No. 661,864. Patented Nov. 13, 1900.

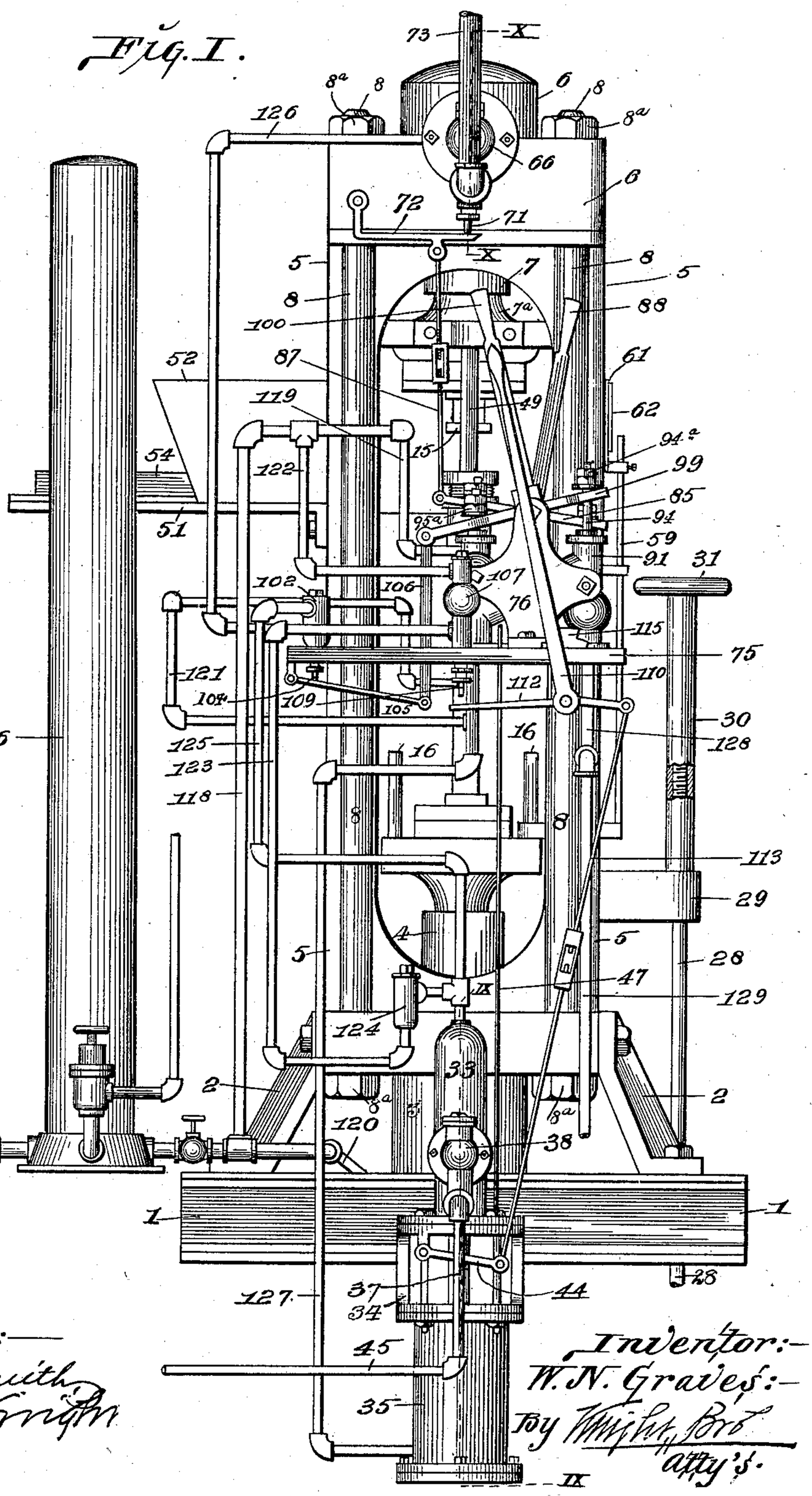
W. N. GRAVES.

HYDRAULIC BRICK MACHINE.

(Application filed Apr. 30, 1900.)

(No Model.) 7 Sheets—Sheet 1.

Fig. 1.



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E. S. Knight

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W. N. Graves:—
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atty's.

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Fig. II:

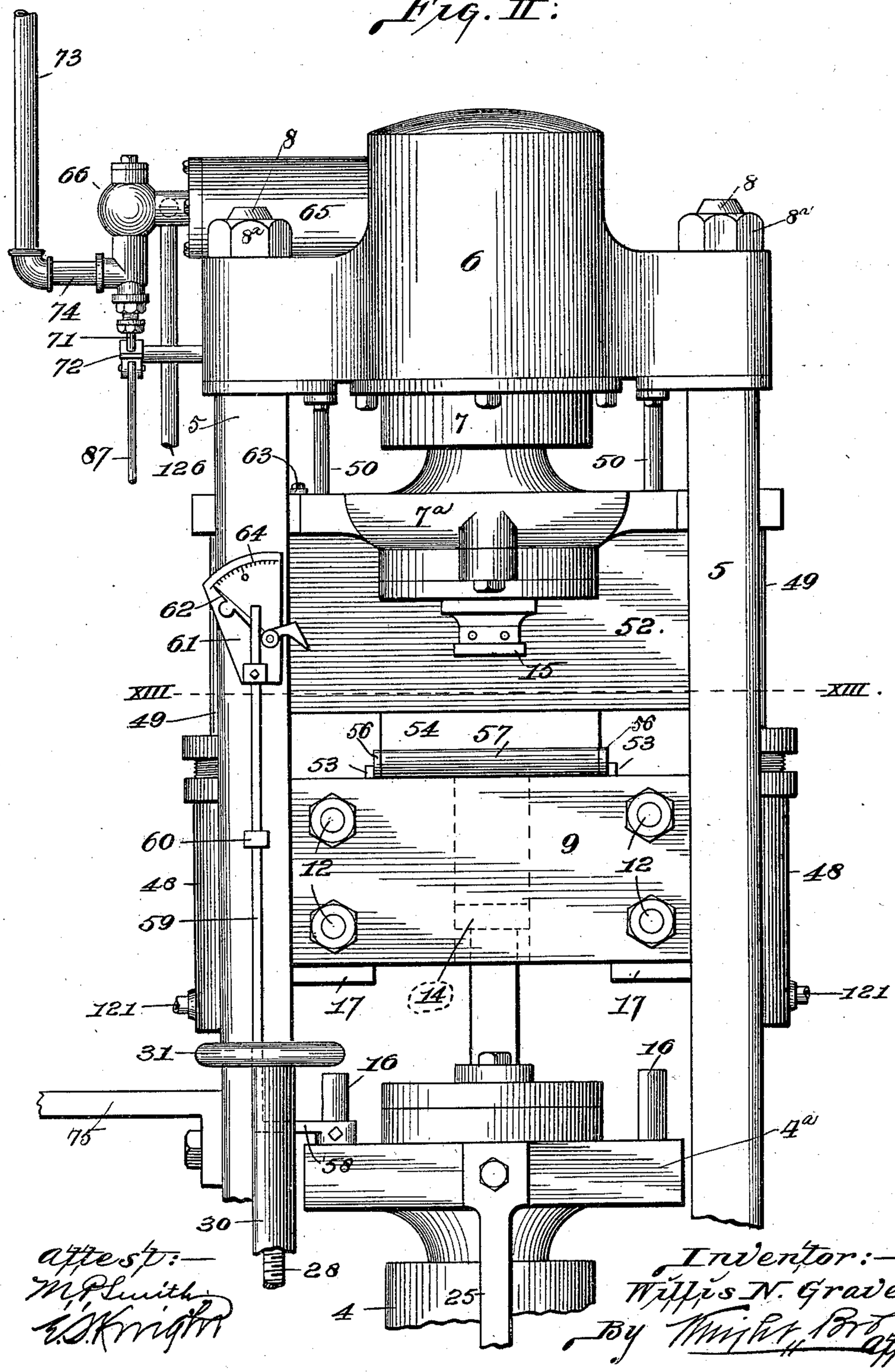

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Fig. III.

