(No Model.)

14 Sheets—Sheet 1.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

No. 451,126. Patented Apr. 28, 1891.

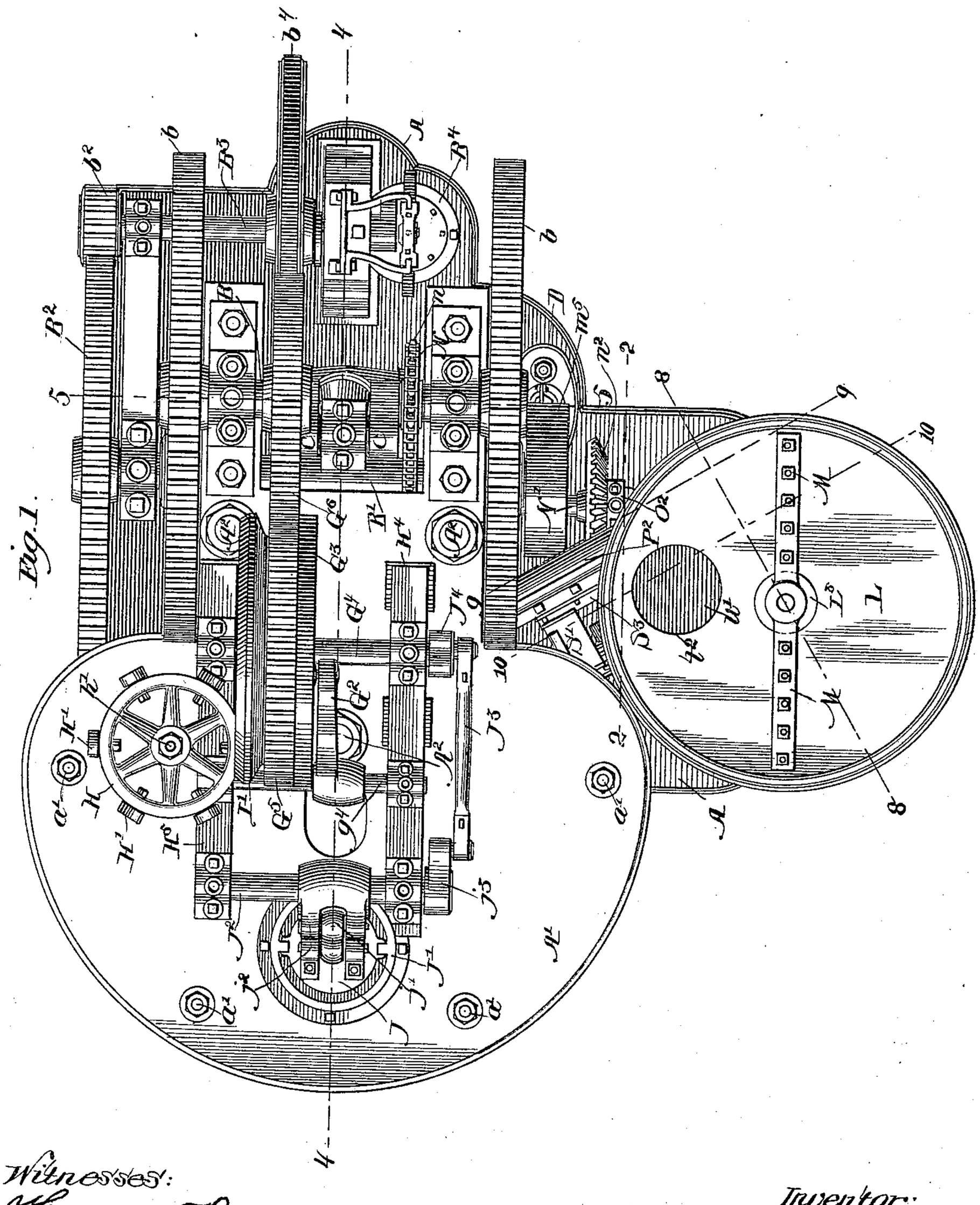

Fig. 1.

Witnesses:
Harry F. Jones.
Charles Shorey

Inventor:
Cornelius Kimplen

(No Model.)

14 Sheets—Sheet 2.

C. KIMPLEN.

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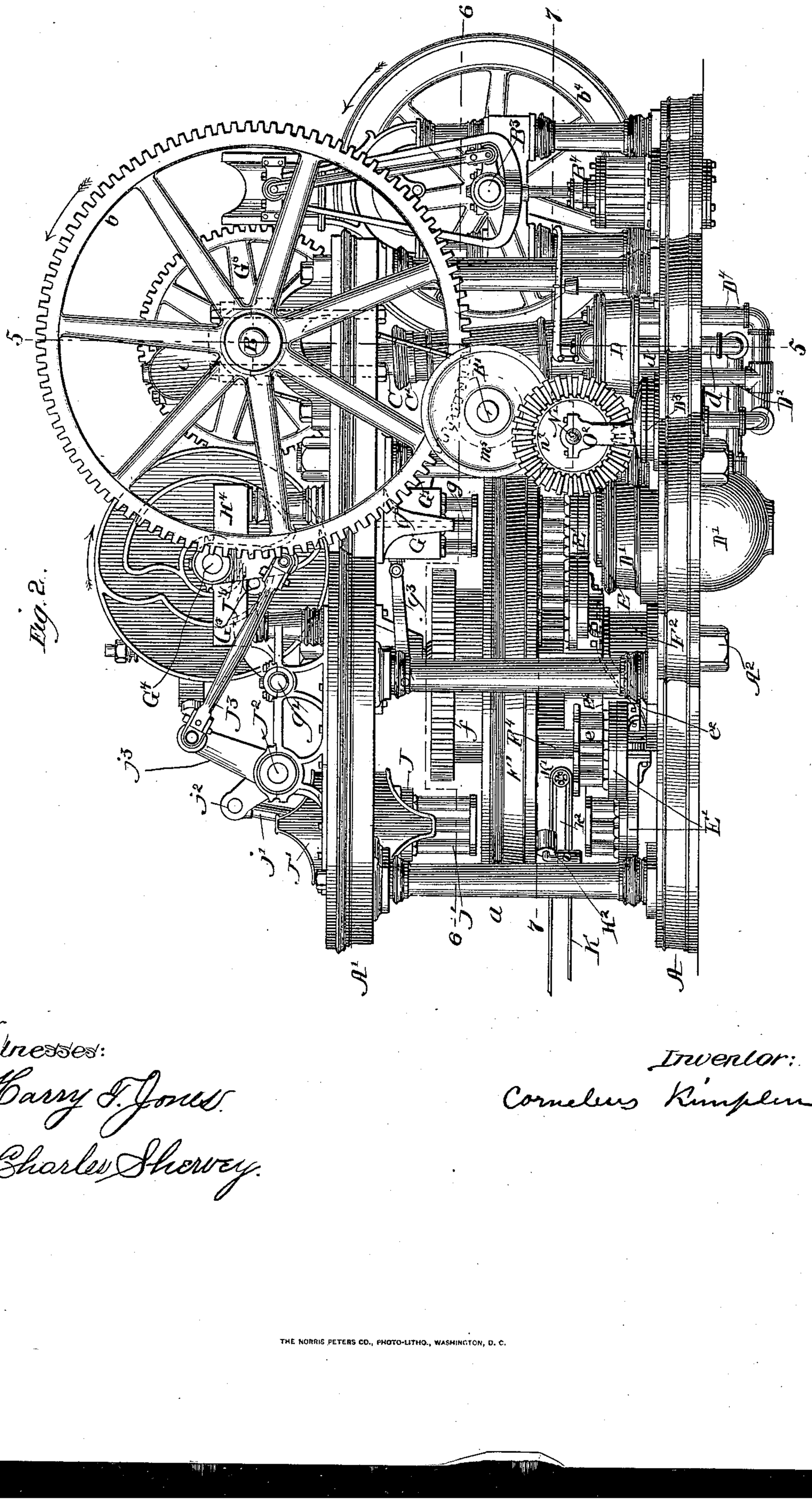

Fig. 2.

Witnesses:
Harry F. Jones.
Charles Shewey.

Inventor:
Cornelius Kimplen

(No Model.)

14 Sheets—Sheet 3.

C. KIMPLEN.

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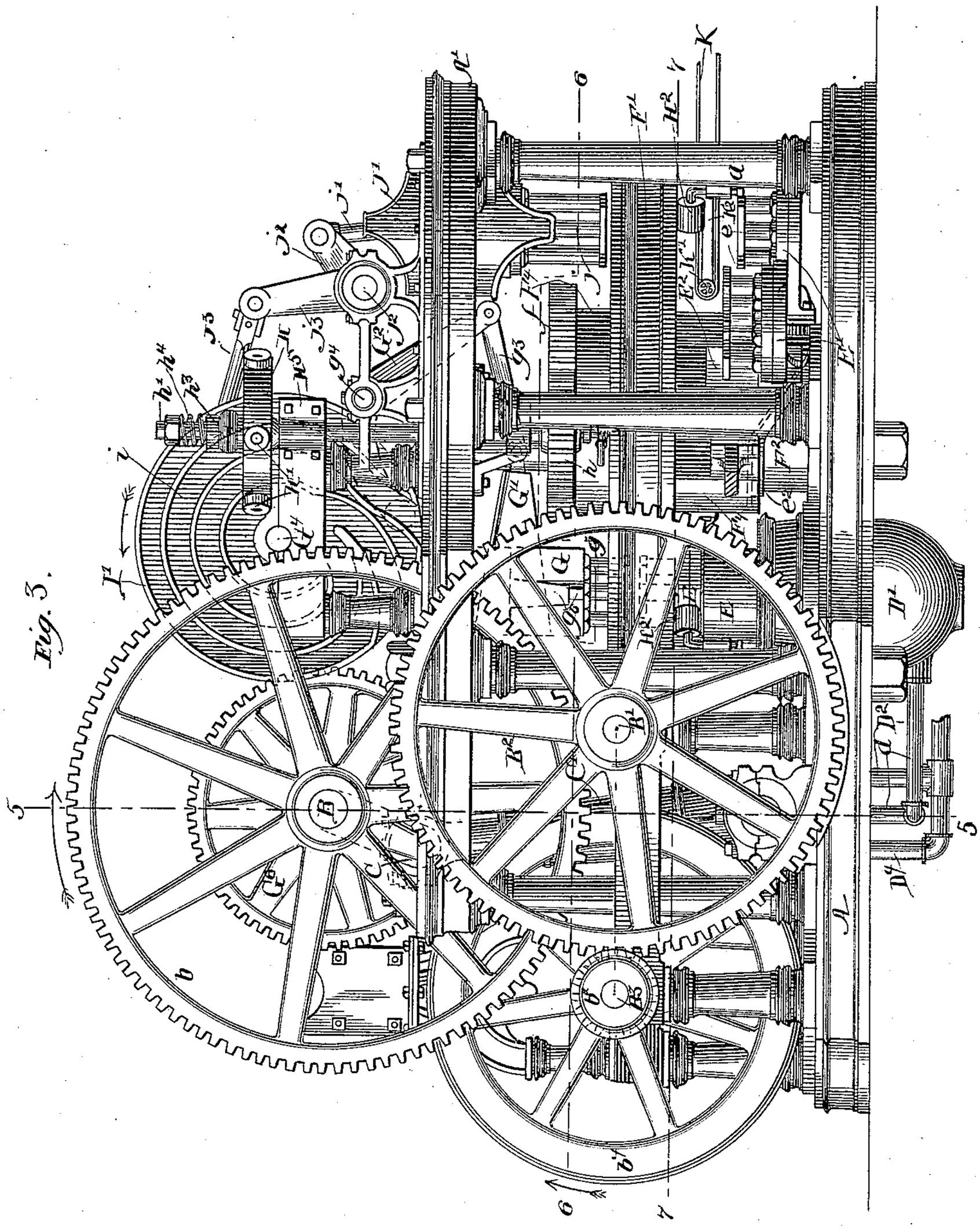

Fig. 3.

Witnesses:
Harry T. Jones.
Charles Sherry

Inventor:
Cornelius Kimplen

(No Model.)

14 Sheets—Sheet 4.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

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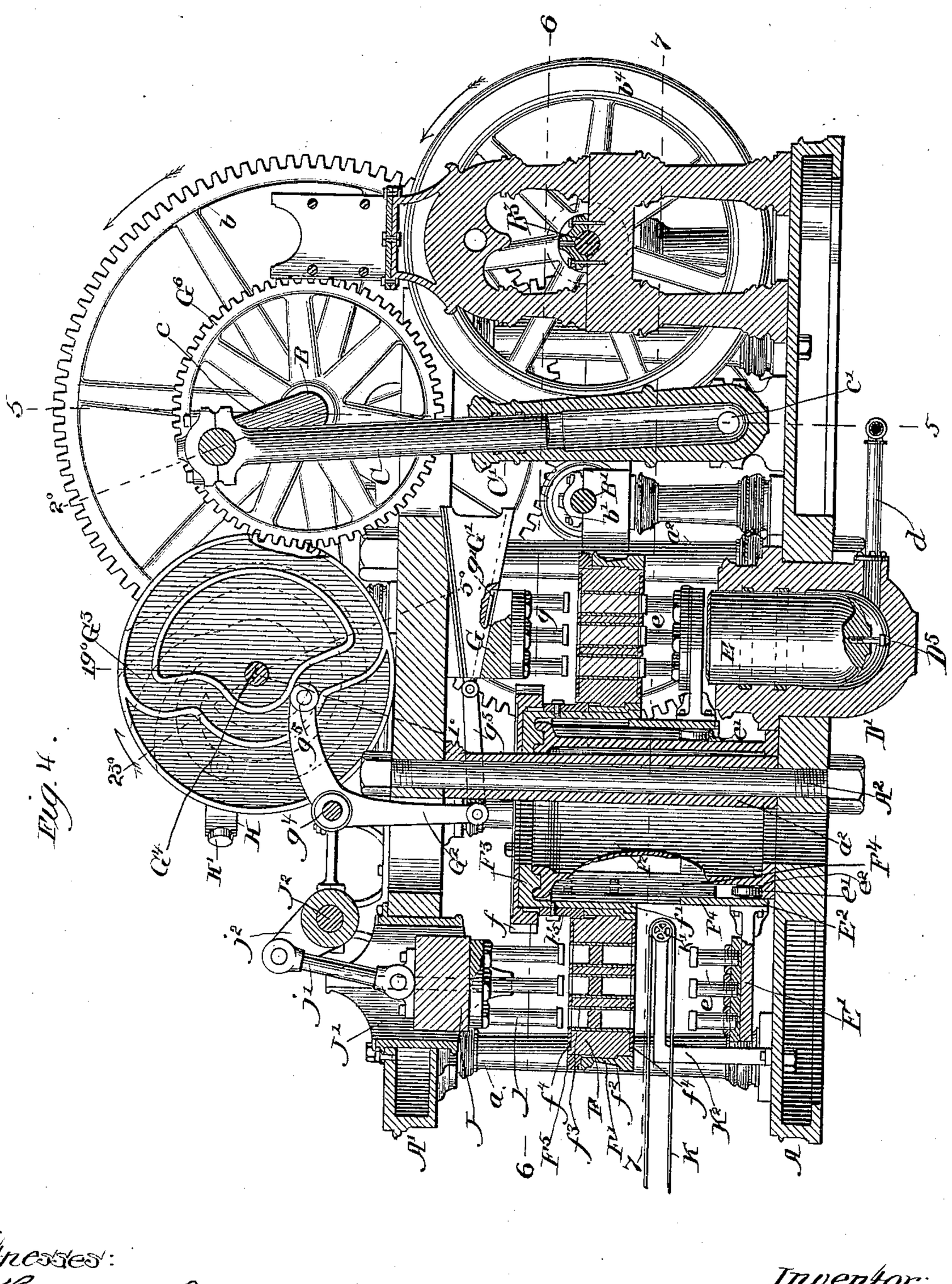

Fig. 4.

