(No Model.)

4 Sheets—Sheet 1.

H. GRUSON.

GUNPOWDER PRESS.

No. 357,124. Patented Feb. 1, 1887.

FIG. I.

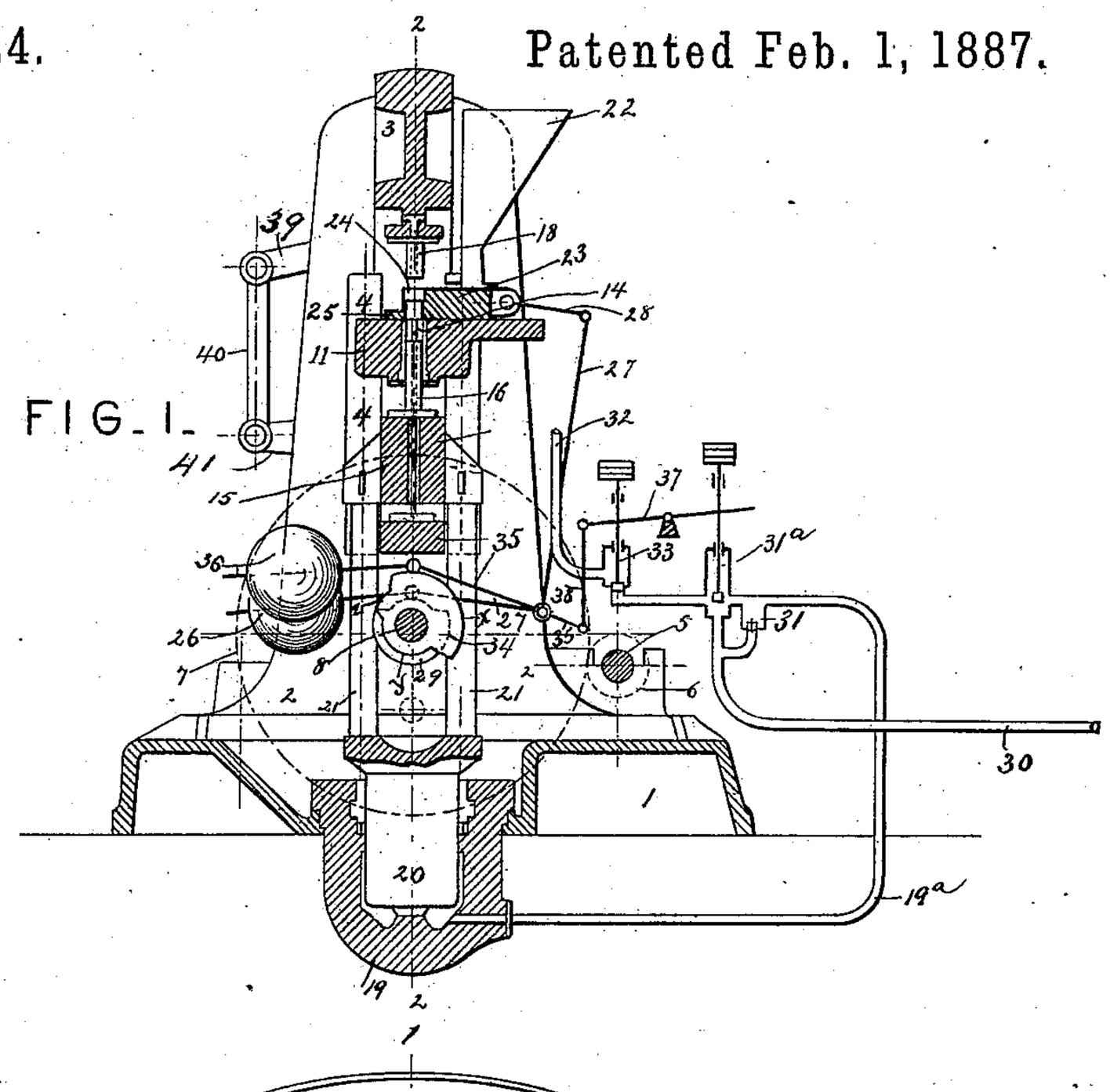
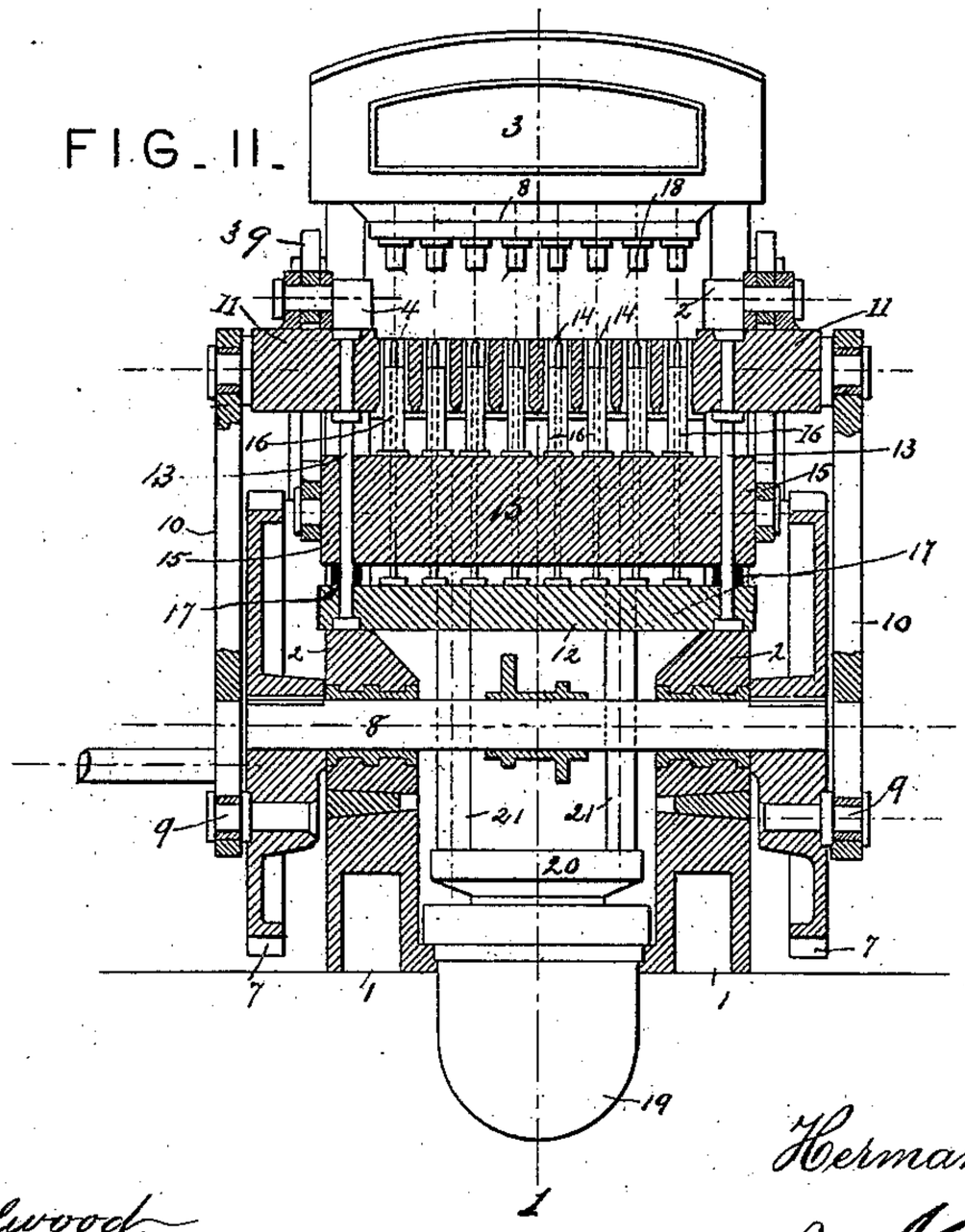