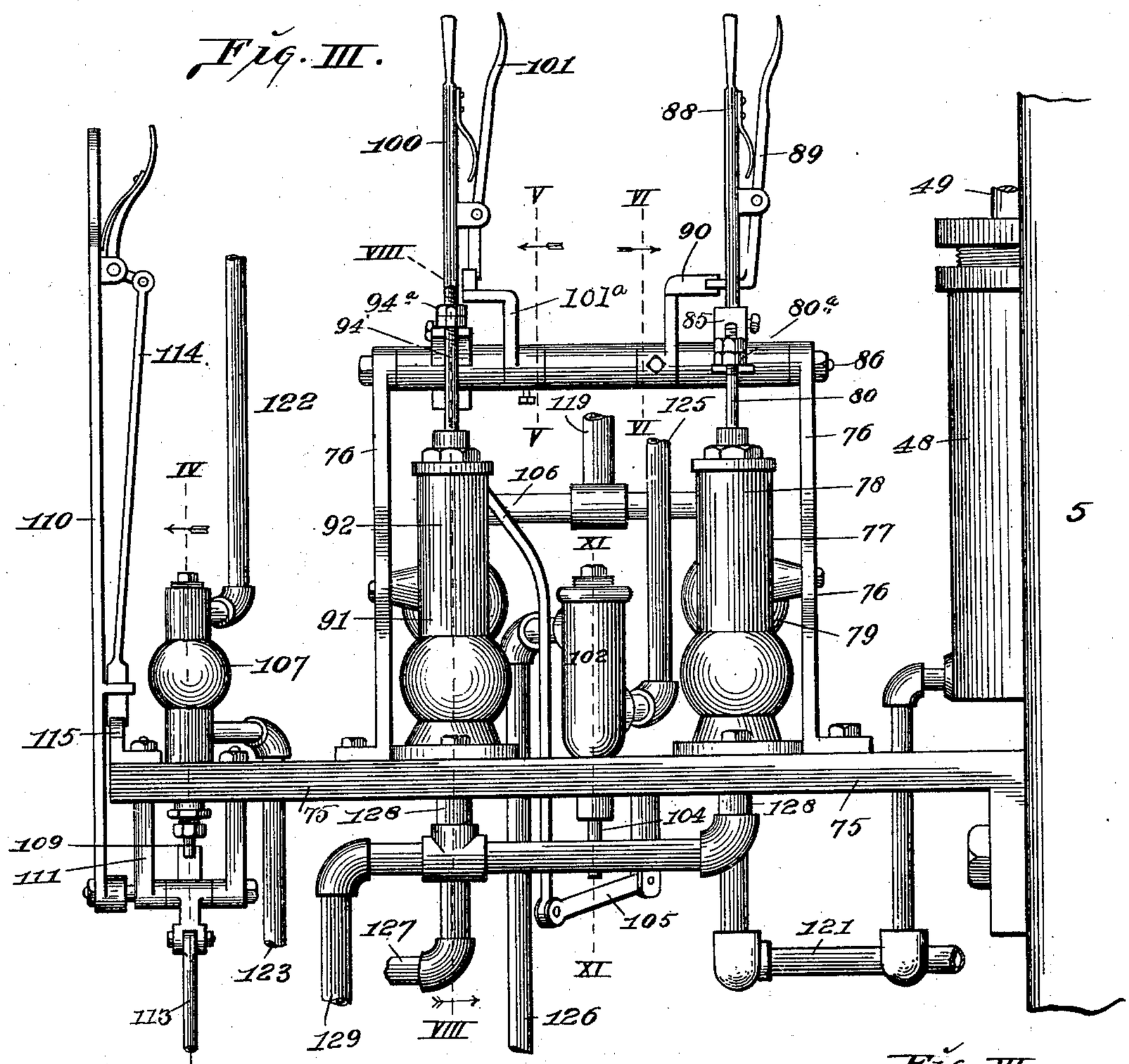


Fig. V.

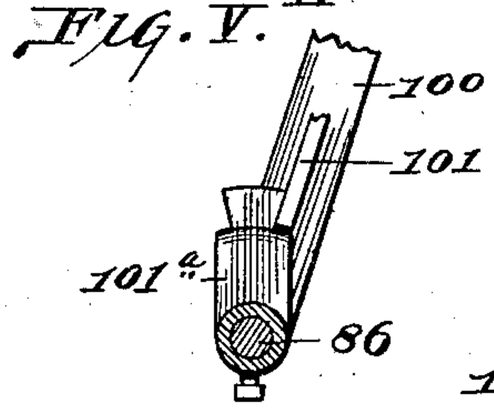


Fig. IV.

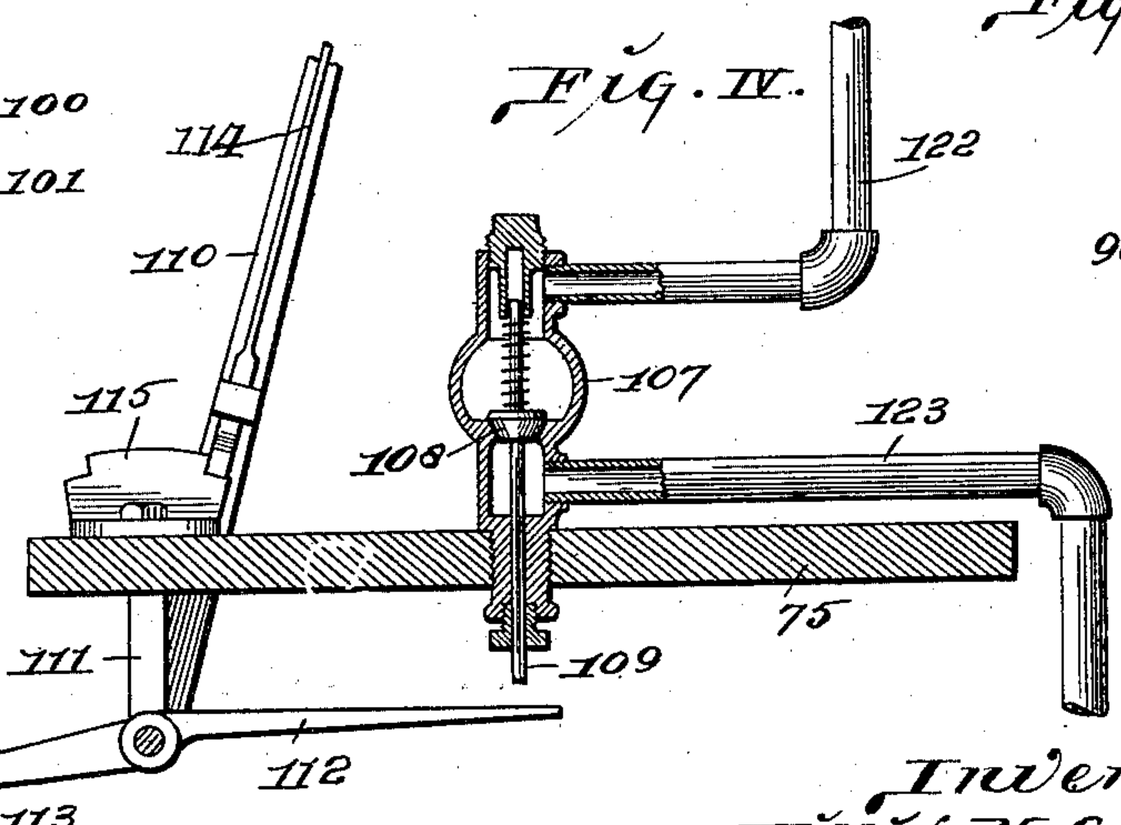
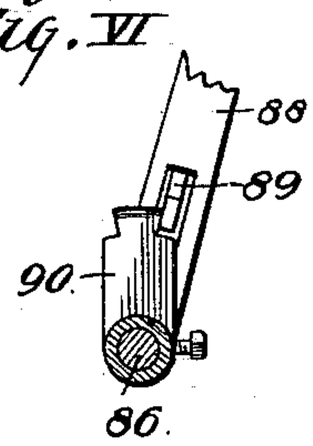


Fig. VI.



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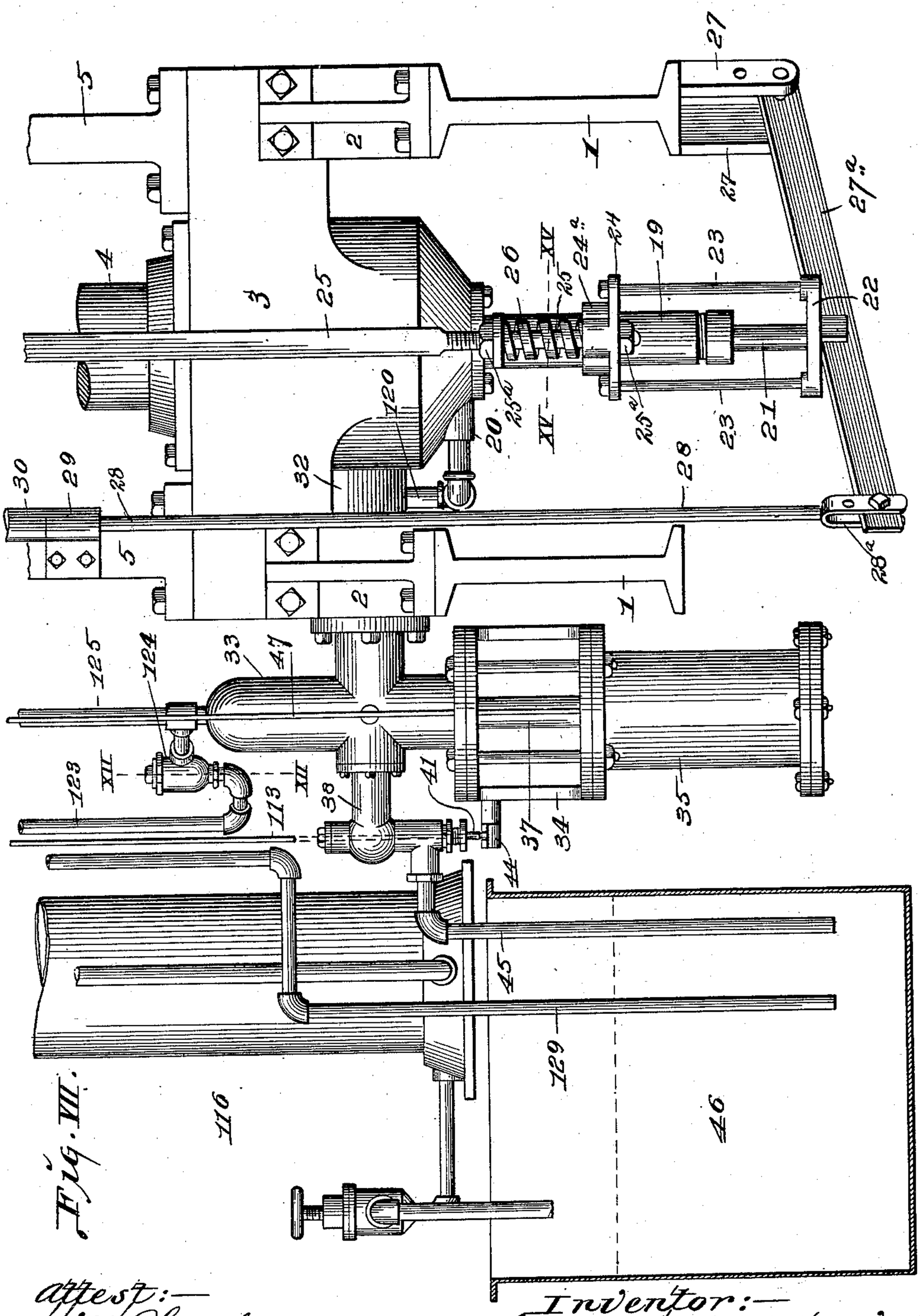

