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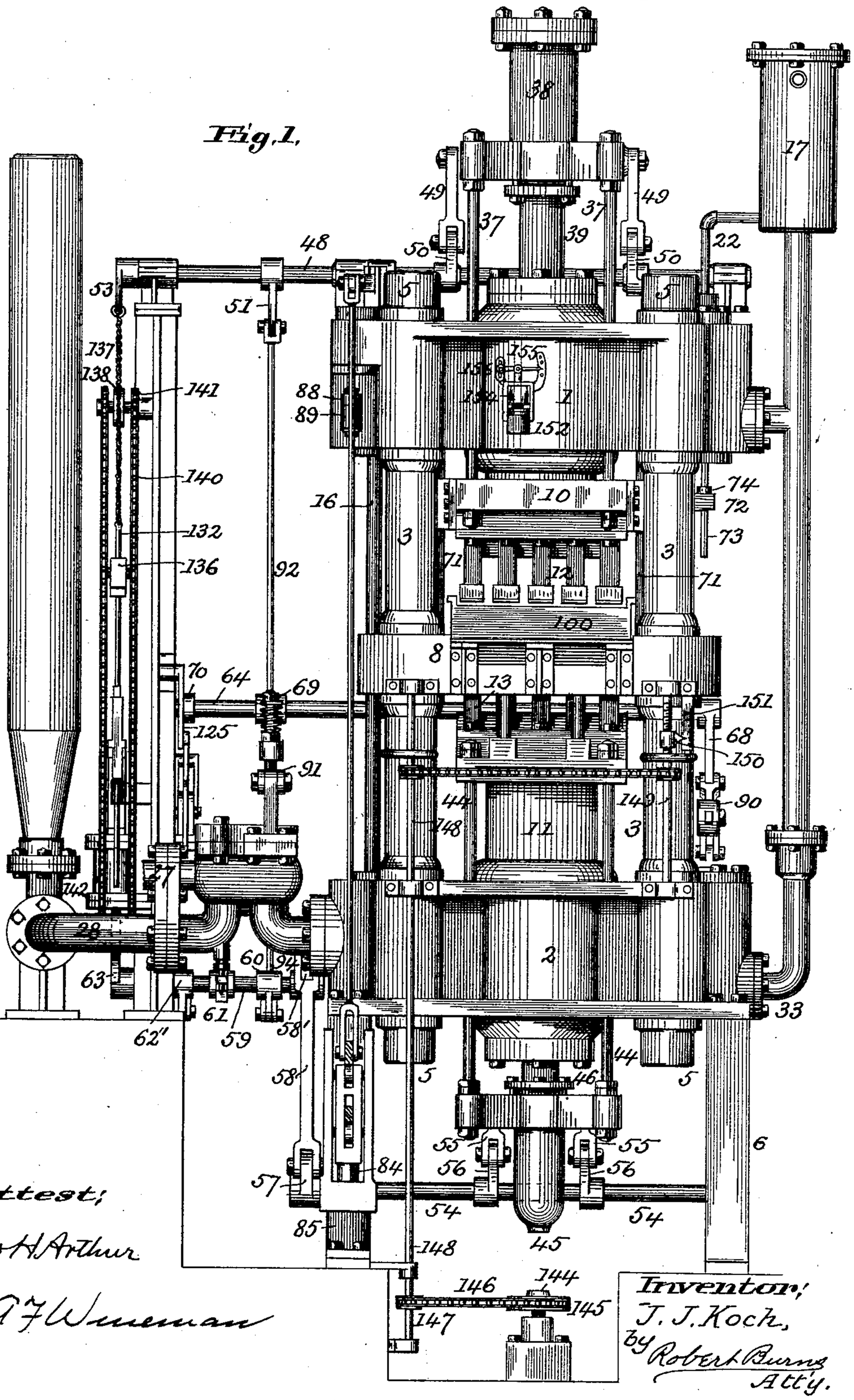
No. 480,818. Patented Aug. 16, 1892.

Fig. 1.



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by Robert Burns

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Fig. 2.

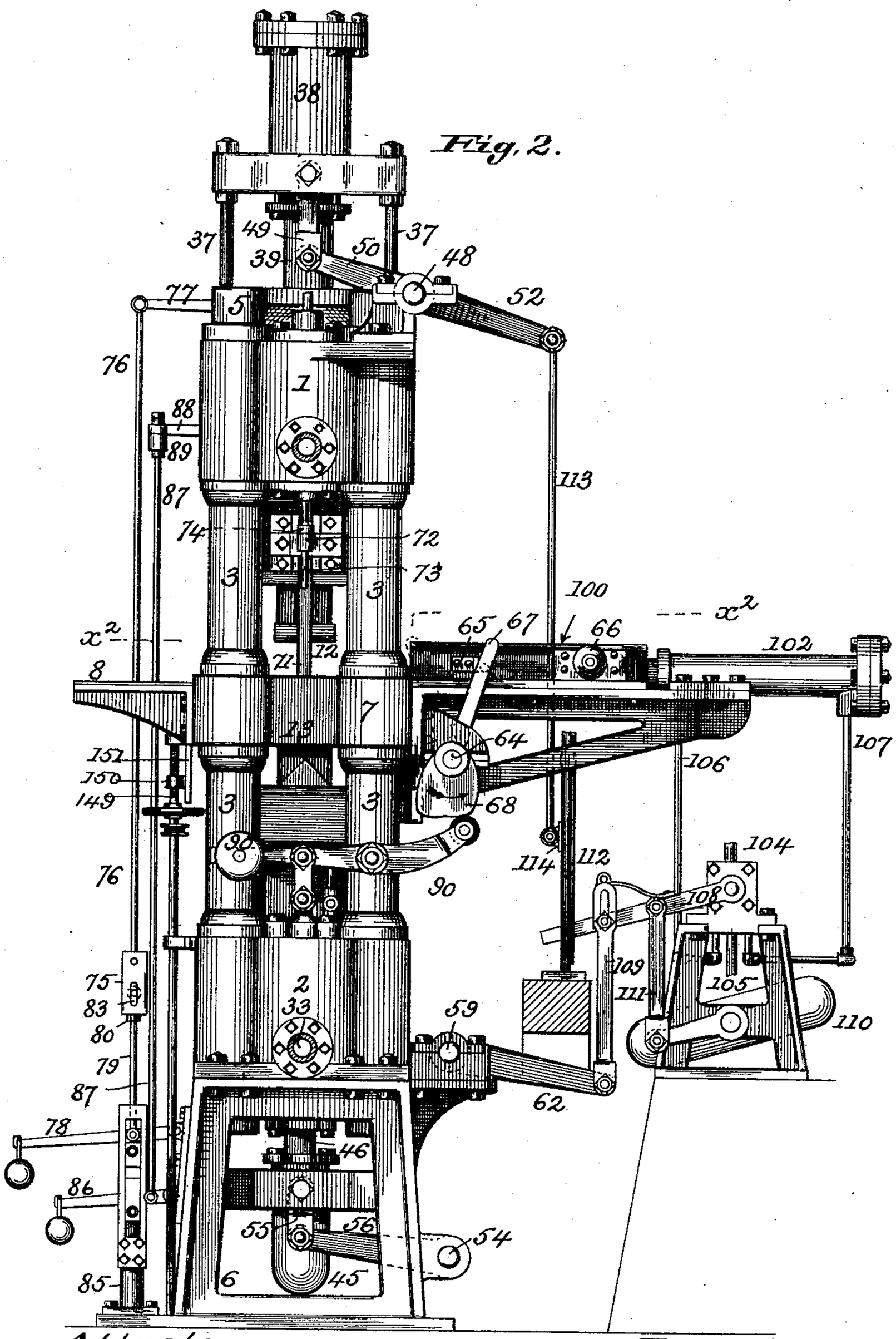

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Fig. 3.

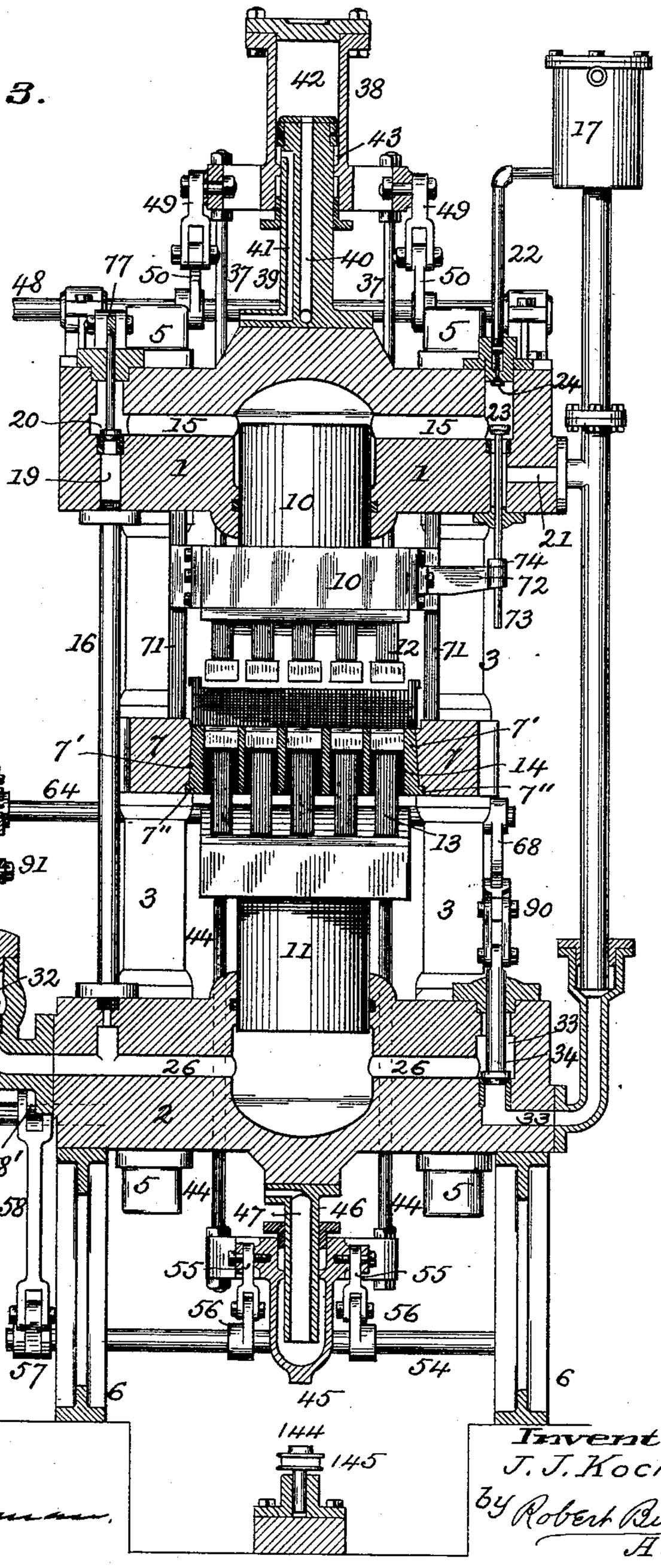

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Fig. 7.

