K. S. BLANCHARD.

PRESS.

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975,204.

Patented Nov. 8, 1910.

9 SHEETS—SHEET 1.

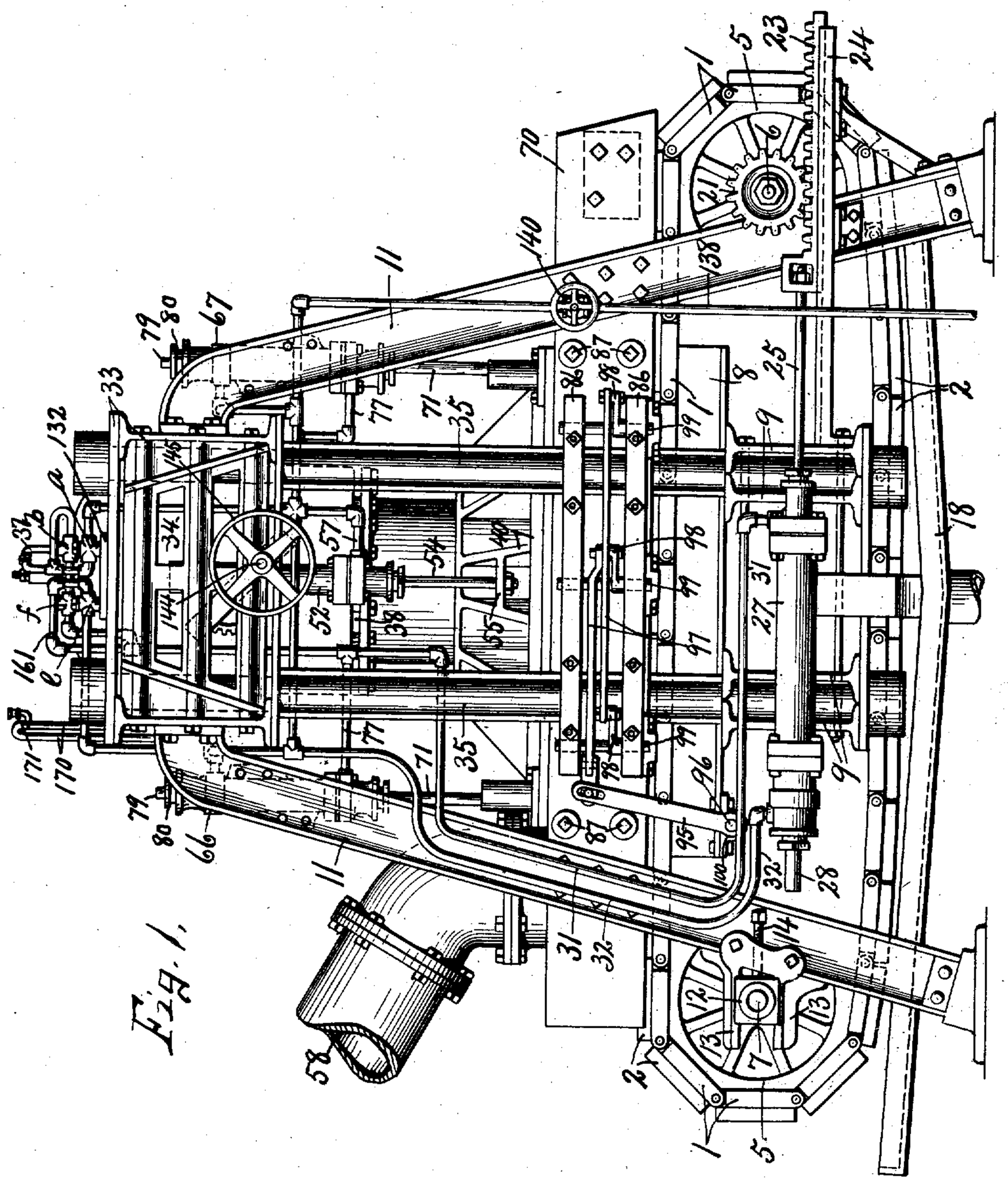

Fig. 1.

Witnesses.

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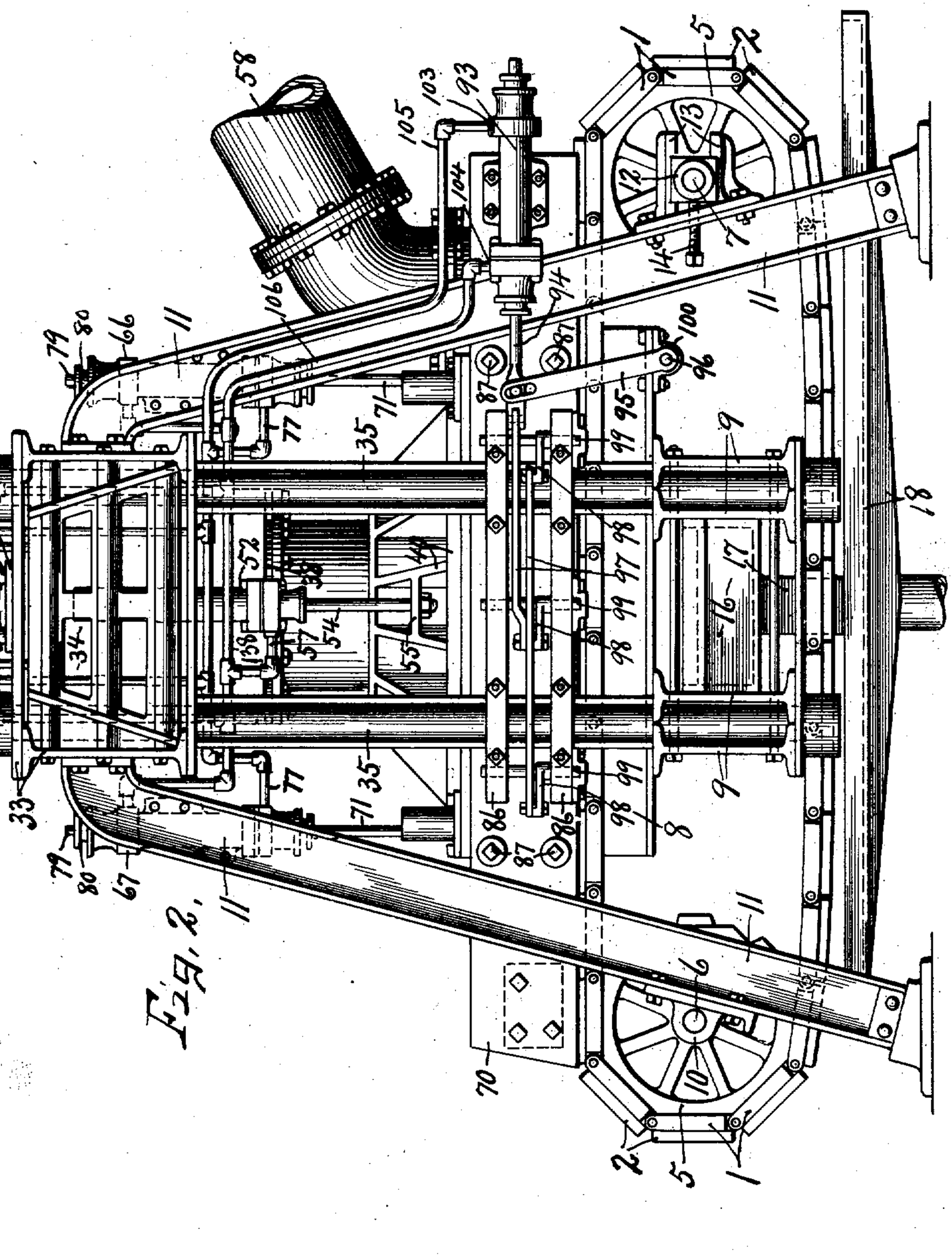

Fig. 2.

Witnesses.

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9 SHEETS—SHEET 3.

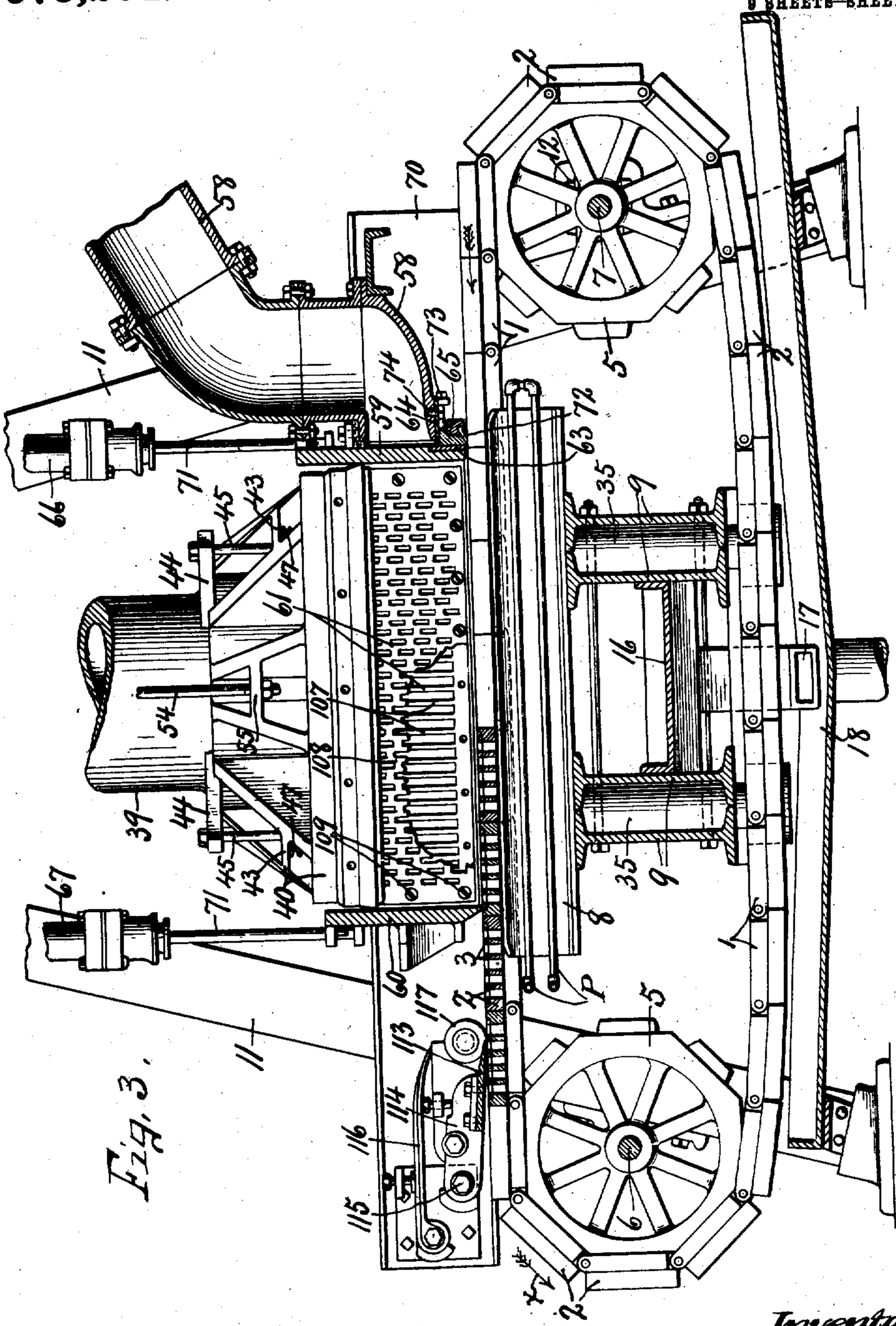

Fig. 3.

