No. 662,674. Patented Nov. 27, 1900.

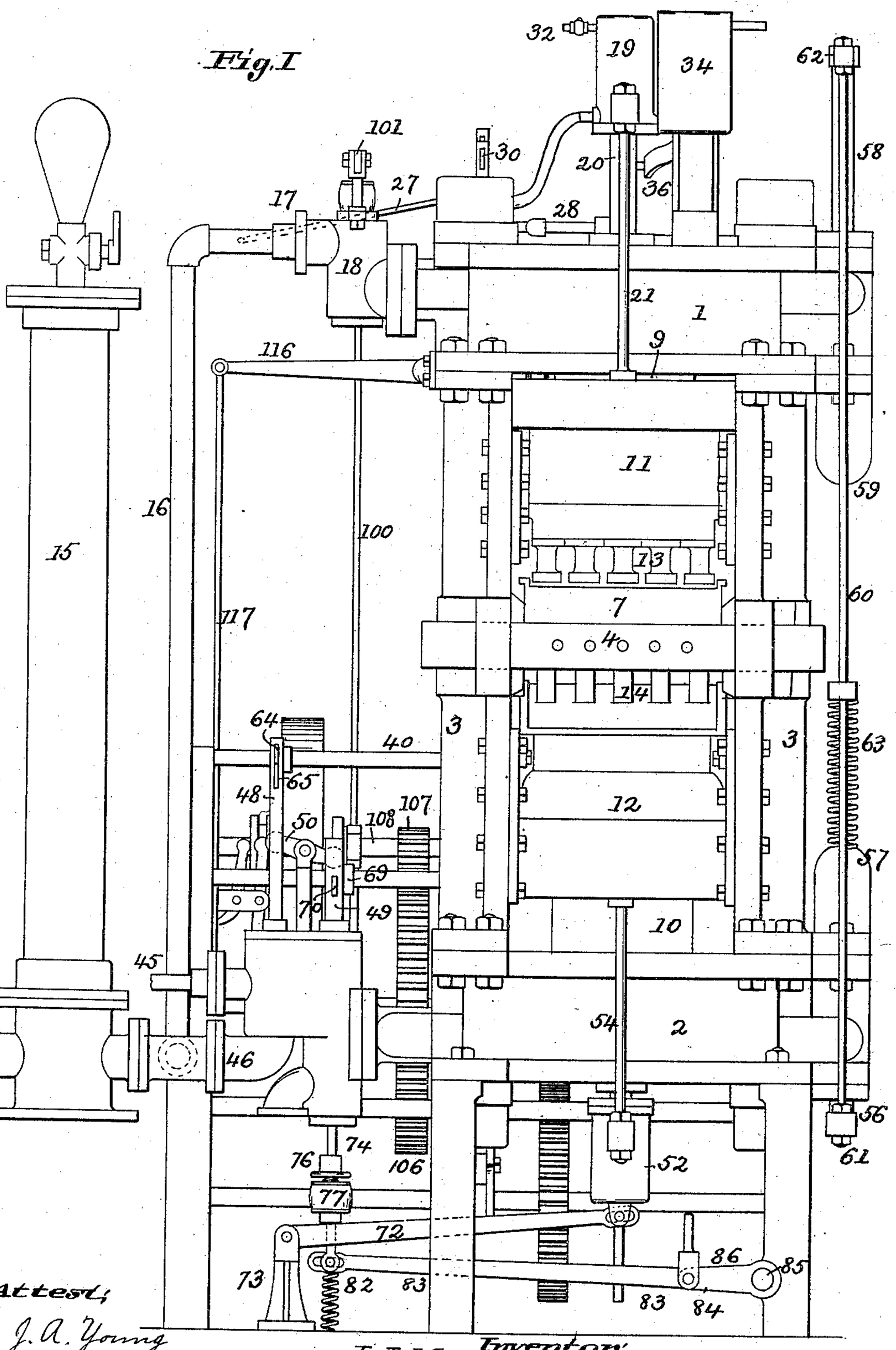
J. J. KOCH.

HYDRAULIC BRICK PRESS.

(Application filed Apr. 6, 1891.)

(No Model.) 8 Sheets—Sheet 1.

Fig. 1.



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M. H. Holmes.

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

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Fig. 2.

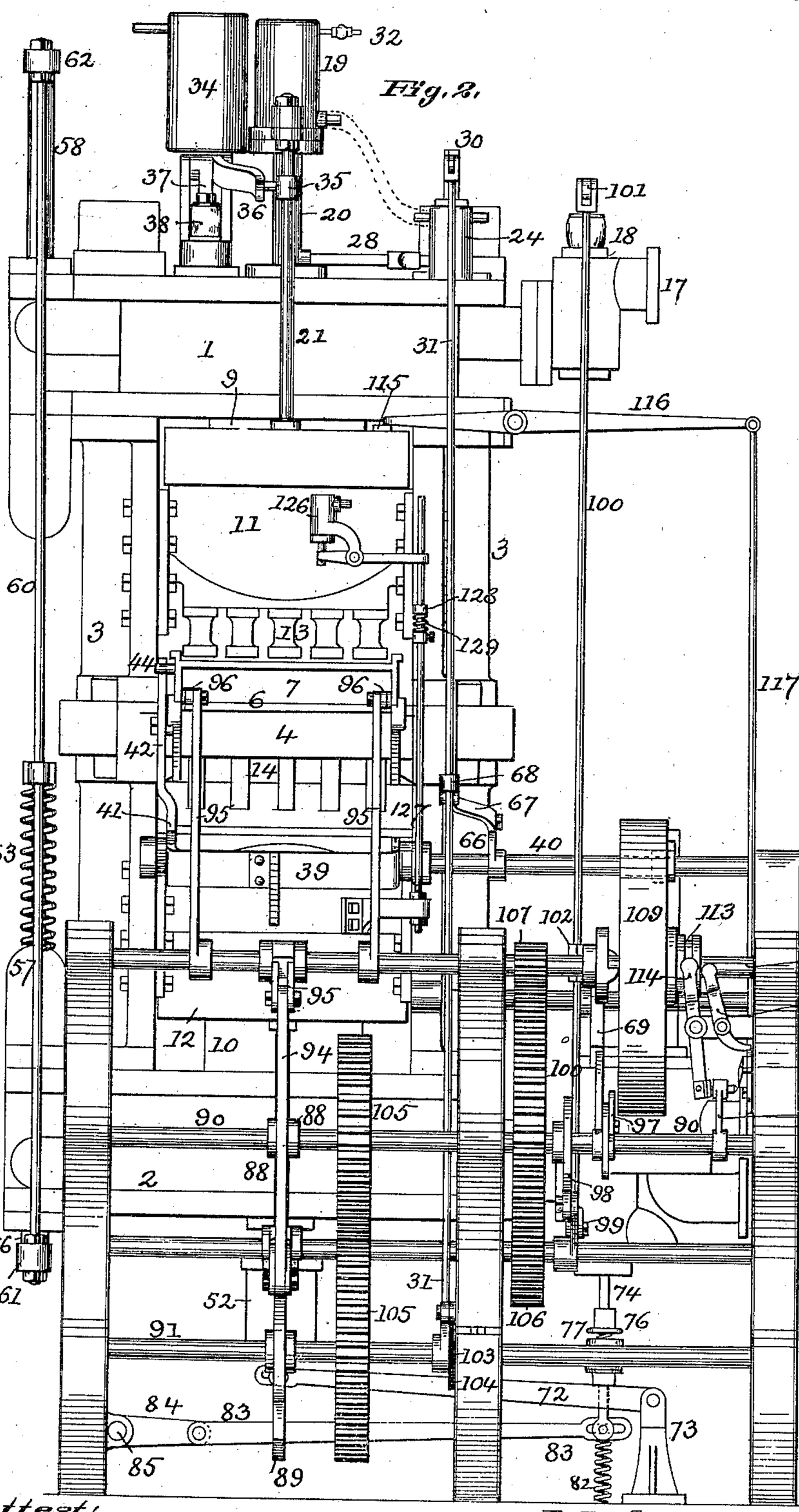

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Fig. 3.

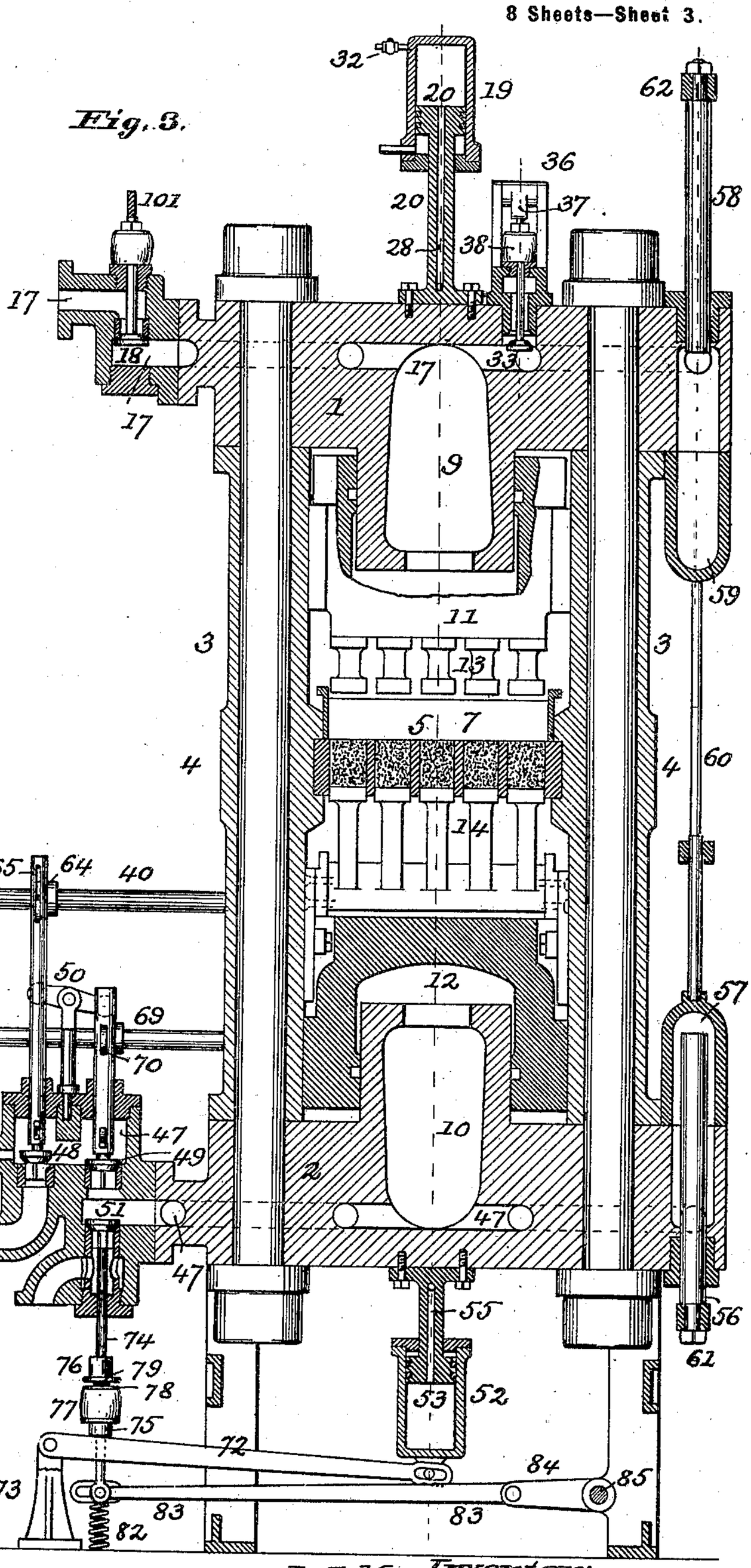

Fig. 4.