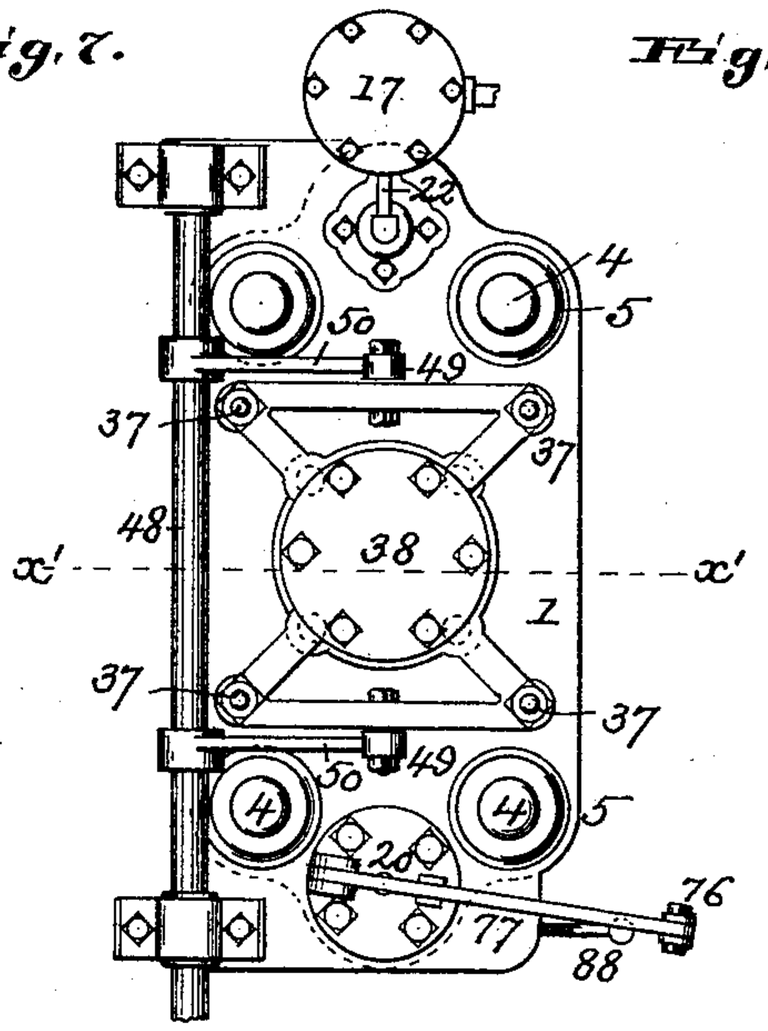

Fig. 4.

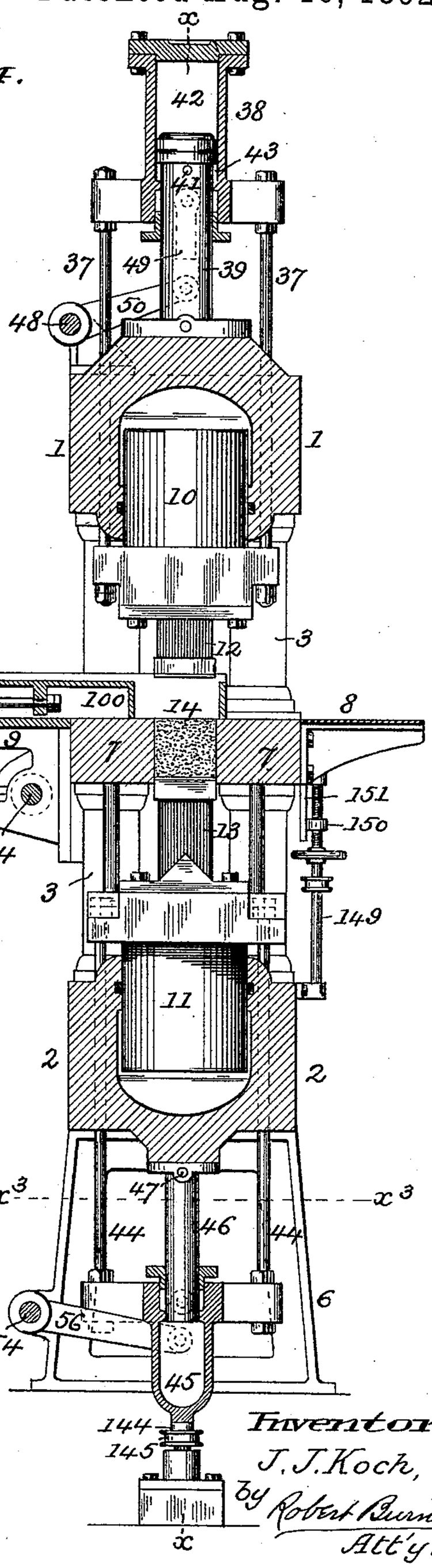

Fig. 6.

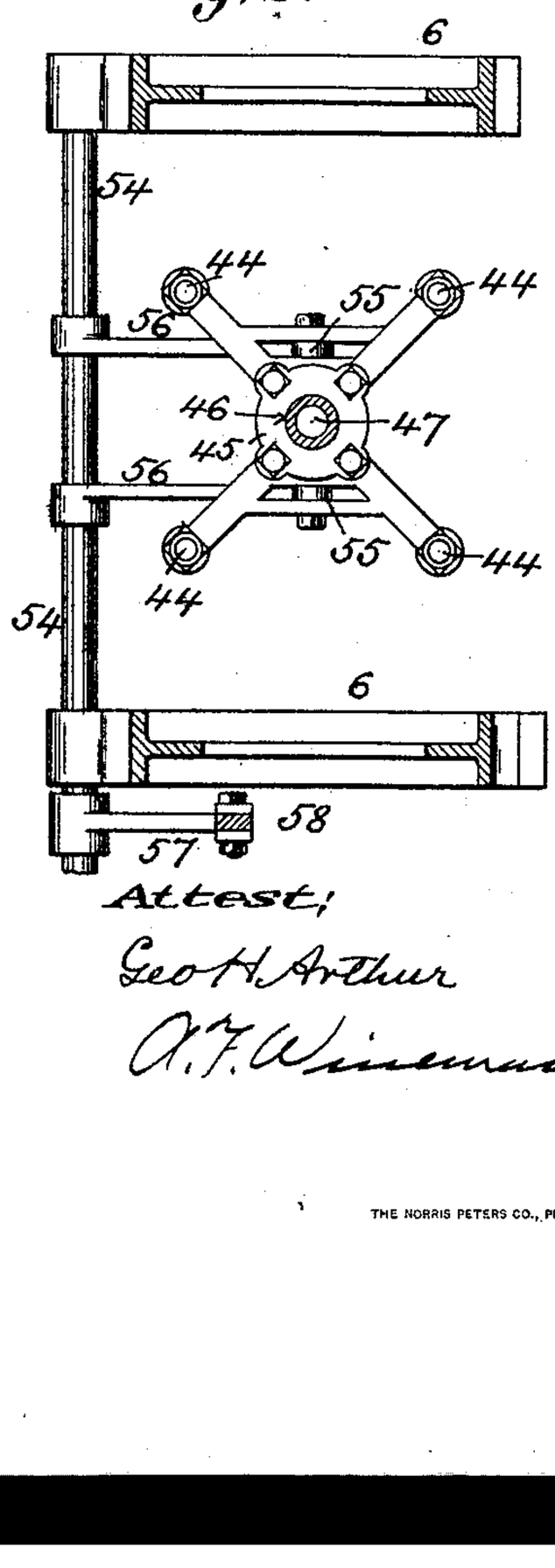

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Fig. 5.

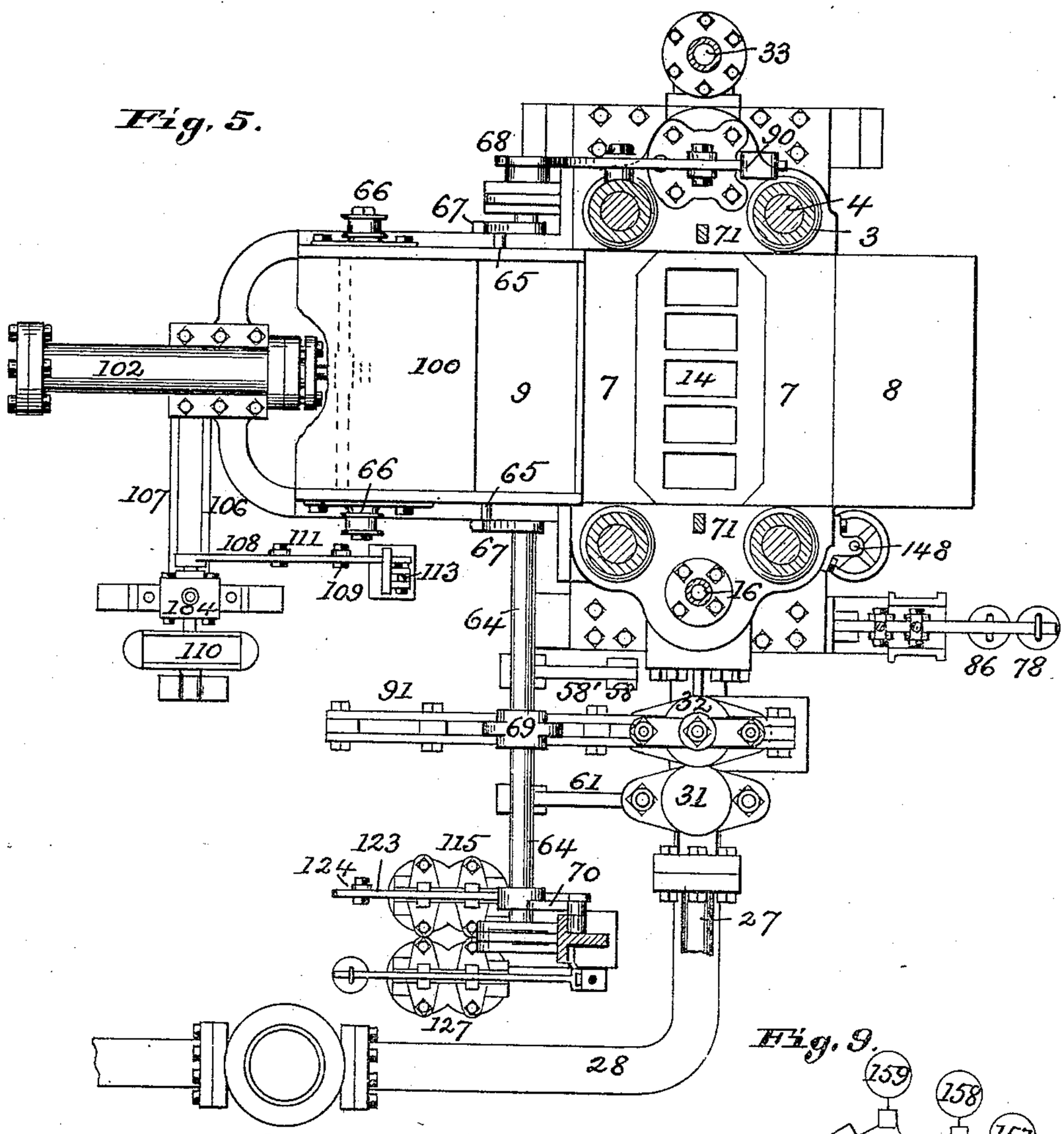

Fig. 8.

