T. R. Hopkins,

Cotton Press.

No 25,232.

Patented Aug. 23, 1859.

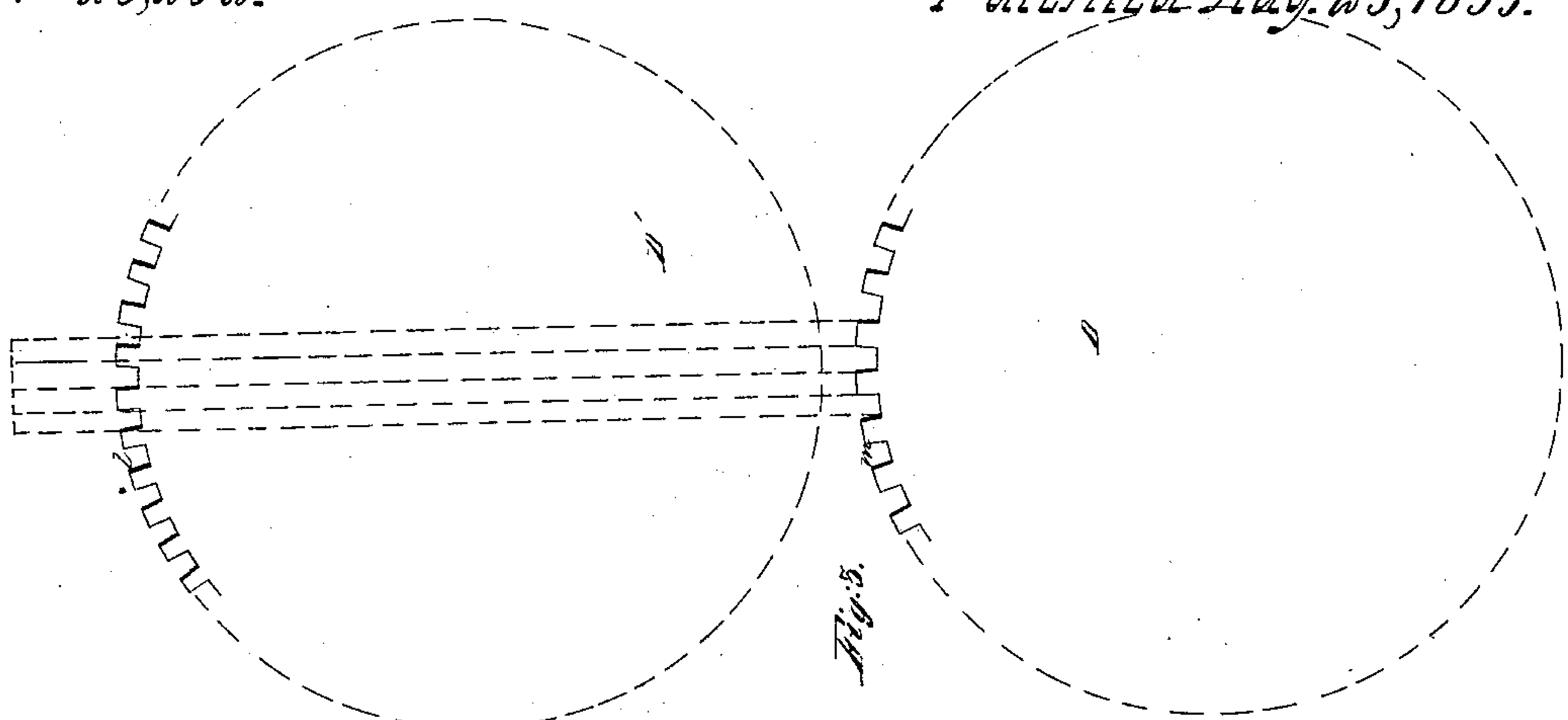

Fig: 5.