FIG. II.



Attest.

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Geo. L. Wheelock.

Inventor:

Hermann Gruson.

By Knight Bros

Attys

(No Model.)

4 Sheets—Sheet 2.

H. GRUSON.

GUNPOWDER PRESS.

No. 357,124. Patented Feb. 1, 1887.

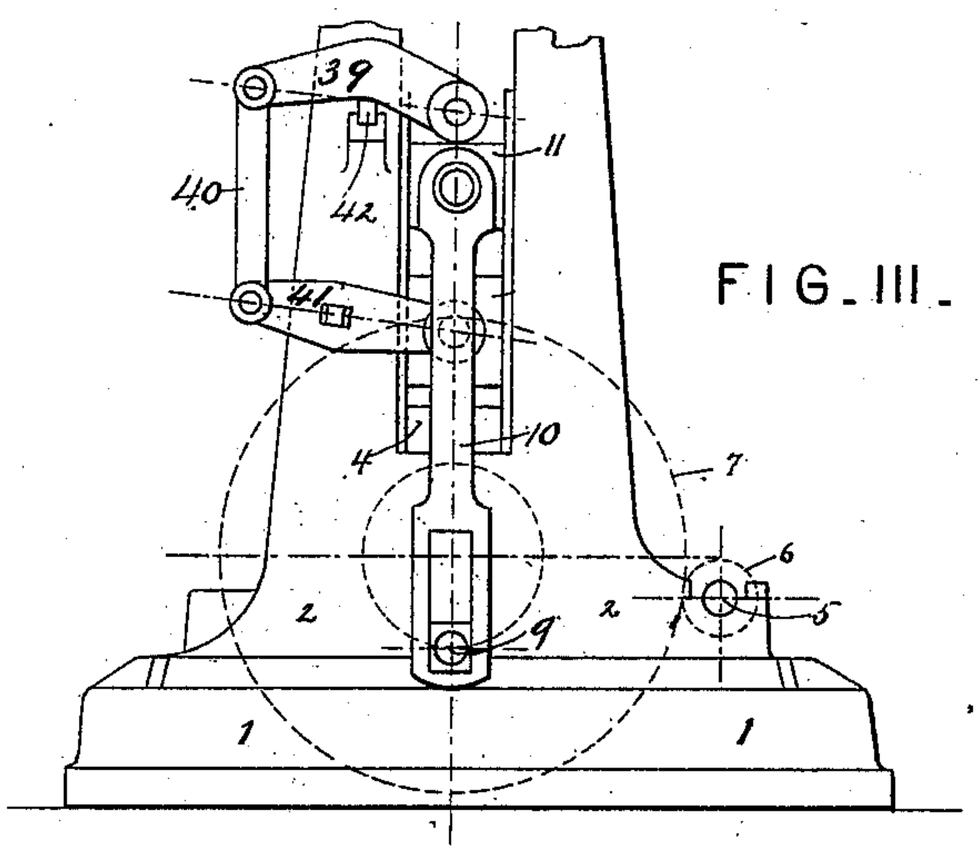
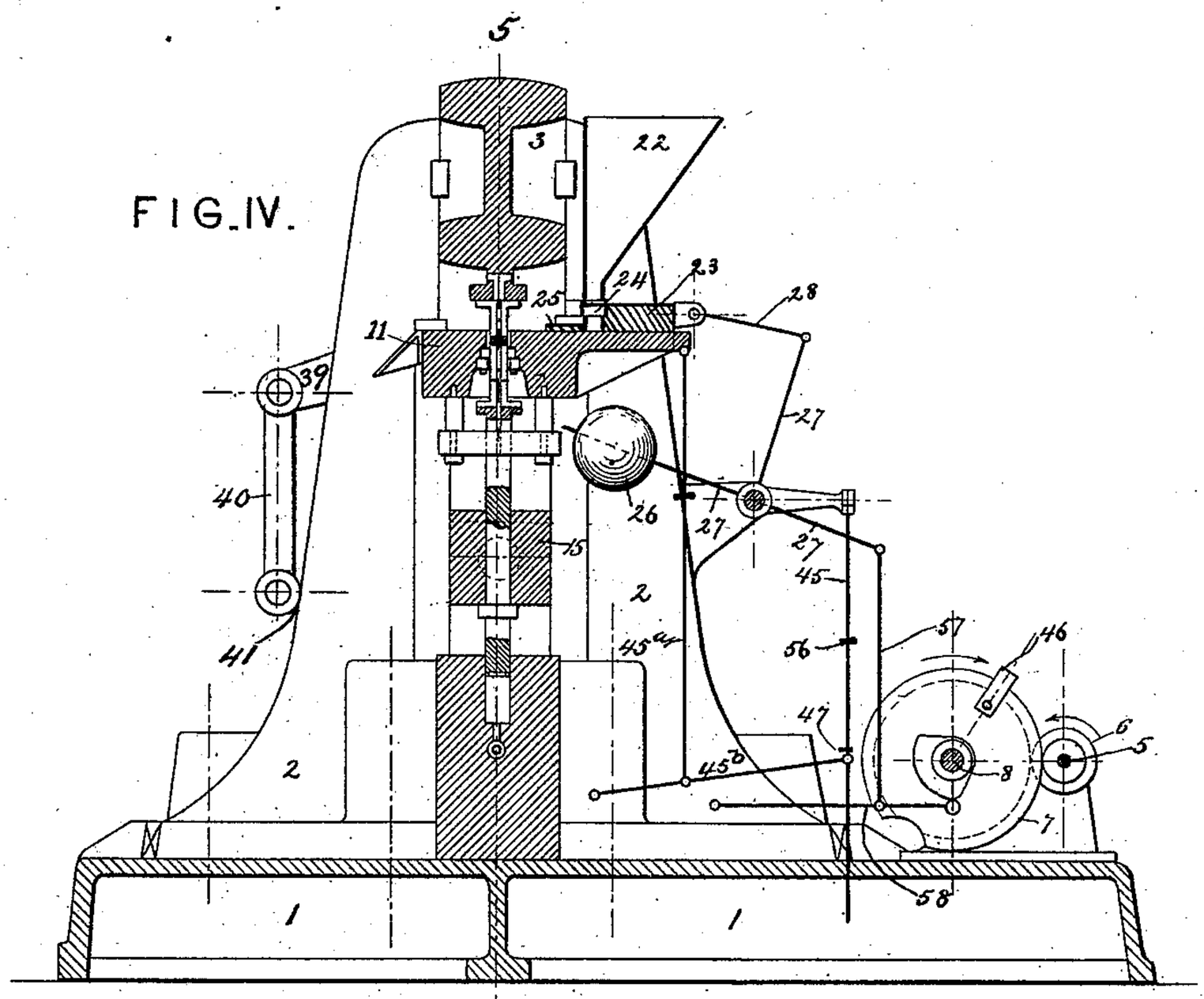