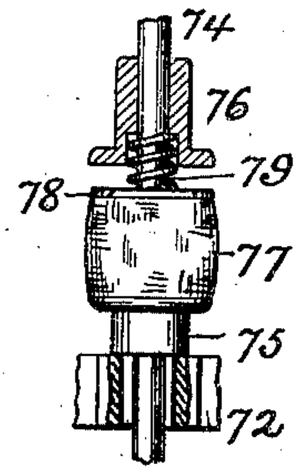

Fig. 5.

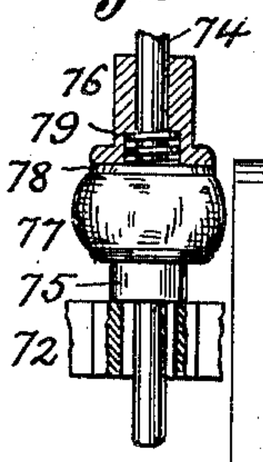

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Fig. 6.

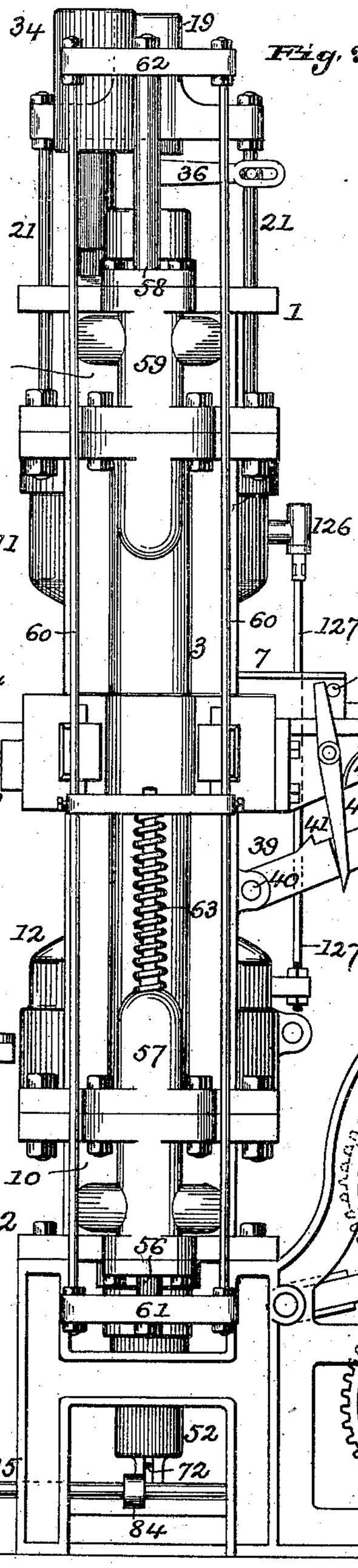

Fig. 7.

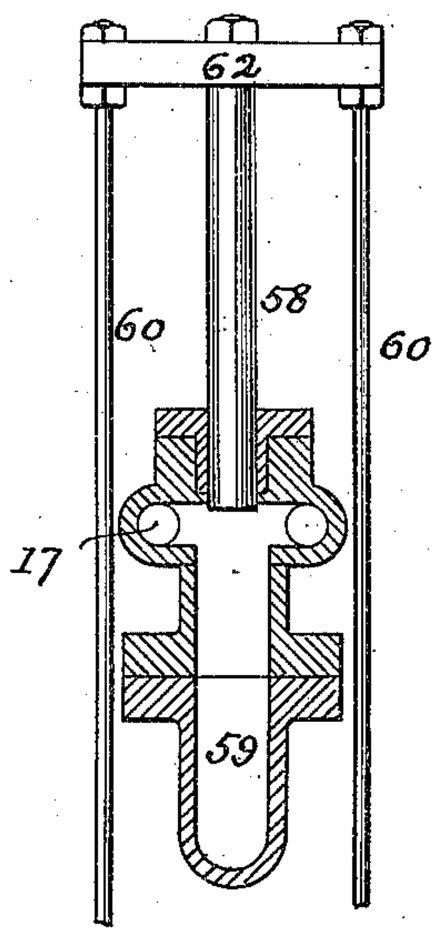

Fig. 8.

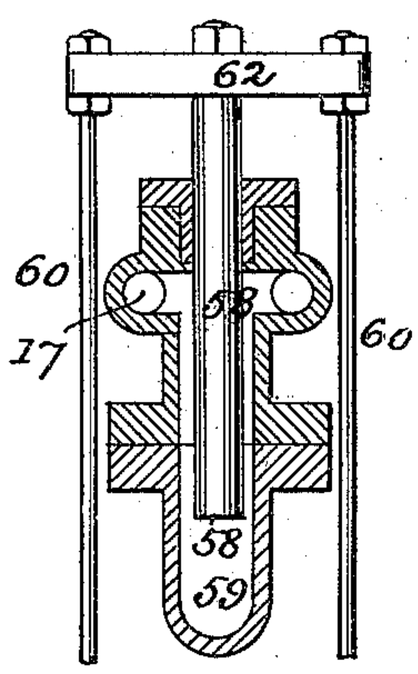

Fig. 9.

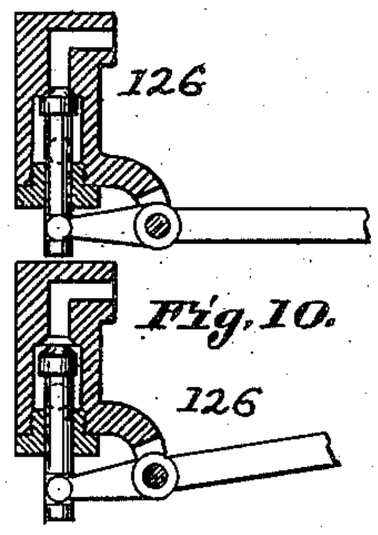

Fig. 10.

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Fig. 12.

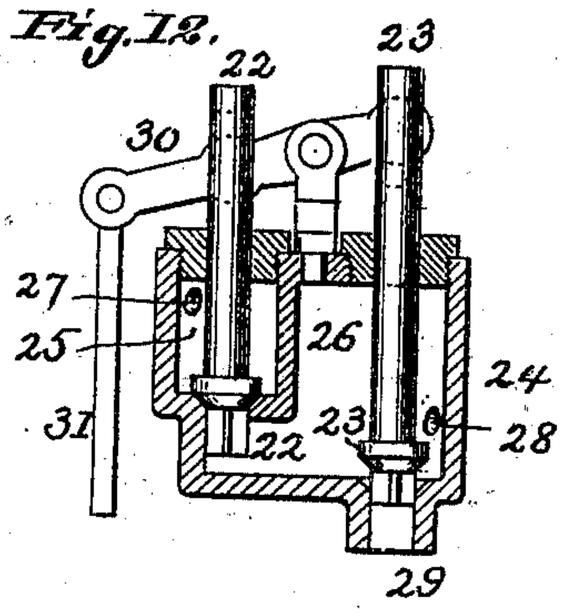

Fig. 13

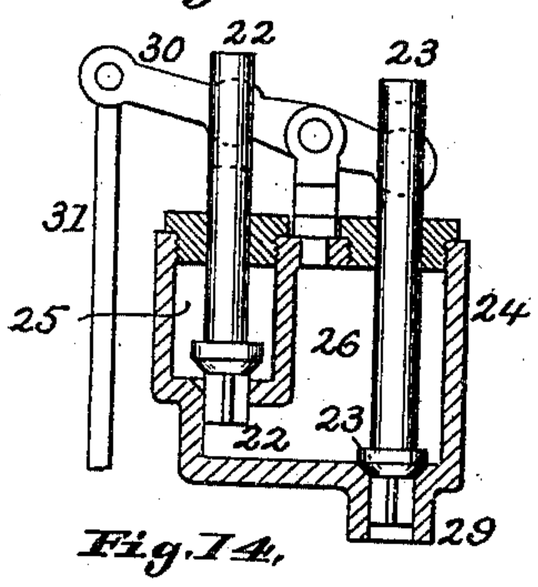

Fig. 14.

