(Model.)

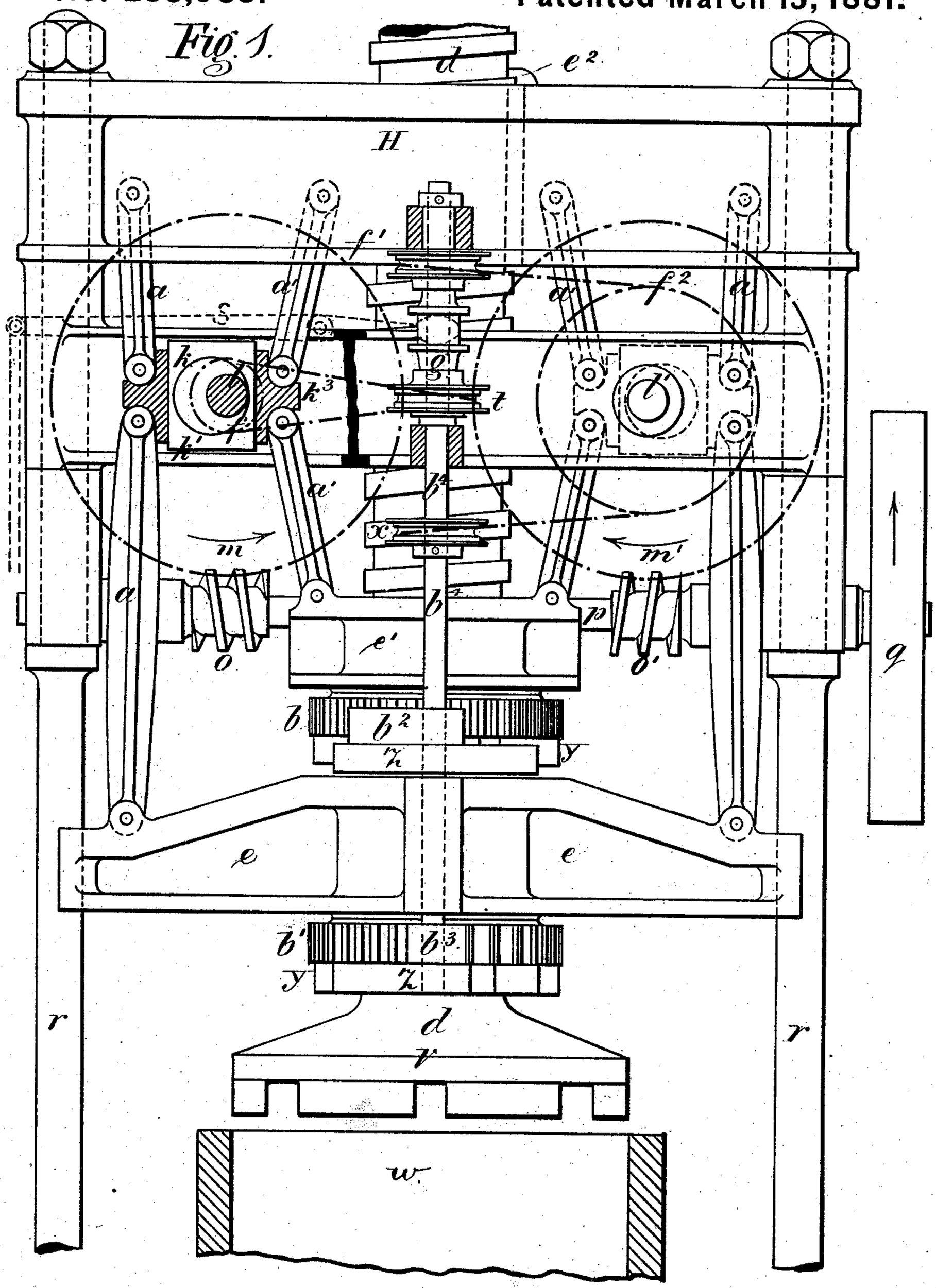
8 Sheets—Sheet 1.

M. STONEHOUSE.

Knuckle Joint Action for Presses, &c.

No. 238,983. **Patented March 15, 1881.**

Fig. 1.



Witnesses:
Harold Serrell
J. Stabb

Inventor:
per M. Stonehouse
Lennuel W. Serrell atty.

