No. 886,404. PATENTED MAY 5, 1908.

W. RAAB.

MACHINE FOR FORMING BUILDING BLOCKS.

APPLICATION FILED AUG. 22, 1903.

9 SHEETS—SHEET 1.

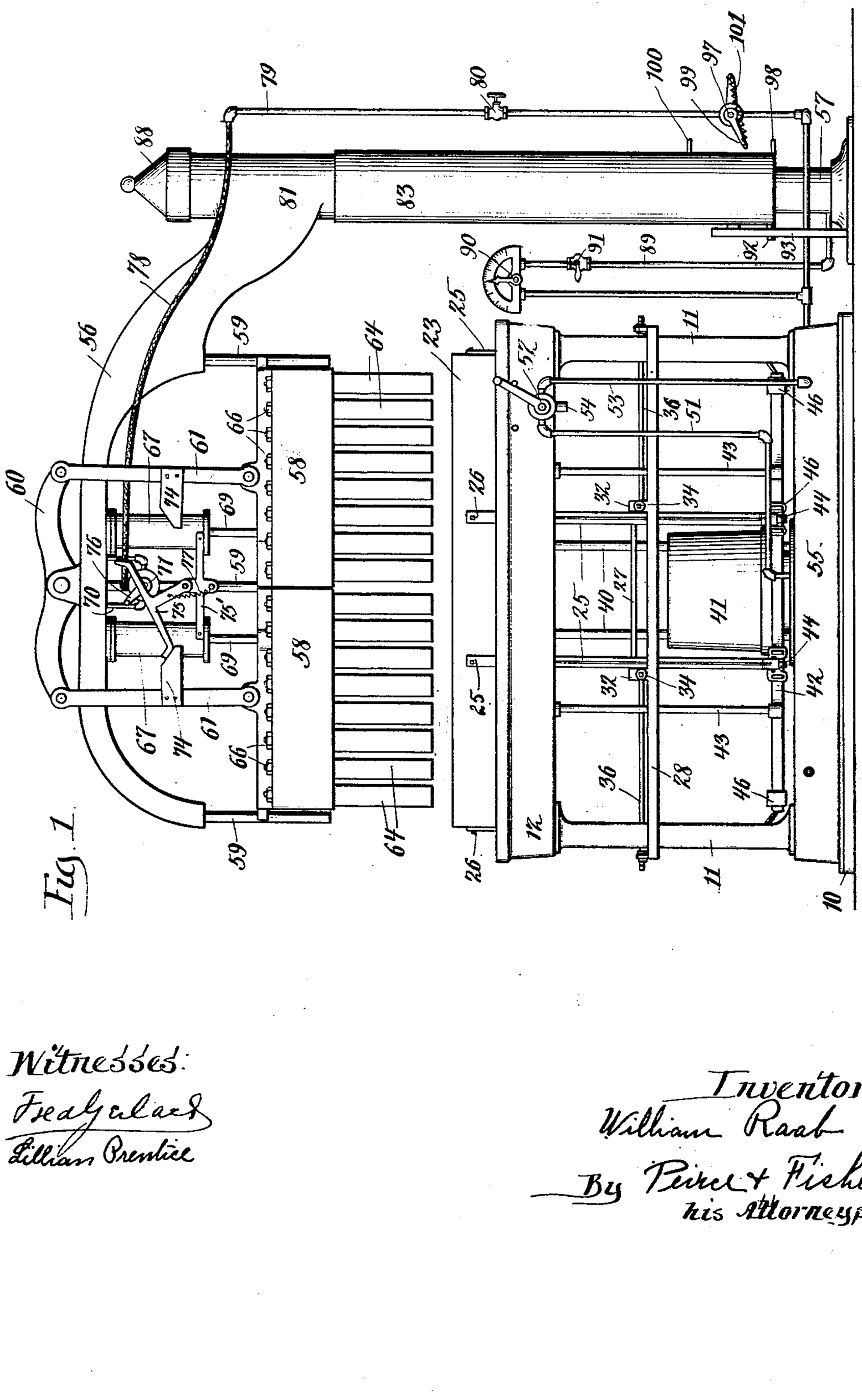

Fig. 1

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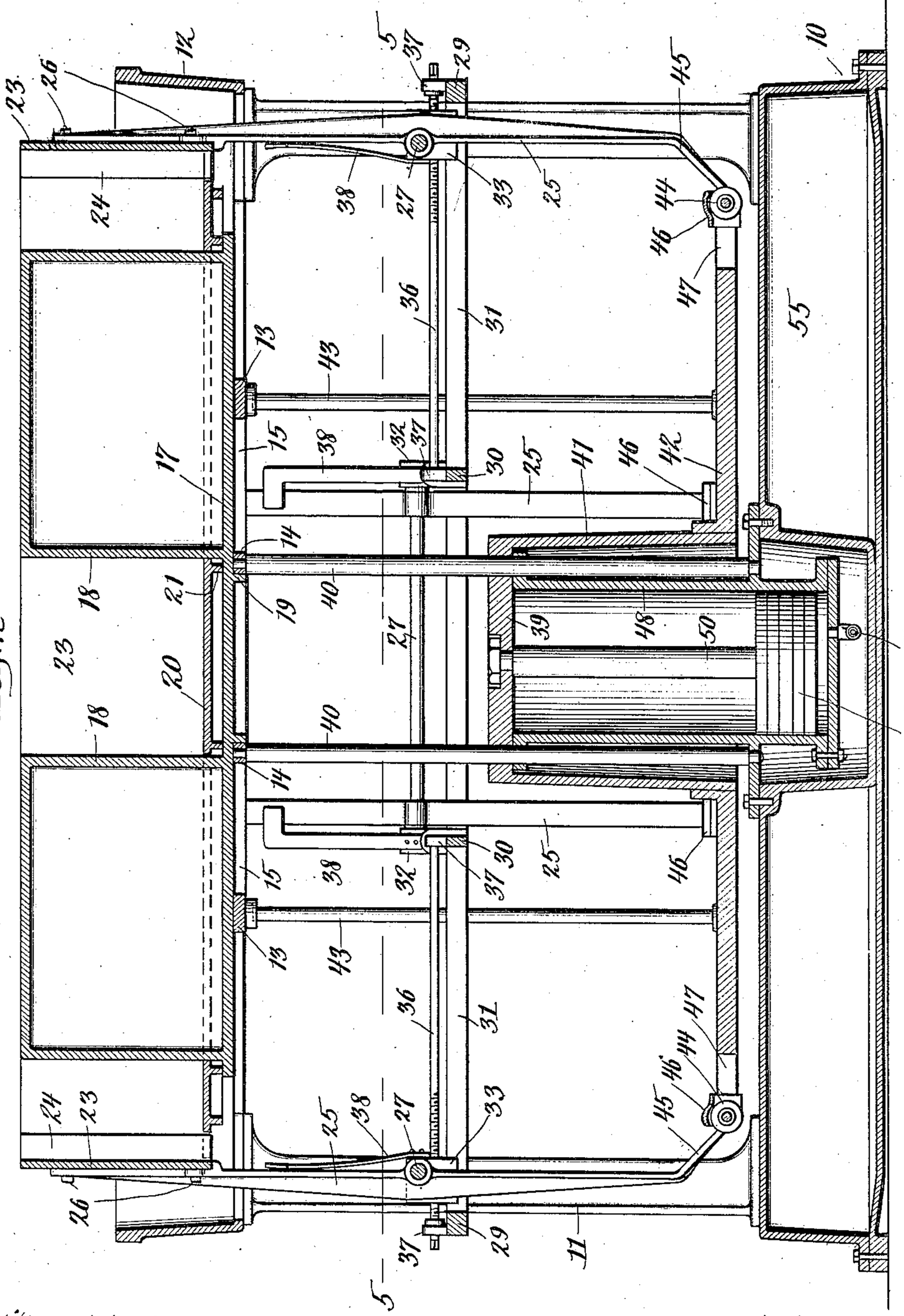
9 SHEETS—SHEET 2.

Fig. 2.



