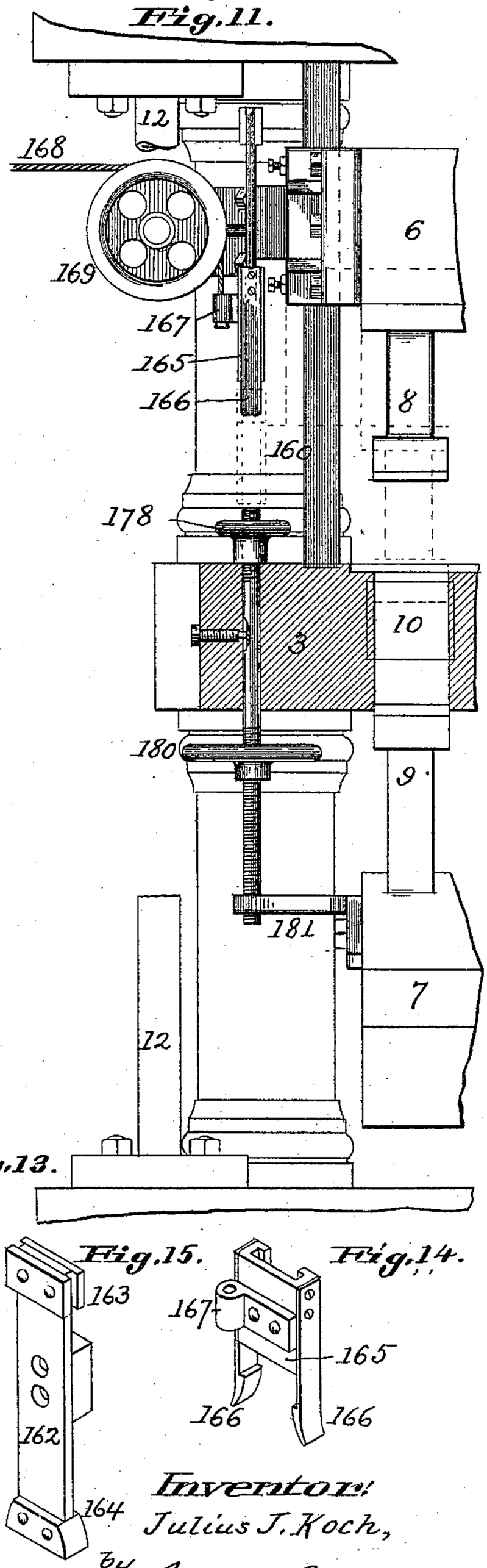

Fig. 13.

Fig. 15.

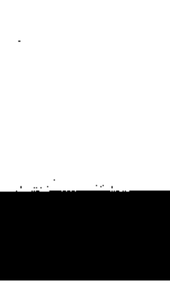

Fig. 14.

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Fig. 16.

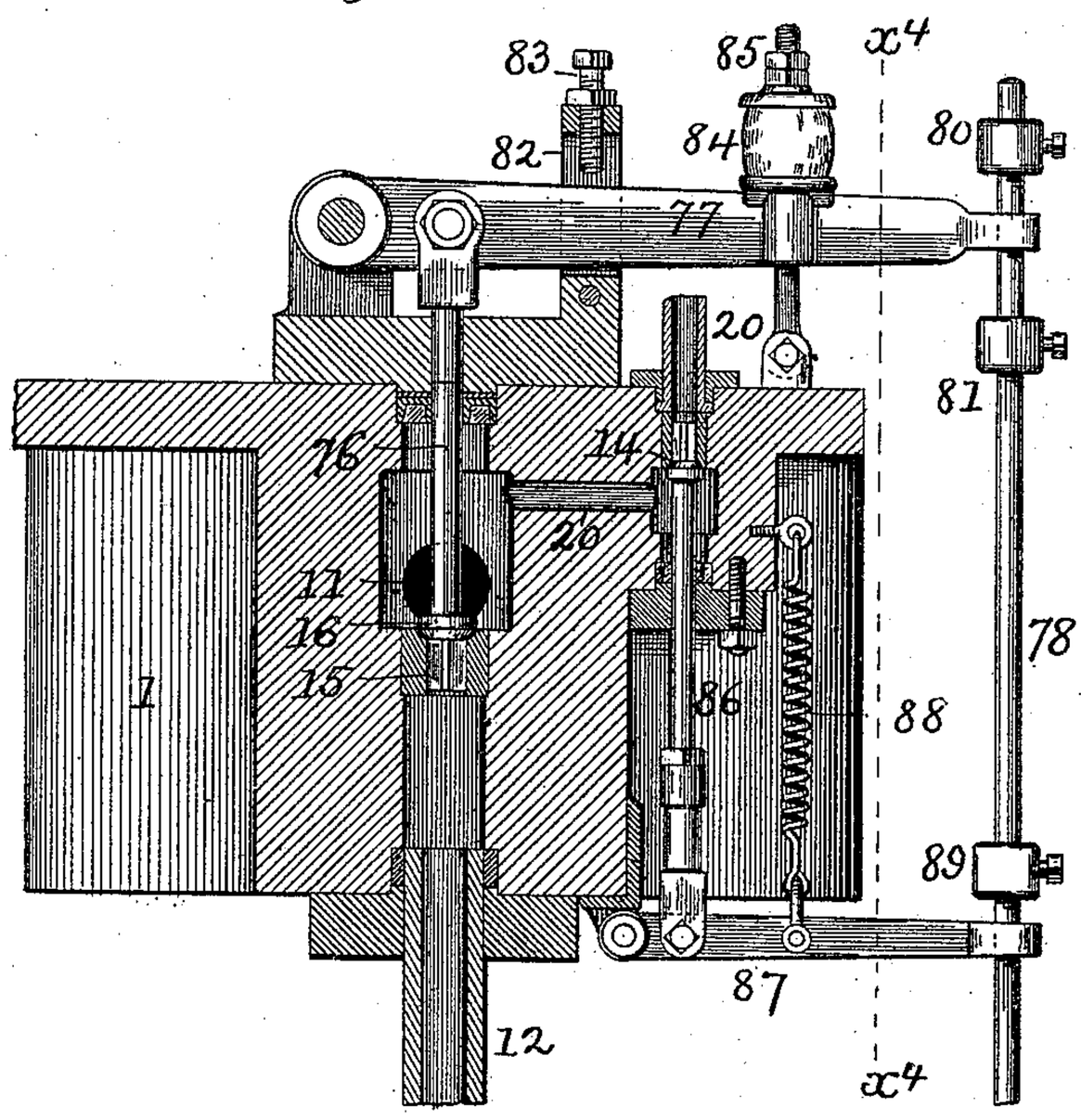

Fig. 17.

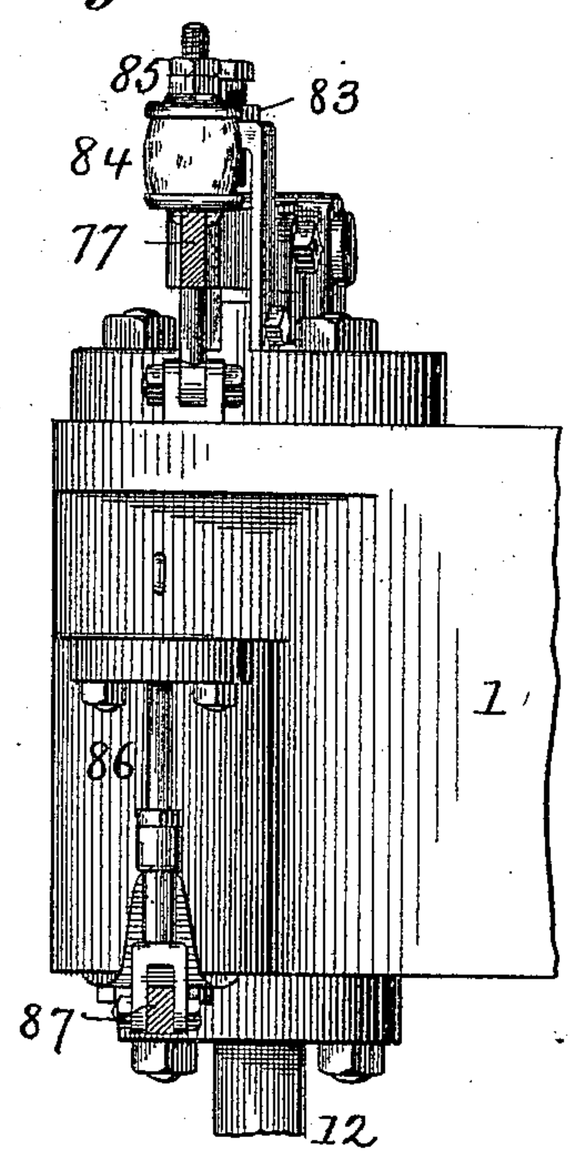

Fig. 18.

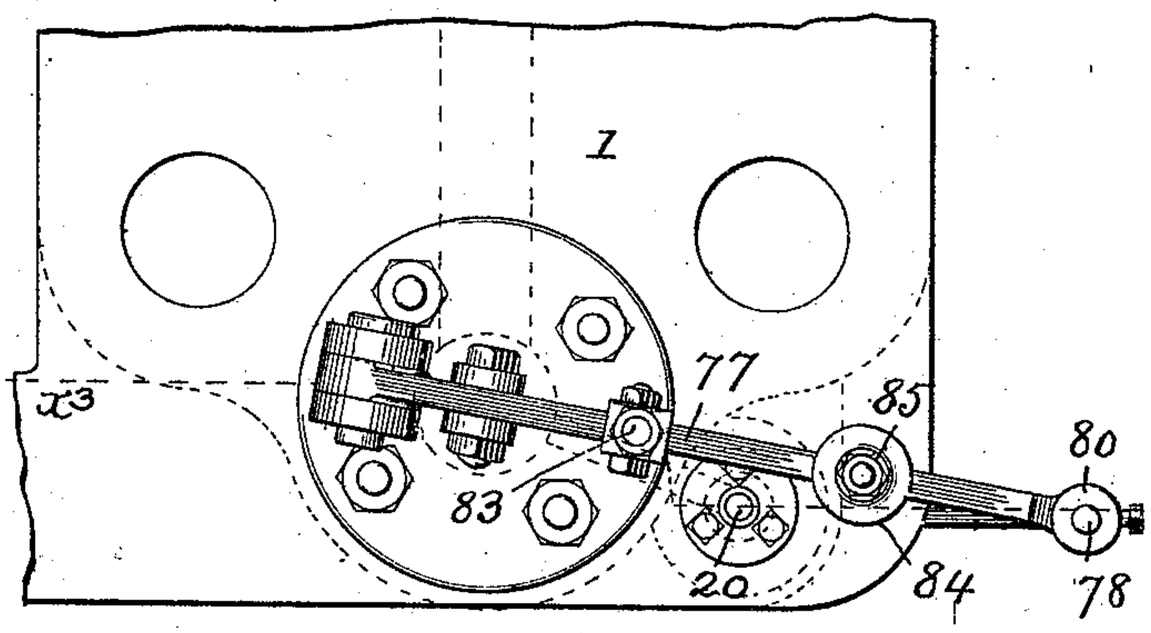

Fig. 19.