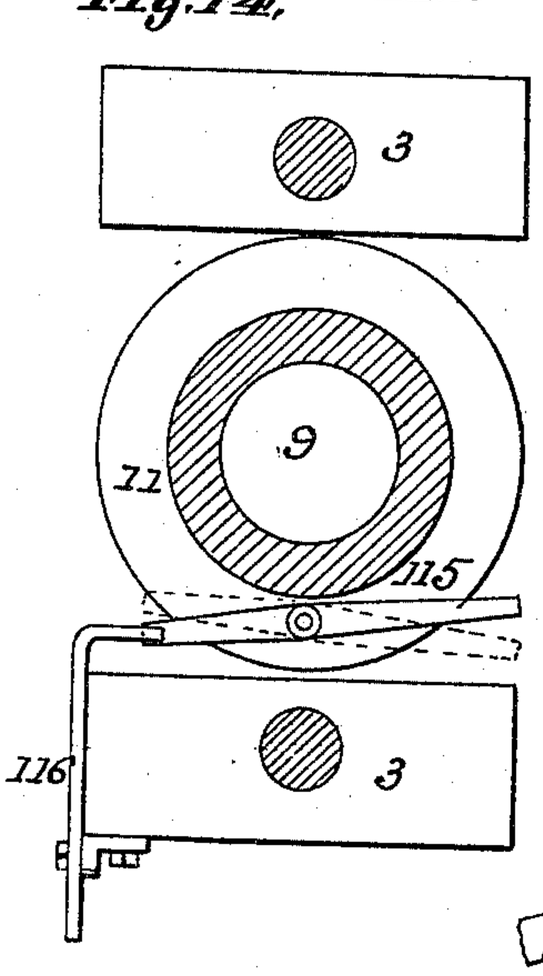

Fig. 11

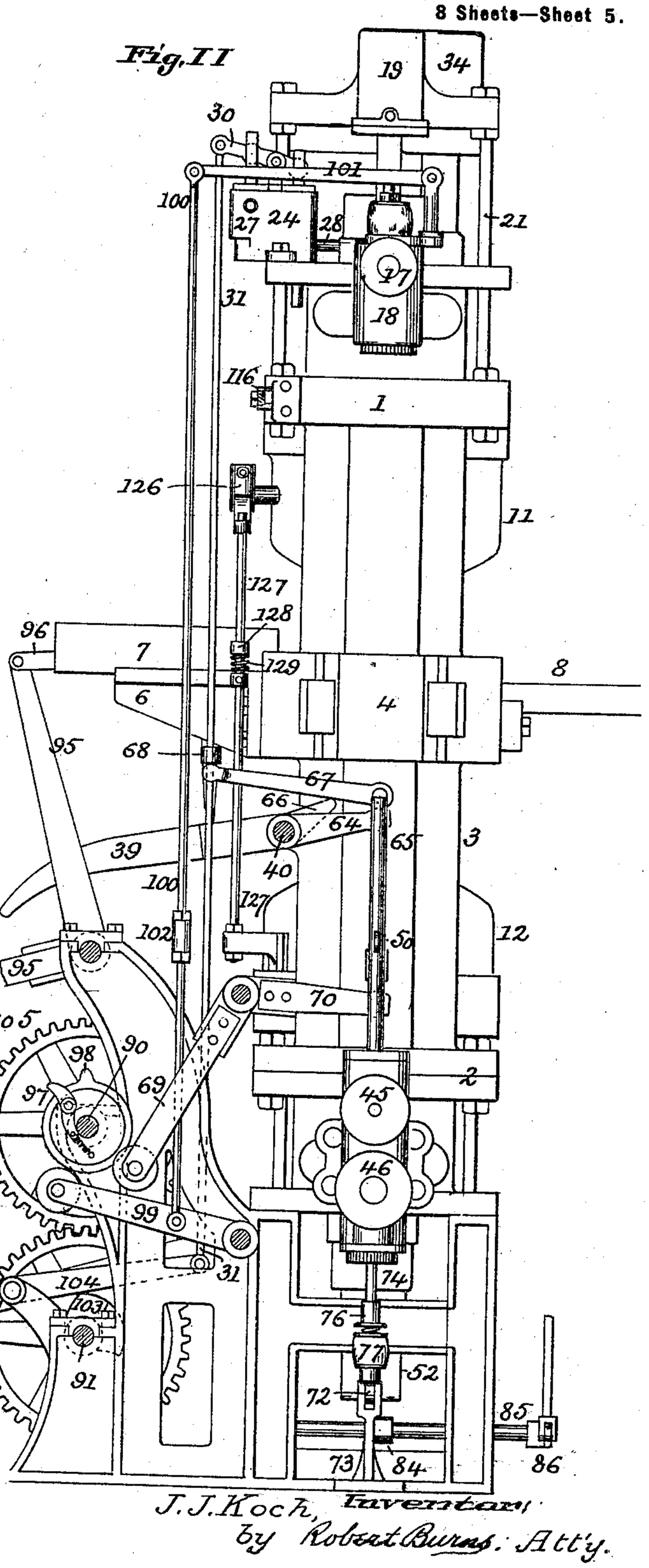

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Fig. 16.

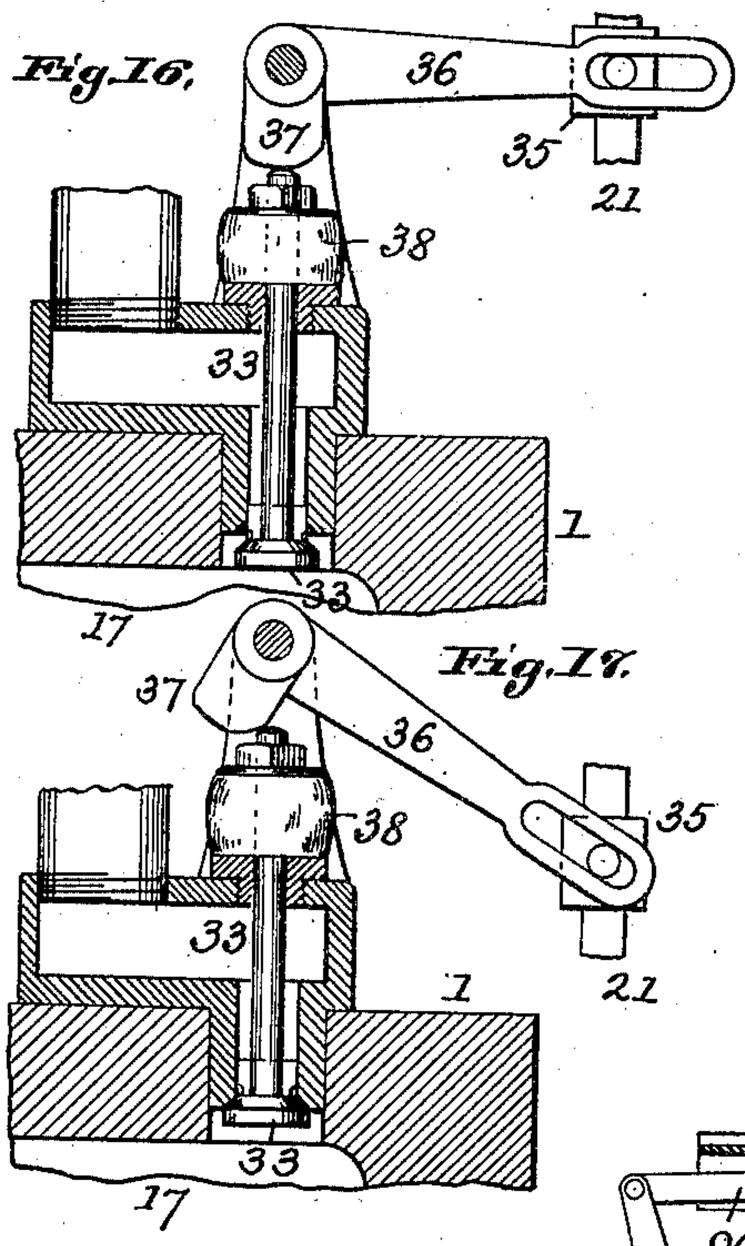

Fig. 17.

Fig. 15.

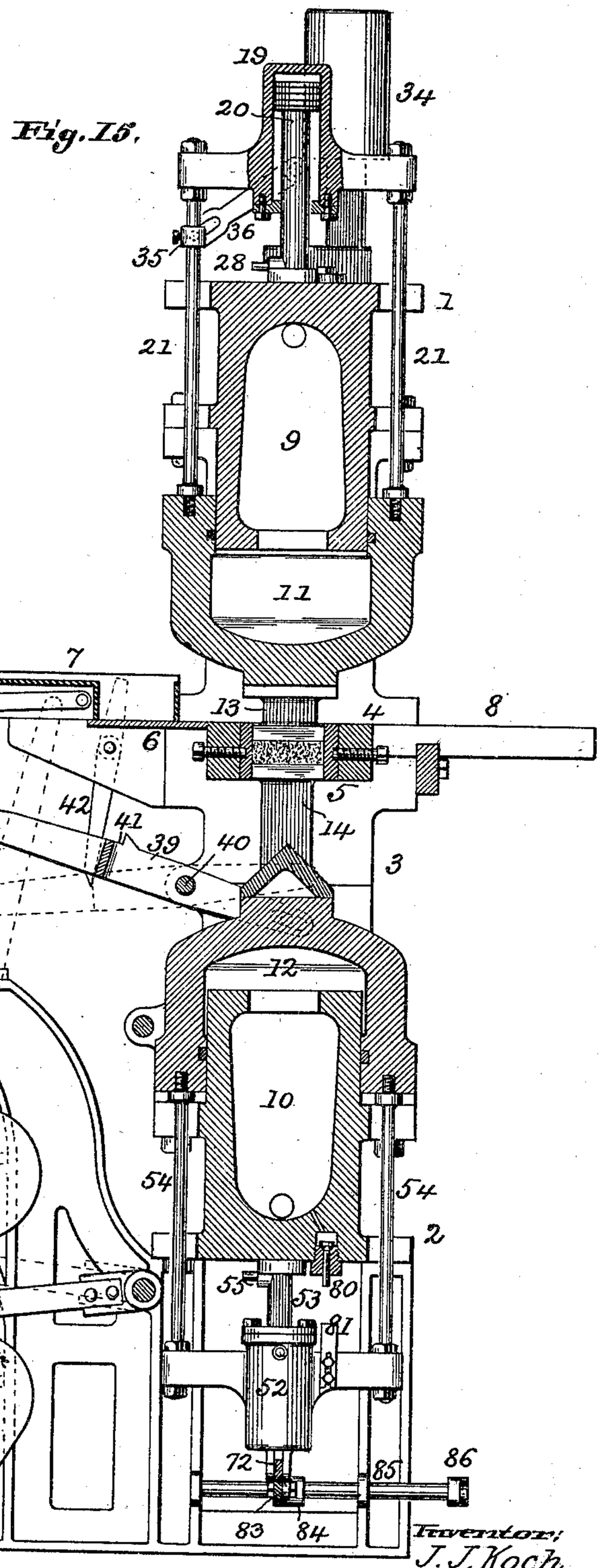

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Fig. 18.

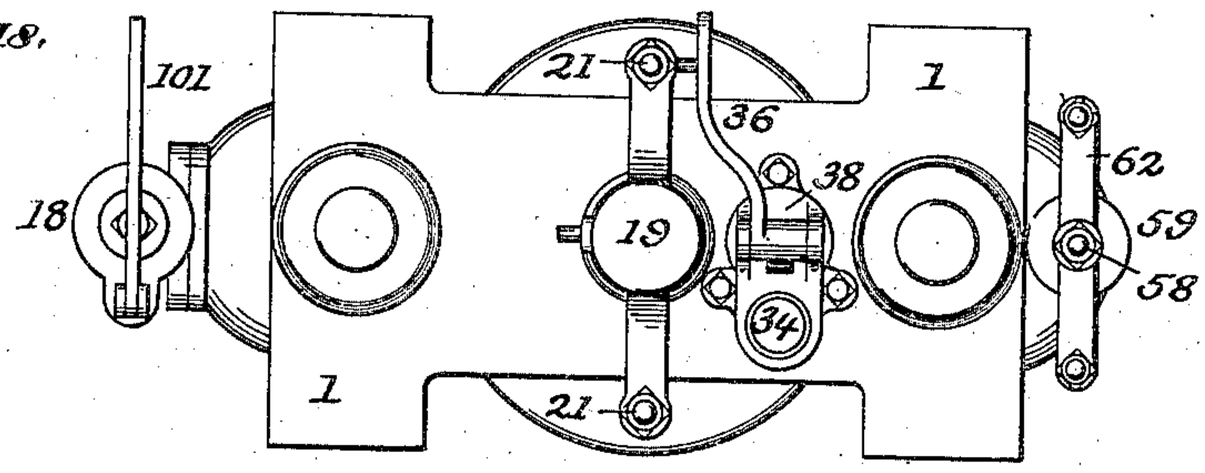

Fig. 19.