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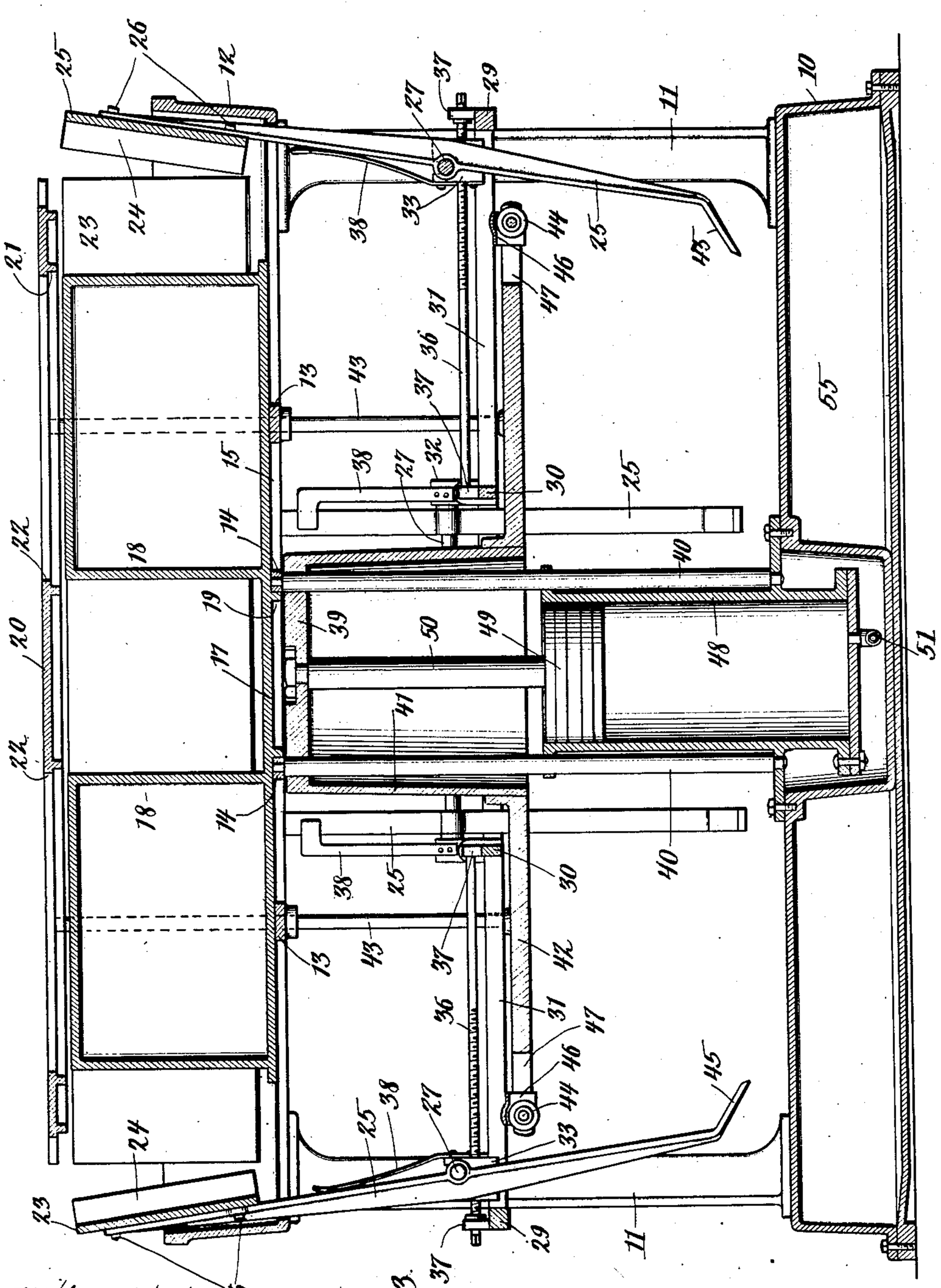

Fig. 3.

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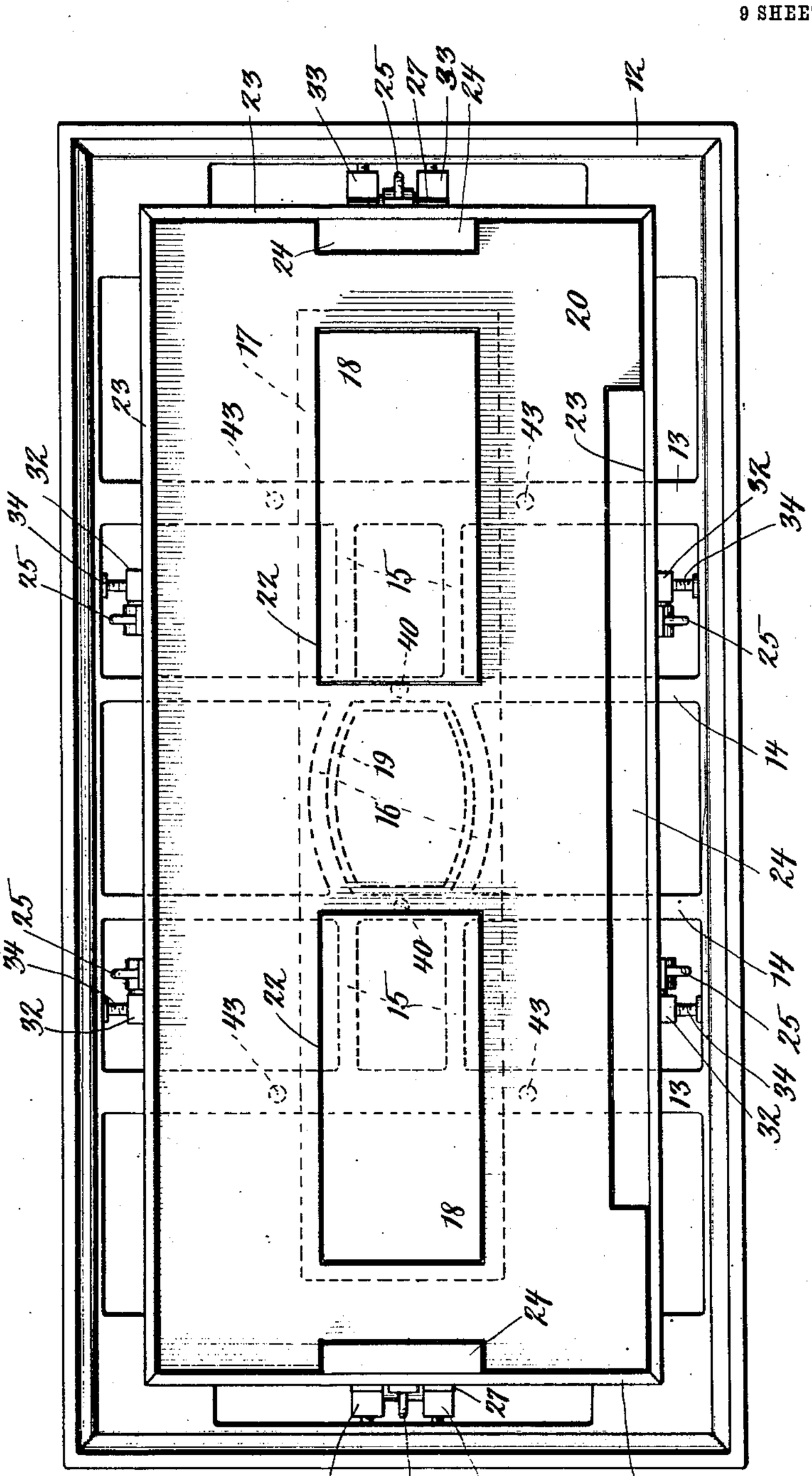
9 SHEETS—SHEET 4.

Fig. 4.



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9 SHEETS—SHEET 5.

Fig. 5.

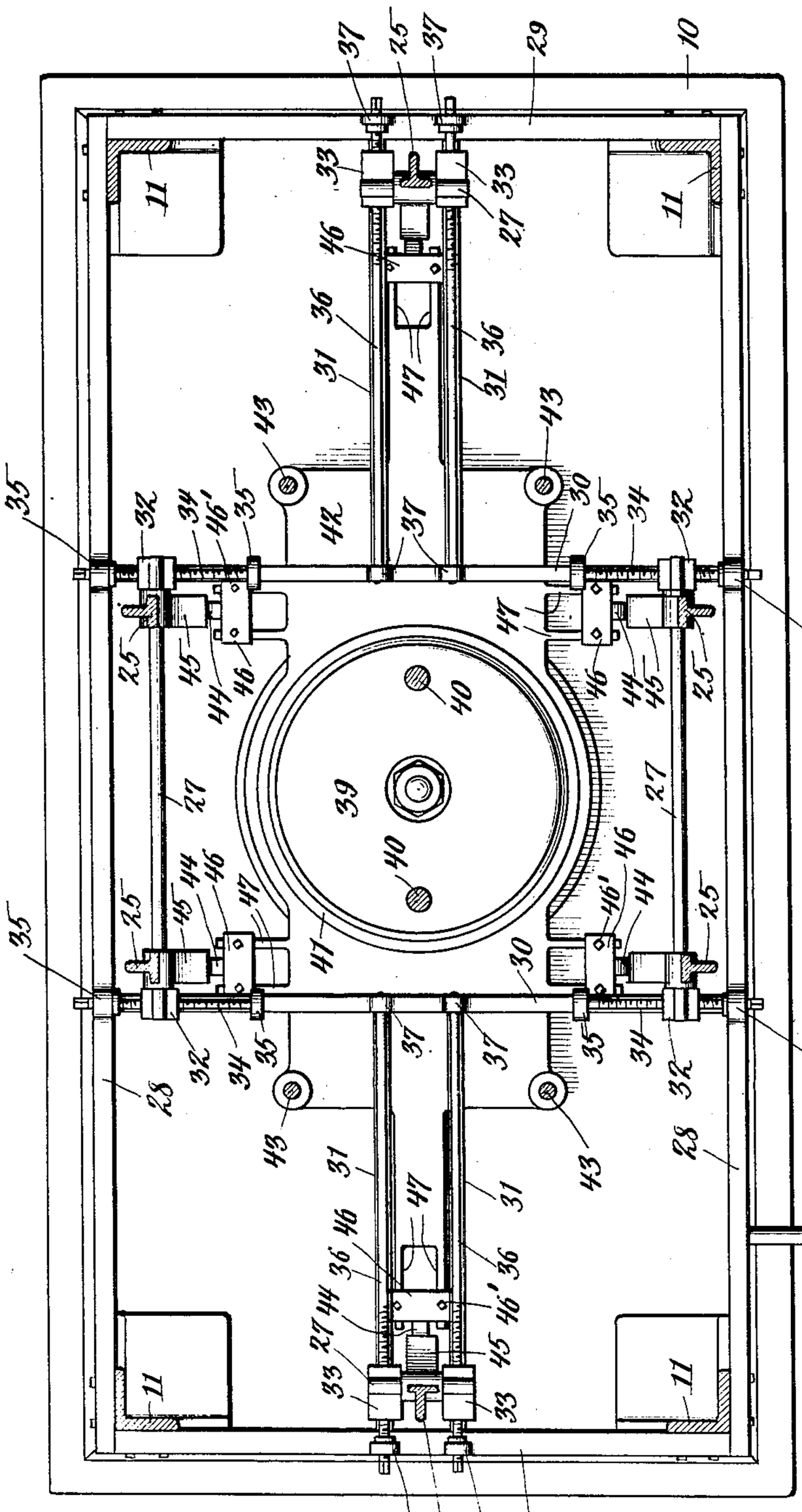


Fig. 5b.