Witnesses:
Harry T. Jones.
Charles Sherry

Inventor:
Cornelius Kimplen

(No Model.) 14 Sheets—Sheet 5.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

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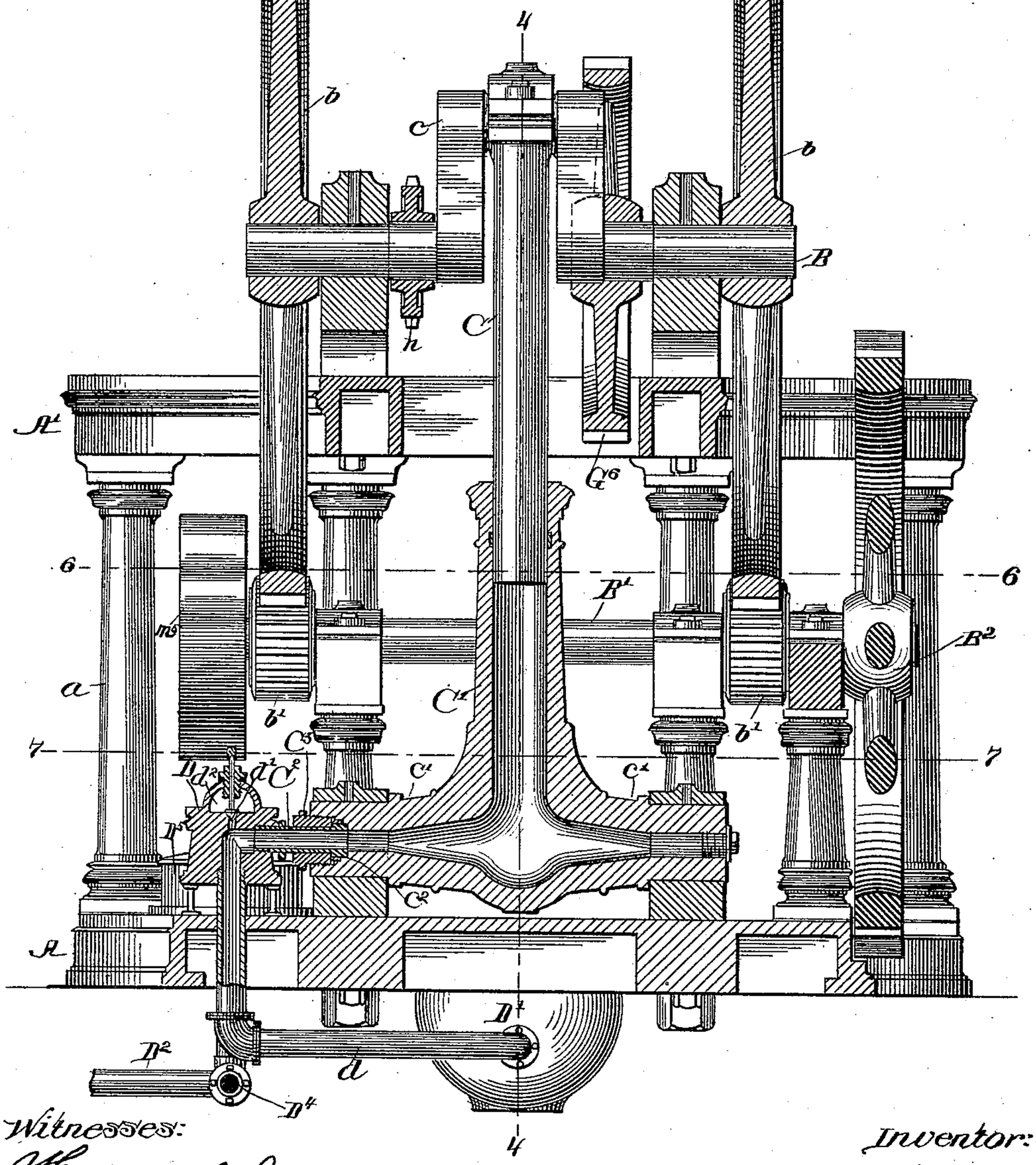
Fig. 5.



Witnesses:
Harry E. Jones.
Charles Sherry.

Inventor:
Cornelius Kimplen

(No Model.) 14 Sheets—Sheet 6.

C. KIMPLEN.

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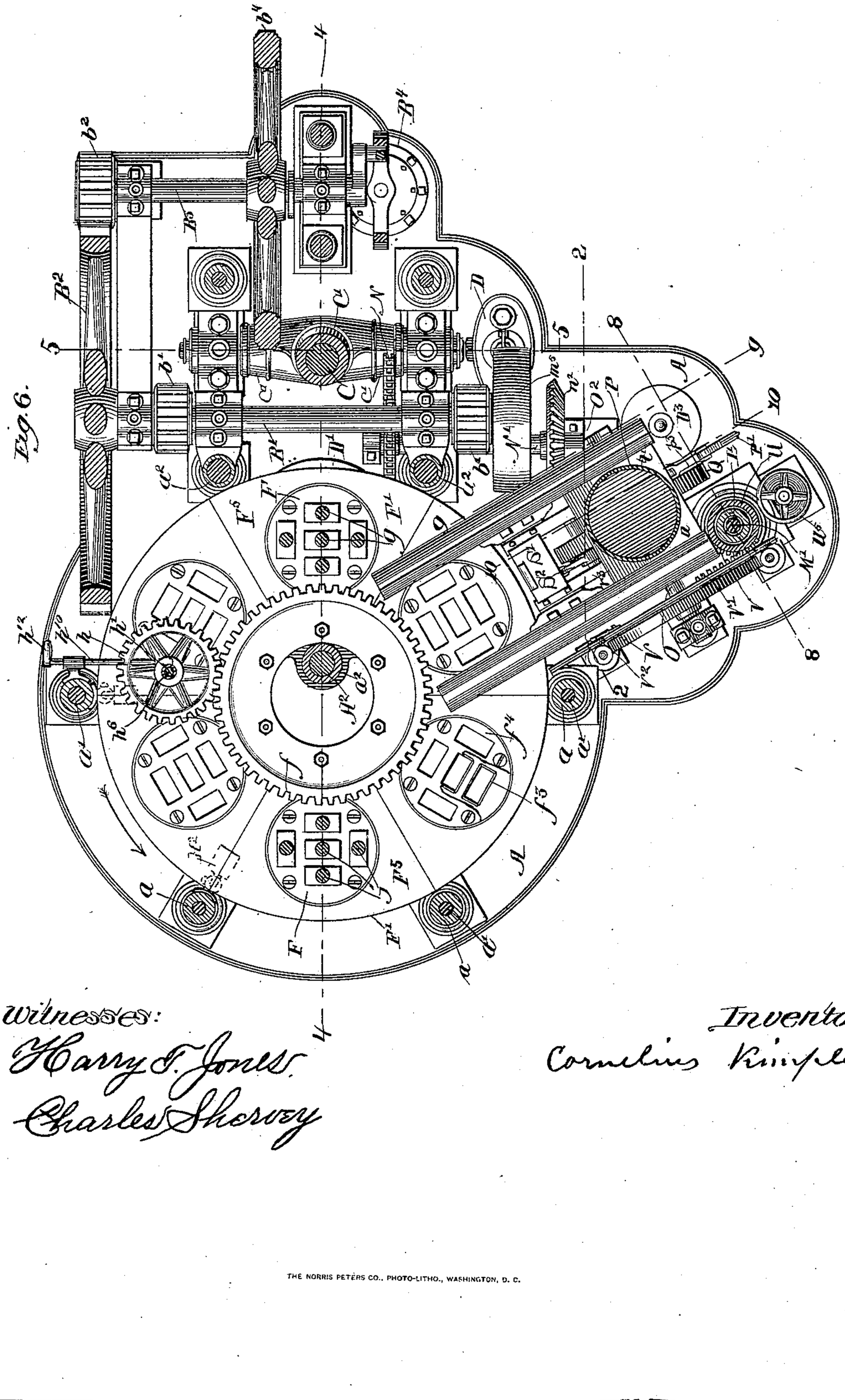
No. 451,126. Patented Apr. 28, 1891.

Fig. 6.



Witnesses:
Harry E. Jones.
Charles Shervey

Inventor:
Cornelius Kimplen

(No Model.)

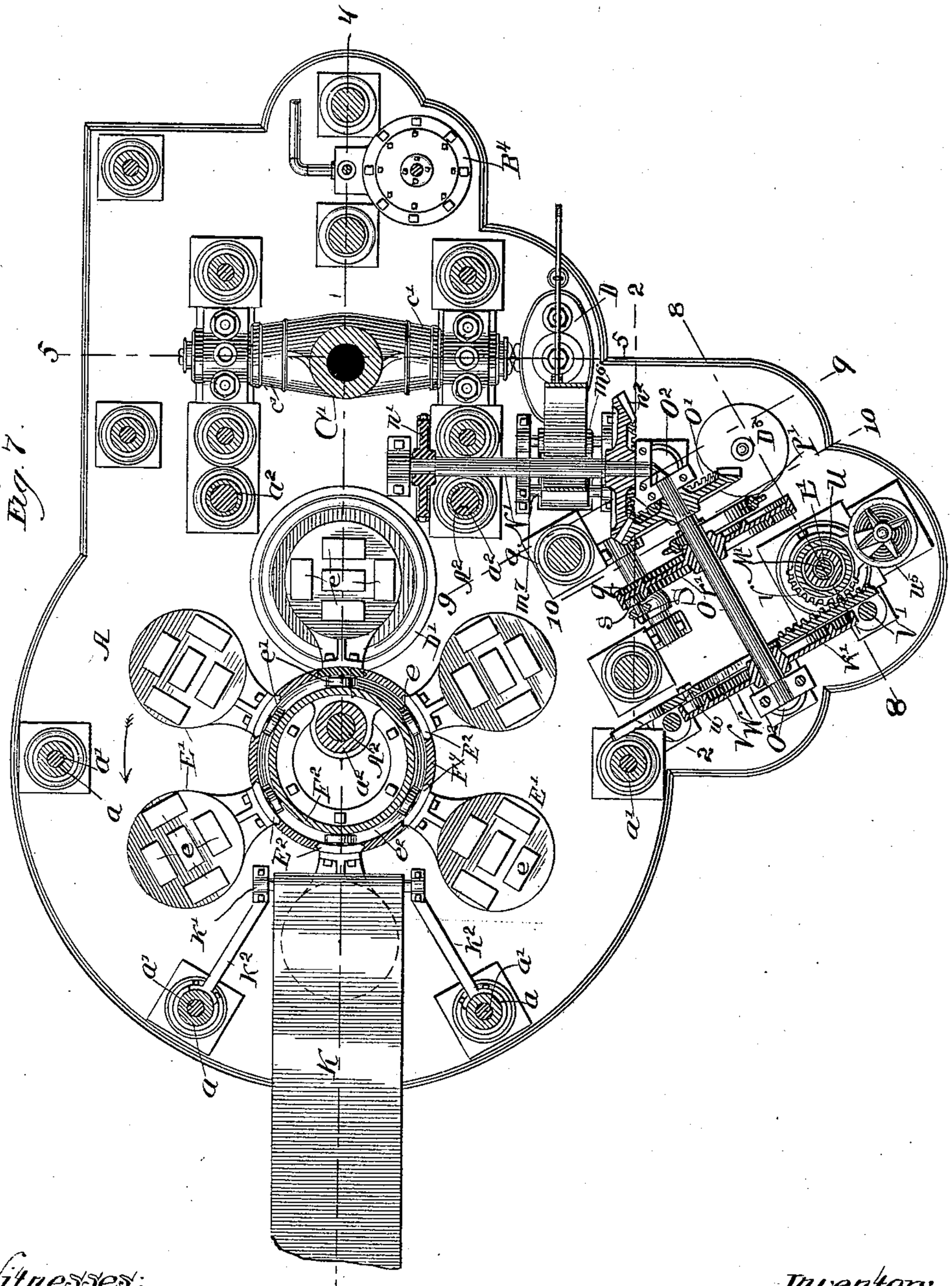
14 Sheets—Sheet 7.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

No. 451,126. Patented Apr. 28, 1891.

Fig. 7.



Witnesses:
Harry E. Jones
Charles Sherry

Inventor:
Cornelius Kimplen

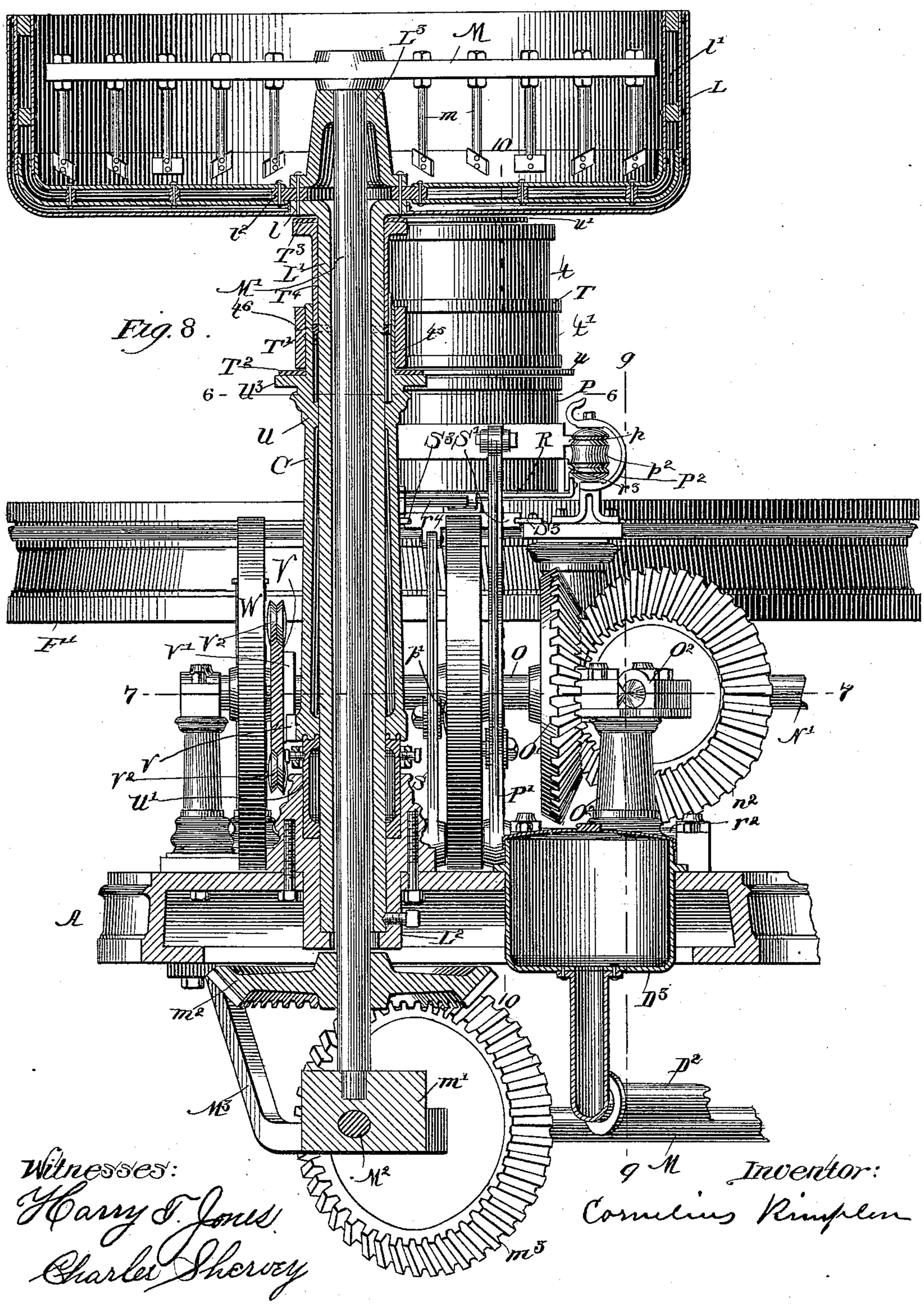
(No Model.) 14 Sheets—Sheet 8.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

No. 451,126. Patented Apr. 28, 1891.

