No. 725,313. PATENTED APR. 14, 1903.

K. S. BLANCHARD.

PRESS.

APPLICATION FILED FEB. 18, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

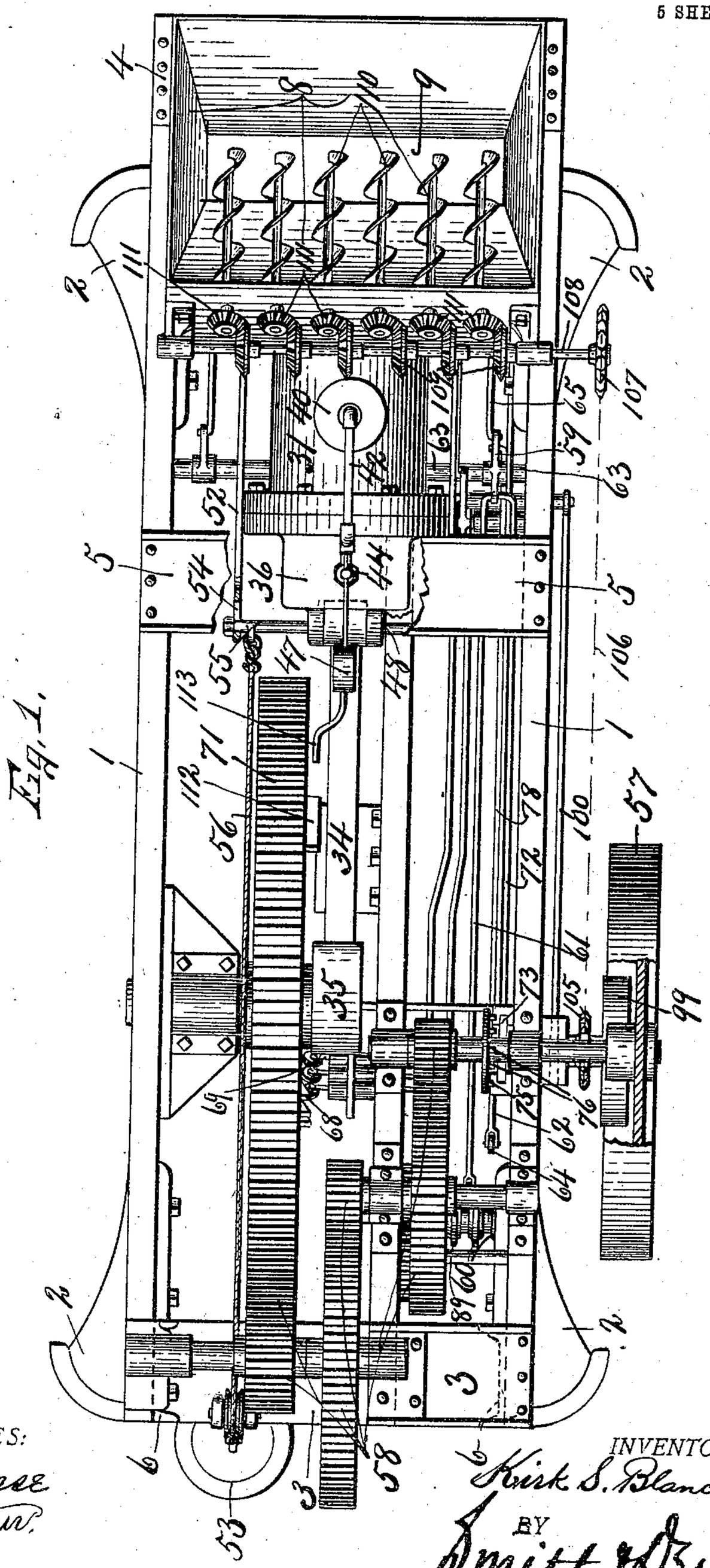

FIG. 1.

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NO MODEL. 5 SHEETS—SHEET 2.

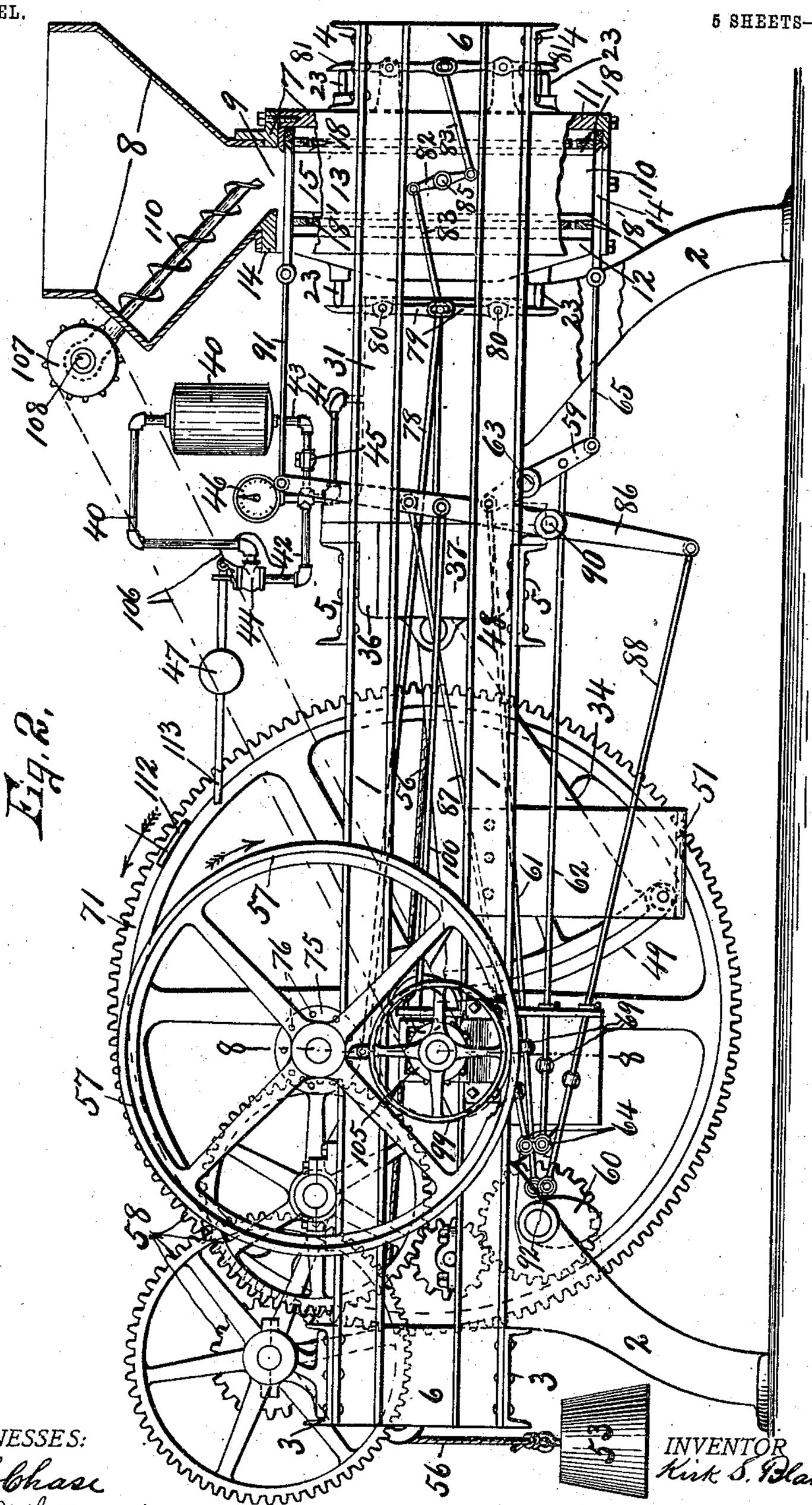

Fig. 2.