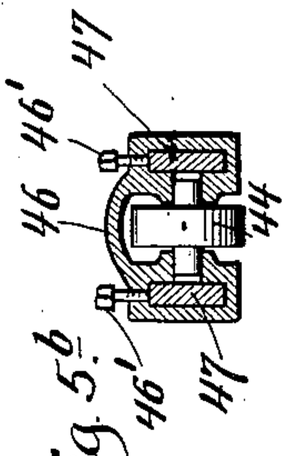
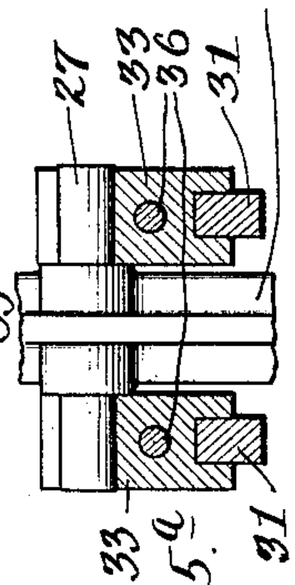


Fig. 5a.



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9 SHEETS—SHEET 6.

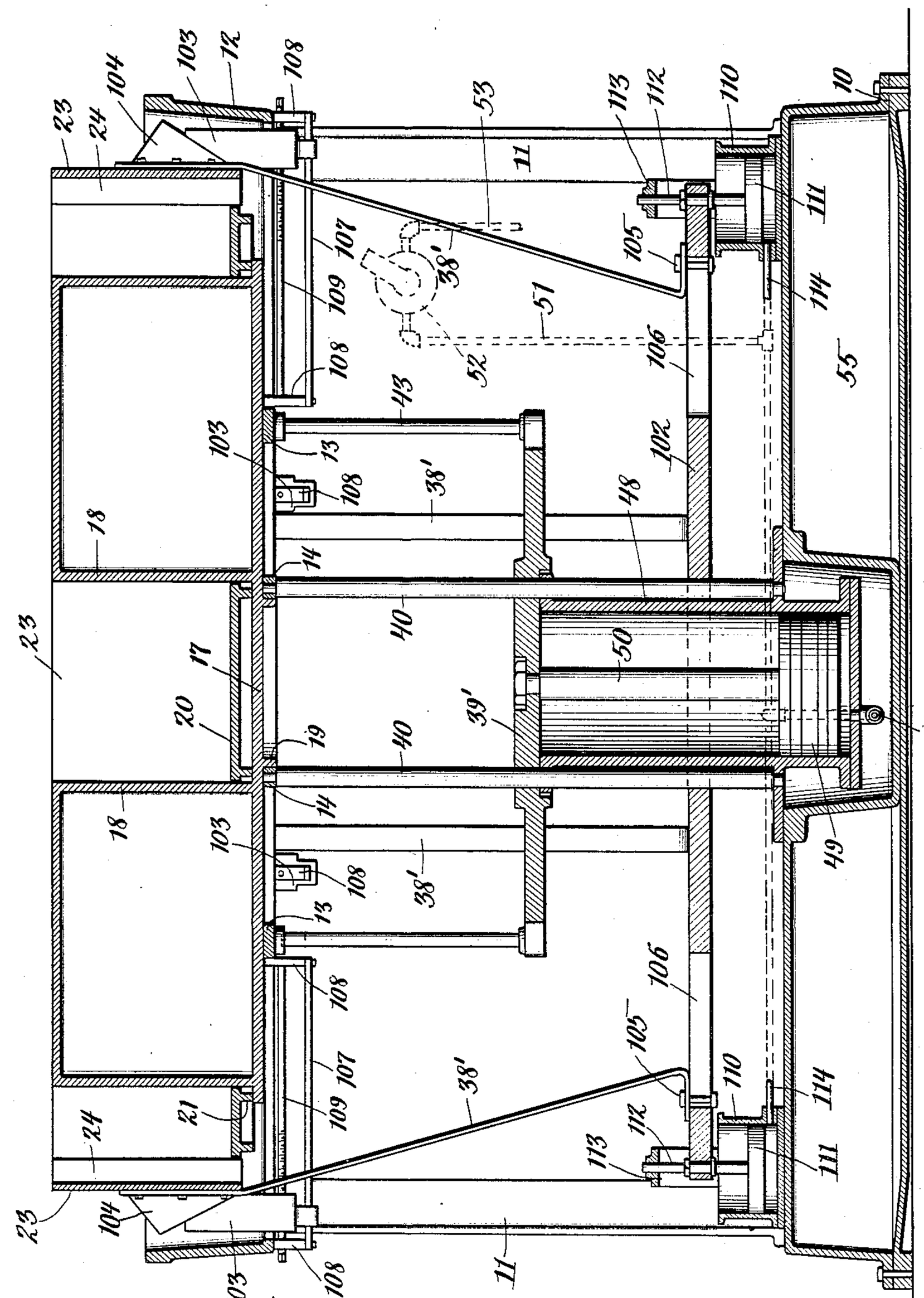

Fig. 6

No. 886,404. PATENTED MAY 5, 1908.

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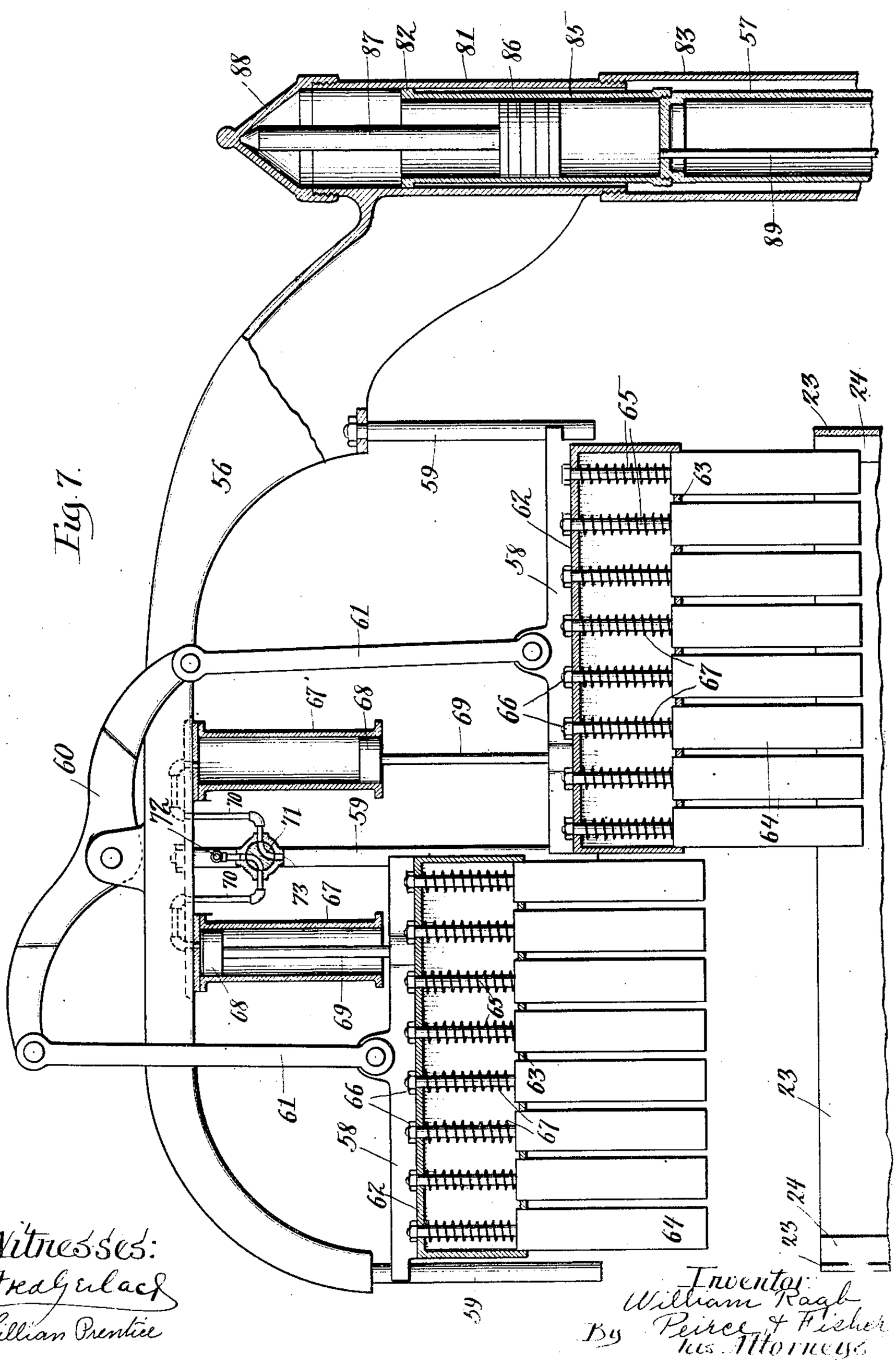
9 SHEETS—SHEET 7.