Fig. VII.

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(No Model.) 7 Sheets—Sheet 5.

Fig. VIII

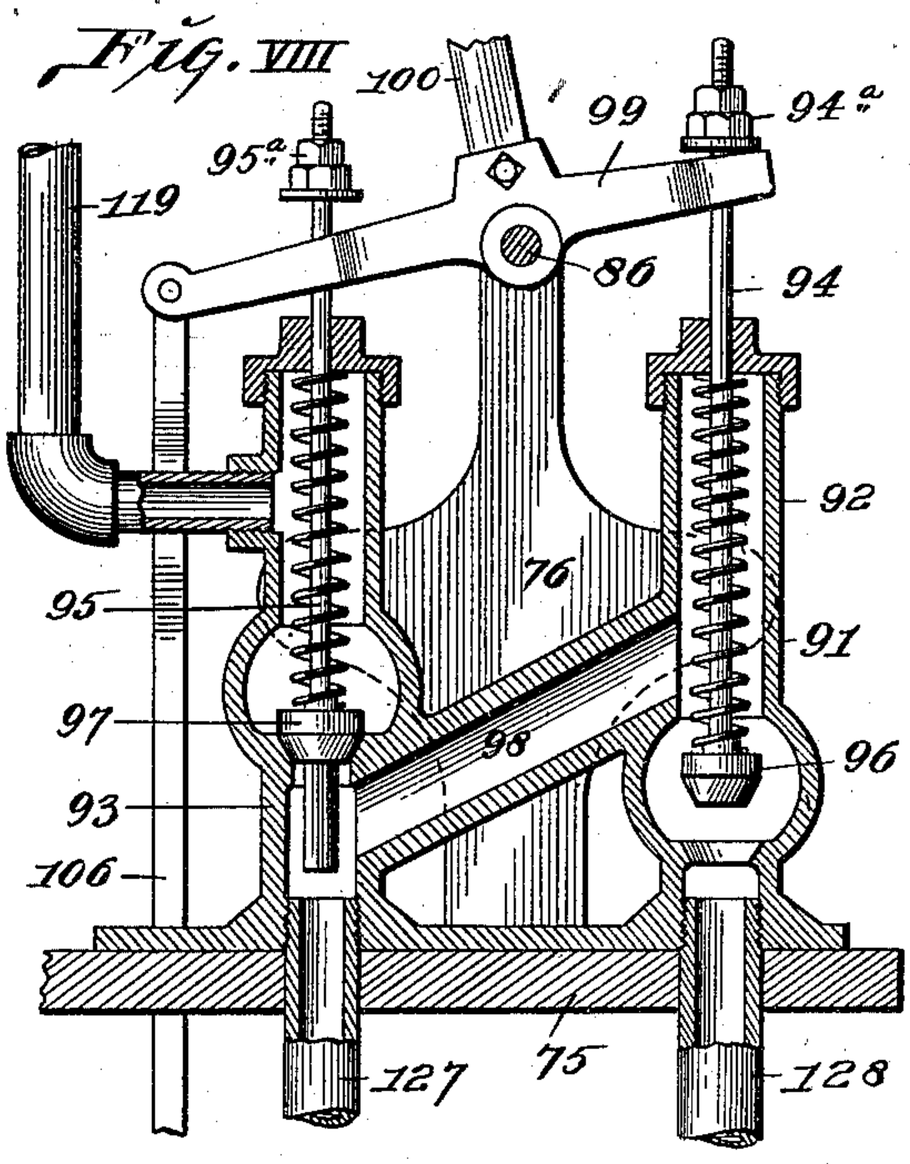


Fig. IX.

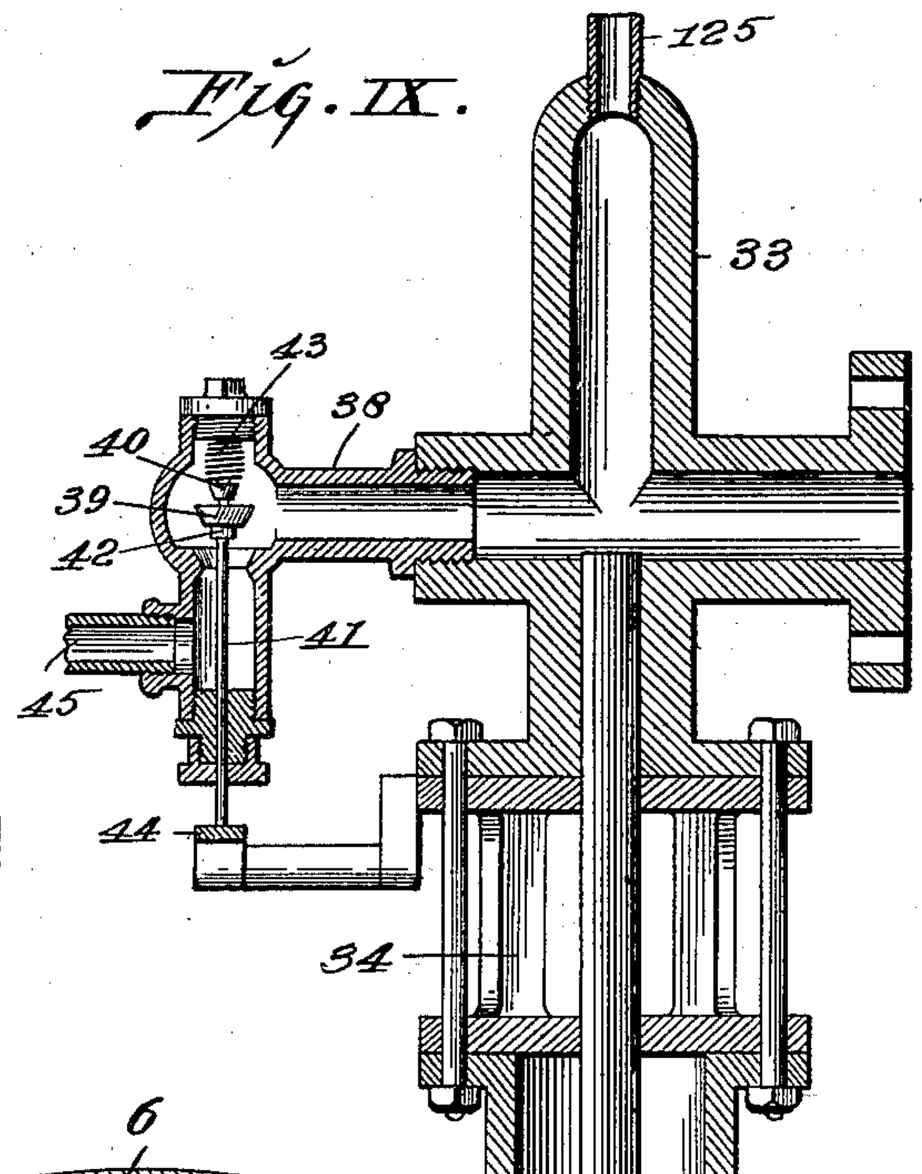


Fig. X.