Fig. 8.



Witnesses:
Harry T. Jones.
Charles Shervey

Inventor:
Cornelius Kimplen

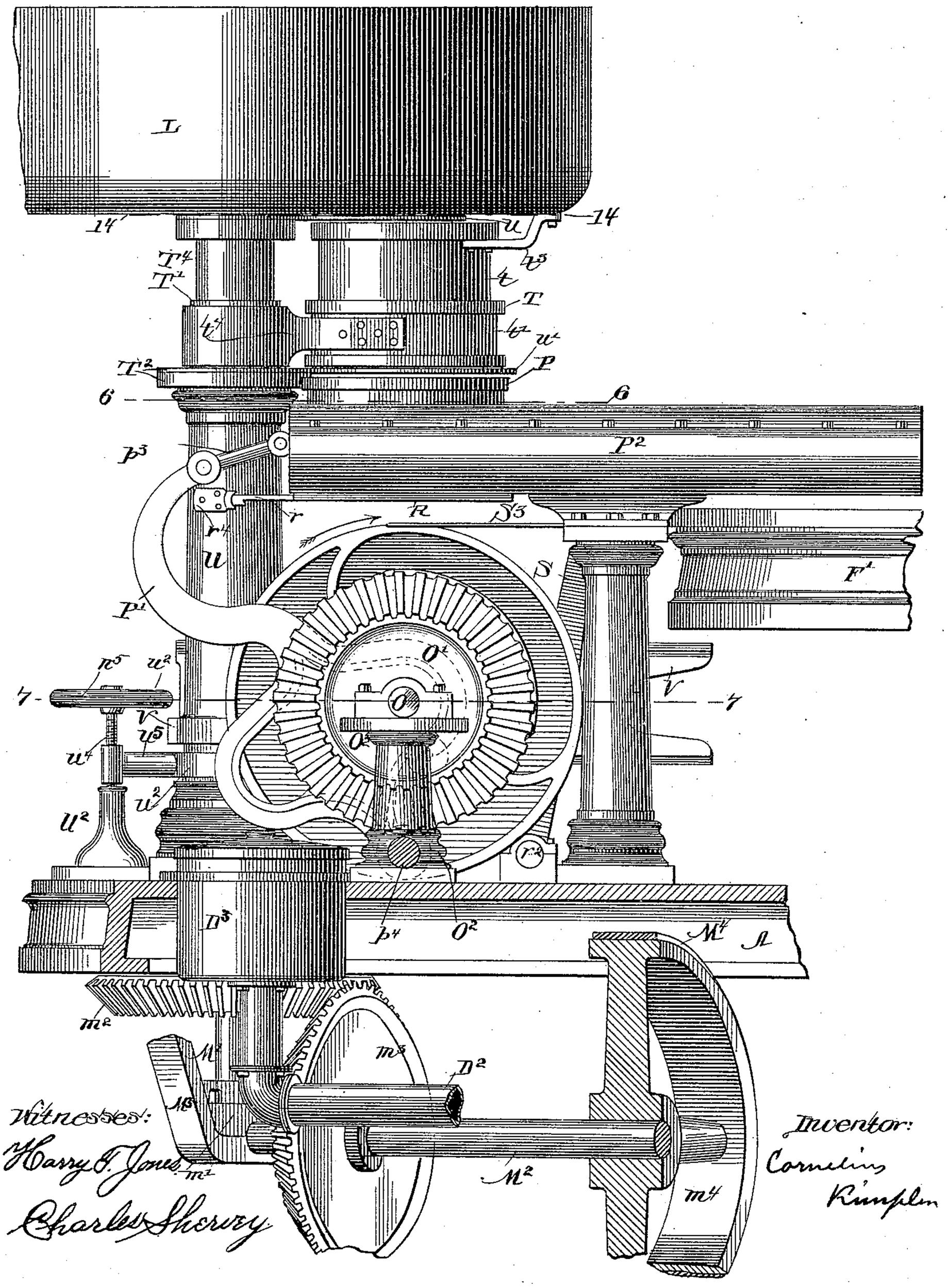
(No Model.) 14 Sheets—Sheet 9.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

No. 451,126. Patented Apr. 28, 1891.

Fig. 9.



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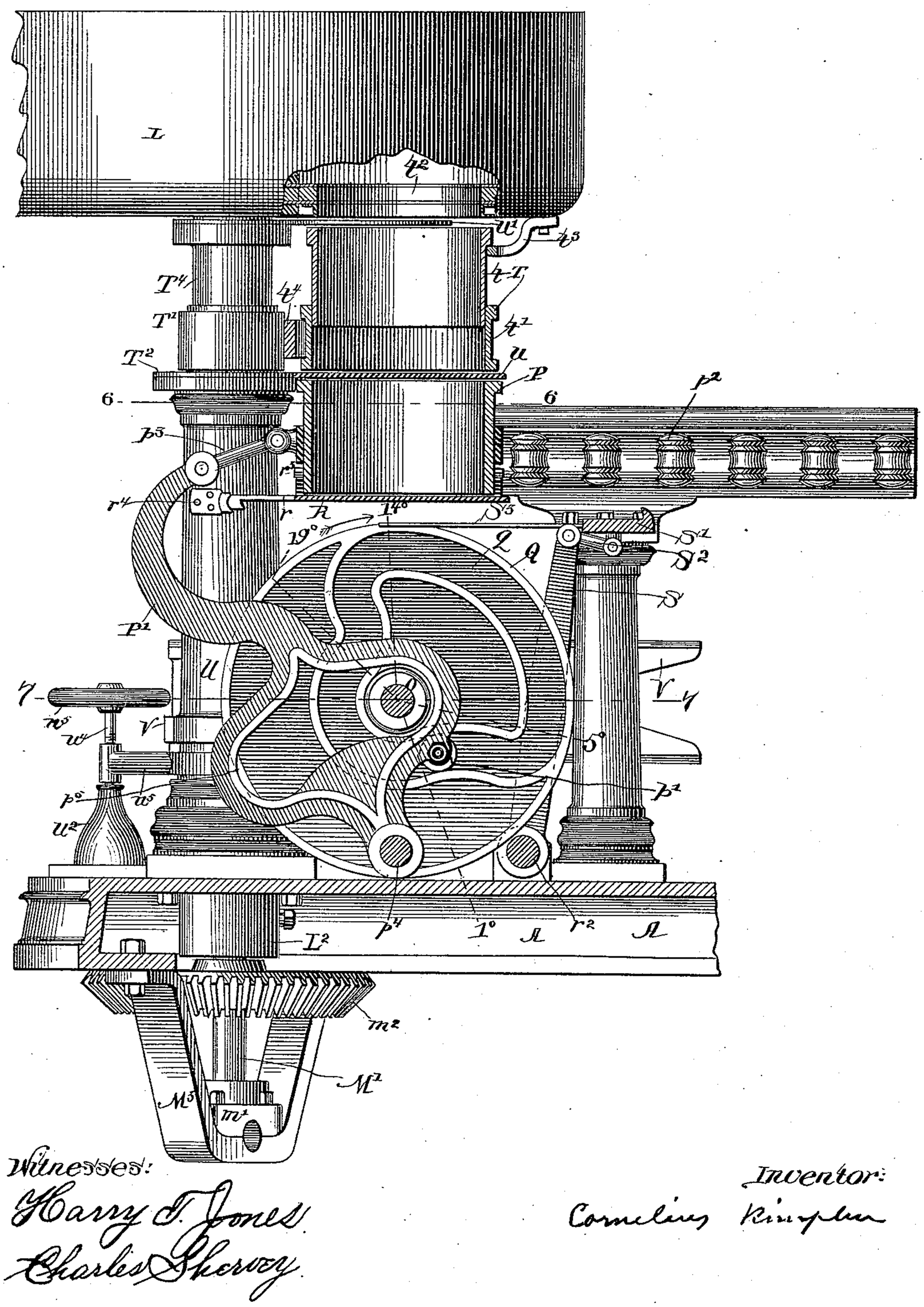
HYDRAULIC BRICK MACHINE.

No. 451,126. Patented Apr. 28, 1891.

Fig. 10.



Witnesses:
Harry T. Jones
Charles Sherry.

Inventor:
Cornelius Kimplen

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C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

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Fig 11.

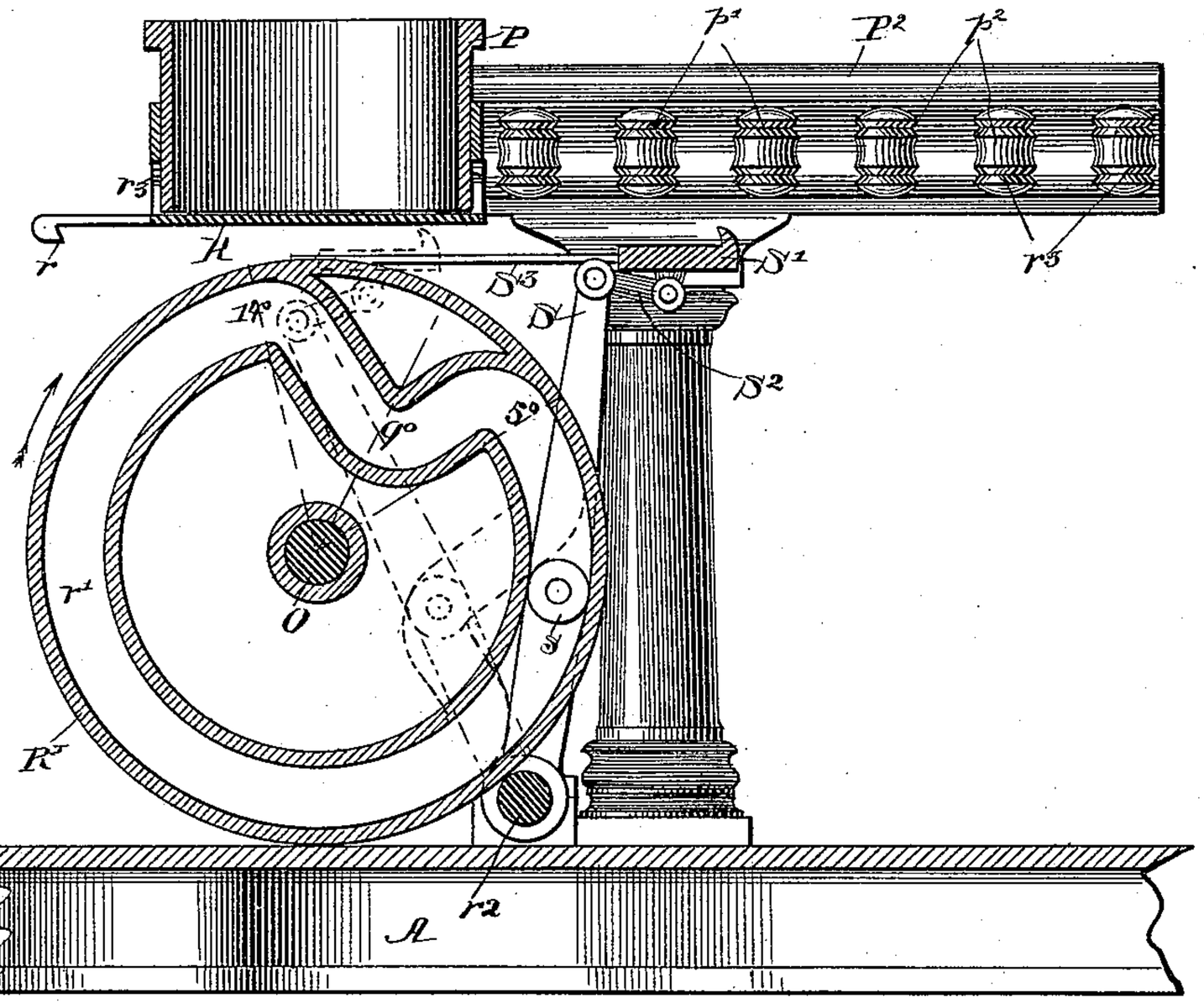
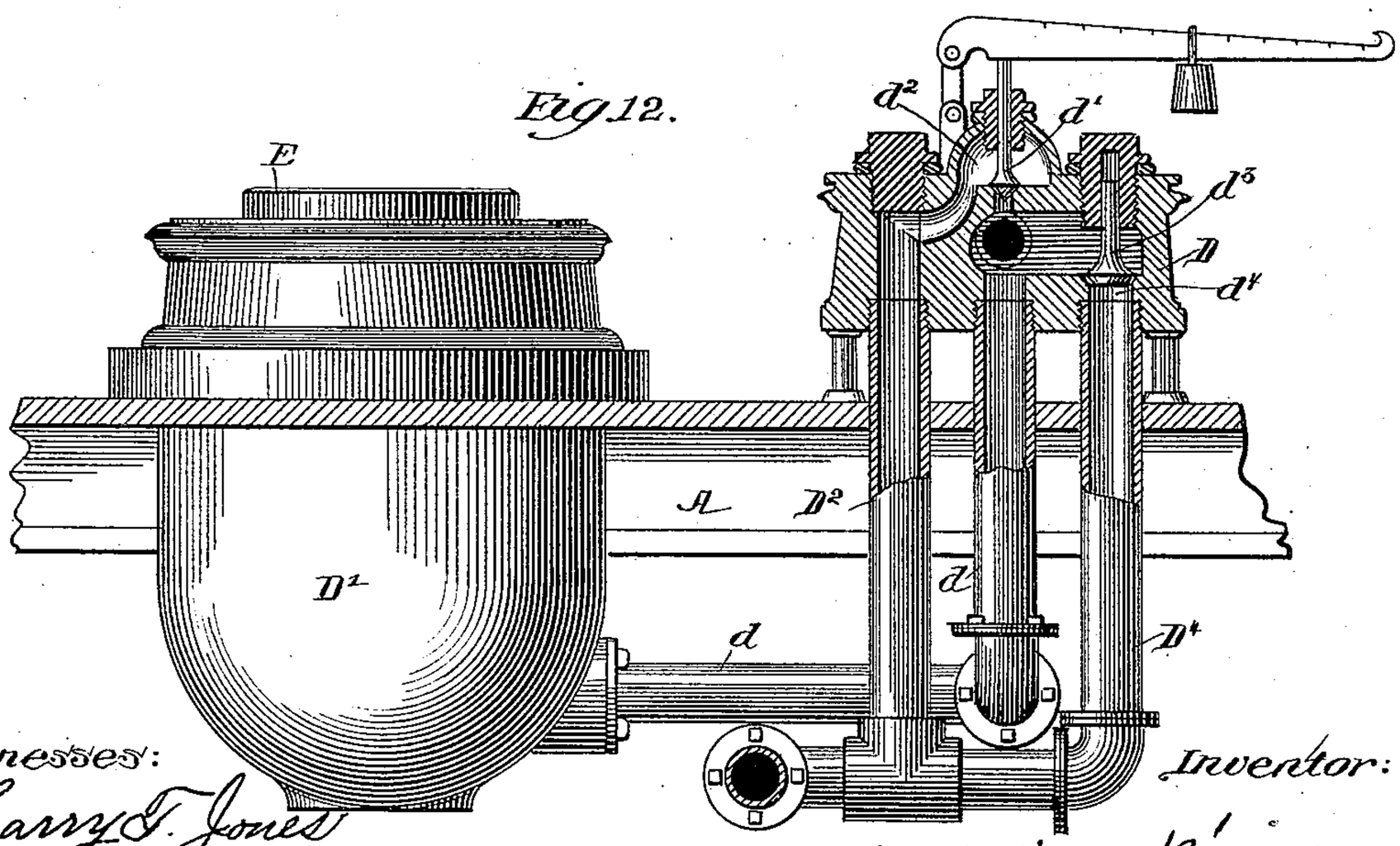


Fig 12.