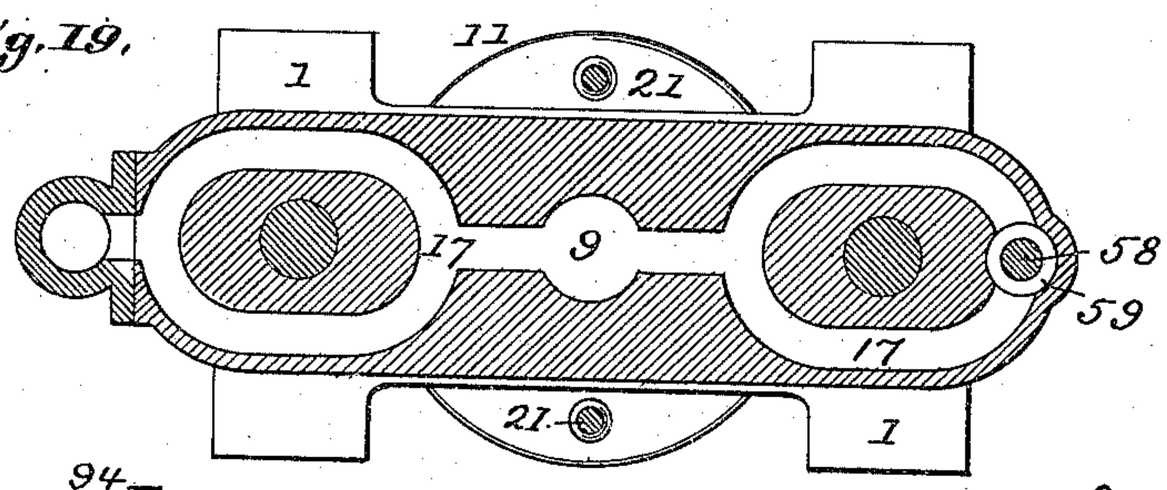

Fig. 20.

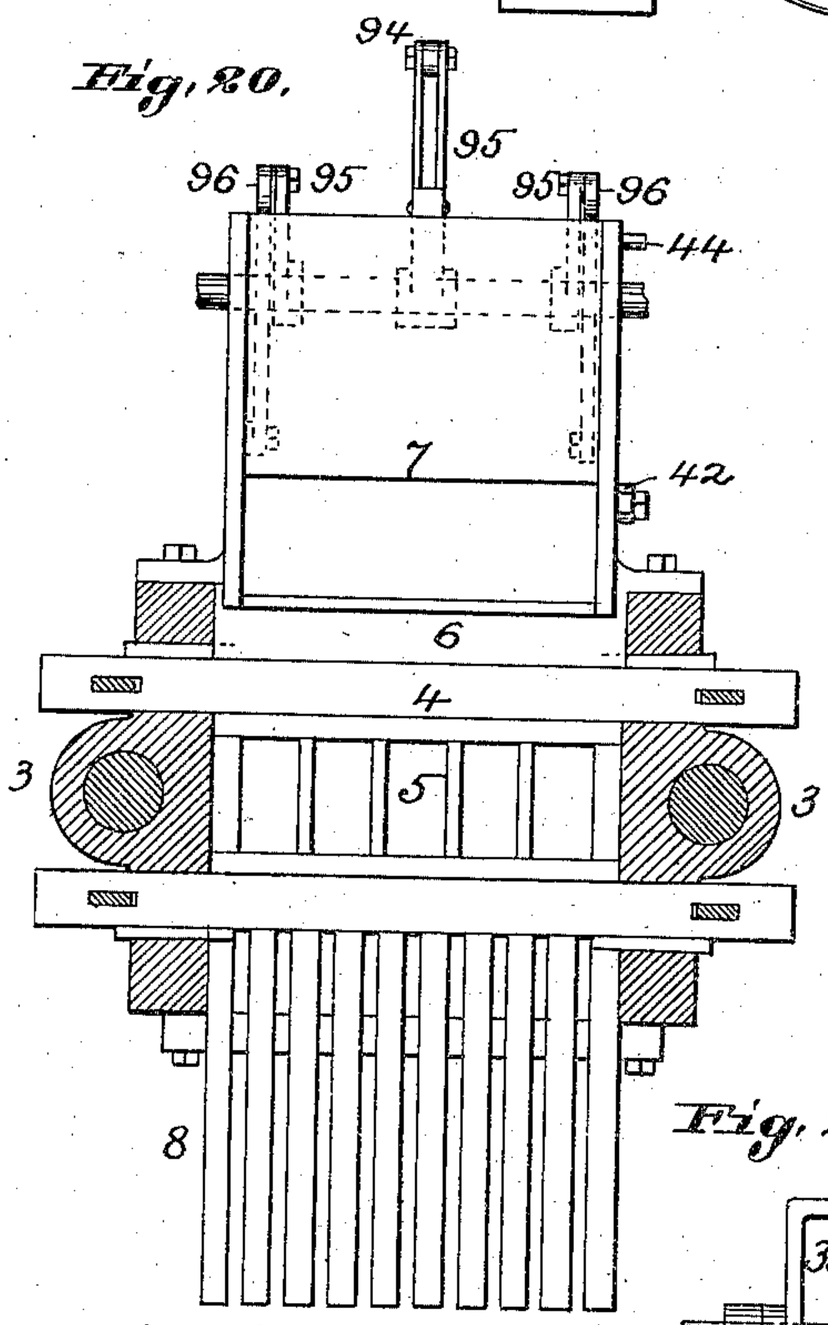

Fig. 21.

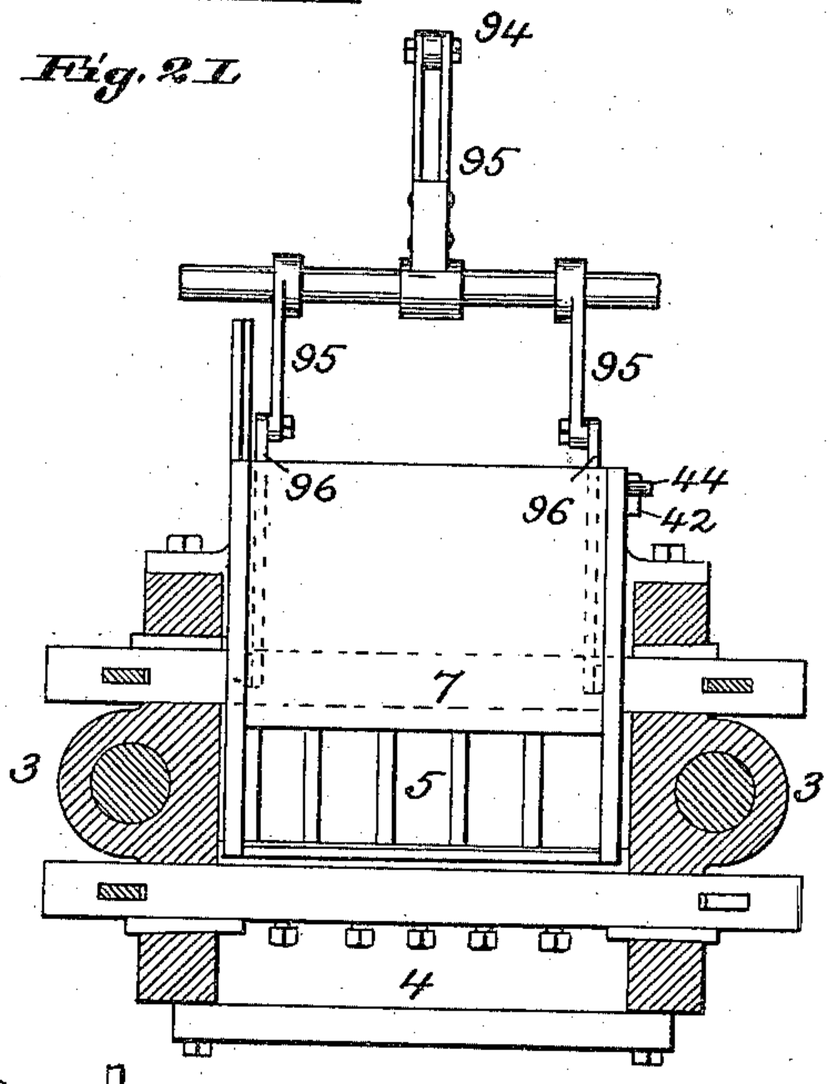

Fig. 22.

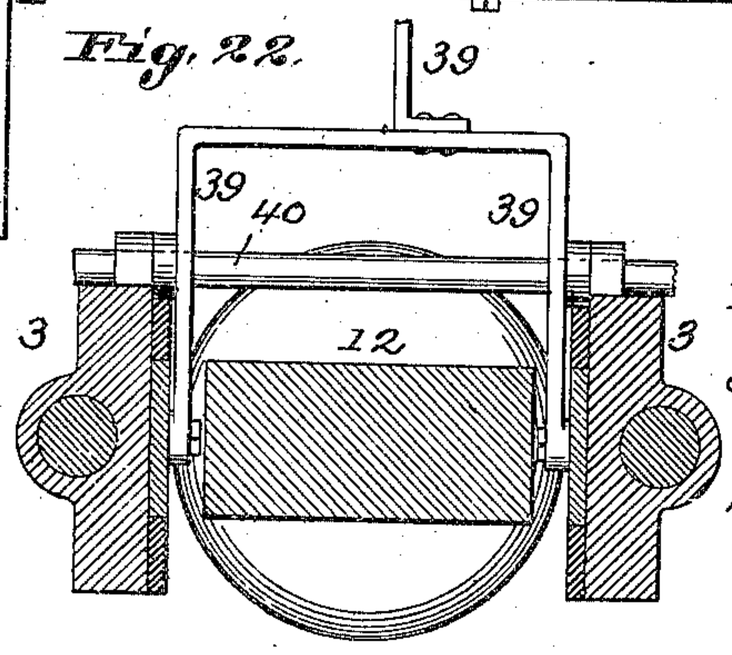

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Fig. 23.

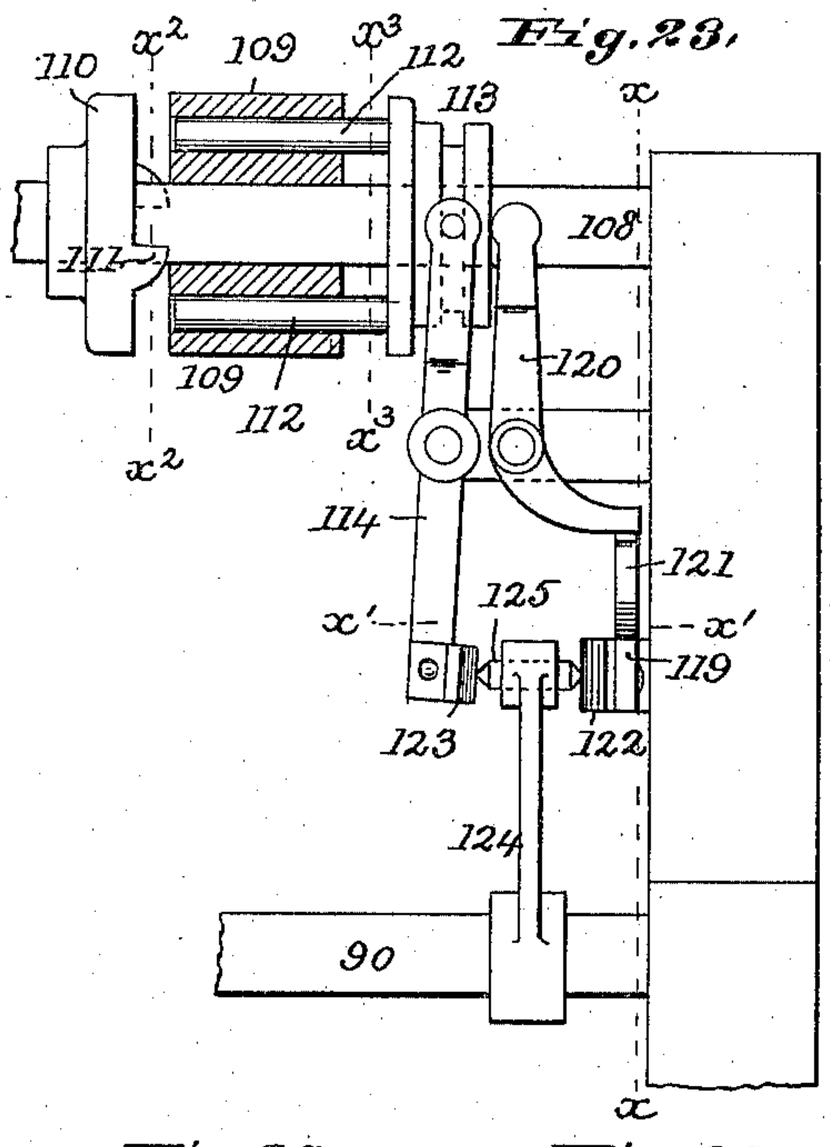


Fig. 24.