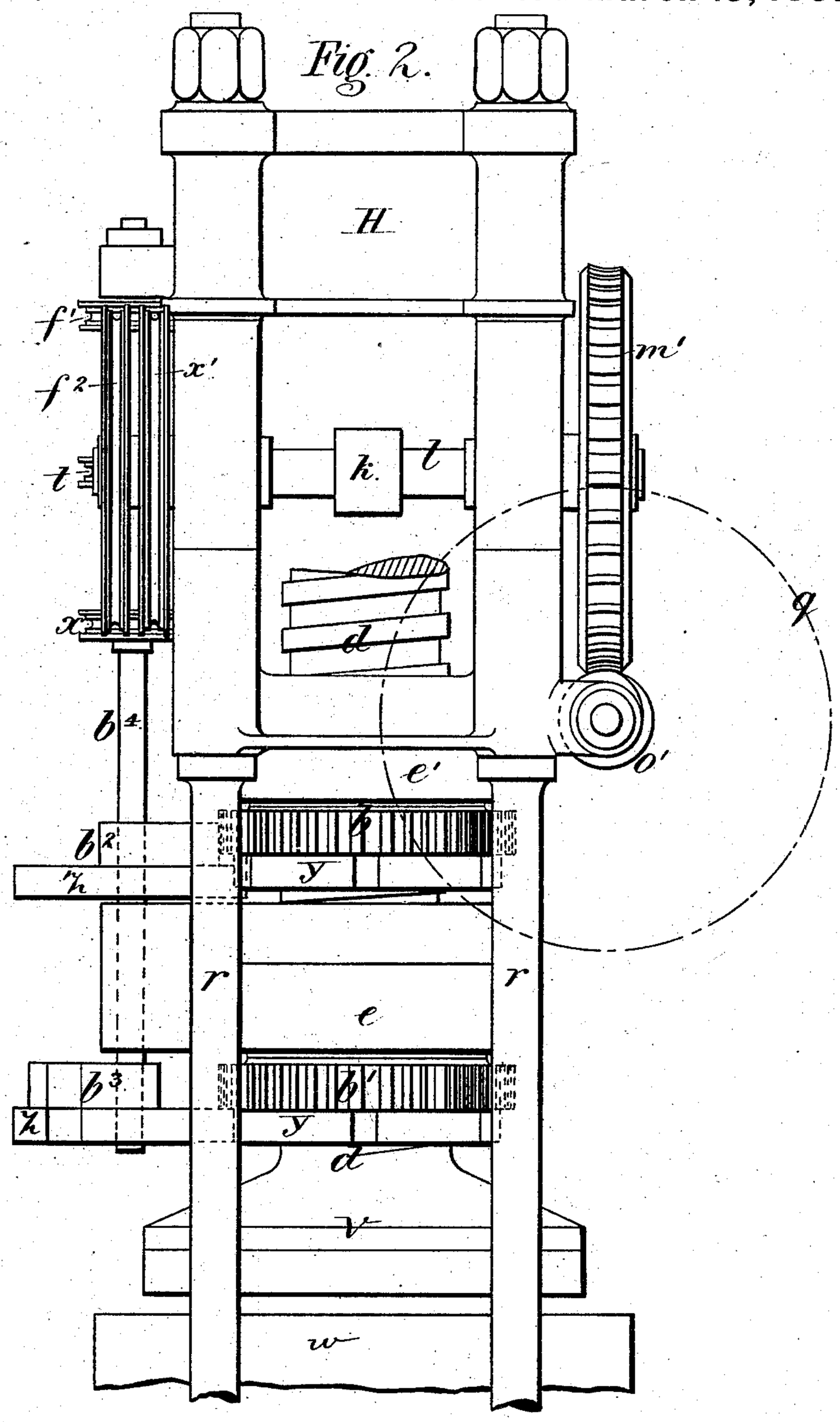
(Model.) 8 Sheets—Sheet 2.

M. STONEHOUSE.

Knuckle Joint Action for Presses, &c.

No. 238,983. **Patented March 15, 1881.**

Fig. 2.



Witnesses
Harold Serrell
J. Stair

Inventor
per M. Stonehouse
Lemuel W. Serrell atty.

(Model.) 8 Sheets—Sheet 3.

M. STONEHOUSE.

Knuckle Joint Action for Presses, &c.

No. 238,983. Patented March 15, 1881.

Fig. 3.