Witnesses.
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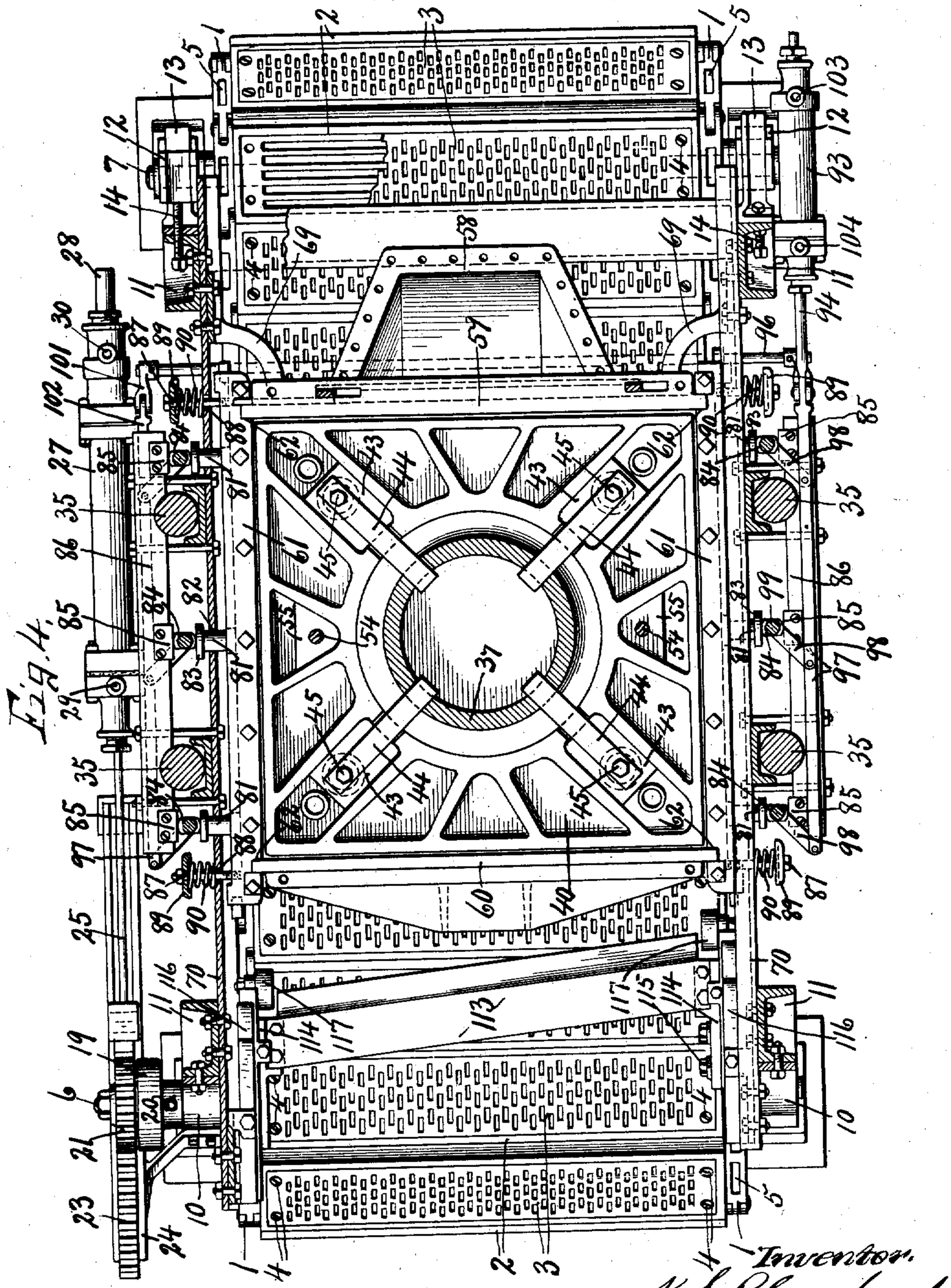

Fig. 4.

Witnesses.

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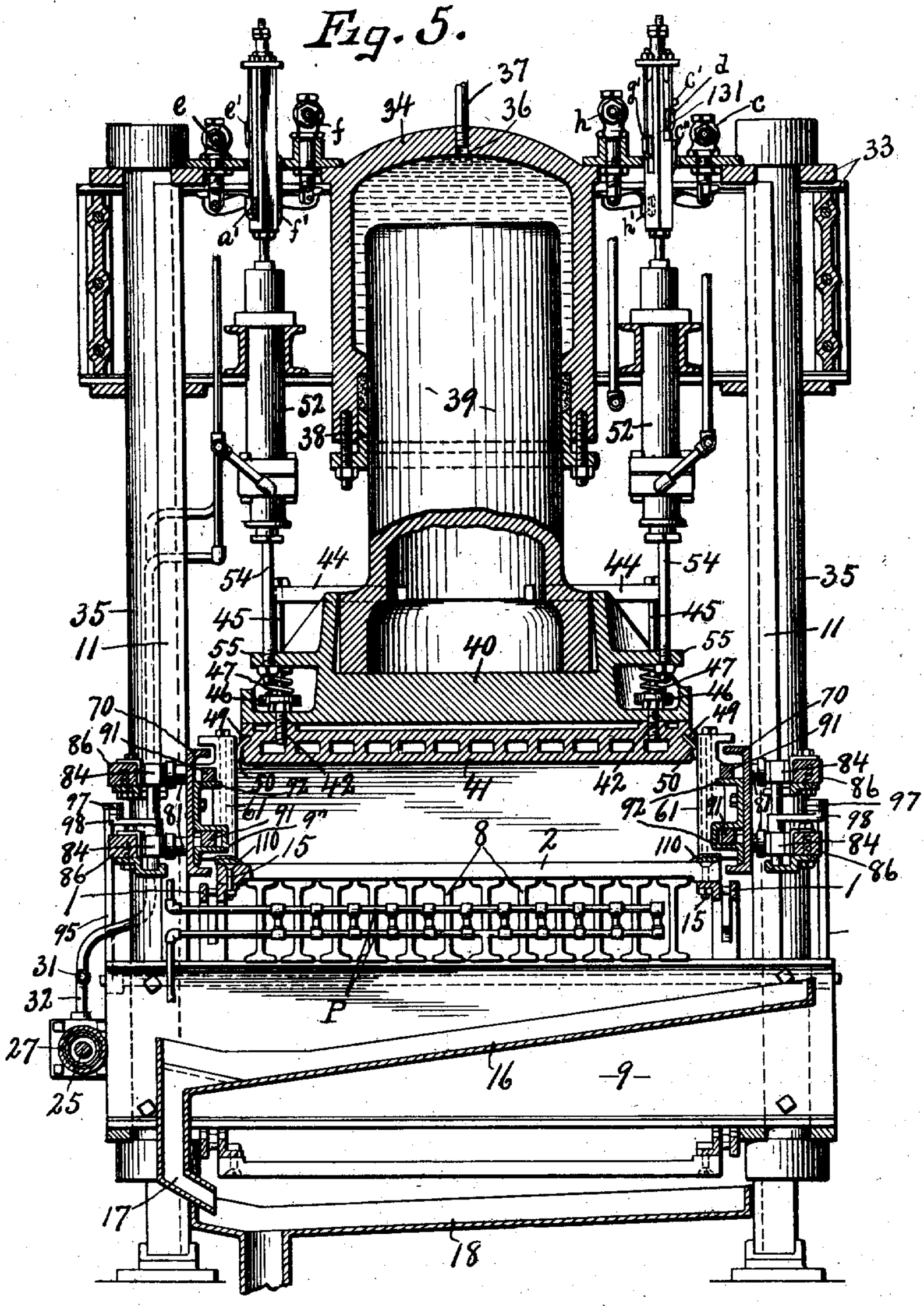
9 SHEETS—SHEET 5.

Fig. 5.



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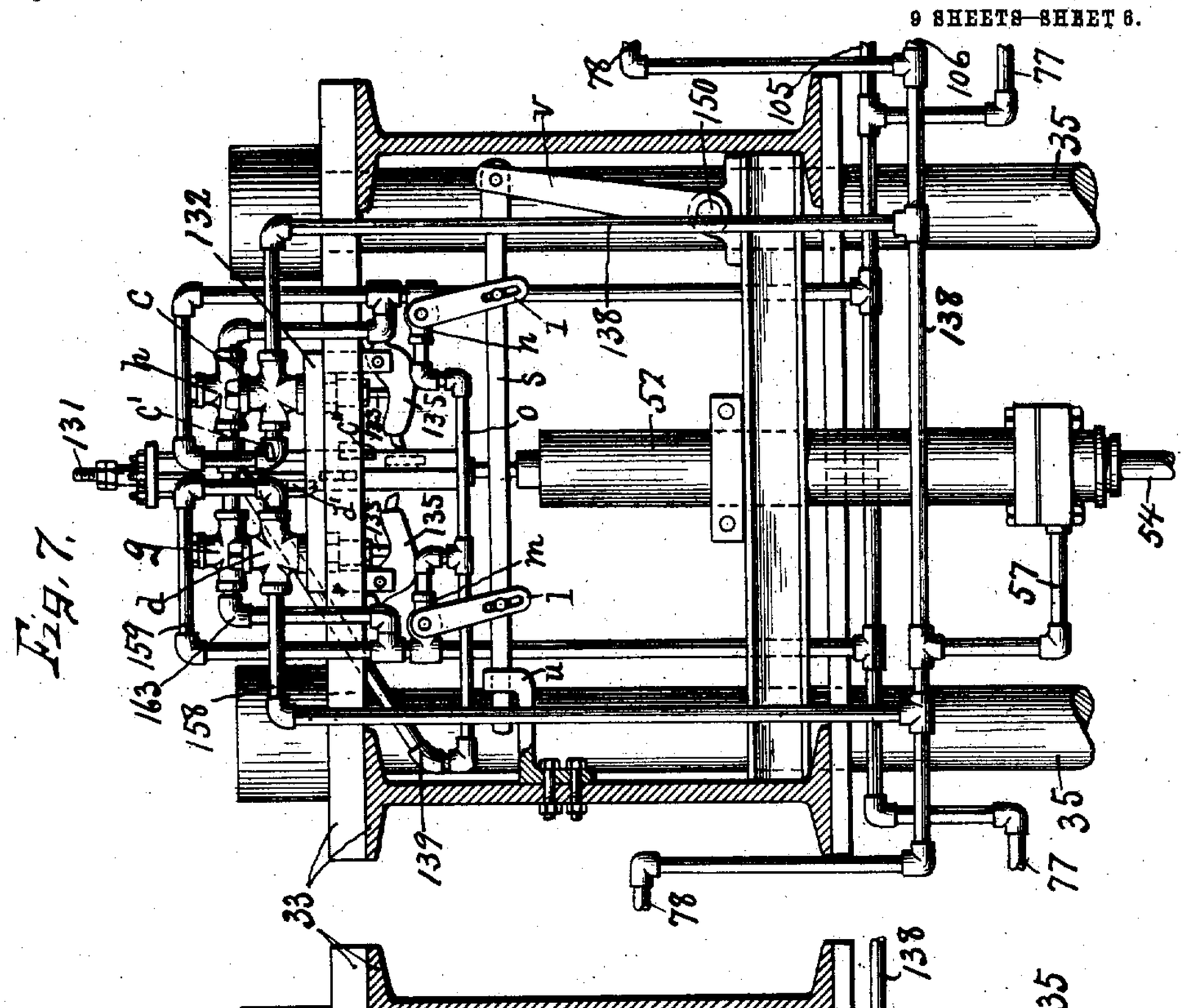
9 SHEETS—SHEET 6.

Fig. 7.



Witnesses.

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9 SHEETS—SHEET 7.

Fig. 8.

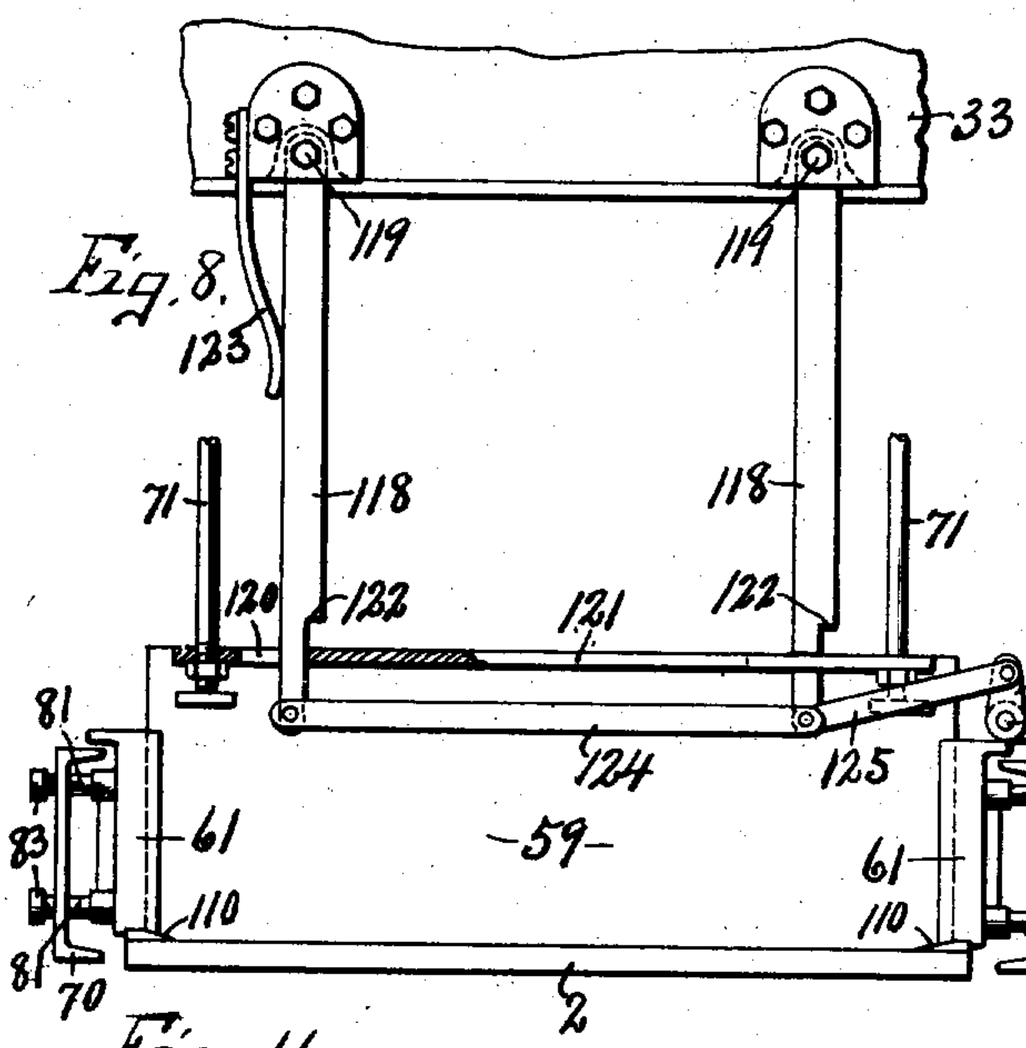


Fig. 9.

