C. L. LIBBY.

AUTOMATIC FEED TRIP MECHANISM.

APPLICATION FILED JUNE 29, 1903.

917,320.

Patented Apr. 6, 1909.

6 SHEETS—SHEET 1.

Fig. 1.

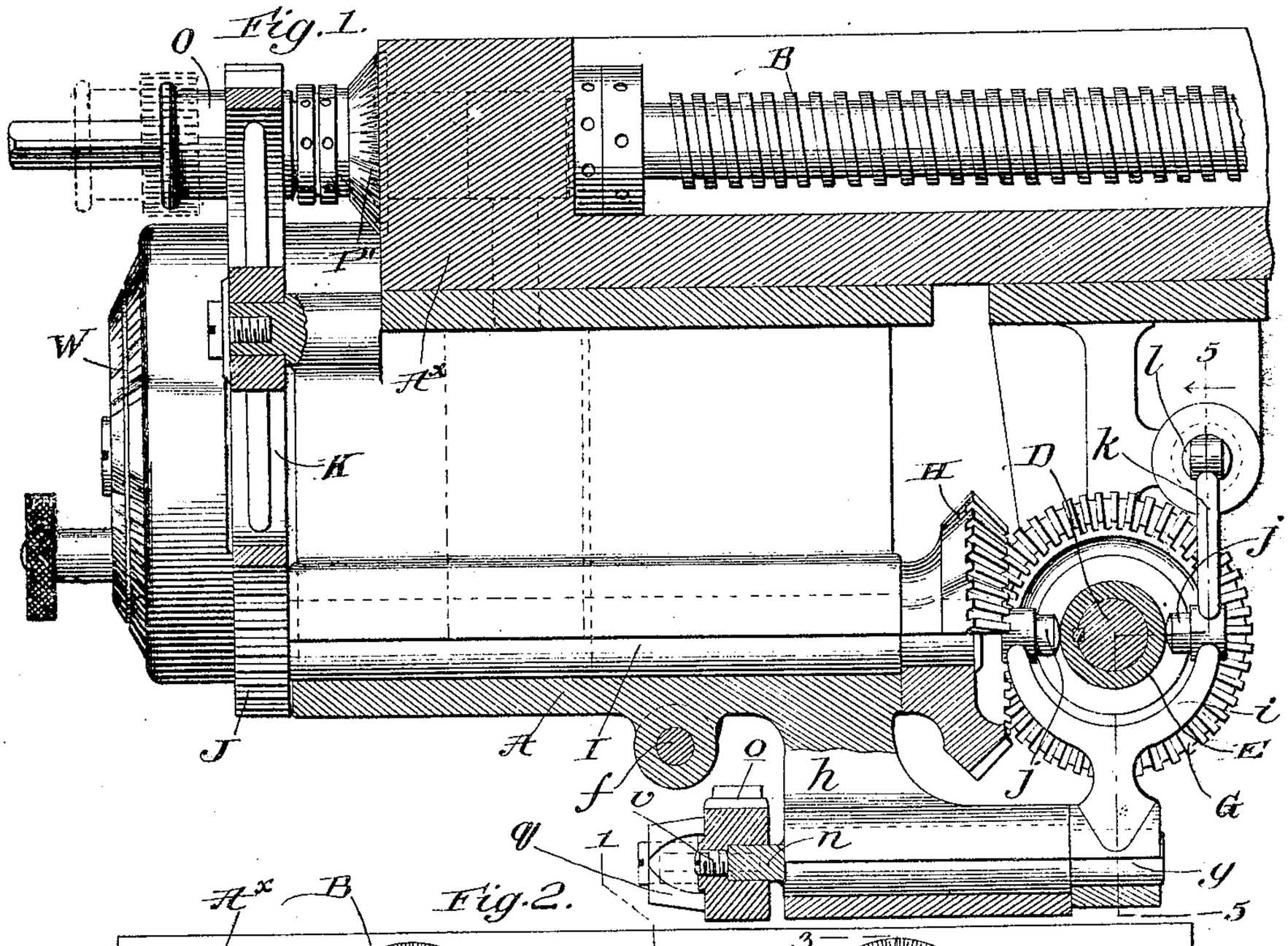
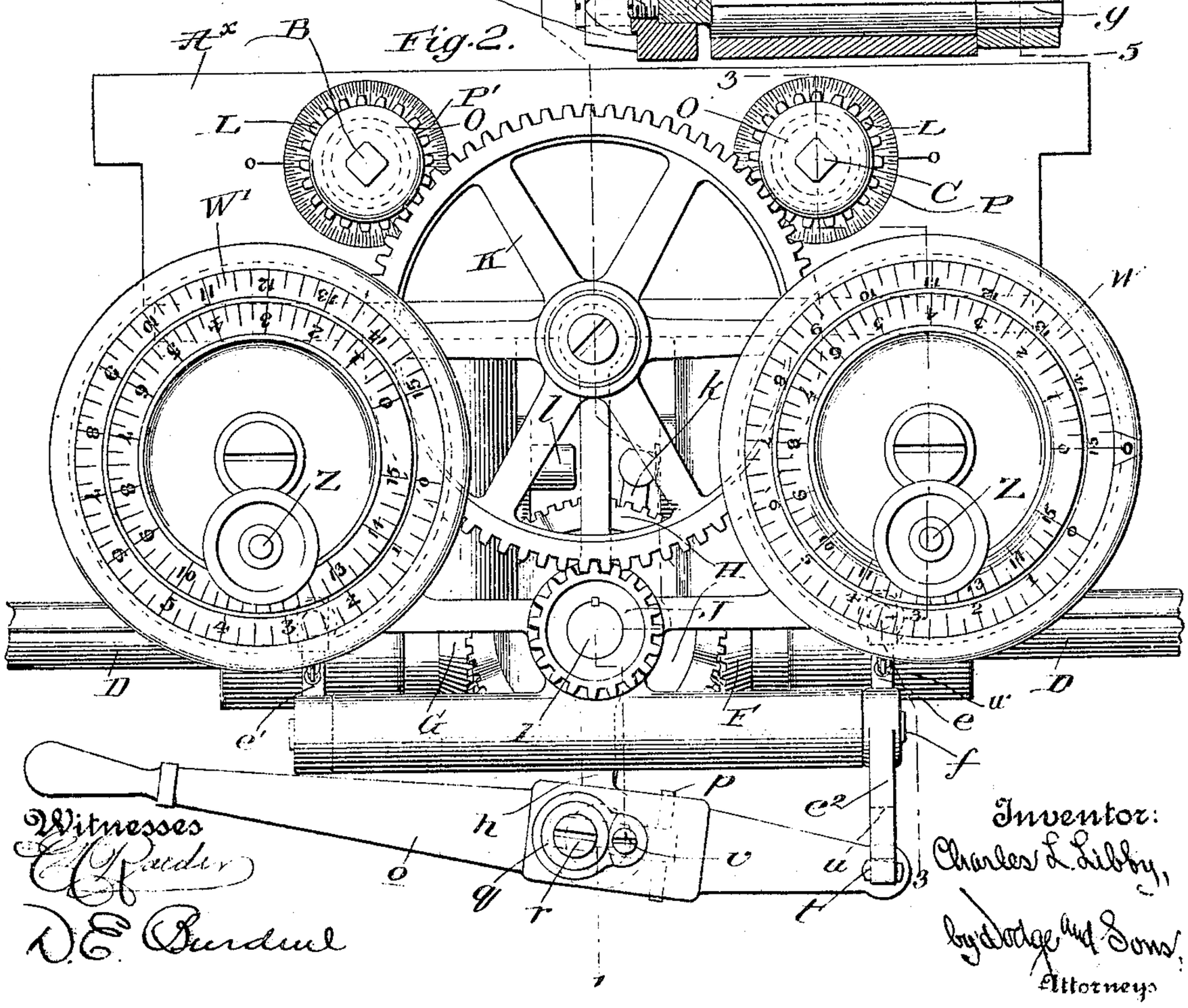


Fig. 2.