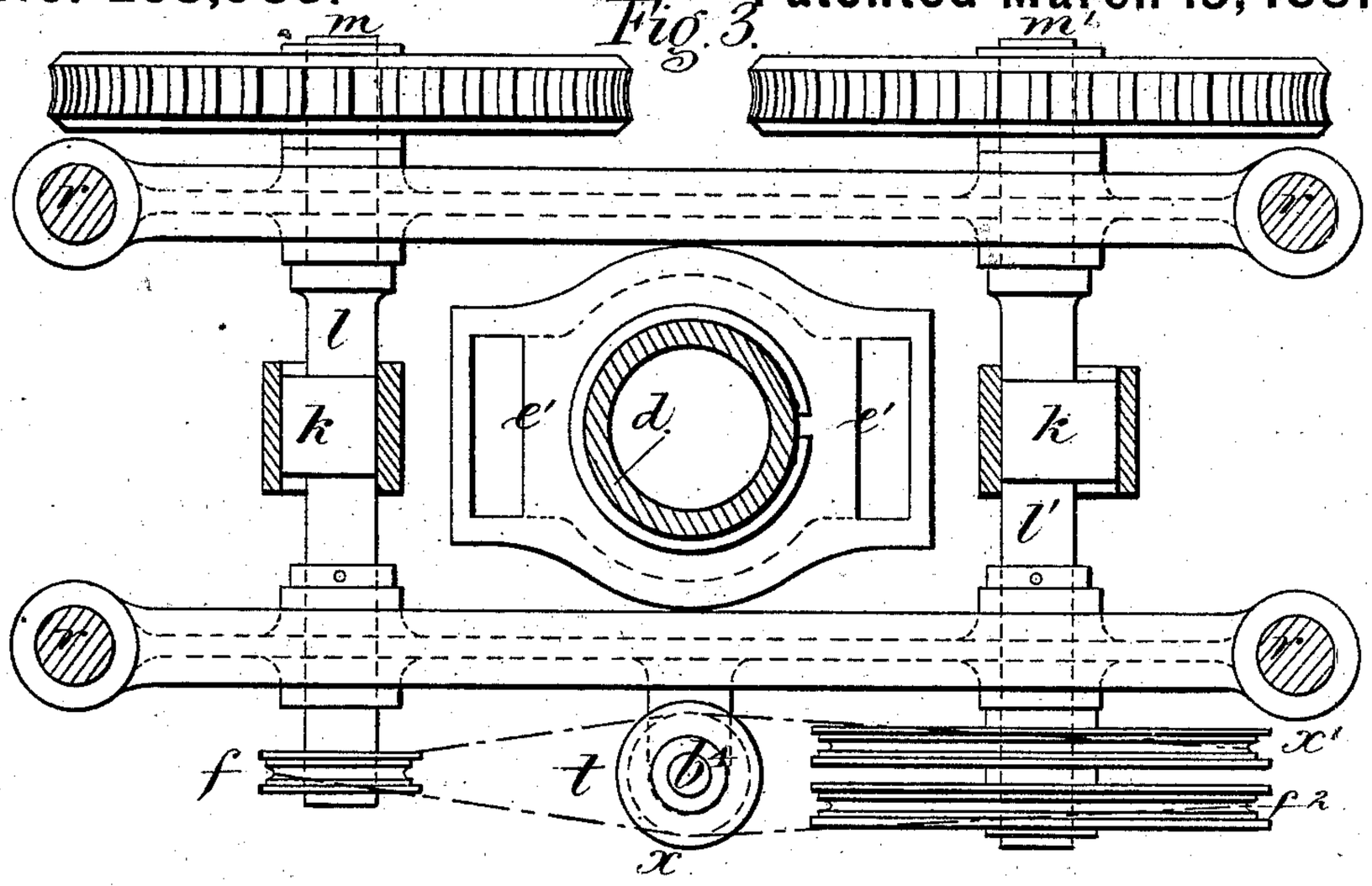
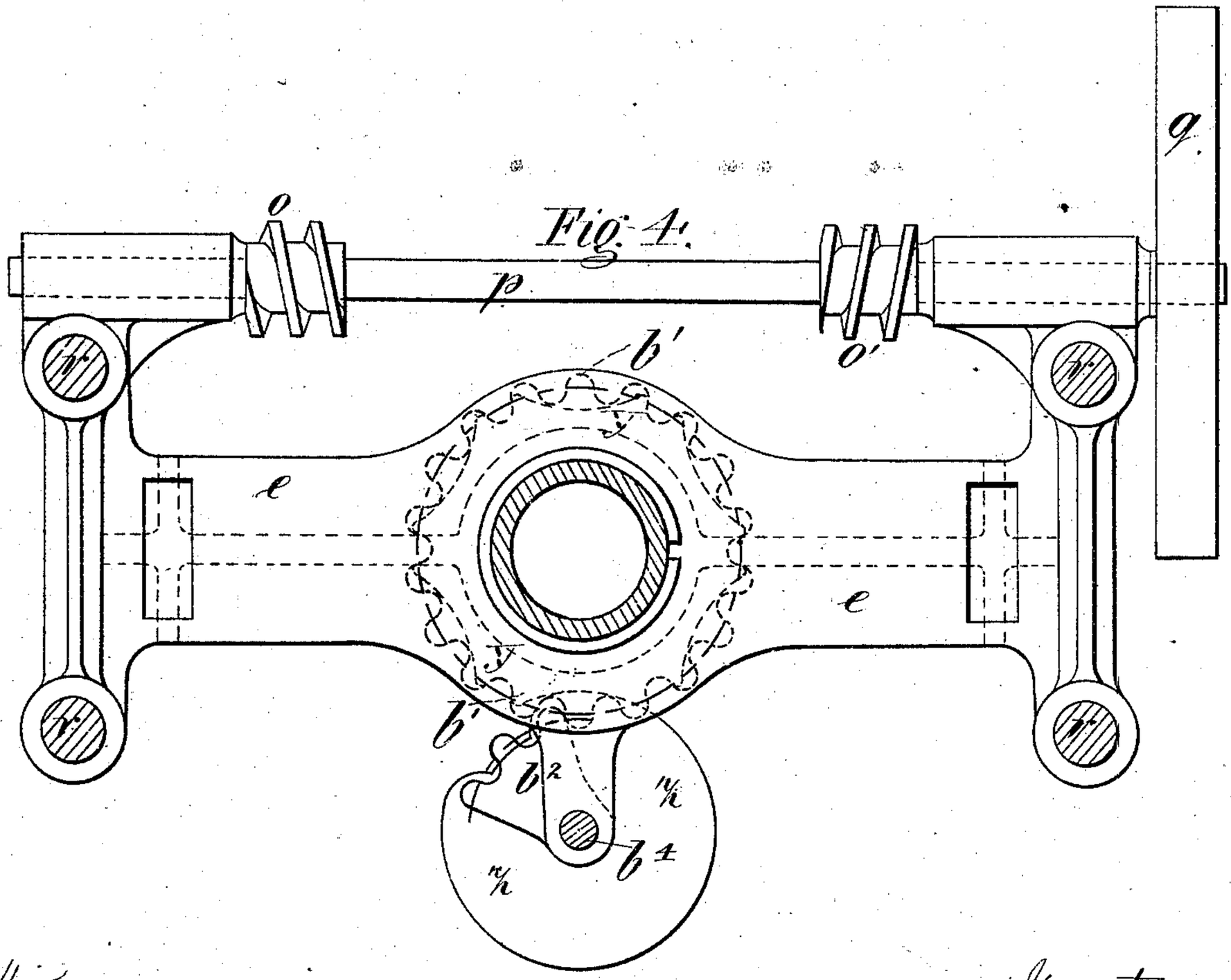


Fig. 4.



Witnesses
Harold Serrell
J. Staib

Inventor
per M. Stonehouse
Lemuel W. Serrell
Atty

(Model.) 8 Sheets—Sheet 4.

M. STONEHOUSE.

Knuckle Joint Action for Presses, &c.

No. 238,983. **Patented March 15, 1881.**

Fig. 5.