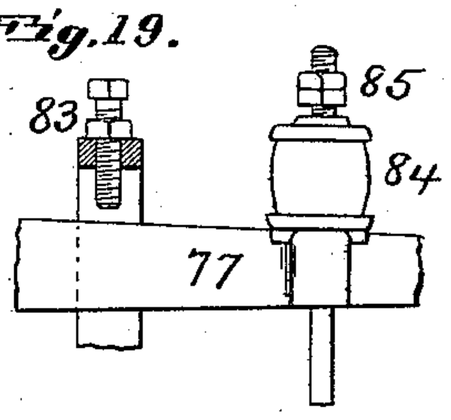

Fig. 20.

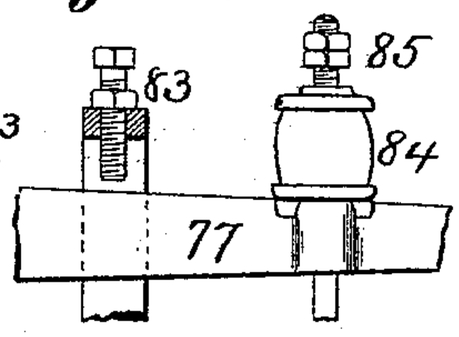

Fig. 21.

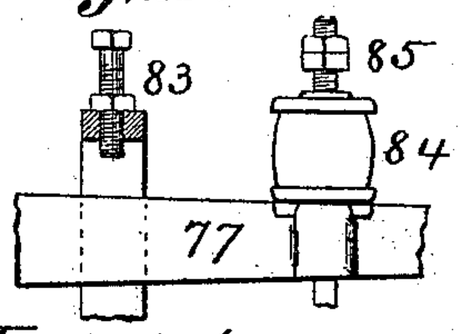

Fig. 23.

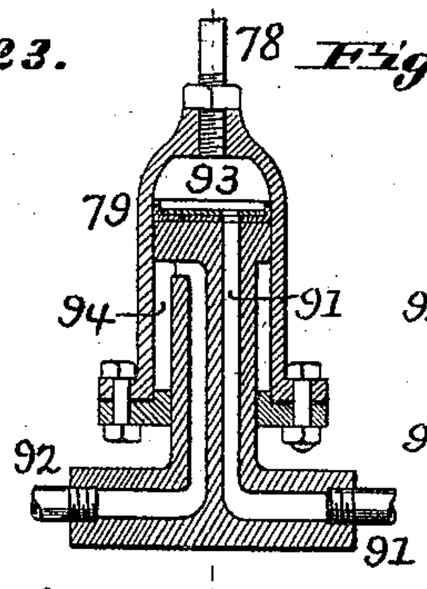

Fig. 22.

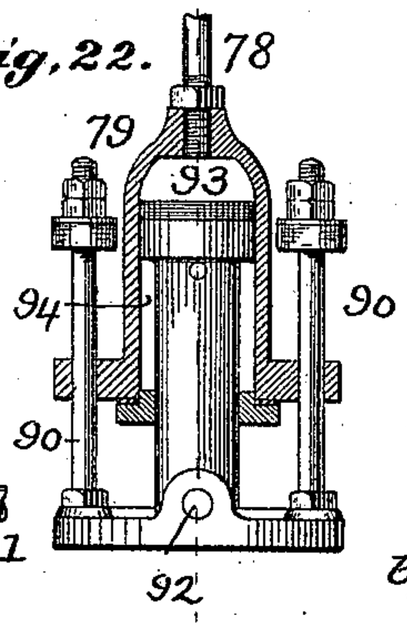

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Fig. 24.

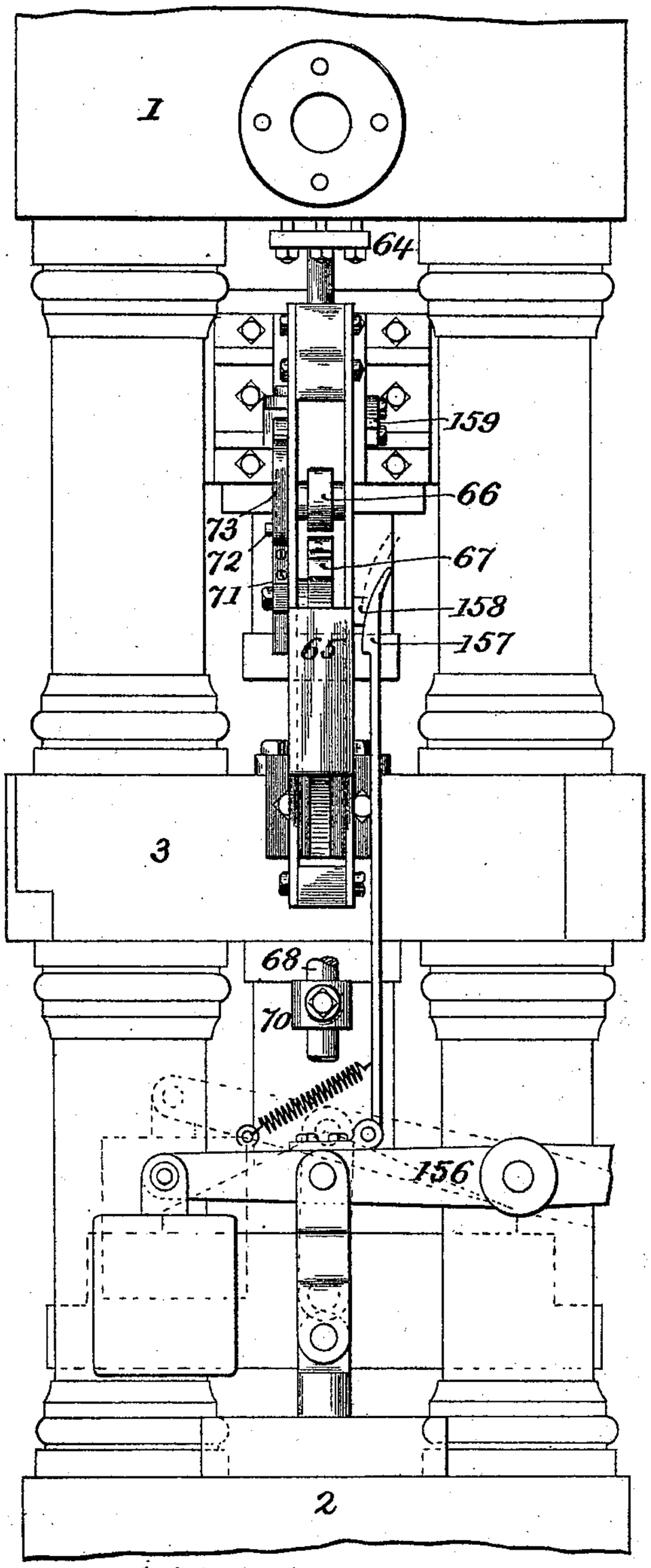
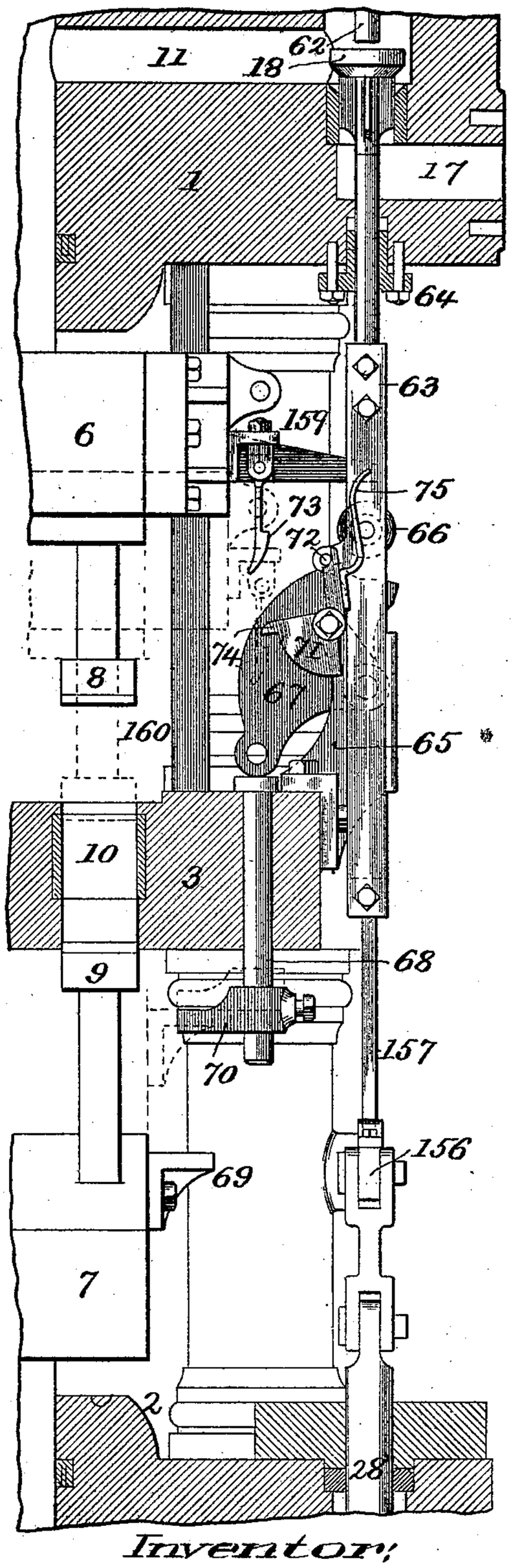


Fig. 25.



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Julius J. Koch,
by Robert Burns Att'y.

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Fig. 26.

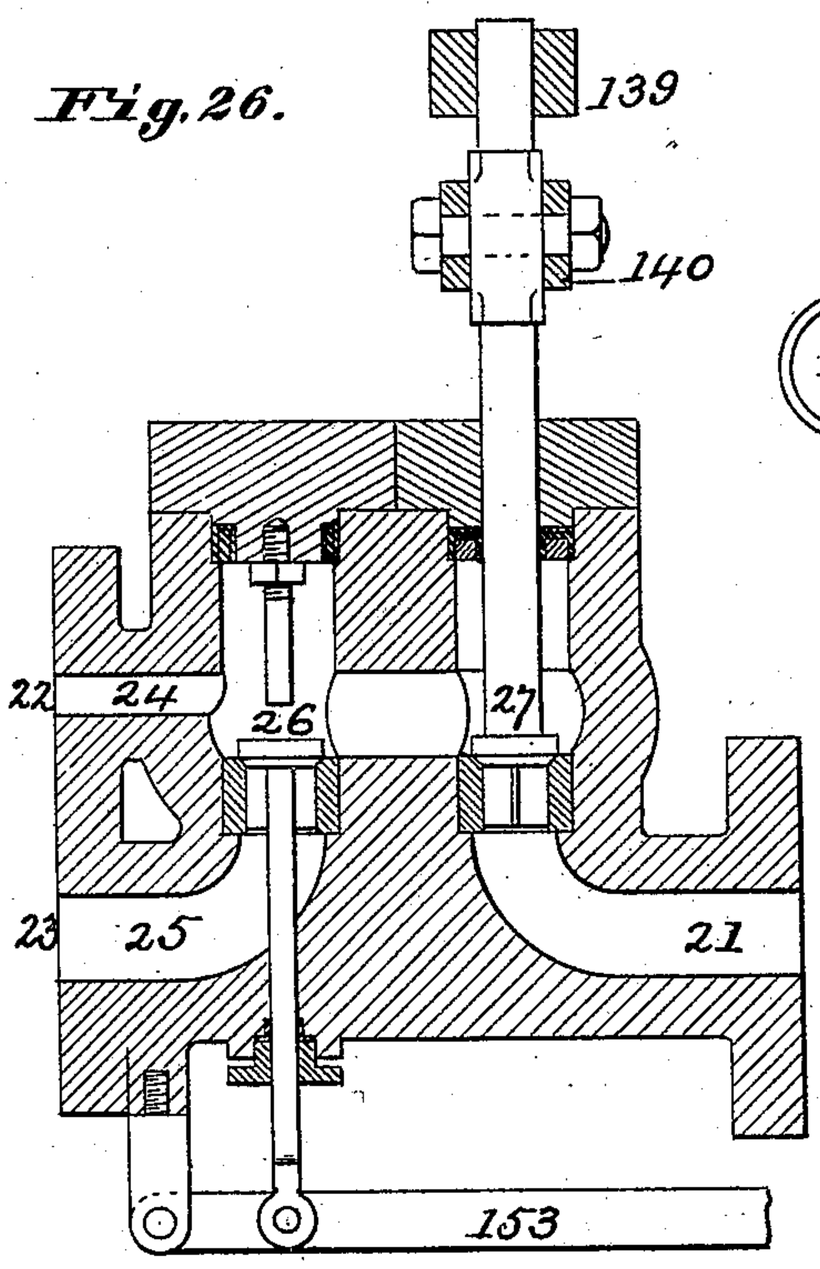


Fig. 27.