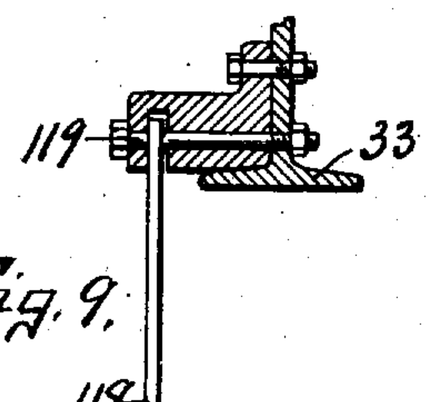


Fig. 10.

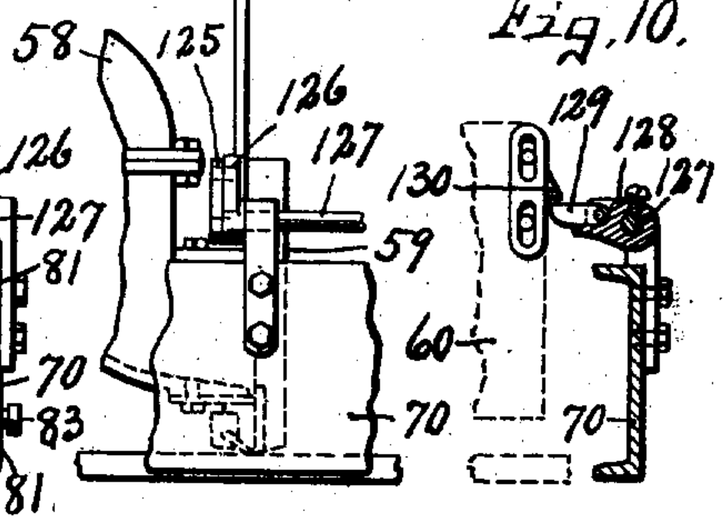


Fig. 11.

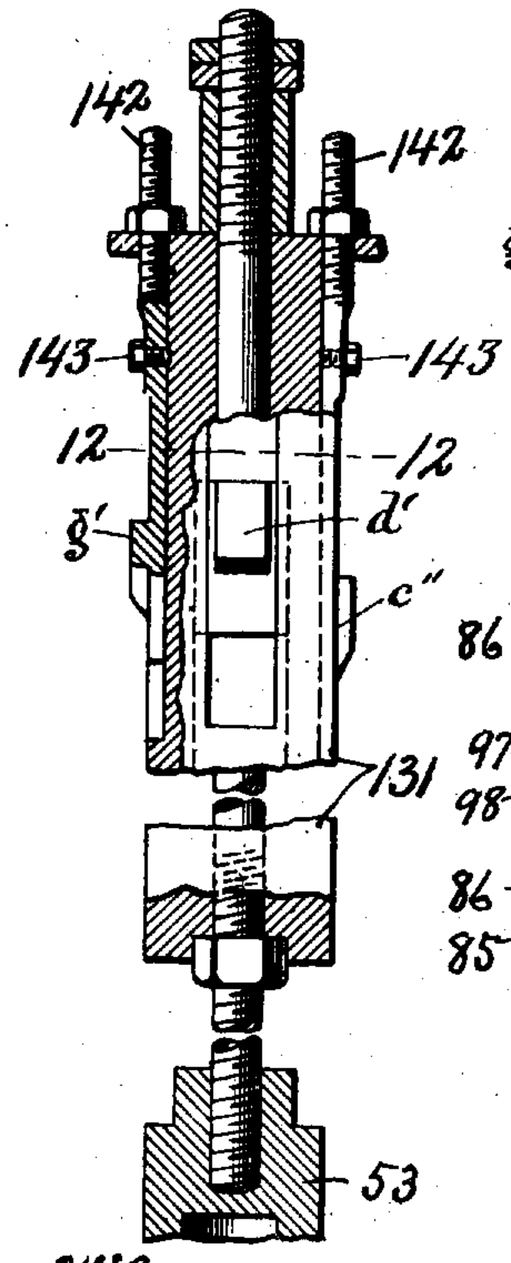


Fig. 12.

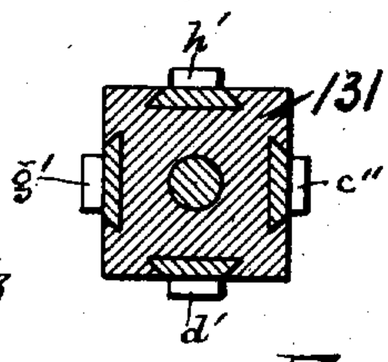


Fig. 13.

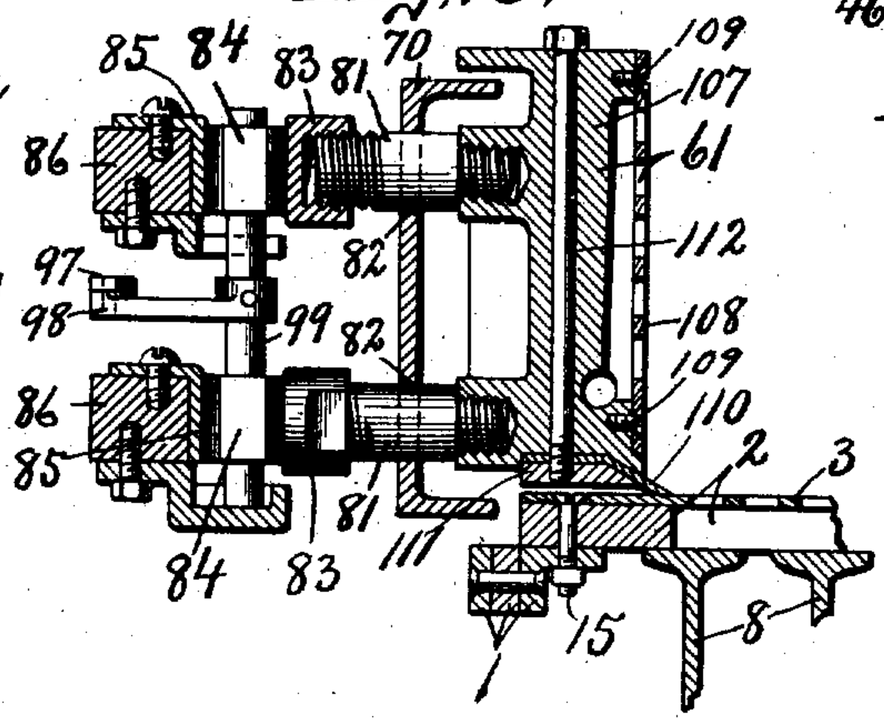


Fig. 14.

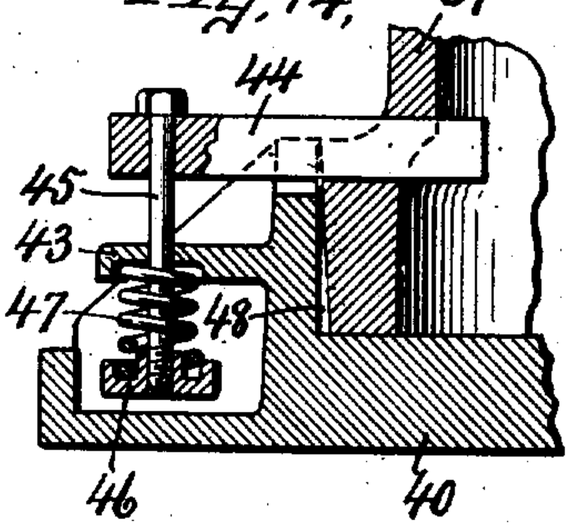
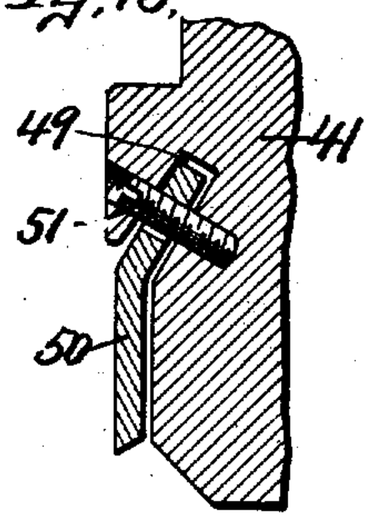


Fig. 15.



Witnesses.

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9 SHEETS—SHEET 8.

Fig. 16.

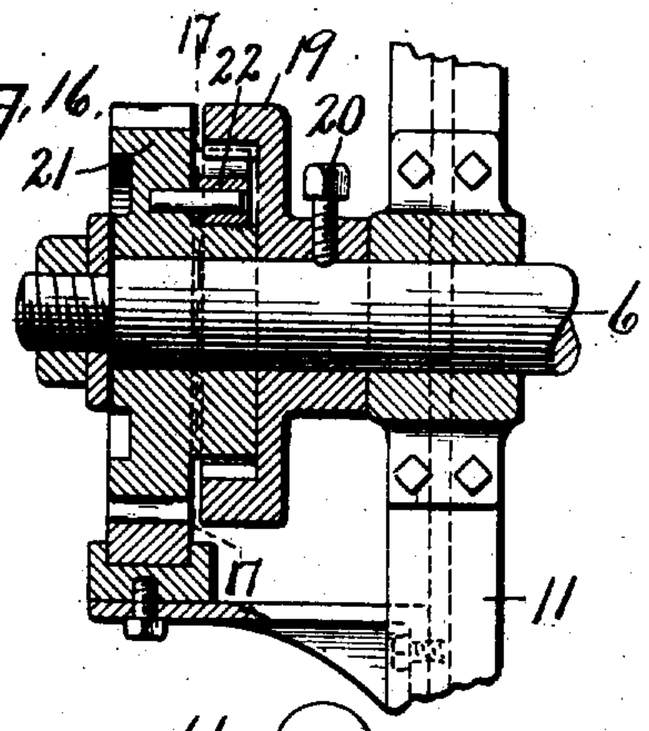


Fig. 17.

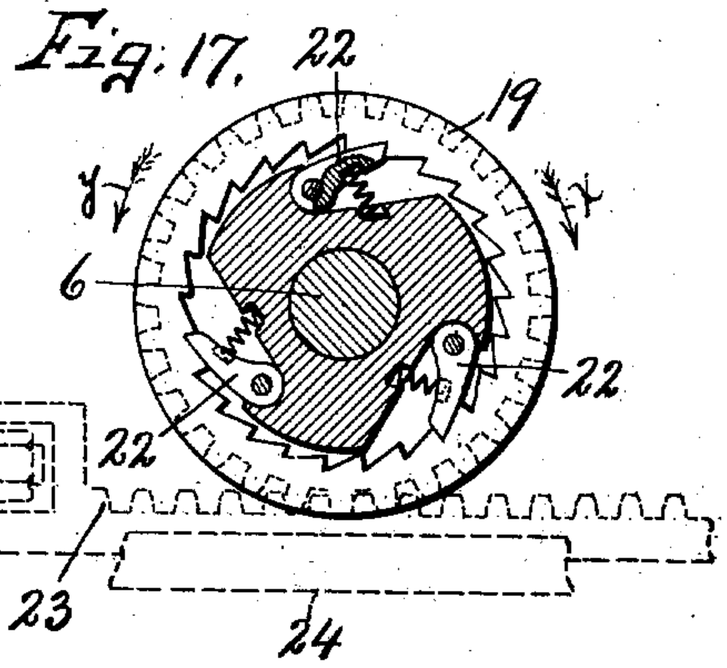


Fig. 22.