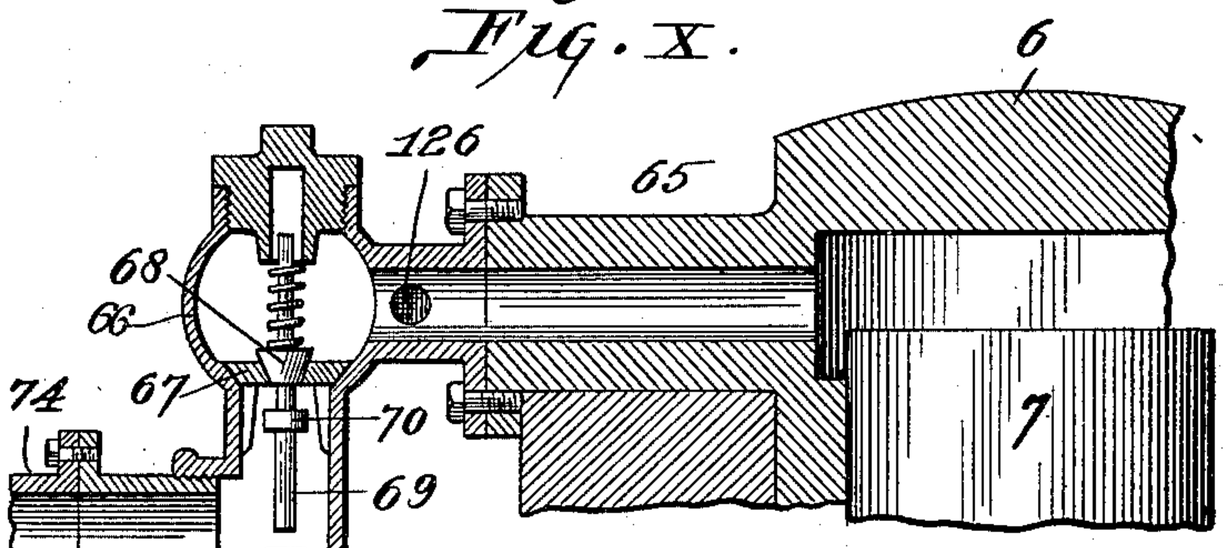


Fig. XII.

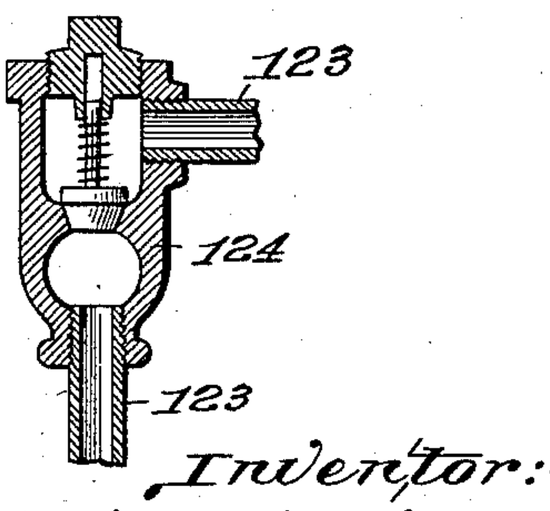
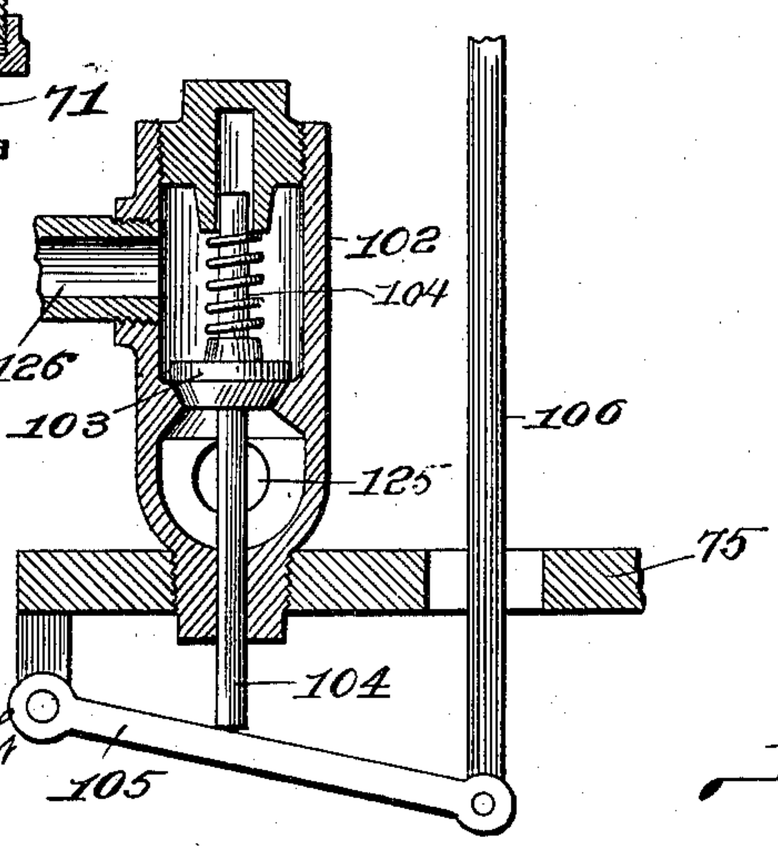


Fig. XI.



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No. 661,864. Patented Nov. 13, 1900.

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Fig. XIII.

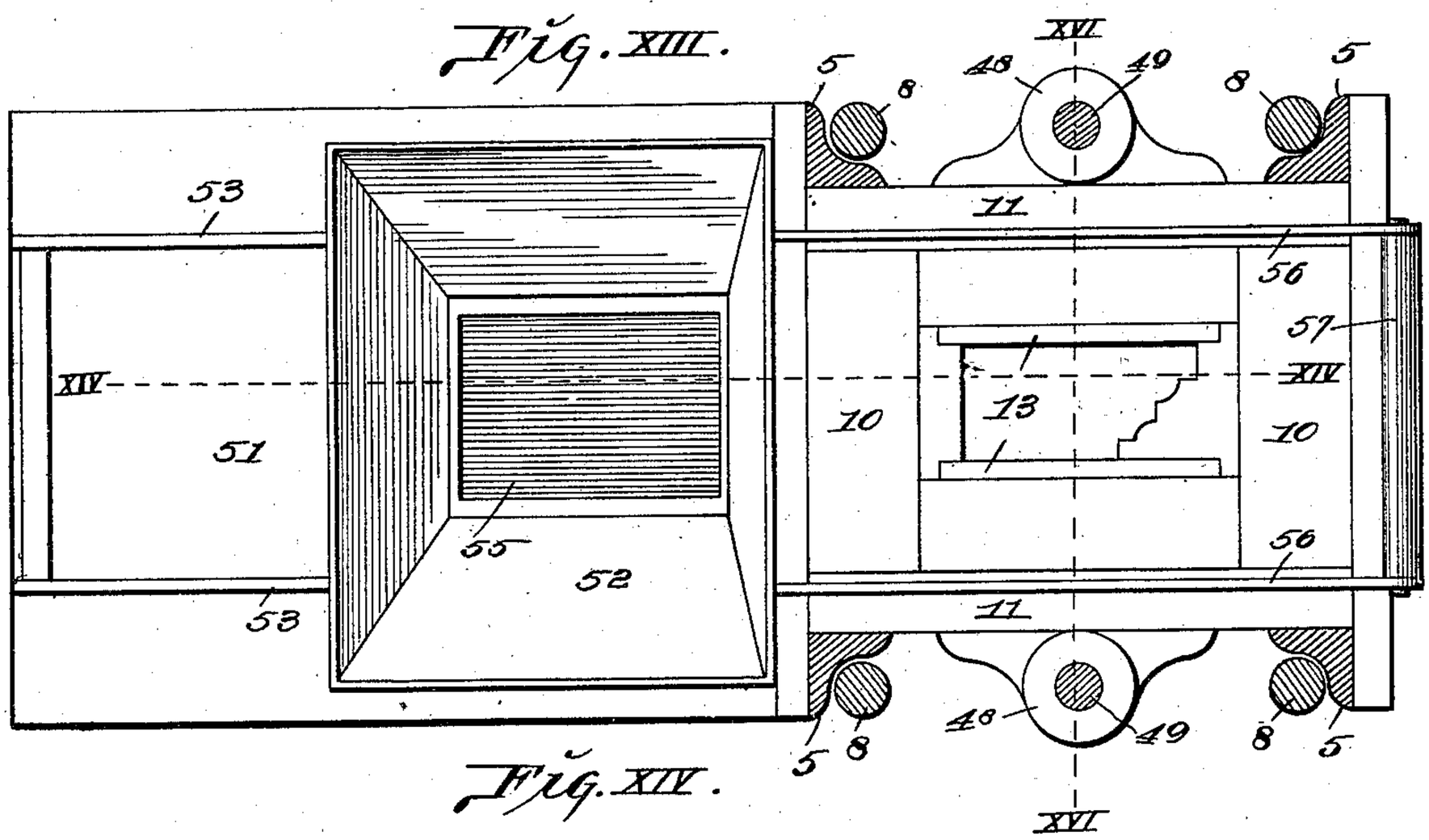


Fig. XIV.