Fig. 7.



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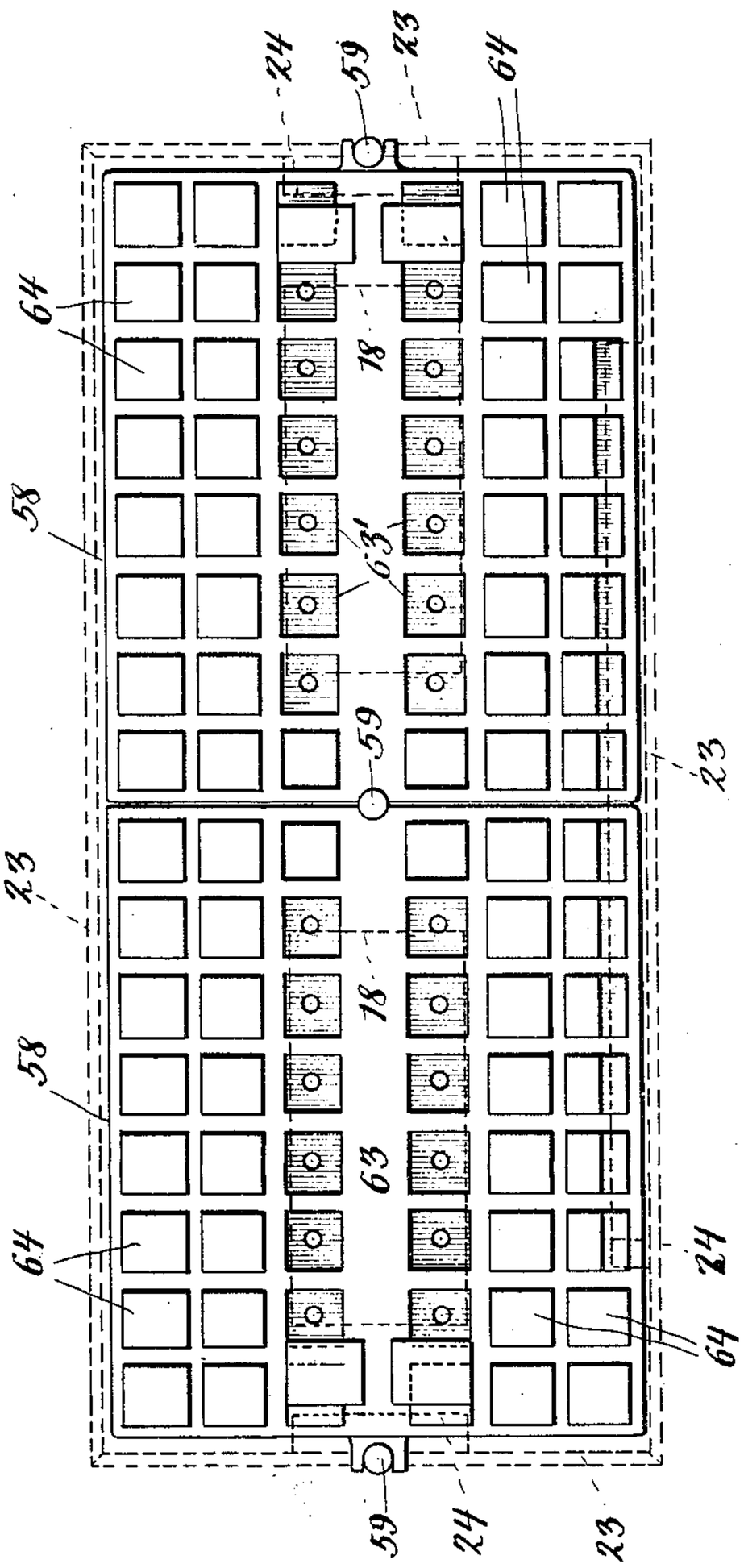
9 SHEETS—SHEET 8.

Fig. 8.



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9 SHEETS—SHEET 9.

Fig. 9.

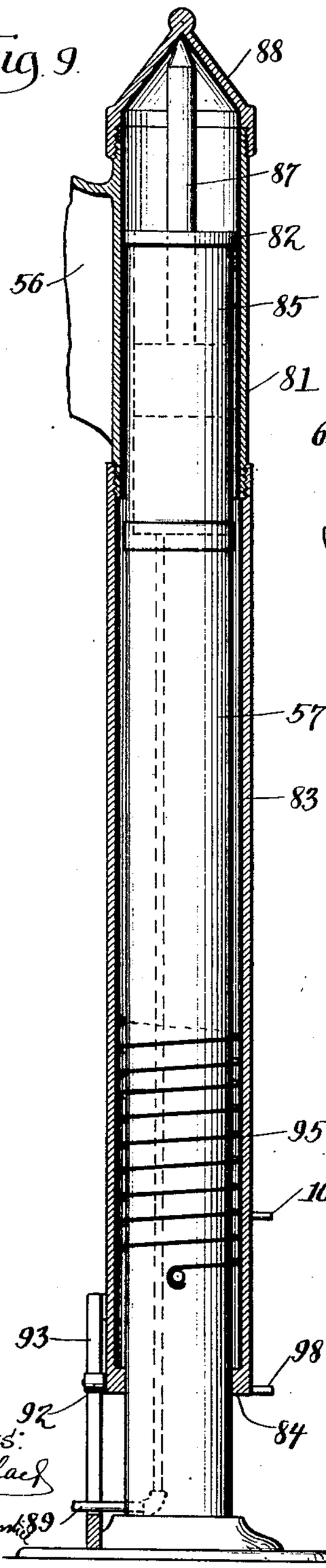


Fig. 11.

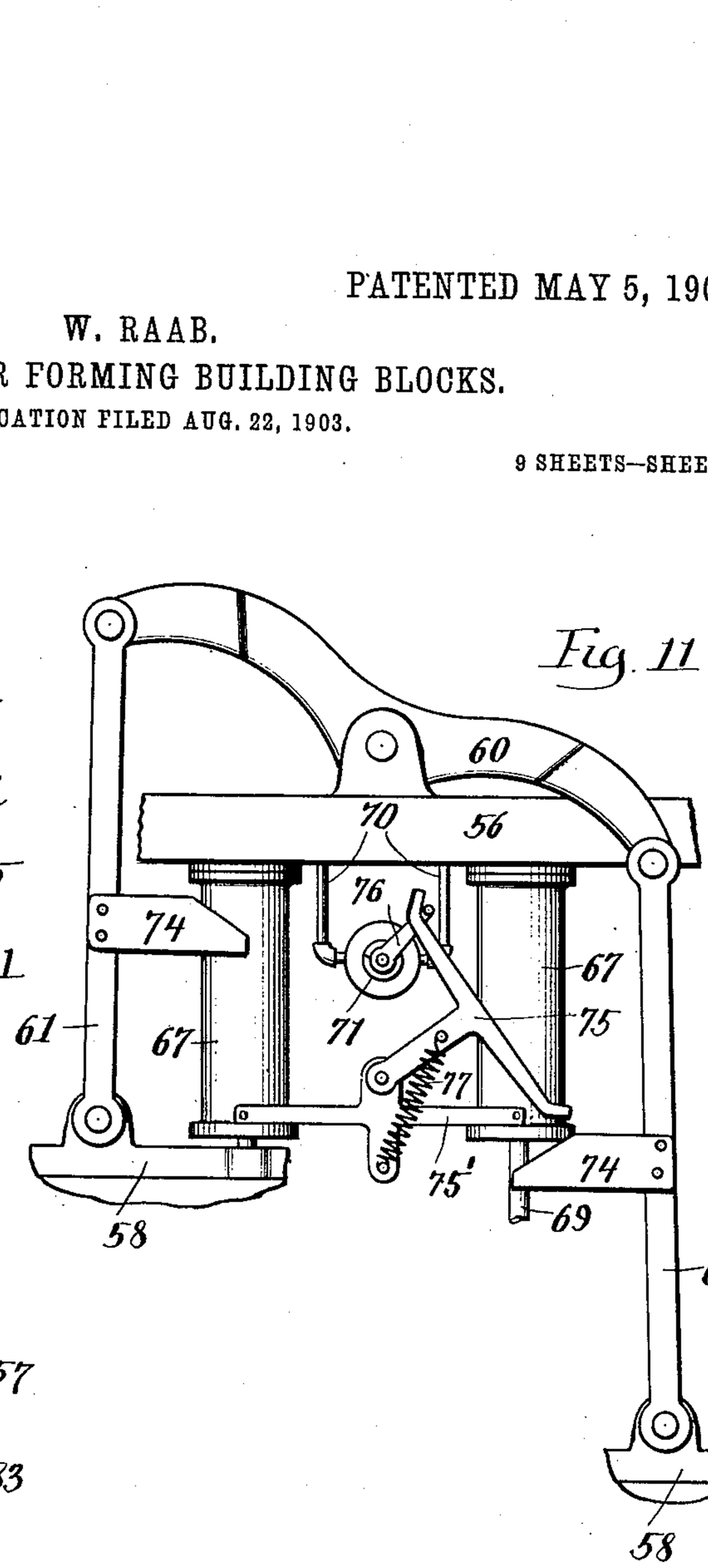
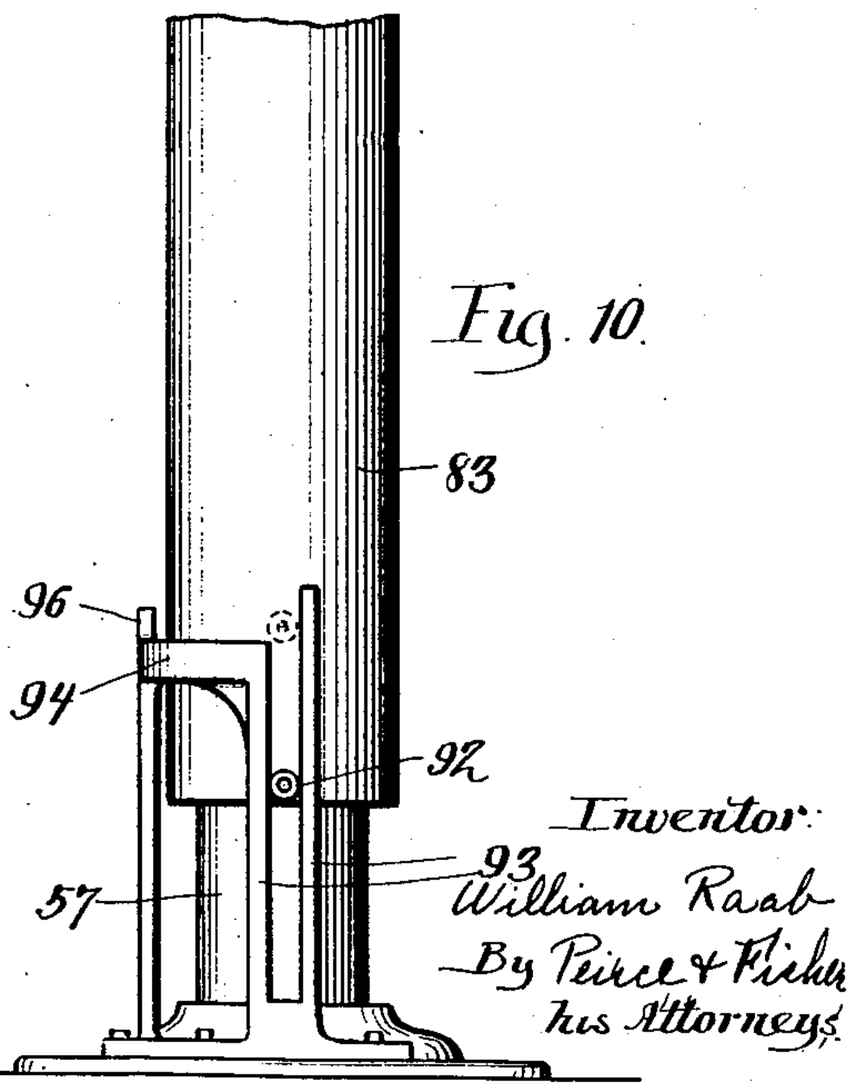