Witnesses:
Harry F. Jones
Charles Shervey

Inventor:
Cornelius Kimplen

(No Model.) 14 Sheets—Sheet 12.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

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Fig. 13.

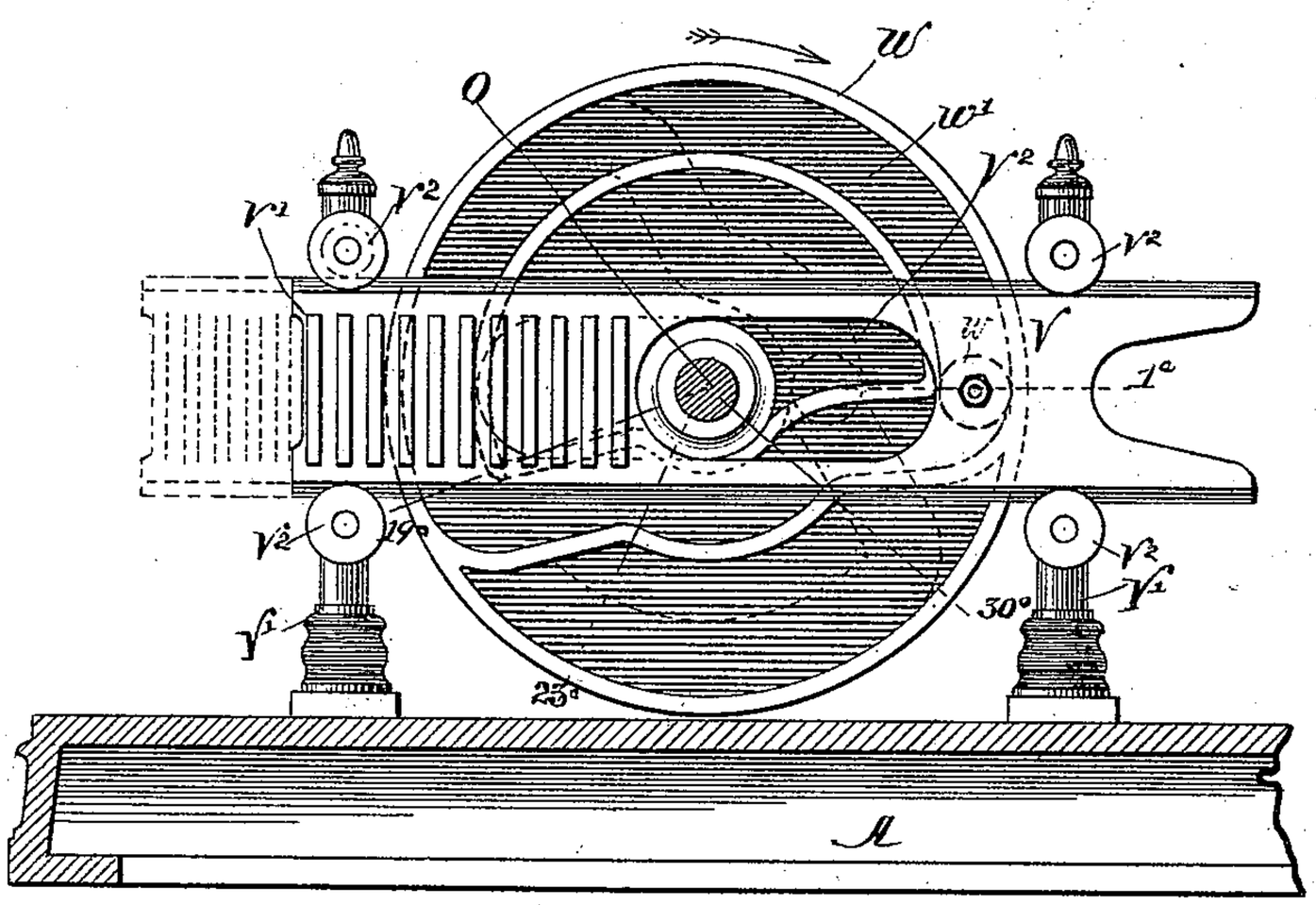
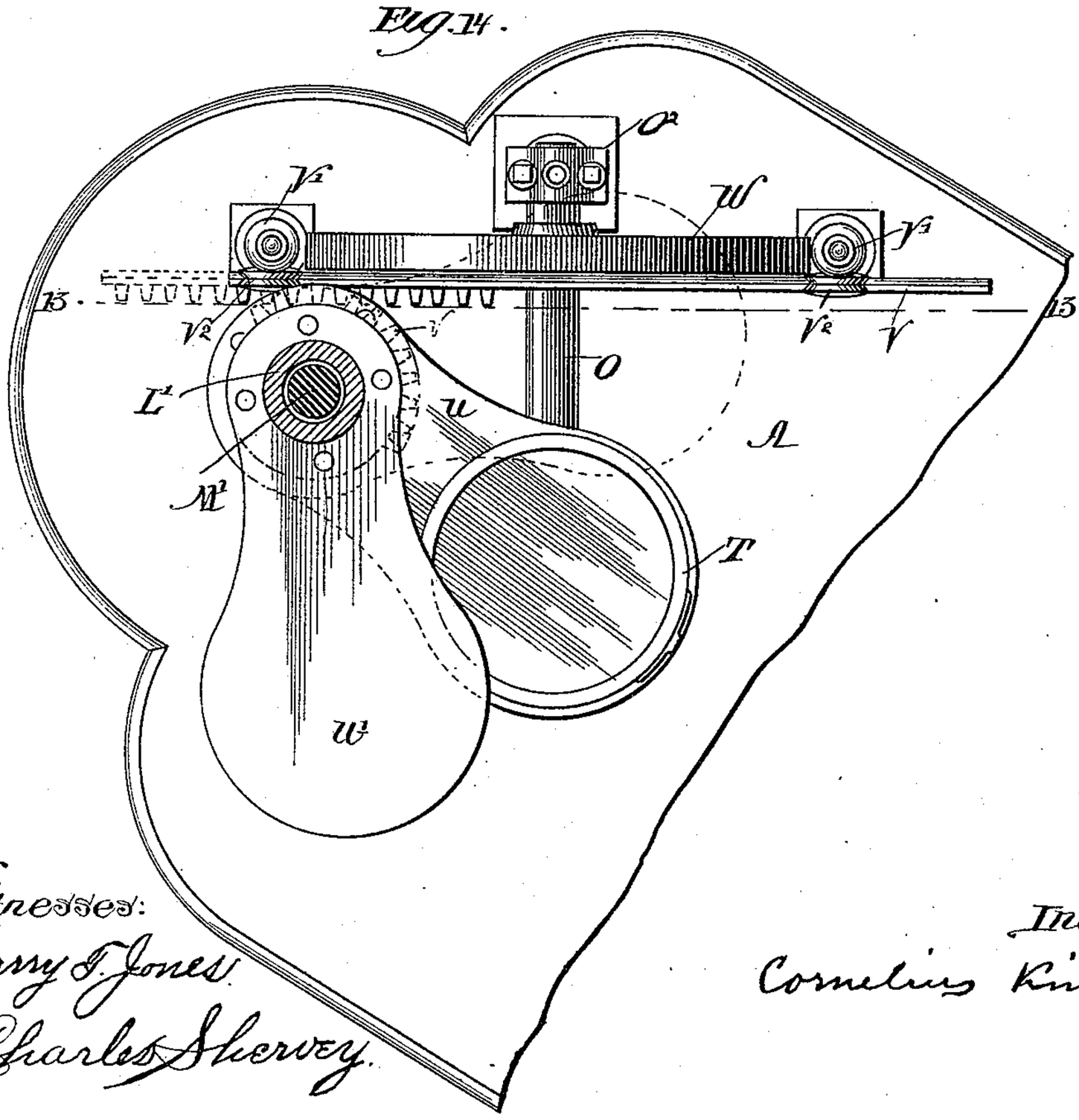


Fig. 14.



Witnesses:
Harry T. Jones.
Charles Shervey.

Inventor:
Cornelius Kimplen

(No Model.) 14 Sheets—Sheet 13.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

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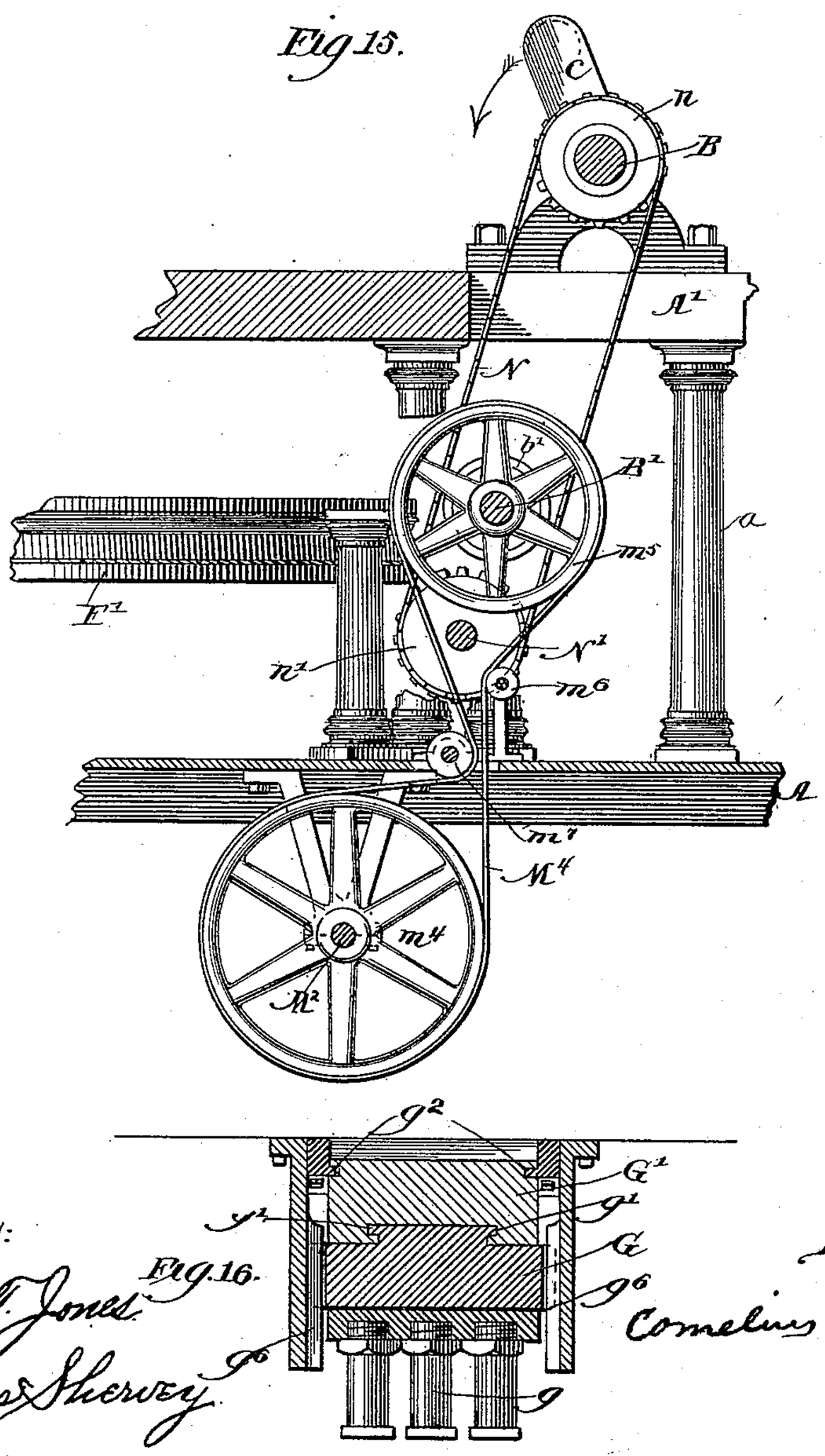
Fig 15.



Witnesses:
Harry E. Jones
Charles Sherwey

Fig. 16.