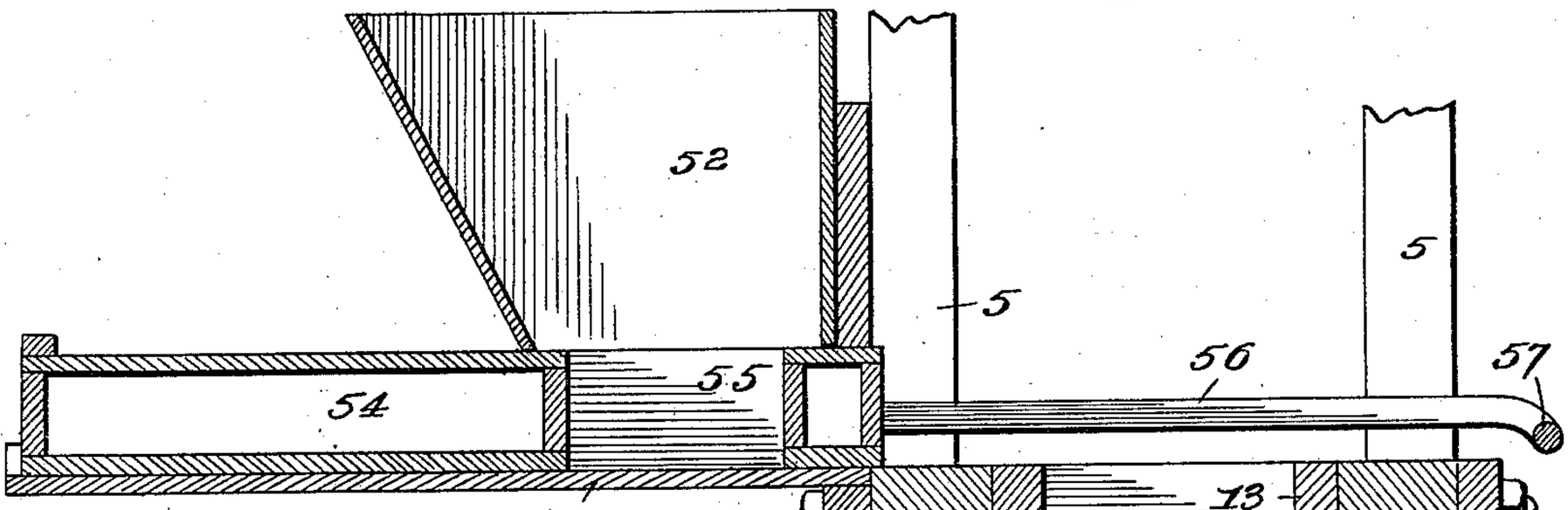


Fig. XV.

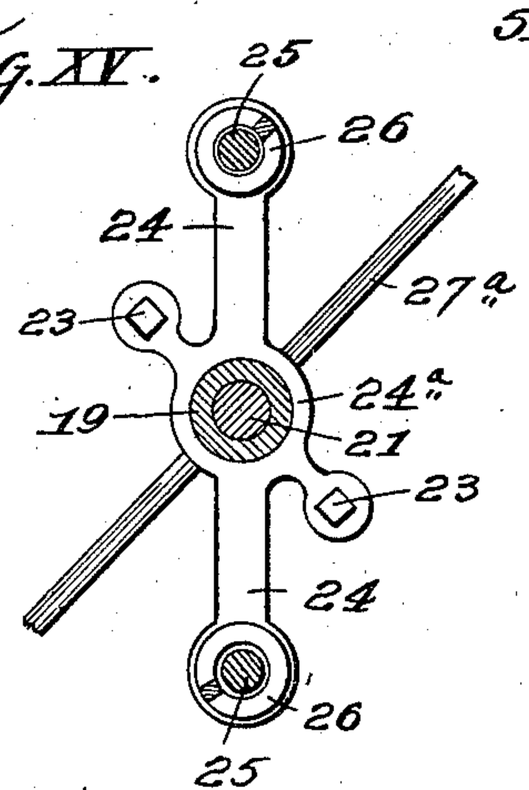
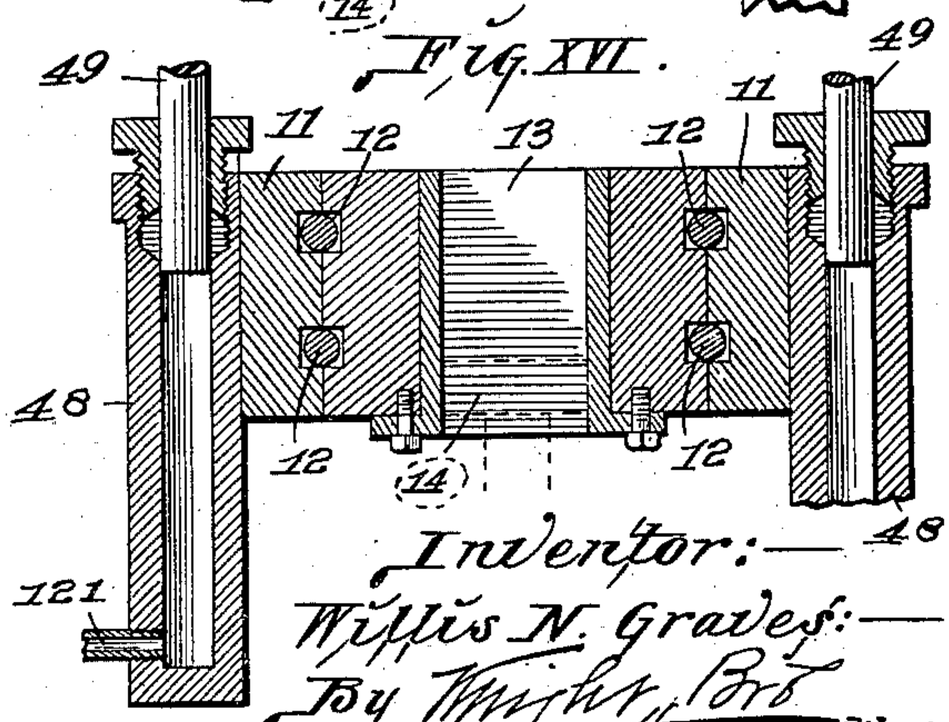


Fig. XVI.



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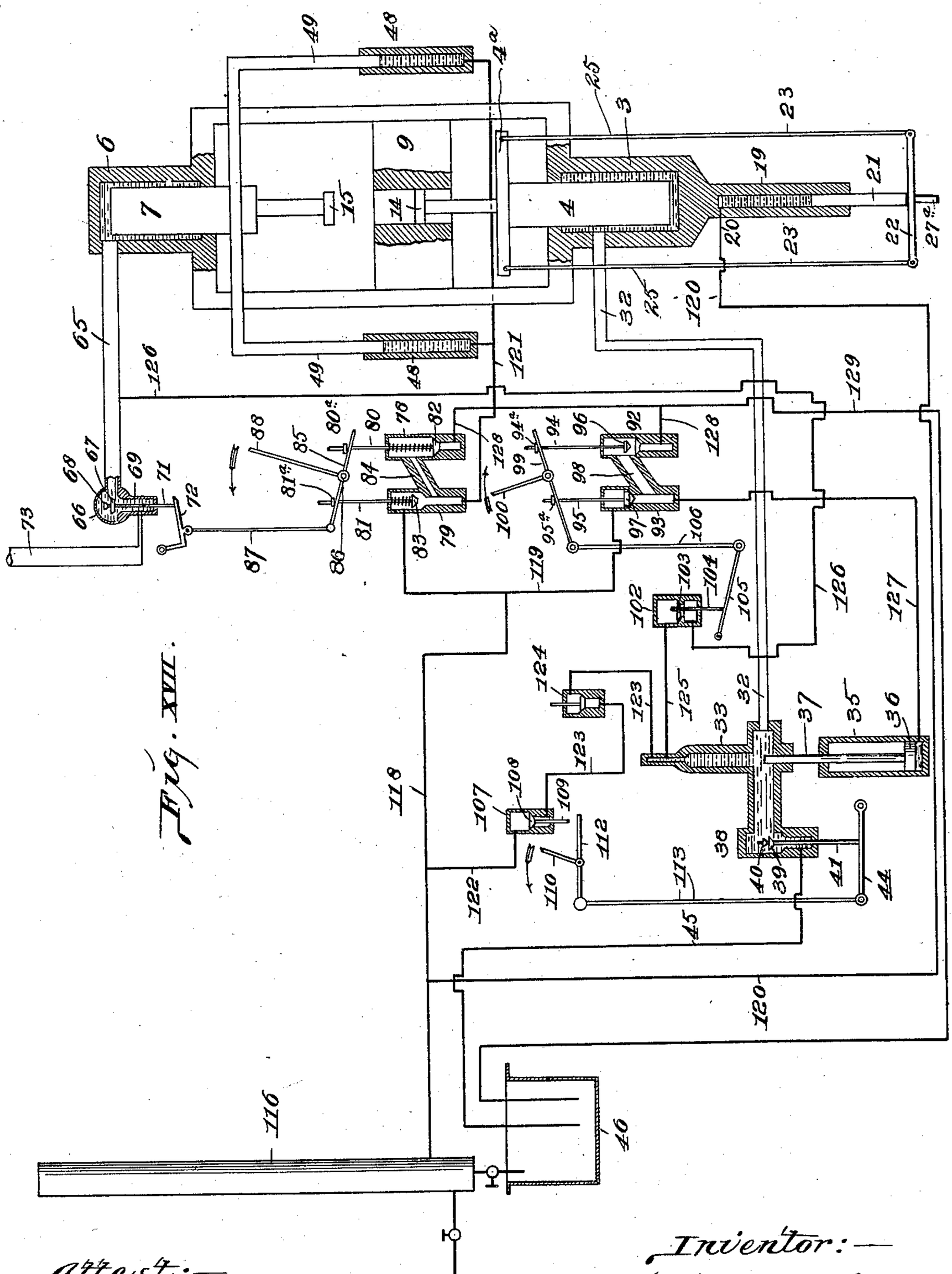

Fig. XIII.