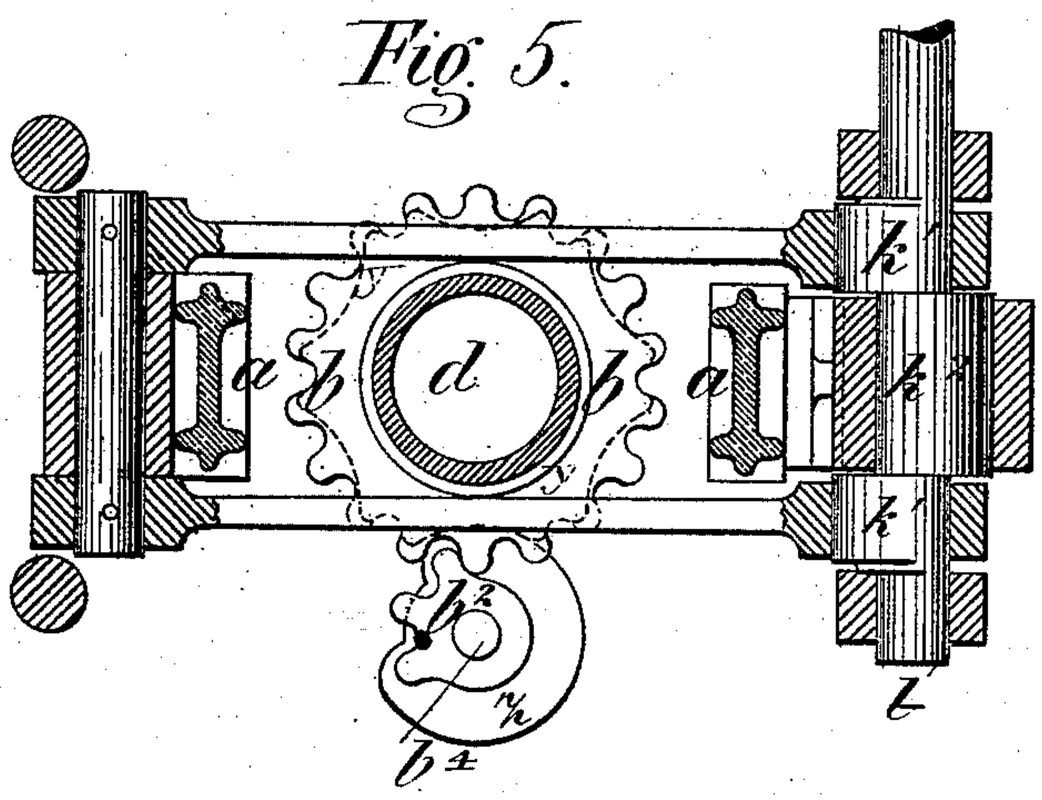
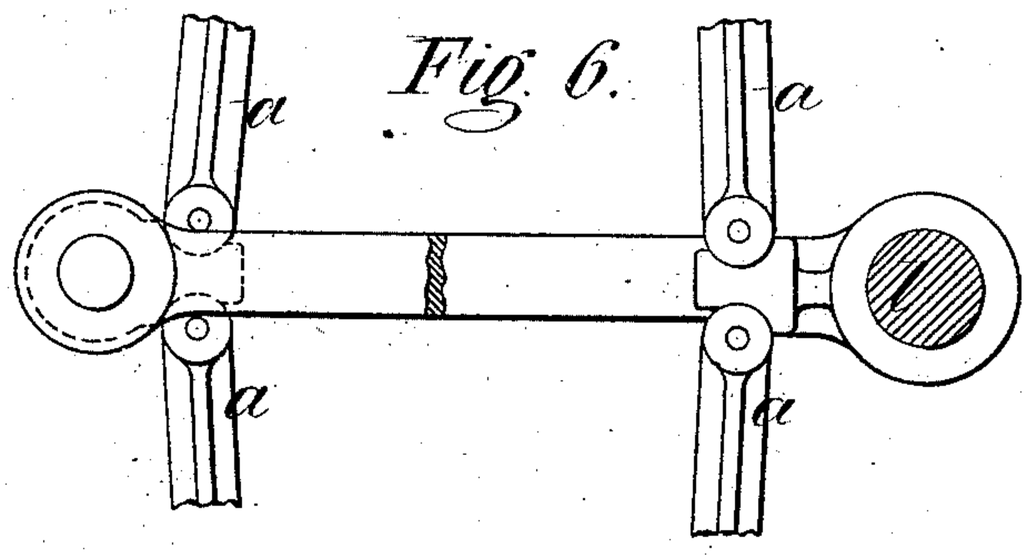


Fig. 6.



Witnesses
Harold Serrell
J. Staib

Inventor
per M. Stonehouse
Lemuel W. Serrell
Atty

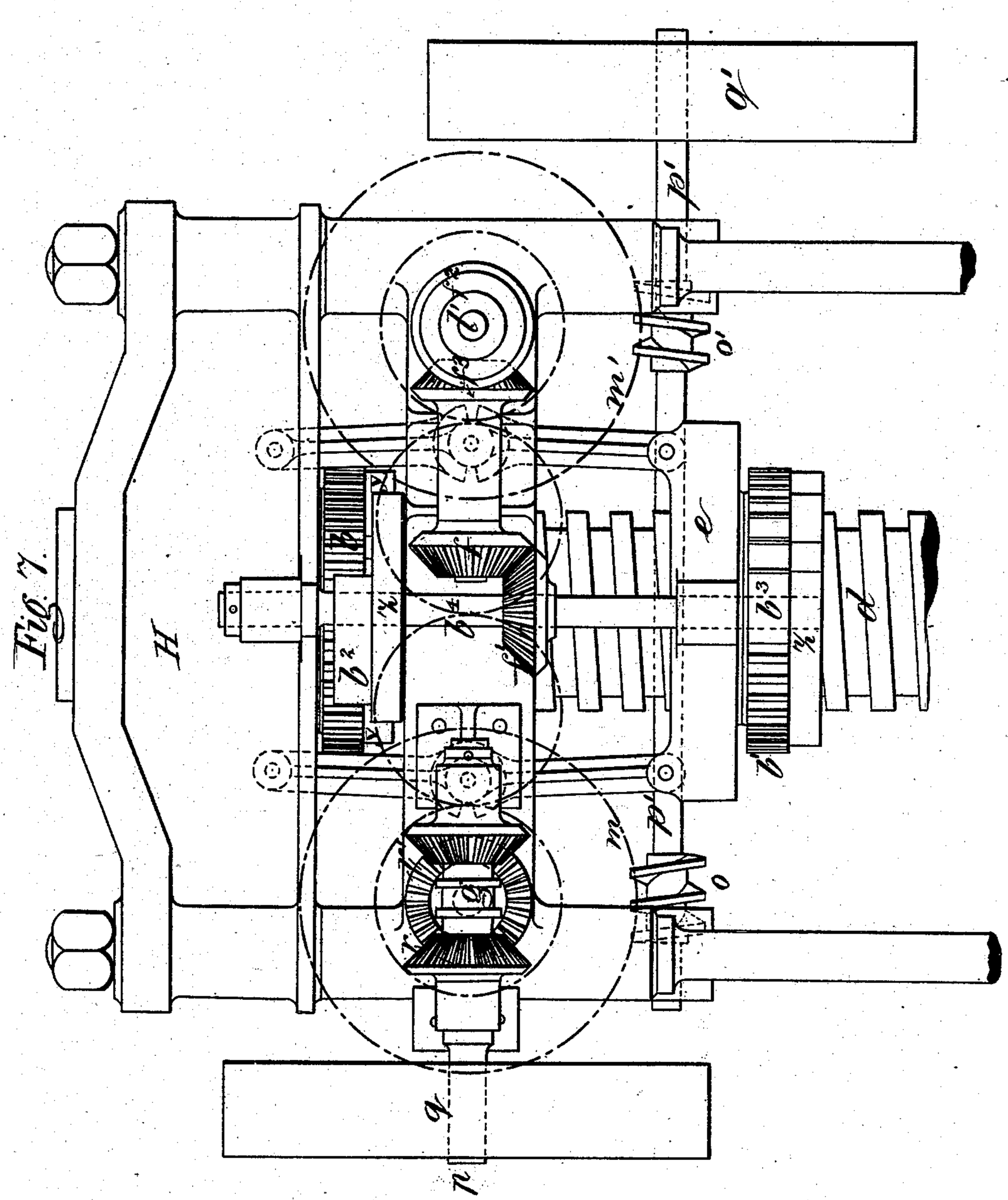
(Model.)