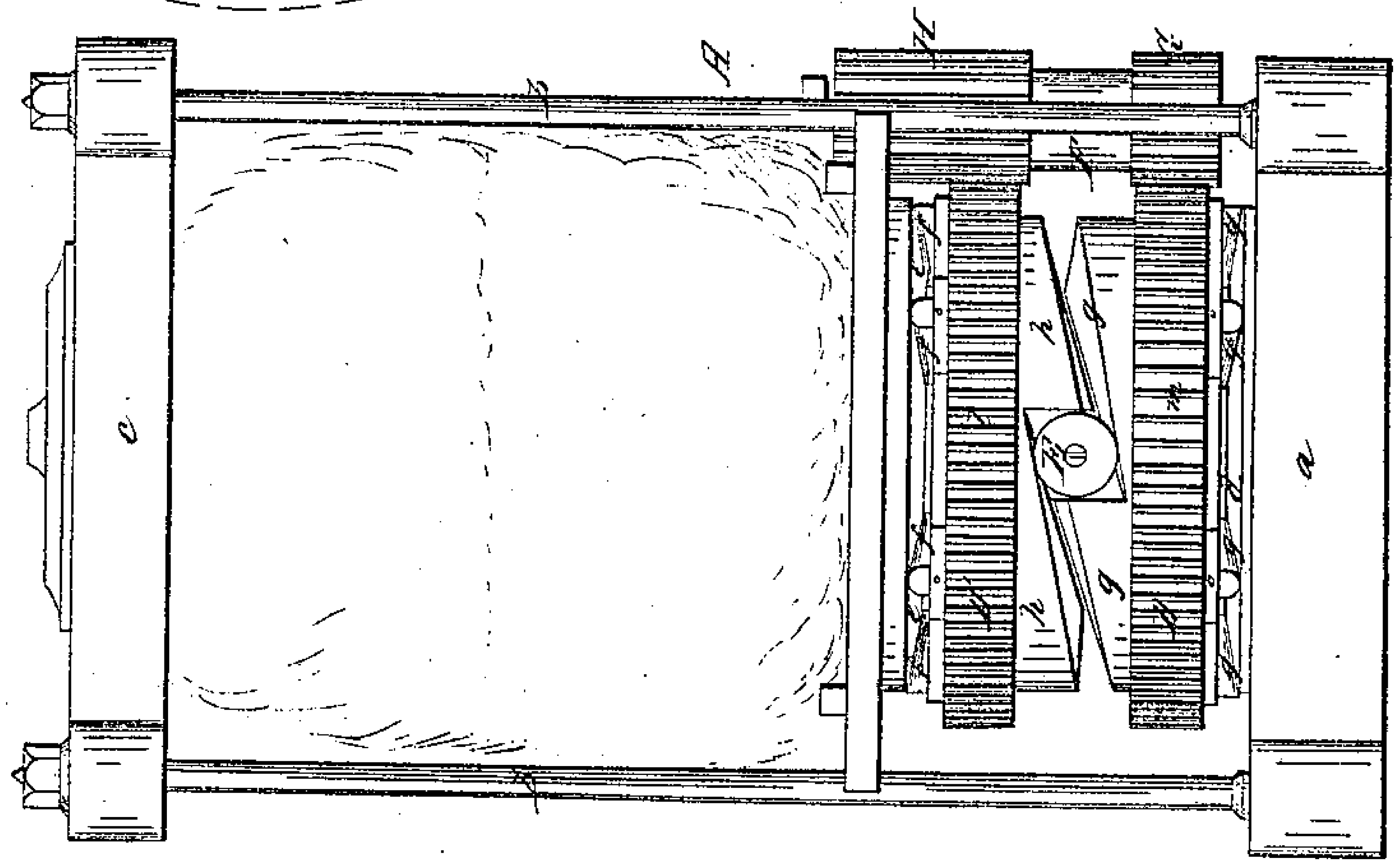

Fig: 1.