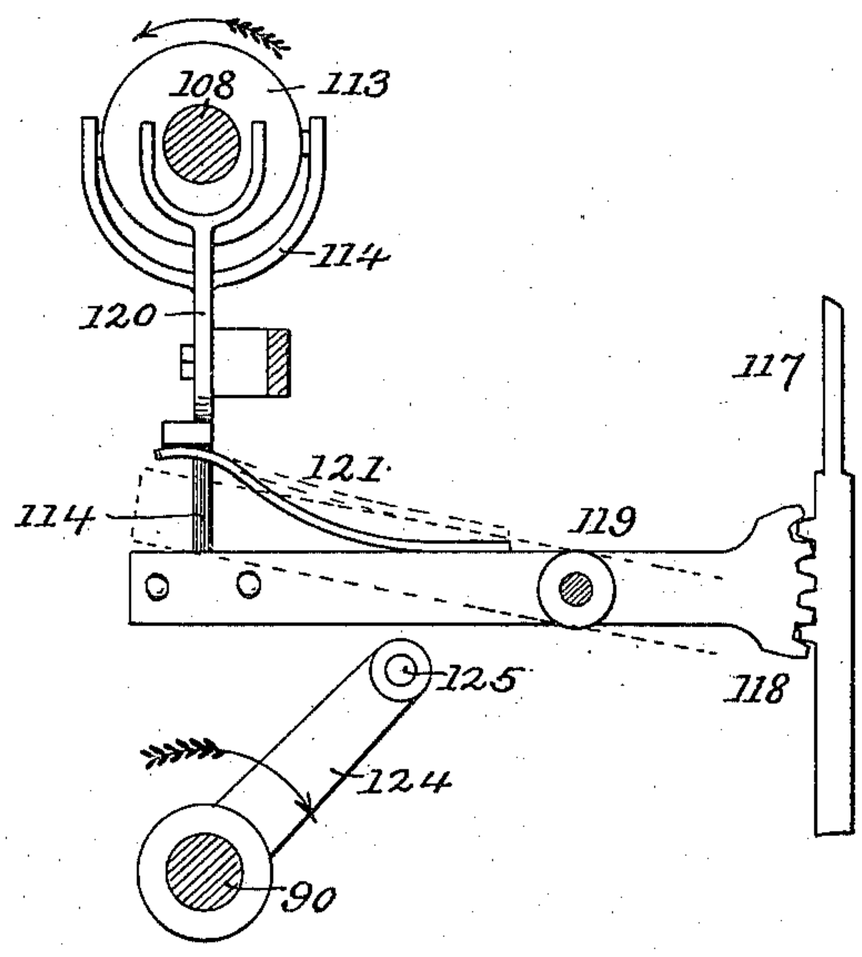


Fig. 25.

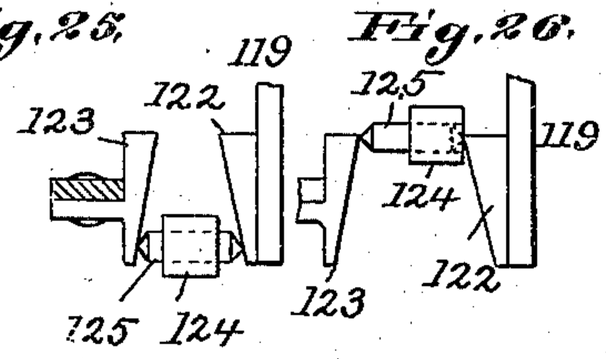


Fig. 26.

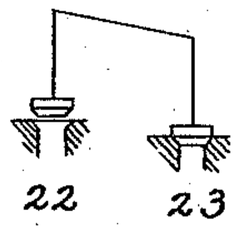


Fig. 29.

Fig. 27.

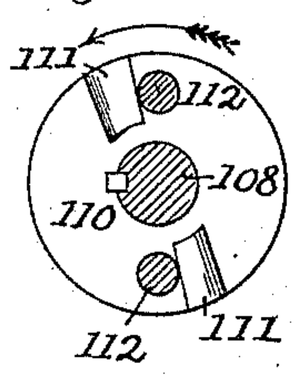
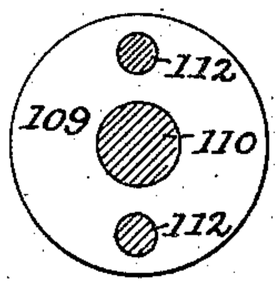


Fig. 28.



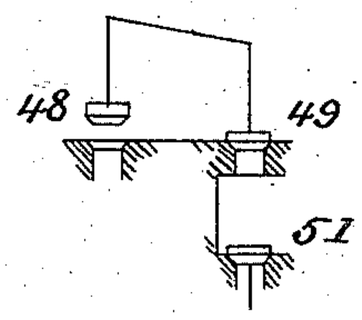
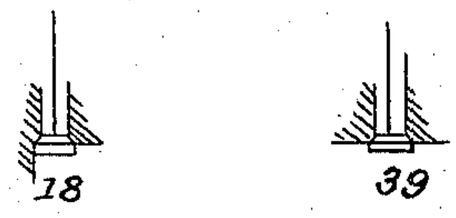
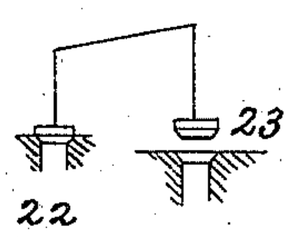


Fig. 30.





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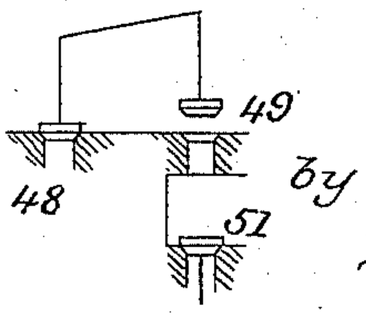

Inventor:

J. J. Koch,

by Robert Burns

Atty.

UNITED STATES PATENT OFFICE.

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

HYDRAULIC BRICK-PRESS.

SPECIFICATION forming part of Letters Patent No. 662,674, dated November 27, 1900.

Application filed April 6, 1891. Serial No. 387,869. (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 invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements on the subject-matter of Letters Patent No. 397,730, issued to me February 12, 1889, the various objects of the present improvements being in the main as follows: first, to provide an improved automatically and successively acting hydraulic mechanism for the upper ram of the press, embodying an auxiliary valve acting automatically to control the low-pressure supply to the same, an exhaust-valve also acting automatically to control the escape and return of the water to the ram, a relief-valve for venting or relieving the upper ram-cylinder when the same reaches a predetermined distance from the lower ram-cylinder, and an auxiliary cylinder for raising said ram and which is adapted to afford pressure to assist in the descent of the upper ram and insure its rapid movement; second, to provide a similar hydraulic mechanism for the lower ram of the press, embodying the different provisions of a dividing-valve acting automatically to divide the high and low pressure supplies, an inlet-valve operating in unison therewith to control the direction of such pressures, an exhaust-valve and automatically-operating mechanism for controlling and regulating the same, and a relief-valve for the initial relief of the lower ram before the regular exhaust-valve opens to fully relieve the lower ram; third, to provide an improved arrangement of the hydraulic equalizing-plungers between the upper and lower rams and their connections whereby the movements of the same are effected by tension between the connections; fourth, to provide, in connection with the raising-cylinder of the upper press-ram, a suction-valve to admit air to the upper end of the cylinder and prevent a vacuum in the initial upward movement of said cylinder; fifth, to provide an automatic means for holding the lower mold-plunger in a raised position even with the top of the mold during the action of the charger in pushing the made brick off onto the receiving-table and admit in the meanwhile the descent of the lower ram, by which the lower mold-plunger had been previously raised, and by this operation effect a material gain in the speed of the press; sixth, to provide a simple and efficient means for imparting an initial positive downward movement to the lower mold-plunger in case the same should become stuck in its elevated position in the molds; seventh, to provide means for automatically stopping the mechanically-operating parts of the press when from any contingency the upper hydraulic ram-cylinder thereof fails to complete its full movement, and which mechanism is adapted to be operated by hand, so as to throw the press parts out of gear when required, and, lastly, to provide minor mechanical arrangements and connections of the press parts, whereby the different movements of the press are accomplished in an automatic manner, the one following the other in successive order and the completion of one setting the one next succeeding in action. 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 with the parts in the following position: upper ram raised, lower ram ready to drop, lower mold locked in a raised position by detent, and outlet-valve of lower ram just opened; Fig. 2, a rear elevation of the same with the parts in a similar position to Fig. 1; Fig. 3, a transverse axial section through hydraulic rams with the parts in the following position: upper ram raised, lower ram down, charger forward over mold, and lower mold-plunger down, its holding-detent having been just tripped by the charger in its forward movement; Figs. 4 and 5, enlarged detail sectional elevations showing the construction of the outlet-valve stem of lower ram; Fig. 6, a right-hand side elevation of the press with the parts in the same position as Fig. 3; Figs. 7 and 8, detail sections illustrating different positions of the upper pressure-equalizing plungers; Figs. 9 and 10, similar views of the relief-valve for upper ram-cylinder; Fig. 11,

a left-hand side elevation of the press with the parts in the same position as in Fig. 1; Figs. 12 and 13, enlarged detail sections illustrating two positions of the valve mechanism of raising-cylinder of upper ram; Fig. 14, a horizontal section through the upper ram-plunger, illustrating the arrangement on the upper ram-cylinder of the movable operating-piece of the clutch mechanism; Fig. 15, a longitudinal section through the hydraulic rams, with high pressure on top and bottom rams; Figs. 16 and 17, enlarged detail sectional elevations of the auxiliary valve in the port of the upper ram-cylinder; Fig. 18, a top plan; Fig. 19, a horizontal section through the port of the upper ram; Figs. 20 and 21, horizontal sections above the clay-charger, illustrating its two positions; Fig. 22, a horizontal section through the top extension of the lower ram-cylinder, illustrating the connection of the lower mold-plunger to its detent-lever; Fig. 23, a detail sectional elevation of the clutch mechanism for driving the mechanically-operated parts of the press; Fig. 24, a similar view at line $x\,x$, Fig. 23; Figs. 25 and 26, similar horizontal sections at line $x'\,x'$, Fig. 23, showing the two positions of the clutch-disengaging lever; Figs. 27 and 28, detail sections at lines $x^2\,x^2$ and $x^3\,x^3$, respectively, Fig. 23, of the clutch; Figs. 29 and 30, diagram views of the valves for the upper and lower hydraulic rams, showing their different relative positions.