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NO MODEL. 5 SHEETS—SHEET 3.

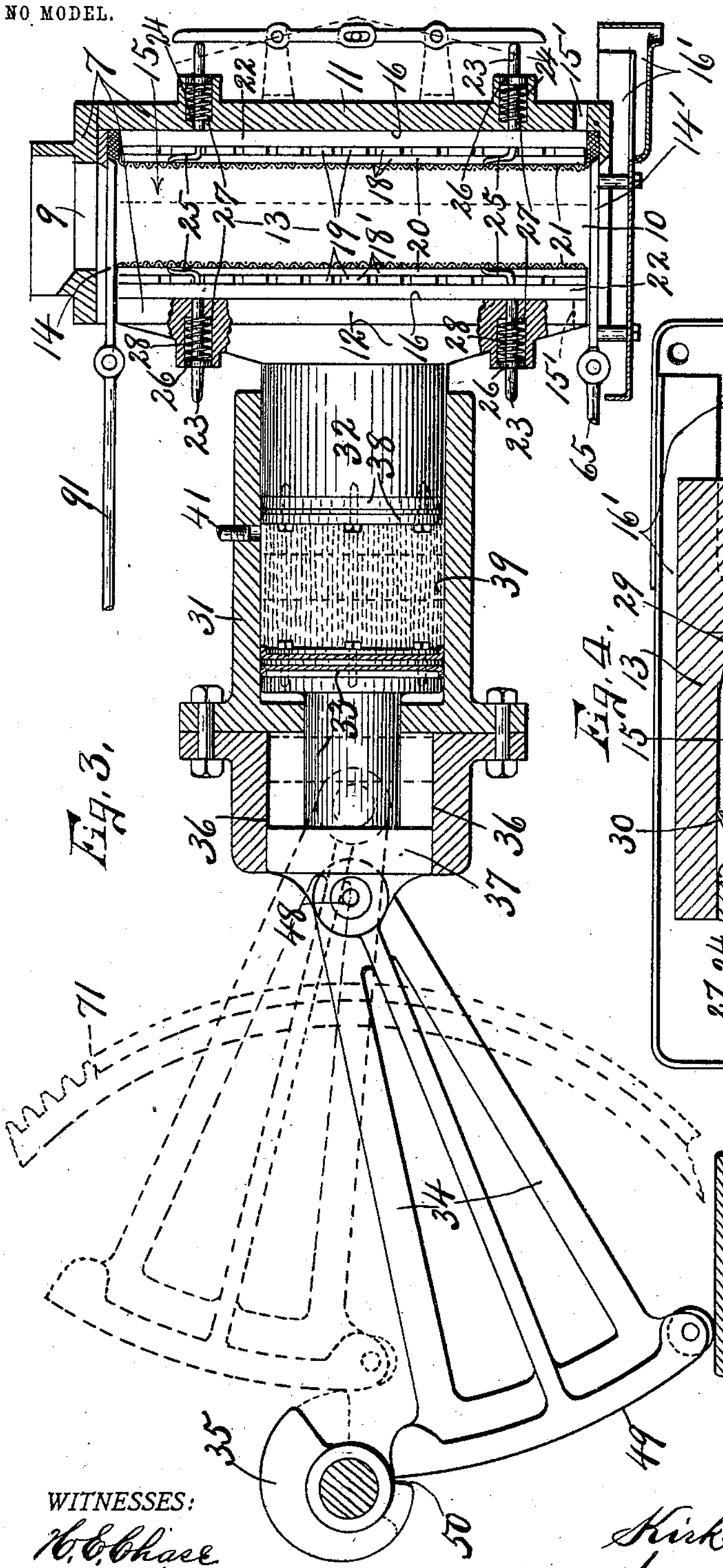

Fig. 3.

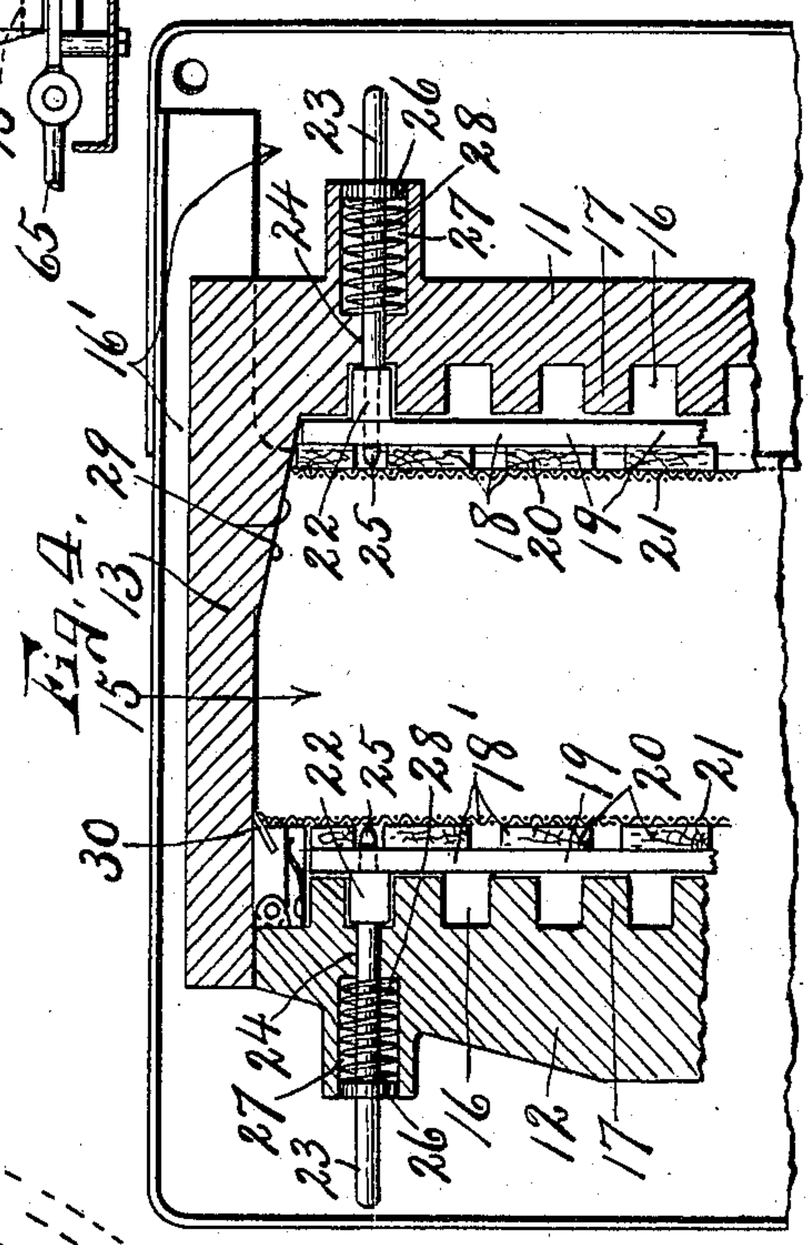

Fig. 4.

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NO MODEL.