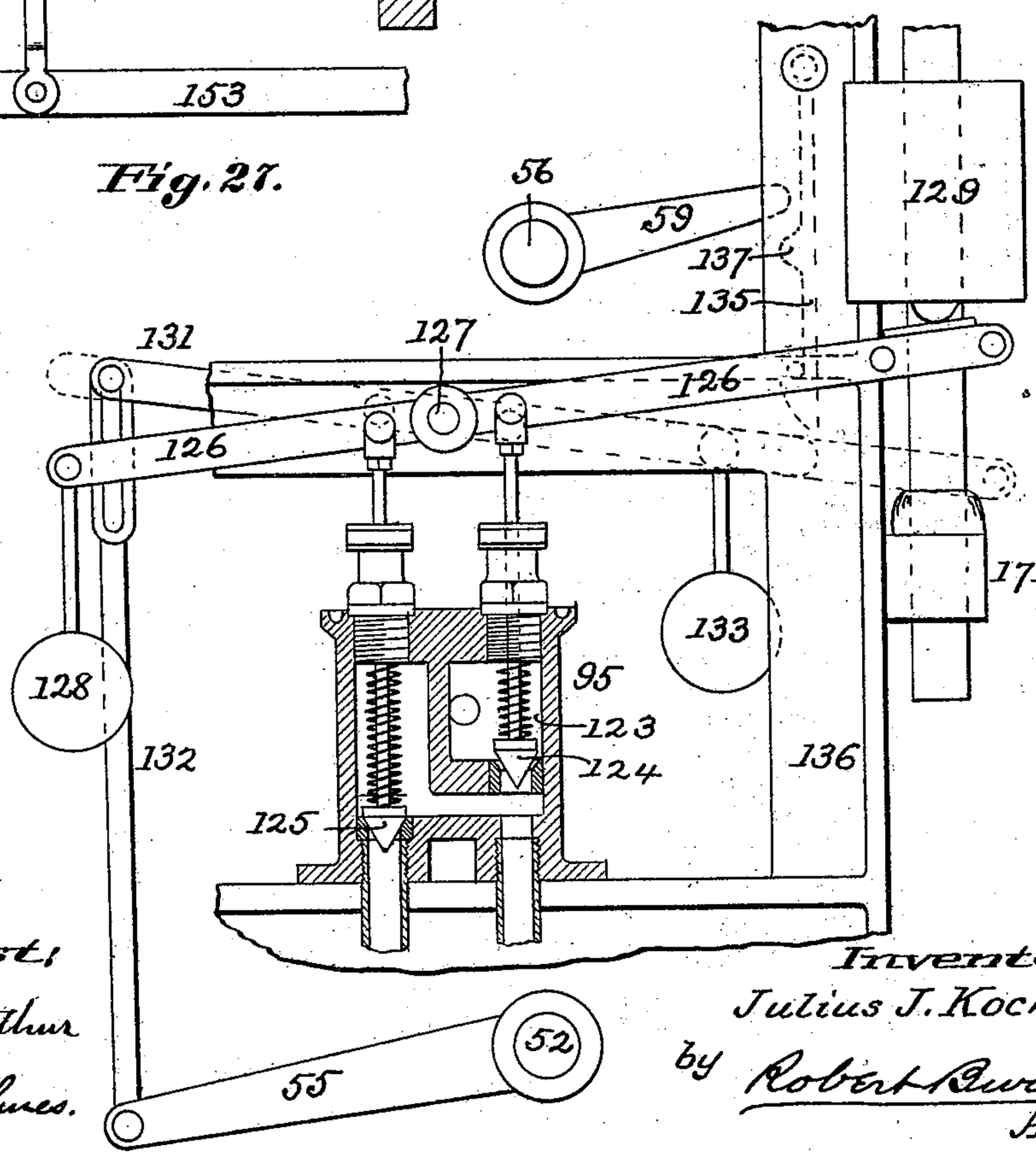
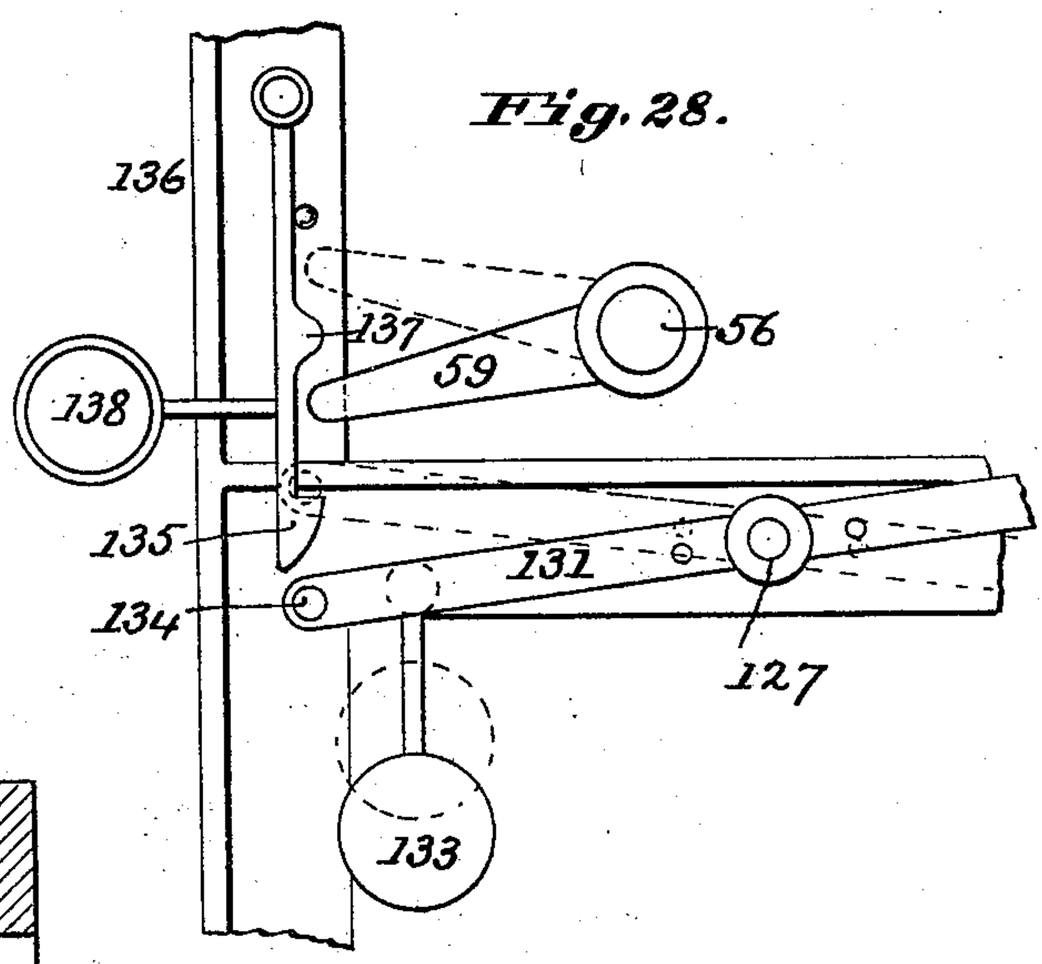


Fig. 28.



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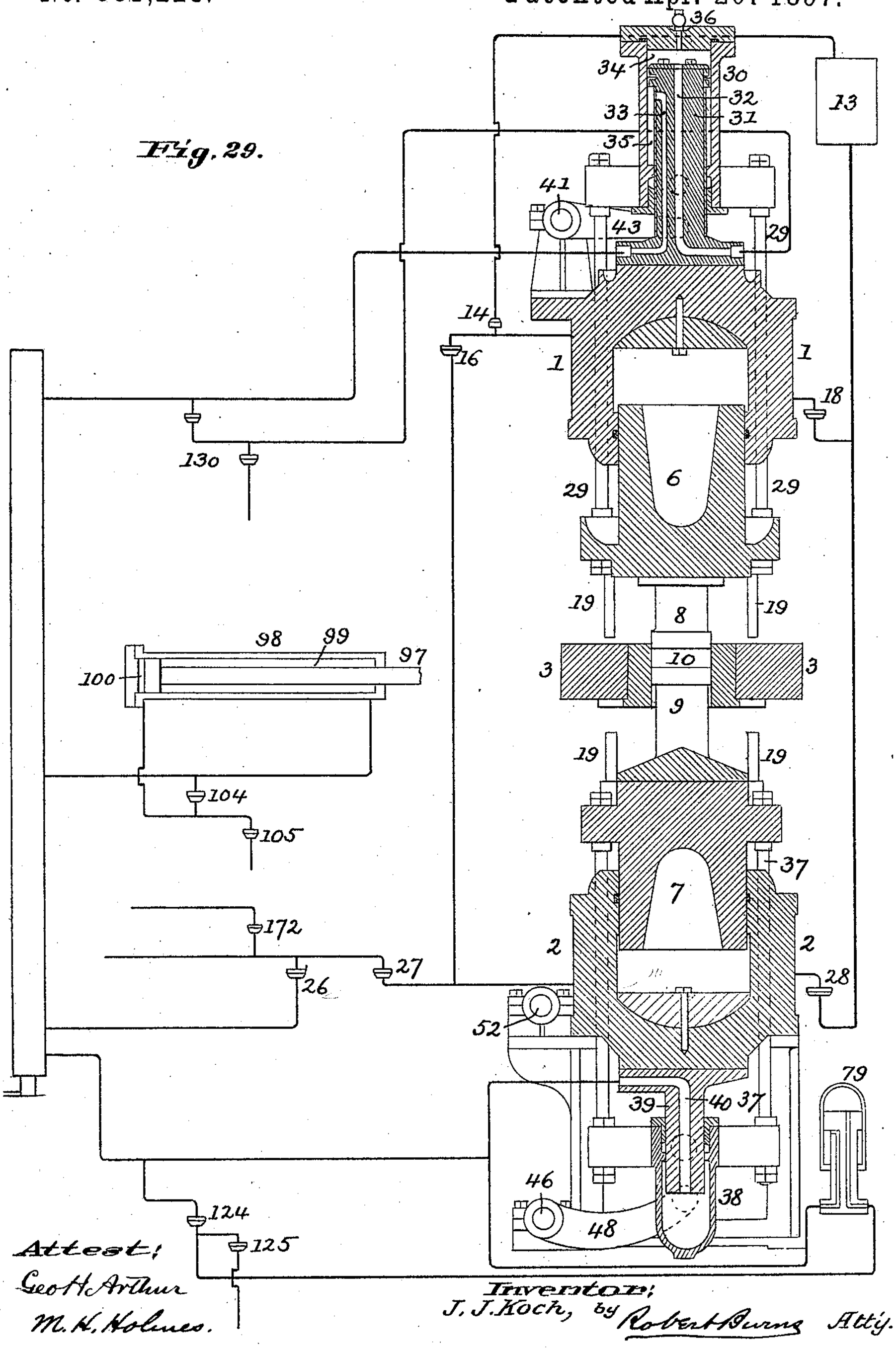
No. 581,223. Patented Apr. 20. 1897.