Witnesses

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6 SHEETS—SHEET 2.

Fig. 3.

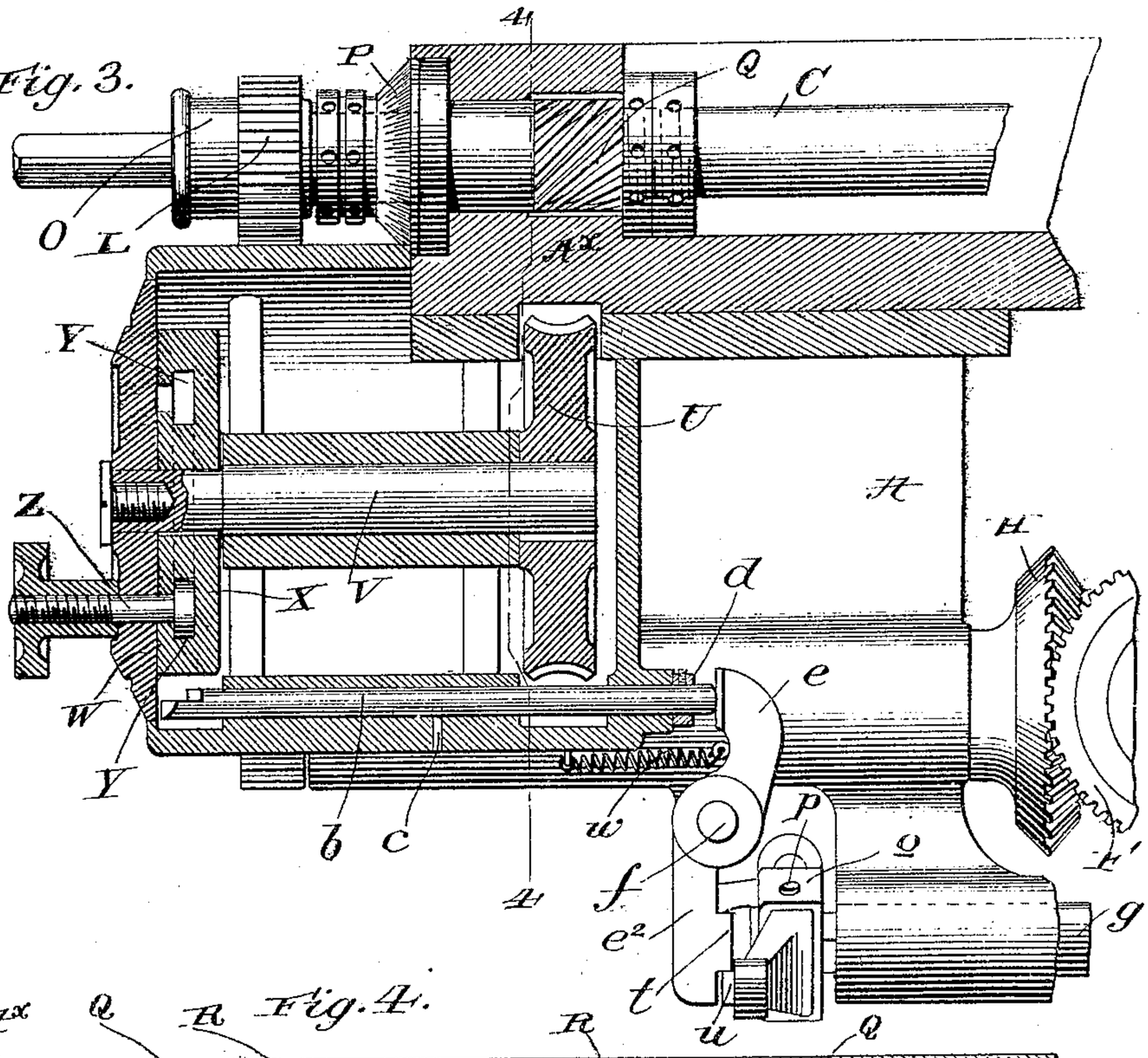
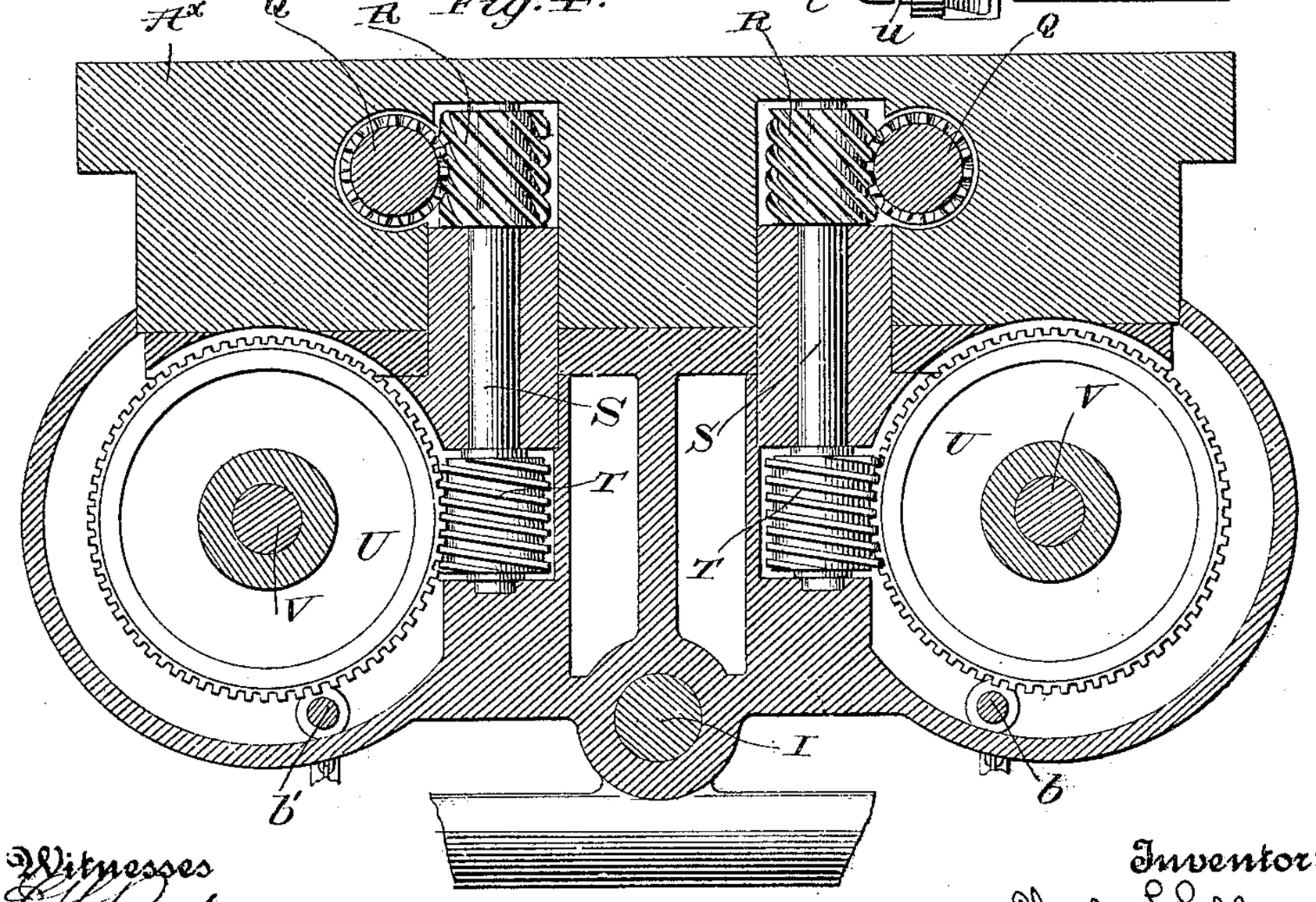


Fig. 4.