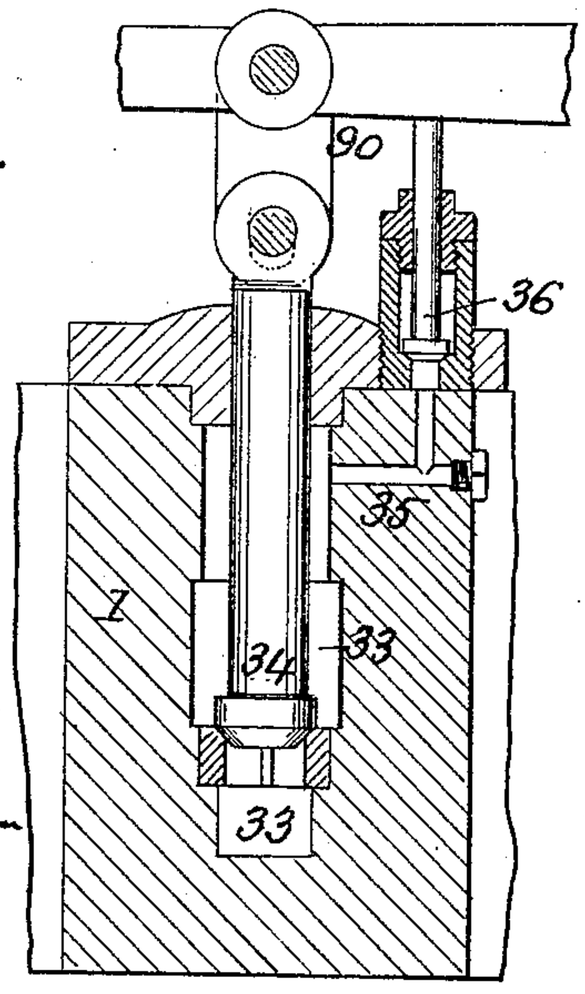

Fig. 9.

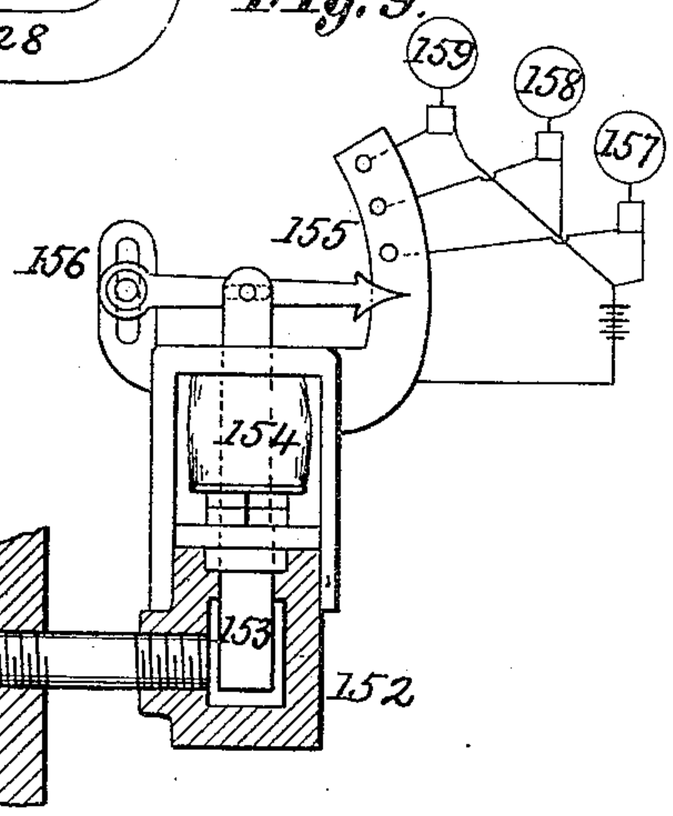

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Fig. 10.

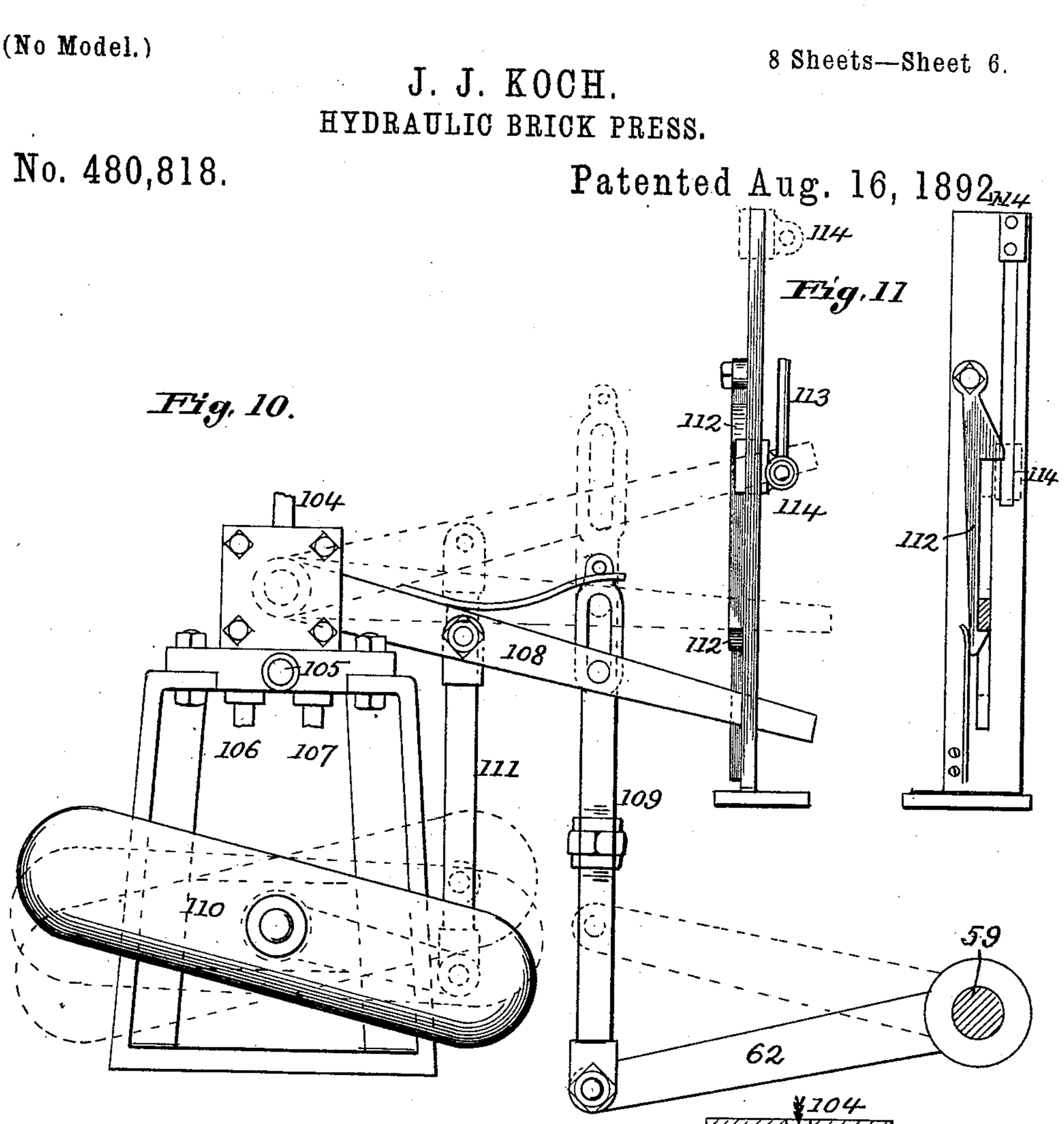

Fig. 11.

Fig. 12.

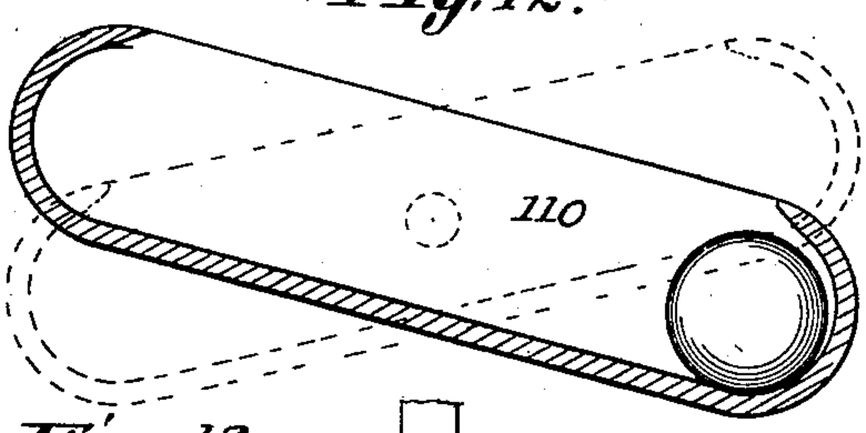

Fig. 13.

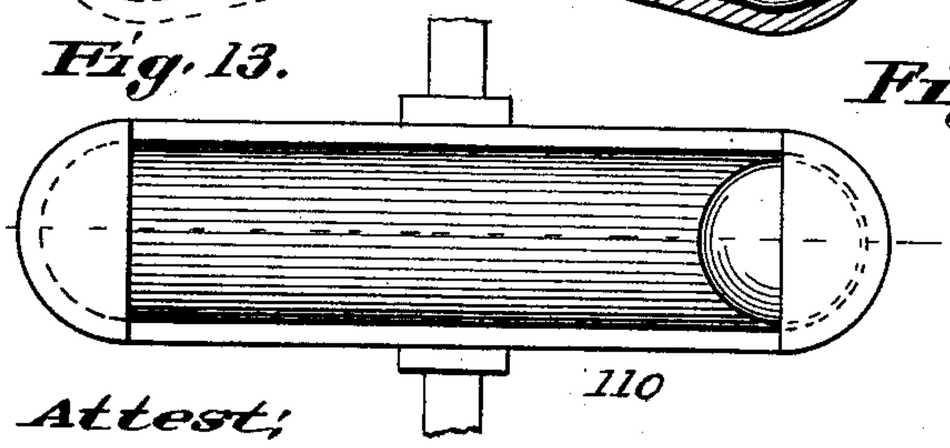

Fig. 14.

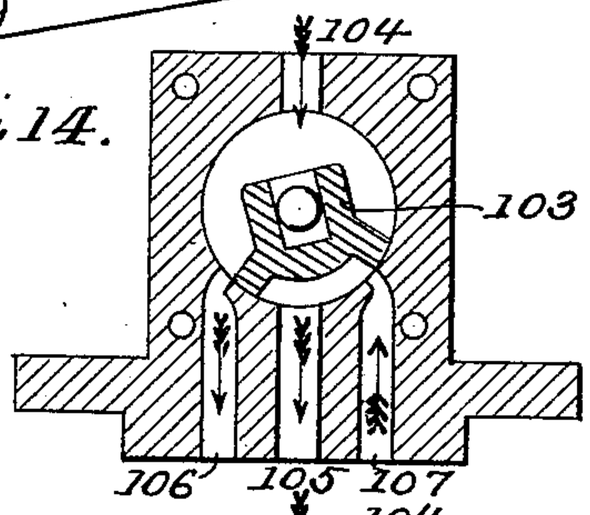

Fig. 15.