Fig. 29.



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M. K. Holmes.

Inventor:
J. J. Koch, by Robert Burns Atty.

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Fig. 30.

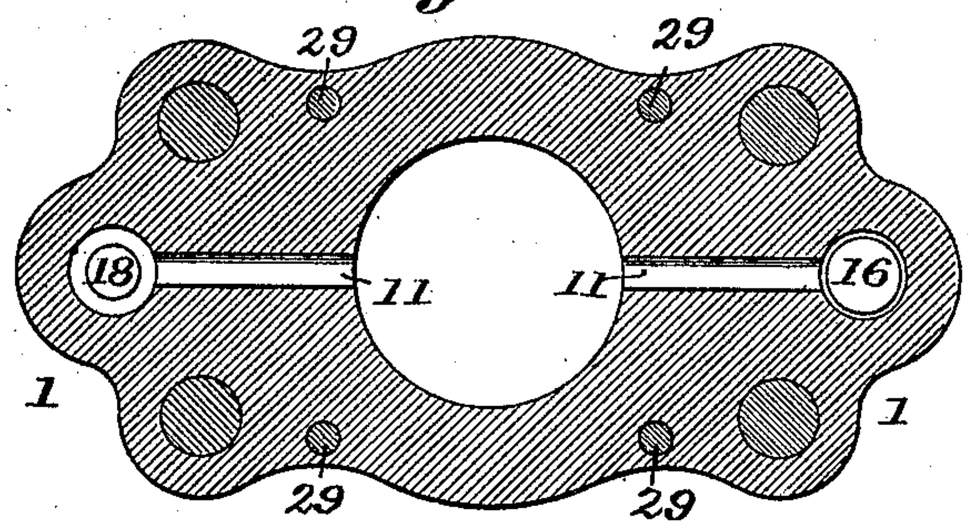


Fig. 31.

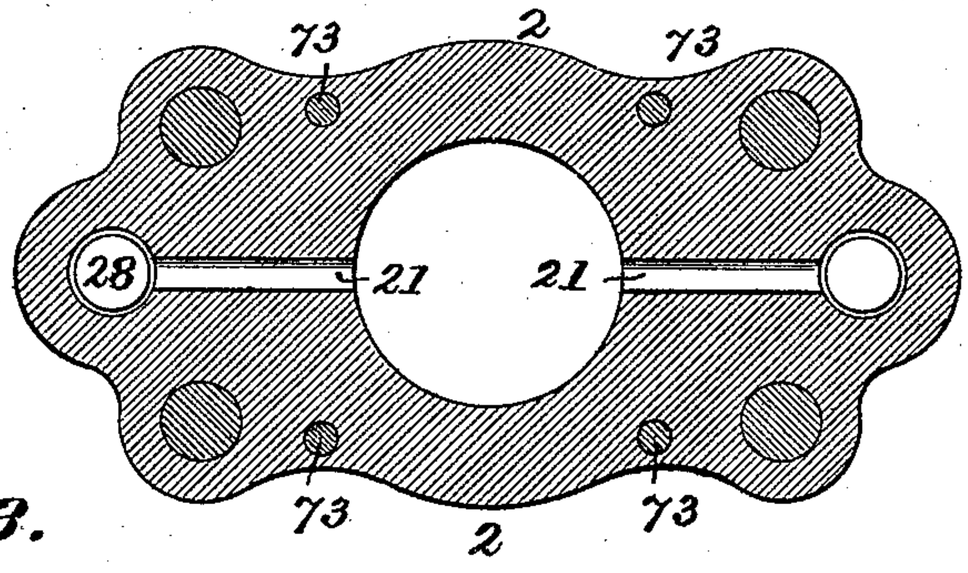


Fig. 33.

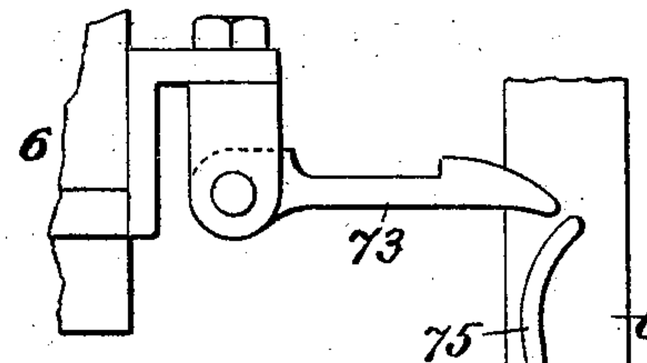
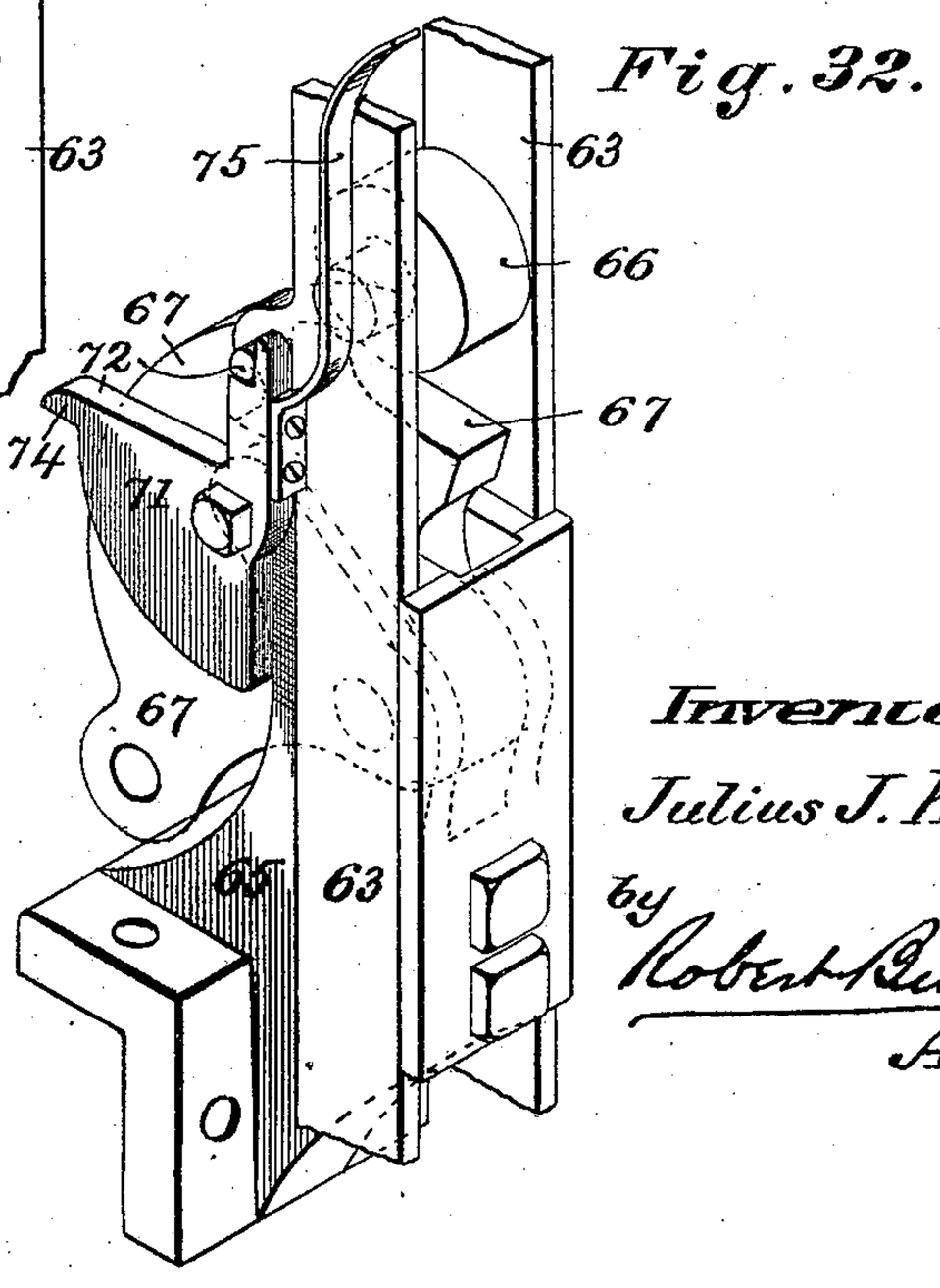


Fig. 32.



Attest;

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J. Coleman

Inventor;

Julius J. Koch,

by Robert Burns

Att'y.

UNITED STATES PATENT OFFICE.

JULIUS J. KOCH, OF ST. LOUIS, MISSOURI.

HYDRAULIC BRICK-PRESS.

SPECIFICATION forming part of Letters Patent No. 581,223, dated April 20, 1897.

Application filed July 2, 1892. Serial No. 438,794. (No model.)