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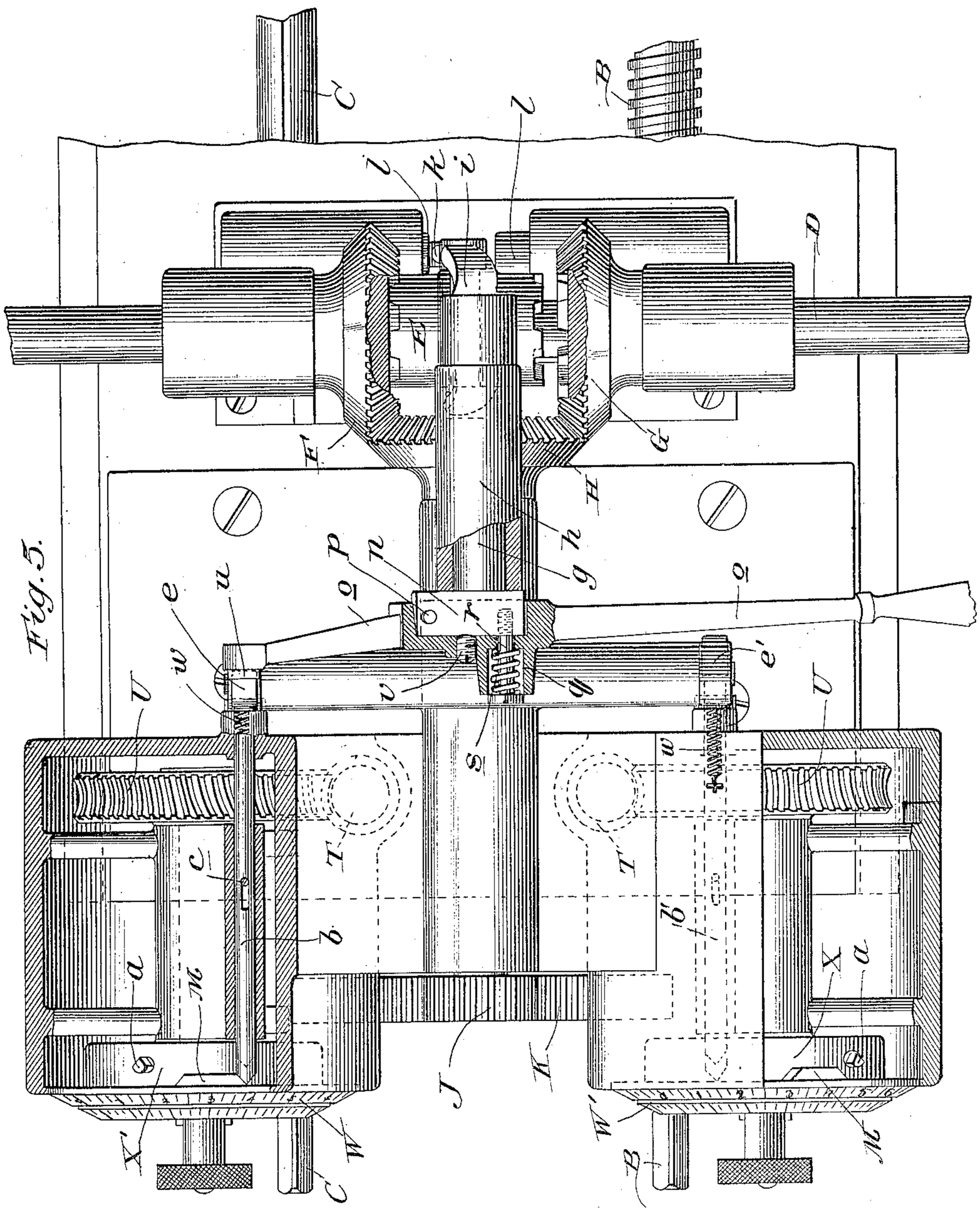

Fig. 5.

Witnesses

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6 SHEETS—SHEET 4.

Fig. 6.

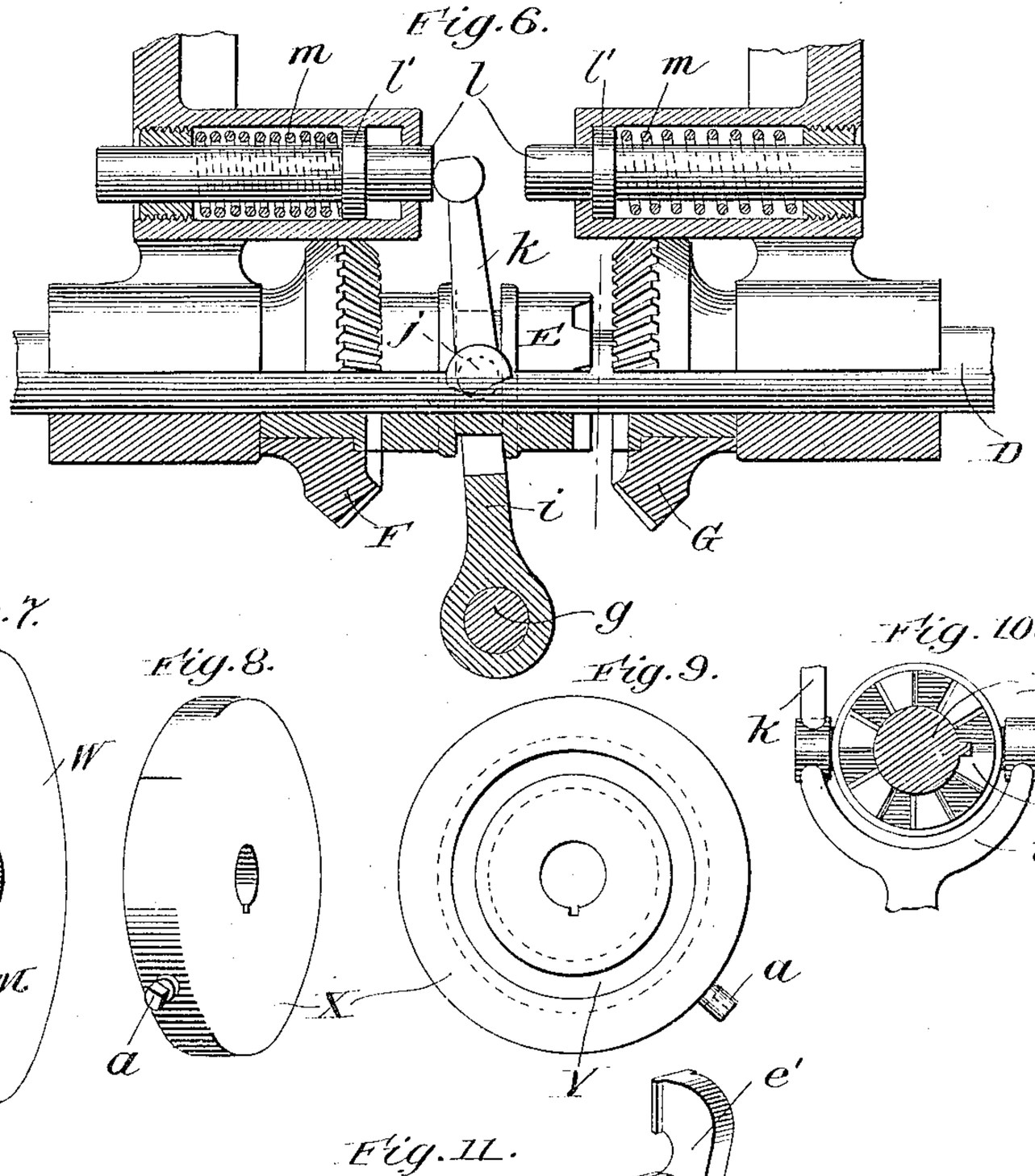

Fig. 7.