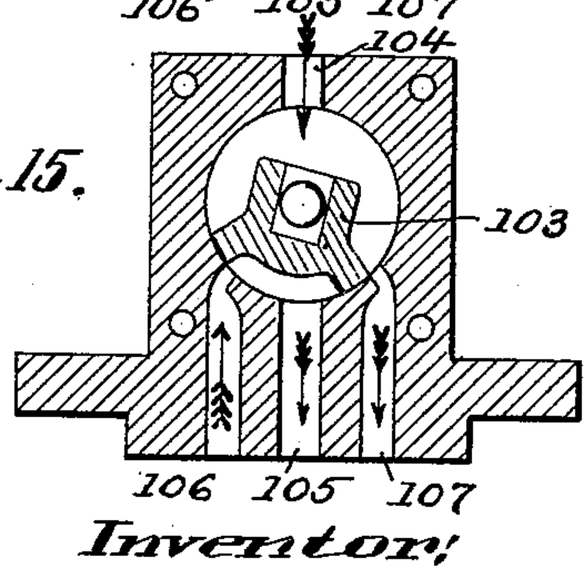

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Fig. 16.

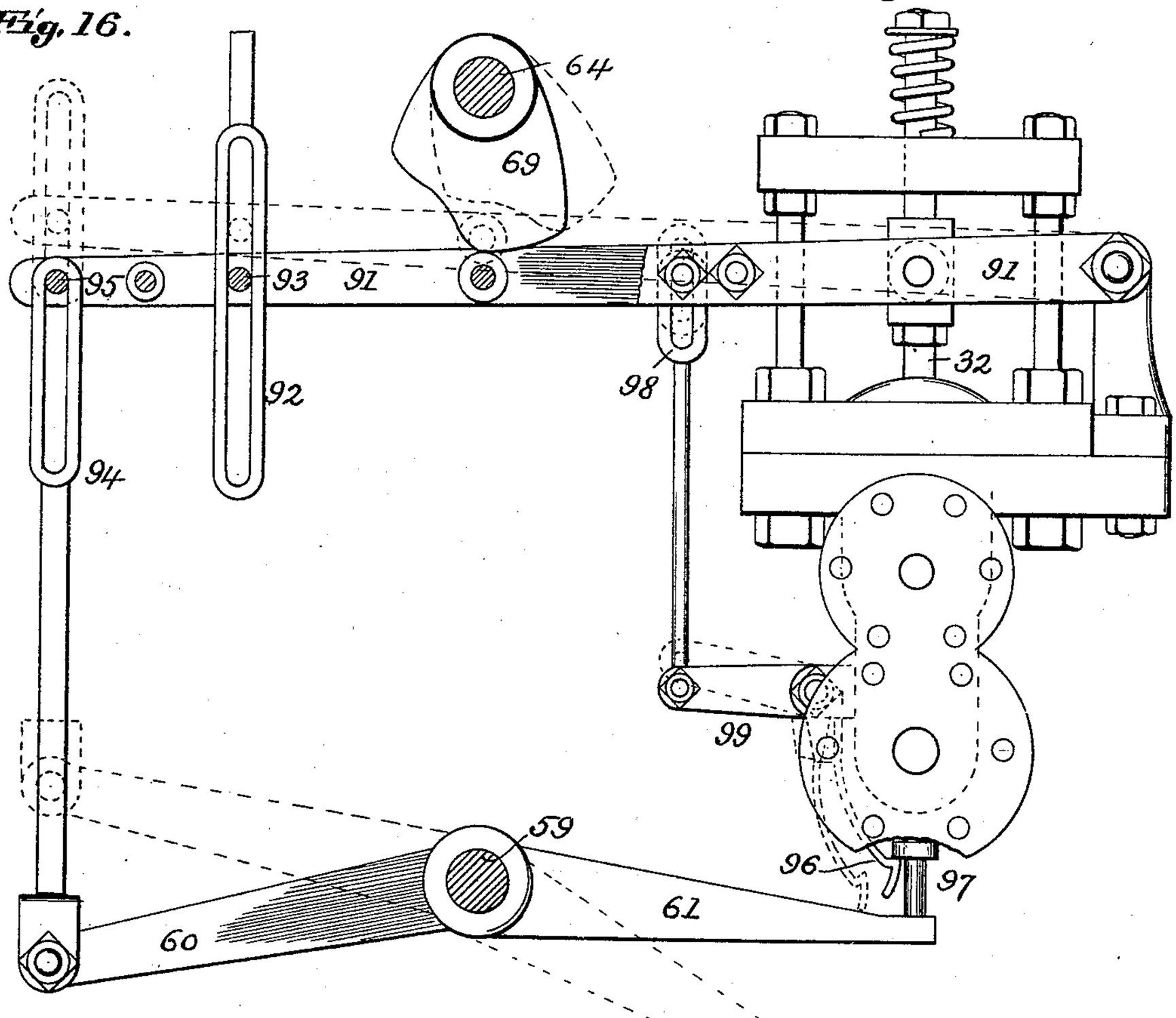

Fig. 17.

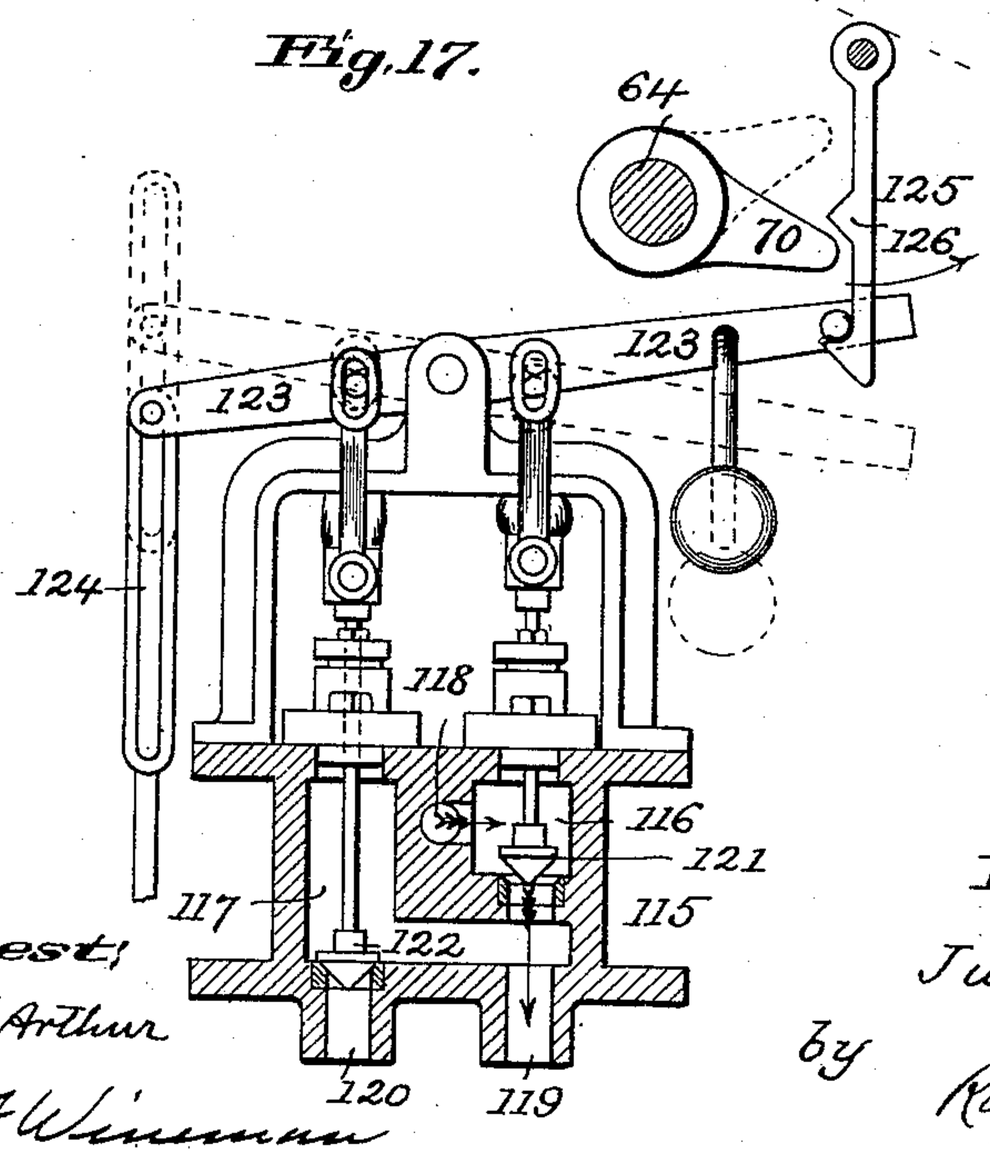

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Fig. 21.

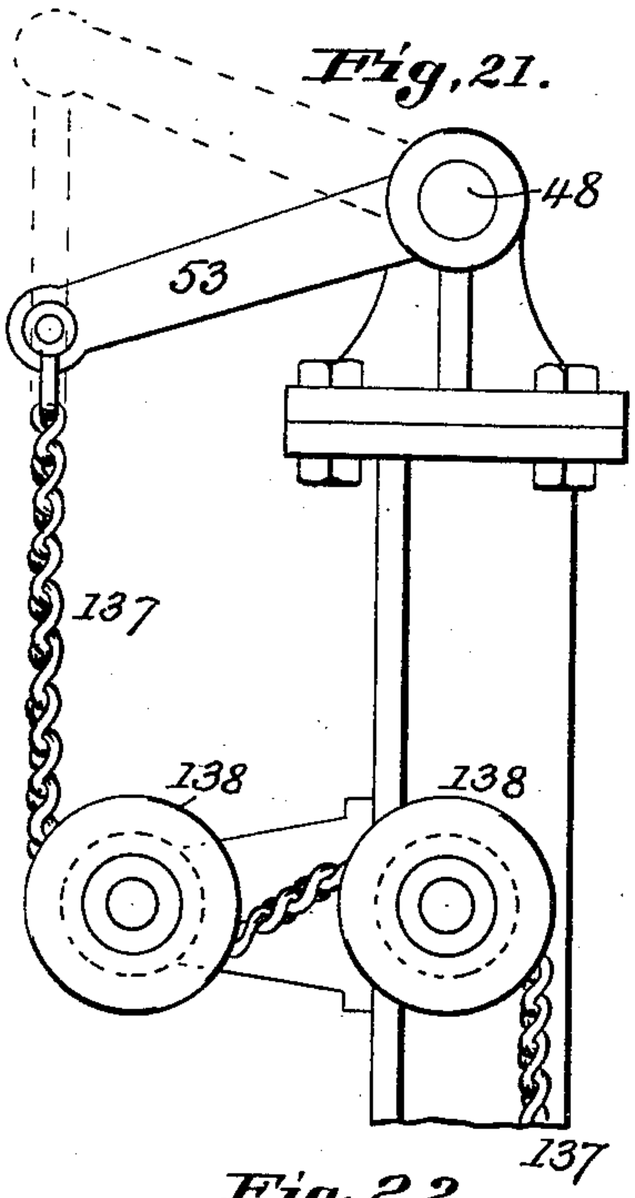


Fig. 22.