Inventor:
Cornelius Kimplen

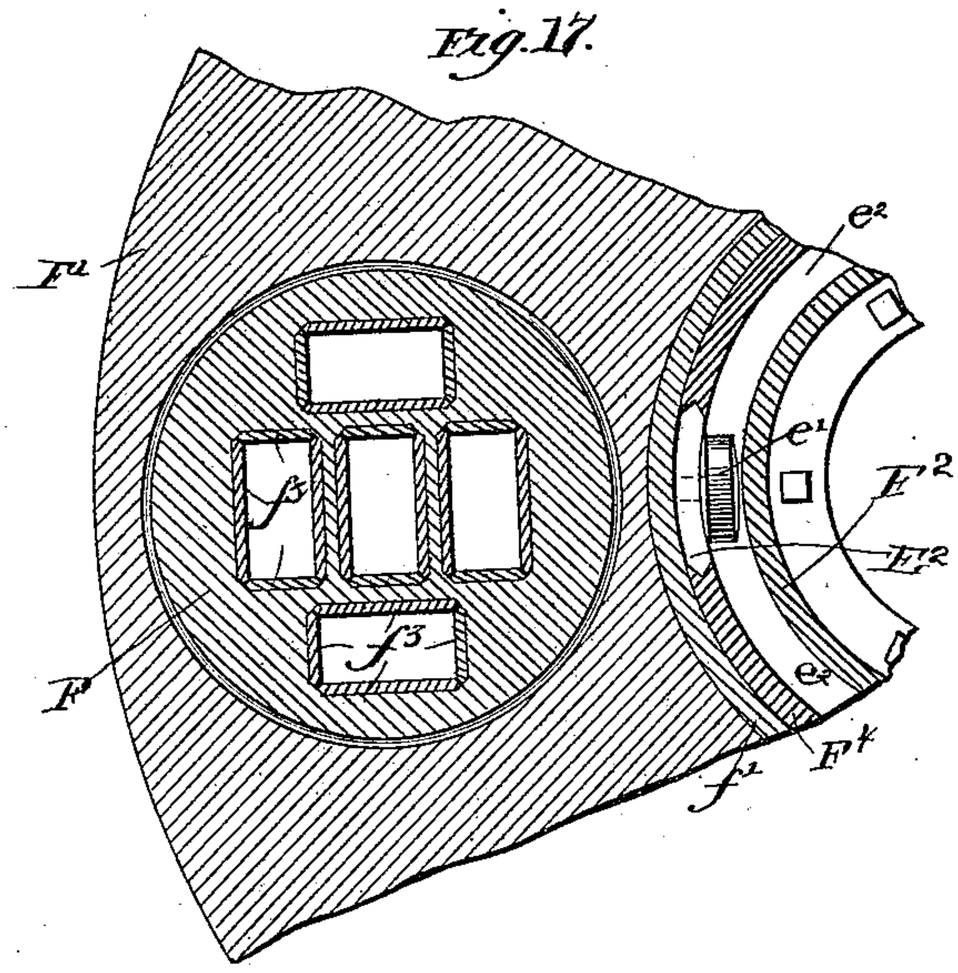
(No Model.) 14 Sheets—Sheet 14.

C. KIMPLEN.

HYDRAULIC BRICK MACHINE.

No. 451,126. Patented Apr. 28, 1891.

Fig. 17.



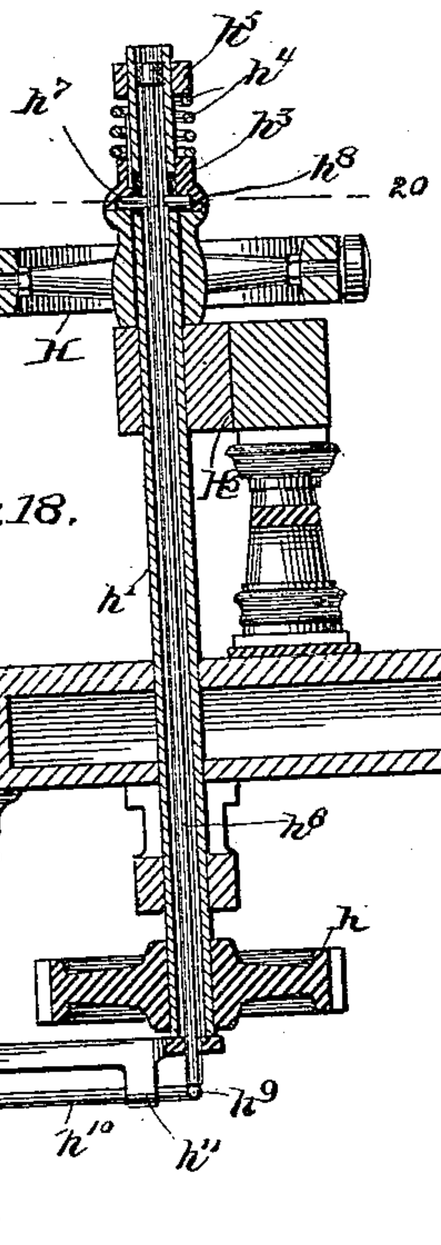


Fig. 18.

Fig. 19.

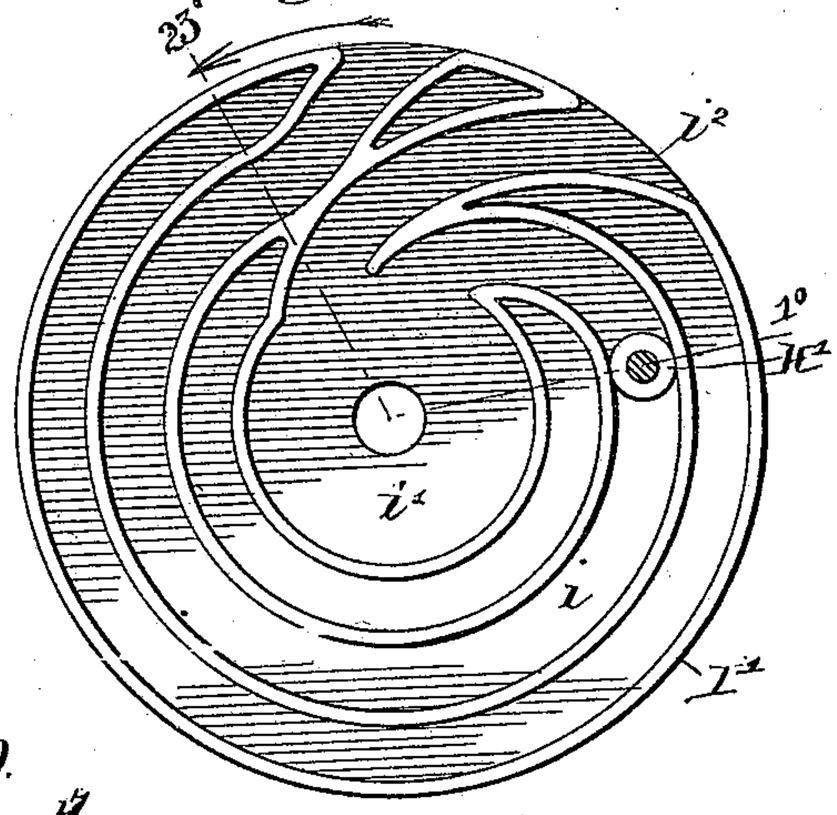


Fig. 20.

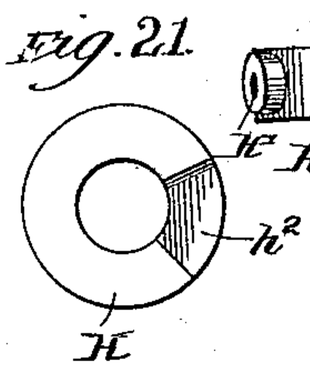


Fig. 21.

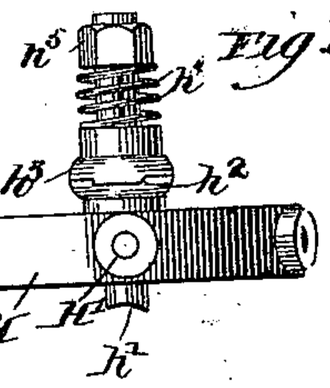


Fig. 22.

Witnesses:
Harry S. Jones.
Charles Shervey.

Inventor:
Cornelius Kimplen

UNITED STATES PATENT OFFICE.

CORNELIUS KIMPLEN, OF CHICAGO, ILLINOIS.

HYDRAULIC BRICK-MACHINE.

SPECIFICATION forming part of Letters Patent No. 451,126, dated April 28, 1891.

Application filed July 5, 1890. Serial No. 357,900. (No model.)

To all whom it may concern:

Be it known that I, CORNELIUS KIMPLEN, residing in the city of Chicago, county of Cook, State of Illinois, and a citizen of the United States, have invented certain new and useful Improvements in Hydraulic Machines, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a top or plan view. Fig. 2 is a front elevation, the feed mechanism being removed, on line 2 2 of Figs. 1, 6, and 7. Fig. 3 is a rear elevation. Fig. 4 is a longitudinal vertical section on line 4 4 of Figs. 1, 5, 6, and 7. Fig. 5 is a cross vertical section on line 5 5 of Figs. 1, 2, 3, 4, 6, and 7. Fig. 6 is a horizontal section on line 6 6 of Figs. 2, 3, 4, 5, 8, 9, and 10. Fig. 7 is a horizontal section on line 7 7 of Figs. 2, 3, 4, 5, 8, 9, and 10. Fig. 8 is an enlarged vertical section through the feed mechanism on line 8 8 of Figs. 1, 6, and 7. Fig. 9 is an enlarged vertical section, most parts being shown in elevation on line 9 9 of Figs. 1, 6, 7, and 8, through the feed mechanism. Fig. 10 is an enlarged vertical section, some parts being in elevation on line 10 10 of Figs. 1, 6, 7, and 8. Fig. 11 is an enlarged detail showing the cam for withdrawing the bottom of the feed-box. Fig. 12 is an enlarged detail showing the safety-valve, the valve being in section. Fig. 13 is an enlarged detail, being a vertical section on line 13 13 of Fig. 14. Fig. 14 is an enlarged horizontal section on line 14 14 of Fig. 9, some parts being omitted to avoid confusion. Fig. 15 is a detailed view showing the gearing for communicating motion from the main shaft to the driving-shaft of the feed mechanism and the belt-gearing for driving the mixer. Fig. 16 is an enlarged detail, being a section through the resistance-block. Fig. 17 is an enlarged detail, being a horizontal section through a mold-block and a portion of the turn-table. Fig. 18 is a detail, being a vertical section through the safety device and the devices for throwing the turn-table gearing out of gear. Fig. 19 is a side elevation of the cam-wheel which drives the turn-table. Fig. 20 is an enlarged detail, being a section on line 20 20 of Fig. 18. Fig. 21 is an enlarged detail, being an end view of a wheel H; and Fig. 22 is a detail, being a side elevation of a portion of the safety device.

The object of my invention is to construct a new and improved hydraulic machine. The machine may be used for making bricks, paving-blocks, coal-blocks, tile, and other similar pressed manufactures.

The nature of my invention consists in the improved mechanisms forming my machine, as illustrated in the drawings and as hereinafter specified. Those things which I claim as new and as my invention will be pointed out in the claims.

In a machine which I have designed I have for convenience in timing the parts divided the circle representing a complete rotation of the main shaft into thirty-two equal parts. While the main shaft in the machine which I have designed is making one complete rotation the operating parts each make a single complete operation.

To enable others to readily understand the timing of the movements of the several parts, I will take the point which the crank in the main shaft will occupy at the completion of one rotation and the commencement of the new rotation as the starting-point. This point is the upper dead-center of the crank, and in the drawings is indicated as 32°. Wherever I have hereinafter indicated the position or time of movement of a part by degrees, the degrees refer to the thirty-two degrees, in which I have divided the circle of rotation, starting from the point above mentioned, and indicate the position in relation to the cranks in the main shaft.

In all of the views except Fig. 3 I have shown the parts in the position which they will occupy when the crank in the main shaft has turned two degrees from the dead-center 32°, and in all of the views of cams I have marked the different periods of movement by degrees. In Fig. 3 the crank in the main shaft and the operating parts are shown as having moved through eighteen degrees, or one-half of a rotation from the position shown in the other figures.

Similar letters and figures refer to similar parts throughout the several views.

The base-plate A is made in suitable form to support the operative parts of the machine,

and is provided with various features, hereinafter pointed out in connection with the various operating parts. The form and other features may be varied to suit the various requirements of the machine.

The upper plate A′ is supported from the base-plate A by columns *a*, as shown in the several figures, and is firmly secured upon these columns *a* by strain-bars *a′*. The size, number, position, and arrangement of the columns *a* may be varied to suit the arrangement of the operative parts and the strength required, the arrangement shown being the best known to me. The form and size of the upper plate A′ must be such as to support the operative parts, which are secured thereon, and to withstand the pressure, as hereinafter set forth; but these features may be varied according to the requirements of the machine.

The main driving-shaft B is supported in suitable bearings upon the upper plate A′, as best shown in Figs. 1 and 5. Upon this shaft B are secured two driving-wheels *b*, as best shown in Figs. 1 and 5. Each driving-wheel *b* is driven by a pinion *b′*, secured upon a shaft B′, as best shown in Fig. 5. Upon the shaft B′ is secured a gear-wheel B^2, which is driven by a pinion b^2, as best shown in Figs. 1, 3, and 6. The pinion b^2 is secured upon a shaft B^3. This shaft is provided with a fly-wheel b^4 and is driven by an engine B^4. The shafts B′ and B^3 are mounted in suitable bearings supported from the base-plate A, and the engine B^4 is also mounted upon the base-plate A.

The gearing above described for driving the shaft B from the engine B^4 is well adapted and arranged for driving the shaft at the required speed with the required power; but it is evident that the shaft B may be driven by any suitable power-transmitter separate from the remainder of the machine. I do not limit my invention to the gearing shown for driving the shaft B. When a belt is used a band-wheel may be mounted on the shaft B^3 in place of a crank for the engine B^4.

The shaft B is provided with a crank *c*, to which is connected the upper end of a plunger C. The plunger C works in a cylinder C′, as best shown in Figs. 4 and 5. The cylinder C′ is provided with trunnions *c′*, which are mounted in suitable bearings secured upon the base-plate A, so that the cylinder C′ can oscillate with the plunger C. The trunnions *c′* of the cylinder C′ are hollow, as shown in Fig. 5, and the end of one of the trunnions is closed by a plug, while to the opposite trunnion is attached a pipe C^2. The pipe C^2 is provided with a head c^2, and the end of the trunnion is countersunk to receive the head c^2 and a packing-ring. The head c^2 is secured in the countersink by a screw-threaded follower C^3, which firmly holds the pipe C^2 in position, while permitting the trunnion to turn.

The outer end of the pipe C^2 enters a valve-chest D, as shown in Fig. 5. This valve-chest is connected with the large hydraulic cylinder D′ by a pipe *d*, as best shown in Figs. 5 and 12. The cylinder D′ is the large hydraulic cylinder hereinafter referred to.

The valve-chest D is provided with a safety-valve *d′*, as shown in Fig. 12, which is held onto its seat by a weight, as shown; but a spring-valve may be employed, if desired. Above the valve *d′* is a chamber d^2, which receives the overflow from the pipe C^2 when the valve *d′* is lifted. A pipe D^2 leads from the chamber d^2 to a tank D^3. (See Fig. 8.) The valve-chest D is provided with a check-valve d^3, and a pipe D^4 connects the port d^4 of the check-valve d^3 with the tank D^3. As shown, the pipe D^4 is connected to the pipe D^2 by a T-coupling communicating with the tank D^3; but it is evident that it may be connected directly to the tank D^3. The arrangement shown is the best arrangement for various reasons.

A ram E, as shown in Fig. 4, is located in the cylinder D′, which is firmly supported upon the base-plate A. In a machine which I have designed the area of the ram E is about six times the area of the plunger C, so that the ram E will move about one-sixth the length of a stroke of the plunger C and at about one-sixth of its speed. The ram E moves about six inches and the plunger C moves about thirty-six inches, the crank *c* being about eighteen inches in length. These proportions may be varied to suit the requirements of different-sized machines and to suit different powers which it may be necessary to employ.