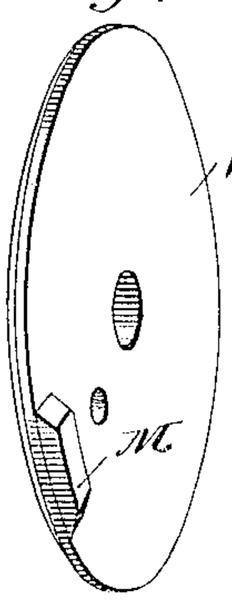

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

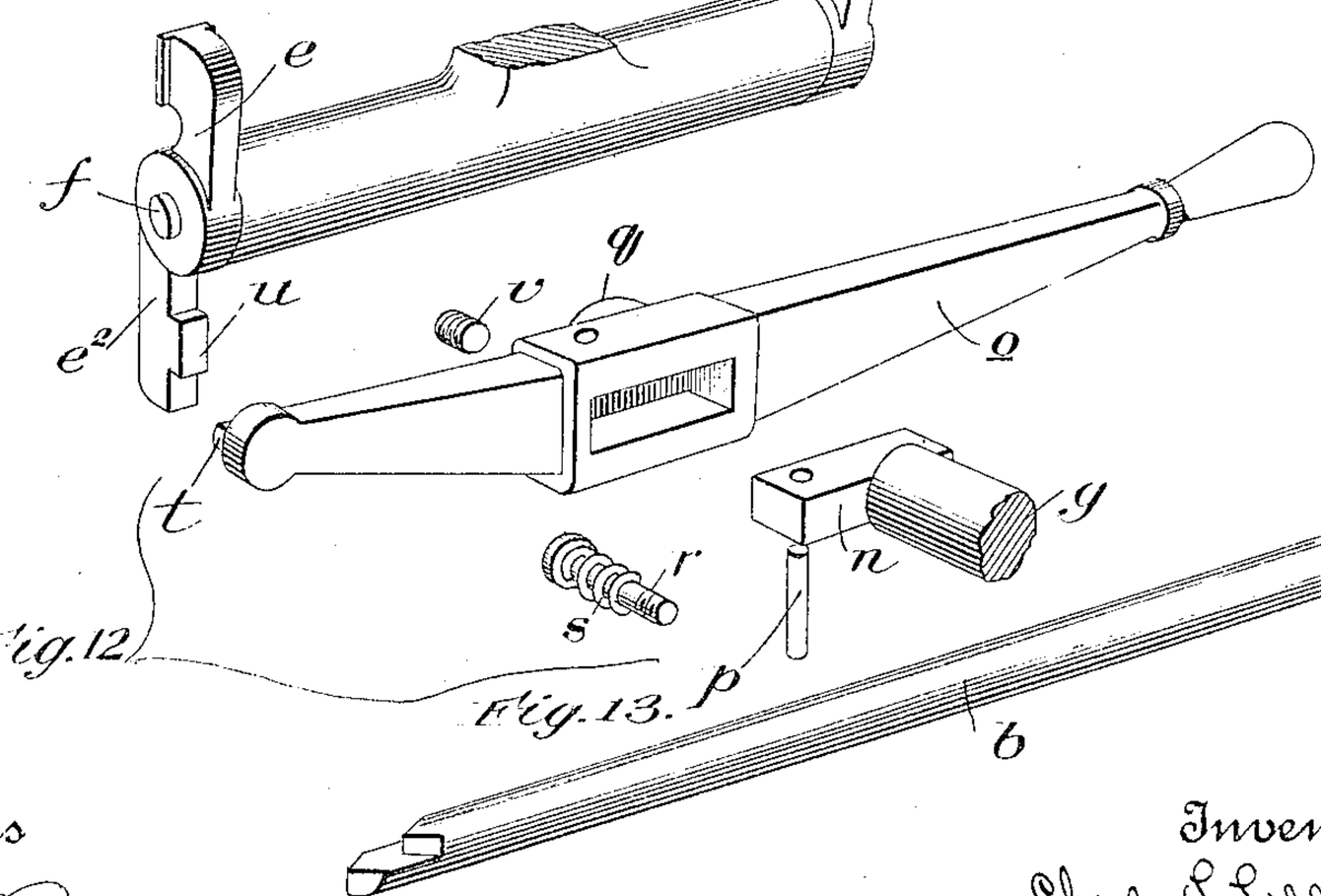

Fig. 12

Fig. 13.

Witnesses

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6 SHEETS—SHEET 5.

Fig. 14.

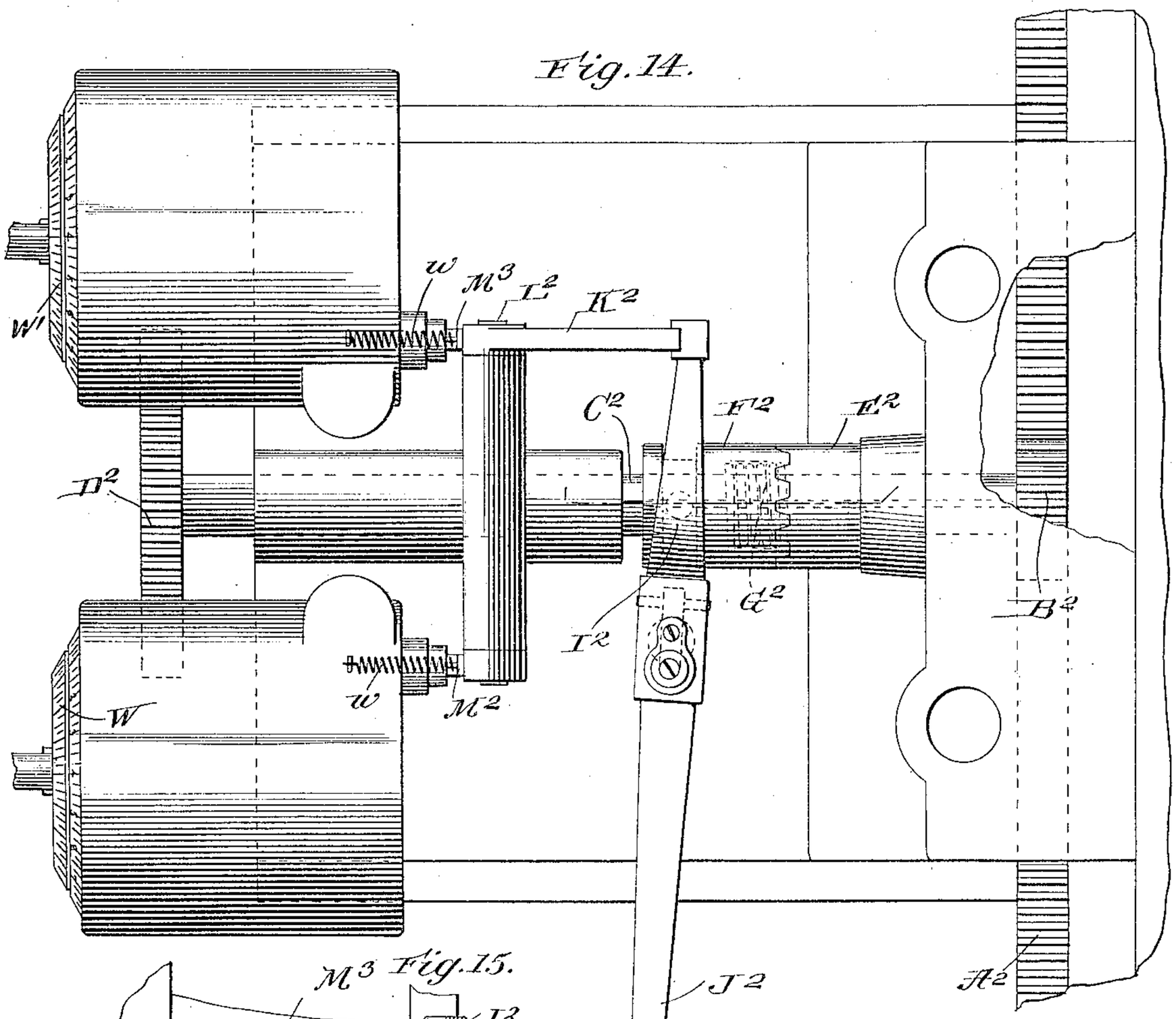


Fig. 15.