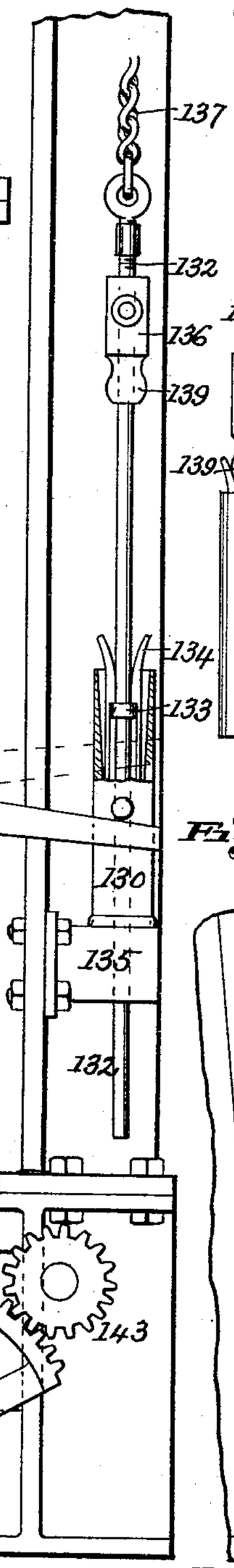


Fig. 20.

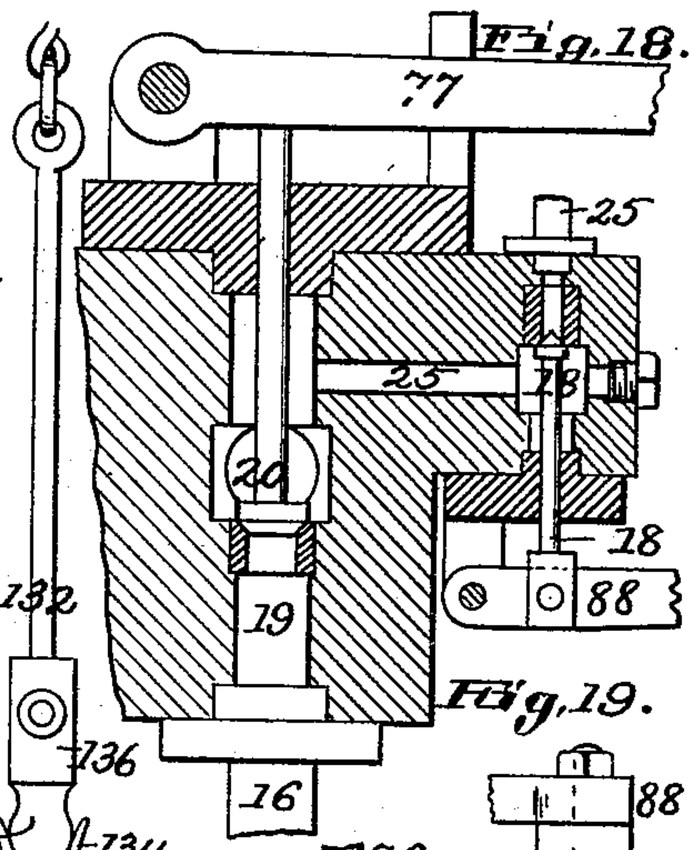


Fig. 18.

Fig. 19.

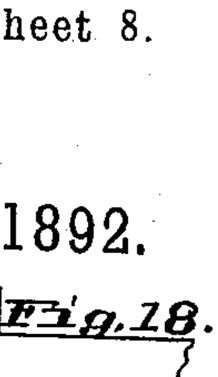
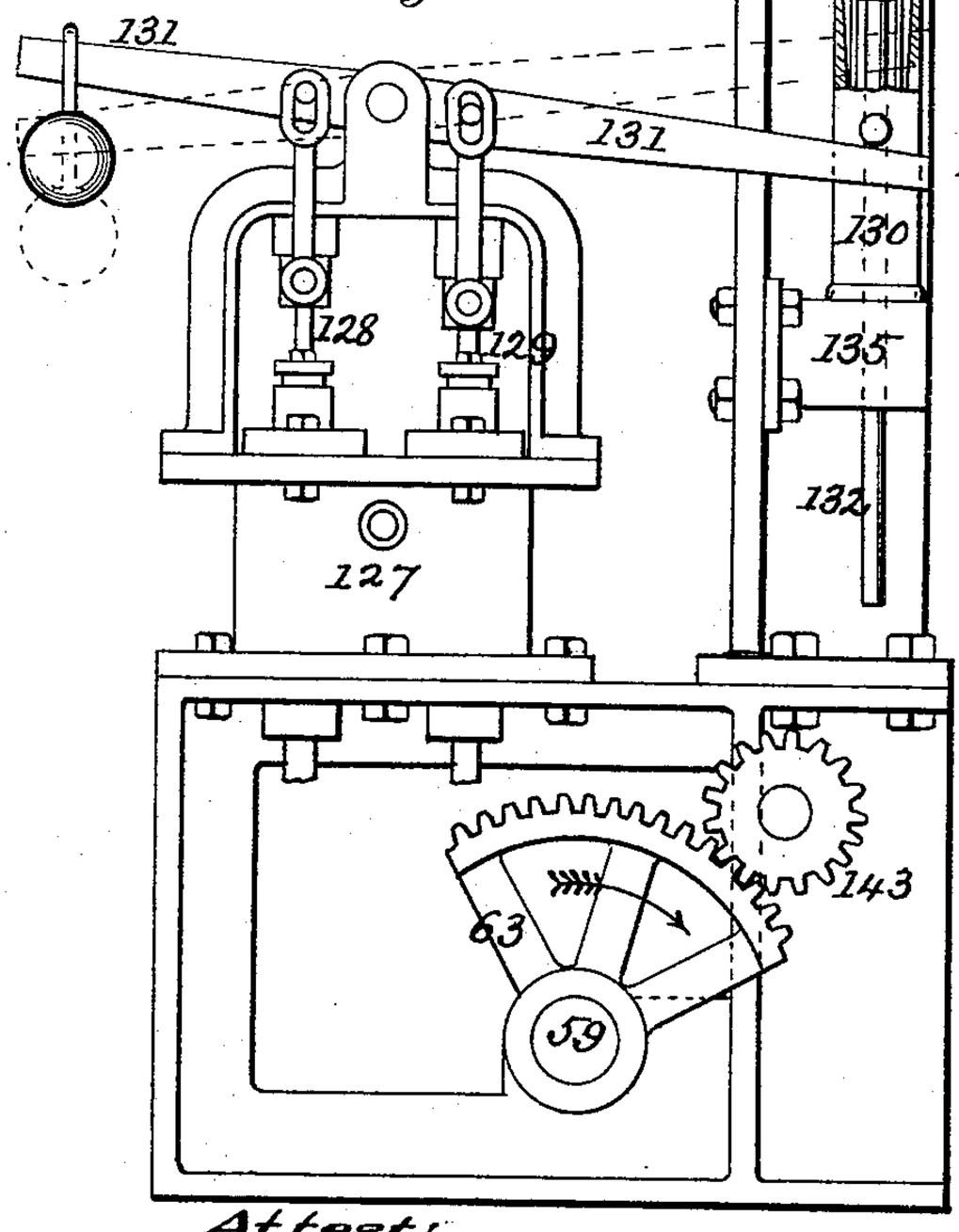
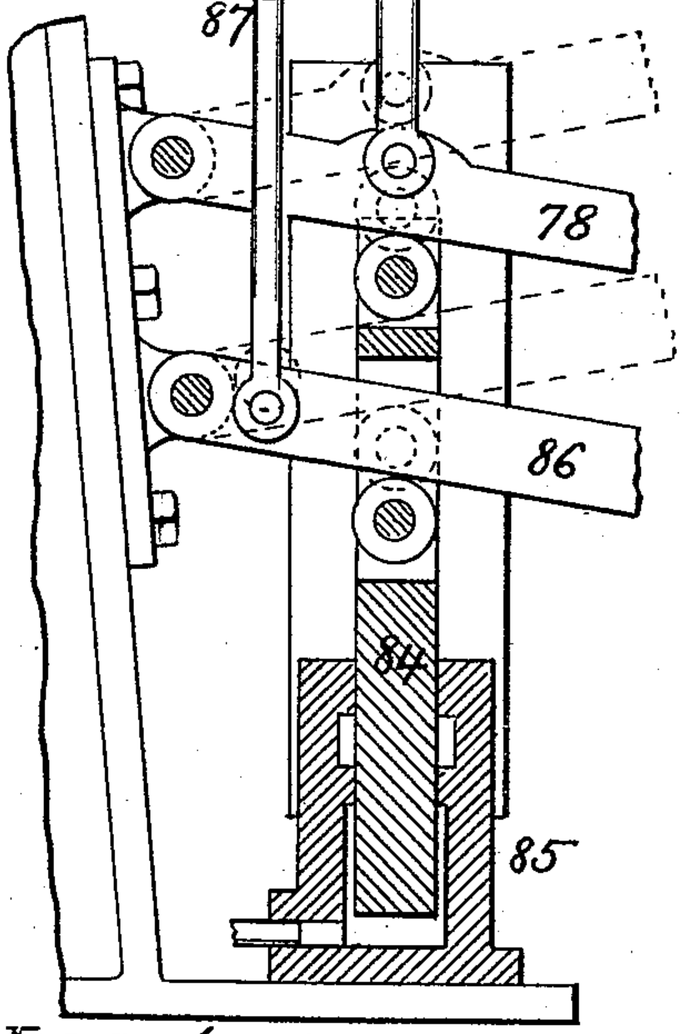


Fig. 23.





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UNITED STATES PATENT OFFICE.

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

HYDRAULIC BRICK-PRESS.

SPECIFICATION forming part of Letters Patent No. 480,818, dated August 16, 1892.

Application filed June 1, 1891. Serial No. 394,749. (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 hydraulic mechanism for compressing dry clay in blocks or bricks.