FIG. III.

FIG. IV.



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(No Model.) 4 Sheets—Sheet 3.

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GUNPOWDER PRESS.

No. 357,124. Patented Feb. 1, 1887.

FIG. V.

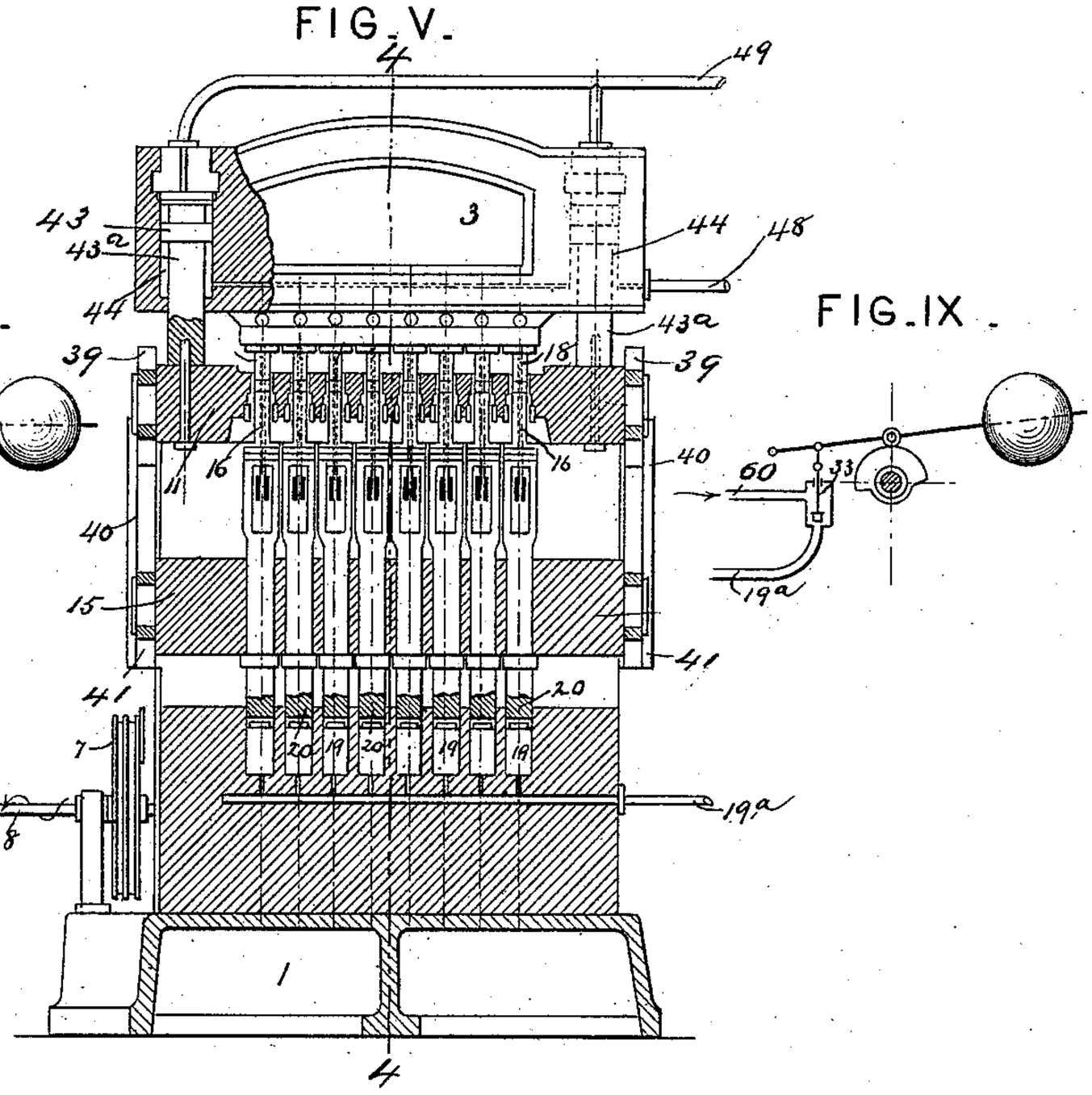


FIG. VIII.