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

As represented in the drawings, the general arrangement and construction of the press parts and the consecutive movements of such parts in converting a charge of loose clay into bricks, described in my former patent, No. 397,730, is preserved.

As shown, the main stationary frame of the press consists of the upper and lower fixed members 1 and 2, connected together by a pair of vertical posts 3, that midway of their height support the main stationary table 4, in which are the brick-molds 5 and which constitutes at the rear a table extension 6, upon which the clay-charger 7 has the usual intermittent reciprocating movement, and at front a receiving-table 8 for the pressed bricks.

The upper and lower fixed frame members 1 and 2 carry or form an integral part of the fixed hydraulic plungers 9 and 10 of the upper and lower movable hydraulic rams or cylinders 11 and 12, that carry on their adjacent ends the respective upper and lower mold-plungers 13 and 14, by which a charge of clay in the molds is compressed into bricks.

The upper ram is in communication with the low-pressure hydraulic accumulator 15 through pipe 16 and circuitous port 17, (see Figs. 1 and 3,) so as to receive a pressure therefrom, the return of the water being prevented by the auxiliary valve 18 in said port, and the lifting or raising up of the ram-cylinder 11, carrying the upper mold-plunger 13, is effected by an auxiliary hydraulic cylinder 19 and piston 20, such piston being attached to the upper fixed member 1 of the press-frame, with the cylinder adapted to move vertically thereon and connected by tie or suspension rods 21, (see Figs. 11 and 15,) with the upper ram-cylinder 11, as shown in the drawings, so that the two will move in unison together. The hydraulic pressure by which said auxiliary raising-cylinder is actuated is received from the low-pressure accumulator 15, the passage of such hydraulic pressure to and from said cylinder being controlled and regulated by a pair of valves 22 23, (see Figs. 2, 11, 12, and 13,) arranged within a suitable valve-casing 24, having valve-chambers 25 and 26, connected as follows: the inlet-chamber 25 by pipe or passage 27 with the low-pressure accumulator 15 and the outlet-chamber by pipe or passage 28 with the upper end of the auxiliary raising-cylinder 19 through the hollow piston and piston-rod of the same, as shown in Figs. 1, 2, and 3, and by an outlet-passage 29, Fig. 12, with a suitable waste-tank. The valves 22 and 23 are connected together in order that the one will complete its opening or closing movement before the other commences its movement and so that both valves may be in a closed condition at one and the same time, but only one valve open at the one time, by the following improved connection: 30 is a lever having its fulcrum midway between the valve-rods and passing through vertically-elongated slots in the same, of a height sufficient to admit of a limited independent movement of the lever 30, as illustrated in Figs. 12 and 13, in its independent operation or movement of the valves 22 and 23, as above stated. The lever 30 receives positive automatic movement at the proper time through a rod 31, extending from the automatic valve-operating mechanism hereinafter described and connected to an extension-arm of the lever 30, as clearly illustrated in Figs. 12 and 13.

The comparatively smaller annular space below the piston-head of the auxiliary raising-cylinder 19 (see Fig. 2) is in communication with the low-pressure accumulator to constitute a hydraulic spring or cushion and afford a positive means for forcing down the upper ram and insuring its rapid descent to insure a closing of the valve between said ram and its reservoir. With such provision the usual low pressure in the upper ram-cylinder may be dispensed with, if so desired.

32 (see Figs. 1, 2, and 3) is a suction-valve communicating with the top of the auxiliary raising-cylinder 19 and adapted to admit air into the same to fill the vacuum that may be formed by the independent raising of the upper ram-cylinder by the lower ram-cylinder in its movement of forcing the bricks up out of the mold.

In the upward movement of the upper-ram cylinder 11 the water displaced therefrom flows through a valve 33 into a receiving-tank

34, said valve being operated in a positive manner by mechanism as follows: 35 (see Figs. 1, 2, 3, 6, 15, 16, 17, and 18) is a collar or tappet adjustably secured to one of the suspension-rods 21 of the upper ram-cylinder or any other suitable part thereof and having a pin or stud engaging in the slotted end of the long arm of a bell-crank lever 36, pivoted in a standard on the upper fixed member 1, its shorter arm 37 being of a cam form and adapted to engage against and force down the stem of the valve 33 and cause the same to open against the tendency of the spring 38 or its equivalent to hold the valve in a closed condition, as illustrated in Figs. 2, 3, 6, 15, 16, 17, and 18.

The lower ram-cylinder 12 (see Figs. 3 and 15) is separate from the lower mold-plungers 14, which latter in the present invention are adapted to remain in their elevated position even with the top of the mold, leaving the ram-cylinder 12 free to descend in or during the time that the charger is moving forward to push the finished brick off onto the brick-receiving table 8 at the front of the press, and thus add materially to the speed of the press.

The lower mold-plungers 14 are locked in their elevated position by the pivoted lever 39 on a rock-shaft 40, (see Figs. 6, 11, and 15,) one end of the lever being connected to the side frame of said plungers, while the other end is provided with a notch or shoulder 41, that is engaged by a pendent detent-lever 42, pivoted on the stationary frame of the machine and held to its normal or engaging position by a spring 43 (see Fig. 6) and which is adapted to be disengaged to allow the mold-plungers 14 to drop by a stud or projection 44 on the side of the clay-charger 7 which in the forward movement of said charger comes in contact with and moves the upper end of the aforesaid detent-lever 42 to disengage the same from the pivoted lever 39 of the lower mold-plungers, as represented in Figs. 6 and 15.

The lower ram is in communication with both the low-pressure accumulator 15 and the high-pressure pump through low and high pressure pipes 45 and 46 and the circuitous port or passage 47, (see Figs. 1 and 3,) which is provided with the following series of valves: An outer valve 48, secured loosely to its stem, so as to be capable of a limited independent movement with relation to such stem in order to act as a check-valve and which when closed divides the high and low pressure supply to the lower ram-cylinder and cutting off the low-pressure supply from the accumulator. The construction shown admits of said valve being positively raised into an open position, and when placed in such condition the high-pressure pump can only pump low pressure and that into the low-pressure accumulator. An inlet-valve 49, controlling the pressure-supply to the lower ram-cylinder and connected to and operating in unison with the valve 48 by means of a rock-lever 50, so that when said valve 48 is positively open, as above described, the inlet-valve 49 will be closed. This inlet-valve may be loosely connected to its main stem, so as to be capable of a limited independent movement with relation to the same, and an outlet or exhaust valve 51, the opening and closing of which is effected by the lower ram-cylinder in its movement or by a connection thereof.

The pulling down of the lower ram-cylinder 12 is effected in a positive manner by means of an auxiliary hydraulic cylinder 52 and piston 53, such piston being attached to the lower fixed member 2 of the press-frame, with the cylinder 52 adapted to move vertically thereon and connected by tie or pull rods 54 with the lower ram-cylinder 12, as clearly illustrated in Fig. 15, so that the two will move in unison together. This pulling-down cylinder is in constant communication with the low-pressure accumulator 15 by pipe or passage 55, that extends down through the hollow piston 53 and piston-rod, as shown in Figs. 3 and 15.

Pressure from the lower ram-cylinder 12 is communicated to the upper ram-cylinder 11 in the following manner: 56 (see Figs. 3, 6, 7, and 8) is a vertically-moving hydraulic equalizing-plunger arranged in a hydraulic chamber 57 at the side of the lower ram and communicating with the circuitous port or passage 47 thereof. This equalizing-plunger is connected to a similarly-arranged plunger 58 in a hydraulic chamber 59 at the side of the upper ram and communicating with the circuitous port or passage 17 thereof, such connection consisting in tie-rods 60, extending from the oppositely-projecting cross-heads 61 62 of said plungers and forming a yoke connection between the same, so that in transmitting motion from the one plunger to the other the strain upon the yoke will be that of tension.

63 (see Figs. 2 and 6) is a counterbalance spring or cushion the tendency of which is to force the equalizing plungers upward and counterbalance the dead-weight of such plungers and their connections in a greater or less degree, in accordance with the tension or resiliency imparted to such spring.

With the above described arrangement of equalizing-plungers when pressure is let onto the upper ram through the auxiliary valve 18 (see Figs. 1, 2, and 3) the position of such plungers is changed from the normal one to the position shown in Figs. 3 and 7, producing equal pressure in the lower ram. When high pressure is let onto the lower ram, such equalizing-plungers will move downward, thereby producing an equal compression in the upper ram. If the spring is compressed beyond its normal condition, the tension of the spring will move the plungers upward until there is an equal pressure on both rams, the excess of water in the lower ram being forced back through the inlet-valve 49, (see

Fig. 3,) the same having limited independent motion to admit of such action, as before described.

The rock-shaft 40, (see Figs. 1, 2, 3, 6, 11, 15, and 22,) that receives motion from the lower mold-plunger 14 through the pivoted lever 39, is arranged at the rear of the press, as shown, and carries a rock-arm 64, that moves in a vertically-elongated slot 65 in the upper end of the stem of the outer valve 48, so as at the proper time to raise the said pressure-dividing valve 48 and close the inlet-valve 49 through rock-lever 50, thereby arresting the further upward movement of the lower ram-cylinder and cause the high-pressure pump to discharge into the low-pressure accumulator 15. The said rock-shaft also carries a rock-arm 66, that engages and communicates upward movement to the lever 67, which in turn communicates a movement upward to the vertical operating-rod 31 of the inlet and outlet valves 22 23 of the auxiliary raising-cylinder 19 of the upper ram to cause the same to move upward through the collar 68 on said rod that is engaged by the forked end of said lever. (See Figs. 2 and 11.) The downward movement of the lower mold-plunger 14 imparts a return movement to the rock-shaft 40 and returns the same and its above-described connections back to their normal position.

69 (see Figs. 3 and 11) is a bell-crank lever pivoted at the rear of the press-frame, one arm of which receives an intermittent oscillation from the rotating spring tappet or projection on the upper cam-shaft of the charger-operating mechanism, as hereinafter described, the other arm 70 being engaged in an eye 71 at the top of the stem of the inlet-valve 49 and adapted to open said inlet-valve and close the outer valve 48, so that the same can act as a dividing-valve between the high and low pressure supplies, as heretofore described.