5 SHEETS—SHEET 4.

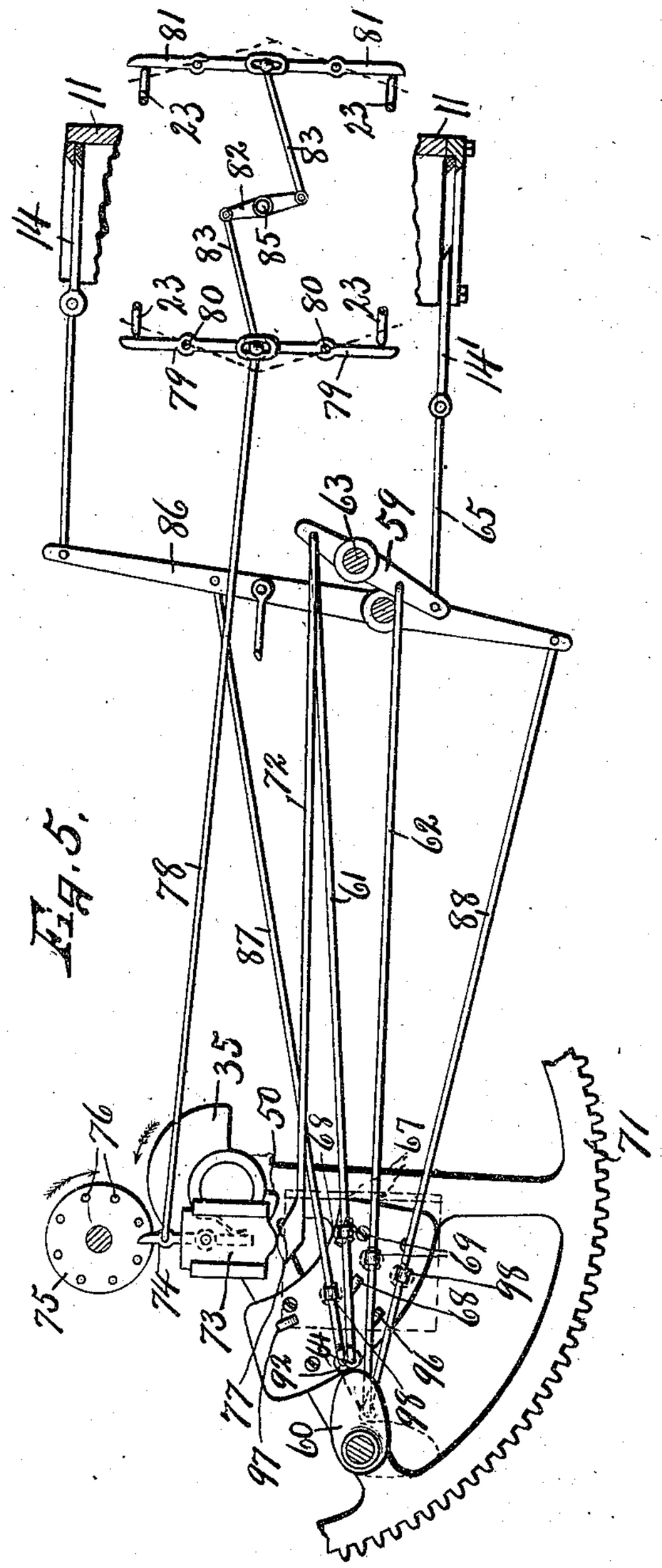

FIG. 5.

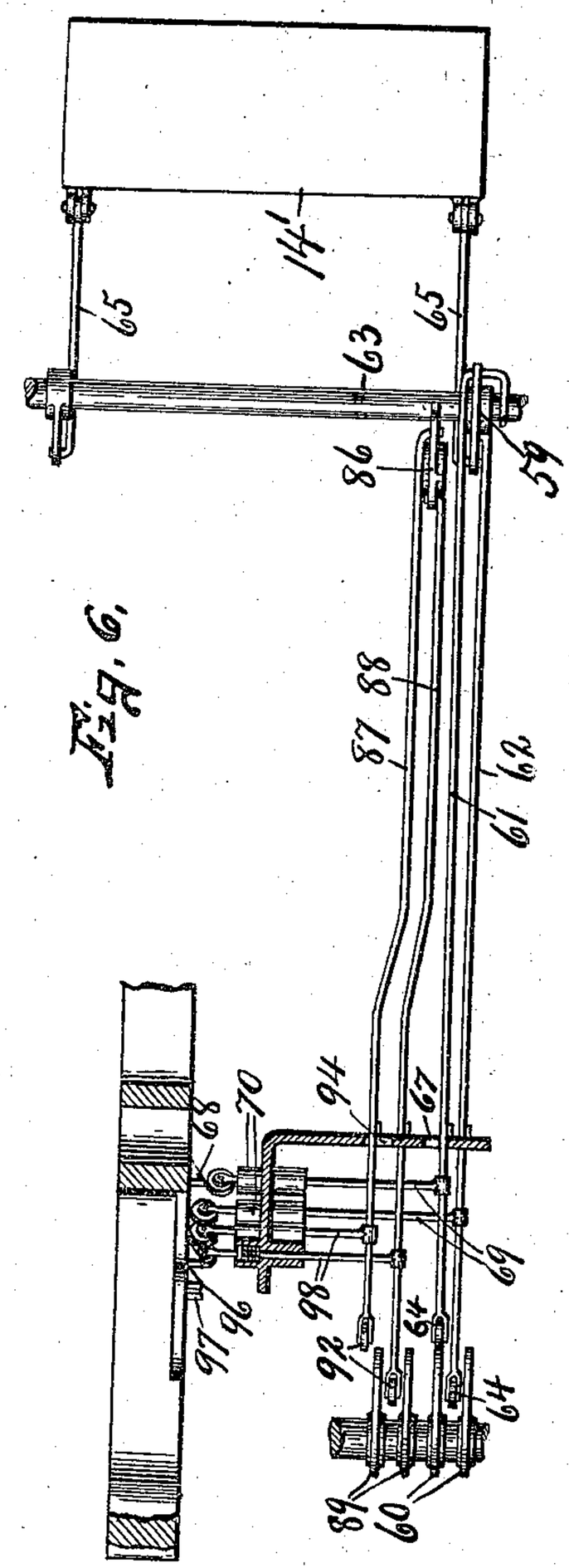

FIG. 6.