Fig. 10.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING BUILDING-BLOCKS.

No. 886,404. Specification of Letters Patent. Patented May 5, 1908.

Application filed August 22, 1903. Serial No. 170,420.

To all whom it may concern:

Be it known that I, WILLIAM RAAB, a citizen of the United States, and a resident of Waterloo, county of Black Hawk, and State of Iowa, have invented certain new and useful Improvements in Machines for Forming Building-Blocks, of which the following is declared to be a full, clear, and exact description.

The improvement relates to machines for forming artificial stone building-blocks from mixtures of cement and sand or similar plastic material, and particularly to the type of machine adapted to form hollow building-blocks.

The invention seeks to provide a simple and effective construction by which the block-forming mold may be quickly opened and closed and the completed block removed from the mold.

A further object of the invention is to provide an effective form of an automatically operating tamping device so that the mold-box may be rapidly and compactly filled with the plastic material.

A further object of the invention is to provide fluid pressure operating devices in connection with suitable controlling valves so that the machine may be operated for rapidly forming the building-blocks at a small cost.

The invention consists in the features of construction, combinations and arrangement of parts set forth in the following description, illustrated in the accompanying drawings and more particularly set forth in the appended claims.

In the drawings Figure 1 is a side elevation of the improved machine. Fig. 2 is a vertical section through the supporting-frame, mold-box and operating devices therefor, showing the parts of the mold in normal, closed position. Fig. 3 is a similar view showing the parts of the mold in open or expanded position. Fig. 4 is a plan view of the parts shown in Fig. 3. Fig. 5 is a horizontal section on line 5—5 of Fig. 2. Fig. 6 is a view similar to Fig. 3 showing a modified arrangement of parts. Fig. 7 is a detail, vertical section through the tamping device, its support and operating means. Fig. 8 is an inverted plan view of the tamping device. Fig. 9 is a detail view of the supporting upright for the tamping device, parts being shown in section. Fig. 10 is a detail elevation of the lower portion of the supporting upright. Fig. 11 is a detail view illustrating the motor for operating the reciprocating tampers.

The supporting-frame for the mold-box comprises the base portion 10, corner posts 11 mounted thereon and an upwardly flanged top-piece 12 fixed to the upper ends of the corner posts. Cross-bars 13 and 14 (see Figs. 2 and 4) extend between the lower portion of the top-piece 12, these cross-bars being cast in piece or otherwise rigidly secured to the top-piece. Between the outer pairs of cross-bars 13, 14, extend connecting members 15 (see dotted lines Fig. 4) and between the central pair of cross-bars 14, 14 extend the curved bars 16, also shown in dotted lines in Fig. 4.

Upon the frame members 13, 14, 15 and 16 rests a supporting piece 17 which, if hollow blocks are to be manufactured, is provided with the upwardly projecting cores 18 formed in piece therewith or connected thereto in any suitable manner. The plate 17 provided with the vertically disposed cores, is preferably removably mounted in position, so that another similar plate having a different arrangement of cores may be substituted as desired. To hold the plate accurately in position it is provided with a downwardly projecting flange 19 which sets within the cross-bars 14 and the connecting members 16 at the top of the frame. In this manner the plate 17 is held in accurate position yet may be readily removed for the substitution of another plate having a different arrangement of cores.

Upon the supporting plate 17 rests the vertically shiftable bottom plate 20 of the mold-box, which, as indicated is preferably provided on its underside with strengthening ribs 21. The bottom plate 20 is provided with suitable openings 22 which correspond with the cores 18 and through which the latter normally extend. Other bottom plates may be readily substituted in accordance with the arrangement of cores employed.

The outwardly expansible side walls 23 of the mold-box are arranged about the edges of the bottom plate 20 and, in closed position (see Fig. 2) are vertically disposed closely adjacent the edges of the bottom plate. The side walls 23 may be provided as desired, with inwardly projecting core blocks 24, the edge of the bottom plate 20 being correspond-

ingly cut away to fit about such core blocks. In order that the side walls may expand outwardly to release the molded block, they are preferably mounted upon the upper ends of the pivoted supporting arms 25, two of such supporting arms being preferably provided for the long side walls of the mold-box and one only for the short end side walls. In order that the side walls may be readily interchanged for varying the size, shape or surface of the molded block, they are preferably removably secured by bolts 26 to the upper ends of the supporting arms 25 so that they may be readily removed and others substituted as desired.

The supporting arms are mounted on pivot-pins or shafts 27 arranged some distance below the bottom of the mold-box so that the side walls 23 may swing outwardly in substantially right-line direction without defacing the molded block. Side and end bars 28 and 29 extend between the corner posts 11 just below the position of the pivot pins 27. Side bars 28 are connected by the cross-bars 30 and connecting bars 31 extend between the cross-bars 30, and the end bars 29. Bearing blocks 32 and 33 for the pivot shafts 27 are respectively mounted upon the supporting-frame bars 30 and 31 and are preferably arranged thereon to slide to and from the center of the mold-box so that the swinging supports 25 and side walls 23 may be adjusted to and from the center of the mold-box to vary its size, it being understood of course that the side walls 23 must be changed when the size of the mold is altered.

Any suitable means may be provided for adjusting the bearing blocks 32 and 33. In the construction shown, screws 34 are mounted to revolve in bearings 35 upon the frame members 28 and 30 (see Fig. 5). These screws are held against longitudinal movement, threaded through the bearing blocks 32 and are provided with squared outer ends or with other suitable means whereby they may be rotated to adjust the bearing blocks 32 to and from the centers of the mold, as desired. Similarly screws 36 are mounted in bearings 37 on cross-bars 29 and 30 of the frame and are threaded through the bearing blocks 33 to effect their adjustment.

For automatically expanding the side walls of the mold, heavy leaf springs 38 are preferably provided and arranged to engage the supporting arms 25 in such a manner that they tend to expand the side walls 23 of the mold-box outwardly against the upwardly projecting flange of the top piece 12, as indicated in Fig. 3. Such springs are preferably mounted upon the bearing blocks 32 and 33 so that their relative position with reference to the supporting arms 25 is not changed when the latter are adjusted.