The exhaust or outlet valve 51 of the lower ram is opened by means of the lever 72, one end of which is pivoted to a standard 73 and the other end connected by a pin and elongated slot or other equivalent connection to the lower end of the auxiliary pulling-down cylinder 52, as shown in Figs. 1 and 2. The valve-stem 74 (see Figs. 1, 2, 3, 4, 5, 6, 11, and 15) passes freely down through an aperture in such lever and is provided with a bearing-collar 75, capable of independent movement on the valve stem or rod and adapted to engage against the fixed collar 76 of the valve-rod through the instrumentality of the main cushion-spring 77, having a top bearing-disk 78 and a small supplementary spring 79, arranged between the bearing-disk 78 and the fixed collar 76. The purpose of the supplementary spring 79 is to impart additional upward movement to the valve 51 over that attained by the main spring 77 and move the valve so far up that it will remain open until again closed by the positive closing mechanism hereinafter described.

In the operation of the above valve-opening mechanism the main spring 77 is first compressed by its lever 72 and remains in a compressed condition, due to pressure in the lower ram, until said pressure is relieved in the further movement of the press by a relief-valve 80, actuated by a finger 81. (See Fig. 15.) In the construction shown in Fig. 15 the relief-valve 80 is connected to the stationary lower ram-plunger and the finger 81 carried by the pulling-down cylinder 52. The position of the parts may be modified and yet attain like results by placing the relief-valve on the hydraulic cylinder 12 and the actuating-finger 81 therefor on a stationary part of the press. In a similar manner the auxiliary spring 79, Figs. 4 and 5, may be arranged in any other suitable position, either as shown or assisted by a second auxiliary spring 82, such minor details of construction and arrangement being left to the judgment of the constructor.

The lower end of the outlet-valve stem or rod 74 is connected by a pivot-pin and elongated slot or other equivalent connection to the free end of the lever 83, (see Figs. 1, 2, 3, and 6,) the fulcrum of which is made adjustable by being arranged at the end of a rock-arm 84 on a rock-shaft 85, having an operating-lever 86, having a rod connection with the adjusting-screw of the hand-wheel 87, by which the operator is enabled to adjust the aforesaid fulcrum as required and in accordance therewith the limit of downward movement of the lower ram and lower mold-plungers to regulate the amount of clay received by the molds. In the operation of the press such lever draws the outlet or exhaust valve 51 down to a closed position, movement being imparted to said lever by the downward movement of the pulling-down cylinder 52, as represented in Figs. 3 and 15.

Motion is imparted to the charger by means of a pair of cams 88 89 on the rotating cam-shafts 90 91 between the bearing-roller 92 of the cam-lever 93, which receives an intermittent positive oscillation and imparts a reciprocating motion, through link 94, bell-crank 95, and link 96, to the clay-charger 7, as fully illustrated in Fig. 15.

In the present invention the pivoted lever 39 of the lower mold-plungers 14 is extended backward into the path of the shorter horizontal arm of the bell-crank lever 95, so that the same in its oscillation will impart a rocking movement to said lever and a corresponding positive initial downward movement to the lower mold-plungers 14 in case they have not previously descended from their elevated position.

The upper cam-shaft 90 in addition to the charger-cam 88 also carries the rotary spring-tappet 97, (see Fig. 11,) by which movement is imparted to the bell-crank lever 69 of the

inlet-valve 49 of the lower ram, such tappet being of a spring form, as illustrated in Fig. 11, so that a sudden return movement of the bell-crank lever caused by a rapid closing of said inlet-valve will not be apt to cause a breakage of parts, and the rotary tappet 98 is adapted to depress the lever 99, that has connection with the lower end of the rod 100, that connects with the lever 101 of the auxiliary valve 18, so as to open said valve and hold it open for a desired length of time, the rod 100 being made vertically adjustable by a screw-coupling 102 to admit of such regulation of the movement of the auxiliary valve 18.

The lower cam-shaft 91 in addition to the charger-cam 89 also carries the cam 103, adapted to raise the cam-lever 104, to which is attached the lower end of the rod 31 of the valve mechanism of the inlet-valves 22 23 of the auxiliary raising-cylinder of the upper ram, the purpose of this construction being to hold the valves open a desired time after the lever 67, operated by the lower mold-plunger 14, as heretofore described, has moved away from engagement with the collar 68 on said rod.

The cam-shafts 90 and 91 are intended to make one complete revolution during each operation of the press and receive motion, through gears 105 106 and pinion 107, from the main driving-shaft 108, (see Figs 1, 2, 23, and 24,) the main driving-pulley 109 of which is mounted loosely and adapted to be positively clutched to the shaft by the following mechanism: 110 is a collar fixed on the driving-shaft and having lateral projections 111 on its face that are engaged by one or more clutch-pins 112, arranged to slide laterally in the hub of the driving-pulley 109 and attached to a head or collar 113, that rotates with the driving-pulley and has lateral movement imparted to it by a lever 114 of the usual forked formation pivoted to the frame of the machine, its lower end being operated in the manner hereinafter described to throw the driving-wheel out of gear with the driving-shaft when required.

During the ordinary and proper action of the press the upper ram, by means of the lifting-toe 115, carried by its upper ram-cylinder 11, rocks the lever 116 to force down the pendent rod 117, attached to the outer end of said lever, to actuate the following mechanism for pushing and holding the clutch into gear: 118 is a rack and sector or other equivalent connection between the rod 117 and one end of the lever 119, the opposite end of said lever being adapted to engage under the bent end of a lever 120, that rests against the clutch-collar 113, carrying the clutch-pins 112. An interposed spring 121 is arranged between the levers 119 and 120, as indicated in Figs. 23 and 24, to afford a yielding pressure between the two, so that no breakage will occur in cases where in the clutch-engaging movement the clutch-pins 112 strike upon the lugs or lateral projections 111 in moving into engagement. The end of the lever 120 is also provided with a bevel-faced lateral projection 122, facing a similarly-formed lateral projection 123 on the clutch-lever 114, a space being left between the two for the passage of the rotating arm 124 on the upper cam-shaft 90, as shown in Figs. 23 and 24.

In the construction shown, 125 is a pin or block arranged to have free lateral movement in the end of the arm 124, so that when the end of the lever 120 is down in a plane with the lower end of the clutch-lever 114 and in the path of the lateral pin 125 said pin in its passage will be forced laterally to move the clutch-lever 114 and throw the driving-clutch of the press out of gear. The lever 120 retains this last-mentioned disengaging position at all times except when lifted by the upper ram-cylinder reaching its full height or elevation.

When it is desired to stop the press from further action, the lifting-toe 115 (see Figs. 2 and 14) is pushed to one side out of the way of the lever 116, when the press parts will be automatically thrown out of gear and come to a gradual stop.

Attached to the side of the upper ram is a valve 126, (see Figs. 2, 6, 9, 10, and 11,) closed normally and traveling with the upper ram. This valve is operated to open by an adjustable rod 127, carried by the lower ram and supplied with a yielding abutment 128 for actuating the valve. Such yielding abutment may consist of a loose collar, an interposed spring 129, and a fixed collar on the rod 127, as illustrated in Figs. 2, 9, 10, and 11. The valve acts as a relief-valve for the upper ram-cylinder, for when the two rams in approaching each other reach a desired distance apart the rod 127 will force the relief-valve open and the yielding abutment will additionally open the same, so as to admit of free escape of the liquid-pressure in the upper ram-cylinder. The additional movement imparted by the yielding abutment to valve lifts the same so fully open that there is no liability of its being accidentally closed by the outflow of liquid from the upper ram-cylinder.

The operation of the press is as follows: Assume the press parts to be in the position illustrated in Fig. 2—to wit, upper ram elevated, the valves 22 23 for the auxiliary raising-cylinder 19 being in the position indicated in Fig. 29, (upper half,) lower ram elevated, charger ready to move forward, and with lower mold-plunger 14 in position to support the made bricks up out of the mold. During the upward movement of the lower ram the same imparts compression to the spring-cushion 77 and auxiliary spring 79 through lever 72, Figs. 3, 4, and 5. A further upward travel of said ram actuates the relief-valve 80, Fig. 15, thus reducing the pressure in the lower ram and allowing the compressed springs 77 and 79 to open the exhaust-valve 51 of the lower ram and retain said valve in an open condition until the said ram is drawn

down by its auxiliary pulling-down cylinder 52, which, coming in contact with the lever 83, causes the same to draw the exhaust-valve down into a closed position and prevent further downward movement of the lower ram. The valves of the lower ram are now in the position shown in the lower half of Fig. 29. In its movement upward (see Fig. 11) the lower mold-plunger 14, through the connections 39, 40, 66, 67, 68, and 31, reverses valves 22 23 from the position shown in Fig. 12 to that shown in Fig. 13, thereby letting water-pressure from the accumulator into the top of the upper auxiliary raising-cylinder, thereby raising the upper ram and keeping the valves raised in a positive manner by the cam 103 on lower cam-shaft 91 and its connections to said valves until valves are again reversed in the further movements of the press. The upper ram in its initial upward movement has reversed the valve 33 from its closed position (shown in Fig. 17) to its open position (shown in Fig. 16) through the connections 36, 35, and 21 to allow the water to escape from upper ram into the overflow-tank 34. The clay-charger is now moved forward by its cam 89 and connections (see Fig. 15) and when near the end or its forward movement brings the pin or stud 44 in contact with the detent-lever 42 to disengage the same from the rock-lever 39 of the lower mold-plunger 14 and allow such mold-plunger to descend. (See Fig. 6.) The descent of the lower mold-plunger causes the lever 64 (see Figs. 3 and 11) to move the lower valves into the position shown in Fig. 3. After the charger has completed, or nearly so, its backward movement the cam 103 (see Fig. 11) on the charger cam-shaft 91 allows the valve 22 23 to reverse from position shown in Fig. 13 to that shown in Fig. 12. This allows the upper ram to drop, its downward movement being assisted by the low pressure from the accumulator in the annular space of the auxiliary cylinder 19. The upper ram in its descent reverses the valve 33 from the position shown in Fig. 16 to that shown in Fig. 17, thereby shutting off further communication between the overflow-tank 34 and the upper ram-chamber. The mechanical movement of the press parts meanwhile continuing, the cam or tappet 98 (see Fig. 11) on the upper cam-shaft 90 opens for a desired time the auxiliary valve 18, normally held closed by spring-pressure against the pressure from the accumulator. Continued movement of the cam-shafts causes the spring-tappet 97, through its connections, to open the inlet-valve 49, (see Figs. 3 and 11,) allowing water-pressure to enter lower ram. At this period mechanical action ceases. The valves of the lower ram being in the position shown in lower half of Fig. 30, the loose construction of the outer valves allows water to enter lower ram from high and low pressure source until the pressure in the ram is the same as in the low-pressure accumulator, when the said valve will close against the low-pressure supply and let only high-pressure water into the ram. High pressure continuing, as soon as the resistance of the spring 63 is overcome the equalizing-plungers 56 58 (see Figs. 3, 6, 7, and 8) will move down, producing compression in the upper ram and forcing the same down until the top and bottom pressures are equal. Both rams are now in the position shown in Fig. 15. When both rams have approached each other the desired distance, the rod 127 by its yielding abutment 128 opens the relief-valve 126, (see Figs. 2, 6, 9, 10, and 11,) thus allowing pressure to escape from the upper ram-chamber. The pressure remaining on the lower ram causes both rams to go up together, carrying with them the finished brick out of the molds. The upper ram in such upward movement causes the valve 33 to be changed from the position indicated in Fig. 17 to that shown in Fig. 16 to allow the water free exhaust from the upper ram in its farther upward movement, which is attained by the auxiliary raising-cylinders, the valves 22 and 23 of which are operated, as hereinbefore described, to cause the upper ram to assume the position initially described at the commencement of the operation and as illustrated in Fig. 2.