Each rotation of the shaft B forces the plunger C down into the cylinder C′ and withdraws it in position for another stroke. When the plunger C descends, the liquid in the cylinder C′ will be forced through the pipe *d* into the cylinder D′, raising the ram E. The motion given to the plunger from the time the crank leaves the dead-center 32° until it reaches about 2° is very slight, while from 2° down to about 14° it is quite rapid, so that the ram E will be lifted first slowly and then with comparative rapidity until near the end of its movement. From about 14° to about 16° (which is the lower dead-center) the downward movement of the plunger is slight and the power of the crank is very great. It is at this point that the heavy pressure is needed on the ram E, and the advantage which the crank gains at this point, together with the momentum of the driving-gearing, will carry the crank by the dead-center with great force. The advantage of this will appear hereinafter, where the operation of the ram is specifically set forth.

The safety-valve *d′* is weighted to withstand a desired pressure. When the ram E meets with an unusual amount of resistance, the cylinders C′ and D′ will be relieved of the excessive pressure caused by such resistance by the liquid passing into the chamber d^2 through the pipe D^2 to the tank D^3. It will

be understood that the pipe D^2 and chamber d^2 are entirely filled with the liquid, while the tank D^3 is partially filled. The escape of the liquid through the safety-valve d' will relieve the cylinders of the excessive pressure above the amount to which the valve d is weighted, so that the crank c will pass the lower dead-center.

When the plunger C begins to rise, it rises slowly at first, then comparatively rapid. The rising of the plunger C will draw the liquid from the cylinder D′ into the cylinder C′, the weight of the ram E causing the liquid to flow rapidly. When the ram E has reached its lower limit, enough liquid will be drawn through the check-valve d^3 from the pipe D^4 and tank D^3 to fill the cylinder C′. The check-valve d^3 will prevent the passage of any liquid through the port d^4 when the plunger C is descending.

A set-bolt D^5 is screwed into the lower end of the ram E, so that it will engage with the bottom of the cylinder D′ and limit the descent of the ram E. This bolt D^5 may be set so that it will stop the descent of the ram at the point necessary to cause it to be lifted to the proper point in operation, as hereinafter set forth. By properly adjusting the weight on the valve d' the excessive pressure may be relieved while the crank c is passing through a few degrees near its lower dead-center, thereby holding the ram E up under the predetermined pressure while the crank is passing through these degrees, as hereinafter explained.

The mold-blocks F are mounted in a turn-table F′, as best shown in Figs. 4 and 6. As shown, I have provided the turn-table F′ with six mold-blocks, and I have therefore designed the parts which operate with the turn-table to operate correspondingly; but it is evident that the number of mold-blocks F may be varied and the parts operating therewith varied accordingly.

The turn-table F′ is supported from a cylindrical column F^2, as best shown in Fig. 4 and hereinafter set forth. This column F^2 is provided with an annular oil-groove at its top adapted to receive an annular guiding-ring on the under side of an annular supporting-plate F^3. A spur-gear f is secured upon the plate F^3, as shown in Figs. 4 and 6, by which the supporting-plate and turn-table are turned, as hereinafter described.

As shown in Fig 4, the turn-table F′ is secured to a flange f', depending from the plate F^3. A cap-plate F^5, made in sections, is secured upon the flange f' above the turn-table F′ and holds the mold-blocks F in the turn-table. Each mold-block F, as shown, contains five molds, as it is designed for pressing five bricks or blocks at one time; but the number of molds in each block may be varied as desired. Each mold-block is provided with a shoulder f^2, which rests upon a ledge in the turn-table F′, and each mold-block can be lifted vertically in the turn-table for purposes hereinafter set forth.

As best shown in Fig. 17, each mold is lined by hard-metal plates f^3, which are double-mitered at their edges, so that they can be reversed when one side is worn. The corners of the openings in the blocks F, which receive the plates f^3, are left full to the extent of the double miter. This avoids sharp angles in the block F and strengthens the block F at its weakest point. They are held in place, as shown in Figs. 4 and 6, by plates f^4, one above and one below, secured to the mold-block F. The use of these securing-plates enables the plates f^3 to be secured in place without the use of screws or rivets, which would injure the wearing capacity of the plates f^3.

Below the turn-table F′ is a series of plunger-blocks E′. There are as many plunger-blocks E′ as there are mold-blocks F. Each plunger-block E′ is provided with plungers e, arranged to enter the molds in the mold-block F. The under side of each plunger-block E′ is adapted to be engaged by the ram E when brought into proper position, as shown in Figs. 4 and 7. The inner end of each block is secured to a vertically-sliding guide-block E^2, as shown in Figs. 4 and 7. Each guide-block E^2 has its vertical edges formed as guides, as shown in Fig. 17, adapted to enter grooves in a shell F^4, depending from the flange f', as shown in Fig. 4. This shell F^4 rotates with the turn-table F′, carrying with it the plunger-blocks E′, and the guide-blocks E^2 of the plunger-blocks E′ can slide vertically in the shell F^4. Each guide-block E^2 is provided with an anti-friction roller or wheel e', which runs upon a track e^2, secured to or formed with the column F^2. This track e^2 has an upward incline on the front side of the machine in advance of the mechanical feed mechanism hereinafter set forth and indicated by dotted lines in Fig. 2, and on the rear side of the machine it has a downward incline, as indicated by dotted lines in Fig. 3. By this arrangement each plunger-block E′ is raised to a little above the level of the upper end of the ram E, so that the plungers e will enter the molds in the corresponding mold-block F a short distance. When the mold-block arrives at the point where the molds are filled, it will be held in that position until after it has passed the ram E, when the plunger-block will descend, as shown, for purposes hereinafter set forth.

The upper plungers g are secured to the under side of a plunger-block G. The plunger-block G, as shown in Fig. 16, is provided with guides g', which enter grooves in a resistance-block G′, as shown in Figs. 4 and 16. The plunger-block G is provided with vertical grooves adapted to receive guides g^6, which guide the plunger-block G in its vertical movements. The guides g^6 are secured to the under side of the upper plate A′.

The upper and lower surfaces of the block G′ are inclined, as shown in Fig. 4. The upper inclined surface of the block G′ is in contact with the incline on the lower side of the upper plate A′. The lower inclined surface of the block G′ engages with an incline upon the plunger-block G, as shown in Fig. 4. The block G′ is supported by guides g^2, as shown in Fig. 16, so that it can slide horizontally. When the block G′ is in the position shown in Fig. 4, the plunger-block G will be raised clear from the mold-block F. When the resistance-block G′ is drawn in, the plunger-block G will be lowered, so that the plungers g will enter the upper ends of the molds in the mold-block F. When the lower plungers e are raised by the ram E, the upper plungers g will remain stationary and resist the upward pressure, so that the material in the mold will be pressed between the plungers e and g. When the ram E rises, the plunger-block G is firmly held down with the plungers g in the molds by the resistance-block G′, which is capable of withstanding the immense upward pressure exerted by the ram E against the upper plunger-block G.

In order to prevent the upper plate A′ from being lifted or sprung by the immense upward pressure, I provide three columns a^2, arranged in triangular form about the cylinder D′, as shown in Fig. 7, through which pass large strain-bars A^2. The strain-bars A^2 are arranged at about equal distances from the center of the cylinder D′, so that they divide about equally the strain upon the plate A′. One of these columns a^2 and strain-bars A^2 pass through the column F^2.

The resistance-block G′ is moved in and out by a link g^3, which is pivotally connected at its other end with an elbow-lever G^2, which is secured upon a rock-shaft g^4, as shown in Figs. 1 and 4. The other end of the lever G^2 is provided with an anti-friction roller g^5, which engages with a face-cam G^3. The cam G^3 is mounted upon a shaft G^4. Upon this shaft G^4 is also secured a spur gear-wheel G^5, which meshes with a spur gear-wheel G^6, secured upon the shaft B, as shown in Figs. 1 and 4. The wheels G^5 and G^6 are of equal diameter, so that they rotate with equal speed. When the crank c is at 2°, the cam G^3 will be turned so that the point marked 2° will engage with the roller g^5, as shown in Fig. 4. The block G′ is then shoved out, as shown. When the cam G^3 rotates from 2° to 5°, the upper arm of the lever G^2 will be swung downwardly and its lower arm will be swung backwardly, drawing the block G′ forward and lowering the plunger-block G, so that the plungers g will enter the molds in the mold-block F. This will bring the resistance-block G′ and the plungers g into position at the time when the ram E begins to lift the plunger-block E′ and lower plungers e. While the crank c is passing from 5° to 19° the pressure upon the resistance-block G′ from the ram E will be immense, and the block will remain firmly in position. The portion of the cam G^3 which passes the roller g^5 during this time is circular, as shown. After the crank c has passed 19° the pressure is off the plunger g and block G′, and the plungers are then lifted by the block G′, being pushed out by means of the cam G^3 engaging with the roller g^5 from 19° to 23°. From 23° up to 2° the block G′ remains stationary in its outer position, as shown in Fig. 4, the cam G^3 from 23° to 2° being circular. It will thus be seen that the resistance-block G′ is drawn in at the proper time to lower the plungers g to meet and resist the plungers e, which begin to be lifted by the ram E.

The resistance-block G′ is inclined, as shown and hereinbefore described, to raise and lower the plunger-block G, which is the preferable form; but it is evident that the plunger-block G may be raised and lowered by other means. The chief office of the resistance-block G′ is to furnish a perfectly solid resistance to the upward pressure of the ram E. In the machine which I have designed the plungers g are not given sufficient downward movement to cause them to act as compressors of the material in the molds; but they simply form resistant plungers against which the plungers e press the material to form the bricks or blocks.

The mold-blocks F are made to slide vertically in the turn-table F′, so that the molds can rise with the lower plungers, if necessary, and so that the material in the molds will be pressed uniformly, forming perfect bricks or blocks. The block E′ is raised vertically by the ram E, its roller e' being raised from the track e^2 and its guide-block E^2 sliding vertically in the shell F^4. When the plungers e and g have been withdrawn from the molds, the turn-table F′ is turned sufficiently to bring another mold-block with filled molds into position over the ram E.

The spur-wheel f, which is connected with the turn-table F′, is rotated by a spur-wheel h, as best shown in Fig. 6. This spur-wheel h in a machine which I have designed has one-half as many cogs as the spur-wheel f, so that when it rotates twice it will cause the spur-wheel f to rotate once. This wheel h is secured upon a shaft h', which is secured in suitable bearings in the plate A′ and in a support H^5, as best shown in Fig. 3. One end of the shaft G^4 is also supported in this support H^5, as shown in Fig. 1, its other end being mounted in bearings upon a support H^4, as shown in Fig. 2. Upon the upper end of the shaft h' is mounted a wheel or disk H, which is provided with six anti-friction rollers H′, as best shown in Fig. 1. This wheel or disk H is secured to the shaft h' by a clutch, hereinafter described.

The rollers H′ are arranged to enter grooves in a cam-wheel I′, which is secured upon the shaft G^4, and is provided with a groove i, adapted to receive one of the rollers H′ and extending outwardly a short distance from a

circular recess i' at the center, as best shown in Fig. 19. It then extends around the wheel I′ nearly from 1° to 23° in a circle. It then extends outwardly to the periphery of the wheel. A second groove i^2 extends outwardly from the center i' to the periphery of the wheel. When the crank c has passed to 23°, the resistance-block G′ has been pushed out and withdrawn the plungers g from the molds, as before stated, and the ram E has descended so that the plunger-block E′ can turn with the molds. The turn-table F′ is now free to turn and must be turned one-sixth of a rotation to bring a second mold-block into position. When the crank is at 23°, a roller H′ will be at 23° in the groove i in the cam-wheel I′. The continued rotation of the wheel I′ will cause the roller H′ to be moved in the outwardly-extending portion of the groove, thereby rotating the wheel H, and before one roller H′ has passed out of the groove i a second roller H′ will enter the groove i^2 at the center i' and pass outwardly to the periphery of the wheel I′, and a second roller H′ will enter the groove i, passing outwardly until it strikes the circular portion, beginning at 1°. The wheel H has thus been rotated through an interval of two rollers H′ or one-third of a rotation. This has been done while the crank c is passing from 23° to 1°. The rotation of the wheel H has caused the spur h to rotate likewise and has rotated the spur-wheel f and turn-table F′ one sixth of a rotation, thereby bringing a second mold-block into position for a second operation. When the roller H′ enters a circular portion of the groove i at 1°, the wheel H and turn-table F′ will be prevented from rotating or oscillating either forwardly or backwardly. The roller H′ will remain in the circular groove i to 23°, so that the turn-table F′ will be held perfectly stationary while the crank c is passing from 1° to 23°, during which time the plungers e and g enter the molds in the mold-block F on the turn-table F′ and press the material forming the bricks or blocks. The bricks or blocks formed in the molds in the mold-blocks F are carried around in the molds, after leaving the plungers e and g, one-half of the rotation of the turn-table F′ in the machine which I have designed. They are there pushed out upon a belt or other carrier K, as hereinafter described. The bricks or blocks are pushed out of the molds by plungers j, which are secured to a push-out block J. The plungers j are made in such form and arranged so that they will enter the molds and push out the blocks readily.

The push-out J is guided in a frame J′, so that it will move in a vertical line. To the push-out block J is pivotally connected a connecting-rod j', which at its other end is pivotally connected to two arms j^2. The arms j^2 are secured upon a rock-shaft J^2, as shown in Figs. 1 and 4, and upon the outer end of the rock-shaft J^2 is secured an arm j^3. To the arms j^3 is pivotally connected a pitman J^3, which at its other end is pivotally connected with a crank J^4, secured upon the shaft G^4. Each rotation of the shaft G^4 will rock the rock-shaft J^2 and arms j^2 through the crank J^4 and pitman J^3. The crank J^4 is set at about sixteen degrees in relation to the crank c in the shaft B. When the crank c is passing from about 16° to about 2°, the push-out plungers j are moving upwardly and back above the surfaces of the mold-blocks F as the crank J^4 is set upon the shaft G^4, so that it is pulling the arm j^3 forwardly and raising the arms j^2. While the crank c is passing from about 1° to about 16°, which is the period that the turn-table is at rest, the push-out plungers j pass down into the molds in the mold-block F, push out the bricks or blocks onto the carrier K, and return above the surface of the mold-blocks F.

To the columns a and a^2, arranged around the turn-table F′, as shown in Fig. 6, are secured brackets in which are mounted anti-friction rollers H^2, as indicated in dotted lines in Fig. 6. These anti-friction rollers H^2 are arranged to engage with the under side of the turn-table F′ and prevent its being twisted by the action of the push-out plungers j or the plungers e and g.

The carrier K is arranged beneath the push-outs j, so that it will carry away the bricks or blocks pushed out from the molds.

The plunger-blocks E′ descend by means of the incline in the track e^2, so that they pass beneath the carrier K. The inner end of the belt which I employ as a carrier runs over a pulley K′, as best shown in Fig. 7. This pulley K′ is supported upon brackets K^2, extending out from the columns a. It is most convenient to deliver the pressed bricks or blocks to the carrier K at the point which I have shown and described; but it is evident that the push-out j and operating devices and the carrier K may be arranged at other convenient points where they can operate while the turn-table is not moving. The arrangement shown I consider preferable for many reasons.

The wheel H is loosely mounted upon the shaft h', as best shown in Fig. 18, and the upper face of its hub is provided with a beveled clutch-recess h^2, as best shown in Figs. 21 and 22. A clutch-section h^3 is secured upon the shaft h' above the wheel H by a spline or feather, so that it can be moved longitudinally thereon. It is provided with a beveled portion adapted to engage with the recessed portion h^2 of the hub. This section h^3 is held in contact with the hub of the wheel H by a spring h^4, which at its upper end abuts against a set-nut h^5.