The objects of the present improvement are in the main, first, to provide successively and automatically operating connecting mechanism between the charger-cylinder, the upper, and the lower ram-cylinders, in which the completion of the movement of the one part will bring the next succeeding part into action automatically, and so on through the movements of the different press parts; second, to provide an improved valve connection between the lower and the upper ram-cylinder adapted to control communication between the same and acting to cause a compression on the charge of clay from the top, then from the bottom, and then simultaneously from the top and bottom after a predetermined pressure has been reached on the bottom of the charge of clay; third, to provide simple and efficient mechanism for connecting the different press parts to insure the above results, as hereinafter described, and more particularly pointed out in the claims. 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; Fig. 2, a side elevation of the same; Fig. 3, a transverse section at line $x\,x$, Fig. 4; Fig. 4, a longitudinal section at line $x'\,x'$, Fig. 7; Fig. 5, a horizontal section at line $x^2\,x^2$, Fig. 2; Fig. 6, a horizontal section at line $x^3\,x^3$, Fig. 4; Fig. 7, a top plan of the press proper; Fig. 8, a detail sectional elevation of the outlet-valve and auxiliary valve for lower ram-cylinder; Fig. 9, a detail sectional elevation of the pressure-alarm mechanism; Fig. 10, a detail side elevation of the operating and controlling mechanism for the charger-valve; Fig. 11, a detail side view of the holding-latch for the same; Fig. 12, a detail section of the shifting weight for the charger-valve; Fig. 13, a detail plan of same. Figs. 14 and 15 are detail sections of the charger-valve in its two positions. Fig. 16 is a detail side elevation, partly sectionized, of the operating mechanism for the inlet and pressure dividing valves to the lower ram-cylinder; Fig. 17, a detail sectional elevation of the valves and their operating mechanism for the auxiliary cylinder of the upper ram. Fig. 18 is a detail longitudinal section of the pressure-controlling valve and the relief-valve for upper ram. Fig. 19 is a detail elevation of the outer end of the lever for relief-valve and its connection; Fig. 20, a sectional elevation of the hydraulic mechanism for moving the pressure-controlling and relief valves of the upper ram; Fig. 21, a detail side elevation of the upper portion of the locking and unlocking mechanism for valves of the hydraulic operating-cylinder of the pressure-controlling and relief valves of the upper ram; Fig. 22, a similar view of the lower portion of the same; Fig. 23, a detail side elevation of the trip mechanism for valve mechanism illustrated in Fig. 22.

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

As represented in the drawings, 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 3, tie-rods 4, and nuts 5, and supported on a suitable frame 6, as shown, the mold-frame 7 being supported in the usual manner midway the height between the upper and lower fixed members 1 and 2, the brick-receiving table 8 being arranged in front of said mold-frame, and the charger-table 9 at the rear of the same in any usual manner.

In the present improvement the cavity in the mold-frame 7 for the reception of the mold proper is made of a downwardly-flaring form as ending in a shouldered recess, as shown in Fig. 3, the mold proper 7′ being correspondingly formed, and with a bottom flange 7″ to fit the shouldered recess in the mold-frame.

With this construction the mold is held in position by friction without the necessity of any additional means of attachment.

The fixed members 1 and 2 constitute the hydraulic cylinders for the main hydraulic plungers or rams 10 and 11, to which are attached the mold-plungers 12 and 13, by which the charge of clay is compressed in the mold-cavity 14. (See Figs. 3 and 4.)

15 is a circuitous port-passage in the upper fixed member 1, having communication with the upper ram-chamber and with the side pipe connection 16, the storage-tank 17, and the relief-valve 18, as shown in Fig. 3, in the following manner: with the side pipe 16 connection through branch passage 19, controlled by the valve 20, with the storage-tank 17, through branch passages 21 and 22, controlled, respectively, by the inlet and outlet valve 23 and the suction check-valve 24, and with the relief-valve 18 by branch passage 25, that may communicate with the storage-tank 17 or with any other suitable receptacle.

26 is a circuitous port or passage in the lower fixed member 2, having communication with the lower ram-chamber and with the high and low pressure supplies 27 and 28, the storage-tank 17, and the side pipe 16, that connects with the upper ram-chamber, as shown in Fig. 3, in the following manner: with the high and low pressure supplies, through the branch passages 29 and 30, the respective connections of which are controlled by pressure-dividing valve 31 and the inlet-valve 32, and with the storage-tank 17 by branch passage 33, controlled by valve 34, which passage 33 may have a sub-passage 35, controlled by a relief-valve 36, as indicated in Fig. 8. In the present invention the upper hydraulic ram or plunger 10 is connected by tie-rods 37 with the vertically-moving auxiliary cylinder 38, the piston 39 of which is stationary and is attached to the top of the fixed member 1, such piston being provided with the respective ports or passages 40 and 41, that respectively open or lead into the upper chamber 42 and the annular chamber 43 of the auxiliary cylinder 38, as illustrated in Figs. 3 and 4. The lower hydraulic ram or plunger 11 is connected by tie-rods 44 with the vertically-moving auxiliary cylinder 45, the piston 46 of which is stationary and is attached to the under side of the main fixed member 2, such piston being provided with a single port or passage 47, that introduces a constant pressure into the cylinder 45, and producing a constant downward-pulling strain upon the lower ram-plunger 11 and the lower mold-plunger 13.

48 (see Figs. 1, 2, 3, 4, and 7) is the upper rock-shaft turning in suitable bearings and receiving motion from the upper vertically-moving auxiliary cylinder 38 through the links 49 and arms 50 and provided with arms 51, 52, and 53, that have connection with and operate different press parts, as hereinafter set forth.

54 (see Figs. 1, 2, 3, 4, and 6) is the lower rock-shaft turning in suitable bearings and receiving motion from the lower vertically-moving auxiliary cylinder 45 through links 55 and arms 56 and provided with an arm 57, that connects by link 58 with the arm 58′ of a supplementary rock-shaft 59, that also carries arms 60 61 62 62′ and sector-arm 63, that have connection with and operate different press parts, as hereinafter set forth.

64 (see Figs. 1, 2, 3, 4, and 5) is an intermediate rock-shaft turning in suitable bearings and receiving motion from the clay-charger by a fixed tappet 65 and an adjustable tappet 66, that in turn intermittently move the arm 67 of the rock-shaft, said rock-shaft carrying cams 68 69 and tappet 70, adapted to operate different press parts, as hereinafter set forth.

The upper press-plunger 10, (see Fig. 3,) moving in guides 71, is provided with a fixed arm 72, having a guide-eye at its outer end for the passage of the stem 73 of the inlet and outlet valve 23 between the upper hydraulic chamber and the storage-tank 17 and adapted on its upward movement to engage the adjustable collar 74 of the valve-stem 73 and lift the valve from its seat, opening communication to the storage-tank, and on its downward movement allows the valve 23 to close at the desired time. The downward movement of this valve 23 may, if desired, be assisted by a spring or weight. On a further initial downward movement of the press-plunger 10 after the valve 23 is closed a vacuum will be prevented by the opening of the suction check-valve 24.

The controlling-valve 20 (see Figs. 2, 3, 18, and 20) between the side pipe 16 and the upper hydraulic chamber is held primarily to its seat by means of the adjustable weight 75, connecting-rod 76, and valve-lever 77 until a sufficient pressure in the side pipe 16 is attained to overcome the weight or resistance of the valve 20 and weight 75, when the said valve will open and admit high pressure to the upper ram-chamber, thus affording means for producing a differential pressure as well as an equal maximum pressure in both the upper and lower ram-chambers. The valve 20 is secondarily held closed by the assistance of the weighted lever 78, the rod 79 of which is connected to the weight 75 by a stop-collar 80, pin 81, and elongated slot 83, so as to be capable of a limited independent vertical movement, as hereinafter set forth.

The relief-valve 18 (see Figs. 1, 2, 18, 19, and 20) of the upper ram-cylinder is closed by the upward movement of the hydraulic plunger 84 of cylinder 85, which lifts the weighted lever 86, connecting-rod 87, lever 88, and interposed cushion 89, the opening of said valve being effected at the proper time by a reversal of the above-mentioned parts.

The outlet-valve 34 (see Figs. 1, 2, 3, 5, and 8) between the lower ram-chamber and the

storage-tank 17 is operated in one direction by cam 68 on the intermediate rock-shaft 64 through weighted valve-lever 90 and in the opposite direction by the weight on the outer arm of the lever 90, as shown in Fig. 2.

The relief-valve 36 when used will be operated by having its stem arranged to contact with and be operated by the weighted valve-lever 90. (See Figs. 2 and 8.)

The inlet-valve 32 (see Figs. 1, 3, and 16) to lower ram-chamber is moved to a closed position by the cam 69 on the intermediate rock-shaft 64, through the valve-lever 91, its movement to an open position being effected by an arm 51 on the upper rock-shaft 48, through the slotted link 92, engaging a cross-pin 93 on the valve-lever 91, as shown. A partial closing of this inlet-valve is effected at the proper time by an arm 60 on the supplementary rock-shaft 59, through the slotted link 94, engaging a cross-pin 95 on the valve-lever 91, as shown. The movement of the valve may be assisted by a spring, as shown in Figs. 3 and 16.

The pressure-dividing valve 31 (see Figs. 1, 3, and 16) is at the proper time raised from its seat by the arm 61 of the supplementary rock-shaft 59, enabling the spring-latch 96 to engage under the collar 97 on the stem of the valve to keep the valve raised, when the arm 61 recedes therefrom, said latch being disengaged at the proper time by the movement of the inlet-valve lever 91, slotted link 98, and rock-arm 99, carrying the spring-latch 96, enabling the valve to act as a pressure-dividing valve.

The charger 100 (see Figs. 2, 4, and 5) is operated by a hydraulic piston and cylinder 101 and 102, as shown, the supply of hydraulic pressure thereto being governed by valve mechanism, as follows: 103 (see Figs. 10, 11, 12, 13, 14, and 15) is a semi-rotary valve, the chamber of which is provided with supply-port 104, exhaust-port 105, and inlet and outlet ports 106 107, communicating with the respective ends of the charger-cylinder 102. Motion is imparted to the valve 103 by an arm 108 on its shaft that is connected as follows: first, to and receiving motion from the arm 62 of the lower rock-shaft 59, through slotted adjustable link connection 109; second, to one end of the shifting overbalance device 110, through link 111, and, third, with a spring-latch 112, that locks it in its proper position, the construction being such that the lower ram in its upward movement will cause the link 109 to move independent of the valve-arm 108 (the distance of its elongated slot) and leave the valve-arm engaged by the spring-latch 112 until the same is released by the upward movement of the upper ram through its connections, viz: rock-shaft 48, arm 52, link 113, and sliding block 114, that is adapted to move the spring-latch 112 laterally out of engagement with the valve-arm 108 and hold it in a disengaged condition until a reversal of the upper ram. The arm 108 now drops, carrying the valve 103 into the position illustrated in Fig. 15, with pressure on the rear end of the charger-cylinder. A downward movement of the lower ram reverses the valve 103 to the position shown in Fig. 14, lifting the valve-arm to its upper position, as indicated in dotted lines in Fig. 10, the arm passing the lower end of the spring-latch 112 in its upward movement, so that the latch will engage said arm, when the latch is released by the downward movement of the upper ram. (See Fig. 11.)

The shifting overbalancing device 110 is for the purpose of insuring a full movement or opening of the semi-rotary valve in either of its positions and may consist of an elongated trough pivoted centrally and carry a loose body or weight adapted to shift from one end to the other and constitute an overbalance-weight at such ends.