8 Sheets—Sheet 5.

M. STONEHOUSE.

Kruckle Joint Action for Presses, &c.

No. 238,983. **Patented March 15, 1881.**



Witnesses
Harold Serrell
I. Staib

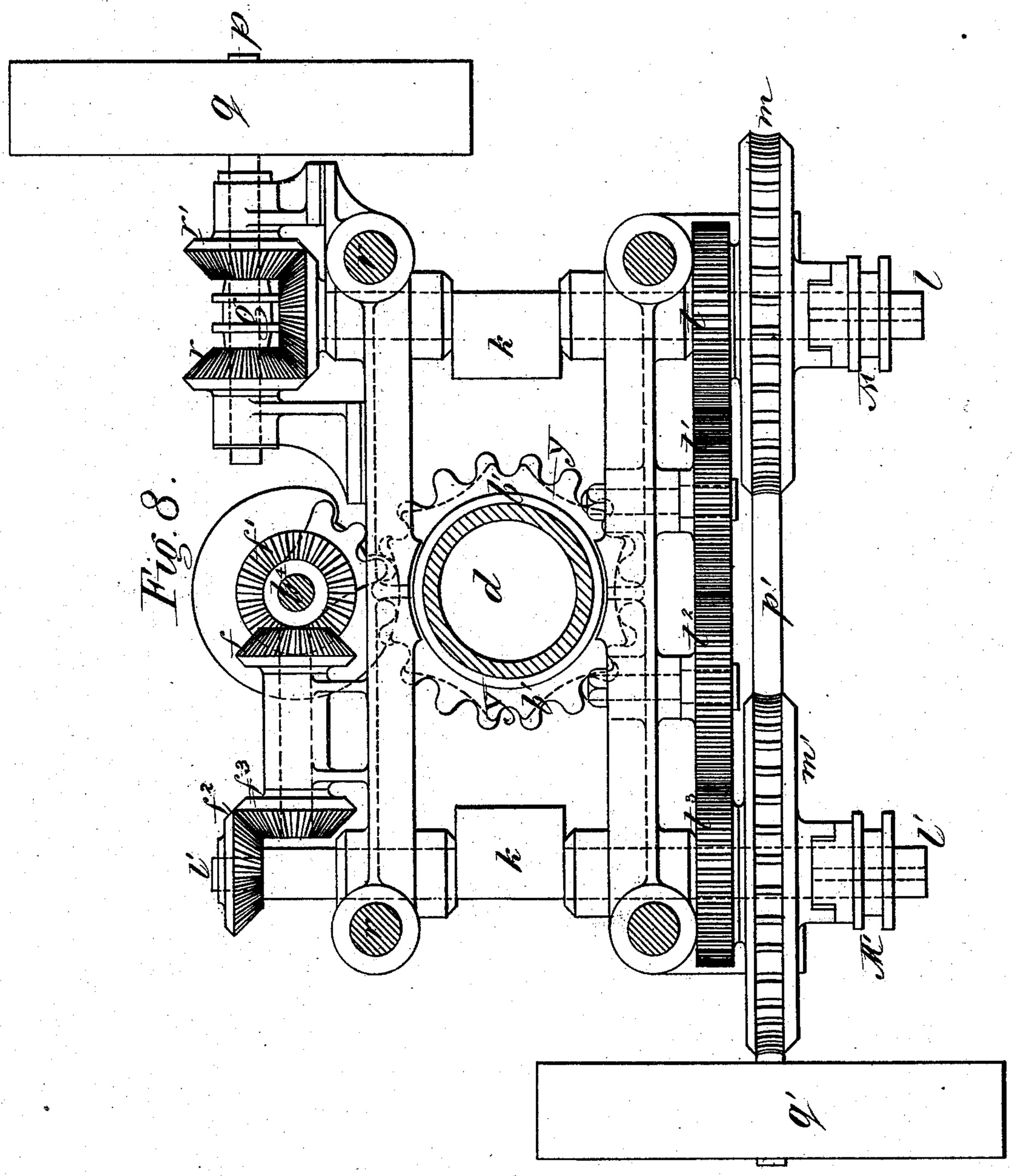
Inventor
per M. Stonehouse
Lemuel W. Serrell atty.

(Model.) 8 Sheets—Sheet 6.

M. STONEHOUSE.

Knuckle Joint Action for Presses, &c.

No. 238,983. Patented March 15, 1881.