In case any of the plungers e, g, or j fail for any reason to be freed from the turn-table F′, or in case from any other cause the turn-table could not be turned, the unusual power necessary to turn the table will cause the clutch-section on the hub of the wheel H to lift the clutch-section h^3 and thereby permit the wheel H to rotate without rotating the

shaft h'. The tension of the spring h^4 may be adjusted to allow the clutch-section h^3 to be lifted at the desired time to prevent breakage. If the clutch-section h^3 is lifted, as above described, the turn-table will remain stationary until the wheel H has made a complete rotation, so that the plungers e, g, and j will work in the molds and not strike the turn-table F'.

The shaft h', as shown in Fig. 18, is made hollow, and a rod h^6 extends longitudinally through it. The rod h^6 at its upper end is provided with a pin h^7, which projects through vertical slots in the shaft h' and enters an annular recess h^8 in the clutch-section h^3. The lower end of the rod h^6 engages with an arm h^9 on a rod h^{10}, which is supported in brackets h^{11}, as best shown in Figs. 6 and 18. The outer end of the rod h^{10} is provided with a handle h^{12} by which it may be rocked.

The operator can raise the rod h^6 by rocking the rod h^{10} by the handle h^{12}, thereby raising the clutch-section h^3 out of engagement with the wheel H, so that at any time the operator can throw the devices for driving the turn-table out of gear.

The foregoing description gives in detail the operation of the respective parts for pressing the material in the molds, for turning the turn-table containing the molds, and removing the pressed bricks or blocks from the molds, the molds being filled by mechanism hereinafter described.

In order that the general operation of the machine may be understood, I will now give a general description of a single operation of the parts hereinbefore described. Starting, for convenience, with the crank c at 2°, the parts will be in the position shown in all the figures except Fig. 3. At this time the plunger C is beginning to descend and the cam G^3 is just beginning to rock the elbow-lever G^2 to draw the resistance-block G' and cause the plunger-block G to descend. The roller H' has just arrived at the circular portion of the groove i in the cam I', so that the turn-table is at rest and the push-out plungers j have just entered the mold. While the crank c is passing from 2° to 5° the plunger C is descending slowly, causing the ram E to rise slowly and engage with the plunger-blocks E', and at 5° the resistance-block G' has been drawn to its seat by the cam G^3 and intermediate devices, lowering the plungers g into the molds in the mold-block F. From 5° onward to 16° all the parts of the machine hereinbefore mentioned are at rest excepting the plunger C, ram E, and the push-out devices. The descent of the plunger C from 5° onward is comparatively rapid, causing the ram E to rise, lifting the plunger-block E' and plungers e, and compressing the material in the molds. When the crank c arrives at about 14°, the downward descent of the plunger C is comparatively very slow, and at this time the greatest pressure is exerted upward upon the ram E and plungers e, which are then finally compressing the material. By reason of the fact that the crank c is approaching its lower dead-center 16° it is acting with the greatest advantage to force the plunger C downward. At this time the greatest compressing-power is necessary, as at all other times the resistance is small, and at this time the plungers are finally compressing the material. The advantage gained by the crank c while approaching its dead-center enables the driving-power to carry the crank by this nip with the greatest advantage and utilizes the momentum at the very time when the greatest force is required. The resistance-block G' being a solid block and the plunger-block G pressing against it, and it in turn pressing against the upper plate, a solid and unyielding support is given to the upper plungers g, which remain at rest at this time. If the resistance offered by the material being pressed passes beyond a certain predetermined point—as, for instance, four hundred tons—the safety-valve will be lifted, allowing a sufficient amount of the liquid to overflow to prevent breakage, as hereinbefore set forth. It will thus be observed that the plunger C descends very slowly and is comparatively stationary while the crank c is passing the dead-center, thereby holding the material being pressed under the greatest pressure for a considerable time. As soon as the plunger C begins to rise the pressure is relieved from the plungers e and g, and the ram E, with the plunger-block E', begins to descend, gradually relieving the machine of its immense strain. When the crank c begins to lift the plunger more rapidly, the ram E descends quite rapidly, forcing the liquid in the cylinder D' back into the cylinder C'. When the crank c rotates to 19°, the pressure is entirely off from the resistance-block G', and the block G' is moved outwardly by the cam G^3 and intermediate devices, raising the plungers g, and when the crank c arrives at 23° the block G' is fully out and the plunger-block E' free to turn with the table. By this time the plunger-block E' has been freed from the ram E by the descent of said ram. At 23° therefore the turn-table is free to move as regards these parts. It will be remembered that the lower plungers rotate with the molds in the turn-table. While the operation above described has been taking place the push-out plungers j have pushed out the bricks or blocks from the molds and have returned above the edge of the molds. The turn-table is therefore ready to be moved, and at 23° is turned rapidly one-sixth of a rotation in the machine, which I have designed by means of the cam-wheel I' and intermediate devices hereinbefore described. From 23° to 1° the table is rotating, and at 1° it stops ready for a second operation. While the crank c was passing from 16° to 32° the liquid was being withdrawn from the cylinder D' into the cylinder C' and any overflow was being taken up, as hereinbefore described, so that at 32° the

crank is ready for a second operation and at 2° (the starting-point) has begun its second operation.

As hereinbefore stated, in case either of the plungers *e*, *g*, or *j* should fail to be clear from the mold-blocks F, the turn-table F′ cannot be turned and the clutch-section h^3 will be lifted by the unusual strain, thereby throwing the driving mechanism for the turn-table out of gear and preventing accident. If for any similar reason it is necessary to throw the turn-table out of action, the operator can do so by means of the handle h^{12}.

I will now describe the mechanisms by which the material is supplied to the molds. The base-plate A is extended on one side, as shown in Figs. 6 and 7, to form a support for the mechanisms for feeding the material to the molds. As the plungers *e* are caused to enter the molds at one-sixth of a rotation from the ram E and at that point close the bottoms of the molds, I have arranged the feed mechanism to operate at that point. It is evident, however, that the feed mechanism can be arranged at any other desired point at which the molds can be closed by the lower plungers *e*. When more or less than six mold-blocks are used in the turn-table F′, the position of the feed mechanism may be shifted as necessary. The arrangement shown is preferable for various reasons, and the base-plate A is extended at the point shown in order to support the operating parts. A mixing-tank L is supported upon the column L′, extending up from the base A, as best shown in Fig. 8. The column L′ is supported in a step-box L^2, secured upon the base-plate A, and at its upper end is provided with a flange *l*, to which the mixing-tank L is bolted. This column L′ is hollow, as shown in Fig. 8, for purposes hereinafter set forth. The mixing-tank L is composed of plate metal and provided with steam-passages *l*′, as best shown in Fig. 8. The two plates forming the tank L are bolted to a ring l^2, which is secured upon the flange *l*. Upon the ring l^4 is also bolted a vertical box L^3. The mixers *m* are secured upon arms M, which are mounted upon a shaft M′. The shaft M′ is located within the hollow column L′ and supported at its upper end in a vertical box L^3. At its lower end it rests in a bearing-block *m*′. As shown, this shaft M′ is provided with a beveled gear-wheel m^2 below the base-plate A, by which wheel the shaft M′, arms M, and mixers *m* are rotated. The beveled gear-wheel m^2 is driven by a beveled gear-wheel m^3 upon a shaft M^2, as best shown in Figs. 8 and 9. One end of the shaft M^2 is supported in the block *m*′, and the block *m*′ is supported by a bracket M^3, as best shown in Figs. 8 and 9. Upon the inner end of the shaft M^2 is secured a band-wheel m^4, as best shown in Fig. 9. This band-wheel m^4 and the parts connected therewith are not shown in Figs. 2 and 5, as they would conceal some of the important parts there shown. The gearing for driving the band-wheel m^4 is clearly shown in Fig. 15. A band M^4 passes around the wheel m^5, secured upon the shaft B′, and also around the band-wheel m^4. At the point of passing through the base A two guide-pulleys m^6 and m^7 are located, as shown in Fig. 15. The gearing for driving the shaft M′ from the shaft B′ may be regulated to drive the shaft M′ at any desired speed. The form of gearing is unimportant. Upon the shaft B, as shown in Fig. 15, is secured a sprocket-wheel *n*, which drives a drive-chain N. This drive-chain N passes around a sprocket-wheel *n*′ upon a shaft N′, which is supported in suitable bearings upon the base-plate A, as best shown in Figs. 7 and 15. Upon the outer end of the shaft N′ is secured a beveled gear-wheel n^2, as best shown in Figs. 7 and 8. A shaft O is mounted in suitable bearings upon columns O^2 upon the extension of the base-plate A, as shown in Fig. 7, and is provided with a beveled gear-wheel O′, which meshes with the beveled gear-wheel n^2. The gearing between the shaft O and the shaft B is such that the shaft O rotates at the same speed as the shaft B. The feed-box P is provided with two guides *p*, one on each side. A track P^2 is provided with anti-friction rollers p^2, provided with grooves adapted to receive the guides *p* of the feed-box P, as shown in Fig. 8. The feed-box P can be moved on the anti-friction rollers from the position shown in Fig. 10, where it is filled to a position immediately above the molds in one of the mold-boxes F in the turn-table F′. A lever P′ is connected with the feed-box P by a link p^3, as shown in Figs. 9 and 10. At its opposite end it is mounted upon a pivot p^4, secured in one of the columns O^2. This lever P′ is provided with an anti-friction roller *p*′, adapted to enter a cam-groove *q* in the cam-wheel Q. The cam-wheel Q is secured upon the shaft O, as best shown in Fig. 10. While the turn-table is at rest—that is, while the crank *c* is passing from 1° to 23°—the feed-box must pass to the molds in the mold-block F, fill the molds, and return. When the crank *c* arrives at 1°, the portion of the cam-groove *q* indicated at 1° (see Fig. 10) will be at the roller *p*′. From this point to the point marked 5° the cam-groove *q* extends outwardly toward the periphery, so that while the cam is passing from 1° to 5° the anti-friction roller *p*′ and lever P′ will be moved inwardly, thereby carrying the feed-box rapidly inward from the position shown in Fig. 10 to a point above a mold-lock F. From 5° to 14°, as indicated in Fig. 10, the cam-groove *q* is circular, so that while the crank *c* is passing from 5° to 14° the feed-box will remain stationary over the mold-block F. The feed-box is returned from 14° to 19°, as hereinafter set forth. The feed-box P is provided with a movable bottom R. This movable bottom R is provided with guides r^3, as shown in Fig. 8, which enter grooves in the anti-friction rollers p^2. The

bottom R is provided with a hook r, which extends outward, as shown in Figs. 9 and 10. A cam-wheel R′ is secured upon the shaft O, as shown in Fig. 11. This cam-wheel R′ is provided with a cam-groove r'. A lever S is pivoted upon the shaft r^2 at its lower end, and its upper end is connected with a hook S′ by a link S^2. The hook S′ slides upon a guide S^3, as best shown in Fig. 11. The hook S′ is arranged in position to engage with the hook r upon the feed-box P when the feed-box is moved into its inner position and to draw the bottom R outward, so that the contents of the feed-box P can fall into the molds in the mold-blocks F. The lever S is provided with an anti-friction roller s, which runs in the cam-groove r'. The parts will be in the position shown in Fig. 11 at 2°, at which time the box P is moving toward the mold-block F. The feed-box P will arrive at its destination at 5°. At this time the cam-groove r' will be moved so that the point indicated at 5° will pass the roller s. From 5° to 9° the cam-groove r' extends toward the center of the wheel R′, so that the roller s and lever S will be moved outwardly to the position indicated by dotted lines in Fig. 11. This will draw the hook S′ outwardly and will withdraw the bottom R from the feed-box P. From 9° to 14° the cam-groove r' extends outwardly from the center of the wheel R′, so that the lever S will return to the position shown in Fig. 11 and the hook S′ be entirely disengaged from the bottom R. From 14° to 5° the cam r' is circular, so that the lever S and roller s will be at rest. From 14° to 19° the cam-groove q extends inwardly toward the center of the cam-wheel Q, as shown in Fig. 10, so that the roller p' and lever P′ will be moved outwardly rapidly, thereby returning the feed-box P to the station at which it is filled. When the feed-box P returns, it overtakes the bottom R, which is stopped by the engagement of the hook r with a bracket r^4 upon a vertical rock-shaft U, hereinafter described, the arrangement being such that the bottom R and feed-box P stop immediately beneath a measuring device, hereinafter set forth. The bracket r^4 may be arranged upon any other convenient part of the mechanism to stop the bottom R at the proper point. From 19° to 1° the cam-groove q is circular, so that the feed-box P is held stationary in the position shown in Fig. 10. The lever P′ is provided with a slot p^5 to permit it to straddle the shaft O. The tank L is provided with an opening t^2, as shown in Figs. 1 and 10. Beneath this opening t^2 is located a measuring-box T, which is preferably made similar in form in cross-section to the feed-box P. This measuring-box T consists of two sections. The upper section t is supported from the mixing-tank L by a bracket t^3. The lower section t' is of larger diameter and is adapted to slide over the upper section t. The lower section t' is supported by a bracket t^4, which is attached to a collar T′, which surrounds a rock-shaft U, which surrounds the vertical column L′, as best shown in Fig. 8. The collar T′ is supported by a shoulder U^3. The vertical rock-shaft U at its lower end rests upon a block U′, which block is provided with an annular oil-groove in which the rock-shaft U may turn, as shown in Fig. 8. The block U′ is located in a countersink in the step-block L^2, as best shown in Fig. 8. This block U′ is supported by a collar u^2, which is provided with an arm u^3, that extends outwardly and is provided with a head through which passes a screw-bolt u^4, which is provided with a hand-wheel n^5. The screw u^4 at its lower end is supported in a stand U^2. By means of the hand-wheel n^5, screw u^4, arm u^3, and collar u^2 the block U′ may be raised or lowered, thereby raising the rock-shaft U. By raising the shaft U the collar T′ and section t' of the measuring-box T may be raised or lowered, thereby decreasing or increasing the amount of material fed to the feed-box P. The plate u, which forms the bottom of the measuring-box T, is provided with a collar T^2, which surrounds the rock-shaft U and is secured upon the shoulder U^3. The collar T′ rests upon this collar T^2. The plate u', which forms the lid to the measuring-box T, is provided with a collar T^3, which is secured upon the upper end of a sleeve T^4, as best shown in Fig. 8. The sleeve T^4 rests upon a collar t^6, which is secured by screws to the column L′, as shown in Fig. 8^5. The sleeve T^4 is provided with a spline t^3, which enters a groove in the interior of the rock-shaft U and causes the sleeve T^4 to rock with the rock-shaft U while enabling the rock-shaft U to move longitudinally without moving the sleeve T^4. The plates u and u' are so set upon the shaft U and the sleeve T^4, which is in effect a part of the shaft U, that when the plate u closes the bottom of the measuring-box T the plate u' will be moved from the top, allowing the measuring-box T to be filled with material from the mixing-tank L, as shown in Fig. 14. When the bottom plate u is moved from beneath the measuring-box T, the top plate or lid u' will be moved over the top of the measuring-box T, thereby preventing more material from entering the box T and also measuring the amount of material to be used for a single operation of the machine.