An operating cross-head 39 is mounted to shift vertically upon a pair of guide-rods 40 which are fixed between the base 10 of the machine and the cross-bars 14 at the upper part of the frame. This cross-head comprises a downwardly extending cylindrical portion 41 to the lower end of which is secured a horizontally projecting plate portion 42. At the corners of the plate 42 of the cross-head, are fixed four upright rods 43, which are arranged to slide through bearings upon the cross-bars 13 at the upper part of the frame, and which are adapted to engage and elevate the bottom plate 20 of the mold above the top of the side walls 23, as indicated in Fig. 3 when the cross-head is operated.

The cross-head is provided with means arranged to engage the supporting arms 25 and hold the side walls of the mold in closed position against the tension of the expanding springs 38, when the cross-head is in lowermost position. Such means preferably comprises a series of rollers 44 mounted upon the projecting plate portion 42 of the cross-head, and arranged to engage inwardly inclined, cam portions 45 upon the lower, downwardly extending ends of the supporting arms 25 and hold the supporting arms upright against the tension of the springs 38 to close the sides of the mold when the cross-head is in lowermost position. As the cross-head is elevated, rollers 44 move upwardly over the inclined cam portions 45, thus releasing the supporting arms and permitting the springs 38 to automatically expand the side walls of the mold and release the completed block. It will be noted that, as indicated in Fig. 2, the upper ends of the rods 43 are spaced somewhat apart from the lower surface of the mold bottom plate 20 when the cross-head is in lowermost position, so that the side walls of the molds are released and outwardly expanded before the bottom plate 20 is shifted to lift the completed block above the cores 18, so that the block is lifted without damaging its surface, which may be ornamented or molded to represent cut stone, if desired.

In order that the rollers 44 may hold the supporting arms 25 and side walls 23 of the mold-box in upright, vertical position when such parts are adjusted to change the size of the mold, the rollers are journaled in adjustable slides 46 mounted upon the forked projections 47 extending outwardly from the edge of the cross-head plate 42, and these slides are held in adjusted position by set screws 46′.

The cross-head may be operated in any suitable manner but preferably a fluid pressure motor is provided for this purpose so that the machine may be rapidly operated with little labor and at small expense. Such a motor preferably comprises an upright open-top cylinder 48 mounted on base 10 within which reciprocates a piston 49 having a piston-rod 50 connected to the cross-head,

as indicated. A pipe connection 51 (see Figs. 1 and 2) opens into the lower end of the cylinder 48 and is provided with a manually operated three-way valve 52 of ordinary construction, adapted to connect pipe 51 either with a supply pipe 53 or with an exhaust pipe 54. Steam, air or water under pressure may be employed but air under a few pounds of pressure is used. A supply reservoir 55 with which the pipe 53 connects, is conveniently located within the hollow air-tight base portion 10 of the machine, and within which air may be maintained under pressure by a pump or other suitable means. By means of the valve 52 the flow of fluid under pressure to the motor cylinder 48 may be nicely and accurately controlled to effect the upward movement of the mold-box bottom plate 20, and thus lift the completed block above the cores 18 at any desired rate of speed.

A support 56, which carries a suitable tamping device extends above the mold-box and is preferably laterally shiftable to permit the removal of the molded block. For this purpose, the support 56 is arranged to swing in a horizontal plane upon the upper end of a standard or upright 57 arranged to one side of the supporting-frame for the mold-box. The tamping device preferably comprises duplicate tamping-heads 58, arranged to reciprocate vertically on guide-rods 59, which project downwardly from the support 56. The shift of the tamping-head is controlled by a walking beam 60 journaled upon the support 56 and connecting rods 61 extending between the ends of the walking beam and the separate tamping-heads. Each of the tamping-heads comprises upper and lower plates 62 and 63 and is provided with a series of downwardly projecting blocks or tampers 64. The latter are journaled to slide through rectangular openings 63′ in the bottom plates 63 of the tamping-heads and are provided with supporting rods 65 which extend upwardly through openings in the top plates 62. Nuts 66 upon the upper ends of the supporting rods serve to removably hold the tampers in place upon the tamping-heads, and springs 67 coiled about the rods 65 and extending between the upper plates 62 and the upper ends of the tampers, serve to hold the latter yieldingly in lowermost position. By removably supporting the tampers in place upon the heads, they may be arranged in accordance with the size of the mold employed and the arrangement of cores therein (see Fig. 8 in which the mold and cores are indicated in dotted lines). By yieldingly supporting the tampers the material may be rapidly packed within the mold to fill all portions thereof without undue shock upon the operating parts of the tamping device.

The tamping heads may be operated in any suitable manner but preferably the fluid pressure motor carried by the support 56 is employed. As illustrated, such, motor comprises a pair of open-ended cylinders 67, secured to the underside of the support 56 and provided with pistons 68 having piston-rods 69 connected to the separate tamping-heads. The closed ends of the cylinders are connected by pipes 70 with a four-way valve 71 (see Fig. 7), which is adapted to alternately connect the ends of the cylinders with a supply pipe 72 and an exhaust port 73. Valve 71 is automatically operated by a pair of cam-lugs 74, (see Fig. 11) fixed to the separate connecting-rods 61 and arranged to actuate a T-shaped tappet 75, which in turn is arranged to actuate a crank-arm 76 fixed to the stem of the valve 71. The tappet-arm 75 is pivoted to a support 75′ extending between the lower ends of the cylinders 67 and is held on either side of the central position by a spring 77, which also assists in completing its movement. A flexible pipe-connection 78 (see Fig. 1) extends between the inlet-pipe 72 of the valve 71 and a vertically disposed supply pipe 79 arranged near the upright 57 so that fluid under pressure may be supplied to the tamper-actuating motor without interfering with the shift of the support 56. The pipe 79 preferably connects with the compressed air reservoir 55, although steam under pressure could be employed if desired. A manually controlled throttle-valve 80 in the pipe 79, serves to regulate the flow of compressed air to the motor and thereby controls the speed at which the tampers are operated.

It is necessary to gradually diminish the extent to which the tampers are projected within the mold-box as the latter is filled with material. To effect this purpose, means are preferably provided for gradually raising the support 56 which carries the tampers and their actuating devices, while the tampers are being operated and the mold-box filled with material. The support 56 is guided in its upward shift by a sleeve 81 which is connected to or formed in piece with support 56, surrounds the upper end of the upright 57 and engages a flange 82 (see Fig. 9) at the upper end thereof. A second sleeve 83 surrounds the upright 57 and is secured to the lower end of the sleeve 81. The lower end of the sleeve 83 is provided with an inwardly extending flanged portion 84 at its lower end which engages the surface of the upright 57 to assist in guiding the sleeves and the support 56 during their vertical shift.

A fluid pressure motor is preferably provided for effecting the upward shift of the support 56, comprising an open-ended cylinder 85 upon the upper end of the upright 57, and provided with a piston 86 and upwardly extending piston-rod 87. The cone-shaped cap 88 upon the upper end of the sleeve 81, rests upon the upper conical end of the piston-rod 87, so that at the end of its upward

movement support 56 may be swung to one side away from the mold-box. A pipe 89 extends upwardly within the standard 57 and connects the lower end of the cylinder 85 with the pressure supply reservoir 55. The pipe 89 is provided with a manually controlled throttle-valve 90 for regulating the flow of compressed air to the motor cylinder 85 and a manually controlled valve 91 by which the cylinder may be connected to the atmosphere and the compressed air therein exhausted. By setting the valve 90 in accordance with the scale and index provided, the vertical shift of the tamper support 56 may be effected at any desired rate of speed as the tampers are reciprocated and the mold-box filled with material, thereby gradually diminishing the extent to which the tampers are projected within the mold-box. Valve 90 will be so set that the support 56 will not reach the end of its upward movement before the operator has had time to completely fill the mold with material.

Support 56 and connected parts are guided in their upward movement by a roller 92 (see Figs. 9 and 10), journaled upon the lower end of the sleeve 83 and arranged to shift between the vertically disposed guide-bars 93. One of the bars 93 is shorter than the other so that at the end of the upward movement of the tamper support the roller 92 is released and the tamper support and connected parts are then free to swing laterally with the roller 92 in engagement with a horizontal support 94 connected to the shorter upright 93 and extending about the lower end of the sleeve 83.

A spring 95 coiled about the upright 57 and inside the sleeve 83, is connected at opposite ends to such parts and is arranged to automatically swing the tamper support 56 to one side as soon as the roller 92 is released from between the upright guide-bars 93. The upper end of the longer vertical guide 93 and a stop 96 at the end of the horizontal support 94, serve to limit the lateral swing of the tamper support.

The valve 97 interposed in the pipe-connection 79, is arranged to be automatically closed by a lug 98 upon the lower end of the sleeve 83 which strikes a crank-arm 99 on the valve stem when the tamper support reaches the end of its upward movement so that the supply pressure of the tamper-actuating motor is cut off and the operation of the tamper checked as it is swung to one side. The valve 97 is automatically opened when the tamper support is returned to lowermost position by a lug 100 on sleeve 83 arranged to strike the crank-arm 99 and shift the valve in the opposite direction. A spring 101, connected to the crank-arm 99, serves to hold the valve 97 in open or closed position and also assist in completing its shift as the crank-arm is struck by the lugs 98 and 100.