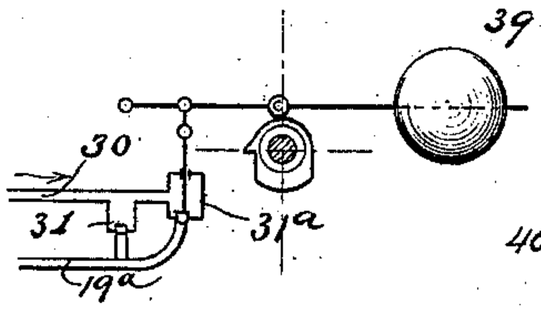


FIG. IX.

FIG. VI.

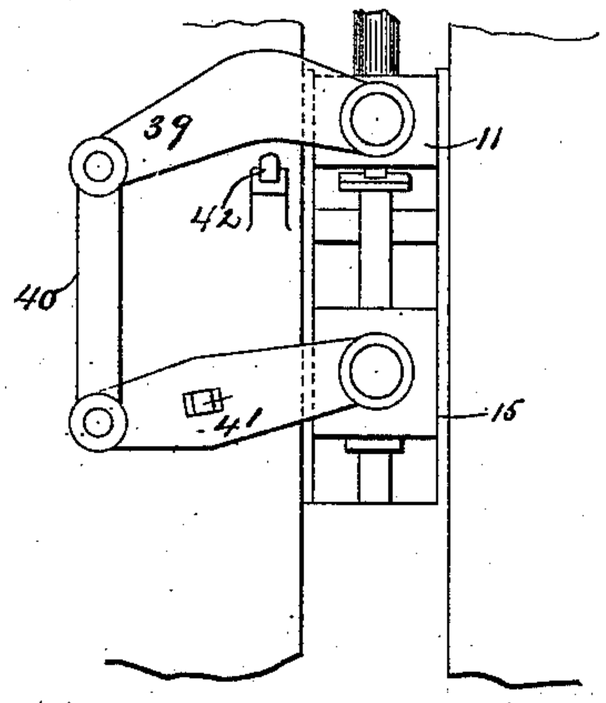
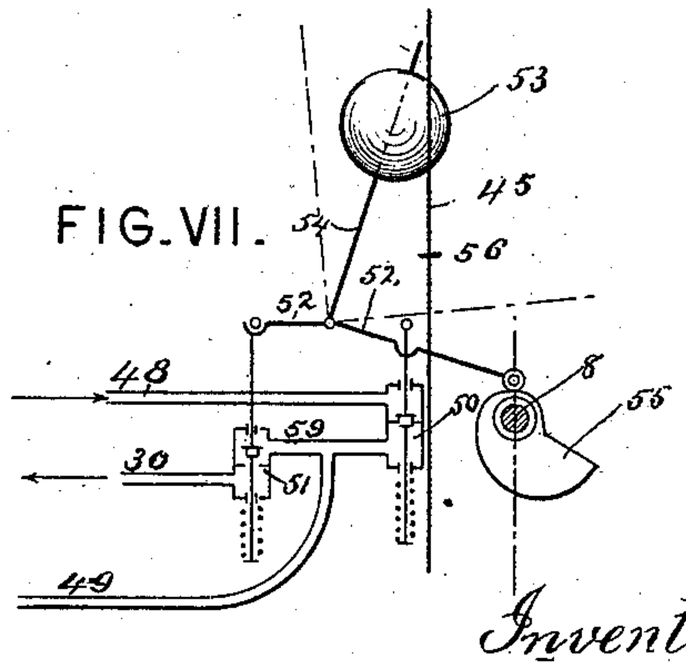


FIG. VII.



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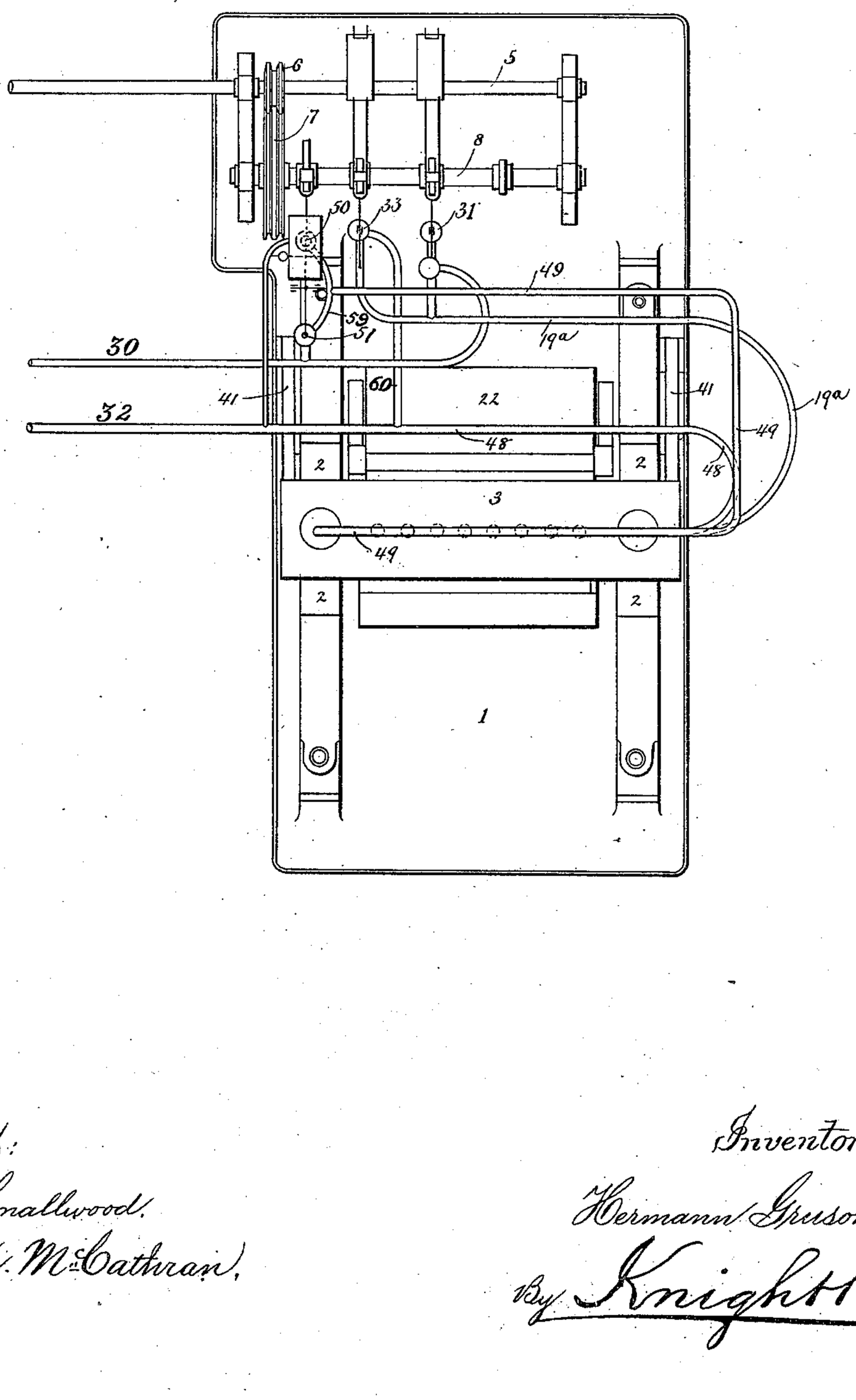
(No Model.) 4 Sheets—Sheet 4.