Witnesses
Harold Serrell
J. Stair

Inventor
per M. Stonehouse
Lennie W. Serrell
atty

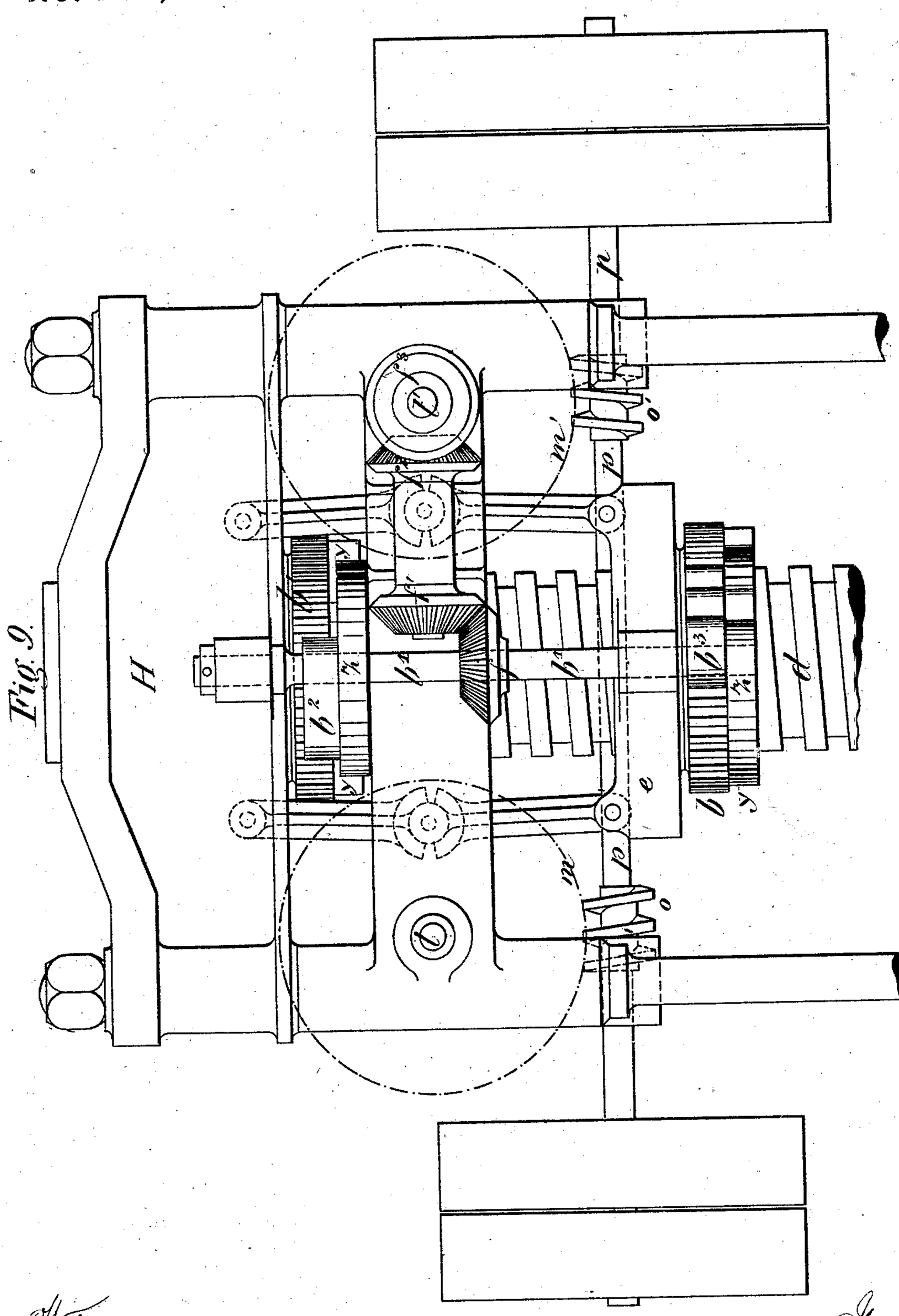
(Model.)

8 Sheets—Sheet 7.

M. STONEHOUSE.

Knuckle Joint Action for Presses, &c.

No. 238,983. Patented March 15, 1881.



Witnesses
Harold Serrell
J. Staib

Inventor
per M. Stonehouse
Lemuel W. Serrell atty.

(Model.)

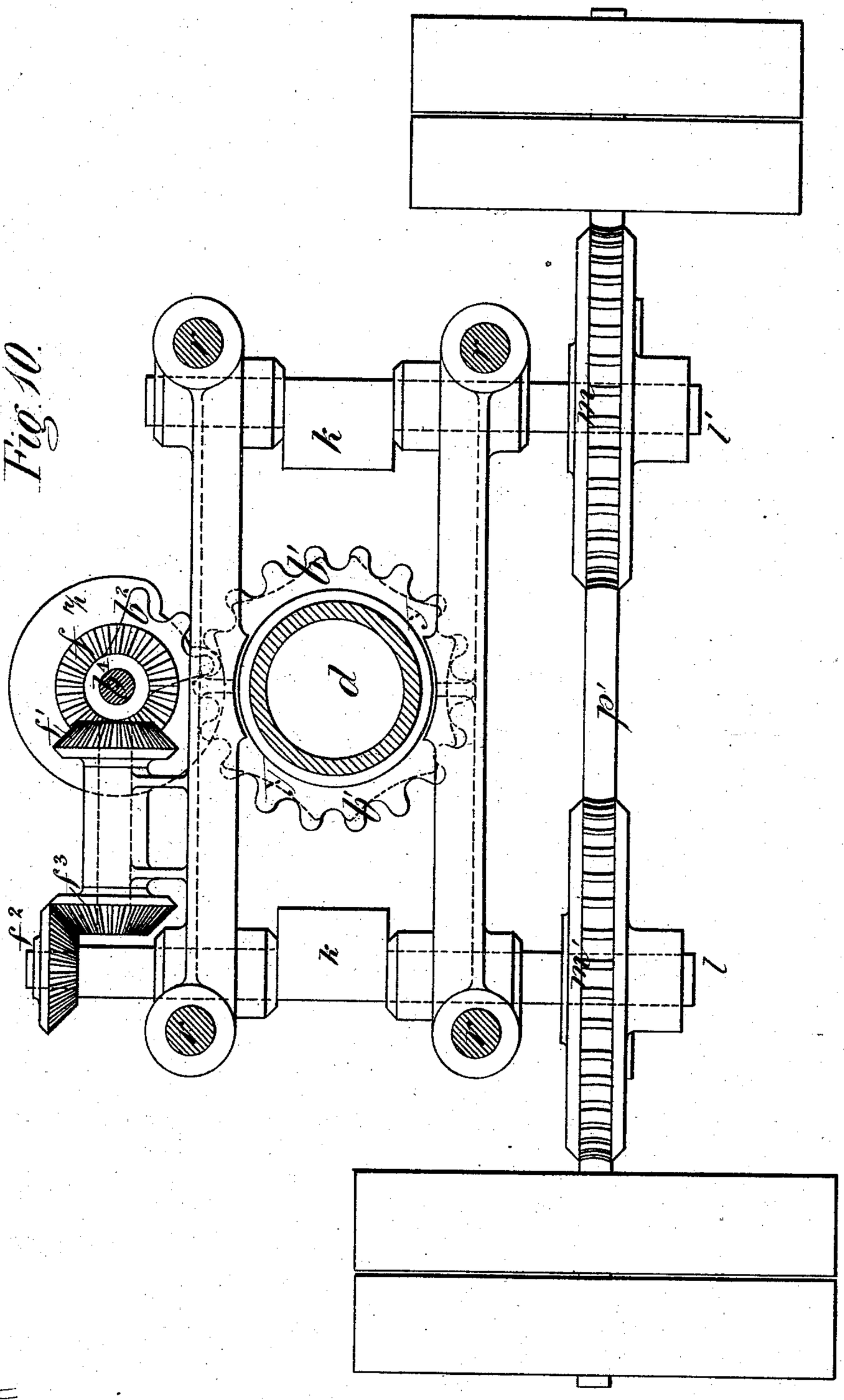
8 Sheets—Sheet 8.