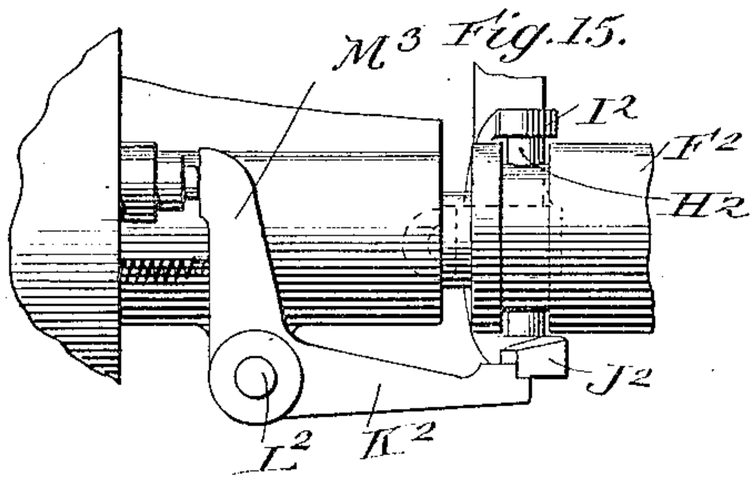
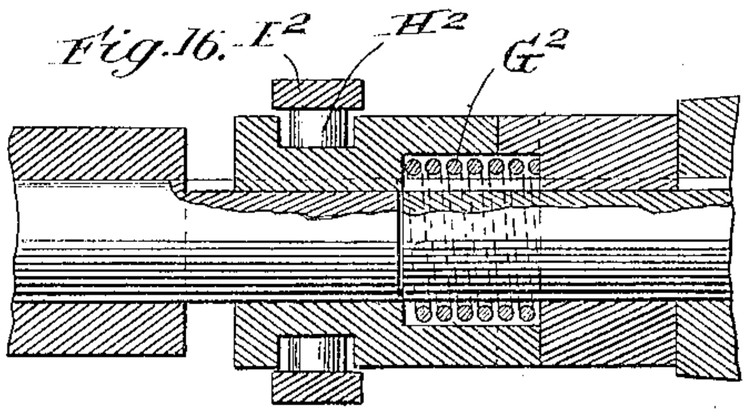


Fig. 16.



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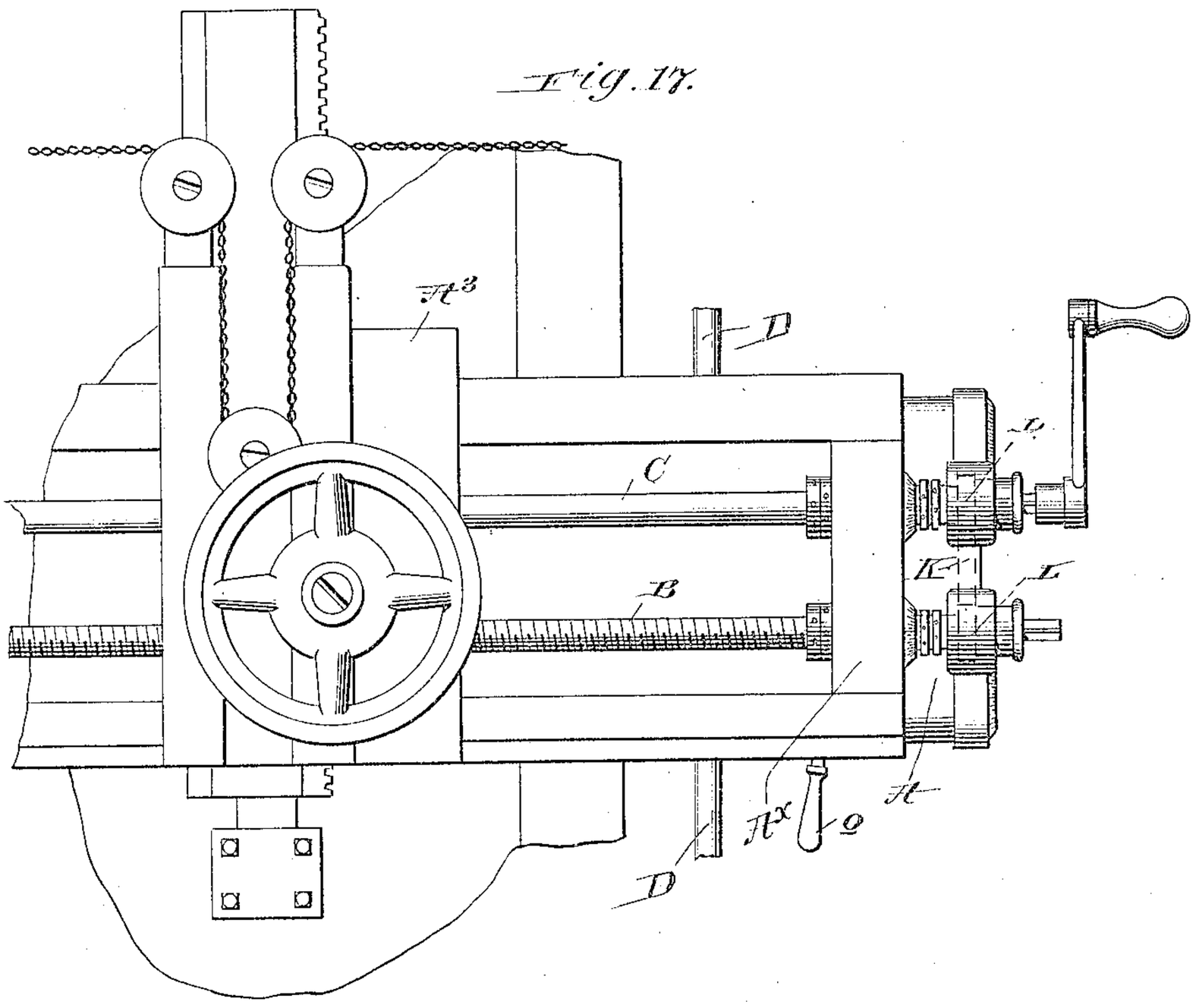
6 SHEETS—SHEET 6.

Fig. 17.



WITNESSES

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UNITED STATES PATENT OFFICE.

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AUTOMATIC FEED-TRIP MECHANISM.

No. 917,320. Specification of Letters Patent. Patented April 6, 1909.

Application filed June 29, 1903. Serial No. 163,623.

To all whom it may concern:

Be it known that I, CHARLES L. LIBBY, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Automatic Feed-Trip Mechanism, of which the following is a specification.

My present invention pertains to automatic feed trip mechanism as applied to machines employing a cross-rail carrying crossheads, such for instance as vertical mills, planers, milling machinery, and the like.