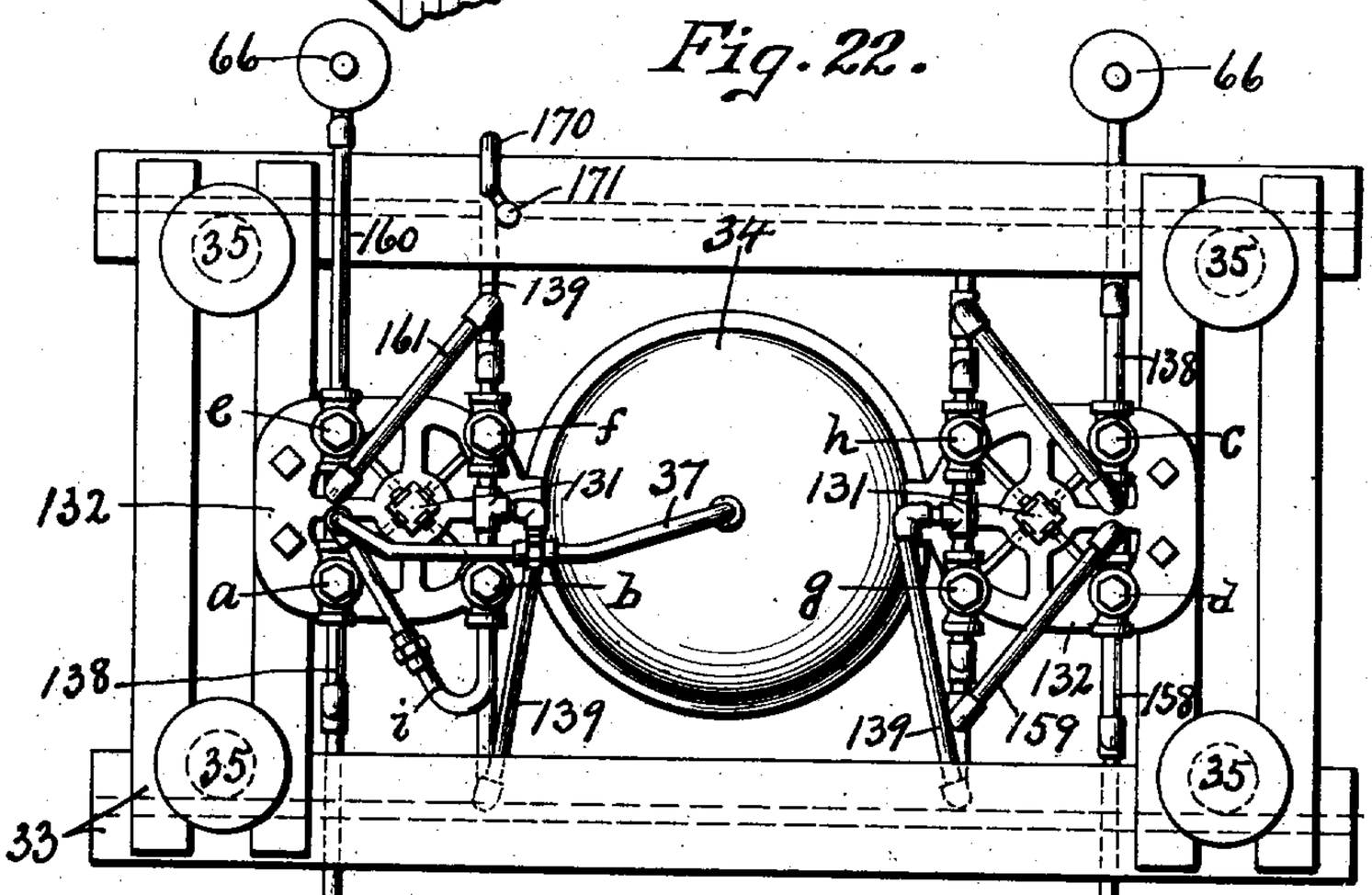
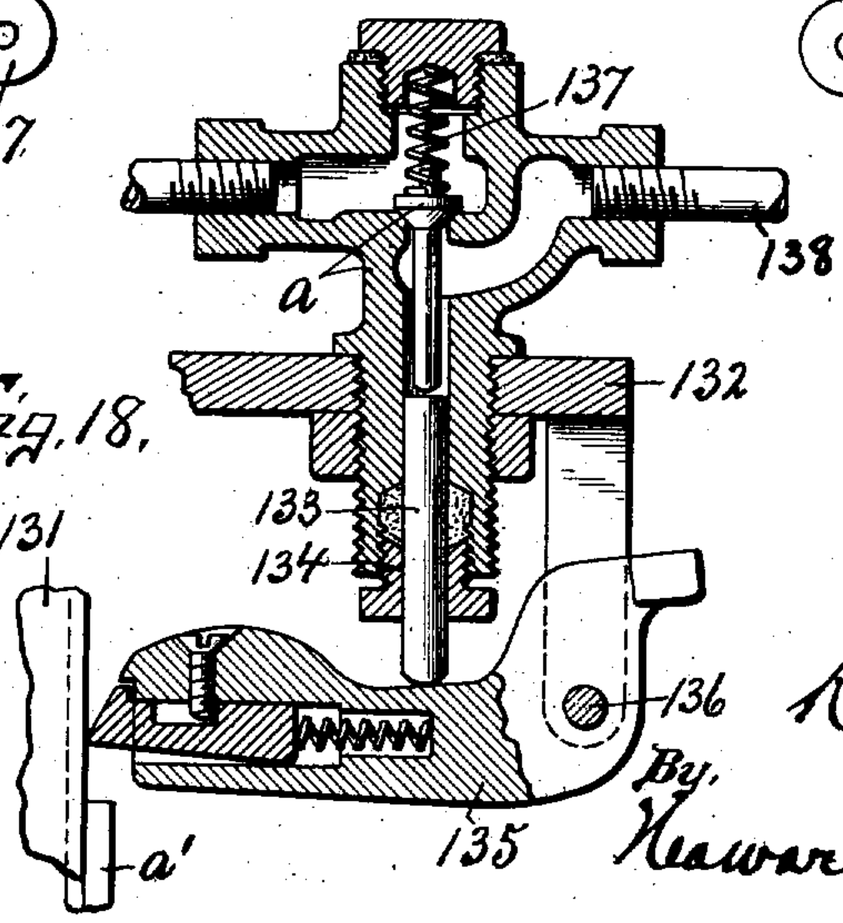


Fig. 18.



Witnesses.
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9 SHEETS—SHEET 9.

Fig. 19.

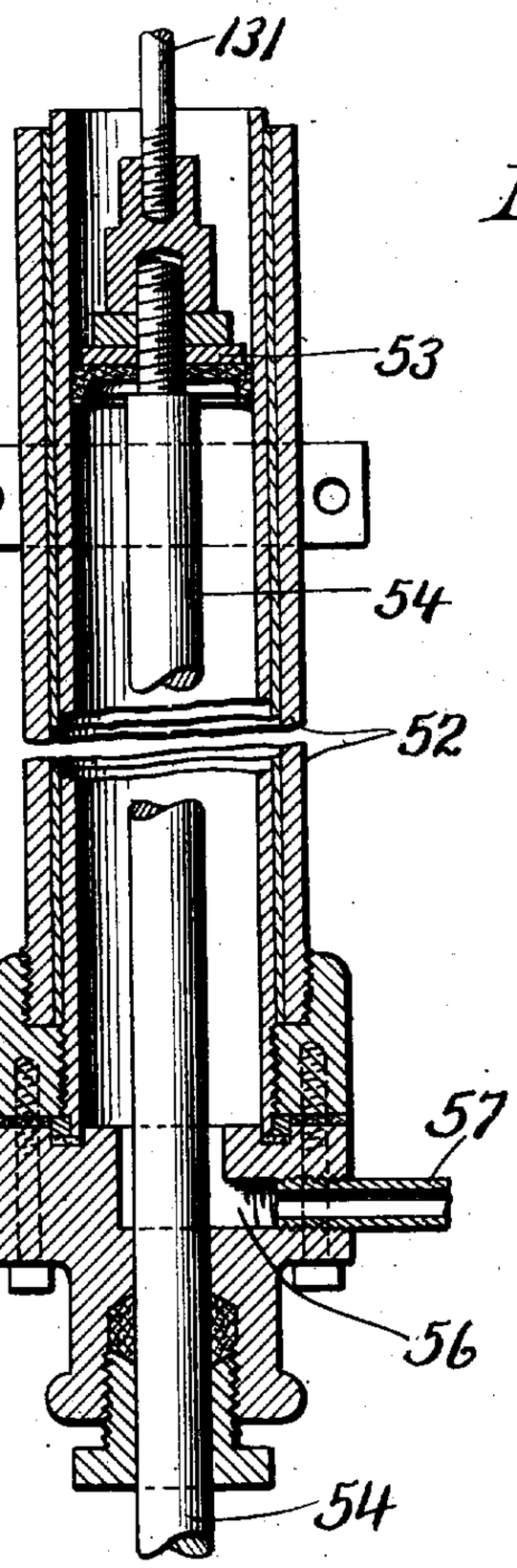


Fig. 20.

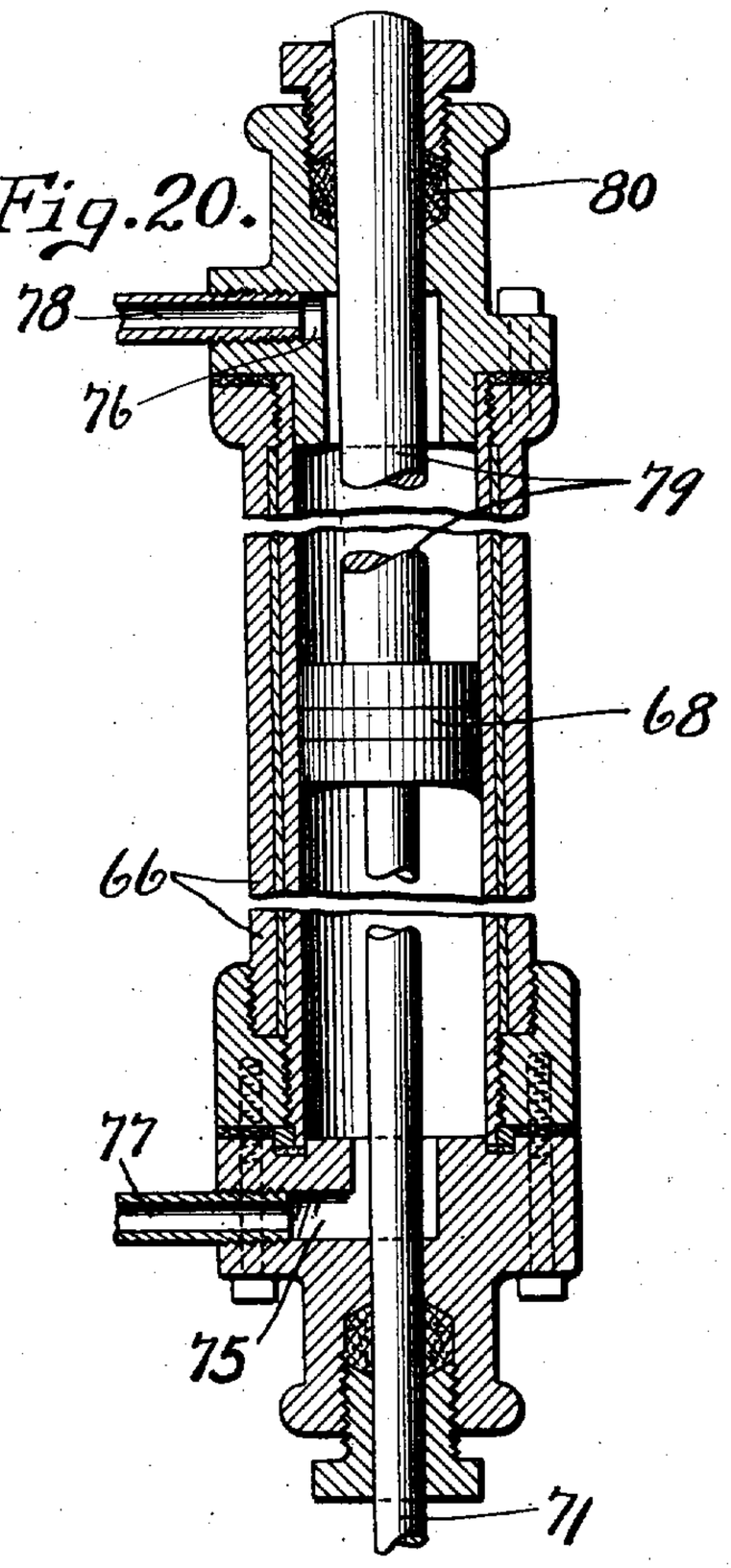
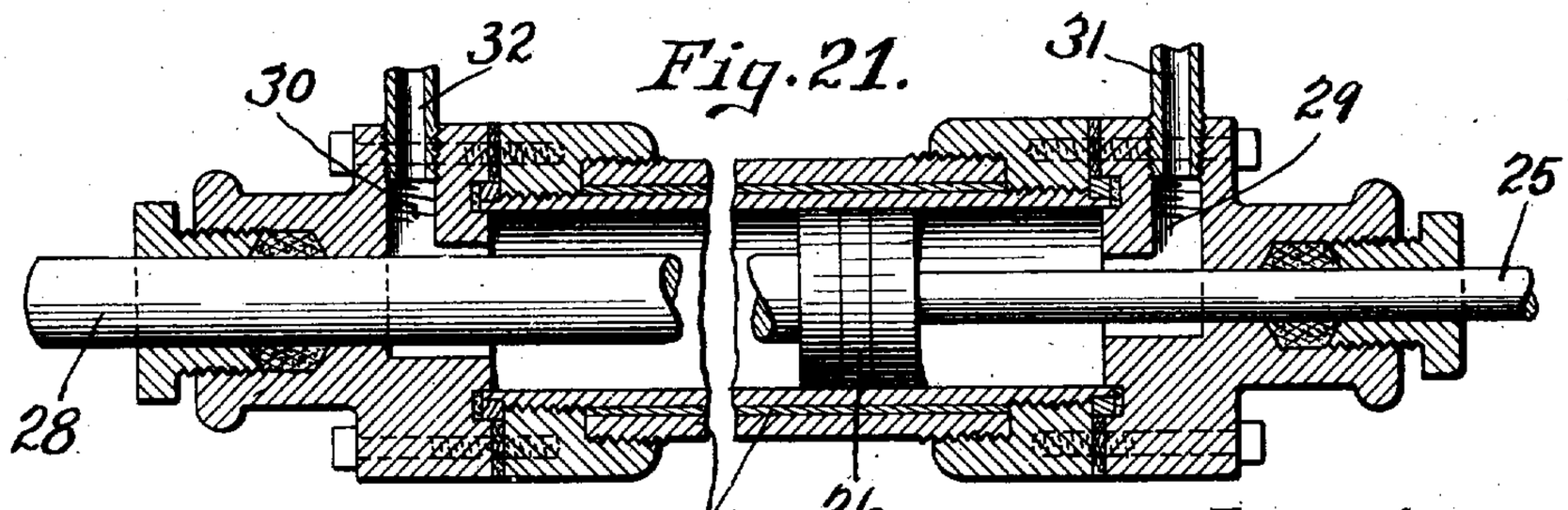


Fig. 21.