M. STONEHOUSE.

Knuckle Joint Action for Presses, &c.

No. 238,983. **Patented March 15, 1881.**

Fig. 10.



Witnesses
Harold Serrell
J. Staib

Inventor
per M. Stonehouse
Lemuel W. Serrell, atty

UNITED STATES PATENT OFFICE.

MARSHALL STONEHOUSE, OF SOUTH STOCKTON-ON-TEES, COUNTY OF YORK, ENGLAND.

KNUCKLE-JOINT ACTION FOR PRESSES, &c.

SPECIFICATION forming part of Letters Patent No. 238,983, dated March 15, 1881.

Application filed October 25, 1880. (Model.) Patented in England April 27, 1880.

To all whom it may concern:

Be it known that I, MARSHALL STONEHOUSE, of South Stockton-on-Tees, in the county of York, England, have invented new and useful Improvements in Knuckle-Joint Actions for Presses and other Pressing or Forcing Apparatus, (for which I have obtained a patent in Great Britain on the 27th day of April, 1880, No. 1,723,) of which the following is a specification.

The object of this invention is to obviate the disadvantages inherent in knuckle-joint or toggle actions as heretofore usually made, and to give the platen or follower, or other equivalent part of a press or other pressing or forcing apparatus, any required length of travel with a force or pressure as near as may be equal throughout. I give the knuckle-joint arms reciprocating motion by any suitable means, and combine the said arms with the stationary head, with a sliding head, and with the platen or follower, the latter being connected to a pressing-screw having nuts which are caused to revolve; or there may be more than one sliding head or more than one screw.

In the drawings, Figure 1 is a front elevation of my improved press, partly in section. Fig. 2 is a side elevation of the same. Fig. 3 is a sectional plan, showing the eccentrics, shafts, and driving-wheels. Fig. 4 is a sectional plan, showing the screw-shaft and sliding head. Fig. 5 is a sectional plan, and Fig. 6 an elevation, of an arrangement by means of which both toggle-arms can be operated from one shaft. Fig. 7 is a front elevation, and Fig. 8 a plan, partially in section, of a modified form of this press, in which gearing is used for communicating power and motion to the parts. Fig. 9 is an elevation, and Fig. 10 a plan, partially in section, of a simpler form of press, the actuating-shaft in which can be run slowly and powerfully when applying the pressure in the press, or more rapidly in returning the parts to their normal position.

The shaft p is caused to revolve by belt on the pulley q, and has a right-hand worm, o, and a left-hand worm, o', which impart slower revolving motion to the worm-wheels m and m' on the shafts l and l', respectively. These latter have eccentrics k, which work in blocks k', whereon the connecting-pieces k^3 are free to slide. To the latter are jointed the toggle-arms a and a'. The upper ends of the arms a and a' are jointed to the stationary press-head H, and the lower ends to the sliding head e and to the sliding head e', and both these heads are bored to fit easily on the external part of the thread of the pressing-screw d, which also passes freely through the head H, which acts as a guide, but at the same time is prevented from turning therein by a gib, e^2, which projects into a slot formed into said screw d, leaving the latter free to move up or down; and v is the platen or follower on the bottom end of the screw d.

Underneath the sliding heads e and e' there are two nuts, b and b', working on the screw d. These nuts are formed as tooth-wheels, as shown, and are caused to revolve intermittently and alternately by means of the tooth-sectors b^2 b^3, or pinions having teeth on only part of their circumference, as shown clearly in Fig. 4, and they are somewhat deeper than the nut-wheels b and b'. These are mounted on the vertical spindle b^4, which is revolved by chain, strap, or pulley gear either in one direction or the other, right-round or left-round, from the shaft l or the shaft l', which latter revolve continuously in opposite directions, as shown by the arrows, Fig. 1.

g is a clutch sliding on a feather on the shaft b^4, and, by means of the lever s, capable of being thrown into gear with the loose chain-pulley f' or t. The pulley f' is driven at a quick speed from the pulley f^2 on the shaft l', the driving-chain passing also over the guide-pulley x on the spindle b^4 and the guide-pulley x' on the spindle l'. The pulley t is driven at a slow speed from the pulley f on shaft l, as shown in plan view, Fig. 3.

To insure a regular and reliable motion of the sliding heads e and e' and corresponding action or gearing of the sector-pinions b^2 b^3 with the right teeth or the same teeth of their nut-wheels b and b' at each revolution of the shaft b^4, it is necessary for this purpose that each nut b' and b have a star-wheel, y, and each sector-pinion b^2 b^3 a corresponding cam, z, gearing therewith, as shown in Fig. 4.