H. GRUSON.

GUNPOWDER PRESS.

No. 357,124. Patented Feb. 1, 1887.

FIG. X.



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UNITED STATES PATENT OFFICE.

HERMANN GRUSON, OF BUCKAU, NEAR MAGDEBURG, PRUSSIA, GERMANY.

GUNPOWDER-PRESS.

SPECIFICATION forming part of Letters Patent No. 357,124, dated February 1, 1887.

Application filed October 1, 1884. Serial No. 144,466. (No model.) Patented in France April 23, 1884, No. 161,685; in Belgium May 5, 1884, No. 65,046; in Italy June 30, 1884, XXXIII, 309, and in Austria-Hungary September 2, 1884, No. 17,600 and No. 39,647.

To all whom it may concern:

Be it known that I, HERMANN GRUSON, of Buckau, near Magdeburg, Prussia, German Empire, have invented certain new and useful Improvements in Powder-Presses, (for which I have obtained Letters Patent of France, No. 161,685, dated April 23, 1884; of Belgium, No. 65,046, dated May 5, 1884; of Italy, No. 309, dated June 30, 1884, Volume XXXIII, and of Austria-Hungary, No. 17,600 and No. 39,647, dated September 2, 1884,) of which the following is a full, clear, and exact description.

In order that the invention may be fully understood it will be described with reference to the accompanying drawings, in which—

Figure I is a vertical sectional elevation of the preferred form of the press, the line 1 1, Fig. II, indicating the cutting-plane. Fig. II is a vertical section of the same on the line 2 2, Fig. I. Fig. III is a side elevation of the lower portion thereof. Fig. IV is a vertical sectional elevation of a press embodying the same principle as that shown in Figs. I, II, and III, but having some of the minor features modified, the line 4 4, Fig. V, showing the cutting-plane. Fig. V is a vertical section of the same on the line 5 5, Fig. IV. Fig. VI is an elevation of some of the details. Figs. VII, VIII, and IX are detail views of the several valves employed and of the levers and accessories by which they are actuated. Fig. X is a plan view of the press of modified form and of the complete system of pipes through which the hydraulic pressure is conveyed, together with the valves, cams, cam-shaft, and other accessories.

1 represents the base of the press-frame, from which rises a pair of standards, 2, connected at top by a cross-head, 3. Each of the standards 2 is provided with a vertical slot, as at 4, which slots form guides for the moving parts of the press, as hereinafter to be described.

5 is the driving shaft, which is journaled in the base 1, and provided with a pinion or gear-wheel, 6, which meshes with a similar wheel, 7, keyed to the main operating-shaft 8 of the press. These gear-wheels 6 and 7 are preferably duplicated, as shown in Figs. I and II, in order to avoid subjecting the main shaft 8 to undue torsional strains. Each of the wheels 7 is provided with a wrist-pin, 9, which works within a longitudinal slot formed in the respective lower extremities of connecting-links or pitmen 10, the upper ends of said links or pitmen being pivotally connected to the respective extremities of the matrix-block 11, projecting through the guideways 4 of the standards 2. By this means a positive upward movement will be imparted to the matrix-block 11 as soon as the wrist-pins 9 reach the upper extremities of the slots within which they work, such movement being continued until said pins reach the highest point of their permitted movement, and (said matrix-block being held temporarily in elevated position by means to be hereinafter described) a positive downward movement will commence as soon as said pins reach the bottoms of said slots, such movement being continued until said pins reach the lowest point of their permitted movement, and so on.

12 is a cross-bar connected rigidly to the matrix-block 11 by means of hangers 13, whereby the two are made to move in perfect unison. This bar 12 carries a number of needles, 14, which extend upwardly to the upper surface of the matrix-block 11, one being received centrally within each of the matrices, as shown, for the purpose of producing an aperture through each of the blocks of powder when completed.

15 is a block which carries the lower followers or plungers, 16, and will therefore be called the "follower-block" throughout this description. This follower-block is pierced near its extremities for the passage of the hangers 13, and rests upon the top of the needle-bar 12, either directly or through the intervention of blocks, as shown at 17. By this means the follower-block 15 is made to partake of the upward movement of the matrix-block 11 and needle-bar 12, while it is also capable of a limited vertical movement independently thereof by reason of the space between its upper side and the lower side of said matrix-block. This follower-block, and also the followers, are of course pierced for the passage of the needles 14.

18 are the upper plungers, which depend from the under side of the cross-head 3, and

enter the upper ends of the matrices when the matrix-block is moved up thereto.

In the base 1 of the press is placed or formed a hydraulic cylinder, 19, within which works a piston or plunger, 20, which is connected to the follower-block 15 by means of four (more or less) vertical rods, 21. It is preferred to employ four, however, for the reason that by so doing the main shaft 8 and its cam-disks, to be hereinafter fully described, may be located centrally to the press.

22 is the feed-hopper, which is secured to and consequently moves with the matrix-block 11. Between the bottom or discharge aperture of this hopper and the upper surface of the matrix-block is a reciprocating feeder, 23. This feeder is made sufficiently long to serve all the matrices, and is provided near its forward edge with a series of vertical apertures, 24, which, when the feed is retracted, receive the material from the hopper 22, and when forced forward coincide with said matrices and permit the material to fall thereinto.