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 an upper moving ram-cylinder, a stationary ram, a moving auxiliary raising-cylinder, a stationary piston therefor, and tie-rods connecting the ram-cylinder and the auxiliary raising-cylinder together, substantially as set forth.

2. In a hydraulic brick-press, the combination of an upper moving ram-cylinder, a stationary ram, a moving auxiliary raising-cylinder, a stationary piston therefor, an inwardly-opening check-valve 32, in the upper portion of the auxiliary raising-cylinder, and tie-rods connecting the ram-cylinder, and the auxiliary raising-cylinder together, substantially as set forth.

3. In a hydraulic brick-press, the combination of an upper moving ram-cylinder, a stationary ram, a moving auxiliary cylinder, a stationary piston therefor, the lower annular chamber, of the auxiliary raising-cylinder, being in constant communication, with the source of pressure-supply, and tie-rods connecting the ram-cylinder, and the auxiliary raising-cylinder together, substantially as set forth.

4. In a hydraulic brick-press, the combination of the upper ram-cylinder, the auxiliary raising-cylinder, the upper chamber of which is in communication through its hollow piston and rod, with a valve-chamber, a pair of valves in said chamber, controlling the pressure-supply to the upper chamber of the auxiliary cylinder, and tie-rods connecting the auxiliary and ram cylinders together, essentially as set forth.

5. In a hydraulic brick-press, the combination of the upper ram-cylinder, the auxiliary raising-cylinder, the lower annular chamber of which is in constant communication with the low-pressure accumulator, and the upper chamber of which is in communication, through its hollow piston and rod, with a valve-chamber, a pair of valves in said chamber, controlling the pressure-supply to the upper chamber of the auxiliary cylinder, and tie-rods connecting the auxiliary and ram cylinders together, essentially as set forth.

6. In a hydraulic brick-press, the combination with the auxiliary raising-cylinder for the upper ram-cylinder, of the valve-casing 24, valves 22 and 23, connected together by a rock-lever, and rod for operating the same, essentially as set forth.

7. In a hydraulic brick-press, the combination with the auxiliary raising-cylinder of upper ram, of the valve-casing 24, having chambers 25, 26, the valves 22 and 23, connected together by rock-lever 30, passing through elongated slots in the valve-stems, and rod 31, for operating the same, essentially as set forth.

8. In a hydraulic brick-press, the combination with the auxiliary raising-cylinder of the upper ram, of the valve-casing 24, having chambers 25, 26, the valves 22 and 23, connected together by rock-lever 30, connecting-rod 31, and actuating-lever 67, operated by lower mold-plunger connections, essentially as set forth.

9. In a hydraulic brick-press, the combination with the auxiliary raising-cylinder of the upper ram, of the valve-casing 24, having chambers 25, 26, the valves 22 and 23, connected together by rock-lever 30, connecting-rod 31, and holding-up lever 104, and cam 103, essentially as set forth.

10. In a hydraulic brick-press, the combination with the auxiliary raising-cylinder of the upper ram, of the valve-casing 24, having chambers 25, 26, the valves 22 and 23, connected together by rock-lever 30, connecting-rod 31, holding-up lever 104 and cam 103, and actuating-lever 67 operated by lower mold-plunger connections, essentially as set forth.

11. In a hydraulic brick-press, the combination of a relief-valve 33, held closed by a spring or its equivalent, the bell-crank lever 36, and the auxiliary raising-engine of the upper ram, connected to the lever 36, and adapted to operate the valve, substantially as set forth.

12. In a hydraulic brick-press, the combination of a relief-valve 33, held closed by a spring, or its equivalent, the bell-crank lever 36, and the auxiliary raising-engine of the upper ram, connected in an adjustable manner to the lever 36, substantially as set forth.

13. In a hydraulic brick-press, the combination of a relief-valve 33, held closed by a spring, or its equivalent, the bell-crank lever 36, elongated slot-and-pin connection, adjustable collar 35, and tie-rod 21, essentially as set forth.

14. In a hydraulic brick-press having an upper ram, the combination with the upper ram-chamber connected to a source of fluid under pressure, an auxiliary valve 18, interposed between the said ram-chamber and the source of fluid under pressure, and adapted to supply said upper ram-chamber with part of its compressing medium from the fluid under pressure, and means for supplying the chamber with the remainder of the compressor force from an independent source, substantially as set forth.

15. In a hydraulic press, having upper and lower ram-chambers, one ram-chamber being connected to a source of fluid under pressure, the combination of the auxiliary valve 18, arranged in the path between the two, and adapted to furnish part of the compressive force to said ram, and mechanical means adapted to furnish the remainder of the compressive force to said ram, such mechanical means being influenced in its action by the compressive force contained in the other ram-chamber, substantially as set forth.

16. In a hydraulic press, the combination with the upper ram, having connection with the low-pressure accumulator, of the auxiliary valve 18, arranged in the inlet-port between the two, the spring or its equivalent for holding said valve closed, lever 101, rod 100, and operating lever and tappet 99, 98, essentially as set forth.

17. In a hydraulic press, the combination with the upper ram, having connection with the low-pressure accumulator, of the auxiliary valve 18, arranged in the inlet-port between the two, the spring or its equivalent for holding said valve closed, lever 101, rod 100, adjustable connection 103, and operating lever and tappet 99, 98, essentially as set forth.

18. In a hydraulic brick-press, the upper ram having a circuitous port or passage 17, connecting with accumulator, ram-cylinder equalizer-chamber and overflow-tank, and provided with valves 18 and 33, essentially as set forth.

19. In a hydraulic brick-press, the combination of the relief-valve 126 on the side of the upper ram, and the operating tappet-rod 127, attached to the lower ram, and a yielding abutment, essentially as set forth.

20. In a hydraulic brick-press, the combination with a ram and ram-cylinder, of a lower mold-plunger, made separate from the ram, and adapted to be raised to its full height thereby, and mechanism for holding such plunger in its raised condition, to admit of an independent downward movement of the ram, substantially as set forth.

21. In a hydraulic brick-press, the combination of the disconnected lower mold-plunger, lever 39, detent-lever 42, and charger-carrying pin 44, and adapted to trip said detent, essentially as set forth.

22. In a hydraulic brick-press, the combi-

nation of the disconnected lower mold-plunger 14, with the lever 39 having a rearward extension in the path of the charger-operating mechanism, essentially as set forth.

23. In a hydraulic brick-press, the combination of the disconnected lower mold-plunger 14, with the lever 39, rock-shaft 40, and operating-arm 64, of the dividing-valve 48, of the lower ram, essentially as set forth.

24. In a hydraulic brick-press, the combination of the disconnected lower mold-plunger 14, with the lever 39, rock-shaft 40, operating-arm 64, and valves 48 and 49, united together by a rock-lever 50, so as to operate in unison, essentially as set forth.

25. In a hydraulic brick-press, the dividing-valve 48, between the high and low pressure supplies, having its valve-head arranged loosely to constitute a check-valve, essentially as set forth.

26. In a hydraulic brick-press, the inlet-valve 49, of the lower ram, having its valve-head arranged loosely to constitute a check-valve, essentially as set forth.

27. In a hydraulic brick-press, the combination of the inlet-valve 49, with the bell-crank lever 69, 70, and tappet on the charger-operating mechanism, essentially as set forth.

28. In a hydraulic brick-press, the combination of the inlet-valve 49, with the bell-crank lever 69, 70, and a spring-tappet 97, on the charger-operating mechanism, essentially as set forth.

29. In a hydraulic brick-press, the combination of the dividing-valve 48 and inlet-valve 49, connected together by rock-lever 50, with the bell-crank lever 69, 70, and tappet 97, on the charger-operating mechanism, essentially as set forth.

30. In a hydraulic brick-press, the lower ram having a circuitous port or passage 47, connecting the high and low pressure supplies, the ram-cylinder and the equalizer-chamber, and provided with valves 48, 49 and 51, essentially as and for the purpose set forth.

31. In a hydraulic brick-press, the combination with the lower ram-cylinder of a moving pulling-down auxiliary cylinder the piston of which is stationary, said cylinder being in constant connection with the low-pressure accumulator, essentially as set forth.

32. In a hydraulic brick-press, the combination with the lower ram-cylinder of a moving pulling-down auxiliary cylinder, the piston of which is stationary, said cylinder being in constant connection with the low-pressure accumulator, the relief-valve 80, and tappet 81, essentially as set forth.

33. In a hydraulic brick-press, the combination with the lower ram, of the exhaust-valve 51, a lever for operating the same, and an interposed compressible cushion, essentially as set forth.

34. In a hydraulic brick-press, the combination with the lower ram, of the exhaust-valve 51, a lever for operating the same, and an interposed compressible cushion, consisting of main spring 77, auxiliary spring 79, and fixed and loose collars 75 and 76, essentially as described.

35. In a hydraulic brick-press, the combination with the lower ram, of the exhaust-valve 51, a lever 83, for closing the same and an adjustable fulcrum for said lever, essentially as set forth.

36. In a hydraulic brick-press, the combination with the lower ram, of the exhaust-valve 51, a lever 83 for closing the same, adapted to be automatically operated by the descent of the lower ram-cylinder, and an adjustable fulcrum for said lever, essentially as set forth.

37. In a hydraulic brick-press, the combination with the lower ram, of the exhaust-valve 51, a lever 83, for closing the same, adapted to be automatically operated by the descent of the lower ram-cylinder, an adjustable fulcrum for said lever formed by a rock-arm 84, rock-shaft 85, lever 86, and adjusting-screw and hand-wheel 87, essentially as set forth.

38. In a hydraulic brick-press, the combination with its driving-shaft provided with a clutch mechanism, of a lifting-toe 115, on the upper ram-cylinder, and mechanism between the same and the clutch, so as to keep the clutch in gear during the normal action of the press.

39. In a safety-gear for hydraulic brick-presses, essentially as described, the toe 115, made movable out of the path of the lever 116, essentially as set forth.

40. In a clutch mechanism for brick-machines, the combination of a laterally-moving piece on a moving part of the press, the clutch-lever 114, and the automatically-moving abutment 122, essentially as set forth.

41. In a clutch mechanism for brick-machines, the combination of a laterally-moving piece on a moving part of the press, the clutch-lever 114, and the automatically-moving abutment and the yielding spring or connection 121, essentially as set forth.

42. In a hydraulic brick-press, the combination of the valves 48 and 49, rock-lever 50, and lever-arm 70, essentially as set forth.

43. In a hydraulic brick-press, the combination of the valves 48 and 49, rock-lever 50, and lever-arm 64, essentially as set forth.

44. In a hydraulic brick-press, the combination of the valves 48 and 49, rock-lever 50, and lever-arms 64 and 70, essentially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JULIUS J. KOCH.

Witnesses:
ROBERT BURNS,
GEO. H. ARTHUR.