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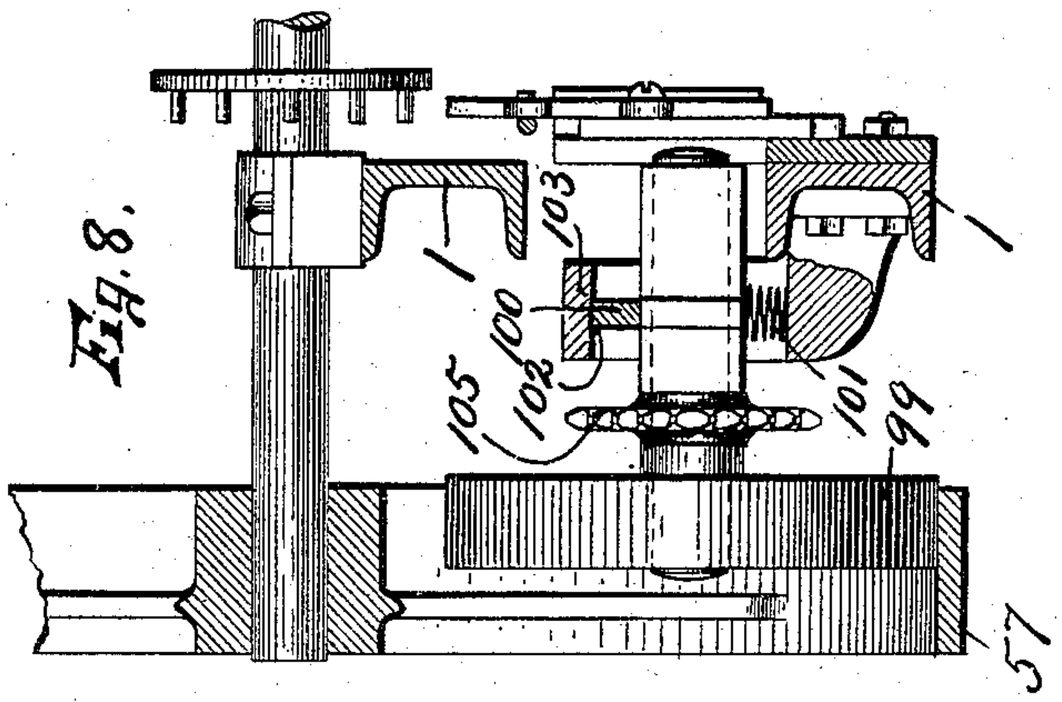
NO MODEL. 5 SHEETS—SHEET 5.

Fig. 8.



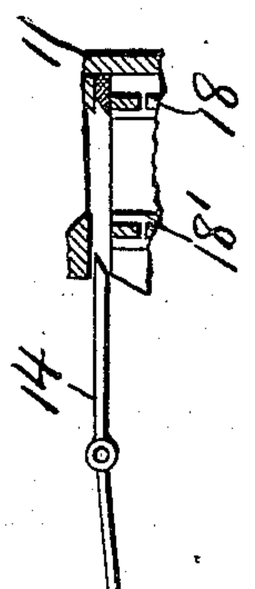
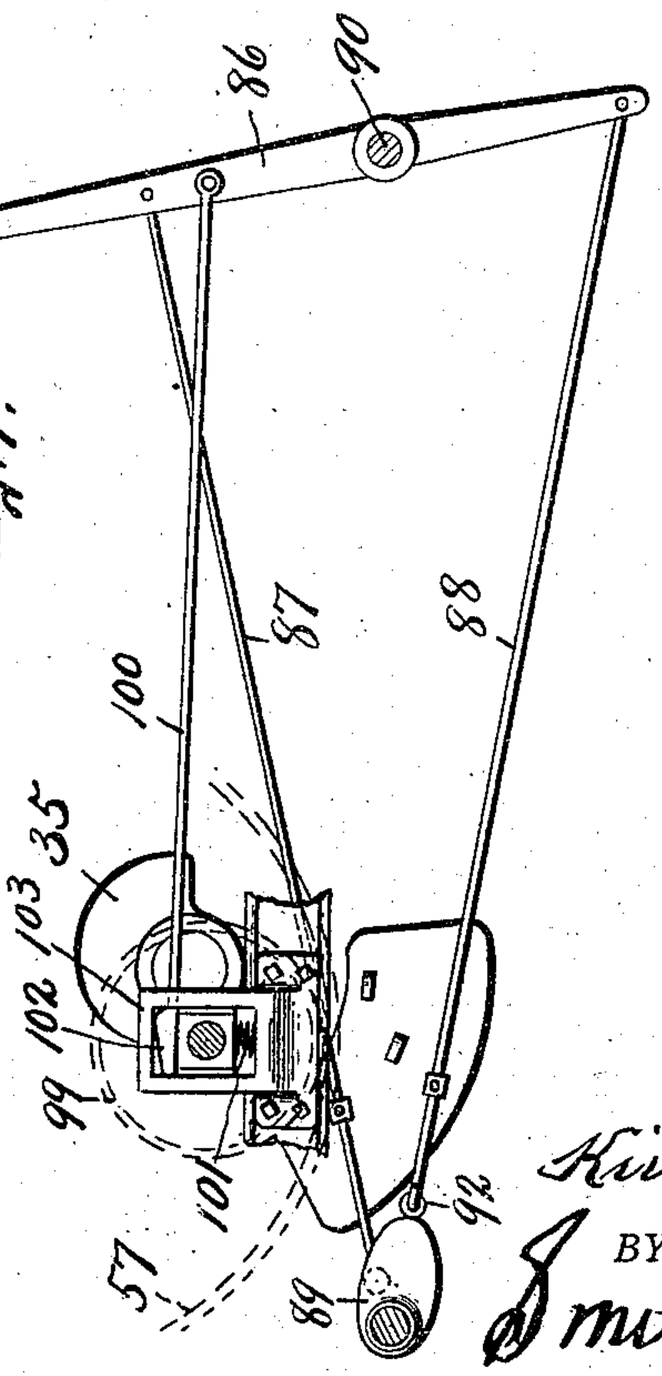




Fig. 7.




WITNESSES:

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# UNITED STATES PATENT OFFICE.

KIRK S. BLANCHARD, OF SYRACUSE, NEW YORK.

## PRESS.

SPECIFICATION forming part of Letters Patent No. 725,313, dated April 14, 1903.

Application filed February 18, 1902. Serial No. 94,668. (No model.)

*To all whom it may concern:*

Be it known that I, KIRK S. BLANCHARD, of Syracuse, in the county of Onondaga, in the State of New York, 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.

My invention relates to improvements in presses, having particular reference to that class in which the material to be pressed is first fed into a suitable receptacle and the material acted upon by an intermittently-moving head-block, which is adapted to form one of the walls of the receptacle.

One of the objects of this invention is to provide means whereby bodies of unequal compressibility may be subjected to a uniform pressure for producing cakes or compact bodies of substantially uniform density, but of varying thicknesses, especially where the materials to be pressed are of varying densities in their initial state, this compression being effected by positive means without liability of straining or otherwise impairing the utility or integrity of the machine.

Another object is to provide means actuated by one or more of the moving parts of the machine whereby the compressor-head is moved to the work under a rolling cam-pressure in order to produce a steady gradually-increasing pressure.

A further object is to provide means for automatically returning the compressor mechanism to its normal position irrespective of the cam which operates the same.

A still further object is to provide a suitable feed for the material to be compressed, which feed is operated automatically and is so timed as to operate to fill the receptacle between the time of discharge of the compressed material therefrom and the initial movement of the compressor-head to the work in the act of compressing the material.

Another object is to provide a suitable mechanism operated by one or more of the moving parts of the machine whereby the compressed material or any portion thereof which may adhere to the compression-surfaces is automatically agitated or shaken for the purpose of discharging the body and thoroughly cleansing the compression-walls of the receptacle from any particles which may have adhered thereto.

A further object is to provide suitable valves or gates at the inlet and discharge openings of the receptacle which are operated automatically and intermittently at regular predetermined intervals in the operation of the machine in such manner that both gates are closed during the operation of pressing the material. The gate at the discharge-opening is opened immediately upon the completion of the operation of compression and just before the action of the shakers, and the upper gate at the inlet-opening is automatically opened to permit the entrance of the material to be compressed into the receptacle immediately after the closing of the former gate and just before the operation of compressing the material, it being understood that this inlet-gate is automatically closed also before the operation of the compression mechanism; and a still further object is to so construct and arrange the supporting-frame and the several mechanisms mounted thereon as to resist any pressure which may be applied to the compression mechanism.