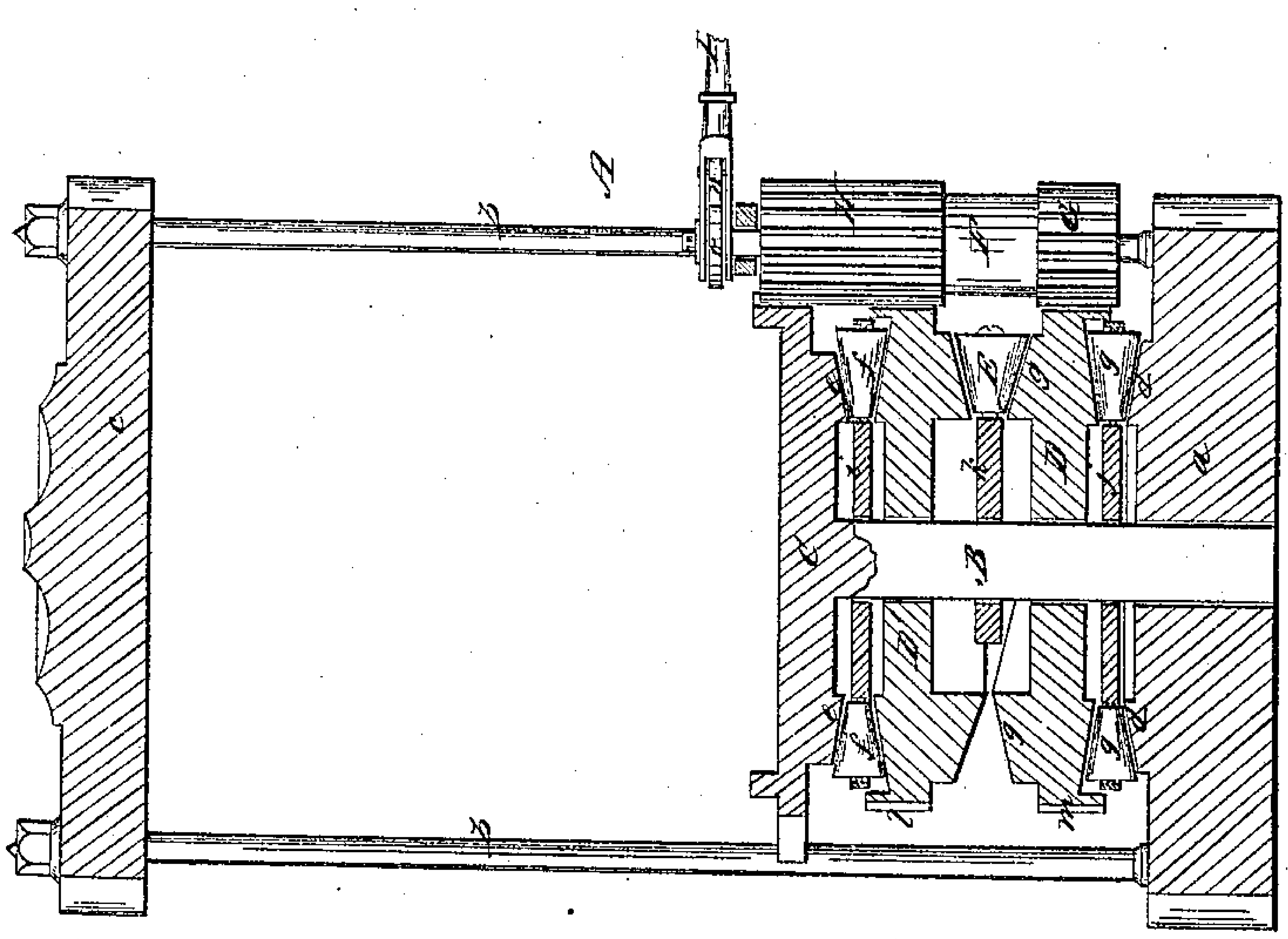

Fig: 2.

Witnesses.

Wm. S. Pleasants

J. Van Hollnash

Inventor.

Tho R Hopkins.

AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS)

UNITED STATES PATENT OFFICE.

THOMAS R. HOPKINS, OF PETERSBURG, VIRGINIA, ASSIGNOR TO HIMSELF AND R. E. ROBINSON, OF SAME PLACE.

IMPROVEMENT IN CAM-PRESSES.

Specification forming part of Letters Patent No. **25,232**, dated August 23, 1859.

To all whom it may concern:

Be it known that I, THOMAS R. HOPKINS, of Petersburg, in the county of Dinwiddie and State of Virginia, have invented a new and useful Anti-Friction Differential Cam-Press; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a front view of a press constructed after my invention. Fig. 2 is a vertical section of the same. Fig. 3 represents plan views of the gearing for producing the differential movement.

Similar letters of reference in each of the several figures indicate corresponding parts.

The nature of my invention consists in operating a press-follower or other part of a machine which is required to give a gradual pressure by means of the combined agency of two differentially-toothed disks, which revolve at unequal speeds two sets of reverse-acting cams, and intermediate friction-rollers or their equivalents, substantially as hereinafter described.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

In the drawings I have shown my invention applied to a press; but I do not intend to limit its use to any particular machine, as it is obvious that great advantage will be derived from it in all cases where it is employed for elevating or lowering that part of a machine which is required to give a gradual pressure.