The amount of material which the measuring-box T can contain may be varied by raising or lowering the lower section t' by raising the rock-shaft U, as hereinbefore described, the bottom plate u rising with the rock-shaft U and lower section t', the upper section t, lid u', and sleeve T^4 remaining in the same horizontal plane.

In order that the rock-shaft U may be rocked to shift the plate u and u', as above described, this rock-shaft U at its lower portion is provided with gear-teeth v, as shown in Figs. 8, 9, and 10, and indicated by dotted lines in Fig. 14, which are engaged by teeth v' upon a rack-bar V. The teeth v' upon the

rack-bar V are quite wide, so that they will engage with the teeth v on the shaft U in its different positions, as adjusted. The rack-bar V is supported upon and guided by anti-friction rollers v^2, which are mounted upon standards V′, as best shown in Fig. 13. The rack-bar V is provided with an anti friction roller w, which runs in a cam-groove w' in the face of a wheel W, as best shown in Fig. 13. When the crank c is at 1°, the roller w will be in the circular portion of the groove w'. The groove w' is circular from 1° to 19°, as indicated in Fig. 13. From 19° to 23° it extends inwardly toward the center of the wheel W. From 23° to 30° it is circular, and from 30° to 1° it extends outwardly toward the periphery of the wheel W. This will cause the rack V to occupy the position shown in Fig. 1 from 1° to 19°, which will cause the plates u and u' to occupy the position shown in Fig. 14, at which time the measuring-box T will be filled. During this time the feed-box P will be going to the mold, filling the mold, and returning. From 19° to 23° the rack V will be shifted to the position indicated by dotted lines in Fig. 13, opening the bottom of the measuring-box T and closing the lid u'. From 23° to 30° the bottom plate u will be open, so that the material in the measuring-box T will fall into the feed-box P. From 30° to 1° the plates u and u' will be shifted, closing the bottom and opening the top of the measuring-box T, the rack V being returned to the position shown in Fig. 13. The rack-bar V is provided with a slot V^2, so that it can straddle the shaft O.

From the foregoing description it will be understood that during the period that the turn-table F is at rest—that is, from 1° to 23°—the feed-box P moves in over the mold-block and its bottom is withdrawn, allowing the material to fall into the mold-block and the feed-box to then return to its station beneath the measuring-box. When the mold-box arrives at the position shown in the several figures, the bottom plate u closes the bottom of the measuring-box and the crank c is at 19°. From 19° to 23° the plate u is shifted, opening the bottom, and the upper plate u' is shifted, cutting off the top of the measuring-box T. From 23° to 30° the feed-box is filled with material from the measuring-box T. From 30° to 31° the plates u and u' are shifted back, when the feed-box is again ready to move forward and fill the molds in a second block. From 23° to 30°—that is, during the time while the the turn-table F′ is turning—the feed-box is being filled and at 1° is ready to move into the turn-table, which comes to rest at 1°.

The entire feeding apparatus moves automatically in proper relation to the movements of the turn-table and pressing apparatus, so that the pressing alone is done by the ram E and at that point, the bricks or blocks being pushed out by separate apparatus. This construction and combination of mechanisms allows the pressing to be done more slowly and with better effect than would be the case were the molds fed at the point of pressing and the bricks or blocks removed at the same point. The mechanisms hereinbefore described are all designed to operate in relation to each other; but many of the mechanisms will be operated in connection with other mechanisms now in use.

Having now described the mechanisms which form my improved hydraulic machine and the construction set forth in the drawings and the mode of operation of the several parts and of the mechanisms as a whole, I desire it to be understood that the different mechanisms which I have employed are the preferred forms of various forms of mechanisms which I have contemplated and which may be effectually employed for carrying out the main features of my invention, one of which is the hydraulic ram, which is operated by a plunger driven by a crank, so as to cause the ram to make a single operation with the greatest amount of power upon each complete operation of the remaining parts of the machine, and automatic mechanisms which will cause the coacting devices of the machine to act in unison with the ram, and another of which main features is the turn-table and the automatic devices co-operating therewith to utilize the hydraulic ram E and plunger C. It is evident that various forms of gearing may be employed to operate some of the automatic parts, such as a cam for operating the push-out plungers j. The construction which I have shown and have fully described is the preferred one in all details and is one which I have designed for actual employment.

The system of timing which I have hereinbefore explained and which I have made use of in explaining the operation of the several operating parts is one adopted simply for convenience in the construction of my machine and the description of the operation. It is evident, therefore, that the scale employed is not an essential part of my machine, but is merely an aid in describing the timing of the parts, which must act automatically at certain times in relation to other operating parts. I do not, therefore, limit my invention to the precise gearing and mechanism employed in every instance; but what I consider important and claim as my invention will be set forth in the claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a shaft B, having a crank c, and a plunger C, connected with said crank, with a cylinder C′, having trunnions c', bearings for said trunnions, a larger cylinder D′, a ram E therein, and an uninterrupted communication between said cylinders C′ and D′, said communication passing through one of the trunnions c', substantially as specified.

2. The combination, in a hydraulic machine, with a ram and cylinder, of a smaller cylinder, a plunger therein, a connecting-pipe, a shaft B, and crank c, so arranged that the

crank passes the dead-center at the time the ram meets its greatest resistance, substantially as and for the purpose specified.

3. The combination, in a hydraulic machine, with a ram and cylinder, of a smaller cylinder, a plunger therein, a driving mechanism for said plunger, a communication between the cylinders, and a safety-valve on said communication, substantially as and for the purpose specified.

4. The combination, in a hydraulic machine, with a ram and cylinder, of a smaller cylinder, a plunger therein, a driving mechanism for said plunger, a communication between said cylinders, a safety-valve on said communication, and a return-valve through which the overflow from the safety-valve can be returned, substantially as and for the purpose specified.

5. The combination, in a hydraulic machine, with a ram and cylinder, of a smaller cylinder, a plunger therein, a driving mechanism for said plunger, a communication between the cylinders, and a valve-chest connected with said communication, containing a safety-valve, a return check-valve, an overflow-tank, and pipes connecting said tank with said valve-chest, substantially as and for the purpose set forth.

6. The combination, in a hydraulic machine, with a mold-block and upper plungers, of lower plungers, a hydraulic ram for operating said lower plungers, cylinder for said ram, a smalier cylinder, a plunger in said smaller cylinder, a communication between said cylinders, and driving mechanism for the plunger, whereby each operation of the plunger presses a block or brick in said mold-block, substantially as and for the purpose specified.

7. The combination, in a hydraulic machine, with a ram and cylinder, of a smaller cylinder, a plunger therein, a driving mechanism for the plunger, a communication between said cylinders, a safety-valve on said communication, a return check-valve, and a stop for the downward descent of the ram, substantially as and for the purpose specified.

8. The combination, in a hydraulic machine, with a ram, lower plungers, and molds, of a plunger-block G, having plungers g, provided with an inclined upper face, an inclined resistance-block G′, guides g' and g^6, and mechanism for moving the resistance-block into and out of operative position, substantially as and for the purpose specified.

9. The combination, in a hydraulic machine, with a ram, lower plungers, and molds, of an inclined resistance-block G′, plunger G, devices for connecting the plunger-block G with the resistance-block G′, a link g^3, lever G^2, and cam G^3, substantially as and for the purpose specified.

10. The combination, in a hydraulic machine, with a ram, a cylinder for said ram, a smaller cylinder, a plunger therein, driving mechanism for said plunger, communication between the said cylinders, and a mold-block, of an upper plunger-block, resistance-block, and mechanism for intermittently moving the resistance-block into and out of operative position in proper relation to the movements of the ram and plunger, substantially as and for the purpose specified.

11. The combination, with upper and lower plungers e and g, of a turn-table and a vertically-movable mold-block in said table, substantially as and for the purpose specified.

12. The combination, in a hydraulic machine, with a turn-table and a number of moid-blocks carried by said turn-table, of plungers g, lower plungers e, a ram E for operating the lower plungers, a cylinder for said ram, a small cylinder, a plunger C therein, a communication between said cylinders, a driving mechanism for said plunger C, and mechanism for intermittently rotating said turn-table in proper relation to the ram E and plunger C, substantially as and for the purpose specified.

13. The combination, with upper and lower plungers e and g, a resistance-block, and a ram E, of an intermittently-rotating turn-table carrying molds, said molds being vertically movable in said table, substantially as specified.

14. The combination, with a turn-table carrying a number of molds, upper plungers g, a resistance-block, and a ram E, of a plunger-block E′, rotating with said turn-table, substantially as and for the purpose specified.

15. The combination, with a ram E, a resistance-block, and upper plungers g, of a rotatable turn-table F′, molds carried by said turn-table, plunger-blocks E′, and vertically-movable supports for said plunger-blocks rotating with said turn-table F′, whereby the plunger-blocks can be raised by the ram, substantially as and for the purpose specified.

16. The combination, with a ram and upper plungers g, of a rotatable turn-table F′, molds carried by said turn-table, plunger-blocks E′, guide-blocks E^2, and a shell F^4, secured to said turn-table, substantially as and for the purpose specified.

17. The combination, with a vertically-moving ram, a turn-table carrying molds, upper plungers g, and push-out plungers j, of rotatable plunger-blocks E′, a carrier K, and devices for raising the blocks E′ above the ram and lowering them below the carrier, substantially as specified.

18. The combination, with a rotatable turn-table and upper plungers g, of plunger-blocks E′, rotating with said turn-table, a carrier K, and a track having inclines whereby the plunger-blocks can pass beneath the carrier K, substantially as specified.

19. The combination, with a ram E, upper plungers g, push-out plungers j, and carrier K, of a rotatable turn-table, a number of molds carried by said table, lower plunger-blocks E′, adapted to be engaged by the ram E, vertically-movable supports for the blocks E′, and mechanism for rotating the blocks

with the turn-table, substantially as and for the purpose specified.

20. The combination, with a ram E and upper plungers *g*, of a rotatable turn-table, a number of molds carried by said turn-table, a number of plunger-blocks E′, rotating with said turn-table, vertically-movable supports for the blocks E′, a track having inclines, and mechanism for filling the molds in advance of the ram, substantially as and for the purpose specified.

21. The combination, with a ram E, of upper plungers *g*, a rotatable turn-table, molds carried by said rotatable turn-table, push-out plungers *j*, mechanism for operating the said plungers *g* and *j*, plunger-blocks E′, rotating with said turn-table, adapted to be operated by the ram E, vertically-movable supports for the blocks E′, carrier K, and mechanism for filling the molds in advance of the ram, substantially as specified.

22. The combination, with a hydraulic ram E, cylinder D′, plunger C, cylinder C′, and pipe *d*, of a rotatable turn-table, molds carried by said turn-table, lower plunger-blocks, vertically-movable supports for said plunger-blocks, a resistance-block G′, a plunger-block G, push-out plungers *j*, and mechanism for operating all of said parts in proper relation, substantially as and for the purpose specified.

23. The combination, with a ram E, cylinders D′ and C′, plunger C, turn-table F′, plunger-blocks E′, and resistance-block G′, of mechanism for automatically operating the block G′ and turn-table F′ in proper relation to the ram E, substantially as and for the purpose specified.

24. The combination, with a rotatable turn-table F′, of a wheel H, rollers H′, cam-wheel I′, and connecting-gearing between the wheel H and table F′, substantially as and for the purpose specified.

25. The combination, with an intermittently-rotating turn-table F′, of the wheel H, rollers H′, a wheel I′, having cam-grooves for moving the rollers H′, and an annular groove *i* for holding the table at rest, and connecting-gearing between the wheel H and turn-table F′, substantially as and for the purpose specified.

26. The combination, with a turn-table and driving mechanism, of a cam-wheel I′, wheel H, connecting-gearing between the wheel H and turn-table, rollers H′, clutch h^3, and spring h^4, substantially as and for the purpose specified.

27. The combination, with a turn-table and driving mechanism, of a cam-wheel I′, wheel H, connecting-gearing between the wheel H and turn-table, clutch h^3, rod h^6, and rod h^{10}, substantially as and for the purpose specified.

28. The combination, with upper and lower plates A A′, hydraulic ram E, a cylinder D′, supported upon the lower plate, and a resistance-block G′, acting against the upper plate A′, of three strain-bars A^2, arranged around said ram, substantially as and for the purpose specified.

29. The combination of double-mitered plates f^3 with a mold-block having openings provided with full corners to fit the mitered plates, substantially as specified.

30. The combination, with a block F and double-mitered plates f^3, of securing-plates f^4, substantially as and for the purpose specified.

31. The combination, with a mold, of a movable feed-box, mechanism for moving said feed-box, a sliding bottom for said feed-box, and mechanism for withdrawing said bottom, substantially as specified.

32. The combination, with an intermittently-rotatable turn-table and a number of mold blocks therein, of a movable feed-box, a movable bottom for said box, and operating mechanism for said feed-box and bottom, substantially as specified.

33. The combination of a track P^2 and vertical anti-friction rollers *p′* with a feed-box, a sliding bottom for said feed-box, and flanges on said feed-box and bottom adapted to run on said rollers, substantially as specified.

34. The combination, with a movable feed-box and sliding bottom, of a lever P′, cam-wheel Q, lever S, cam-wheel R′, and hook *s*, substantially as and for the purpose specified.

35. The combination, with a mold, of a movable feed-box, a sliding bottom for said feed-box, a hook for withdrawing said bottom, and a stop r^4 for said bottom, substantially as and for the purpose specified.

36. The combination, with a mold, of a movable feed-box, a measuring-box, and a tank, substantially as specified.

37. The combination, with a feed-box, of a measuring-box, devices for varying the capacity of the measuring-box, plates *u u′*, and devices for operating the plates, substantially as specified.

38. The combination, with a measuring-box, of upper and lower plates *u u′*, shaft U, and mechanism for rocking said shaft, substantially as specified.

39. The combination, with a measuring-box composed of adjustable sections, of plates *u u′*, shaft U, sleeve T^4, and devices for adjusting the shaft U longitudinally, substantially as specified.

40. The combination, with a measuring-box, upper and lower plates, and shaft U, of a rack-bar V, teeth on said shaft, cam-wheel W, and roller *w*, substantially as specified.

41. The combination, with a longitudinally-adjustable shaft, an adjustable measuring-box carried by said shaft, means for adjusting the said shaft longitudinally, and teeth on said shaft, of a rack-bar V, having wide teeth, and mechanism for operating said rack-bar, substantially as specified.

42. The combination, with a mold, of a movable feed-box, mechanism for moving said feed-box, a measuring-box, plates *u u′*, mech-

anism for operating said plates, a movable bottom for said feed-box, mechanism for withdrawing said bottom, and a tank L, substantially as and for the purpose specified.

43. The combination, with a ram, plunger C, crank *c*, and shaft B, of a turn-table, mechanism for intermittently rotating said turn-table, a number of mold-blocks carried by said turn-table, plunger-blocks E′, rotating with said turn-table, plungers *g*, mechanism for raising and lowering said plungers *g*, mechanism for filling the molds in advance of the ram E, push-out plungers *j*, and intermittently-operating mechanism for operating the several parts in proper relation, substantially as and for the purpose specified.

CORNELIUS KIMPLEN.

Witnesses:

HARRY T. JONES,

ALBERT H. ADAMS.