The driving-shaft p being caused to revolve,

the shafts *l* and *l'* are driven in opposite directions by the worms *o* and *o'* and worm-wheels *m* and *m'*. The reciprocating motion imparted by the eccentrics *k* to the blocks *k'* and connecting-pieces k^3 causes the toggle-arms *a a'* to bend and straighten alternately, and so move the screw *d* and platen *v* downward. The clutch *g*, by a lever shown in dotted lines, Fig. 1, is thrown into gear with the chain-pulley *t*, causing the shaft b^4 to turn round from right to left. The tooth sector-pinions b^2 b^3 will each in its turn impart part of a left-to-right revolution to the nuts *b* and *b'*, respectively, the cams *z* and star-wheels *y* retaining them securely in that position until they are again moved by the toothed sectors b^2 and b^3. The nut-wheels, being revolved from the left to the right, will thus rise, while the sliding heads *e* and *e'* are raised alternately by the bending toggle-arms *a a'*. The screw *d* and follower *v*, not being able to turn, will remain stationary until, on the downstroke caused by the straightening toggle-arms, said screw *d* will be forced down with the sliding heads *e e'* and through the stationary head H, and so the movements are repeated alternately. When the platen *v* has traveled the required stroke, (which may be any desired length,) the clutch *g* is thrown out of gear with the pulley *t* automatically or by hand. The platen *v* may now be brought up quickly by throwing the clutch *g* in gear with the pulley *f'*, whereby the nut-wheels *b b'* are revolved in the opposite direction, causing the platen *v* to rise with the screw *d*.

w is the receptacle into which the material to be compressed is placed.

The arms *a a* may, if desired, be worked from one shaft having three eccentrics, and on the shaft *l* are formed said eccentrics. The outside ones, *k' k'*, work the arms *a* on the left-hand side, and the center eccentric, k^2, works the arms *a* on the right-hand side, as shown in Figs. 5 and 6, the other parts of the press being constructed and operating the same as described, and shown by Figs. 1 to 4, inclusive.

Figs. 7 and 8 show a press in which the spindle b^4 is caused to revolve by means of bevel-gear with a slow motion and a quick motion. On the shaft *p'* of the slow-motion strap-pulley *q'* are right and left hand worms or screws *o o'*, gearing into worm-wheels *m m'* on the shafts *l l'*, for working the eccentrics. On the shaft *l'* there is a miter-wheel, f^2, which gears with a miter-wheel, f^3, and on the spindle of the latter there is a miter-wheel, *f*, which gears with a miter-wheel, *f'*, on the vertical spindle b^4, communicating the slow descending motion to the screw *d* and platen *v* by means of the tooth sector-wheels b^2 and b^3 on the spindle b^4, said sector-wheels alternately communicating a partial revolving motion to the nut-wheels *b* and *b'* on the screw *d*, causing the latter to descend slowly in the same way as described with reference to Figs. 1 to 4, only that in this case I employ one sliding head *e* only, instead of two, the nut-wheels *b* working against the stationary head H and the nut-wheel *b'* against the sliding head *e*.

q is the pulley for the quick-motion shaft *p*, which is brought into action by suitable means when the quick down or up motion is required for the screw *d* and follower *v*.

On the shaft *p* there is a sliding clutch, *g*, for bringing the shaft *p* in fixed connection with the miter-wheel *r* or the miter-wheel *r'*, thereby causing the eccentric-shaft *l* to revolve in one direction or the other, for lowering or raising the screw *d* rapidly, and, by the spur-wheels *t t'* t^2 t^3, to communicate motion to the other eccentric-shaft, *l'*, which acts on the spindle b^4. The shafts *l* and *l'* have clutches M and M', for putting in gear the worm-wheel *m* and *m'*, according as required in working the press by a slow or a quick motion through the quick-motion pulley *q'* or the slow-motion pulley *q*. By the above arrangement it will be seen that the screw *d* may be given varied speed for the downstroke or upstroke.

A plan of a much simpler arrangement of press is shown in Figs. 9 and 10, in which the speed is uniform throughout the upstroke and the downstroke of the screw *d*, but where, by the driving-strap-pulley arrangement outside of the press itself, the screw *d* may nevertheless receive uniformly slow descent and uniformly quick ascent; or, if desired, by means of cone-pulleys outside of the press itself, the screw *d* may receive a gradually-decreasing speed in the descent and a gradually-increasing speed in the ascent. The worm-shaft *p* is in this case provided with fast and loose belt-pulleys at each end, one belt being open and the other crossed, so that it may receive a right-hand or left-hand revolving motion—one for the ascent and the other for the descent of the screw *d*. The worms *o* and *o'*, gearing with the worm-wheels *m* and *m'*, cause the eccentric-shafts *l* and *l'* to revolve as before. The vertical spindle b^4 receives motion from the shaft *l* by means of the miter-wheels *f f'* f^2 f^3. It will thus be seen that the miter-wheels *r r*, (shown in Figs. 7 and 8,) and also the spur-wheels *t t'* t^2 t^3 and clutches M M', are omitted.

The arms may be connected directly to the platen and the gearing be between the upper ends of arms and the head-block.

The press may obviously be arranged vertically inverted or horizontal.

For obtaining a quick ascent or descent I may, by suitable gear, cause the barrel *d* to revolve and so screw it up through the nut-wheels *b'* and b^2.

I claim as my invention—

1. The toggle-arms *a a'*, stationary head H, and sliding heads *e e'*, in combination with the alternately-revolved nut-wheels *b b'*, pressing-screw *d*, and platen *v*, to which heads and nut-wheels alternate step-by-step motions are communicated, substantially as described.

2. The toggle-arms *a a'*, sliding heads *e e'*, and nut-wheels *b b'*, in combination with the motive spindle b^4, toothed sector-wheels b^2 b^3,

cams *z*, and star-wheels *y*, said parts communicating an alternate step-by-step and descending or ascending motion to the screw *d* and platen *v*, substantially as described.

3. The toggle-arms *a*, in combination with the stationary head H and sliding head *e*, and the alternately-revolved nut-wheels *b b'*, screwed cams *z*, and gearing, substantially as described.

4. In combination with a pressing-screw, *d*, and the two nut-wheels *b b'* thereof, toggle-arms *a a'*, a follower mechanism for actuating the toggle-arms, and means for turning the nut-wheels *b b'* alternately when the strain is relieved from such nut-wheels, substantially as specified.

MARSHALL STONEHOUSE.

Witnesses:

W. W. SCOTT,

GEO. LAMB SCOTT.