The operation is as follows: A plate 17 having the desired arrangement of cores, is placed upon the upper portion of the mold-box frame, the mold-box bottom plate 20 is placed in position as indicated in Fig. 2 and the side walls 23 of the desired size are bolted to the upper ends of the supporting arms 25. The supporting arms and their operating rollers 44 are then adjusted, as previously described, so that when the operating cross-head is in lowermost position the rollers 44 will hold the side walls of the mold closed and vertically upright. The tamper support 56 is then swung over the top of the mold and valve 91 opened so that any air in the motor cylinder 85 is exhausted and the tamper support 56 descends by gravity to its lowermost position. This movement automatically opens the valve 97 so that air under pressure is supplied to the tamper-actuating motor cylinders 67 and the tamper-heads are set in operation. Valve 80 is adjusted so that the tampers will be operated at the desired speed. Valve 91 is then closed and valve 90 set to supply air to the motor cylinder 85, so that the tamper support 56 will be gradually raised as the operator fills the mold with material. When the mold is full valve 97 is automatically closed, as above described, by the engagement of the lug 98 with the crank-arm 99 so that the operation of the tampers is stopped, roller 92 is released from between the upright guides 93 and the spring 95 operates to shift the tamper support to one side. The operator then connects the motor cylinder 48 with the supply reservoir by shifting the valve 52, thus lifting the cross-head 39 releasing the side walls 23 so that the latter are expanded outwardly by the springs 38 and lifting the bottom plate 20, together with the molded block above the cores 18 (see Fig. 3). Bottom plate 20, together with the molded block, may be then removed, valve 52 shifted to exhaust the air from the motor cylinder 48 and another bottom plate placed in position so that the machine is ready for the next succeeding operation.

A somewhat modified arrangement of the operating mechanism for the mold-box, is illustrated in Fig. 6. The arrangement of the core-supporting plate and the movable bottom plate from the mold and the operating mechanism for the latter, is similar to that previously described, except that the cross-head 39′ on the piston-rod 50, is flat and is not dished. Moreover, the cross-head is not provided with means for releasing the spring-actuated side walls. The side walls in the modification are pressed outwardly by springs 38′, which also preferably serve to support the side walls 23 and are secured as indicated, to a supplemental cross-head 102 below the cross-head 39′ and surrounding the cylinder 48. The sides 23 are held in closed position against the tension of the springs 38′

by a series of blocks 103 having wedge-shaped upper ends and adapted to engage wedge-shaped pieces 104, secured to the side walls. The side walls 23 and springs 38′ are removably and adjustably held in place upon the cross-head 102 by bolts 105, which extend through the lower bent ends of the springs 38′ and slots 106 in the cross-head 102, and the blocks 103 are adjustably mounted to slide on rods 107 fixed to supports 108 depending from the top of the mold-box frame. Screws 109, journaled in the supports 108, held against longitudinal movement thereby are threaded through the blocks 103 and provided with squared outer ends, or other means whereby they may be turned to adjust the blocks 103, as desired. Fluid pressure cylinders 110, mounted on opposite ends of the base portion 10, of the frame, are provided with pistons 111 having piston-rods 112 to which the ends of the cross-head 102 are secured. The upper ends of the piston-rods 112 slide through openings in guide-yokes 113, which also serve to limit the upward movement of the cross-head 102. Supply pipes 114, opening into the lower ends of the cylinders 110, connect, as indicated in dotted lines, with supply pipe 51 and the passage of fluid therethrough is controlled by the valve 52. When the molding operation is complete the operator connects the supply reservoir with the pipes 51 and 114 by means of the valve 52, so that pistons 49 and 111 are shifted upwardly. The upward movement of the cross-head 102 lifts the side walls 23 upwardly and the latter are thus released from the blocks 103 and are free to be expanded outwardly by their actuated springs 38′. The upward movement of the cross-head 39′ lifts the bottom plate 20 in the manner previously described, but since the upper ends of the rods 43 are, as indicated in dotted lines, normally somewhat below the plane of the bottom plate, the cross-head 39′ must be lifted some distance before it commences to shift the bottom plate. In this way the side walls 23 are released and expanded before the molded block is lifted from the cores, as previously described in connection with the form shown in Figs. 2 and 3.

It is obvious that numerous changes can be made in the details of the construction without departure from the essentials of the invention. For example, instead of two single-acting cylinders, a single double-acting cylinder could be employed for operating the tampers. It is also obvious that parts of the invention could be employed without its adoption in entirety.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls and a bottom plate movable to and from the top of said side walls, springs for automatically expanding said side walls, means for holding said side walls in closed position against the tension of said springs, a core projecting through an opening in the mold-box bottom and means for releasing said spring actuated side walls and for shifting said movable bottom above the top of said core to effect the removal of the molded block therefrom.

2. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls and a bottom plate movable independently of said side walls and to and from the top thereof, springs for automatically expanding said side walls, means for holding the latter in closed position against the tension of said springs, a fixed core projecting through an opening in the mold-box bottom plate when in lowermost position and common means for releasing said spring actuated side wall and for effecting the shift of said bottom plate above the top of said core to effect the removal of the molded block.

3. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls and a bottom plate movable independently of said side walls and to and from the top thereof, springs for automatically expanding said side walls, means for holding the latter in closed position against the tension of said springs, a core projecting through an opening in the mold-box bottom plate when in lowermost position, mechanism arranged to successively release said spring actuated side walls and elevate said bottom plate above the top of said core.

4. A machine for forming hollow building blocks comprising a non-revoluble, rectangular mold-box having side walls and a bottom plate, a core extending vertically through an opening in said bottom plate, said bottom plate being vertically movable to the tops of said core and of said side walls, springs for automatically expanding said side walls, abutments for holding said side walls in closed position against the tension of said springs and mechanism for effecting a relative shift between said side walls and said abutments, and for elevating said bottom plate to the tops of said core and side walls.

5. A machine for forming hollow building blocks comprising an open-top mold box having outwardly expansible, pivoted side walls and a bottom plate movable independently of said side walls to and from the top thereof, a core extending vertically through an opening in said mold box bottom plate when in lowermost position, springs for automatically expanding said side walls, shiftable abutments for holding said side walls in closed position against the tension of said spring and mechanism for shifting said abut-

ments to release said side walls and for raising said bottom plate to the tops of said core and side wall,

6. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls and a bottom plate movable independently of said side walls and to and from the top thereof, a core extending through an opening in the mold-box bottom and a shiftable member arranged to elevate said bottom plate and provided with means for controlling the movement of said side walls.

7. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls and a bottom plate movable independently of said side walls and to and from the top thereof, a core extending through an opening in the mold-box bottom, springs for automatically expanding said side walls and a shiftable member arranged to elevate said bottom plate and release said spring-actuated side walls.

8. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls and a bottom plate movable independently of said side walls and to and from the top thereof, a core extending through an opening in the mold-box bottom, springs for automatically expanding said side walls and a shiftable member for elevating said bottom plate and provided with means for holding said side walls in closed position against the tension of said springs whereby said side walls will be released when said shiftable member is actuated to engage said bottom plate.

9. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls, a bottom plate and a core extending through an opening in said bottom plate, springs for automatically expanding said side walls and a shifter for effecting a relative movement between said bottom plate and core to remove the core from the molded block, said shifter being provided with means for holding said side walls in closed position against the tension of their actuating springs, whereby when said shifter is moved said spring-actuated side walls will be released.

10. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls, pivoted, spring-actuated supports whereon said side walls are mounted, a bottom plate movable to and from the top of said side walls, a core extending through an opening in said bottom plate and a shifting cross-head for elevating said bottom plate provided with means for engaging said spring-actuated supports to hold said side walls in closed position against the tension of their actuating springs.

11. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls, pivoted spring-actuated supports whereon said side walls are mounted, a bottom plate shiftable to and from the top of said side walls, a core extending through an opening in said bottom plate, a shiftable cross-head, means carried by said cross-head arranged to engage said supports and hold said side walls in closed position against the tension of said actuating springs and arranged to release said spring-actuated supports and side walls by a slight initial movement of said cross-head and means carried by said cross-head arranged to engage and elevate said bottom plate after a slight initial movement of said cross-head.

12. A machine for forming hollow building-blocks comprising a bottom plate outwardly expansible side walls pivotally supported at points below said bottom plate, springs for automatically expanding said side walls, means for holding said side walls in closed position against the tension of said springs, a core extending through an opening in said bottom plate, means for releasing said spring actuated side walls and for effecting a relative movement between said core and bottom plate to withdraw the core from the molded block.

13. A machine for forming building blocks comprising a mold having outwardly swinging side walls, shiftable blocks or mounts to which said walls are pivotally connected, rails with which said blocks or mounts engage and whereon they are guided in straight line direction to and from the center of the mold, mechanism engaging said blocks or mounts sliding the same along said rails and adjustable mechanism for automatically opening and closing said swinging side walls in any of their adjusted positions, substantially as described.

14. A machine for forming building blocks comprising a mold having outwardly swinging side walls, shiftable blocks or mounts to which said side walls are pivotally connected, rails with which said blocks or mounts engage and whereon they are guided in straight line direction to and from the center of the mold, adjusting screws extending parallel with said guide rails and threaded through said blocks or mounts, means for holding said adjusting screws against longitudinal movement and adjustable mechanism coöperating with said swinging side walls to automatically open and close the same in any of their adjusted positions, substantially as described.

15. A machine for forming building blocks comprising a mold box having outwardly swinging side walls, swinging supporting arms to the upper ends of which said side walls are removably and interchangeably secured and blocks or mounts to which said supporting arms are pivoted below the bottoms of said side walls, substantially as described.

16. A machine for forming building blocks comprising a mold box having outwardly swinging side walls, supporting arms to which said walls are removably and interchangeably secured, slidable mounts or blocks to which said supporting arms are pivoted and means for adjusting said mounts to and from the center of the mold box to vary the size of the molded block, substantially as described.