To this end the invention consists in the combination, construction, and arrangement of the parts of a press, as hereinafter fully described, and pointed out in the claims.

Referring to the drawings, Figures 1 and 2 are respectively a top plan and side elevation of a press embodying the various features of my invention, portions of the device being shown in section. Fig. 3 is an enlarged vertical section of my machine, showing particularly the compression mechanism and the receptacle in which the material is pressed, said mechanism being shown in its normal position by full lines and in its operative position by dotted lines, the hopper and feed mechanism being omitted. Fig. 4 is a still further enlarged horizontal section through one end of the receptacle, showing the shaking-grates in their normal position. Fig. 5 is an elevation of the gate-operating mechanism and the devices connected thereto for controlling the operation of the frames. Fig. 6 is a top plan view of the mechanisms seen in Fig. 5. Fig. 7 is an elevation of the de-

tached upper gate and feed-controlling mechanism. Fig. 8 is an enlarged sectional view taken on line 8 8, Fig. 2.

Similar reference characters indicate corresponding parts in all the views.

In the drawings I have shown a press of the class mentioned consisting of a suitable supporting-frame upon which is mounted at one end a receptacle for receiving the material to be pressed, mechanism for compressing said material in the receptacle, means for relieving the excessive pressure beyond a certain predetermined degree, means for automatically feeding the material to be compressed into the compresssion-chamber of the receptacle, and mechanism for automatically opening and closing suitable inlet and outlet gates at the opposite ends of the compression-chamber and for shaking or agitating the material from the receptacle after its compression.

The supporting-frame may be of any desired size, form, or construction adapted to carry the various parts of my invention, and consists, essentially, of oppositely-arranged substantially parallel lengthwise bars 1, mounted in pairs at opposite sides of the machine upon suitable supporting-legs 2 and connected by transverse bars 3, 4, and 5, the side bars of each pair being also united to each other by upright bars 6. These longitudinal, transverse, and upright bars preferably consist of channel-irons which are suitably riveted or otherwise secured to each other and to the legs 2 to form a united, strong, and durable frame adapted to resist the strains incidental to the operation of the compression or other mechanisms. The receptacle for the material to be compressed may also be of any desired form or construction, depending upon the material or the form of the compressed blocks or bodies desired. As seen in the drawings, this receptacle consists of an upright inclosing shell 7 and a hopper 8, the shell 7 being suitably mounted upon and secured to the side bars 1 and is braced in position by the end cross-bars 4, which counteract the pressure of the compression mechanism when moving to its operative position. This shell 7 forms the compression-chamber of the receptacle, having inlet and discharge openings, and preferably consists of opposite end walls 11 and 12, side walls 13, and upper and lower walls 14 and 14′, which together form the inclosing walls of a compression-chamber 15, the end wall 11 and side walls 13 being united to each other to form an open-ended chamber, and the end wall 12 is movable toward and away from the end wall 11 and forms the head or pressure plate of the compression mechanism, presently described, said movable wall or head 12 being of substantially the same area as the cross-sectional area of the chamber 15—that is, it travels in close proximity to the inner faces of the side walls 13 and upper and lower walls 14 and 14′, the advance edges of the gates 14 and 14′ shearing with corresponding edges on the wall 11 to trim the ends of the compressed body. The inner faces of the end walls 11 and 12 are usually corrugated transversely for forming vertical channels 16 and ribs 17, the inner faces of the ribs serving as suitable abutments between which the material is compressed, and the channels 16 serve to receive and conduct the liquid expressed from the compressed material to the bottom of the chamber 15, from which it may be readily drawn off through openings provided therefor into a tray or tank 16′. The end walls 11 and 12 are preferably provided with inner linings or gratings 18 and 18′, which are separate from and movable independently of said end walls and consist of a series of separated transverse or horizontal bars 19, separated upright bars 20, and a fabric or screen facing 21, the bars 19 of each grate being normally arranged contiguous to the inner faces of the ribs 17, and the upright bars 20 are secured to the inner faces of the transverse bars, while the fabric or screen 21 is secured to the inner faces of the upright bars 20, and it is thus apparent that the bars 19 and 20 and the screen 21 are permanently secured to each other and together form what will hereinafter be designated as a "shaker." Arranged in one of the grooves 16 at each of the opposite ends of each end wall 11 and 12 are upright bars 22, said bars being movable in their respective grooves and are mounted upon reciprocally-movable rods 23, which are guided in openings or bearings 24, Fig. 4, in the end walls 11 and 12, the inner ends of the rods 23 being extended beyond the inner faces of the bars 22 and are formed with hook-shaped extremities 25, which receive one of the transverse bars 19 of each of the shakers and serve to hold the shakers in operative position and at the same time permit either to be removed when desired, it being understood that the hook-shaped extremities 25 are turned upwardly, and in order to more effectually hold the shakers in position I usually provide rods 23 at both the upper and lower ends of the end walls 11 and 12, each of which is similar in construction and is provided with a shoulder 26, guided in a socket 27, and is held in its normal position by a spring 28, also arranged in said sockets 27 and interposed between the shoulders 26 and the inner wall of the socket. The rods 23 are preferably secured to the upright bars 22, and the hook-shaped extremities 25 are arranged to hold the transverse bars 19 firmly against the inner faces of the bars 22, and it is therefore apparent that the shakers are firmly locked to the upright bars 22, and therefore to the rods 23, so that as the rods are reciprocated in their respective bearings the shakers will also be similarly moved toward and away from each other.

In order to prevent the binding or sticking of the compressed material against the walls of the chamber 15, I usually provide the side walls 13 with inclined faces 29, Fig. 4, which incline outwardly from the end wall 11 toward the movable end wall 12 in such manner that

when the end wall 12 is moved to the limit of its inward movement in the act of compressing the material said material will be compressed transversely by being forced against the inclined surface 29, and when the shaker adjacent to the end wall 11 is operated in a manner hereinafter described the compressed block or brick will be moved away from the inclined surface and being then free from engagement with the side walls 13 will readily drop by gravity through the discharge-opening 10 when the movable end wall 12 recedes or is withdrawn from operative position.

It is necessary that the head or end wall 12 move freely in the chamber 15, and it therefore fits somewhat loosely between the walls of said chamber, and in order to prevent the expression of the moisture or any of the material between the upright edges of the head and the adjacent faces of the side walls I preferably provide the inner opposite corners of the head with suitable packing 30, Fig. 4, which fits closely against the inner faces of the side walls and is preferably disposed at an angle with the movement of the head 12.