The valve mechanism of the upper raising-cylinder 38 (see Figs. 5 and 17) consists of a casing 115, having valve-chambers 116 and 117, provided with inlet and outlet ports 118, 119, and 120, that communicate, respectively, with the low-pressure accumulator, the port or passage 40, and a suitable waste-receptacle. The ports or passages 118 and 119 are controlled by valves 121 and 122, the stems of which are connected by elongated eyes and cross-pins to the pivoted and weighted lever 123 to receive motion in one direction by means of the slotted link 124, connected to the arm 62′ of the supplementary rock-shaft 59, motion in the other direction being obtained by gravity when released from engagement by the latch or hook 125, by which it had been held, a release from the latch-hook 125 being effected by a tappet 70 on the intermediate rock-shaft 64. With the construction shown the slotted link 124 holds the lever 123 in the position shown in Fig. 17 to allow the tappet 70 on its forward stroke to pass the inclined projection 126 of the hook. Preceding the backward stroke of the tappet 70 the slotted link 124 will have moved away from its end of lever 123, leaving it free to move subsequently.

The operating-valve mechanism for the hydraulic cylinder and plunger 85 and 84, that operates the controlling-valve 20 and relief valve 18 of the upper ram-chamber, consists as follows: 127 (see Figs. 5, 21, 22, and 23) is a valve-chamber having valves 128 and 129, constructed similarly to valves 121 and 122 (illustrated in Fig. 17) and operated in one direction by a weight 130, engaging over a forked end of the pivoted valve-lever 131, the other end of which is weighted, as shown, the arrangement being such that when said weight 130 is raised the lever 131 will reverse the valves 128 and 129 by gravity and admit pressure into the cylinder 85 to raise the plunger 84 and its connected parts. The raising of the weight 130 is effected by means of

an adjustable rod 132, having a fixed collar 133, that is engaged by spring-hooks 134, attached to the weight. Said adjustable rod passes through guides 135 and 136, its upper end being attached to an arm 53 on rock-shaft 48 through chain or rope and pulley connections 137 and 138, as shown in Figs. 21 and 22. The guide 136 has a pendent wedge-shaped projection 139 and is carried by chains 140, passing around the upper and lower pulleys 141 and 142. The shaft of the lower pulleys carries a pinion 143, that is operated by a sector-arm 63 on the supplementary rock-shaft 59. With such construction, when both the rams have reached a desired position with relation to each other the wedge 139 will act to disengage the spring-hooks 134 from the collar 133 and allow the weight 130 to drop, reversing the valves 128 and 129, and thereby govern the thickness of the brick produced. The drop of the lower ram is governed by means of a vertically-adjustable stop-block 144, screwing into a fixed base-block, as shown in Fig. 1. 145 is a chain-wheel on said block, gearing by chain 146 with a chain-wheel 147 and a vertically-arranged shaft 148, that in turn rotates a secondary shaft 149 through chain and chain-wheels, as shown, the upper end of the shaft 149 being screw-threaded and carrying a pointer-sleeve 150, that registers on the scale 151 the quantity of clay entering the mold.

Attached to any part of the press proper where high pressure will be exerted is a pressure-alarm, consisting of a hydraulic cylinder 152 and a plunger 153, (see Figs. 1 and 9,) the movement of which is controlled by a spring-cushion 154. Attached to said plunger is an index-finger 155, having an adjustable fulcrum 156 to admit of an adjustment of its travel. The finger 155 is adapted to come in contact with one or more electric alarm-bells 157, 158, and 159, and indicate by sound the amount of pressure on the material in the molds and, as illustrated in Fig. 9 of the drawings, the mimimum allowable, the desired, and maximum pressures. This serves as a guide to enable an operator in charge to fill the molds with the proper amount of clay to effect the desired pressure.

The operation of the press is as follows: Assuming the press parts to be in the position illustrated in Fig. 2, with the upper ram just finishing its upward stroke, the lower ram up, supporting a batch of brick on line with the delivery table, and the charger back; as the upper ram completes its stroke the arm 52 is moved downward and through rod 113 and sliding block 114 releases the catch 112 from its engagement with the valve-lever 108, allowing said lever to drop and reverse the charger-valve 103, so as to admit pressure to the rear end of the charger-cylinder 102 through port 107 and cause the charger to move forward and push the batch of brick onto the delivery-table 8. As the charger completes its forward movement the adjustable stop 66, coming in contact with arm 67, rocks the shaft 64 to effect the following results: first, by means of cam 69 and valve-lever 91, to close the inlet-valve 32 to lower ram-chamber; second, by means of cam 68 and weighted lever 90, to open the exhaust-valve 34 of the lower ram-chamber, and, third, to move the tappet 70 into position ready to disengage the latch 125, as illustrated in Figs. 1, 2, 3, 4, 5, and 17. The pulling-down cylinder 45 coming into action draws the lower ram and its attachments into their "down" position, thereby forcing water from lower ram-chamber through exhaust-valve 34 and passage 33 into storage-tank 17. (See Figs. 1, 2, 3, 4, 5, 8, 10, 11, 12, 13, 14, 15, 21, and 22.) While such downward movement of the lower ram is being effected, the rock-shaft 54 has a rocking motion imparted to it by the connecting-links 55 and arms 56, which rocking motion is in turn imparted to a rock-shaft 59 through connecting link and arm 58 and 58′. The rocking of such last-mentioned shaft effects the following results: first, by means of its sector-arm 63 and pinion, chain, and pulley connections 143 140 141 142, (see Figs. 21, 22, and 23,) to move the guide and wedge 136 139 upward; second, by means of its arm 62′, to move the slotted link 124 to the position indicated in dotted lines in Fig. 17; third, by means of the downward movement of its arm 61, to leave the pressure-dividing valve 31 (see Fig. 16) in an open position, locked thereto by means of the spring-latch 96; fourth, by means of its arm 60, to move the slotted link 94 to the position shown in dotted lines in Fig. 16; fifth, by means of its arm 62 and the slotted link 109, (see Fig. 10,) to lift the valve-lever 108 and with it the overbalancing device 110, to a position to reverse the valve 103 and cause the charger to move backward, the same in the meanwhile having filled mold-cavity with clay and the overbalancing device having shifted to lock the parts in the last-mentioned position. (See Fig. 4.) The charger in moving backward, as last described, when nearing the end of its stroke operates the rock-shaft 64 by arm 67 and the fixed charger-tappet 65 to effect the following results: first, to remove cam 68 from engagement with the weighted lever 90 (see Fig. 2) and allow the same to close the exhaust-valve 34 of the lower ram-chamber by gravity; second, to remove the cam 69 (see Fig. 10) from engagement with valve-lever 91; third, by means of its tappet 70, (see Fig. 17,) to disengage the latch 125 from the weighted valve-lever 123 and allow the same to drop and reverse the valves 121 and 122, closing communication between the usual low-pressure accumulator and the upper chamber 42 of the auxiliary cylinder 38 and opening exhaust therefrom. The upper ram now drops by gravity alone or gravity assisted by hydraulic pressure in the annular chamber 43 of the

auxiliary cylinder 38 to produce the first or initial pressure on the upper portion of the charge of clay. In its descent it first imparts motion to the rock-shaft 48, (see Fig. 2,) and when it has descended a desired distance it allows valve 23 (see Fig. 3) to close the main communication between storage-tank 17 and the upper hydraulic chamber. After the valve 23 has closed, should a further descent of the upper ram take place water will be supplied to the upper hydraulic cylinder through the check-valve 24 to prevent the formation of a vacuum in said hydraulic chamber. The rocking motion imparted to rock-shaft 48 by the initial downward movement of the upper ram effects the following results: first, by means of its arm 53 (see Figs. 1, 21, and 22) and chain-and-pulley connection 137 and 138 with the rod 132, to lift the weight 130 by means of the engagement of the spring-hooks 134 with the collar 133 of the rod 132; as the weight 130 is lifted the weighted lever 131 drops into the position indicated in dotted lines in Fig. 22 to reverse the valves 128 and 129 of the hydraulic cylinder 85 (see Fig. 20) and cause its plunger 84 to rise, and in its upward movement raises the respective weighted levers 86 and 78; the lever 86, through its connecting-rod 87 and lever 88, closes relief-valve 18, (see Figs. 18, 19, and 20,) the cushion 89 admitting of any further movement of the parts, and the lever 78, through its connecting-rod 79, relieves the rod 76 of any excess beyond that of the weight 75, and may, if so desired, relieve the pressure-controlling valve 20 of the upper ram-cylinder of all the weight that holds it closed; second, by means of its arm 52 and rod 113 and sliding block 114, (see Figs. 2, 10, and 11,) to retract the spring-latch 112; third, by means of its arm 51, (see Figs. 1, 3, and 16,) slotted link 92, and cross-pin 93, to lift the valve-lever 91 and open the inlet-valve 32 of the lower ram-cylinder. At the desired time the valve-lever 91 in upward movement releases the spring-latch 96, through the adjustable link 98 and arm 99, from engagement with the stem of the valve 31, to enable said valve to act as a "pressure-dividing valve" at the proper time. Water enters the lower ram-chamber through passages 29, 30, and 26, raising the lower ram, producing compression in the mold-cavity. As soon as the pressure is equal in said passages and chamber valve 31 (see Figs. 3 and 5) will close automatically and allow only high pressure to enter lower ram-chamber until said lower ram-chamber is relieved of high pressure. If valve 20 is not held down forcibly, pressure will enter the upper ram-chamber through side pipe connection 16, thus producing bricks made in the ordinary way; but if valve 20 is held down forcibly, as hereinbefore described, water-pressure passing through side pipe will enter upper ram-chamber only when sufficient pressure has been produced in the lower ram-chamber to overcome the resistance of the controlling-valve 20 and its weighted connections. The final pressure in the upper ram-chamber is thereby governed so that the material being compressed will receive three distinct pressures, to wit: first, initial pressure from the top ram; second, pressure from the bottom ram, and, third, simultaneous pressure from both top and bottom rams. The lower ram in its upward movements imparts a rocking movement to the rock-shaft 54 and 59 (see Figs. 1, 2, and 6) to effect the following results: first, by means of sector-arm 63, pinion 143, chain and pulleys 140, 141, and 142, (see Figs. 1, 21, and 22,) to draw down the guide-wedge 136 139; second, by means of its arm 61, raises the valve 31 into engagement with the locking spring-latch 96, (see Fig. 16;) third, by means of its arm 60 and slotted link 94, to partially close or throttle the inlet-valve 32; fourth, when near the end of its stroke, by means of its arm 62′ and slotted link 124, (see Figs. 1 and 17,) to reverse the valves 121 and 122 and cause the auxiliary cylinder 38 to raise the upper ram, and, fifth, by means of the arm 62 and slotted adjustable link 109, (see Fig. 10,) lifts the valve-lever 108 into engagement with the spring-latch 112. The upper ram in its continued downward movement, by means of the rock-shaft 48, arm 53, chain-and-pulley connections 137 138, adjustable rod 132, (see Figs. 1, 21, and 22,) draws the weight 130 upward, so that when the desired thickness of the bricks has been reached the wedge 139 and spring-hooks 134 will be brought together to disengage and release the weight 130, that then drops to depress the valve-lever 131 and reverse the valves 128 and 129 of the hydraulic cylinder 85 and allows water to escape therefrom. The plunger 84 then descends and permits a downward movement of the weighted connections of the valves 18 and 20 to pull the relief-valve 18 open and afford additional weight to hold the controlling-valve 20 closed. The relief-valve 18 (see Figs. 18 and 19) being open and controlling-valve 20 closed, both rams will move upward together, water escaping from the upper ram-cylinder through relief-valve 18 and none entering through valve 20, the inlet and outlet valve 23 opening at the proper time to admit of a freer discharge from the upper ram-chamber. The upper ram as it moves upward re-engages the weight 130 with the rod 132 ready for a succeeding next operation.