Witnesses.

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UNITED STATES PATENT OFFICE.

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PRESS.

975,204. Specification of Letters Patent. Patented Nov. 8, 1910.

Application filed April 2, 1909. Serial No. 487,379.

To all whom it may concern:

Be it known that I, KIRK S. BLANCHARD, of Philadelphia, in the county of Philadelphia, in the State of Pennsylvania, have invented new and useful Improvements in Presses, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in presses, preferably of the hydraulic type, and while it is specifically adapted for the reduction of garbage in expressing oils, fats and other liquids therefrom, it is equally applicable for expelling the moisture and liquids from any liquid containing solids either in a liquid or semiliquid state.

Large quantities of the garbage are usually placed in suitable digesters or tanks where it is subjected to steam in the presence of an effective solvent for liquefying the garbage and liberating any oils and fats which may be present therein.

The present method of handling garbage, so far as I am aware, not only requires the employment of considerable labor, but necessitates more or less handling of certain parts of the apparatus which have been in direct contact with the garbage, thereby rendering the process laborious and extremely unsanitary, at least so far as the health of the workmen is concerned.

The main object of my present invention is to render the process of expelling the oils, fats and other liquids entirely automatic and to thereby avoid the necessity for handling any part of the apparatus which may come in direct contact with the garbage during such process. In other words, I have sought to produce a more expeditious, economical and sanitary method of recovering the by-products of garbage and similar materials, and at the same time to obtain a greater quantity of such by-products from the same amount of raw material than has heretofore been practiced.

Other objects and uses relating to specific parts of the machine will be brought out in the following description.

This process briefly described is as follows: The steam heated liquid garbage or similar material is introduced by gravity in limited quantities into a suitable receptacle or press-box having a foraminous movable bottom and sides and movable inlet and outlet end gates, the inlet gate being temporarily opened to receive such quantity, during which the outlet gate is closed, and when a sufficient quantity has flowed into the receptacle the inlet gate is automatically closed, whereupon the entire mass is subjected to pressure by an automatic hydraulic piston or plunger until practically all of the oils, greases, and other liquids are expelled therefrom through the foraminous bottom and sides, after which the outlet gate is automatically opened and the foraminous bottom or bed is then moved sufficiently to expel the compressed solids from the machine, the gates being then restored to the proper positions for permitting the flow of the next charge or quantity of liquid tankage into the receptacle, the action of the gates, piston and movable bed being entirely automatic and properly synchronized to obtain the desired filling, compression and discharge.

In the drawings—Figures 1 and 2 are opposite side elevations of a press embodying the various features of my invention. Fig. 3 is an enlarged longitudinal vertical sectional view through the center of the machine showing the press-head and greater portion of the underlying endless bed in elevation, the upper portion of the machine being broken away. Fig. 4 is a horizontal sectional view of the same machine through the piston just above the press-head, showing particularly the press-box, press-head and endless bed, together with the cylinders and connections for operating the bed and side walls of the box, and also showing the scraper plate for loosening the compressed material from the bed. Fig. 5 is a central transverse vertical sectional view of the machine shown in Figs. 1 and 2 except that the upper portion of the piston is shown in elevation. Figs. 6 and 7 are enlarged elevations partly in section of opposite sides of the upper portions of the machine, showing in Fig. 6 a portion of the piping system and power driven mechanism for controlling the supply and relief valves for the main compression cylinder, Fig. 7 showing the safety valves and operating mechanism therefor to afford relief for the operating fluid under pressure in case of leakage in any of the supply valves, or small cylinders. Fig. 8 is an outer face view partly in section of the inlet or rear end gate showing a locking device for preventing the full opening of

such gate until the outlet or front end gate is closed. Fig. 9 is a side elevation of the same locking device shown in Fig. 8. Fig. 10 is a detail sectional view of the rock shaft and pawl and pawl actuating device on the outlet gate for rocking said shaft and releasing the locking device shown in Figs. 8 and 9 as the outlet gate assumes its closed position. Fig. 11 is an enlarged elevation, partly broken away and partly in section, of one of the rods which control the action of one set of supply and relief valves which control the flow of the power fluid to and from the several cylinders hereinafter described. Fig. 12 is a transverse sectional view taken on line 12—12, Fig. 11. Fig. 13 is an enlarged transverse sectional view through one of the side walls of the press-box and adjacent portion of the endless bed showing particularly the means for actuating said side walls laterally. Fig. 14 is an enlarged detail sectional view of a portion of one side of the lower end of the piston and adjacent portion of the presser plate, showing the connection between said parts. Fig. 15 is an enlarged detail sectional view of a portion of one side of the presser plate showing particularly the packing strip which co-acts with the adjacent side of the press box to prevent leakage. Fig. 16 is an enlarged vertical sectional view through the rack and pinion and adjacent clutch for actuating the endless bed. Fig. 17 is a sectional view taken on line 17—17 Fig. 16. Fig. 18 is an enlarged vertical sectional view through one of the valves seen in Fig. 6, showing particularly the operating lever and adjacent portion of its actuating rod seen in Fig. 11. Fig. 19 is a vertical sectional view partly broken away of one of the lifting cylinders for the main piston and presser head. Fig. 20 is a similar sectional view of one of the cylinders and piston for controlling the action of one of the gates. Fig. 21 is a longitudinal sectional view partly broken away of the cylinder and piston for controlling the operation of the endless bed or belt. Fig. 22 is a top plan of the main cylinder and upper portion of the frame, showing the groups of pressure and relief valves and pipes connected thereto.

This machine comprises an intermittently movable endless bed, a press-head movable toward and from the bed, and a press-box having movable sides and inlet and outlet gates co-acting with the bed for receiving and confining a limited quantity of material within the area of the presser face of the press-head, all of said moving parts being operated separately but in proper synchronism through the medium of a system of hydraulic mechanisms deriving their power or fluid pressure from the same source.

Endless bed.—This bed forms the bottom of the press-box to support the material under pressure and to discharge the compressed solids from the machine after the liquid by-products have been expelled therefrom, and in this instance is disposed in a substantially horizontal position and comprises a pair of link belts —1— and separate foraminous bars —2— having removable perforated surface plates —3— secured thereto by suitable fastening means, as screws —4—. The link belts —1— are mounted in parallel vertical planes at opposite sides of the machine upon sprocket wheels —5— which in turn are secured in pairs upon shafts —6— and —7— at opposite ends of the machine and at some distance beyond the front and rear end gates of the press-box hereinafter described for supporting the upper portion of the endless bed in a substantially horizontal plane, the intermediate portion of the bed being suspended in this plane against sagging by underlying guide beams or ways —8— which in turn are supported upon transverse I-beams —9— forming a part of the main supporting frame.

The shaft —6— which supports the front sprocket wheels —5— at the discharge end of the machine, is journaled in fixed bearings —10— on the outer upright sides of upwardly converging frame bars —11—, the shaft —7— at the opposite or inlet end of the machine being journaled in adjustable bearings —12— which are movable lengthwise of the machine in suitable ways —13— on the adjacent upright frame bars —11—, said bearings being adjusted and held in their adjusted position by adjusting screws —14—, as best seen in Figs. 1, 2 and 4 to permit the endless bed to be tensioned when necessary.

The bars —2— which constitute the bedplate or bottom of the press-box correspond in number to the number of links in each of the belts —1— and are arranged edge to edge in close proximity thereupon, each bedplate being secured at its ends to the corresponding links of the belt —1— by suitable fastening means, as bolts —15—, as best seen in Fig. 5, and also having a series of parallel slots extending therethrough from top to bottom, which, together with the superposed perforated plates —3—, allow the passage of the expressed liquid therethrough and into an underlying inclined vat or conduit —16—, the latter discharging through a suitable outlet —17— into an underlying conduit —18—, from which the liquid may be conducted by gravity or otherwise to suitable storage tanks or any other receptacle not shown. Each of the perforated plates —3— is comparatively thin and lies in a recess of corresponding size in the outer side of the slotted bar —2—, the perforations being elongated transversely of the slots in

said bars and are comparatively small to afford ample support for the solids, and at the same time to allow the liquid to readily escape therefrom by gravity through the perforations and slots, said plates being removable, as previously described, by the removal of the screws —4— to permit the removal of plates that might become defective and the replacing of new ones. These bars and plates —2— and —3— are preferably made of steel or other suitable metal capable of withstanding the pressure to which they are subjected by the operation of the presser-head against the material which is supported upon the bed, the sustaining guides or bars —8—, upon which the central portion of the upper side of the endless bed rides, being arranged side by side in close proximity from side to side of the superposed press-box and extending endwise slightly beyond the end gates to afford ample support to effectively resist the pressure upon this portion of the bed throughout the area of the bottom of the press-box and presser-head.

Belt operating mechanism.—The endless bed is normally at rest during the pressing operation or compression stroke of the piston and presser-plate, but immediately at the beginning of the upstroke of the piston, sufficient to clear the compressed solids, and after the outlet gate is opened and the inlet gate slightly elevated to clear the bed, and the sides of the box slightly separated to clear the compressed material, the endless bed is operated with considerable speed and a sufficient distance to carry the compressed solids from under the presser-head and beyond the outlet gate and forcibly eject or expel them at the front end of the bed into a receptacle or conveyer not shown, and delivered to any point desired.

A clutch section or internal ratchet wheel —19— is secured by a set screw —20—, Fig. 16, to the outer end of the sprocket shaft —6— and upon the adjacent end of the same shaft is loosely mounted a pinion —21— carrying a series of, in this instance, three pawls —22—, Fig. 17, said pawls being spring pressed into engagement with the teeth of the ratchet wheel —19— which allows the pinion to be rotated in the direction indicated by the arrow *x*, Fig. 17 without rotating the shaft, but when the pinion is rotated in the opposite direction the engagement of the pawls —22— with the teeth of the ratchet wheel —19— serves to rotate said ratchet wheel and shaft —6— to which it is secured, thereby operating the endless bed to discharge the compressed solids therefrom. As best seen in Fig. 1, the pinion —21— meshes with a sliding tooth rack —23— which is guided in suitable ways —24— and is connected to a piston rod —25— carrying a piston —26— which is movable in a cylinder —27—, the opposite end of said piston being provided with a guide stem or rod —28— of somewhat greater diameter than the rod —25— so that the exposed area at one end of the piston facing the smaller rod —25— is greater than that at the opposite end, as clearly shown in Fig. 21. The cylinder —27— is provided at its opposite ends with ports —29— and —30— which are connected respectively by pipes —31— and —32— to suitable controlling valves hereinafter described. The piston is operated by fluid, such as water or oil, under pressure, which is alternately admitted to the ports —29— and —30— of the cylinder through the pipes —31— and —32— for moving the piston in opposite directions. The port —29— communicates with the end of the piston of greatest area, while the opposite port communicates with the smaller end of the piston, and as soon as the main compression piston has completed its compression stroke and has begun its upward movement sufficient to clear the compressed solids, at which time the outlet gate is fully opened and the inlet gate is elevated just sufficiently to clear the bed and the sides of the press-box are moved from each other sufficient to clear the compressed material, the valve, controlling passage of the pressure fluid through the pipe —31— and port —29—, is opened to allow the entrance of the pressure fluid to the cylinder and against the end face of the piston of greatest area, thereby rapidly moving such piston toward the opposite end of the cylinder and transmitting similar movement to the endless bed through the medium of the rack —23—, pinion —21— and clutch section —19—, after which the valve connected to the pipe —31— is closed and such pipe is immediately placed in communication with a relief valve and the pressure fluid admitted to the smaller end of the piston for returning such piston to its starting position. The check valves for controlling the passage of the pressure fluid to the several cylinders will be hereinafter more fully described.

The main supporting legs —11— are arranged in pairs located at opposite sides of the machine, those of each pair converging upwardly and supporting at their upper ends a strong and rigid steel frame —33— in which is rigidly secured by any suitable fastening means a main pressure cylinder —34— and pendent upright rods —35— which sustain at their lower ends the I-beams —9—.