To all whom it may concern:

Be it known that I, JULIUS J. KOCH, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Hydraulic Brick-Presses; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

The present invention relates to improvements in hydraulic brick-presses, and more particularly in that type of presses described in my application for Letters Patent, filed June 1, 1891, Serial No. 394,749; and the present improvement has for its object to provide successively and automatically operating connecting mechanisms between charger-cylinder and the upper and the lower ram cylinders, and in which the parts are provided with varied means of adjustment in order that action of the press can be modified and changed, so as to adapt itself to the successful manipulation of the different nature of clays from which bricks are made. I attain such objects by the construction and arrangement of parts illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the press, partly in section; Fig. 2, a longitudinal sectional elevation of the same at line $x\ x$, Fig. 3; Fig. 3, a horizontal section at line $x'\ x'$, Fig. 2; Fig. 4, an enlarged detail longitudinal sectional elevation of the valve-chest and valves of the charger-cylinder; Fig. 5, an enlarged detail transverse sectional elevation of high-pressure-regulating valve mechanism; Fig. 6, a detail side elevation of the latch mechanism for the valve mechanism of the charger-cylinder; Fig. 7, a front elevation of the same. Fig. 8 is an enlarged detail longitudinal sectional elevation of the charger, charger-cylinder, and connections; Fig. 9, a side elevation of the same, partly sectionized; Fig. 10, a detail plan view illustrating the arrangement of the cam-plate that actuates the throttle-valve of the charger-cylinder; Fig. 11, an enlarged detail transverse sectional elevation of the press, illustrating the locking and unlocking mechanism for the valves of the operating-cylinder of the side pipe and the relief-valves of the upper ram; Fig. 12, a detail side elevation of the same; Fig. 13, a horizontal section of the same at line $x^2\ x^2$, Fig. 12; Fig. 14, a detached perspective view of the spring-latch block of the locking and unlocking mechanism for the side-pipe and relief valves; Fig. 15, a similar view of the guide-bar of such mechanism; Fig. 16, an enlarged detail sectional elevation at line $x^3\ x^3$, Fig. 18, of the side-pipe and relief valves and connections; Fig. 17, a sectional front elevation of the same at line $x^4\ x^4$, Fig. 16; Fig. 18, a detail plan view of the same. Figs. 19, 20, and 21 are detail sectional elevations illustrating the side-pipe-valve lever and connections in the different positions it assumes in different operations of the press; Fig. 22, a detail sectional elevation of the operating-cylinder and piston of the side-pipe and relief valve mechanism; Fig. 23, a longitudinal section of the same; Fig. 24, a detail side elevation of the press, illustrating the operating mechanism for the valve controlling the inlet and outlet of water to the upper-ram cylinder and the mechanism for holding and releasing the exhaust-valve of lower-ram cylinder; Fig. 25, a transverse section of the same; Fig. 26, an enlarged detail section of the inlet and pressure-dividing valves and connections of the lower-ram cylinder; Fig. 27, an enlarged sectional elevation illustrating the valve and valve mechanism for the operating-cylinder of the side-pipe and relief valve mechanism and the operating mechanism for the valves of the auxiliary raising-cylinder of the upper ram; Fig. 28, an opposite detail elevation of the operating mechanism of the valves of auxiliary raising-cylinder of the upper ram; Fig. 29, a central vertical section of the press through the rams and ram-cylinders with the valves and pipe connections illustrated in diagram. Fig. 30 is a detail horizontal section of the cylinder or housing of the upper ram, illustrating the ports or passages therein. Fig. 31 is a similar view of the cylinder or housing of the lower ram; Fig. 32, a detail perspective of the latch mechanism shown in Figs. 24. and 25. Fig. 33 is a detail elevation of the latch mechanism in a different position from that shown in Fig. 25.

Similar numerals of reference indicate like parts in the several views.

As in my former construction, the press

proper consists of the upper and lower fixed members 1 and 2, connected together in proper relative position by means of stay-sleeves, tie-rods, and nuts, as usual, and supported on a suitable frame or base, as shown, the mold-frame 3 being supported in the usual manner midway the height between the upper and lower fixed members 1 and 2, with the brick-receiving table 4 arranged in front thereof and the charger-table 5 at the rear of the same.

The fixed members 1 and 2 constitute the hydraulic cylinders for the main hydraulic plungers or rams 6 and 7, to which are attached the mold-plungers 8 and 9, by which the charge of clay is compressed in the mold-cavity 10, (see Fig. 29,) and 19 are the usual stops on the upper and lower rams that limit the respective movements of the rams.

11 is a circuitous port or passage in the upper fixed member 1, (see Figs. 1, 16, and 25,) having communication with the upper-ram chamber and with the side-pipe connection 12, the storage-tank 13, and the relief-valve 14 in the following manner: with the side-pipe connection 12 through branch passage 15, controlled by a valve 16, (see Fig. 16,) with storage-tank 13 through branch passages 17, controlled by the inlet-outlet valve 18, (see Figs. 1 and 25,) and with the relief-valve 14 by the branch 20, (see Fig. 1,) which may communicate with the storage-tank 13 or any other suitable receptacle.

21 is a circuitous port or passage in the lower fixed member 2, (see Figs. 1, 2, 25, 26, and 29,) having communication with the lower-ram chamber and with the high and low pressure supplies 22 and 23, the storage-tank 13, and the side pipe 12, that connects with the upper-ram chamber, in the following manner: with the high and low pressure supplies through the branch passages 24 and 25, (see Fig. 26,) the respective connections of which are controlled by the pressure-dividing valve 26, and the inlet-valve 27, and with the storage-tank 13 by a branch passage containing a valve 28. (See Figs. 1 and 29.)

As in my former construction and as illustrated in Figs. 1, 2, and 29, the upper ram or plunger 6 is connected by tie-rods 29 with the vertically-moving auxiliary cylinder 30, the piston 31 of which is stationary on the fixed press member 1, (see Fig. 29,) such piston being provided with the respective ports or passages 32 and 33, that respectively open or lead into the upper chamber 34 and annular chamber 35 of the auxiliary cylinder 30. In the present construction, 36 is an inwardly-opening check-valve in a passage communicating with the upper chamber 34 of the auxiliary cylinder, which is adapted to admit air and prevent a formation of a vacuum on the upward movement of the cylinder, as illustrated in Figs. 1, 2, and 29.

The lower ram or plunger 7 (see Fig. 1) is connected by tie-rods 37 with the vertically-moving auxiliary cylinder 38, the piston 39 of which is stationary on the under side of the lower fixed member 2 (see Fig. 29) of the press, such piston being provided with a single port or passage 40, that introduces a constant pressure into the cylinder 38 and produces a constant downward pulling strain upon the lower-ram plunger 7 and the lower mold-plunger 9.

As illustrated in Figs. 1, 2, and 29, 41 is the upper rock-shaft of the press, receiving motion from the upper vertically-moving auxiliary cylinder 30 through links 42 and arms 43, and provided with arms 44 and 45, that have connection with and operate the different press parts, as hereinafter described, and 46 is the lower rock-shaft, receiving motion from the lower vertically-moving auxiliary cylinder 38 through links 47 and arms 48, and provided with an arm 49, that connects by a link 50 with the arm 51 of a supplementary rock-shaft 52.

The supplementary rock-shaft 52, as illustrated in Figs. 1, 2, 3, and 27, is provided with arms 53, 54, (see Figs. 2 and 3,) and 55, (see Figs. 1 and 27,) that have connection with and operate different press parts, as hereinafter described.

The intermediate rock-shaft 56, as illustrated in Figs. 1, 2, 3, 8, 9, 27, and 28, is provided with arms 57, (see Figs. 1, 2, 3, 8, and 9,) through which it receives motion from the clay-charger, as hereinafter set forth, and carries arms 58 (see Fig. 8) and 59 (see Figs. 27 and 28) and cams 60 (see Fig. 3) and 61, (see Fig. 2,) adapted to operate different press parts, as hereinafter described.

In the present construction the inlet-outlet valve 18 of the upper-ram chamber (see Figs. 1, 24, 25, and 29) is made separate or movable on its stem (see Fig. 25) and capable of independent movement, in order that it may at the proper time act as a suction check-valve for the upper-ram chamber, and thus perform the combined functions of the independent and distinct inlet-outlet valve 23 and suction check-valve 24 of the construction shown in my former application, Serial No. 394,749, a suitable stop, as 62, (see Figs. 1 and 25,) being employed to limit the stroke of the valve when acting as suction check-valve.

The movement of the valve 18 as an inlet-outlet valve for the upper-ram chamber is accomplished by the following mechanism: The slotted valve-stem 63 (see Figs. 1 and 25) is guided by the gland 64 at top and the bracket-piece 65 at bottom, and carries a roller 66, that is engaged by the cam-faced lever 67, (see Fig. 25,) having its fulcrum on the bracket-piece 65, with its lower end or heel in contact with the headed upper end of the intermediate rod 68, (see Fig. 25,) that extends down into the path of a projection 69 on the lower ram 7. In the construction shown the rod 68 passes through a guide-orifice in the mold-frame and is provided at its lower end with an adjustable shoe 70, that projects into the path of the ram projection 69, in order to

admit of any desired adjustment in the relation of the parts to cause an opening of the valve 18 at the desired time.

With the construction so far described the opening of the valve 18 (see Figs. 24 and 25) is effected, and in order to hold it in an open condition I pivot to the bracket-piece 65 or other suitable part of the press (see Figs. 24, 25, and 32) the weighted latch-piece 71, adapted to engage beneath a pin projection 72 on the slotted valve-stem 63 as the same reaches its raised position, such latch-piece being released at the proper time by a suitable connection with the upper ram.

In Figs. 25 and 33 I illustrate a hook-bar 73, pivoted to the upper ram 6 by a rule-joint or other equivalent mode of attachment. With the hook 73 in a pendent position, as shown in Fig. 25, the same will on the downward travel of the upper ram be engaged under the arm 74 of the latch-piece, and on the upward travel of said ram will draw the latch-piece 71 out of engagement with the valve-stem to allow the same to drop and the valve 18 to close. With the hook-bar swung into a horizontal position, as shown in Fig. 33, its outer end on the downward travel of the upper ram will engage the curved arm 75 of the latch-piece 71 and force the same out of engagement with the valve-stem to allow the same to drop and the valve 18 to act as an independently-operating suction check-valve during a required period of the downward travel of the upper ram.

The use of the last-described operative mechanism is preferred whenever during the compression of the charge of clay the ram does not reach its limit of descent with its stops 19 resting against the mold-frame, in that water under pressure entering the upper-ram chamber will produce a compression of the charge of clay from the top to the same degree of density as is effected by the lower ram acting upon the under side of the charge of clay. When, however, the upper ram, owing to the large amount of clay entering the molds or to the damp nature of the clay, has descended to its full limit, with its stops 19 resting against the mold-frame, and before maximum pressure has been attained upon the upper surface of the charge of clay, no further compression of the material in the molds can be attained from the upper ram. Accordingly the operative mechanism first above described is preferably used, in that it affords means for obtaining a maximum compression upon the upper side of the charge of clay. With such mechanism the inlet-outlet suction or triple valve 18 is opened by the upward movement of the lower ram and locked in such open condition by the latch-piece 71 during the downward travel of both the upper and lower rams. This will allow initial compression from the top ram. The water entering lower-ram chamber now compresses the clay sufficiently from the lower side to raise the mass of clay and the upper ram. During the continued rising of the upper ram the hook 73 detaches the latch-piece 71 from engagement with the valve-stem 63 and allows the same to drop, in turn permitting the triple valve 18 to close, thus stopping the upward travel of the upper ram and placing the same in such a relative position to the lower ram that pressure can be produced on both the upper and lower plungers or rams without having any resistance from the stops.

The controlling-valve 16, between the upper and lower ram chambers, (see Figs. 1, 2, 3, and 16 to 23,) has its stem 76 engaging a valve-lever 77, fulcrumed on the fixed member 1 of the press, the valve-lever being operated at the proper times by a valve-rod 78, (see Fig. 16,) attached to the moving cylinder 79 (see Figs. 1, 2, 3, 22, and 23) of a water-engine. In the construction shown, 80 and 81 (see Fig. 16) are adjustable upper and lower collars or tappets on the valve-rod that are adapted, respectively, to draw down and lift up the free end of the valve-lever 77.

82 (see Fig. 16) is a yoke-piece attached to the fixed member 1 of the press, having an adjustable abutment 83 to limit the upward movement of the valve-lever 77 and the opening of the controlling-valve 16.

84 (see Figs. 1, 2, 16, 17, 18, 19, 20, and 21) is a compressible abutment, preferably having pivotal attachment to the fixed member 1 of the press, resiliency of which is made adjustable by the temper screw and nut 85, as shown.

The relief-valve 14 (see Fig. 16) of the upper-ram chamber has its stem 86 engaging a valve-lever 87, fulcrumed to the fixed press member 1, the valve-lever being drawn upward by a spring 88 and downward at the proper time by an adjustable collar or tappet 89 on the valve-rod 78, attached to the moving cylinder 79 (see Figs. 1, 2, 16, 22, and 23) of a water-engine, the time of lowering and length of stroke depending upon the position of the collar 89.