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UNITED STATES PATENT OFFICE.

WILLIS N. GRAVES, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE HYDRAULIC-PRESS BRICK COMPANY, OF SAME PLACE.

HYDRAULIC BRICK-MACHINE.

SPECIFICATION forming part of Letters Patent No. 661,864, dated November 13, 1900.

Application filed April 30, 1900. Serial No. 14,906. (No model.)

To all whom it may concern:

Be it known that I, WILLIS N. GRAVES, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Hydraulic Brick-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

In the manufacture of bricks by hydraulic machines small orders for fancy bricks or bricks of ornamental shapes are frequently received, and to shut down such a machine, which represents the expenditure of considerable capital, while changing the dies and molds to fill such small orders, incurs an expense which is frequently more than the entire amount received for the order.

The object of my invention is to make a comparatively inexpensive hydraulic machine for filling such small orders and which if allowed to stand idle between the receipts of orders the loss entailed is slight compared with the loss that would be incurred by allowing a hydraulic machine such as is now in use to remain idle, as the amount of capital involved is very much less. In order to thus make a comparatively inexpensive hydraulic machine, I depart from the practice heretofore followed of having the valves operate automatically, and I arrange the valves to be operated manually, but in doing this I maintain the high pressure and the other desirable characteristics of a hydraulic machine.

My invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a side elevation of my improved brick-machine. Fig. II is a front elevation of the upper portion of the machine. Fig. III is a front elevation of a plate or table on which a number of valves and actuating-levers are mounted. Fig. IV is a vertical transverse section taken on line IV IV, Fig. III. Fig. V is a detail section taken on line V V, Fig. III. Fig. VI is a detail section taken on line VI VI, Fig. III. Fig. VII is a front elevation of the lower portion of the machine. Fig. VIII is a vertical section of a pair of double valves made use of in my improved machine, taken on line VIII VIII, Fig. III. Fig. IX is an enlarged vertical section taken on line IX IX, Fig. I. Fig. X is an enlarged detail vertical section taken on line X X, Fig. I. Fig. XI is an enlarged vertical section taken on line XI XI, Fig. III. Fig. XII is an enlarged vertical section taken on line XII XII, Fig. VII. Fig. XIII is a horizontal section taken on line XIII XIII, Fig. II. Fig. XIV is a vertical section taken on line XIV XIV, Fig. XIII. Fig. XV is a horizontal section taken on line XV XV, Fig. VII. Fig. XVI is a transverse section taken on line XVI XVI, Fig. XIII. Fig. XVII is a diagrammatic view illustrating the operation of the machine, showing the general arrangement of the parts without reference to their detail construction.

Referring by numerals to the accompanying drawings, 1 1 indicate a pair of beams, Figs. I and VII, which are held in a fixed position in any suitable manner and which serve as a base for the framework of the machine. Fixed to and extending upwardly from each beam is a pair of brackets 2, (see Figs. I and VII,) that support a vertically-arranged lower cylinder 3, in which operates the piston 4 of the lower ram. Extending upwardly from this lower cylinder are four upright angle-bar posts 5, the upper ends of which support an upper cylinder 6, in which operates the piston 7 of the upper ram. Tie-rods 8, which are arranged in the angles of the post 5, are provided on their ends with nuts 8^a and serve to rigidly hold the frame together and to receive the greater portion of the strain while the rams are under pressure.

A mold 9, comprising end pieces 10 and side pieces 11, held together by the bolts 12, is movably positioned in the upright frame between the rams. Located in this mold is a lining 13, which is removable in order that different linings may be positioned in the mold to make any configuration of brick that may be desired. The lower ram is provided with a removable die 14, (see Fig. II,) which must necessarily correspond with the form of the lining within the mold 9, and the upper ram carries a corresponding removable die 15. The body 4^a of the lower ram carries pins 16, which engage against stop-plates 17 on the under side of the mold 9 to limit the

upward movement of said lower ram. Depending from the under side of the lower cylinder 3 is a small auxiliary cylinder 19, (see Figs. VII and XVII,) the inlet thereto being at the upper end through a tubular connection 20. Operating in this auxiliary cylinder 19 is a piston 21, the lower end of which extends below the auxiliary cylinder and bears upon a bar 22. This bar is connected by rods 23 to a cross-head 24, which is provided at its center with a sleeve 24ª, that slides upon the auxiliary cylinder 19. Secured to the front and rear faces of the body 4ª of the lower ram are the upper ends of connecting-rods 25, the lower ends of which pass through the ends of the cross-head 24. Nuts 25ª are located on the ends of these rods, above and below the cross-head, and interposed between the cross-head and the nuts above the same are coil-springs 26. These springs receive any jar resulting from a sudden downward movement of the lower ram.

Pivoted between ears 27, that depend from one of the beams 1, is a lever-beam 27ª, upon the center of which bears the bar 22, and detachably secured to the forward end of this beam is the forked lower end 28ª of a rod 28. This rod extends upwardly through a bearing 29, fixed to the frame of the machine, the portion of said rod above the bearing being screw-threaded and engaging in an interiorly-screw-threaded sleeve 30, that is provided on its upper end with a hand-wheel 31. (See Fig. II.) The ears 27 and the fork at the lower end 28ª of the rod 28 are provided with a plurality of apertures to permit of the lever-beam 27ª being held at different elevations, this adjustment, together with the sleeve 30, operating on the upper end of the rod 28, determining the normal position of the lower ram and necessarily the position of the lower die 14 in the mold 9.

Formed integral with and projecting laterally from the lower cylinder 3 is a tubular projection 32, to the outer end of which is bolted a flanged extension of a vertically-arranged upper cylinder 33 (see Fig. VII) of the high-pressure pump. To the lower end of this upper cylinder is secured a skeleton frame 34, beneath which is bolted a lower cylder 35 of greater diameter than the upper cylinder 33. A piston 36 (see Fig. IX) operates within the lower cylinder 35, and the stem 37 of said piston passes upwardly into the upper cylinder 33, acting as a piston therein. The chamber within the cylinder 33 is slightly larger in diameter than is the stem 37. By this construction the pressure entering beneath and elevating the piston 36 will be multiplied within the upper cylinder 33 as the stem 37 rises therein.

A valve-casing 38 is secured to the upper cylinder 33 directly opposite from the point where said upper cylinder joins the tubular projection 32, and constructed to rest upon the seat within said valve-casing is a valve 39, in the center of which is a small valve 40. This small valve is carried by a stem 41, which extends downwardly through the casing 38, there being a collar 42 on said stem a short distance below the large valve when the latter is seated, and a spring 43 is interposed between the upper end of the stem 41 and the plug in the top of the valve-casing. Immediately beneath the valve-stem 41 and arranged to bear thereagainst is a short lever 44, (see Fig. I,) the rear end of which is pivoted to the skeleton frame 34. A pipe 45 leads from the chamber in the valve-casing 38 below the valve to a suitably-located tank 46. (See Figs. VII and XVII.)

Carried by the piston 36 and extending upwardly through the skeleton frame 34 is a rod 47, (see Figs. I and IX,) which is for the purpose of indicating the movement of said piston.

Arranged at the sides of the mold (see Fig. XVI) are small cylinders 48, in which operate the pistons 49, the upper ends of which are detachably secured to the sides of the body 7ª of the upper ram. (See Fig. II.) Pressure within these auxiliary cylinders 48 beneath the pistons causes the upper ram to ascend to its limit of movement, and the pistons also serve as guides for the vertical movement of the upper ram and die carried thereby. The upward movement of this upper ram is limited by the stop-pins 50, depending from the body of the upper cylinder 6. Extending rearwardly from the mold is a table 51, immediately above the forward end of which is a hopper 52. (See Fig. XIV.) Arranged to slide between guide-strips 53 on the table is a box 54, in the forward portion of which is a pocket 55, that is normally positioned immediately beneath the hopper. Fixed to the sides of the box and extending forwardly over the mold is a pair of straps 56, joined at their forward ends by a handle 57.

The box 54 constitutes the charger of the machine and fills the space between the table 51 and the hopper 52, and at the time said box is drawn forward by the handle 57 to discharge the clay from the pocket 55 into the mold the rear portion of the box acts as a cut-off for the lower end of the hopper. Secured to one of the pins 16 (see Fig. II) and projecting laterally therefrom is an arm 58, which has fixed to its outer end an upright rod 59, the same sliding through a bearing 60 on one of the uprights 5 and carrying on its upper end a vertically-adjustable plate 61. Pivoted to the face of this plate is a bell-crank lever 62, the longer arm of which serves as an indicating-finger, while the shorter horizontal arm projects laterally into the path of travel of a finger 63, carried by the body of the upper ram. The indicating-finger of the bell-crank lever 62 is weighted, and at the outer end of said finger, on the face of the plate 61, is a scale or series of graduated marks 64.