17. A machine for forming building blocks comprising a mold box having outwardly swinging side walls, supporting arms to which said side walls are interchangeably and removably secured, sliding blocks or mounts to which said supporting arms are pivotally connected and screws engaging said blocks or mounts to adjust the same to and from the center of the mold box to vary the size of the mold, substantially as described.

18. A machine for forming building blocks comprising a mold box having outwardly swinging side walls, swinging supporting arms to the upper ends of which said side walls are interchangeably and removably secured, sliding blocks to which said supporting arms are pivoted below the bottoms of said side walls, guide-ways whereon said blocks are mounted and screws engaging said blocks to adjust the same to and from the center of the box to vary the size of the mold box, substantially as described.

19. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls, spring-actuated supports whereon said side walls are removably mounted, means for adjusting said supports to and from the center of said mold-box to vary the size of the molded blocks, adjustable devices for holding said side walls and supports closed in different positions against the tension of said springs, a core extending through an opening in the mold-box bottom and means for releasing said spring-actuated supports and side walls and for effecting the removal of the core from the molded block.

20. A machine for forming hollow building-blocks comprising outwardly expansible side walls, pivoted supports whereon said side walls are removably mounted, means for adjusting said pivoted supports to and from the center of the mold-box, a bottom plate, a core extending through an opening in said bottom plate, a shifting cross-head for effecting a relative movement between said bottom plate and core to withdraw the latter from the molded block and adjustable devices carried by said cross-head for controlling the movement of said side walls.

21. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls, a bottom plate and a core extending through an opening in said bottom plate, and fluid pressure actuated devices for effecting the relative movement between said bottom plate and said core to withdraw the latter from the molded block.

22. A machine for forming hollow building-blocks comprising laterally and outwardly movable side walls, a bottom plate vertically movable to and from the top of said side walls, a core extending through an opening in said bottom plate and fluid pressure actuated devices for elevating said bottom plate and for controlling the movement of said side walls.

23. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible side walls, a bottom plate and a core extending through an opening in said bottom plate, a shiftable cross-head provided with means for controlling the movement of said side walls and with means for effecting a relative movement between said bottom plate and core to withdraw the latter from the molded block, a fluid pressure cylinder, a piston therein operatively connected to said cross-head, means for controlling the admission of fluid under pressure to said cylinder.

24. A machine for forming hollow building-blocks comprising a mold-box having outwardly expansible, pivoted spring-actuated side walls, a bottom plate movable to and from the top of said side walls, a core extending through an opening in said bottom plate, a cross-head provided with means for holding said side walls in closed position against the tension of said springs and also provided with means for elevating said bottom plate, a fluid pressure cylinder, a piston therein connected to said cross-head and means controlling the flow of fluid to said cylinder.

25. In machines for forming building blocks, the combination with an open-top mold box, of a support above the top of said mold box, a vertically reciprocating tamping head carried by said support and a series of independently spring-held tampers mounted upon and shiftable with said vertically reciprocating tamping head.

26. In machines for forming building blocks, the combination with an open-top mold box having vertically disposed cores and side walls, said cores and side walls being interchangeably and adjustably held in position to vary the size of the mold and the contour of the molded block, of a support above the top of said mold box, a vertically reciprocating tamping head carried by said support and a series of tampers removably and interchangeably mounted upon and shiftable with said vertically reciprocating tamping head, substantially as described.

27. In machines for forming building blocks, the combination with an open-top mold box, of a support laterally shiftable

over the top of said mold box, a vertically reciprocating tamping head and operating means therefor carried by said support and a series of independently spring-held tampers mounted upon and shiftable with said tamping head, substantially as described.

28. In machines for forming building-blocks, the combination with an open-top mold-box, of a support above the top of said mold-box, two tamping-heads vertically shiftable upon said support, a series of tampers carried by each of said heads, a walking-beam connecting said tamping-heads and means carried by said supports for operating the same.

29. In machines for forming building-blocks, the combination with an open-top mold-box, of a laterally shiftable support mounted to swing over the top of said mold-box, two tamping-heads mounted to shift vertically upon said support, a series of spring-held tampers carried by each of said heads, a walking-beam and connecting rods between said tamping-heads, a fluid pressure motor carried by said support for operating said tamping-heads, valve mechanism for said motor controlled by the movement of said heads and a flexible pipe connection leading to said motor.

30. In machines for forming building blocks, the combination with an open-top mold box, of a support laterally shiftable over the top of said mold box, a tamping device of substantially the same size as the mold and operating means for automatically reciprocating said tamping device carried by said support, means for holding said support against lateral shift during the tamping operation and means for gradually decreasing the extent to which said tamping device is projected within said mold box as the latter is filled.

31. In machines for forming building-blocks, the combination with an open-top mold-box, of a support laterally shiftable above the top of said mold-box, a tamping device substantially the same size as the mold and automatic operating means therefor carried by said support means for holding said support against lateral shift during the tamping operation and means for gradually elevating said support as the mold-box is filled.

32. In machines for forming building blocks, the combination with an open-top mold box, of a support laterally shiftable above the top of said mold box, a reciprocating tamping device and operating means therefor carried by said support, means for gradually elevating said support as the mold box is filled and stop devices arranged to hold said support against lateral shift during the tamping operation, and arranged to automatically release the same when the mold box is filled.

33. In machines for forming building-blocks, the combination with an open-top mold-box, of a support laterally shiftable above the top of said mold-box, a reciprocating tamping device of substantially the same size as the mold carried by said support, a fluid pressure motor carried by said support for operating said tamping device, automatic valve mechanism therefor controlled by the reciprocations of said tamping device, a stop for holding said support against lateral shift during the tamping operation, a fluid pressure motor for gradually elevating said support, a pipe connection leading to said motor and a manually controlled throttle-valve in said connection.

34. In machines for forming building-blocks, the combination with an open-top mold-box, of a support over the top of said mold-box, a tamping device and operating means therefor carried by said support, means for gradually elevating said support as the mold-box is filled and automatically acting means for laterally shifting said support at the end of its upward movement.

35. In machines for forming building-blocks, the combination with an open-top mold-box, of a support above the top of said mold-box, a tamping device and operating means therefor carried by said support, an upright whereon said support is mounted to shift vertically and swing laterally in a horizontal plane, means for gradually lifting said support as the mold-box is filled, a spring for swinging said support laterally and means for holding said support in position against the tension of said spring arranged to release the same at the end of its upward movement.

36. In machines for forming building-blocks, the combination with an open-top mold-box, of a support above the top of said mold-box, a reciprocating tamping device and operating means therefor carried by said support, means for gradually lifting said support as the mold-box is filled, means controlled by the vertical shift of said support for starting and stopping the operating means for said tamping device and means for laterally shifting said support at the end of its upward movement.

37. In machines for forming building-blocks, the combination with an open-top mold-box, of a support above the top of said mold-box, a reciprocating tamping device carried by said mold-box, a fluid pressure motor carried by said support for operating said tamping device, a flexible pipe connection leading to said motor, means for gradually elevating said support as the mold-box is filled and a cut-off valve in said pipe connection controlled by the vertical shift of said support.

38. In machines for molding building-blocks, the combination with an open-top mold-box, of a support above the top of said mold-box, a reciprocating tamping device

and means for operating the same carried by said support, a fixed upright, a fluid pressure cylinder in the upper end of said upright, a piston and piston-rod in said cylinder and a sleeve connected to said support surrounding said upright and swiveled upon the upper end of said piston-rod.

39. In machines for forming building-blocks, the combination with an open-top mold-box, a support above the top of said mold-box, a reciprocating tamping device carried by said support, a fluid pressure motor for operating said tamping device, a flexible pipe connection leading to said motor, an upright whereon said support is mounted to shift vertically and swing laterally in a horizontal plane, a fluid pressure motor mounted on said upright for gradually lifting said support as the mold-box is filled, means for laterally shifting said support at the end of its upward movement and means operated by the vertical shift of said support for controlling the flow of fluid to said tamper-operating motor.

40. In machines for forming hollow building blocks, the combination with a mold box having outwardly expansible side walls, a bottom plate and a core projecting through an opening in said bottom plate, of a laterally shiftable support above said mold box, a tamping device and operating means for automatically reciprocating said tamping device carried by said support, means for holding said support against lateral shift during the tamping operation, means for automatically elevating said support as the mold box is filled and means for expanding the side walls of said mold box and for effecting a relative movement between said box bottom and said core to withdraw the latter from the molded block.

41. In machines for forming hollow building-blocks, the combination with a mold-box having outwardly expansible side walls, a bottom plate and a core projecting through an opening in said bottom plate, of a vertically movable and laterally shiftable support above said mold-box, a reciprocating tamping device carried by said support, fluid pressure operating devices for said tamping device and said support and for elevating said mold-box bottom, a supply reservoir, connections between said supply reservoir and said fluid pressure operating device and controlling valves in said connections.

42. A machine for forming hollow building blocks comprising a mold box having outwardly expansible side walls a bottom plate vertically shiftable to and from the top of said side walls, a core vertically projecting through, an opening in said bottom plate when the latter is in lowermost position, operating mechanism arranged to automatically effect first the expansion of said side walls, and subsequently the elevation of said bottom plate to the tops of said side walls and of said core, and a common shiftable member controlling the operation of said mechanism, substantially as described.

WILLIAM RAAB.

Witnesses:
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ORREN C. MILLER.