Pressure mechanism.—The main pressure cylinder —34— is disposed in an upright position over, and some distance above, the center of the endless bed and is provided with a port —36— which is connected by a pipe —37— to supply and relief valves hereinafter described for controlling the flow of

the pressure fluid to and from the cylinder, said cylinder being provided with a suitable gland or stuffing-box —38— in its lower end. A piston —39— is movable in the cylinder —34— through the gland or stuffing-box —38— and has its lower end loosely seated in a recess in the upper side of an underlying plate —40—. A hollow or chambered presser-plate —41— is secured by suitable fastening means, as bolts —42— to the under side of the plate —40— and, together with the plate —40— and piston —39—, constitutes the presser-head, the lower plate —41— being provided with tortuous steam passages adapted to be connected to a source of steam supply for heating the head and thereby facilitating the separation of oils and similar by-products from the solids, particularly while the latter are under compression. These plates —40— and —41— are preferably rectangular or square in top plan and project laterally some distance beyond the vertical sides of the lower end of the piston, the plate —40— being yieldingly connected to the lower end of the piston to allow the plates —40— and —41— to tilt slightly relatively thereto in case some hard uncrushable substance may lodge between the edges of the presser-plate and upper surface of the bed as the piston approaches the limit of its compression stroke. In order that this yielding connection may be effective and still prevent lateral movement of the presser-plates relatively to the piston, said piston is provided with radially projecting arms —44— extending over the four corners of the underlying plate —41—, and in these arms are loosely sustained bolts —45— which pass through apertured lugs —43— projecting laterally over the four corners of the plate —40— some distance from the bottom thereof. Secured to the lower end of each bolt is a spring seat or washer —46— and interposed between each washer and the under side of the adjacent lug —43— is a coil spring —47—, the combined tension of said springs being sufficient to hold the plate —40— against the under side of the piston. The upper edges of the portions of the plate —40— which surround the lower end of the piston fit snugly against the sides of the piston, but the lower edges of the piston are spaced a slight distance apart from the surrounding sides of the plate —40—, leaving a slight clearance or opening —48—, as best seen in Fig. 14, which allows the plate —40— to tilt slightly under the conditions previously described against the action of the springs —47—.

The opposite sides of the platen —41— are formed with lengthwise grooves —49— in which are loosely seated steel packing strips —50— held in place by suitable fastening means, as screws —51—, and serve to ride against the inner faces of the sides of the press-box to prevent leakage of the material at such joints.

The main piston —39— is forced downwardly by the introduction of the fluid under pressure through the port —36— and into the cylinder above the piston, which is of comparatively large area to produce a high degree of pressure upon the underlying material upon the endless bed previously described, but is elevated or withdrawn from the bed by separate hydraulic devices consisting in this instance of a pair of upright cylinders —52— which are supported in the upper frame —33—, as best seen in Fig. 5, at opposite sides of the main cylinder —34— and in which are movable pistons —53— having piston rods —54— extending through suitable glands in the lower ends of the cylinders —52— and connected to laterally projecting lugs —55— on the plate —40— of the presser-head. Each of the cylinders —52— is provided with a port —56— which is connected by a pipe —57— to main supply pipe admitting the fluid under pressure to the cylinders —52— which is constant and has no controlling valves save main operating valve —140— so when valve —140— is opened admitting fluid to the press cylinders —52— the pistons of the latter are at once lifting on pressure-head which will be thereby elevated when the pressure valve —A— is closed leading to cylinder —34— and relief valve —B— is opened allowing the pressure fluid to be discharged from main cylinder —34— thereby elevating presser-head until the latter reaches the limit of its upward movement, when the relief valve —B— is closed and the pressure valve —A— is again opened admitting the pressure fluid to main cylinder —34—which causes the descent of piston —39— and also cylinder pistons —53— the operating fluid in cylinders —52— being forced out through the same conduits —57— by the main piston —39— and finds its exit in its return to the main pressure line or accumulator.

Press-box.—The tankage, such as garbage or other liquid solids to be treated, is introduced by gravity from the superposed tanks not shown, through a suitable conduit —58— into one end of a suitable press-box comprising an inlet gate —59—, an outlet gate 60 and opposite movable sides —61—, all of which parts lie directly over and in close proximity to the central upper portion of the underlying endless bed and serve to confine limited quantities of the material to be acted upon by the presser-head. The gates —59— and —60— are movable vertically toward and from the underlying bed and are guided at their ends in upright grooves —62— in the inner faces of the opposite ends of the sides —61—,

said gates being spaced a distance apart corresponding to the length of the presser plate —41—. The inlet gate —59— is movable across the adjacent discharge end of the conduit —58— to control the supply of material to the press-box and is provided at its lower edge with a knife-plate —68— shearing with a horizontal adjustable shearing-plate —64— on the under side of the adjacent end of the conduit —58—, as best seen in Fig. 3, and also riding against the inner face of a bar —65— which extends transversely of the bed across the under side of the inner edge of the shearing-plate —64— and, together with the adjacent end of the conduit —58—, are secured by brackets —69— to opposite frame bars —70—, the latter being rigidly connected to the upright legs —11— at the adjacent sides of the machine and serving to additionally stiffen or strengthen the main supporting frame. A steel packing strip —72— is pivotally mounted in the under side of the cross-bar —65— and extends transversely across and bears upon the upper face of the underlying bed to prevent the escape of the liquid from the press-box at this joint, said strip inclining downwardly from its rear edge in the direction of movement of the adjacent portion of the bed. The shearing plate —64— is adjustable to take up wear, such adjustment being effected by means of a screw —73—, the shear-plate being held in its adjusted position by a set screw —74—, as best seen in Fig. 3. These inlet and outlet gates —59— and —60— are operated at regular intervals by separate hydraulic devices, consisting in this instance of similar upright cylinders —66— and —67— in which are movable similar pistons —68— having piston rods —71— connected to their respective gates, and in practice I preferably employ two cylinders and corresponding pistons for each gate, the piston rods of each pair of cylinders being connected to their corresponding gates at points equidistant from the center thereof, so as to move both ends of the gate simultaneously uniform distances, it being understood that in operation the pistons of each pair of cylinders are operated simultaneously under the same fluid pressure.

As shown in Fig. 20, each of the cylinders —66— and —67— is provided at its opposite end with separate ports —75— and —76— which are connected by pipes —77— and —78— to suitable supply and relief valves hereinafter described.

The upper end of the piston —68— is provided with a stem —79— of larger diameter than the rod —71— and guided in a suitable gland —80— in the upper end of the cylinder beyond the port —76— so that the upper end of the piston which communicates with the port —76— is of less area than the lower end of the piston which communicates with the port —76— and, therefore, any unit pressure on the bottom end of the piston —68— greater than that on the top end of the piston, would move the piston upwardly and thereby open the gates, while the relief of the pressure from the lower end of the piston would by the constant pressure on top end —79— force down and close the gate, such pressure and relief being controlled by the supply and relief valves previously mentioned, the operating mechanism for both gates being adjusted so as to close their lower ends firmly against the bed during the operation of compressing the material thereon.

The opposite side pieces or plates —61— of the press-box are spaced some distance apart, preferably directly over the outer edges of the underlying bed or belt, and are movable slight distances toward and from each other to free the compressed material just prior to the discharge thereof by the movement of the belt in the manner previously described. This lateral movement of the side pieces or plates is, however, insufficient to withdraw the grooves —62— from the adjacent ends of the gates —59— and —60—.

In order that the side plates —61— of the press-box may be properly supported for adjustment or lateral movement, each plate is provided with a series of studs —81— arranged at regular intervals throughout their height and length and project laterally or outwardly through apertures —82— in the adjacent frame bar —70—, each stud being provided on its outer end with a head —83— somewhat larger than the apertures —82— to prevent undue inward movement of the plate, and at the same time to afford convenient bearings for operating cams —84— which are interposed between said heads and opposite abutments —85—, said abutments being secured to a fixed bar —86— on the main supporting frame, as best seen in Figs. 4 and 5. The opposite ends of each side plate —61— are also provided with bolts or studs —87— projecting laterally or outwardly through apertures —88— in the frame bars —70—, each bolt being provided at its outer end with a head or washer —89— between which, and the outer face of the bar —70—, is interposed a compression spring —90— operating to draw the adjacent side plate —61— laterally or outwardly against the faces of the cams —84—, as best seen in Fig. 4. As additional means for supporting the side plates each end is provided with one or more (preferably two) studs or bearings —91— which ride upon suitable ways —92— to sustain the weight of such side and guide it in its inward and outward movements, as best seen in Fig. 5. Both plates or side pieces are moved simul-

taneously in opposite directions by a suitable hydraulic device consisting, in this instance, of a cylinder —93— in which is movable a piston similar to that shown in Fig. 21 for operaing the belt or endless bed, the piston in the cylinder —93— being provided with a rod —94— which is connected to a crank arm —95— of a rock shaft —96— and is also direct connected to a link or bar —97—, the latter being connected to crank arms —98— on rock shafts —99—, to which the cams —84— are secured. The rock shaft —96— extends transversely across the machine and is journaled in suitable bearings —100— on the under side of one end of the bed sustaining beams —8—, the opposite end of said shaft being provided with a crank arm —95— which is attached to a link or bar —97— similar to the bar —97— and connected in substantially the same manner to the corresponding rock shafts of the cams —84—.

The cylinder —93—, like the cylinder —27—, is provided at its opposite ends with ports —103— and —104— communicating with opposite ends of the piston, the end of the piston nearest the port —103— being larger than the opposite end, and so far as the construction of this cylinder and piston is concerned, it is substantially the same as that shown in Fig. 21 for operating the belt except that it is somewhat smaller, the ports —103— and —104— being connected by conduits —105— and —106— to suitable supply and relief valves hereinafter described.

As clearly shown in Fig. 3, each side plate is foraminous and preferably consists of a slotted plate —107— and a perforated plate —108— which is secured by suitable fastening means, as screws —109—, to the outer plate —107— to permit the exit of the liquid of the solids under pressure therethrough and into the underlying receptacles previously described. The lower edge of each side plate is provided with a packing strip —110— lying snugly against the upper surface of the adjacent portion of the belt and preferably inclined downwardly and inwardly from the side plate to prevent leakage of the liquid material at this joint, said packing strip being held in place by a clamping bar —111— and bolt —112—, as best seen in Fig. 13.

I have now described the construction of the endless belt or bed and press-box, including the inlet and outlet gates and side plates, and have also described the press-head and hydraulic operating devices for such movable parts except the means for controlling such devices, and before doing this it may be stated that the controlling mechanisms are adjusted and arranged so that during the compression stroke of the presser-head and its operating piston, the endless belt or bed is at rest; the inlet and outlet gates —59— and —60— are closed, and the side plates of the press-box are at their limit of inward movement, the interior of the press-box being then of substantially the same horizontal area as that of the under side of the press-plate or platen, the several packing strips previously described on the platen and side plates, as well as on the rear end of the box, serving to prevent the leakage of the liquid at the joints where they are located. As soon as the press plate or platen reaches the limit of its compression stroke and has started to return sufficient to free itself from the compressed material on the bed, the outlet gate —60— is fully open, and at the same time the sides are moved a slight distance outwardly or laterally sufficient to clear the compressed material, and the inlet gate is slightly elevated for the same purpose of clearance from the endless bed, but not sufficient to open the discharge end of the conduit —58—, whereupon the endless belt with the compressed material thereon is immediately moved with considerable force in the direction indicated by arrow "X" to discharge the material therefrom. In order that the dry material on the bed may be loosened and freed therefrom during the movement of the bed, I provide a shearing plate —113— which lies flatwise in close proximity to and diagonally of the upper surface of the belt with its cutting edge opposed to the movement of such belt, said knife being mounted upon an oscillatory support —114— which is pivoted at its front end at —115— and its rear end is spring pressed downwardly by a spring —116— to hold the cutting edge of the knife in close proximity to the upper surface of the belt, the rear end of the oscillatory frame being provided with a roller —117— adapted to ride upon the upper surface of the belt at opposite ends of the knife or plate —113— to prevent undue friction of the edge of the plate with the upper surface of the belt.

Safety device for inlet gate.—The inlet and outlet gates —59— and —60— are, as previously described, controlled by separate hydraulic devices involving the use of pressure and relief valves and pistons controlled thereby and connected to their respective gates, and it is, of course, necessary that the outlet gate be absolutely closed before the inlet gate is opened, and in order that this action may be rendered more certain in case of failure of any of the valves or pistons to work at the proper time, as in case of low pressure or the obstruction of one of the valves, I provide a safety device comprising, in this instance, a pair of swinging detents —118— hinged at their upper ends at —119— to a portion of the frame —33—, the lower ends of said detents extending through

elongated slots —120— in a laterally projecting flange —121— on the upper edge of the inlet gate —59—, said detents being provided with shoulders —122— which normally overhang a portion of the flange —121— a sufficient distance above the same to allow the gate —59— to be elevated a sufficient distance to clear the bed, but not sufficiently to open communication between the conduit —58— and press-box, said detents being held in their normal position by a spring —123—. The lower ends of the detents —118— are connected by a link —124— to impart motion from one to the other and are also connected by a link —125— to a crank arm —126— on a rock shaft —127—. This crank shaft extends longitudinally of the frame at the ends of the gates and is journaled in suitable bearings upon the adjacent frame-bar —70—. This shaft extends forwardly to a point in close proximity to the adjacent end of the outlet gate —60— and is provided at its front end with a crank arm —128— carrying a pivoted pawl —129— which is adapted to be engaged by shoulder —130— on the adjacent end of the outlet gate —60—, as shown by dotted lines in Fig. 10. The shoulder —130— is adjustable vertically on the gate —60— to properly time the operation of the rock shaft —127— and consequent tripping of the detents —118— with the closing of the outlet gate; that is, the shoulder —130— is positioned relatively to the pawl —129— on the crank arm —128— so as to rock the shaft —127— and thereby trip the detents 118 as the outlet gate —60— shuts down upon the bed, thereby freeing the inlet gate —59— and allowing it to be moved upwardly by its operating mechanism after the outlet gate is closed, the slots —120— being of sufficient length to allow the detents —118— to be shifted laterally a sufficient distance to bring the shoulders —122— into registration therewith.