A represents the frame of the press. It may consist of a base, *a*, uprights *b b*, and platen *c*, as shown. On the base *a* a beveled plane, *d*, is formed.

B is a vertical rising and falling shaft. It passes up loosely through the base *a*, and has the follower C fastened securely to its upper end, said follower having a beveled plane, *e*, similar to *d*, on its under side.

D D′ are two disks arranged loosely on the shaft B, and between the follower C and base *a*. On the under side of the lower disk and the upper side of the upper disk conical friction-rollers *f g* are placed radially, said rollers being hung in frame *i j*, which are fitted loosely over the shaft B, and rolling against the beveled planes of the base and follower, so as to prevent friction as the disks revolve. On the upper side of the lower disk and on the under side of the upper one beveled inclined cams *g h* are formed, the cams *g* of the lower disk opposing those of the upper disk, as represented. These cams may be graduated in such a manner as to produce motion at one point and intensity of pressure at another. Between the cams of the disks conical friction-rollers E E are arranged, said rollers being hung in a frame, *k*, which is fitted loosely over the shaft B. On the circumference of the disks D D′ spur-teeth *l m* are cut. The upper disk, D′, is constructed with one more tooth than the lower one, in order to produce a differential movement between the two disks.

F represents a vertical shaft with a short pinion, G, and a long pinion, H, constructed or arranged on it. The long pinion gears into the teeth of the upper disk, and is made of considerable length, so that it shall remain in gear while the upper disk rises and elevates the follower. The short pinion gears into the teeth of the lower disk, which is stationary so far as vertical movement is concerned, but is capable of revolving.

I is a lever attached fast to the upper end of the pinion-shaft, and furnished with a click or pawl, *n*, which takes into a ratchet, *o*, which is also attached fast to the pinion-shaft.

To employ my invention for operating a punch, I have a shaft to pass through a head-piece, the disks, and a cross-bar, and terminate in a punch. This shaft and disks are held in place by a spiral spring above the head-piece. The upper disk in this case is stationary, so far as vertical motion is concerned, but revolves, and instead of using cog-gearing one of the friction-rollers between the disks is used to produce the revolution of the upper disk, it being confined so as only to revolve on its axis, and having a crank attached to it. The lower disk does not revolve, but has a vertical motion, as its cams are operated upon by the revolving and traveling friction-rollers, said rollers gradually rolling round and ascending the summits of the cams on the lower disk, which cams with the disk are gradually caused to descend and carry down the punch. The spring brings back the punch and all the parts to their position.

The operation of the invention as applied to

a press is as follows: The vibrations of the lever are horizontal. Let us suppose it to be moved from right to left. The pinions acted upon by the click will revolve with their common axis in the same direction, and this motion will of course turn the spur-wheels D D′, into which the pinions are geared, from left to right. Now, let us suppose the pinions to have twenty-five teeth, the lower spur-wheel one hundred teeth, and the upper one hundred and one. The lower spur-wheel, having a smaller number of teeth than the upper, will of course move a little faster. With the numbers assumed above, four revolutions of the pinions must give one of the lower spur-wheel, which will then have gained upon the upper a distance equal to the width of one tooth, which gain will be held, owing to the friction-rollers being acted upon in opposite directions by an equal force, and thus kept from returning. By a continuation of this differential motion the lower wheel with its cam will gain upon the upper until finally the most eccentric points of the cams will be opposite each other and separated by the rollers. Now, the lower cam being fixed in its horizontal position, the upper spur-wheel and cam and the follower must have been carried upward a distance equal to the sum of the eccentricities of the cams. In order to return the follower and cams to their original position, the click must be reversed and the lever moved in an opposite direction—*i. e.*, from left to right. It might be supposed that these cams under a very heavy pressure would return of themselves. There is certainly a tendency in each of them to do so; but this tendency, being exerted in opposite directions, cannot result in any motion. They will consequently rest in any position, but require very little effort to return them when the weight is withdrawn.

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

Operating a press-follower or other part of a machine which is required to give a gradual pressures by means of the combined agency of two differentially-toothed disks, D D′, which revolve at unequal speeds, two sets of reverse-acting cams, *h g*, and intermediate friction-rollers, E, or their equivalents, substantially as herein described.

The above specification of my improved anti-friction differential cam-press signed by me this 19th day of July, 1859.

THOS. R. HOPKINS.

Witnesses:

THO. S. PLEASANTS,

JOS. VAN HOLLNASH.