The object of the invention is to provide means for tripping off the feed at any predetermined point, whether the tools are moving or working in a vertical or a horizontal direction.

The arrangement of the mechanism is such that it may be set so as to feed the required distance and then throw out automatically; and, if desired, again set to feed a greater distance. The dials which are employed may also be used as a continuous scale for the extreme travel of the heads in either direction, and by the use of four dials the heads may be moved in either direction any number of inches or fractions thereof to within one one-thousandth of an inch.

In the drawings: Figure 1 is a horizontal sectional view of the mechanism shown as applied to a vertical mill cross-rail, the section being taken on the line 1—1 of Fig. 2; Fig. 2 a front elevation thereof; Fig. 3 a sectional view taken on the line 3—3 of Fig. 2; Fig. 4 a transverse sectional view on the line 4—4, of Fig. 3; Fig. 5 an elevation, portions being shown in section to more clearly illustrate certain features of construction; Fig. 6 a sectional elevation of the clutch mechanism, the section being taken on the line 5—5 of Fig. 1; Fig. 7 a perspective view of one of the dial plates, viewed from the rear, and showing the cam carried thereby; Fig. 8 a perspective view of one of the disks which work in conjunction with the dials, said disk carrying a cam which actuates the stop mechanism; Fig. 9 a front face view thereof; Fig. 10 a detail of the clutch; Fig. 11 a perspective view of the rocker-shaft and arms; Fig. 12 a similar view of the setting lever with its attendant parts; Fig. 13 a perspective view of one of the actuating rods; Fig. 14 a rear view of a modification of the invention, the stop mechanism being shown as applied to a planer; Fig. 15 a side elevation of a portion of the same; Fig. 16 a sectional view of the clutch mechanism; and Fig. 17 an elevation of a portion of a mill showing my invention applied thereto.

Referring to the first construction illustrated, A denotes the case or feed bracket, $A^{\times}$ the cross-rail, and A^{3} the tool head (see Fig. 17). The cross feed screw is denoted by B, and C indicates the feed rod.

D designates the actuating rod or shaft, to which motion is imparted in any suitable manner. Said rod has splined upon it a clutch member E, provided with teeth at its opposite ends which, when the clutch is shifted on the shaft, engage similar teeth formed on the outer face of each of the bevel-gears F, G. Said gears are free to rotate upon the actuating shaft, and are constantly in mesh with a bevel-gear H, mounted upon one end of a shaft I, a pinion J being secured to the opposite end of said shaft and meshing with a large gear K. This gear occupies a position intermediate the cross feed screw and the feed rod and meshes with pinions or gears L, mounted on the feed rod and screw. The outer ends of said last-named members are polygonal in form, and the pinions L are slidably mounted thereon, so that they must of necessity rotate with the rod and screw, but may still be moved out of mesh with the gear K, when desired. Each of the pinions or gears L is provided with an extended sleeve or collar O, in order to facilitate its manipulation.

Mounted upon the feed rod C is a dial P, having suitable graduations marked thereon, which are to be read in conjunction with a zero-mark, shown in Fig. 2. Said rod also carries a spiral gear Q, which meshes with a spiral gear R, mounted upon one end of a shaft S, a worm T being secured to the other end of said shaft. The worm T meshes with a worm gear U, carried by a shaft V, the latter having at its outer end a large dial W. A disk X is securely fastened upon shaft V in rear of said dial, said disk being provided with a T-shaped channel or groove Y. A bolt or screw Z is seated in this channel, the threaded end thereof extending through the dial and being provided with a thumb-nut, so that by manipulation of the nut the dial and disk may be locked together when the parts have been brought into any desired relation.

Disk X carries a beveled stud or cam *a*, see Figs. 5, 8 and 9, which under certain conditions, as the disk is rotated, comes into contact with the beveled face formed on the end of rod *b*. Said rod is mounted in a suitable bearing formed in the case or feed bracket A, and is prevented from turning in its seat by a pin *c*, secured in the feed bracket, and having its inner end projecting into a groove or channel formed in the rod. A collar *d* is secured upon the rod adjacent to its rear end and serves to limit its inward movement. Said rear end of the rod bears against the upper extremity or face of a rocker-arm *e*, mounted upon one end of a rocker-shaft *f*. To the opposite end of the shaft is secured a second arm *e'*, which works in conjunction with a rod *b'*, similar in its construction to rod *b;* in fact, the parts just described are duplicated for the feed screw and in order to save unnecessary repetition are not described in detail, similar letters of reference being applied thereto, which are primed to avoid confusion.

Each of the dials W and W' is provided with a cam or lug M, which as will be hereinafter set forth acts as a trip-off for the mechanism when the zero-mark on the dial being used coincides with that on the fixed portion of the mechanism.

A shaft *g* is journaled in an extension *h* of the member A, said shaft carrying at its rear end a yoke *i*, with inwardly-projecting fingers *j*, which engage the clutch E and serve to actuate the same. The yoke is provided with an arm or finger *k*, the rounded end of which is in direct alinement with two spring-actuated plungers *l*, *l*. Said plungers are so proportioned and arranged that when the clutch occupies its medial, inoperative position, each plunger will bear against the end of said finger; the plunger-actuating springs *m* being at such time under like stress, or under no stress, as the case may be, and the collars *l'*, *l'* carried by the plungers bearing against the wall of the casing in which they work, to prevent overthrow of the parts.

The forward end of shaft *g* is provided with a rectangular lug or block *n*, which fits into a recess formed in one face of a lever *o*, said lever being pivoted to the block by a pin *p*, which is passed through said parts. This lever is provided with a hollow projection *q* (see Fig. 5) and a screw *r* is threaded into the block, passing freely through an opening formed in the lever in line with the hollow projection. A spring *s* encircles the screw and, bearing on the under face of the head thereof and at its opposite end on the lever, serves to hold the same against the lug or block *n*.

Lever *o* is provided with a handle at one end, while at the opposite end it is formed with a lug *t* which extends out in line with a lug or projection *u* formed upon the extended portion e^2 of the rocker-arm *e*.

In the operation of the machine the lug *t* is in engagement with one or another of the faces of lug *u* according to the direction of feed required. To determine the extent of contact or bearing between these two lugs a set-screw *v* is mounted in the lever *o* in line with lug *n*. By turning the screw inward, the lever will be shifted on its fulcrum and the extent of contact between the two lugs consequently lessened, thereby effecting a quick release of the lugs as soon as one or the other of the rocker-arms *e*, *e'* is actuated. The adjustment of the lever in this manner enables the mechanism to be brought to a position of rest, with the dials in exact register with the zero-marks.

Springs *w*, Figs. 2, 3 and 5, are attached to the rocker-arms *e*, *e'*, and to a fixed portion of the bracket, and serve to hold said arms in contact with the rods *b*, *b'*, and also to hold lug *t* in contact with lug *u* until the rocker-arms are actuated by one or the other of said rods.

The large dials W, W', may be graduated as desired, they being shown in the drawings as graduated to one-fourth of an inch, while the small dials P, P', are shown as graduated to read to one one-thousandth of an inch. Of course, these graduations may be modified to suit the requirements of any particular machine, and will vary according to the pitch of the threads upon the feed screw and the gears actuated by the feed rod.

It is thought that the operation of the apparatus thus far set forth will be evident from the description given. Supposing, for instance, that the feed rod C is to be brought into action, the slidable pinion L thereon will be shifted into position with relation to the large intermediate gear K, which as before stated is constantly in mesh with the pinion J, mounted upon the shaft I. The lever or handle *o* will then be shifted in one or the other direction so as to bring the clutch E into driving engagement with gear G, or F according to the direction of feed required, whereupon the motion of the shaft D will be imparted through the gearing to the pinion L, and consequently the dials P and W will be rotated.