The compression mechanism preferably consists of a cylinder 31, a piston 32, a second piston 33, a piston-rod or connection 34, and a rotary cam 35. The cylinder 31 may be of any desired form, size, or construction and preferably consists of a cylindrical shell suitably mounted upon the supporting-frame in proximity to the end wall or head 12 and is provided at one end with ways 36 for receiving and supporting a cross-head 37, connecting the piston 33 with the rod 34. The piston 32 is movable in one end of the cylinder 31 and preferably forms a part of the head 12, being provided with packing-rings 38 for a purpose hereinafter described. The piston 33 is movable in the opposite end of the cylinder 31, its inner end being normally separated from the inner end of the piston 32 for forming an interposed chamber 39, Fig. 4, which is arranged to receive and retain a suitable body of liquid, as water. I usually provide a sufficient quantity of the liquid to entirely fill the chamber 39, so as to form a slightly compressible or yielding cushion between the adjacent ends of the pistons 32 and 33, and when the piston 33 is actuated toward the piston 32 the compressed liquid in the chamber 39 forms a positive force to actuate the piston 32 for moving the head 12 toward the end wall 11 in the act of compressing the material in the chamber 15. This material is usually subjected to a predetermined degree of pressure, and owing to the fact that the same or different materials vary in their degrees of resistance to compression it is evident that some of the material will be compressed into a smaller space than other material, and the movement of the pistons 33 being necessarily positive and uniform at each cycle of operation it is necessary to provide some means to offset this differential compression and consequent differential movement of the piston 32 and head 12, secured thereto. This means preferably consists of the liquid body in the chamber 39, a reservoir 40, a conduit 41, leading from the chamber 39, conduits 42 and 43, leading to and from the reservoir 40, a pressure-regulating valve 44, connected in the conduit 42, a check-valve 45, connected in the conduit 43, and an indicator 46 common to each of said conduits. The predetermined pressure required for the compression of the material within the chamber 15 is regulated by a suitable weight or equivalent device, as 47, operating to normally hold the valve 44 closed, the pressure exerted upon the piston 32 being indicated by the gage 46. The conduits 42 and 43 are both connected to the conduit 41, and the operation of this portion of my device is as follows: Suppose, for instance, the pressure required to compress the material to be ten tons and the weight 47 to be set for such pressure. When the piston 33 is moved forward by the cam 35 and connecting-rod 34, the liquid between the pistons 32 and 33 is compressed to its limit, and the piston 32 and head 12 are thereby moved forward simultaneously with the movement of the piston 33, and should the degree of pressure or compression of the material be effected before the piston 33 reaches the limit of its positive movement and the resistance of the material be sufficient to prevent the further movement of the head 12 the liquid in the chamber 39 is then forced outwardly through the conduits 41 and 42, thereby opening the valve 44 against the action of the weight 47, which liquid then passes on through the conduit 42 into the upper end of the reservoir 40, it being understood that the check-valve 45 is arranged to prevent the flow of the liquid into the base of the reservoir, and it is apparent from this arrangement that the check-valve cannot be opened on account of the equalization of the pressure at both sides thereof, such pressure being indicated by the gage 46. As soon as the piston 33 has reached the limit of its inward movement the valve 44 is automatically closed by the weight 47 and the pressure in the conduit 41 is relieved, whereupon the liquid in the reservoir 40 automatically gravitates, through the valve 45 and conduit 41, back into the chamber 39, thus returning to said chamber all of the liquid displaced therefrom, and the operation repeated.

The means for effecting the inward movement of the pistons 33 forms one of the features of my invention, and consists of the connecting rod or member 34 and the cam 35, the member 34 being normally held in its inoperative position, as seen in Fig. 3, by its own gravity or by a suitable spring, if necessary, and is pivotally connected at 48 to the cross-head 37, the free end of said connection being provided with a bearing-face 49, having a rolling contact with the bearing-face of the cam 35. This cam-face is of substantially the same circumferential length as the bear-

ing-face 49 and is arranged to operate the connecting member 34 and piston 33 intermittently, being provided with an engaging shoulder 50 for effecting the initial or starting movement of the member 34, it being understood that the upper end of the bearing-face 49 is normally held in the path of the shoulder 50 by a suitable support or guide 51 in such manner that as shoulder 50 is regularly presented against the upper end of the bearing-face 49 the contact forces the piston 33 forwardly and at the same time elevates the member 34 and continues the forward movement of the piston by a rolling engagement of the cam-face with the bearing-face 49 until the cam has forced the member 34 to the limit of its movement, as indicated by dotted lines in Fig. 3, whereupon the cam leaves the bearing-face 49 in its rotation, and the member 34 automatically returns to its normal position in engagement with the guide or support 51.

The means for returning the pistons 32 and 33 to their normal positions preferably consists of a link 52 and a counterweight 53, the link 52 being connected at one end to the head 12, and its opposite end is provided with an elongated slot 54 for receiving a pin or stud 55, secured to the cross-head 37 and preferably forming an extension of the pivotal pin 48. This slot 54 is so arranged as to permit the forward movement of the piston 33 after the piston 32 has reached the limit of its movement and also to effect the return movement of the piston 32, together with the return movement of the piston 33, and in order to return the piston 33 to its normal position I preferably connect the stud 55 directly to the weight 53 by means of a flexible cable 56. Although I have described a specific means for returning these pistons to their normal positions, it will be evident that other means may be employed without departing from the spirit of this invention.

The cam 35 is so constructed and timed in its movement that after the operation of compressing the material in the chamber 15 a limited time elapses before the operation is repeated, and during this period of rest of the compression mechanism the lower gate or closure 14′ is open and the shakers are immediately thereafter operated to remove any material which may adhere to the inner surfaces of the shakers, and also during this period of rest and immediately after the discharge of the material from the chamber 15 and closure of the gate 14′ the upper gate 14 is open and the feeding mechanism is operated to refill the chamber 15 with additional material to be compressed.

The means for rotating the cam 35 preferably consists of a band-wheel 57 and a train of gears 58, which are so arranged and connected as to give a greatly-increased power to the cam 35 by the application of a very much less power to the band-wheel 57, said band-wheel and train of gearing being suitably mounted in bearings provided upon the supporting-frame.

The mechanism for opening and closing the lower gate or closure 14′ preferably consists of a rocking lever 59, revolving cams or eccentrics 60, links or rods 61 and 62, normally out of the path of their respective cams 60, and means for moving the engaging ends of said rods into the paths of their respective operating-cams. The lever 59 is pivotally connected at 63 to the supporting-frame, and the links 61 and 62 are respectively connected at corresponding ends to the lever at opposite sides of its pivot, the opposite ends of said links or rods being provided with roller-engaging ends 64, adapted to be engaged by their respective operating-cams 60. One end of the lever 59 is connected to the lower gate by a link 65 and the lever 59, as shown in Fig. 2, in position for closing the gate 14′, and the link 61 is therefore forced back toward the axis of revolution of the cam 60, ready to be operated by said cam when the roller 64 is moved into its path of rotation, while the other link 62 is shown as drawn forwardly beyond the path of movement of its operating-cam 60. These links 61 and 62 are preferably of considerable length, and their free ends—that is, the ends provided with rollers 64—are movable laterally into and out of the path of their respective operating-cams and are usually guided in suitable slots or bearings 67. The means for effecting this lateral movement of the links 61 and 62 into and out of the path of their respective and operating cams preferably consists of beveled teeth or shoulders 68, Fig. 5, which are secured to one of the revolving members of the train of gearing—as, for instance, the larger member—having a slower movement, and reciprocating plungers 69, guided in suitable bearings 70, provided on the supporting-frame, said plungers having one end connected to their respective links 61 and 62, and their opposite ends are provided with roller-bearings adapted to be engaged with the beveled faces of the teeth or shoulders 68. The last gear of the train, or the gear of greatest power, which may be designated by the numeral 71, is mounted upon the same shaft as the cam 35, and the teeth or shoulders 68 are usually mounted upon a suitable plate secured to the web of this gear 71, said teeth 68 being so relatively arranged to each other and to the cam 35 that immediately after the cam has forced the pistons 32 and 33 to the limit of their inward movement in the act of compressing the material and has left the bearing-face 49 in its continued rotation the tooth 68 is immediately presented to the inner end of the plunger 69, which operates the link 61 to force the engaging roller 64 of said link 61 into the path of its continuously-revolving operating-cam 60, whereupon said cam actuates the link 61 to rock the lever 59 to the opposite position from that seen in Fig. 2 for opening the gate 14′, and simultaneously