25 is a finger projecting from the forward edge of the feeder 23, which forces away the cakes from over the matrices previous to their receiving a new charge. This feeder is moved forward at the proper time (which will be hereinafter fully set forth in the description of the operation of the press) by means of a weight, 26, through the medium of a bell-crank lever, 27, and a connecting-link, 28, when permitted to do so by the cam 29 upon the main shaft 8. This cam is so disposed as to hold the weighted end of the bell-crank lever 27 normally elevated and the feeder 23 consequently retracted.

19ª is the pipe through which the liquid enters and leaves the cylinder 19. This pipe communicates with a pipe, 30, from a reservoir containing liquid under atmospheric pressure, and also with a hydraulic pump or other high-pressure apparatus. The communication with the low-pressure pipe is controlled by a suction-valve, 31, and an outlet-valve, 31ª, while communication with the high-pressure pipe is controlled by a valve, 33, all of which are weighted or otherwise automatically held to their seats.

The valves 31 and 31ª are so seated that when high pressure is being exerted it will tend to hold them securely to their seats. These valves are controlled by a cam-disk, 34, carried by the main shaft 8, through the medium of the following devices:

35 is a lever fulcrumed near one extremity on one side of the main shaft 8, and, crossing the latter, is provided at or near its other extremity with a weight, 36. This lever bears near its center upon the cam-disk 34 through the medium of an anti-friction roller.

37 is a simple lever fulcrumed centrally between the stems of the valves 31 and 33, being connected thereto, near its respective ends, in such a manner that when either of said extremities is depressed it will move independently of said stem, and consequently have no effect upon the valve, but when it is elevated the stem will be carried upward thereby, and the valve consequently opened; hence, when the lever 37 is horizontal, the valves will both remain closed, either one being opened by rocking the lever one way or the other, as may be necessary. This lever 37 has one extremity connected with the shorter arm of the lever 35 through the medium of a connecting-link, 38. The three conditions of which these valves are thus capable are governed by the cam-disk 34, which consequently has three faces, viz: *x*, which opens valve 31ª and closes valve 33, *y*, which opens valve 33 and closes valve 31ª, and *z*, which permits both valves to remain closed.

39 is a floating lever pivotally connected at its respective ends to the matrix-block 11 and one extremity of a link, 40, the other extremity of said link being in turn connected to one extremity of a lever, 41, fulcrumed to one side of its mid-length to the standard 2 of the press, and connected at its other extremity with the follower-block 15.

42 is a stud projecting from the standard of the press and across the path of the floating lever 39 in such a manner that said lever will in its descent come in contact therewith. These parts 39, 40, 41, and 42 are duplicated and employed at both ends of the press for completing the descent of the follower-block 15, which is begun by the descent of the matrix-block 11, in the manner hereinafter described.

The operation of this form of the press is as follows: With the parts in the positions shown in the drawings, the weighted lever 35 is resting upon the face *x* of the cam 34, and the valve 31ª is consequently open, which permits the free ingress or egress of water from or to the low-pressure reservoir. Soon after the press is started from this position, (which is effected by the driving-shaft 5 through the medium of the gear-wheels 6 7,) and before the wrist-pins 9 reach the upper extremities of the slots in the respective links 10, the cam 29 elevates the weighted lever 27 and thereby retracts the feeder 23. When the wrist-pins 9 reach the upper ends of these slots the links 10 will start to ascend, carrying with them the matrix-block 11 until the latter reaches the fixed plungers 18. The follower-block 15, being connected with the matrix-block through the medium of the hangers 13, will of course partake of this motion. It should here be observed that if each of the levers 39 and 41 were fulcrumed at its mid-length the levers would merely be rocked upon their fulcrums by the synchronous movement of the matrix-block and follower-block, and would therefore remain at all times parallel. This would of course render it impossible for the follower-block to ascend or the matrix-block to descend independently of each other, which is absolutely necessary, as will appear hereinafter. For this reason the lever 41 is fulcrumed

nearer the extremity which has connection with the floating lever 39, whereby the corresponding end of said floating lever 39 is not lowered by the ascent of the follower-block 15 the same distance as its opposite end, which is attached to the matrix-block 11, is elevated. This causes the said floating lever 39 to be raised above its fulcrum-block 42. While this upward movement of the matrix-block, the follower-block, and their accessories is being effected by the links 10, the valve 31 remains open, the liquid being sucked into the cylinder 19 from the low-pressure reservoir. Immediately upon the arrival of the wrist-pins at their highest point (the matrix-block having reached the upper stationary plungers, 18) the face *y* on the cam 34 permits the weight 36 to drop, and thereby simultaneously close the valve 31ª and open the high-pressure valve 33, which admits the high-pressure liquid to the cylinder 19, thereby forcing up the piston 20, and causing the pressure to be exerted upon the powder through the medium of the plungers or followers 16, follower-block 15, and standards 21. This is the upward movement of the follower-block independently of the matrix-block, which has been before referred to. It causes the lever 41 to be rocked upon its fulcrum, thereby drawing the floating lever 39 downward a little farther, though not sufficiently to bring it into contact with the lug 42. When the powder is sufficiently pressed, the face *z* of the cam 34 raises the weighted lever 35, thereby permitting both of the valves 31ª and 33 to remain closed, during which time the pressure-liquid is confined in the cylinder. This takes place while the wrist-pins are moving from their highest point to a point where they come in contact with the lower ends of the slots in the pitmen. When they reach this point, they commence the downward movement of the matrix-block, which is entirely independent of the follower-block until it brings the floating levers 39 into contact with their lugs 42. The upper surface of the matrix-block will, however, become flush with the upper extremities of the plungers 16 just an instant before the floating levers 39 come into contact with the said lugs 42, and at this instant the depressed portion of the cam 29 comes uppermost and permits the weighted lever 27 to descend, thereby moving the feeder 23 forward, which pushes the compressed cakes from over the matrices and brings the openings 24 directly over the matrices. The instant this movement of the feeder has taken place the face *x* of the cam 34 raises the weighted lever 35 and opens the outlet-valve 31ª, which permits the fluid to escape from the cylinder 19 and into the low-pressure reservor. Immediately upon the opening of this valve 31 the floating levers 39 strike against the lugs 42 and any further descent of the matrix-block 11 causes the said floating levers 39 to rock upon their fulcrum-blocks, thereby elevating the shorter end of the levers 41 and causing the descent of the follower-block 15, which is more rapid than that of the matrix-block 11 by reason of the positions of the fulcrums upon which said levers 41 swing. The feeder 23 is still in its forward position over the matrices, which position it keeps until the parts all come to their lowest positions, or for a short time after they have reached this position, and the wrist-pin 9 has commenced its upward movement, in order to give time for the matrices to fill, after which it is retracted. The same movements are repeated at each rotation of the main shaft 8.