In the construction shown the water-engine for operating the controlling-valve 16 and relief-valve 14 has its cylinder 79 (see Figs. 22 and 23) arranged to move on guides 90, while its piston is stationary and provided with ports 91 and 92, that communicate, respectively, with the chambers 93 and 94 above and below the head of the piston, the port 92 being in continuous communication with the source of water-pressure, while the port 91 is connected with the valve-chest 95, (see Figs. 3 and 27,) the valves of which are operated by the valve mechanism hereinafter described.

In the present construction the relief-valve 14 first opens, and following the same at the proper time the controlling-valve 16 is closed, the relative coöperation of the two depending upon the position of the adjustable collar 80. (See Figs. 1, 2, 16, and 18.)

The operation of the controlling-valve 16 can be varied in various ways, so as to adapt the press to the many different qualities of clay and thus impart a universal adaptability to the present improved construction of hy-

draulic brick-press. By raising the controlling-valve lever 77 by means of the collar 81 the controlling-valve is fully opened to allow pressure to be effected on both hydraulic rams simultaneously in equal ratio. By restricting the opening of the controlling-valve by means of the adjustable abutment 83 the pressure will increase in both rams in unequal ratio, although the final maximum pressure will be the same on both rams. By restricting the opening of the controlling-valve by means of the compressible abutment 84 the flow of water to the upper-ram chamber will increase with the compression of such abutment, and to limit the compression of the abutment 84 the adjustable abutment 83 can be utilized and thus afford ready means for controlling the desired final speed of compression effected by the upper ram.

Fig. 16 illustrates a loaded limited moving arrangement of the above parts with which the controlling-valve 16 will first open after a desired degree of pressure has been reached in the lower-ram chamber to overcome the resistance of the compressible abutment 84. The controlling-valve will then gradually open, depending upon the increase of pressure in the side pipe 12 and the relative compression of the abutment 84, until arrested by the adjustable abutment 83. Say the original compression of the abutment 84 was equivalent to a load of eight hundred pounds per square inch, then it would follow that water would not enter upper-ram chamber until said load had been overcome, and the pressure would then increase in both ram-chambers with unequal speeds until the maximum opening of the controlling-valve takes place, which would then allow pressure to increase with equal speed in both ram-chambers; but if the upward movement of the controlling-valve was restricted the speed of an increase of pressure in the upper-ram chamber would be restricted correspondingly. However, in all cases, the final desired maximum pressure would be the same.

Fig. 19 illustrates a limited moving arrangement of the said parts in which the primary opening of the controlling-valve is in sympathy with the water-pressure entering lower-ram chamber and side pipe 12 and which is subsequently restricted by the compressible abutment 84, the gradual compression of which allows the controlling-valve to gradually open until arrested by the stop 83.

Fig. 20 illustrates an arrangement of such parts uninfluenced by the compressible abutment 84, but with the opening of the controlling-valve limited by the adjustable abutment 83. With this arrangement the water-pressure will enter the upper-ram chamber in a uniform stream during the time that the valve is open and until pressing is completed.

Fig. 21 illustrates an arrangement of such parts with which the primary opening of the controlling-valve is uninfluenced by the compressible abutment, but is subsequently influenced by the same, so that the gradual opening of the controlling-valve is in sympathy with the gradual compression of the abutment 84 and is entirely unaffected by the adjustable abutment 83.

From the above it will be observed that with the relative adjustments of the abutments 83 and 84 a large number of variations in the mode of compression is induced, and in consequence the scope of the press is enlarged to handle a large variety of clay and the different conditions thereof.

The reciprocating clay-charger 96, (as illustrated in Figs. 2, 3, 4, 8, 9 and 10,) as in my former application, is operated by a hydraulic piston and cylinder 97 and 98. In the present construction the annular water-chamber 99 (see Fig. 8) of the cylinder 97 is in constant communication with the source of water-pressure, so that the tendency at all times is to draw the charger backward. The chamber 100 of said cylinder is in communication with the valve-chest 101 (see Figs. 2, 3, and 4) and receives at proper times a pressure of water therefrom, so as to move the clay-charger forward, such valve-chamber being formed with supply and exhaust valve chambers 102 and 103, (see Fig. 4,) containing the supply and exhaust valves 104 and 105, the stems of which are connected to the rock-lever 106 on a rock-shaft 107 in any usual manner, so as to be capable of a limited independent movement.

The rock-lever 106 is attached to its rock-shaft 107 by a set-screw or other equivalent device, so as to be capable of being readily loosened upon said shaft when required, and is provided with a handle extension 108, (see Fig. 4,) the construction being such that the lever can be loosened and operated independently by hand to actuate the clay-charger when desired without affecting the automatic mechanism by which the charger-valves are ordinarily operated.

Each of the charger-valves 104 and 105 will have a primary or closing movement and a secondary or opening movement, the primary movements being imparted to the rock-shaft 107 and its arm 109 (see Figs. 2 and 3) by a slotted adjustable link 110 and rock-arm 53, attached to supplementary rock-shaft 52, that receives motion from the lower ram, as heretofore described, the secondary movement being imparted to the rock-shaft 107 and its arm 109 by a link connection 111 and shifting overbalance device 112.

113 (see Figs. 2, 6, and 7) is a spring-latch adapted to engage the outer end of the arm 109 when the overbalancing device 112 is in the position indicated in dotted lines in Fig. 2 to hold the same against further downward movement until the spring-latch is released from such engagement by the upward movement of the upper ram 6, acting through links 42, arm 43, upper rock-shaft 41, arm 45, and rod 114, provided with an adjustable block 115, adapted to engage the arm 116 of the

spring-latch 113 to release the same from its engagement with arm 109 and permit the drawing down of such arm by the overbalancing device to open the supply-valve 104 and cause the clay-charger to move forward. (See Fig. 2.)

The backward movement of the clay-charger is effected by the lower ram 7, as it nears the completion of its downward movement, through link 47, arm 48, lower rock-shaft 46, arm 49, link 50, arm 51, supplementary rock-shaft 52, arm 53, and slotted adjustable link 110, (see Fig. 2,) so as to first effect a closing of the supply-valve 104 and the tilting of the shifting overbalance device 112, so that it will act to open the exhaust-valve 105 to admit the escape of water from the rear chamber 100 of the charger-cylinder 98, so that the constant pressure in the forward annular chamber 99 will draw the clay-charger back to receive a fresh supply of clay.

117 (see Figs. 9 and 10) is a cam-plate attached to the clay-charger, the cam-face 118 of which is adapted to engage the stem of a throttle-valve 119, arranged in the inlet-passage to the rear chamber 100 of the charger-cylinder, so as to regulate the speed or movement of charger.

Motion is communicated to the arm 57 (see Fig. 9) of the intermediate rock-shaft 56 of the press by an adjustable tappet 120 in one direction and in the other direction by means of a chain or other adjustable device 121, the ends of which are attached to the charger and to the end of the arm 57, respectively.

122 (see Fig. 8) is a compressible abutment attached to the press proper and located in the path of the arm 58 on the intermediate rock-shaft 56, the purpose of which is to afford an emergency stop for the forward movement of the clay-charger.

The valve mechanism for the water-engine by which the controlling and relief valves of the upper-ram chamber are operated, as heretofore described, consists of a valve-chest 95, (see Figs. 3 and 27,) the supply-chamber 123 of which is in communication with the port 91 (see Fig. 23) and the top chamber 93 of the water-engine. The supply and exhaust valves 124 and 125 (see Fig. 27) of the valve-chest are connected by their valve-stems to the rock-lever 126 on the rock-shaft or axis 127 in any usual manner that will permit of a limited independent movement of the valves.

128 is a weight attached to one end of the rock-lever 126, the tendency of which is to draw the supply-valve 124 to an open condition.

129 is a superior weight that engages the other end of the rock-lever 126 to first close the supply-valve 124 and then open exhaust-valve 125 of the water-engine that actuates the controlling and relief valves of the upper-ram chamber.

On the opening of the exhaust-valve 125, as described, the cylinder 79 (see Figs. 1, 2, 22, and 23) descends, drawing the valve-rod 78 downward and through the collar 89, (see Figs. 2 and 16,) and lever 87 opens the relief-valve 14 of the upper-ram chamber and through the collar 80 and lever 77 closes the controlling-valve 16 of the upper-ram cylinder against water-pressure in the side pipe 12. As the superior weight 129 is lifted, in manner hereinafter described, the weight 128 (see Fig. 27) comes into action to first close the exhaust-valve 125 and then open the supply-valve 124 of the water-engine aforesaid to raise the cylinder 79 and valve-rod 78 to effect the different operations of the relief and controlling valves heretofore described.

130, as shown in Fig. 3, is the valve-chest of the auxiliary raising-cylinder 30 of the upper ram, having supply and exhaust chambers and supply and exhaust valves identical in construction with the valve-chests 95 and 101, heretofore described. The stems of such valves are connected to a rock-lever 131 (see Figs. 27 and 28) on the axis 127, one end of which is connected by a slotted link 132 to the rock-arm 55 of the supplementary rock-shaft 52 of the press, the other end carrying a weight 133 and a pin or stud 134, that is engaged by a swinging latch or hook 135, pivoted to the press-standard 136 and provided with a toe or projection 137, which at proper times is operated by the arm 59 of the intermediate rock-shaft 56, independent movement of the hook being effected by a handle 138.

The inlet-valve 27 of the lower-ram chamber (see Figs. 1, 2, 3, and 26) has its stem guided by a guide yoke or frame 139 and connected to a valve-operating lever 140, pivoted at 141 to the press-frame and having a roller 142, that is engaged at the proper time to close the inlet-valve 27 by the cam 61 of the intermediate rock-shaft 56; a vertical orifice or guide-opening 143 for the valve-opening rod 144, that is connected to the arm 44 of the upper rock-shaft 41 of the press; a vertical orifice or guide-opening 145 for a "throttle-rod" 146, connected to rock-arm 54 of the supplementary rock-shaft 52 of the press, and an angular or bell-crank extension 150, the lower end of which has pivotal connection with the horizontally-moving slide-bar 151, having a locking projection 152, adapted to engage the lever of the pressure-dividing valve 26 of the lower-ram chamber, as hereinafter described.

The valve-opening rod 144 is provided with an adjustable abutment 147 to determine the time of opening and an interposed compressible abutment 148 to afford means for completing the opening movement of the inlet-valve 27 after the same has been primarily opened.

149 is an emergency compressible abutment between the valve-lever 140 and the throttle-rod 146.

The pressure-dividing valve 26 of the lower-ram chamber is arranged between the high and low pressure inlets 24 and 25, as in my former application. In the present construc-

tion, as illustrated in Figs. 1, 2, 3, and 26, the valve-stem is connected to a valve-lever 153, pivoted at one end to the valve-housing and provided with an adjustable weight 154, (see Fig. 1,) the tendency of which is to draw the pressure-dividing valve into its closed condition.

The free end of the valve-lever 153 is in the path of the locking projection 152 (see Fig. 2) and in the path of an adjustable arm 155 (see Figs. 1 and 2) on the connecting-link 50, between the rock-arms 49 and 51 of the lower and supplementary rock-shafts 46 and 52 of the press.