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 16, and an independently-moving loaded controlling-valve 20, operating automatically to admit pressure to the upper ram-cylinder when a predetermined pressure is attained in the lower ram-cylinder, substantially as set forth.

2. In a hydraulic brick-press, the combina-

tion of the upper and lower rams and their respective cylinders, a connecting-pipe 16 between said cylinders, an independently-moving loaded controlling-valve 20, and a loading and unloading attachment for said valve, adapted to automatically change the amount of load upon said valve while the same is held closed, 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 16, with the relief-valve 18 and controlling-valve 20, arranged independent of each other, and weighted connections adapted to pull the relief-valve 18 open and hold the controlling-valve 20 closed, 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 16, relief-valves 18, controlling-valve 20, said valves being arranged independent of each other, weighted connections to the valves, and a hydraulic cylinder and plunger 84 85, adapted to push the weighted connections upward to close the relief-valve 18 and reduce the maximum load by which the controlling-valve 20 is held closed, substantially as set forth.

5. In a hydraulic brick-press, the combination, with the upper ram and ram-cylinder, passages 15 and 21, of the combined inlet and outlet valve 23, having an intermittent operative connection with the upper ram, substantially as set forth.

6. In a hydraulic brick-press, the combination, with the upper ram and ram-cylinder, passage 15, and storage-tank 17, of the independently-arranged combined suction and check valve 24, substantially as set forth.

7. In a hydraulic brick-press, the combination of the upper ram and ram-cylinder, the combined inlet and outlet valve 23, combined suction and check valve 24 in the passage 15, and the valve 23, having an intermittent operative connection with the upper ram, substantially as set forth.

8. In a hydraulic brick-press, the combination of the upper ram and ram-cylinder, passages 15 21, combined inlet and outlet valve 23, stem 73, collar 74, and arm 72, carried by the upper ram, substantially as set forth.

9. In a hydraulic brick-press, the combination of the upper ram-plunger 10, auxiliary raising-cylinder 38, and tie-rods 37, connecting the two together, essentially as set forth.

10. In a hydraulic brick-press, the combination of the upper ram-plunger 10, auxiliary raising-cylinder having its lower annular chamber in constant communication with low-pressure accumulator, and tie-rods connecting the auxiliary cylinder and plunger 10 together, essentially as set forth.

11. In a hydraulic brick-press, the combination of the upper ram-plunger, the auxiliary raising-cylinder 38, the upper chamber 42 of which is in communication, through its hollow piston, with a valve-chamber 115, a pair of valves 121 122 in said chamber, controlling the pressure-supply to the upper chamber of the auxiliary cylinder, and tie-rods 37, connecting the auxiliary cylinder 38 and upper ram-plunger 10 together, substantially as set forth.

12. In a hydraulic brick-press, the combination of the upper ram-plunger 10, auxiliary raising-cylinder 38, stationary piston 39, having ports 40 and 41, connected, respectively, with chambers 42 and 43, substantially as set forth.

13. In a hydraulic brick-press, the combination, with the auxiliary raising-cylinder 38, for the upper ram or plunger 10, of the valve-casing 115, valves 121 and 122, connected together by a valve-lever 123, and a slotted link 124 for operating the same, substantially as set forth.

14. In a hydraulic brick-press, the combination, with the auxiliary raising-cylinder 38 for the upper ram or plunger 10, of the valve-casing 115, valves 121 and 122, connected together by a valve-lever 123, slotted link 124, actuating arm 62′, operated by lower ram connections, substantially as set forth.

15. In a hydraulic brick-press, the combination, with the auxiliary raising-cylinder 38 for the upper ram or plunger 10, of the valve-casing 115, valves 121 and 122, connected together by a weighted lever 123, spring-latch 125, and operating-tappet 70, substantially as set forth.

16. In a hydraulic brick-press, the combination, with the auxiliary raising-cylinder 38 for the upper ram or plunger 10, of the valve-casing 115, valves 121 and 122, connected together by a weighted lever 123, spring-latch 125, operating-tappet 70, slotted link 124, and actuating-arm 62′, operated by the lower ram connections, substantially as set forth.

17. In a hydraulic brick-press, the combination of the auxiliary raising-cylinder 38, rock-shaft 48, arm 50, connected to and receiving motion from the cylinder 38, arm 52, link 113, and sliding block 114, adapted to release the valve mechanism of the charger, substantially as set forth.

18. In a hydraulic brick-press, the combination of the auxiliary raising-cylinder 38, rock-shaft 48, arm 50, connected to and receiving motion from the cylinder 38, arm 51, and link 92, adapted to operate the lever 91 of the inlet-valve 32 of the lower ram-cylinder, substantially as set forth.

19. In a hydraulic brick-press, the combination of the auxiliary raising-cylinder 38, rock-shaft 48, arm 50, connected to and receiving motion from the cylinder 38, arm 53, chain and pulley connections 137 138, rod 132, and drop-weight 130, adapted to operate the valve mechanism for controlling and relief valves of the upper ram-cylinder, substantially as set forth.

20. The combination, with a hydraulic brick-press, of the pressure-chamber 152, plunger

153, cushion 154, pointer 155, adjustable fulcrum 156, and an electric alarm, substantially as set forth.

21. The combination, with a hydraulic brick-press, of the pressure-chamber 152, plunger 153, cushion 154, pointer 155, adjustable fulcrum 156, and a series of electric alarms 157, 158, and 159, substantially as set forth.

22. In a hydraulic brick-press, the combination of the reciprocating clay-charger 100, imparting intermittent motion to the rock-shaft 64, arm 67, cam 68, and weighted lever adapted to operate the outlet-valve 34 of the lower ram-chamber, substantially as set forth.

23. In a hydraulic brick-press, the combination of the reciprocating clay-charger 100, imparting intermittent motion to the rock-shaft 64, arm 67, cam 69, adapted to operate the valve-lever 91 of the inlet-valve 32 of lower ram-chamber, substantially as set forth.

24. In a hydraulic brick-press, the combination of the reciprocating clay-charger 100, imparting intermittent motion to the rock-shaft 64, arm 67, and tappet 70, adapted to release the spring-latch 125 of the valve mechanism of the auxiliary cylinder 38, substantially as set forth.

25. In a hydraulic brick-press, the combination, with the vertically-adjustable stop 144, of the chain-and-pulley connections 145, 146, and 147, and the vertical hand-wheel shaft 148, substantially as set forth.

26. In a hydraulic brick-press, the combination, with the vertically-adjustable stop 144, of the chain-pulley and shaft connections 145, 146, 147, 148, 149, the traveling pointer 150, and scale 151, substantially as set forth.

27. In a hydraulic brick-press, the combination of the rock-shaft receiving motion from the lower ram and carrying an arm 60, and slotted link 94, adapted to operate the arm 91 of the inlet-valve 32 to lower ram-chamber.

28. In a hydraulic brick-press, the combination, with the lower ram-cylinder and its high and low pressure inlets 27 and 28 and the inlet-valve 32, of the pressure-dividing valve 31, arranged between the high and low pressure inlets and receiving its opening movement from the lower ram, and a holding-latch for retaining said valve in a raised condition independent of the lower ram, substantially as set forth.

29. In a hydraulic brick-press, the combination, with the lower ram-cylinder and its high and low pressure inlets 27 and 28 and the inlet-valve 32, of the pressure-dividing valve 31, arranged between the high and low pressure inlets, a rock-shaft 59, receiving motion from the lower ram and carrying an arm 61, adapted to raise the pressure-dividing valve, and a holding-latch for retaining said valve in a raised condition independent of the lower ram, substantially as set forth.

30. In a hydraulic brick-press, the combination of the rock-shaft 59, receiving motion from the lower ram and carrying an arm 62', a slotted link 124, adapted to operate the valve mechanism of the auxiliary cylinder 30, so that the same will lift the upper ram, and a latch, as 125, to lock the valve mechanism in such condition, substantially as set forth.

31. In a hydraulic brick-press, the combination of the rock-shaft receiving motion from the lower ram and carrying a sector 63, with the pinion 143, chain-and-pulley connections 140, 141, and 142, and the wedge 139, adapted to release the weight 130 that operates the mechanism of valves 128 and 129, substantially as set forth.

32. In a hydraulic brick-press, the combination of the rock-shaft receiving motion from the lower ram and carrying an arm 62, and slotted link 109, adapted to operate the valve of the charger-cylinder, substantially as set forth.

33. In a hydraulic brick-press, the combination, with the charger-cylinder and its valve 103, of the link 111 and shifting overbalancing device 110, substantially as set forth.

34. In a hydraulic brick-press, the combination, with the charger-cylinder and its valve 103, of the valve-lever 108 and latch 112.

35. In a hydraulic brick-press, the combination of the pressure-dividing valve 31, the arm 61, receiving motion from the lower ram and adapted to raise the pressure-dividing valve, and a spring-latch 96, adapted to hold said valve open, substantially as set forth.

36. In a hydraulic brick-press, the combination of the pressure-dividing valve 31, spring-latch 96, and arm 99, and adjustable link 98, connected to valve-lever 91, substantially as set forth.

37. In a hydraulic brick-press, the combination of the lower ram-plunger 11, tie-rods 44, and pulling-down cylinder 45 in constant communication with the low-pressure accumulator, for the purpose set forth.

38. In a hydraulic brick-press, the combination, with the mechanism of controlling-valve 20, of a suspended weight 130 and a releasing device adapted to move toward each other and controlled in their movements by the upper and lower rams, substantially as set forth.

39. In a hydraulic brick-press, the combination, with the mechanism of the controlling-valve 20 and relief-valve 18, of a suspended weight 130 and a releasing device adapted to move toward each other and controlled in their movements by the upper and lower rams, substantially as set forth.

40. In a hydraulic brick-press, the combination, with the relief-valve 18, of the upper ram-cylinder and its operating-lever 88, a weight 130, a coupling device, as 133 134, and releasing devices, as 139, such devices being controlled in their movements by the movement of the upper and lower rams, substantially as set forth.

41. In a hydraulic brick-press, the combination of the controlling-valve 20 and controlling-weight 75, holding the valve closed, the weighted lever 78, and rod 79, substantially as set forth.

42. In a hydraulic brick-press, the combination of the controlling-valve 20 and controlling-weight 75, holding the valve closed, the weighted lever 78, rod 79, and hydraulic cylinder and plunger 84 and 85, substantially as set forth.

43. In a hydraulic brick-press, the combination of the relief-valve 18, valve-lever 88, and hydraulic cylinder and plunger 84 85, substantially as set forth.

44. In a hydraulic brick-press, the combination of the relief-valve 18, valve-lever 88, connecting-link 87, and weighted lever 86, substantially as set forth.

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

JULIUS J. KOCH.

Witnesses:
ROBERT BURNS,
CHRISTOPHER C. COWEN.