with this movement of the lever 59 and opening of the gate 14′ the shakers are operated. The means for operating these shakers preferably consists of the lever 59, a sliding rod 72, Fig. 5, a sliding plate 73, carrying a pivoted lever or pawl 74, and a revolving disk 75, secured to the shaft of the band-wheel 57 and provided with a series of engaging shoulders 76. The sliding rod 72 is connected to the lever 59 at the opposite side of the pivot from the gate 14′ and link 62′, and its other end is provided with a cam-face 77, which is adapted to engage the sliding plate 73 for forcing the pawl 74 into the path of the revolving shoulders 76. This link 72 and plate 73 are guided in their movement in suitable bearings provided on the supporting-frame, and the pawl 74 is pivotally mounted upon said sliding plate, which is normally depressed for holding the upper end of the pawl out of the path of the revolving shoulders 76. The upper end of this pawl 74 is connected by a link 78 to one of a pair of oscillating levers 79 at the open side of the receptacle 13. These levers are pivoted at their intermediate portions at 80 to suitable ears or lugs provided upon some stationary part of the machine—as, for instance, the supporting-frame—their inner adjacent ends being pivotally connected to the link 78 in such manner that when the upper end of the pawl 74 is projected into the path of the revolving shoulders 76, so that the pawl is actuated intermittently by the shoulders, the levers 79 are rocked upon their pivots, and their free ends are engaged with the outer ends of the sliding rods 23, and thereby transmit motion to the shakers 18. In like manner the opposite shakers 18 are reciprocated by means of a similar set of levers 81 operating upon the adjacent reciprocating rods 23 of the shakers 18, the motion from the link 78 being transmitted to the operating-levers for the shakers 18 through the medium of a rocking lever 82 and connecting-links 83, it being understood that these latter operating-levers 81 are pivotally mounted upon a stationary support in substantially the same manner as the levers 79 and that the rock-lever 82 is similarly pivoted to a stationary support at 85.

The means for operating the closure or gate 14 at the inlet-opening of the receptacle preferably consists of a lever 86, links 87 and 88, and cams 89, similar to the rotary cams 60, the cams 89 being mounted upon the same shaft as the cam 60 and rotating therewith. The lever 86 is pivoted at its intermediate portion at 90 to a supporting-frame, and its upper end or arm is connected by a link 91 to a gate 14. The links 87 and 88 are connected at corresponding ends to the lever 86 at opposite sides of its pivot, and their opposite ends are provided with rollers 92, adapted to be engaged by their respective operating-cams 89. The ends of the links 87 and 88 adjacent to their operating-cams are normally out of alinement with said cams and are movable laterally in suitable guides 94 into and out of the path of their cams independently of each other. The means for moving these arms laterally, as just described, preferably consists of cams or teeth 96 and 97, which are similar to the teeth 68 and are also mounted upon the same revolving member as the gear 71 in a certain relation to the teeth 68 and to the cam 35. These teeth 96 and 97 are adapted to operate upon plungers 98, similar to the plunger 69, except that their inner ends are connected, respectively, to the links 87 and 88, being so arranged that immediately after the closing of the gate 14′, as previously described, the lever 86 is moved to its other position from that seen in Fig. 2 for opening the gate 14—that is, the tooth 96 first comes in contact with the adjacent end of its plunger 98 for forcing the roller 92 of the link 88 into the path of its operative cam 89, whereupon said cam forces the link 88 endwise, and thereby rocks the upper end of the lever 86 to its other position for opening the gate 14. This forces the roller of the link 87 toward the axis of its operating-cam, which roller is next forced laterally into the path of said cam, and the feeding device which has been brought into action by the opening of the gate 14 ceases its movement. This feeding mechanism, as just stated, is brought into action by means of a friction-wheel 99 and a link 100, the friction-wheel 99 being mounted in a vertically-movable bearing, which is normally held out of action by a suitable spring 101, Figs. 7 and 8, and the link 100 is connected at one end to the lever 86 at the same side of the pivot as the gate 14, the other end of said link being provided with a wedge or cam-face 102, adapted to be inserted between the movable bearing or support for the friction-wheel 99 and a fixed shoulder 103 when the gate 14 is open. During this opening of the gate and the consequent movement of the support for the friction-wheel 99 by means of the cam or wedge 102 said friction-wheel is forced into engagement with the inner friction-surface of the band-wheel 57, thus transmitting rotary motion to the friction-wheel 99. Secured to the friction-wheel, or rather to the same shaft which carries said friction-wheel, is a sprocket-wheel 105, which is connected by a chain 106 to a similar sprocket-wheel 107 upon the shaft 108. This shaft 108 is provided with a series of gears 109, and journaled in the case of the hopper are a series of rotary screw-feeds 110, extending to a point in proximity to the inlet-opening 9 of the receptacle 7, and their outer ends are provided with gears 111, which are meshed with the gears 109, and it is therefore evident that when the gate 14 is open the friction-wheel 99 is forced into frictional engagement with the wheel 57 and that motion is thereby transmitted to the screw-feeds 110. This feed continues as long as the gate 14 is open, and the distance between the shoulders 96 and 97 affords suffi-

cient time to fill the chamber 15 with the material to be compressed. As soon as the hopper is filled, or rather when the screw feeds have been operated a predetermined length of time, depending upon the speed of the rotation of the gear 71 and the distance between the teeth 96 and 97, the tooth 97 operates its plunger 98 to force the roller 92 of the link 87 into the path of its operating-cam, whereupon the gate 14 is closed and the wedge 102 is withdrawn from operative position, and the friction-wheel 99 automatically returns to its inoperative position by means of the spring 101, and the machine is now ready to complete the operation of compression, as hereinbefore described.

In order to provide for the free return movement of the piston 32 to its normal position after the operation of compression when the chamber 39 is filled with liquid, and therefore resists the return of the piston 32 independently of the piston 33, I provide means for opening the valve 44 temporarily immediately after the operation of compression is completed and when it is time for the piston 32 to return. This means preferably consists of a shoulder 112, which is provided on the gear 71 and is adapted to engage an extension 113 of the supporting-arm for the weight 47 in such manner as to elevate said arm against the action of the weight for the purpose of opening the valve 44 and holding the same open during a brief period in the initial movement of returning the pistons to their normal positions.