Formed integral with and projecting laterally from the upper portion of the upper cylinder 6 is a tubular extension 65, to the outer end of which is secured a valve-casing 66. (See Figs. II and X.) Constructed to fit on the seat within this casing is a valve 67, provided with downwardly-extending guide-wings, and in the center of said valve 67 is a small valve 68. This small valve is carried by a spring-actuated upper stem 69, that extends downwardly within the valve-casing and is provided a short distance below said small valve with a collar 70. Operating through the lower portion of the valve-casing is a second lower stem 71, which is arranged to engage the upper stem 69, said second lower stem 71 normally resting upon a lever 72, that is pivoted to the body of the upper cylinder 6. (See Figs. I and II.) A stand-pipe 73 is connected at its lower end by a short pipe 74 to the chamber, below the valve in the casing 66.

Secured to the frame of the machine a short distance below the mold and extending outwardly is a table or shelf 75, (see Fig. III,) upon which are located certain valves and operating-levers, now to be described. Fixed to and extending upwardly from the table is a pair of brackets 76, adjacent to the right-hand one of which is located a double valve-casing 77. This casing comprises a pair of vertically-arranged front and rear cylinders 78 and 79, (see Fig. XVII,) in the upper ends of which operate, respectively, the spring-actuated valve-stems 80 and 81, carrying the valves 82 and 83. A tubular portion 84 of the casing 77 affords communication from the chamber above the valve 82 to the chamber below the valve 83. The upper ends of the valve-stems 80 and 81 pass through the ends of a lever 85, that is journaled at its center upon a rod 86, the ends of which are seated in the upper portions of the brackets 76. Nuts 80^a and 81^a are located on the upper ends of the stems 80 and 81 above the lever 85. To the rear end of this lever 85, that is extended beyond the stem 81, is pivotally connected the lower end of a rod 87, (see Figs. I and XVII,) the upper end of which is connected to the lever 72, the latter controlling the valves 67 and 68. An operating-handle 88 extends upwardly from the center of the lever 85 and carries a locking-latch 89, the lower end of which engages on either side of a small segment 90, fixed to the rod 86. (See Figs. III and VI.) The handle 88 normally stands in a forward position, during which time the valve 82 is closed and the valves 83, 67, and 68 are open, as shown in Fig. XVII. A second valve-casing 91, (see Figs. VIII and XVII,) identical in size and construction with the other valve-casing 77, is arranged adjacent to the left-hand bracket 76, said casing 91 being provided with the front and rear cylinders or tubular members 92 and 93, in which operate the spring-actuated valve-stems 94 and 95, carrying on their lower ends the valves 96 and 97. The parts 92 and 93 are connected by a passage-way 98. The upper ends of the valve-stems 94 and 95 extend upwardly through a lever 99, that is journaled on the rod 86, and nuts 94^a and 95^a are positioned on said valve-stems above the lever 99. An operating-handle 100 extends upwardly from the center of the lever 99, and the lower end of a spring-actuated locking-latch 101, carried by said handle, engages the notches of a small segment 101^a, carried by the rod 86. (See Fig. V.) Seated in the table 75, between and to the rear of the pairs of double valves, is a valve-casing 102, (see Figs. III and XI,) in which operates a valve 103, carried by a spring-actuated stem 104, that extends downwardly through the valve-casing and the table. A lever 105 is pivoted at one end beneath the table 75 in such a position as that it will engage the valve-stem 104 when moved upwardly, and connected to the forward end of this lever 105 is the lower end of a rod 106, which extends upwardly through the table and is connected to the extended rear end of the lever 99. (See Fig. VIII.) The handle 100 of this lever 99 being normally in a rearward position the valve 96 is open and the valves 97 and 103 closed.

Located adjacent the left-hand end of the table 75 is a valve-casing 107, (see Figs. III and IV,) in which operates a valve 108, carried by a spring-actuated valve-stem 109, the same extending downwardly through the lower end of the casing 107 and the table. An operating-handle 110 is pivotally arranged upon a bracket 111, secured to the table 75, and carries a lever 112, the free end of which is positioned directly beneath the stem 109. The opposite end of this lever is connected to the upper end of a rod 113, the lower end of which is connected to the forward end of the lever 44. (See Figs. I and XVII.) The handle 110 is provided with a locking-latch 114, the lower end of which engages in the notches of a small segment 115, fixed to the edge of the table 75. This handle normally stands in a forward position, with the free end of the lever 112 a short distance away from the lower end of the valve-stem 109, thus allowing the valve to stand in a closed position, the valves 39 and 40, controlled by the lever 44, being normally held open.

Suitably located adjacent to the machine is a pressure-tank 116, containing water which is under low pressure from a suitably-located pump 117. Leading from this tank is a pipe 118, (see Fig. XVII,) which extends direct to the chamber of the rear cylinder 79, above the valve 83 therein, and a branch 119 leads from said pipe 118 to the chamber in the rear cylinder 93, above the valve 97 therein. Extending from the pipe 118 to the tubular connection 20 at the upper end of the small auxiliary cylinder 19 is a pipe 120. A pipe 121 leads from the chamber beneath the valve 83 of the rear cylinder 79 to the lower end of one of the small auxiliary cylinders 48, there be-

ing a branch from said pipe 121 leading to the lower end to the opposite auxiliary cylinder 48. Extending from the pipe 118 to the chamber in the valve-casing 107, above the valve 108 therein, is a pipe 122, and leading from the chamber of said casing 107, below the valve therein, is a pipe 123, in which is located a check-valve 124. (See Figs. I and XVII.) This pipe 123 enters the upper end of the cylinder 33, and leading from said pipe 123 (or from the upper end of the cylinder 33) to the chamber in the casing 102, above the valve 103 therein, is a pipe 125. A pipe 126 extends from the chamber in the casing 102, below the valve 103, to the valve-casing 66 at a point between the valves therein and the tubular projection 65. Leading from the chamber beneath the valve 97 in the rear cylinder 93 to the lower end of the lower cylinder 35 is a pipe 127. Leading from the chambers beneath the valves 82 and 96 in the front cylinders 78 and 92 are short pipes 128, which join a waste or discharge pipe 129, which leads to the tank 46.

The normal positions of the various parts of the machine are as seen in the diagrammatic view. The valve 83 being open, the low pressure from the tank 116 passes through the pipe 118, rear cylinder 79, and pipe 121 into the auxiliary cylinders 48. The pistons 49 on being elevated move the upper piston 7 to its upper limit of movement, and the valves 67 and 68 being held open by the lever 72 the water forced out of the upper cylinder 6 by said upper piston 7 passes through the valve-casing 66 and up into the stand-pipe 73. The normal pressure also passes through the pipe 120 into the auxiliary cylinder 19, holding the piston 21 at its lower limit of movement, and said piston bearing on the bar 22 necessarily holds the lower ram at its lower limit of movement, for the reason that said bar 22 and the body of the lower ram are connected by the rods 23, cross-head 24, and rods 25.

The operator to fill the mold pulls on the handle 57 and draws the same forwardly and by so doing brings the charger 55 of the box 54 into coincidence with the opening in the mold. The clay discharges into the mold and upon the lower die therein, after which the charger is returned to its rearward position. The operator now takes hold of the hand-lever 88, at the same time actuating the latch 89, so as to disengage the lower end thereof from the segment 90, and throws said hand-lever rearwardly in the direction of the arrow. This movement draws the lever 72 away from the stem 71, allowing the valves 67 and 68 to close, and at the same time closing the rear valve 83 and opening the front valve 82. The closing of the rear valve 83 and the opening of the front valve 82 releases the pressure within the auxiliary cylinders 48, whereupon the upper ram and the pistons 49 within said cylinders 48 descend by gravity, thus forcing the water within said auxiliary cylinders out through the pipe 121 into the chamber of the inner cylinder 79 of the casing 77, beneath the valve 83, through the tubular portion 84, past the now open valve 82, and from thence through the pipe 129 to the tank 46. The suction created in the cylinder 6 by the descending piston 7 draws the water from the stand-pipe 73 through the valves 67 and 68, which now act as inlets, into the cylinder 6. When the die 15, carried by the upper ram, rests upon the clay in the mold, said suction ceases and the upper ram ceases in its downward movement and the valves 67 and 68 close by gravity, thus trapping the water within the upper cylinder 6. The operator now takes hold of the hand-lever 110, at the same time disengaging the lower end of the latch 114 from the segment 115, and pulls said hand-lever forwardly in the direction of the arrow. This movement rocks the lever 112, moves the rod 113 downwardly, and drops the lever 44, thus allowing the valves 39 and 40 to close, and at the same time the valve-stem 109 is forced upwardly by the lever 112 and the valve 108 is opened. As the valves 39 and 40 close water is trapped in the upper cylinder 33 of the high-pressure pump and also in the lower cylinder 3 beneath the piston 4 of the lower ram. As the valve 108 is opened the normal or low pressure passes from the pipe 118 through the pipe 122, thence through the open valve 108, through the pipe 123 and check-valve 124 therein, through the upper cylinder 33, and finally into the lower cylinder 3. This low pressure acts upon the piston 4, overcomes the pressure upon the small piston 21 within the auxiliary cylinder 19, and forces the lower ram upwardly, consequently compressing the clay somewhat between the dies 14 and 15 in the mold 9.