Valve controlling mechanism and circulating system.—The upper end of each platen-lifting piston is rigidly but adjustably connected to a separate valve-operating bar —131— extending some distance above and co-axial with its corresponding cylinder —52—, and around each bar is grouped a series of, in this instance, four check valves, *a*, *b*, *e* and *f* and *c*, *d*, *g* and *h*, respectively, the valves of each group being secured to a suitable valve-plate —132— on the upper portion of the frame —33—, as best seen in Figs. 1, 2, 6 and 7, each valve being provided with a pendent operating stem —133— extending downwardly through a suitable gland —134— in the lower end of the valve casing.

Associated with each group of valves, and also grouped around the adjacent operating bar —131— is a corresponding number of valve operating levers —135—, each mounted upon a separate fulcrum —136— on the valve supporting plate —132— and having the intermediate portion of its upper side bearing against the lower end of the adjacent valve stem —133— as best seen in Fig. 18. Each valve is normally closed, either by its own gravity, water pressure or aided by a spring —137— controlling communication between the inlet and outlet ports of the valve casing, said valves being all of substantially the same construction. The valves of each group are arranged to operate in pairs, one valve of each pair being designated as the pressure valve, while the companion valve may be designated as the relief valve, the pressure valves being all connected to a main pressure or supply pipe —138—, Fig. 6, while the relief valves are all connected to a relief pipe line —139— and each relief valve is connected to its corresponding pressure valve.

The main pressure or supply pipe —138— is provided with a throttle valve —140— and is connected directly to the upper ends of the gate cylinders —66— and —67— through the upper branch pipes —78—, as best seen in Figs. 1 and 20, and to the rear end of the belt cylinder —27— through the pipe —32—, as best seen in Figs. 1 and 21, said supply or pressure pipe being also connected directly to the lower ends of the platen lifting cylinders through the pipes —57—, as shown in Figs. 1, 2 and 19.

Each operating rod —131— is preferably square in cross section, each side traveling in close proximity to the free end of one of the valve operating levers —135—, as clearly shown in Fig. 18, said operating rod or bar being provided with a series of, in this instance, four valve operating shoulders, one on each face thereof and co-acting with one of the levers —135— to control the action of the corresponding valve, each of said shoulders being preferably adjustable by adjusting screws —142—, as best seen in Fig. 11, to properly synchronize the movement of the levers and valves, each of said shoulders being held in its adjusted position by a set screw —143— Fig. 11.

One side of the pressure valve —*a*— is connected directly to the pressure line —138— and the opposite side of said valve is connected directly to the main platen cylinder —34— through the medium of the pipe —37—, the latter being connected by a branch pipe —*i*— to one side of the relief valve —*b*—, the opposite side of the relief valve —*b*— being connected to the relief pipe —139—, the opening of the pressure valve —*a*— allowing the pressure fluid to flow into the main pressure cylinder —34— for depressing the piston —39— while the opening of the relief valve —*b*— and closing of the pressure valve —*a*— allows the pres-

sure fluid to flow back from the cylinder —34— and into the drainage pipe —139— during the up-stroke of the piston. These two valves —*a*— and —*b*—, therefore, control the operation of the piston, which, of course, is the most important feature of the invention, the operation of the other valves being timed to correspond with the movements of the main piston.

Controlling mechanism for the main cylinder, pressure and relief valves.—A rotary shaft —144— is journaled in suitable bearings on the under side of the superposed auxiliary frame —33— and is provided with a pulley —145— adapted to be connected by a belt to any available source of power not shown. This shaft —144— is connected by a suitable train of gears —146— to a countershaft —147—, the gears being so relatively proportioned as to rotate the shaft —147— at comparatively low speed, one of the gears on the shaft —147— being provided with a laterally projecting stud —148— which engages and operates a bell crank lever —149— at each revolution of the shaft —147—. This bell crank lever —149— is secured to a rock shaft —150— having rigid thereon an additional crank arm —151—. The upright arm of the bell crank lever —149— is connected to one end of a link —152— having its opposite end (with a loss motion) connected to a toggle —153—. One end of this toggle —153— is pivoted at its lower end —154— to a suitable bearing on the frame —33— and the upper arm of the same toggle is attached to the under side of the operating lever —135— for the valve —*a*—. The other crank arm —151— is connected to one end of a link —155— having its opposite end connected to a toggle —156—, the latter having its lower arm pivotally mounted upon the lower supporting frame —33— and its upper arm attached to the under side of the operating lever —135— for the relief valve —*b*—. As the main piston —39— is elevated by its lifting pistons —53— of the cylinders —52— to the limit of its extreme upward movement, the shoulder —*a'*— Fig. 18 for the pressure valve —*a*— engages and elevates the free end of the lever —135— thereby opening the valve —*a*— and at the same time straightening out the toggle —153— and thereby locking said toggle in its straightened position, which operates to hold the corresponding lever —135— in its elevated position, thereby holding the valve —*a*— open a sufficient length of time to allow the compression piston to descend to the limit of its compression stroke, or until it acts with full force upon the material under pressure, this period of compression operation of the piston being regulated by and corresponding to one revolution of the shaft —147— and operating stud —148— carried thereby, which shaft and stud in turn is timed to correspond in its movement to the time required for the movement of the piston through its complete compression stroke, allowing a short time for the piston to remain at the limit of its compression stroke so as to thoroughly express all liquors from the solids under pressure, whereupon the stud —148— actuates the bell crank lever —149— to flex the toggle —153— to the position shown by dotted lines in Fig. 6 to allow the valve —*a*— to close, and at the same time to rock the crank arm —151— to straighten the toggle —156— for opening the relief valve —*b*—, the toggle —156— being previously flexed to allow the relief valve to remain closed during the compression stroke of the piston, or while the pressure valve —*a*— is open. It will thus be seen that the pressure valve —*a*— closes slightly in advance of, but nearly simultaneously, with the opening of the relief valve preparatory to returning the piston to the limit of its upward stroke. This return or lifting of the piston is accomplished through the medium of the cylinder —52— and piston movable therein, by reason of the fact that immediately upon the closing of the valve —*a*— in the manner just described, thereby cutting off the pressure on the main piston, such pressure, which is always present upon the lower ends of the piston lifting cylinders —52—, immediately acts upon the pistons —53— in said lifting cylinders causing said pistons to rise and thereby carry the platen and main piston upward to the limit of its return stroke, the pressure fluid in the main cylinder —34— being expelled back through the pipe —37— and branch pipe —*i*— through the relief valve —*b*— and thence into the main relief pipe line —139— which may be returned to a pressure pump (if the latter is employed) or may be allowed to go to waste according to the source of pressure which is employed.

It is now apparent from the foregoing description that the pressure valve —*a*— and relief valve —*b*—, together with the operating shoulders —*a'* and levers —135— for such valves, control the operation of the main piston and also control the operation of the lifting pistons in the cylinders —52—.

As previously stated, during the compression stroke of the main piston, the inlet and outlet gates —59— and —60— are closed, the endless bed is at rest and the sides of the press-box are moved in close to the corresponding sides of the presser-head or platen, such parts remaining in these positions until the pressure fluid to the main cylinder is cut off by the closing of the valve —*a*— and opening of the relief valve —*b*— as previously described. As soon as the relief valve —*b*— is opened, the platen begins to rise, thereby lifting the operating rods —131—

which are connected with the pistons of the lifting cylinders —52— at opposite sides of the machine, and as soon as these operating rods begin to rise, the valve —*c*—, Fig. 7, is opened for a very short time by a lug —*c'*— which lifts the free end of the corresponding lever —135—, thereby opening the valve —*c*— and allowing the liquid under pressure to flow from the supply pipe —138— through the valve —*c*— and thence through a pipe —157 Fig. 7— to the pipe —77— at the lower end of the cylinder —66—, the stud —*c'*—being very short vertically which allows the valve —*c*— to close instantly, thereby elevating the rear or inlet gate a slight distance, just sufficient to clear the belt or endless bed without opening the inlet, whereupon the valve —*d*— is opened by a lug —*d'*— on the same operating rod —131—, said lug engaging the lever —135— for the valve —*d*— and thereby opening said valve and holding it open just after the valve —*c*— has been opened and again closed. This opening of the valve —*d*— allows the water to flow from the main pressure pipe —138— through a branch pipe —158— and thence through the valve —*d*— and pipe —159—, which latter connects with the pipe —105— leading to the cylinder —93— at the large end of the piston, and also connects with the pipe —78— leading to the lower end of the cylinder —67—, the main supply pipe —138— being connected to the pipe —106— leading to the front end of the cylinder —93— at the large end of the piston, so that the greater pressure exerted upon the large end of the piston operates to force said piston rearwardly, thereby operating the crank arms —95— and connections with the cams —84— for releasing the sides —61— of the press-box and allowing the springs —90— to draw said sides outwardly away from the material in the manner previously described. The pressure pipe —138— is also connected to the pipes —78— leading to the upper end of the cylinder —66—, so that when the valve —*d*— is opened in the manner just previously described, the main line pressure is on both ends of the front end or outlet gate —60—, but owing to the fact that the lower end of the piston in the cylinder —67— is of greater area than the upper end, the piston in the front gate cylinder —67— will be elevated, thereby elevating the front or outlet gate.

It will now be seen that the inlet gate is closed except for a slight elevation sufficient to clear the bed, and that the outlet gate is full open, while the sides of the press-box are separated or moved outwardly to clear the compressed material, all these operations taking place while the main piston is moved upwardly to its starting position, the machine being now ready to discharge the compressed solids which rest upon the movable bed. Immediately after the end gates and sides have been moved to the position just described, the valve —*e*— is opened by a lug —*e'*— on the adjacent operating bar —131—, which lug engages the corresponding lever —135— for the valve —*e*— as the main piston continues its upward movement, thereby opening the valve —*e*— and allowing the fluid under pressure to pass from the main supply pipe —138— through a branch pipe —160— leading to one side of the valve —*e*— and thence through said valve and a branch pipe —161— to the pipe —31— leading to the front end of the belt cylinder —27—, the main supply pipe being connected to the pipe —32— which leads to the rear end of said belt cylinder at the smaller end of the piston in said cylinder, so that the pressure at the front or larger end of the piston will force said piston rearwardly and thereby operate the rack —23— and pinion —21— to actuate the endless bed or belt in the manner previously described for discharging the compressed material therefrom. Immediately after the belt has been operated in the manner just described and the pressure valve —*e*— closed, the relief valve —*f*— is opened by a lug —*f'*— on the adjacent operating bar —131—, said lug —*f'*— engaging and operating the corresponding lever —135— to open the valve—*f*—, thereby relieving the pressure in the pipe —31— at the front end of the belt cylinder —27—, while the main line pressure remains on the small end of the cylinder, thus causing the cylinder —27— to return to its starting position, the pressure fluid at the front end of the piston in the cylinder —27— flowing back through the pipe —31— and through a branch pipe —162— through the valve —*f*— and into the relief pipe —139—.

I have now described how the material is compressed and discharged from the machine, and in order to repeat the operation it is necessary to restore the outlet gate to its closed position and the sides of the box to their inner position and to then open the inlet gate fully open after the outlet gate has been closed tightly down upon the bed.

The outlet gate is closed first, or rather simultaneously, with inward movement of the sides of the box, and in order to accomplish this the vent valve —*g*— is opened by a lug —*g'*— on the adjacent operating rod —131— as the piston continues to move upwardly, which movement is very slow and affords ample time for the discharge of the material in the manner described. This lug —*g'*— engages and elevates its corresponding lever —135—, thereby opening the valve —*g*— and relieving the pressure at the lower end of the piston in the cylinders —67— and —93— while the main line pressure remains

on the upper end of the piston, thereby depressing said piston and closing the outlet gate, the back-flow water from the cylinder passing through the lower pipe —78— and thence upwardly through a branch passage —163— and through the valve —*g*— to the relief pipe —139—. During this closing of the outlet gate the pressure at the rear end of the cam cylinder —93— is relieved, by the same valve —*g*— while the pressure on the front end of the cam cylinder —93— is relieved through the pipe —106—, allowing the pressure at the opposite or rear end of the cylinder to return the piston and sides of the press-box operated thereby to their normal positions. It is now only necessary to open the inlet or rear gate, which is accomplished by a lug —*c''*—, directly under, but some distance from, the short lug —*c'*— on the same operating rod, the lug —*c''*— engaging and elevating the corresponding lever —135— to again open the valve —*c*—, thereby admitting the fluid under pressure to the rear cylinder —66— for elevating its piston and opening the gate connected thereto, thus permitting the tankage, such as liquid garbage, to flow from the supply pipe —58— into the press-box beneath the presser-head. The inlet gate remains open a sufficient time to permit the desired tankage or other material to flow into the press-box and while the main piston is still moving upward, the period of opening of the inlet being determined by the length of the lug —*c''*—. As soon as the lug —*c''*— passes the corresponding lever operated thereby, said lever closes by its own gravity, or aided by the valve spring, thereby causing the closing of the valve —*c*—, and immediately after this valve —*c*— is closed its companion relief valve —*h*— is opened by a lug —*h'*— on the adjacent operating bar —131— thereby relieving the pressure in the lower end of the cylinder —66— and pipe —78— leading therefrom, while the main pressure remains upon the upper end of the cylinder, the pressure fluid flowing back through the lower pipe —78— and up through a branch pipe —164— through the valve —*h*— and into the relief pipe —139—, thus permitting the closing of the inlet gate, whereupon the machine is ready for a repetition of the pressing operation previously described.