The outlet-valve 28 of the lower-ram chamber (see Figs. 1, 3, 24, and 25) is identical in its arrangement with the outlet-valve of my former application, with its stem connected to the weighted valve-lever 156, operated in one direction by the cam 60 on the intermediate rock-shaft 56 of the press and in the other direction by its weight. In the present construction, 157 (see Fig. 24) is a spring-hook attached to the valve-lever 156, with its hook end adapted to engage a holding-lug 158 on a fixed part of the press to hold the outlet-valve 28 open, a disengagement of parts being effected at the proper time by an arm or projection 159 on a moving part of the press.

The upper ram 6, (see Figs. 1, 2, 3, 11, 12, and 13,) moving in guides 160, (see Figs. 11, 12, and 13,) has attached to its side, by means of bracket 161, (see Fig. 13,) the guide-bar 162, (see Fig. 15,) having at its upper end an enlargement or stop 163 and at its lower end an engagement-head 164. Upon this guide-bar 162 and between its stop 163 and head 164 is arranged to move the latch-block 165, (see Fig. 14,) having spring-hooks 166, adapted to engage the head 164, so as to lock the two together.

The latch-block 165 carries an attaching-eye 167, (see Figs. 11, 12, 13, and 14,) to which is attached one end of a rope or chain 168, (see Figs. 1 and 11,) passing over sheaves 169 and 170 (see Fig. 1) and connected to the drop-weight 129, (see Figs. 1 and 27,) the limit of whose downward movement is preferably limited by a stop-block 171, located on standard 136 of the press.

The pressure-reducing valve 172 (see Figs. 1, 3, and 5) is located in the path of the high-pressure fluid and is adapted to relieve the press of high pressure before the relief-valve 14 of the ram-chamber opens. The valve 172 is arranged in a chamber communicating with the high-pressure inlet 24 and by exhaust-passage 173 with a suitable tank, and is held to its seat normally by spring-cushion 174, adjustable to vary the normal load on said valve, as required.

175 (see Fig. 5) is a cam-faced arm on a shaft 176, rocked by an arm 177, that receives motion by a slotted connection with the drop-weight 129, the impact of which is adapted to reduce the resiliency of the spring-cushion 174 to its normal state, which has been previously increased by the upward movement of the weight 129.

178 (see Figs. 11 and 12) is a trip-block upon the upper end of a sliding bar or rod 179, provided with an adjustable disk or tappet 180, that projects into the path of an arm 181 on the lower ram 7, so as to be raised by the upward movement of the lower ram to disengage the spring-hooks 166 of the latch-bar 165 from engagement with the head 164 and permit the drop-weight 129 to fall. With this construction the mold-plungers 8 and 9 are prevented from coming in closer relative proximity to each other than a predetermined distance, which being reached the pressure-reducing valve 172 is opened to prevent further compression.

182 is a pull-rod (see Figs. 2, 3, 6, and 7) attached to the block 115 and adapted to draw the same out of the line of engagement with the spring-latch 113, so as to cause the press to come to a stop as it completes a revolution.

183 (see Figs. 3, 6, and 7) is a pull attached to the spring-latch 113 and adapted to draw the same out of engagement with the rock-arm 110 of the charger-valve mechanism, so as to enable the same to act and cause a forward movement of the charger independent of the automatic press mechanism.

The pull-rods 182 and 183 afford a ready means for controlling the operation of the press. By pulling out the rod 182 the press is stopped on one revolution. By pulling out the rod 183 one revolution of the press is effected. By releasing the rod 182 and pulling on the rod 183 the press is set in continuous action.

184 (see Fig. 1) is a vertical shaft at the front of the press having a hand-wheel by which it is rotated, its lower end being provided with a chain-wheel 185, that connects by endless chain 186 with the chain-wheel 187, that forms a movable nut to lift or lower the non-rotating abutment-screw 188, so as to limit and regulate the descent of the lower ram, and thereby gage the quantity of clay entering the molds.

Operation: Assuming the press parts to be in the following position—a batch of brick has just been pressed, the lower ram 7 is at the end of its upward stroke, and the upper ram 6 is just about to terminate its upward movement. The starting-block 115 has just tripped the spring-latch 113 to allow the shifting overbalance device 112 to open the charger-inlet valve 104 to cause the clay-charger 96 to move forward—the charger in its forward movement rocks the intermediate shaft 56 through adjustable tappet 120 and rock-arm 57 to effect the following duties: Cam 60 opens exhaust-valve 28 of lower-ram chamber by raising its lever 156 and allowing its spring-hook 157 to engage the stop-block 158. Cam 61 closes inlet-valve 27 of lower-ram chamber, and tappet-arm 59 moves down past the toe 137 of the retaining-hook 135 of the valve mechanism of the auxiliary raising-cylinder

30 of the upper ram, with the inlet-valve open and the exhaust-valve closed. The downward movement of the tappet-arm 59 takes place while the valve-lever 131 is pulled down and held by rod 132, receiving its movement from arm 55, and it is during the time that the said rod 132 holds the valve-lever 131 down that the tappet-arm 59 on its downward stroke passes the hook 135 to a point beyond the toe 137 while such hook is in a dormant condition. After this the parts are in position to permit the valve-lever 131 to drop into engagement with the hook 135 after the rod 132 has been subjected to a return movement effected by the arm 55, that in turn is controlled by the relative movement of the lower ram. Exhaust-valve 28 being opened lower ram is allowed to descend and in its descent effects the following duties: Cam-lever 67 is moved away from valve 18, so that the same will be held in an open position solely by the latch-piece 71. Slotted link 132 is moved away from the valve-lever 131 of the valve-chest 130 of the auxiliary raising-cylinder of the upper ram, so that the valve-lever will be held solely by its retaining-hook 135, and arm 155 is moved away from lever 153 of the pressure-dividing valve 26 to leave the same held in a raised condition by the locking projection 152 of the slide-bar 151. The lower ram as it descends allows the molds to fill with clay and also reverses the position of the shifting overbalance device 112 and causes the shifting weight of the same to move into the position indicated in full lines in Fig. 2 to effect a closing of the inlet-valve 104 and an opening of the exhaust-valve 105 of the charger-cylinder 98 to cause a backward movement of the same. At the desired time, which can be regulated, the chain 121 will, through arm 57, rock the intermediate shaft 56 to its normal position to effect the following duties: Cam 60 is removed from the lever 156. Cam 61 is removed from the valve-lever 140. The rock-arm 59 disengages the hook 135 from engagement with the valve-lever 131, so that weight 133 will act to close the inlet-valve and open the exhaust-valve of the valve-chest 130 of the auxiliary raising-cylinder of the upper ram to cause the upper ram to move downward and effect the following duties: Hook 73 passes the toe 74 of the latch-piece 71. The arm 159 disengages the spring-hook 157 from holding-lug 158 to allow the exhaust-valve 28 of the lower ram to close. The downward movement of the upper ram by its head 164 engaging the spring-hooks 166 and connecting mechanism raises the superior weight 129 and, through lever 177, loads the pressure-reducing valve 172 of the lower-ram chamber, as heretofore described. The raising of the weight 129 also allows the weight 128 to close the exhaust-valve 125 and open the supply-valve 124 of the cylinder 79, that actuates the relief and controlling valves of the upper-ram chamber and close said relief-valve 14 and actuate the controlling-valve, so that it will admit pressure into the upper-ram cylinder at times and under conditions dependent upon the adjustments of its fixed and compressible abutments, as heretofore fully described in the body of the specification. The downward movement of the upper ram further acts to compress the spring-abutment 148, while the rod 144 and connections is effecting an initial opening of the inlet-valve 27 of the lower-ram chamber, said spring-abutment affording means for effecting a still further opening of the valve 27, and during such movement the valve-lever 140, through its arm 150, slides the locking projection 152 from engagement with weighted valve-lever 153 to allow the pressure-dividing valve to close against low pressure at a differential period before the limit of low pressure is reached and furnish adjustable means for regulating the speed of final compression. Water entering lower-ram chamber through valve 27 causes ram 7 to move upward and effect the following duties: To compress the charge of clay in the molds sufficiently to overcome the resistance of the upper ram 6 and upon such lifting of the upper ram 6 by lower ram 7, the hook 73 on the upper ram will release latch-piece 71 and allow the inlet-outlet valve 18 of the upper-ram chamber to close and thus terminating the further upward movement of the upper ram. High pressure now ensues in the lower-ram chamber by the automatic closing of the pressure-dividing valve 26 and through side pipe 12, governed by controlling-valve 16, such high pressure is communicated to the upper-ram chamber, the rams moving toward each other effect a final compression of the charge of clay in the molds, and when both rams have reached a predetermined proximity (such position of parts being illustrated in Fig. 2) the spreader-head 178 will release the hooks 166 from their engagement and allow the weight 129 to drop and effect the following duties: To remove the maximum load prevailing on the pressure-reducing valve 172, which acts to relieve the ram-chambers from maximum pressure, and also on a further descent, by contact with lever 126, to close inlet-valve 124 and open exhaust-valve 125 of the operating-clyinder 79 of the relief and controlling valves 14 and 16 of the upper-ram chamber. The cylinder 79 now moves downward, drawing the relief-valve 14 open and then closing the controlling-valve 16 to prevent further ingress of water-pressure from the side pipe 12. Both rams now rise together, effecting the several duties as follows: Arm 155, moving in sympathy with the lower ram, raises pressure-dividing valve 26 to prevent the further occurrence of high pressure. Rock-arm 53, through slotted rod 110 and connections, closes the supply and exhaust valves of the charger-cylinder and sets the shifting overbalance device in the position indicated in dotted lines, Fig. 2. Rock-arm 54, through rod 146 and lever 140, effects a partial closing of the inlet-valve 27 of the lower-

ram chamber, the movement of the lever 140 throwing the locking projection 152 underneath the weighted valve-lever 153 to lock the pressure-dividing valve 26 in an open condition. Projection 69 actuates the cam-lever 67 to open the exhaust-valve 18 of the upper-ram cylinder, so that the water will freely discharge therefrom, the latch-piece 71 automatically engaging the pin or stud 72 to hold the valve 18 in an open condition.

Rock-arm 55, by slotted link 132 and connections, closes the exhaust-valve and opens the supply-valve of valve-chest 130 of the auxiliary raising-cylinder 30 of the upper ram to cause the same to lift the upper ram independently. The upper ram in its upward travel carries the head 164 of the slide-bar 162 into engagement with the spring-hooks 166 of the slide-block 165 of the mechanism of the drop-weight 129, and also moves the engagement-block 115 downward by means of rod 114 and connections, so that the spring-latch 113 will be operated to effect the initial restarting of a fresh movement of the press, as heretofore described.