To obtain the high pressure and properly press the brick, the operator takes hold of the hand-lever 100, disengages the end of the latch 101 from the segment 101[a], and brings said hand-lever forwardly in the direction of the arrow. This movement opens the valves 103 and 97 and closes the front valve 96, and the normal or low pressure from the pipe 118 passes through the pipe 119, thence through the now open valve 97, and through the pipe 127 to the lower cylinder 35 of the high-pressure pump. The pressure entering said lower cylinder 35 is exerted against the piston 36, raising the same in said lower cylinder 35, and as said piston is several times greater in diameter than the stem 37, which acts as a piston in the upper cylinder 33, the pressure beneath said piston 36 will be greatly multiplied within said upper cylinder 33 as the piston 37 rises therein. Thus a high pressure is obtained, which passes simultaneously through the tubular extension 32 into the lower cylinder 3 below the lower ram and through the pipe 125, open valve 103, pipe 126, tubular extension 65, and into the upper cylinder 6 above the upper ram. Both rams being under high pressure are forced toward one another, and as a result the clay is properly pressed within

the mold 9. In order to obtain the desired and uniform thickness for all the bricks made by the machine, the gage-plate 61 is provided, the same having been properly adjusted on the rod 59. As the rams are forced together the finger 63 will engage the short arm of the bell-crank lever 62 and cause the pointer of said bell-crank lever to move along the series of graduated marks 64. As soon as said finger comes to the proper mark the operator reverses the lever 100 or throws the same to its original rearward position, thus closing the valves 97 and 103 and opening the valve 96. This shuts off the high-pressure pump from the upper ram and releases the high pressure from the lower ram. The operator now moves the hand-lever 88 to its original forward position, this actuation first elevating the valve-stem 69 to unseat the small valve 68, which relieves the upper ram from high pressure. Then the large valve 67 is opened, and the water in the cylinder 6 passes upwardly into the stand-pipe 73 as the pistou 7 rises in said cylinder. Immediately after the valve 67 opens the outlet front valve 82 closes and the inlet rear valve 83 is opened to allow the normal or low pressure to pass into the cylinders 48 to elevate the pistons 49 and the upper ram. As this action takes place the low pressure forces the lower ram upwardly until the pins 16 engage against the stop-plates 17. This brings the lower die 14 on a level with the top of the mold 9, and the brick carried upon said die is now removed. The upper ram passes upwardly until it engages against the stop-pins 50. After the brick has been removed the operator moves the hand-lever 110 to its original rearward position. This actuation allows the valve 108 to close and then unseats the small valve 40 to relieve the low pressure from beneath the lower ram, and immediately following the large valve 39 is opened to allow the water below the lower ram and in the upper cylinder 33 to discharge into the tank 46. The normal pressure to the upper cylinder 33 of the high-pressure pump is cut off by the closing of the valve 108, said normal pressure now entering the auxiliary cylinder 19 through the pipe 120 to force the piston 21 and lower ram downwardly to their original positions, thus completing the operation.

From the foregoing it will be observed that when the hand-lever 88 is moved in the direction of the arrow, Fig. XVII, the water will exhaust from the auxiliary cylinders 48 to the tank 46 and permit the upper ram to descend, and as it does so water flows into the upper cylinder 6 from the stand-pipe 73; that when the hand-lever 110 is moved in the direction of the arrow the valves 39 and 40 are closed and the valve 108 opened, thus establishing communication between the low-pressure pump 116 and the cylinder of the lower ram, the water passing through the high-pressure pump 33 and the pipe 32; that when the lever 100 is moved in the direction of the arrow a communication will be established between the pipe 126 and the upper cylinder of the upper ram through the valve 103, and then a communication will be established between the low and high pressure pumps through the pipe 118, valve 97, and pipe 127, the communication between the high-pressure pump and the cylinder of the lower ram remaining open; that by moving the hand-lever 100 to its original position the high pressure is cut off from the lower cylinder (by the opening of the valve 96, which allows the water beneath the piston 36 to escape through the pipes 127, 128, and 129 to the tank 46) and the high pressure is cut off from the cylinder of the upper ram by the closing of the valve 103; that by moving lever 88 to its original position the pressure is relieved in the cylinder of the upper ram by the opening of valves 67 and 68 and the low pressure is admitted through valve 83 to the cylinders 48, thus causing the upper ram to be raised, while the lower ram follows it up under the low water-pressure to eject the bricks, and that by moving the lever 110 when the bricks have been raised to the top of the mold the valve 108 will close, thus shutting off the low-pressure pump from the cylinder of the lower ram and releasing low water-pressure in the cylinder of the lower ram by opening valves 39 and 40, whereupon the lower ram will descend under the force exerted by low water-pressure entering the cylinder 19 through the pipe 120, the above-described movement of the different levers being given in the order of their sequence.

It will be understood that when the pressure is released beneath the piston 36 the piston will be caused to descend under the pressure in the upper cylinder 33.

I claim as my invention—

1. In a brick-machine, the combination of upper and lower rams, pistons carrying the rams, cylinders in which the pistons fit, a low-pressure pump for imparting the initial pressure to the lower ram and for lifting the upper ram, a high-pressure pump for giving the final pressure to the upper and lower rams, a valve controlling communication between the low-pressure pump and the cylinder of the lower ram, a check-valve between the last-mentioned valve and the lower ram, a pivoted lever for moving said controlling-valve, a valve located in the high-pressure pump, a lever for moving the last-mentioned valve, and a connection between said levers whereby when the first-mentioned valve is opened to establish a communication between the low-pressure pump and the cylinder of the lower ram through the high-pressure pump, the last-mentioned valve is closed to shut off communication between the high-pressure pump and the discharge or waste pipe thereof, substantially as set forth.

2. A brick-machine comprising an upper cylinder, a piston carrying a ram and working in the upper cylinder, a tubular extension

to the upper cylinder, a low-pressure tank, a high-pressure pump consisting of a lower cylinder, an upper cylinder having a valve-casing and a piston in the lower cylinder having a stem working in the upper cylinder of the high-pressure pump, an outlet-valve having a pendent stem and located in the valve-casing, an independent valve-casing having a valve provided with a pendent stem, a pipe connecting the low-pressure tank with the independent valve-casing, a pipe having a check-valve and connecting the independent valve-casing with the upper cylinder of the high-pressure pump, a valve-lever on which the stem of the valve in the upper cylinder of the high-pressure pump is supported, an operating-lever on which the stem of the valve in the independent valve-casing is supported, a rod whereby the levers are connected, a pipe having a controlling-valve provided with a pendent stem and connecting the upper cylinder of the high-pressure pump with the tubular extension of the upper ram-cylinder, a lever on which the controlling-valve stem is supported, a valve-casing constructed with connected valve-cylinders, an inlet-valve having a stem and located in one valve-cylinder, an outlet-valve having a stem and located in the other valve-cylinder, a pipe connecting the low-pressure tank with the inlet-cylinder, a pipe connecting the inlet-cylinder with the lower cylinder of the high-pressure pump, and an operating-lever with which the stems of the inlet and outlet valves are connected, having a rod connecting it with the lever of the controlling-valve.

3. A brick-machine comprising a lower cylinder, a piston carrying a ram and working in the lower cylinder, a tubular projection to the lower cylinder, a low-pressure tank, a high-pressure pump consisting of a lower cylinder, an upper cylinder with which the tubular projection is connected, having a valve-casing and a piston in the lower cylinder of the high-pressure pump having a stem working in the upper cylinder, an outlet-valve having a pendent stem and located in the valve-casing, an independent valve-casing having a valve provided with a pendent stem, a pipe connecting the low-pressure tank with the independent valve-casing, a pipe having a check-valve and connecting the independent valve-casing with the upper cylinder, a valve-lever on which the stem of the valve in the upper cylinder is supported, an operating-lever on which the stem of the valve in the independent valve-casing is supported, and a rod whereby the levers are connected.

4. A brick-machine comprising a lower cylinder, a piston carrying a ram and working in the lower cylinder, a tubular projection to the lower cylinder, a low-pressure tank, a high-pressure pump consisting of a lower cylinder, an upper cylinder, with which the tubular projection is connected, having a valve-casing and a piston in the lower cylinder of the high-pressure pump having a stem working in the upper cylinder, an outlet-valve having a pendent stem and located in the valve-casing, an independent valve-casing having a valve provided with a pendent stem, a pipe connecting the low-pressure tank with the independent valve-casing, a pipe having a check-valve and connecting the independent valve-casing with the upper cylinder, a valve-lever on which the stem of the valve in the upper cylinder is supported, an operating-lever on which the stem of the valve in the independent valve-casing is supported, a rod whereby the levers are connected, a valve-casing constructed with connected valve-cylinders, an inlet-valve having a stem, and located in one valve-cylinder, an outlet-valve having a stem and located in the other valve-cylinder, a pipe connecting the low-pressure tank with the inlet-cylinder, a pipe connecting the inlet-cylinder with the lower cylinder of the high-pressure pump, and an operating-lever with which the stems of the inlet and outlet valves are connected.

5. In a brick-machine, the combination of upper and lower rams, means for operating the rams, and an indicator consisting of a rod carried by one of the rams, a graduated plate adjustably secured to the rod, a finger pivoted to the plate, and a projection carried by the other ram for engaging said finger, substantially as set forth.

In testimony whereof I have hereunto set my hand this 25th day of April, 1900.

WILLIS N. GRAVES.

In presence of—
E. S. KNIGHT,
M. P. SMITH.