The movement of the lever *o* to shift the clutch will bring the lug *u* into contact with the outer face of lug *t*, as shown in Figs. 2 and 3. The engagement of the parts will thus hold the clutch in position until the rocker-shaft *f* is rotated and member e^2 carried by said shaft is moved to such an extent as to withdraw the lugs from engagement with each other.

Before positioning lever *o* it is necessary for the operator to ascertain the amount of feed required. If, for instance, it is desired that the tool shall advance 4½ inches, it would only be necessary to bring the graduation on the dial W corresponding to 4½

inches opposite zero on the bracket or stationary part and to clamp the dial by means of the knurled nut on the bolt Z. As shown, the feed will be automatically released when the zero-marks on the dial and bracket coincide, cam M actuating rod *b*, and through the connections above described, releasing clutch E.

When it is desired to use the apparatus as a scale for moving the tool a given distance, for instance, if it be desired to move it $4\frac{5}{8}$ inches from an exact position or point, the following operation will be carried out: The large dial is set so that its zero-mark and that on the bracket or stationary part coincide, at which point the dial is clamped to disk X. When this is accomplished a crank is applied to the outer squared end of the feed rod or screw, as the case may be, and by turning the crank motion is imparted to the cross-head and tool, and through the connecting gears to the dial (W or W′) until the graduation corresponding to $4\frac{1}{2}''$ coincides with the zero-mark on the bracket. Then, by setting the corresponding small dial, P or P′, to zero and manipulating the crank, a further rotation equal to an advance of one-eighth or 125/1000 of an inch will be obtained, which amount may be easily read on the small dial. Thus the total movement of $4\frac{5}{8}$ inches of the tool from a given point is quickly and accurately secured. It will, of course, be understood that it is not essential to turn the small dial back to the zero-mark when advance of the tool is to be effected, as the graduations may be read either forward or backward; but for the average operator and to insure absolute accuracy, it is the better and safer practice to return the dial to zero.

The operation of the mechanism as applied to the feed rod and feed screw is, of course, the same, and any desired length of feed may be secured.

As will be seen, it is possible after having set the dials and fed a given amount, and as a consequence having tripped the feed, to reset the dials and feed to the same or any other amount. This operation can be repeated indefinitely, or until the end of the travel is reached. This, of course, is very desirable in step work, such for instance as with cone-pulleys and the like. Taking, for example, a cone pulley of three steps, each step being three inches wide, the feed dial can be set for three inches for the first step, then again at 3″ for the second step, and so on, the purpose being that when the feed dial has been once adjusted for the proper distance of feed it will trip automatically instead of requiring to be watched by the operator.

The cam *a*, carried by the disk X, acts as before noted to throw the feed at the extreme end of the travel of the cross-head or slide in order to avoid breakage which might otherwise occur.

In Figs. 14, 15 and 16 another embodiment of the invention is illustrated, the mechanism being therein shown as applied to a planer. In these figures A^2 denotes the usual reciprocating rack, which imparts motion to a pinion B^2, mounted upon a shaft C^2, which extends forwardly and carries a gear D^2, which in turn connects directly with the ratchet-gear or feed rods in the rail, these portions, however, being omitted as they form no part of my present invention and are well understood. In order to apply the stop mechanism, the shaft C^2 is divided and couplings E^2, F^2 are applied thereto, the coupling E^2 being fixed to one section of the shaft, while coupling F^2 may be shifted longitudinally upon the shaft to withdraw the teeth of the two members from engagement with one another. A spring G^2 serves normally to force the coupling members apart. The coupling F^2 is formed with an annular groove, into which extend the fingers H^2 of a yoke I^2, secured to the operating-lever J^2. Said operating-lever is similar in all respects to the lever *o*, heretofore described, and its inner end works in conjunction with a locking arm or member K^2. This arm is mounted upon a shaft L^2, to which are attached arms M^2, M^3, which act in conjunction with the releasing rods in the same manner as hereinbefore described in connection with the other form of the invention. The disks and the cams carried thereby are similar to those above set forth, and no further description thereof is deemed necessary.

As will be seen upon reference to Fig. 2, the large dials are each provided with two series of graduations, so that they will correctly indicate the feed in either direction. These dials in operation make somewhat less than a complete revolution for the extreme travel of the cross head or slide, they being graduated in inches from zero to the full amount of travel, or in any other desired manner.

It is obvious that many changes may be made in the construction described without departing from the spirit of my invention and the broader claims made herein are, therefore, to be read with this fact in view.

While two gears L are illustrated in the drawings, in practice but one is provided for each machine, it being shifted from the feed rod to the feed screw, or vice versa, as desired. Two are shown, however, for the purpose of explanation and a clear understanding of the mechanism.

Having thus described my invention what I claim is:

1. In combination with a vertical mill or other machine having a cross-rail; a head carried thereby; feeding mechanism for said head adapted to be actuated mechanically

or manually at will; an automatic feed-release mechanism for throwing out the feed, said mechanism being located out of the path of travel of the head; and means for setting said throw-out mechanism at any point in the course of travel of the head, whereby the feed may be thrown out one or more times at any point or points between the extremes of travel of the head.

2. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; suitable feed mechanism for said head; means for effecting a trip of the feed at any point or points intermediate the extremes of travel of the head and an automatic knock-off for tripping the feed, said knock-off being provided with a cam which automatically and positively trips the feed mechanism at the extreme end of its travel, substantially as described.

3. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; suitable feed mechanism for said head; a graduated dial; gearing intermediate said dial and feed mechanism, the gearing being so proportioned and arranged that the dial makes less than a complete revolution for the extreme travel of the head, whereby the operator may read directly from the dial the extent of travel of the head; and means controlled by the dial for releasing the feed mechanism.

4. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; suitable feed mechanism for said head; an adjustable graduated dial; a second adjustable graduated dial; gearing intermediate said dials to cause them to work in conjunction with each other; and a trip device for the feed mechanism controlled by the dials, said dials being graduated so that they may be adjusted to effect the throwing out of the feed mechanism at a predetermined point, substantially as described.

5. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; suitable feed mechanism therefor; a graduated dial; a second graduated dial, a trip device for the feed mechanism, controlled by the dials, to throw off the feed at any desired point according to the adjustment of the dials; suitable connections intermediate said dials to operate them either separately or conjointly; and a lever for setting the feed mechanism, said lever being so arranged that the feed may be thrown in either direction or out altogether, substantially as described.

6. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; suitable feed mechanism; a graduated dial moving in unison with said head and thereby indicating the extent of travel of the same, substantially as described: and a trip device for the feed mechanism controlled by the dial.

7. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; a cross feed screw; a feed rod; an actuating shaft; driving connections intermediate said shaft, cross feed screw and feed rod, whereby one or the other of said latter members may be placed in operative relation with the actuating shaft; an adjustable trip mechanism for said connections operated by the rotation of the rod or screw, whereby the feed will be interrupted or stopped when the parts have been moved a predetermined distance; and means for determining the adjustment of the trip mechanism.

8. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; a cross feed screw; a feed rod; an actuating shaft, connections intermediate said shaft, cross feed screw and feed rod for throwing one or the other of the latter members into operative relation with said actuating shaft; a trip mechanism for said cross feed screw and feed rod; means for adjusting said trip mechanism to bring it into operation at any predetermined point; and means for determining the adjustment of the trip mechanism.

9. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; a cross feed screw; a feed rod; an actuating shaft; gearing intermediate said shaft, cross feed screw and feed rod; feed-tripping mechanism actuated by said cross feed screw and feed rod; means for adjusting said tripping mechanism to bring it into operation at any desired point; and means for determining the adjustment of the tripping mechanism.