In the present press construction the pressure-reducing valve 172 materially affects and controls the operation of the pressure-plungers of the press in that were such valve either held permanently to its seat or wholly omitted the high-pressure pump, when active for such purpose, would pump up high pressure at a uniform rate, and as it requires a definite space of time for the relief-valve to open, during such time compression would be still governed by the uniform high-pressure liquid. For example, high-pressure fluid enters lower-ram chamber at a uniform rate as produced by the pump and picks up its work at two hundred pounds pressure per square inch and carries it to, say, two thousand eight hundred pounds pressure per square inch, so as to be governed by the high-pressure safety-valve, the volume of water injected being equal to $10x$ in cross-section. Now if the valve 172 be so weighted as to open before maximum high pressure takes place only part of this flow will enter the press and part will escape. Say, for instance, this valve is weighted to open at eight hundred pounds and the volume it will carry is equal to $5x$, then $5x$ liquid will only enter the compression-chamber, and consequently the bricks will be pressed at a slower rate after eight hundred pounds pressure has been reached than before. Such valve can also operate in connection with the compressible cushion 174, so that the compression in the brick-molds will take place in an inverted proportion as the pressure increases, so much so that when the final maximum pressure is reached the escape of liquid through the valve 172 is equal to the amount that can be supplied for high-pressure purposes. Again, the leakage (beginning at a desired pressure) through the valve 172 may be so regulated that the flow of high-pressure liquid to the press-cylinder will gradually decrease, thereby effecting a gradually-decreasing speed of compression in the brick-molds in proportion as the pressure increases; and, again, the travel of the valve 172 on opening may be so restricted that it can only open a certain distance, so that when a desired degree of opening has been reached it cannot open any farther. This will cause a uniform flow of water to the press-chamber, but in a less quantity than the existing supply capacity. The valve 172 will be operative, as stated above, if it is placed anywhere in the path of high-pressure fluid.

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

1. In a hydraulic brick-press, the combination of the upper and lower rams, and their respective cylinders a connecting-pipe 12, a controlling-valve 16, and an adjustable abutment 82 limiting the opening of the controlling-valve, substantially as set forth.

2. In a hydraulic brick-press, the combination of the upper and lower rams, and their respective cylinders, a connecting-pipe 12, a controlling-valve 16, and adjustable compressible abutment 84, controlling the gradual opening of controlling-valve, substantially as set forth.

3. In a hydraulic brick-press, the combination of the upper and lower rams and their respective cylinders, a connecting-pipe 12, a controlling-valve 16, and adjustable abutment 82 and an adjustable compressible abutment 84, for limiting and controlling the gradual opening of the controlling-valve, substantially as set forth.

4. In a hydraulic brick-press, the combination of the upper and lower rams and their respective cylinders, a connecting-pipe 12, a controlling-valve 16, a water-engine, for operating the valve 16, and an adjustable abutment 82, substantially as set forth.

5. In a hydraulic brick-press, the combination of the upper and lower rams, and their respective cylinders, a connecting-pipe 12, relief-valve 14, controlling-valve 16, said valves arranged independent of each other, a water-engine, operated positively in both directions by water-pressure, and attached to said valves, so as to form a loaded connection therefor, substantially as set forth.

6. In a hydraulic brick-press, the combination of the upper and lower rams, and their respective cylinders, a connecting-pipe 12, relief-valve 14, controlling-valve 16, said valves arranged independent of each other, a water-engine, operated positively in both directions, by water-pressure, and attached to said valves, so as to form a loaded connection therefor, one chamber of such engine being in constant communication with the source of water-pressure, substantially as set forth.

7. In a hydraulic brick-press, the combination of the upper and lower rams, their respective cylinders and passages 11 and 17, of

the inlet-outlet valve 18, the opening of which is effected by the movement of the lower ram, and the closing of which is permitted by the upper ram, substantially as set forth.

8. In a hydraulic brick-press, the combination with the upper ram and ram-cylinder, and passages 11 and 17, of the valve 18, having a disconnected head, and adapted to act as an inlet-outlet and suction check valve, substantially as set forth.

9. In a hydraulic brick-press, the combination of the upper ram 6, auxiliary raising-cylinder 30, having an inwardly-opening check-valve 36, connected with its top chamber 34, and tie-rods 29 connecting the cylinder and ram together, substantially as set forth.

10. In a hydraulic brick-press, the combination of the auxiliary raising-cylinder 30, rock-shaft 41, arm 43, connected to and receiving motion from cylinder 30, arm 44, and adjustable rod 144, having a compressible abutment 148, adapted to operate the lever 140, of the inlet-valve 27, of the lower-ram cylinder, substantially as set forth.

11. In a hydraulic brick-press, the combination of the reciprocating clay-charger 96, imparting intermittent motion to the rock-shaft 56, of the arm 58 on the rock-shaft, and the compressible abutment 122, substantially as described.

12. In a hydraulic press, the combination with the arm 57, and rock-shaft 56, of the reciprocating clay-charger 96, having a tappet 120, and an adjustable device, to admit of an adjustable independent motion between the charger and the arm 57 in both directions, substantially as set forth.

13. In a hydraulic brick-press, the combination of the reciprocating clay-charger 96, arm 57, rock-shaft 56, and means of adjustment on both the charger and the rock-arm, capable of adjustment with relation to each other, substantially as set forth.

14. In a hydraulic brick-press, the combination of the reciprocating clay-charger 96, arm 57, rock-shaft 56, cam 60, valve 28, and means of adjustment on both the charger and the rock-arm, capable of adjustment with relation to each other, substantially as set forth.

15. In a hydraulic brick-press, the combination of the reciprocating clay-charger 96, arm 57, rock-shaft 56, cam 61, valve-lever 140, inlet-valve 27, and means of adjustment on both the charger and the rock-arm, capable of adjustment with relation to each other, substantially as set forth.

16. In a hydraulic brick-press, the combination of the reciprocating clay-charger 96, arm 57, rock-shaft 56, tappet 59, latch or hook 135, of the valve mechanism of the auxiliary raising-cylinder 30, and means of adjusting on both the charger and the rock-arm, capable of adjustment with relation to each other substantially as set forth.

17. In a hydraulic brick-press, the combination of the reciprocating clay-charger 96, and its operating piston and cylinder, the cylinder having chambers of different areas, the smaller one of which is in constant communication with a source of pressure substantially as set forth.

18. In a hydraulic brick-press, the combination of the reciprocating clay-charger 96, and its operating piston and cylinder, the cylinder having chambers of different areas, the smaller one of which is in constant communication with a source of pressure and the larger one of which is in communication with a valve-chest 101 by which its supply and exhaust are regulated to effect a movement of the charge in either direction, substantially as set forth.

19. In a hydraulic brick-press, the combination with the reciprocating clay-charger and its operating piston and cylinder, of a throttle-valve 119, located in one of the ports of the charger-cylinder, and throttle-valve mechanism operating in unison with movements of the charger, substantially as set forth.

20. In a hydraulic brick-press, the combination with the reciprocating charger and its operating piston and cylinder, of a cam-plate 117 moving with the charger, and a throttle-valve 119 located in one of the ports of the charger-cylinder, substantially as set forth.

21. In a hydraulic brick-press, the combination with the charger-cylinder and its valve mechanism, of the shifting overbalance device 112, spring-latch 113, engaging the arm 109 of the valve mechanism, and a pull-rod 183, connected to the spring-latch, substantially as set forth.

22. In a hydraulic brick-press, the combination with the charger-cylinder and its valve mechanism, of the shifting overbalance device 112, spring-latch 113, of the adjustable block 115 and pull-rod 182, substantially as set forth.

23. In a hydraulic brick-press, the combination of the upper and lower rams, and volume-reducing valve 172, located in the path of high-pressure supply.

24. In a hydraulic brick-press, in which the pressing is primarily effected from one side, secondly from the opposite side, and finally from both sides simultaneously, the combination of the upper and lower rams and their respective cylinders, a connecting pipe or passage 12, and means substantially as herein described for governing the pressure-supply to the upper and lower ram chambers, and permit of an upward movement of the upper ram during said secondary pressing.

25. In a hydraulic brick-press, in which the pressing is primarily effected from one side, secondly from the opposite side, and finally from both sides simultaneously, the combination of the upper and lower rams, and their respective cylinders, a connecting pipe or passage 12, and means such as the valve 172, for governing the pressure-supply to the upper

and lower ram cylinders, such valve acting as a safety-valve, in manner substantially as herein described.

26. In a hydraulic brick-press, in which the pressing is primarily effected from one side, secondly from the opposite side, and finally from both sides, simultaneously, the combination of the upper and lower rams, and their respective cylinders, a connecting pipe or passage 12, and means such as the valve 172, for governing the pressure-supply to the upper and lower ram cylinders, such valve acting as a pressure-reducing valve, in manner substantially as herein described.

27. In a hydraulic brick-press, in which the pressing is primarily effected from one side, secondly from the opposite side, and finally from both sides, simultaneously, the combination of the upper and lower rams, and their respective cylinders, a connecting pipe or passage 12, and means such as the valve 172, for governing the pressure-supply to the upper and lower ram cylinders, such valve acting as a combined safety and pressure-reducing valve, in manner substantially as herein described.

28. In a hydraulic brick-press, the combination of the lower ram and ram-cylinder of the pressure-reducing valve 172, a spring-cushion 174, the resiliency of which is governed by the movement of the press, substantially as set forth.

29. In a hydraulic brick-press, the combination of the lower ram and ram-cylinder of the pressure-reducing valve 172, a spring-cushion 174, and the drop-weight 129, connected to said cushion, and governing the resiliency of the same, substantially as set forth.

30. In a hydraulic brick-press, the combination of the upper ram 6, carrying a slide-bar 162, sliding latch-block 165, sliding on said bar, and having connection to the drop-weight 129, substantially as set forth.

31. In a hydraulic brick-press, the combination of the upper ram 6, carrying a slide-bar 162, sliding latch-block 165, sliding on said bar, and having connection to the drop-weight 129, and a releasing device 178 operated by the lower ram, substantially as set forth.

32. In a hydraulic brick-press, the combination of a pressure-dividing valve 26, located between the source of high and low pressure, and a lever having an adjustable weight, to effect a differential, cut-off of the low-pressure supply, substantially as set forth.

33. In a hydraulic brick-press, the combination of the rock-shafts 46 and 52, link 50, carrying arm 155, and weighted lever 153 adapted to raise the pressure-dividing valve 26, substantially as set forth.

34. In a hydraulic brick-press, the combination of the pressure-dividing valve 26, weighted lever 153, locking projection 152, sliding bar 151, and the angular extension 150, of the valve-lever 140, substantially as set forth.

35. In a hydraulic brick-press, the combination of the outlet-valve 28 of the lower-ram chamber and its weighted lever 156, with the spring-hook 157 and holding-lug 158, on a fixed part of the press, substantially as set forth.

36. In a hydraulic brick-press, the combination of the outlet-valve 28 of the lower-ram chamber and its weighted lever 156, with the spring-hook 157, holding-lug 158, and a releasing device 159 moving with the upper ram, substantially as set forth.

37. In a hydraulic brick-press, the combination with the inlet-outlet valve 18, of the upper-ram chamber, of the valve-rod 63, roller 66, cam-faced lever 67, connection 68, and tappet 69, on lower ram, substantially as set forth.

38. In a hydraulic brick-press, the combination with the inlet-outlet valve 18, of the upper-ram chamber, of the valve-rod 63, roller 66, cam-faced lever 67, connection 68 having an adjustable toe 70, and tappet 69 on the lower ram, substantially as set forth.

39. In a hydraulic brick-press, the combination with the inlet-outlet valve 18, of the upper-ram chamber, of the valve-rod 63, pin 72, and latch-block 71, substantially as set forth.

40. In a hydraulic brick-press, the combination with the inlet-outlet valve 18, of the upper-ram chamber, of the valve-rod 63, pin 72, latch-block 71, and releasing device 73, carried by upper ram, substantially as set forth.

In testimony whereof witness my hand this 18th day of June, 1892.

JULIUS J. KOCH.

In presence of—
ROBERT BURNS,
GEO. H. ARTHUR.