In the modified form of the device the links 10 are dispensed with, and instead thereof the matrix-block 11 is connected to the respective lower extremities of a pair of piston-rods, 43ª, carrying at their other extremities pistons 43, which work within cylinders 44 formed in the cross-head 3 of the press.

The pistons 43 divide the cylinders 44 into two compartments, and by reason of the presence of the piston-rod 43ª in the lower compartment the latter is reduced to an annular chamber of considerably less area than the upper part.

The table, as in the preferred form of the device, is connected with the follower-block 15 by means of levers 39 41 and link 40. The driving-shaft 5 transmits its movement by friction-wheels 6 7 to a shaft, 8, that corresponds to the main working-shaft of the preferred form of the press—that is to say, it carries all the cams by which the valves and the feeder are actuated. In the friction-wheel 7 upon the latter shaft there is a depression or mutilated portion which effects an interruption of the rotation as soon as it reaches the wheel 6 upon shaft 5. This interruption takes place just before the matrix-block reaches the limit of its downward movement and continues until the said matrix-block commences its upward movement, whereupon a projection, 47, from the vertically-reciprocating rod 45, which is moved by the said matrix-block, comes in contact with a nose, 46, projecting from the periphery of the friction-wheel 7 and sets it in motion. This momentary arrest in the rotation of the operating-shaft 8 is for the purpose of giving all of the parts time to complete their movement at each operation; for it is evident that as the moving parts of the press depend entirely upon the fluid-pressure the regularity of their movements will vary more or less according to the condition of the fluid or other circumstances. If, therefore, all the valves were put under the control of the regularly-moving shaft 8, the one for causing the matrix-block to rise might be opened before said matrix-block had quite completed its descent; hence the valve for producing the initial movement of each operation of the press—*i. e.*, the ascent of the matrix-block—is so placed as to be operated by the final movement of the subsequent operation. To this

end the matrix-block is so connected with the valve which must be opened in order to permit its ascent that said valve will be opened as soon as the said matrix-block has completed its descent. The table thereupon rises, and by means of the projection 47, before mentioned, puts the wheel 7 in motion, as hereinafter more fully described.

48 is a pipe without valves, which connects with the lower chambers of the respective cylinders 44 at one end and with the high-pressure pipe 32 at the other, thereby maintaining a constant pressure in said lower chambers.

49 is a branch of the pipe 48 communicating with upper larger chambers of the cylinders 44, said branch being provided with a valve, 50, for regulating the admission of the pressure-fluid to said chambers. This branch is itself provided with a branch, 59, which connects with the outlet or low-pressure pipe 30, the branch 59 being provided with a valve, 51, so seated that when high pressure is being exerted it will press upon the top of the valve and hold it firmly to its seat.

As before stated, the lower chambers of the pistons 44 are in constant communication with the high-pressure reservoir, and the parts are so proportioned that when the pistons reach the limit of their downward movement they will not quite touch the bottoms of their respective cylinders, thereby leaving an annular space, which is always filled with fluid. The pipe 48 communicates with the cylinders 44 a little above their bottoms, so that after the pistons have passed beyond the mouths of said pipe there will be no means for the escape of the fluid from the annular spaces. When an elastic fluid is employed, that confined within this annular space constitutes a packing for preventing jar, and will also impart the preliminary movement to the pistons when permitted to expand by the closing of the inlet-valve 50 and the opening of the outlet-valve 51. As soon as the cylinders rise far enough to uncover the ends of the pipe 48 pressure-fluid will flow into the lower chambers and elevate the pistons. When the plungers are to be lowered after the high pressure has been exerted on the powder in the matrices, as hereinafter described, the outlet-valve 51 is closed and the inlet-valve 50 opened, thereby placing the upper chambers of the cylinders 44 in communication with the high-pressure reservoir. Although the pressure in both compartments of the cylinders 44 is the same per square inch, yet, by reason of the greater area of the pistons which is exposed to the action of the pressure-fluid in the upper chambers, they will be forced down and the fluid expelled from the lower chambers when the valves are placed in the positions last described.

The inlet and outlet valves 50 and 51 are shown in detail and on a larger scale in Fig. VII. They are both held down upon their seats automatically by springs, and are engaged for being lifted therefrom by the respective horizontal arms 52 of a double bell-crank lever, 52 54, whose vertical arms 54 are provided with a weight, 53, whereby the said lever is held to any position in which it is set. This bell-crank lever is moved into the position indicated by dotted lines in Fig. VII for opening the valve 50 (and closing the valve 51) by means of a cam, 55, secured to the operating-shaft 8. As has been before described, while this valve 50 is open the matrix-block descends. Connected with the matrix-block through the medium of a vertical rod, 45^a, and a lever, 45^b, fulcrumed at one end to the standard or other fixed part of the press, is a rod, 45, so mounted as to partake of the movement of the matrix-block, said rod being provided with a lug or finger, 56, so situated as to project over one of the horizontal arms of the bell-crank 52 54, and when the matrix-table has nearly completed its descent to come into contact with said arm 52, and thereby rock the lever from the position shown by the dotted lines to that shown by full lines, whereby the valve 50 is permitted to close and the valve 51 opened, whereupon the matrix-block commences its upward movement. By this means the projection 47 is brought in contact with the nose 46 and the shaft 8 put in motion, as hereinbefore explained.

The pipe 30, which communicates with the low-pressure reservoir, (and also with the upper chambers of the cylinders 44, as above described,) also communicates with the lower cylinders, 19, in which the plungers 20 work, through the medium of a branch pipe, 19^a, under control of a suction-valve, 31, and the outlet-valve 31^a. As the plungers 20 are being raised by the mechanism just above described, fluid is sucked into the cylinders 19 from the low-pressure reservoir through the suction-valve 31. The high-pressure pipe 32 also communicates with the chambers 20 through a branch, 60, and the same pipe, 19^a, under control of a valve, 33, the suction-valve 31 and the outlet-valve 31^a being so located as to be held tightly to their seats when the high-pressure valve is open. After the upward movement of the matrix-block ceases, the valve 33 is opened and the pressure-liquid flows into the cylinders 19 and produces the final maximum pressure.