Relief valves.—In order to prevent any possibility of rendering the machine inoperative by leakages in any of the pressure or relief valves, I provide safety valves —*m*— and —*n*—, Fig. 7, which are located in the pipes leading to the bottom end of the front and rear gate cylinders, each valve being connected by a pipe —*o*— to the main relief pipe —139—. These valves are provided with operating levers —*l*— which are connected to a sliding bar —*s*—, the latter having one end guided in a suitable bearing —*u*— and its other end connected to crank arm —*v*— projecting upwardly from the rock shaft —150— (see Fig. 7), which is actuated by the stud —148— and lever —149—, Fig. 6. The valves —*m*— and —*n*— are in their open positions when pressure is being applied to the large cylinder and the platen is moving down onto the material. When the time is up for this movement and the stud —148— engages the operating lever —149—, it moves the bars —152— and —155— forward and also moves the bar —*s*—, Fig. 7, which closes the two safety valves —*m*— and —*n*— during the operation of all the other valves. When the stud —148— leaves the lever —149— these valves —*m*— and —*n*— are thrown back to their open positions, in which position they remain during the entire pressing operation, so that in case of a leak in any of the operating valves, the safety valves —*m*— and —*n*— allow that leakage to pass back to the tank through the pipe —*o*— into the main relief pipe —139— without interfering with the operation of the machine. If it were not for these valves the leak, which is liable to occur at times, would allow the water to go to the bottom end of the gate cylinders and open them during the pressing operation, and would thereby allow the material to be pushed out under the gate, which would, of course, be very objectionable.

An inverted U-shape pipe —170— is connected at its ends to the main pressure pipe —138— and to the relief pipe —139— and extends some distance above the horizontal plane of the pressure and relief valves, and is provided near the bend at its upper end with a check valve —171— to prevent the pressure fluid from siphoning over and draining the upright leg which is connected to the main pressure pipe.

I have shown in Figs. 3 and 5 additional steam heating pipes —P— extending transversely and lengthwise under the upper portion of the endless bed or belt for the purpose of heating the latter and thereby aiding in the liberation of the fats and oils from the material under pressure.

What I claim is:—

1. In a press of the character described, a bed, a press-box adjacent to the bed, a press-head movable toward and from the bed, and packing strips on opposite sides of the box co-acting with the bed to prevent leakage at the junction of the sides of the bed.

2. In a press of the character described, a bed, a press-head movable toward and from the bed, a press-box in which the press-head is movable, said box having opposite sides movable toward and from each other and provided with packing strips engaging the

surface of the bed, means for moving the press-head, and additional means for operating the sides of the box.

3. In a press of the character described, a supporting bed for the material to be pressed, a press-box for confining said material, one side at least of said box comprising an outer plate having its inner face slotted and an inner perforated plate secured to said slotted face, a press-head movable toward and from the bed, and actuating means for the press-head.

4. In a press of the character described, a bed for supporting the material to be pressed, a press-box for confining such material on the bed and provided with opposite movable sides having packing strips slidably engaging the bed, means for actuating the press-head, and additional means for actuating the movable sides of the box.

5. In a press of the character described, a supporting bed for the material to be pressed, a confining box for the material having inlet and outlet gates, a press-head movable in the box toward and from the bed, hydraulic means for operating the press-head, and additional hydraulic means controlled by the movement of the press-head for operating the gates.

6. In a press of the character described, a bed for the material to be pressed, a confining box for the material to be pressed having laterally movable sides, a press-head, hydraulic means for operating the press-head, and additional hydraulic devices controlled by the movement of the press-head for operating the movable sides of the box.

7. In a press of the character described, a movable supporting bed for the material to be pressed, a press-box for confining the material on the bed, a press-head movable toward and from the bed, hydraulic means for operating said press-head, and additional hydraulic means separate from that which operates the press-head and controlled by the movement of said press-head for operating the movable bed.

8. In a press of the character described, a supporting bed for the material to be pressed, a press-box for confining the material on the bed and provided with inlet and outlet gates, an adjustable shearing plate with which the inlet gate shears, a press-head movable in the box toward and from the bed, hydraulic means for actuating the press-head, and additional means controlled by the movement of the press-head for opening and closing the gates.

9. In a press of the character described, a supporting bed for the material to be pressed, a press-box having inlet and outlet gates, a packing trip at the lower end of the inlet gate and bearing upon the upper surface of the bed, a press-head movable in the box toward and from the bed, hydraulic means for operating the press-head, and additional means controlled by the movement of the press-head for opening and closing the gates.

10. In a press of the character described, a supporting bed for the material to be pressed, a press-box confining the material on the bed and provided with inlet and outlet gates and having its opposite sides movable laterally, a press-head movable in the box toward and from the bed, hydraulic means for actuating the press-head, additional means controlled by the movement of the press-head for opening and closing the gates, and further means also controlled by the press-head for moving the sides of the box laterally.

11. In a press of the character described, a movable supporting bed for the material to be pressed, a press-box for confining the material on said bed and provided with inlet and outlet gates and laterally movable sides, a press-head movable in the box toward and from the bed, hydraulic means for operating said head, separate hydraulic devices controlled by the movement of the press-head for opening and closing the gates, additional hydraulic means controlled by the movement of the press-head for operating the sides of the box laterally, and further means also controlled by the movement of the press-head for operating the movable bed.

12. In a press of the character described, a supporting bed for the material to be pressed, a press-box for confining the material on the bed and provided with inlet and outlet gates, a metal packing strip at the lower edge of the inlet gate and bearing upon the bed, additional metal packing strips running along the lower edges of the sides of the box and also bearing upon the upper surface of the bed, a press-head movable in the box toward and from the bed, hydraulic means for operating said press-head, and separate hydraulic devices controlled by the movement of the press-head for operating the gates.

13. In a press of the character described, a movable endless bed for supporting the material to be pressed, a press-box confining the material on a portion of said bed, a press-head movable toward and from the bed, means for actuating the press-head, additional means for actuating the endless bed, and a stripping knife running transversely across the upper surface of the bed with its cutting edge in close proximity to, and opposed to, the movement of the upper portion of the bed for freeing the material from said bed as the latter is moved to discharge the pressed material therefrom.

14. In a press of the character described, a supporting bed for the material to be pressed, a press-box for confining the mate-

rial on the bed and provided with inlet and outlet gates, a press-head movable in the box toward and from the bed, means for actuating the press-head, additional means for opening and closing the gates, and means controlled by the outlet gate for preventing the opening of the inlet gate until the outlet gate is closed.

15. In a press of the character described, an intermittingly movable endless bed for supporting the material to be pressed, a press-box having inlet and outlet gates and laterally movable sides, a press-head movable in the box toward and from the bed, and a system of connected hydraulic devices for operating the press-head, gates and sides of the box and endless bed.

16. In a press of the character described, an intermittingly movable endless bed for supporting the material to be pressed, a press-box for confining the material on said bed and provided with inlet and outlet gates and laterally movable sides, a press-head movable in the box toward and from the bed, hydraulic means for actuating the press-head toward the bed, separate hydraulic means controlled by the movement of the press-head for moving the latter away from the bed, additional hydraulic means controlled by the movement of the press-head for opening and closing the gates, separate hydraulic means controlled by the movement of the press-head for moving the sides laterally, and further hydraulic means controlled by the movement of the press-head for operating the endless bed.

17. In a press of the character described, a supporting bed for the material to be pressed, a press-box for confining the material on said bed and provided with inlet and outlet gates, a press-head movable in the press-box toward and from the bed, a fluid pressure cylinder and piston movable therein for moving the press-head toward the bed, a pressure pipe having a self-closing valve therein connected to the cylinder, a relief pipe having a self-closing valve therein connected to the supply pipe between the first named valve and cylinder, means actuated by the up-stroke of the piston for opening the pressure valve, and power-driven mechanism for releasing the last named means and for opening the relief valve.

18. In a press of the character described, a supporting bed for the material to be pressed, a press-box for confining the material on said bed, a press-head movable in the box toward and from the bed, a cylinder, a piston movable in the cylinder and connected with the press-head for moving the same, means for raising the press-head and piston, a supply pipe connected to the cylinder for conducting a fluid therethrough for depressing the piston, a normally closed valve in the supply pipe, and means brought into action by the raising of the piston for opening said valve.

19. In a press of the character described, a supporting bed for the material to be pressed, a press-box for confining the material on said bed, a press-head movable in the box toward and from the bed, a cylinder, a piston movable in the cylinder and connected with the press-head for moving the same, means for raising the press-head and piston, a supply pipe connected to the cylinder for conducting a fluid therethrough for depressing the piston, a normally closed valve in the supply pipe, means brought into action by the raising of the piston for opening said valve, a relief pipe connected to the supply pipe between the pressure valve and cylinder, a normally closed valve in the relief pipe, and means for opening the relief valve at the beginning of the up-stroke of the piston.

20. In a press of the character described, a movable endless bed for supporting the material to be pressed, a press-head movable toward and from the bed, hydraulic means for moving the head toward the bed, separate hydraulic means for moving the head away from the bed, and additional hydraulic means separate from the first named hydraulic means and actuated by the movement of the press-head away from the bed for operating the endless bed.

21. In a press of the character described, a supporting bed for the material to be pressed, an inlet gate controlling the passage of the material onto the bed, a press-head movable toward and from the bed, hydraulic means for operating the press-head toward the bed, automatic means for moving the press-head away from the bed after it reaches the limit of its compression stroke, and hydraulic means brought into action by the movement of the press-head away from the bed for opening the inlet gate.

22. In a hydraulic press, a cylinder, a piston movable in the cylinder, a press-head carried by the piston, a supply pipe for conducting fluid under pressure to the cylinder for depressing the piston, a self-closing valve in the supply pipe, means for raising the piston and press-head, additional means actuated by the raising of the piston and press-head for opening said valve, movable means for holding the valve open during the compression stroke of the piston, and power-driven means for operating said movable means to release and permit the valve to close when the piston reaches the limit of its compression stroke.

23. In a hydraulic press, a cylinder, a piston movable in the cylinder, a press-head carried by the piston, a self-closing supply valve to admit fluid under pressure to the

cylinder for moving the piston through its compression stroke, a self-closing relief valve also communicating with the cylinder for permitting the exit of the fluid from the cylinder during the return stroke of the piston, means for returning the piston and press-head, additional means actuated by the press-head when the piston approaches the limit of its return stroke for opening said supply valve, and movable means for holding said valve in its open position during the compression stroke of the piston, power-driven means for actuating said movable means to release and permit the closing of the supply valve when the piston reaches the limit of its compression stroke, and additional means also actuated by the power-driven means for opening the relief valve just after the supply valve closes.

24. In a hydraulic press, a cylinder, a piston movable in the cylinder, a press-head on the piston, a self-closing supply valve to admit fluid under pressure to the cylinder for moving the piston through its compression stroke, means for raising the piston and press-head, and a means, including a toggle, actuated by the raising of the piston and press-head for opening the valve and holding it open during the compression stroke of the piston.

25. In a hydraulic press, a cylinder, a piston movable in the cylinder, a press-head on the piston, a self-closing supply valve to admit fluid under pressure to the cylinder for moving the piston through its compression stroke, means for raising the piston and press-head, a means, including a toggle, actuated by the raising of the piston and press-head for opening the valve and holding it open during the compression stroke of the piston, and power-driven means for flexing said toggle to permit the valve to close when the piston reaches the limit of its compression stroke.

26. In a hydraulic press, a pressure cylinder, a piston movable in said cylinder and provided with a press-head, a lifting cylinder for the press-head, a piston movable in the lifting cylinder and operatively connected to lift the press-head, a supply pipe for fluid under pressure connected to both cylinders, and mechanism brought into action by the press-head when at the limit of its compression stroke for cutting off the supply of pressure fluid to the pressure cylinder and thereby diverting the full pressure to the lifting cylinder to operate the piston therein and thereby return the press-head and its operating piston.

In witness whereof I have hereunto set my hand this twenty fifth day of March 1909.

KIRK S. BLANCHARD.

Witnesses:
JOHN A. HEYSER,
HANS H. STOLZE.