10. In combination with a vertical mill or other machine having a cross rail; a head carried thereby; an actuating shaft; a feed rod; a cross feed screw; gearing actuated by said shaft for driving the feed rod or feed screw; means for positioning the gearing to throw the same into operative relation with the cross feed screw or feed rod as desired; a trip mechanism for the feed screw; a trip mechanism for the feed rod, said trip mechanisms operating upon the means for positioning the gearing and serving to release said means and the gears when the parts have traveled a predetermined distance; and means for determining the positions of said trip mechanisms.

11. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; an actuating shaft; a cross feed screw; a feed rod; gearing intermediate said cross feed screw, feed rod and actuating shaft; a lever for controlling the position of said gearing to throw it into operative relation with either the cross feed screw of the feed rod; adjustable trip mechanisms for the

cross feed screw and feed rod actuated directly by the rotation of said rod and screw, said trip mechanisms acting upon the lever to shift it to its medial or normal position when the parts have been moved a predetermined distance; and means for adjusting and indicating the positions of the trip mechanisms.

12. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; an actuating shaft; a cross feed screw; a feed rod; gearing intermediate said screw, rod and actuating shaft; a lever; means controlled by said lever for throwing the gearing into operative relation; adjustable trip mechanisms for the feed screw and the feed rod, respectively, said trip mechanisms being driven directly by the movement of said screw or rod; connections intermediate said trip mechanisms and the lever for throwing the lever to its medial or normal position when the parts have traveled a predetermined distance; and means for indicating the adjustment of the trip mechanisms.

13. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; an actuating shaft; a clutch mounted upon said actuating shaft; a cross feed screw; a feed rod; gearing intermediate said cross feed screw, the feed rod and the clutch, said clutch being normally disconnected therefrom; a lever for positioning the clutch; trip mechanisms for the cross feed screw and the feed rod, respectively, said trip mechanisms being driven from said screw and rod; connections intermediate the trip mechanisms and the lever for shifting the lever and releasing the clutch when the parts have moved a predetermined distance; and means for adjusting the trip mechanisms and indicating such adjustment.

14. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; an actuating shaft; a clutch carried by said shaft; a cross feed screw; a feed rod; gearing intermediate said screw, rod and clutch; a lever for moving said clutch into operative relation with the gearing; trip mechanisms for the screw and the rod, respectively, said mechanisms being actuated directly by the movement of the screw or the rod; an adjustable connection intermediate said trip mechanisms and the actuating lever; and means for setting the trip mechanisms and indicating the extent of movement of the head.

15. In combination with a vertical mill or other machine having a cross rail; a head carried thereby; an actuating shaft; a cross feed screw; a feed rod; a clutch mounted upon the actuating shaft; gearing intermediate said clutch and the cross feed screw and feed rod; a lever for controlling the position of said clutch to throw it into operative relation with the gearing; a trip mechanism for the screw; a trip mechanism for the rod, said trip mechanisms being actuated directly by the rotation of the screw or rod; a connection common to both of said trip mechanisms and the lever, for releasing said lever when the parts have moved a predetermined distance; and means for adjusting the trip mechanisms and indicating such adjustment.

16. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; a feed rod or screw; an actuating shaft; gearing intermediate said shaft and the screw or rod; and a trip mechanism for said gearing, said trip mechanism comprising a graduated dial, a second graduated dial, the graduations of which are coarser than those of the first dial, said dials indicating the extent of feed which is to take place, connections intermediate said dials for driving them in a fixed relation, and means actuated by one of said dials for releasing the gearing.

17. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; a cross feed screw or rod; an actuating shaft; gearing intermediate said shaft and the cross feed screw or rod; a trip mechanism operated by the movement of said screw or rod, said trip mechanism comprising a graduated dial mounted upon and rotatable with said feed screw or rod, a second graduated dial, the graduations of which are coarser than those of the first dial, and driving connections intermediate said dials, said dials showing the extent of feed which is to take place; and adjustable means carried by said second dial to bring the trip mechanism into operation at a predetermined point.

18. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; a cross feed screw or rod; an actuating shaft; gearing intermediate said actuating shaft and the cross feed screw or rod; an operating lever for throwing said gearing into position to actuate the rod or screw in one or the other direction; and an automatic trip mechanism for releasing said lever, said trip mechanism comprising a graduated dial carried by and revoluble with the feed screw or rod, a second graduated dial, the graduations of which are coarser than those of the first dial, said dials indicating the extent of feed which is to take place, a shaft upon which said second dial is mounted, connections intermediate said shaft and the cross feed screw or rod for causing said shaft to operate as the screw or rod is turned, a disk carried by said shaft, a cam extending outwardly from said disk, means to clamp together said disk and the dial mounted upon the chaft, a rod extending into the path of the cam, and a locking connection for the lever in line with the opposite end of the rod and adapted and ar-

ranged to be moved thereby to release the lever when the rod is moved endwise by the cam, substantially as described.

19. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; an actuating shaft; a cross feed screw; a feed rod; a clutch member carried by said actuating shaft; gearing intermediate said clutch and the cross feed screw and feed rod; a lever for controlling the position of the clutch; a rocker-shaft; rocker-arms connected to said shaft; a locking arm or projection secured to the rocker-shaft and provided with a lug extending outwardly therefrom in line with a similar lug formed upon the lever; a trip mechanism for the cross feed screw; and a trip mechanism for the feed rod, said mechanisms each comprising a graduated dial carried by the screw or rod, a second graduated dial, the graduations of which are coarser than those of the first dial, a shaft upon which said dial is loosely mounted, driving connections intermediate said shaft and the cross feed screw or feed rod, a disk carried by said shaft, a cam extending outwardly from said disk, a rod having one end lying in the path of the cam, while its opposite end is in contact with one of the rocker-arms, and means for holding said rocker-arm in contact with said rod.

20. In combination with a vertical mill or other machine having a cross rail, a head carried thereby; a cross feed screw or rod; an actuating shaft; a clutch carried by and rotatable with said shaft; gearing intermediate said clutch and the cross feed screw or rod; a shaft *g;* a rocker arm connected to said shaft and in operative relation with the clutch; a lever pivotally connected to the opposite end of said shaft *g;* a rocker shaft; a locking arm or member carried by said shaft; means for adjusting the position of the lever so that it will have a greater or less bearing upon said locking arm; and a trip mechanism operated by the feed screw or rod when the parts have moved a predetermined distance, said mechanism serving to release the lever and to permit the clutch to move back to its normal position, substantially as described.

21. In combination with a vertical mill or other machine having a cross rail; a head carried thereby; a cross feed screw; a feed rod; an actuating shaft; gearing actuated by said shaft to drive the screw or rod; means located at one end of the cross rail to throw the gearing into operative relation with the cross feed screw or rod as desired; a trip mechanism for the feed screw; a trip mechanism for the feed rod, said trip mechanisms operating upon the means for positioning the gearing; and means located at one end of the cross rail in reach of the operator for setting and indicating the position of the respective trip mechanisms.

22. In combination with a vertical mill or other machine having a cross rail; a head carried thereby; a feed rod; a feed screw; a graduated dial working in conjunction with the feed screw; a second graduated dial working in conjunction with the feed rod, said dials moving in unison with the head according as the feed screw or feed rod is in operation and thereby indicating the extent of travel of the head; an actuator for the rod and screw; and a trip device carried by each of said dials for controlling the actuator and consequently the operation of the rod and screw.

23. In combination with a vertical mill or other machine having a cross rail; a head carried thereby; suitable feed mechanism for said head; a graduated dial adjustable about its axis; gearing intermediate said dial and feed mechanism, the gearing being so proportioned and arranged that the dial makes less than a complete revolution for the extreme travel of the head, whereby the operator may read directly from the dial the extent of travel of the head; and means controlled by the dial for releasing the feed mechanism.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES L. LIBBY.

Witnesses:
HARRY J. PARKE,
D. H. WRIGHT, Jr.