The valves 31, 31^a, and 33 are shown in detail and on a larger scale in Figs. VIII and IX, respectively.

The movement of the feeder 23 is effected by the shaft 8 through the medium of the weighted double bell-crank lever 27, the connecting-links 28 and 57, and the lever 58, as shown in Fig. IV.

Although I have throughout this specification described the press as one which is actuated by hydraulic pressure, yet I desire to have it understood that I do not limit myself to the use of any particular medium for producing the final pressure of the piston, as it is obvious that any fluid under pressure might

be employed without requiring the slightest change in the construction of the parts.

I do not herein specifically claim any features of the invention which appear only in the modification shown in Figs. IV, V, VII, VIII, IX, and X, as I have made such the subject of a contemporaneous application filed on the 26th day of April, 1886, Serial No. 200,198.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. The combination of a stationary crosshead, a sliding matrix-block, a main operating-shaft, connections between said matrix-block and shaft, a follower-block carrying plungers, hangers connecting said matrix-block and follower-block, and a pressure-piston for moving said follower-block, substantially as set forth.

2. The combination of a stationary crosshead, a vertically-sliding block having matrices formed vertically therethrough, a horizontally-reciprocating feeder resting upon the top of said matrix-block, and vertically-moving plungers, substantially as set forth.

3. The combination, with the matrix-block 11, of the block 12, hangers 13, connecting them, needles 14, projecting from the block 12 into the matrices, the follower-block 15, located between the matrix-block 11 and block 12, and the plungers carried by the block 15, said follower-block and plungers being perforated for the passage of said needles, substantially as set forth.

4. The combination of a stationary crosshead, a sliding matrix-block, a rotary operating-shaft having eccentric wrist-pins, slotted links connecting said wrist-pins with said matrix-block, a follower-block carrying the plungers, a piston connected to said follower-block, and a pressure-cylinder in which said piston works, substantially as set forth.

5. The combination of a stationary crosshead and plungers, a movable matrix-block, a follower-block having plungers, hangers connecting said matrix-block and follower-block, permitting a slight relative movement between them, as explained, a piston connected to said follower-block, and a cylinder in which said piston works, substantially as set forth.

6. In a press, the combination, with the plungers and a movable matrix-block, of a feeder carried by said matrix-block and jointed connections for operating said feeder, substantially as set forth.

7. The combination, with the moving matrix-block, of a follower-block provided with plungers, hangers connecting said matrix-block and follower-block and upon which the latter slides independently of the former, links for raising said matrix-block, and a piston operated by fluid under pressure for continuing the movement of the follower-block and plungers, substantially as and for the purposes set forth.

8. The combination, with the matrix-block 11 and the follower-block 15, each having a limited movement independently of the other, of the lever 41, fulcrumed at an intermediate point and connected at one end to the follower-block, the floating lever 39, connected at one end to the matrix-block 11, the link 40, connecting the free ends of said levers 39 and 41, and the fixed lug 42, all constructed and arranged to operate substantially as and for the purpose set forth.

9. The combination, with the moving matrix-block and a slotted link for raising and lowering the same at timed intervals, as explained, of a follower-block carrying the plungers, hangers connecting said matrix-block and follower-block, a piston connected to said follower-block, a cylinder in which said piston works, communicating with pipes, having suitable valves, with the source of fluid-pressure, a rotary shaft, a cam carried by said shaft, and suitable levers for opening and closing the valves at timed intervals, substantially as and for the purpose set forth.

10. The combination, with an intermittently-moving matrix-block, an intermittently-moving follower-block carrying the plungers, and means for moving said matrix-block and follower-block alternately, as set forth, of the reciprocating feeder working on the upper side of said matrix-block.

11. The combination, with a vertically-movable matrix-block, of a hopper carried thereby, a feeder, and jointed levers for operating said feeder, substantially as set forth.

12. In a press, the combination, with the plungers and a sliding matrix-block, of a hopper carried by said matrix-block, a feeder resting upon said matrix-block and covering the mouth of the hopper, the rotary operating-shaft, a cam carried by said shaft, and jointed connection between said cam and feeder, substantially as set forth.

13. In a press, the combination of the plungers, a sliding matrix-block, 11, a hopper, 22, carried by the matrix-block 11, a feeder, 23, resting upon said matrix-block and covering the mouth of the hopper, the rotary operating-shaft 8, the cam 29 carried thereby, the weighted bell-crank lever 27, resting upon said cam, and the link 28, connecting the upper arm of said lever 27 with the feeder, as set forth.

14. In a press, the combination, with the plungers, a piston connected thereto, a cylinder in which said piston works, and pipes having valves for placing said cylinder in communication with the fluid-pressure apparatus, of a main working-shaft having connection with said plungers for partially raising them and lowering them, as described, and a cam secured to said shaft for opening the valve in the high-pressure pipe and admitting pressure-fluid to the cylinder for completing the upward movement of the plungers, as explained.

15. The combination, with the follower-block 15 and the slotted links 10, for partially raising it and lowering it, as described, of the

pressure-cylinder 19 and piston 20, for producing the final pressure on the plungers, the automatically-closing valves 31 33, for controlling the admission and escape of the pressure-fluid, the shaft 8, the cam 34, and the levers 35 37 38, through which the said valves are operated by said cam, as set forth.

16. In a press, the combination of an operating-shaft, a sliding matrix-block, connections between said shaft and matrix-block whereby the latter is raised and lowered, a follower, a piston to which said follower is connected, a cylinder in which said piston works, a valve for controlling the admission of high-pressure fluid thereto, a cam for opening said valve and admitting said fluid as the upward movement of the matrix-block is completed, a valve for preventing the egress of fluid therefrom, thereby momentarily interrupting the descent of the said piston and its attachments, so as to give time for the matrix-block to partially descend, and a cam for opening said valve and permitting said piston to fall after the matrix-block has partially descended, substantially as set forth.

17. In a press, the combination, with a sliding matrix-block and an independently-moving follower, of a piston, a cylinder in which said piston works, a valve for controlling the admission and escape of pressure-fluid, cams for first opening said valve and admitting fluid and then closing it to prevent its escape, (thereby holding the piston and follower in elevated position,) means for partially lowering the matrix-block independently of the follower, and a cam for opening said valve and permitting the escape of fluid, substantially as and for the purpose set forth.

H. GRUSON.

Witnesses:
JULIUS VON SCHÜTZ,
EMIL KALLNECKER.