In the operation of my invention, assuming the pistons 32 and 33 and their operating members 34 and 35 to be in the position indicated in Figs. 1 to 4, inclusive, at the beginning of the action of compression, the shoulder 50 carries the member 34 forwardly by its abrupt engagement with the face 49, and the cam then continues its movement with a rolling engagement with the face 49, thereby forcing the pistons 32 and 33 and wall 12 toward the wall 11 for compressing the material therein. Should the head 12 be prevented from the same movement as the piston 33, the liquid is compressed in the chamber 39 and forced into the reservoir 40, and as soon as the pressure on the piston 33 is relieved the liquid again returns to said chamber after the cam 35 has completed its operation upon the member 34, the slot 54 in the link 52 permitting this forward movement of the piston 33 independently of the piston 32. After this operation the member 34 drops to its normal position upon the support 51, and the weight 53 then draws the piston 33 backward until the arm 55 engages the end of the slot 54, when both pistons are returned by the weight 53. The teeth 68 are so arranged relatively to the cam 35 that immediately after the member 34 drops to its normal position and the pistons are returned the lower gate 14′ is opened in the manner previously described, and simultaneously with the opening of the gate 14′ the shaker-operating mechanism is brought into action for a brief period during the rotation of the wheel 71 or until the tooth 68, which operates the link 62, is forced into the path of its cam 60 to rock the lever 59 to close the gate 14′ and also to simultaneously stop the action of the shakers by permitting the slide 73 to drop by gravity and withdraw the pawl 74 out of the path of the shoulders 76. Immediately after this operation of closing the gate 14′ the upper gate is opened and the mechanism for feeding the material into the hopper or receptacle is simultaneously brought into action for a limited period of time and is similarly thrown out of action when the gate 14 is closed, this latter operation taking place just before the shoulder 50 engages the member 34 to repeat the operation of compressing the material first described. The moisture or liquid expressed from the material is conducted into the drainage pan or tray 16′, which tray is formed in sections and arranged beneath the receptacle 7, one of the sections being fixed and the other is connected to move with the lower gate 14′, the construction of these gates being best seen in Figs. 3 and 4.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that some change may be made in the various mechanisms without departing from the spirit thereof.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A press comprising a cylinder, and separate pistons movable therein, a body of liquid between the pistons, a conduit to receive portions of the liquid from between the pistons when one piston moves independently of and toward the other, and actuating means for one of the pistons.

2. A press comprising a cylinder having a liquid-chamber, a conduit leading to and from the chamber, a piston and means to actuate it against the liquid, and a second piston actuated by the liquid for the purpose set forth.

3. A press comprising a cylinder having a liquid-chamber, a conduit leading to and from the chamber, a pressure-regulator connected in the conduit, a piston and means to actuate it against the liquid, a second piston actuated by the liquid and a compression-head actuated by the second piston.

4. A press comprising a cylinder having a liquid-chamber, a conduit leading to and from the chamber, a pressure-regulator connected in the conduit, a piston and means to actuate it against the liquid, a second piston actuated by the liquid, a compression-head actuated by the second piston, a connecting-rod, a rotating cam having a rolling engagement with said rod to elevate and simultaneously

move the same toward the head, and means to transmit motion from the rod to the head.

5. A press comprising a compression-box having a movable wall, a cylinder having a water-chamber, separate pistons at opposite ends of said chamber for the purpose described, a connecting-rod for one of the pistons and a rotating cam having a rolling engagement with the rod.

6. In a press, a cylinder having a liquid-containing chamber, separate pistons at opposite ends of the chamber, a pressure-regulator connected to the liquid-chamber between the pistons, and means controlled by the regulator to permit the escape of the liquid from the chamber when subjected to pressure beyond a predetermined degree.

7. In a press, a cylinder having a liquid-containing chamber, separate pistons at opposite ends of the chamber, a pressure-regulator connected to the liquid-chamber between the pistons, means controlled by the regulator to permit the escape of the liquid from the chamber when subjected to pressure beyond a predetermined degree, and additional means to automatically return the expressed liquid to the chamber.

8. A press comprising compression-walls, one of the walls being movable toward and away from the other, means to actuate the movable wall, and a shaker adjacent the inner face of one of the walls and movable independently thereof for freeing the material therefrom.

9. A press comprising separate walls, one being movable toward and away from the other, a shaker-frame adjacent the inner face of one of the walls, and means to actuate the movable wall and shaker alternately.

10. A press comprising separate walls, one being movable toward and away from the other, a shaker-frame adjacent the inner face of one of the walls, a means to actuate the movable wall, and additional means for automatically operating the shaker.

11. A press comprising a fixed wall and a movable wall, shaker-frames adjacent the inner faces of said walls, means to operate the movable wall, and additional means to actuate the shaker-frames.

12. A press comprising compressor-walls, a movable outlet-gate, a shaker-frame, means to move one of the walls toward and from the other wall, means to automatically return the movable wall, means to open the gate automatically when the wall returns, and additional means to automatically actuate the shaker when the gate is opened.

13. A press comprising compressor-walls, a movable inlet-gate, means to move one of the walls, means to automatically return said movable wall, automatic means to operate the gate, feeding mechanism operating to feed the material between the walls, when the gate is open and means to stop said mechanism when the gate is closed.

14. A press comprising a receptacle having a movable wall and inlet and discharge openings, a gate for the discharge-opening, a shaker in the receptacle, and a means connected to automatically open the gate and to simultaneously operate the shaker, and connections to move the wall to its operative position.

15. A press comprising a receptacle having side and end walls, one of the walls being movable and one of the side walls having an inner beveled surface whereby the material is compressed laterally as it is compressed endwise, a shaker in the receptacle, means to move the wall to its operative position, and additional means to actuate the shaker.

16. A press comprising a receptacle having end and side walls, one of the end walls being movable and one of the side walls having a beveled face inclining outwardly from the other end wall, means to actuate the movable end wall toward the other end wall, a shaker-frame adjacent said other end wall, and means to actuate the shaker-frame.

17. In a press, the combination with a receptacle having one of its walls movable, of a reciprocally-movable support, and a shaker-frame detachably mounted on the support to move therewith.

18. In a press, the combination with an upright receptacle having its upper and lower sides open, gates or closures for the openings, separate mechanisms for alternately opening and closing the gates, a feed, mechanism to operate the feed when the upper gate is open, to stop the feed mechanism when the upper gate is closed, a shaker, mechanism to actuate the shaker only when the lower gate is open, a compressor-head movable in the receptacle, and means to move said head to its operative position.

19. In a press, the combination with a receptacle having an inlet-opening and a gate therefor, means to open and close the gate, a feed mechanism, a prime mover, and connections whereby the feed is operated simultaneously and automatically with the opening of the gate and is similarly stopped with the closing of the gate, and means actuated by the prime mover for compressing the material when the gate is closed.

20. In a press, the combination with a receptacle having a discharge-opening, a gate for the opening, a shaker-frame, a prime mover, and connections whereby the gate is opened and closed and the shaker is simultaneously and automatically operated and stopped, and means actuated by the prime mover to compress the material in the receptacle when the gate is closed.

21. A press comprising a cylinder having a liquid-containing chamber, separate pistons at opposite ends of the chamber, means to actuate one of the pistons, a receptacle, a head actuated by the other piston and movable in the receptacle, means to return the

former piston automatically, and connections to simultaneously return the other piston and head.

22. A press comprising a receptacle, a head movable in the receptacle, a cylinder having a liquid-containing chamber, a conduit leading to and from the chamber between the pistons, a pressure-regulator in said conduit, a piston in the cylinder, means to move the piston against the liquid, a second piston actuated by the liquid, and operated to move the head to its operative position, means to return said pistons to their normal positions, and means to feed the material to the receptacle.

23. A press comprising a receptacle, a head movable in the receptacle, a cylinder having a liquid-containing chamber, a conduit leading to and from the chamber, a pressure-regulator in said conduit, a piston in the cylinder, means to move the piston against the liquid, a second piston actuated by the liquid, and operated to move the head to its operative position, means to return said pistons to their normal positions, means to feed the material to the receptacle and shaker-frames in the receptacle for the purpose set forth.

In witness whereof I have hereunto set my hand this 12th day of February, 1902.

KIRK S. BLANCHARD.

Witnesses:
H. E. CHASE,
MILDRED M. NOTT.