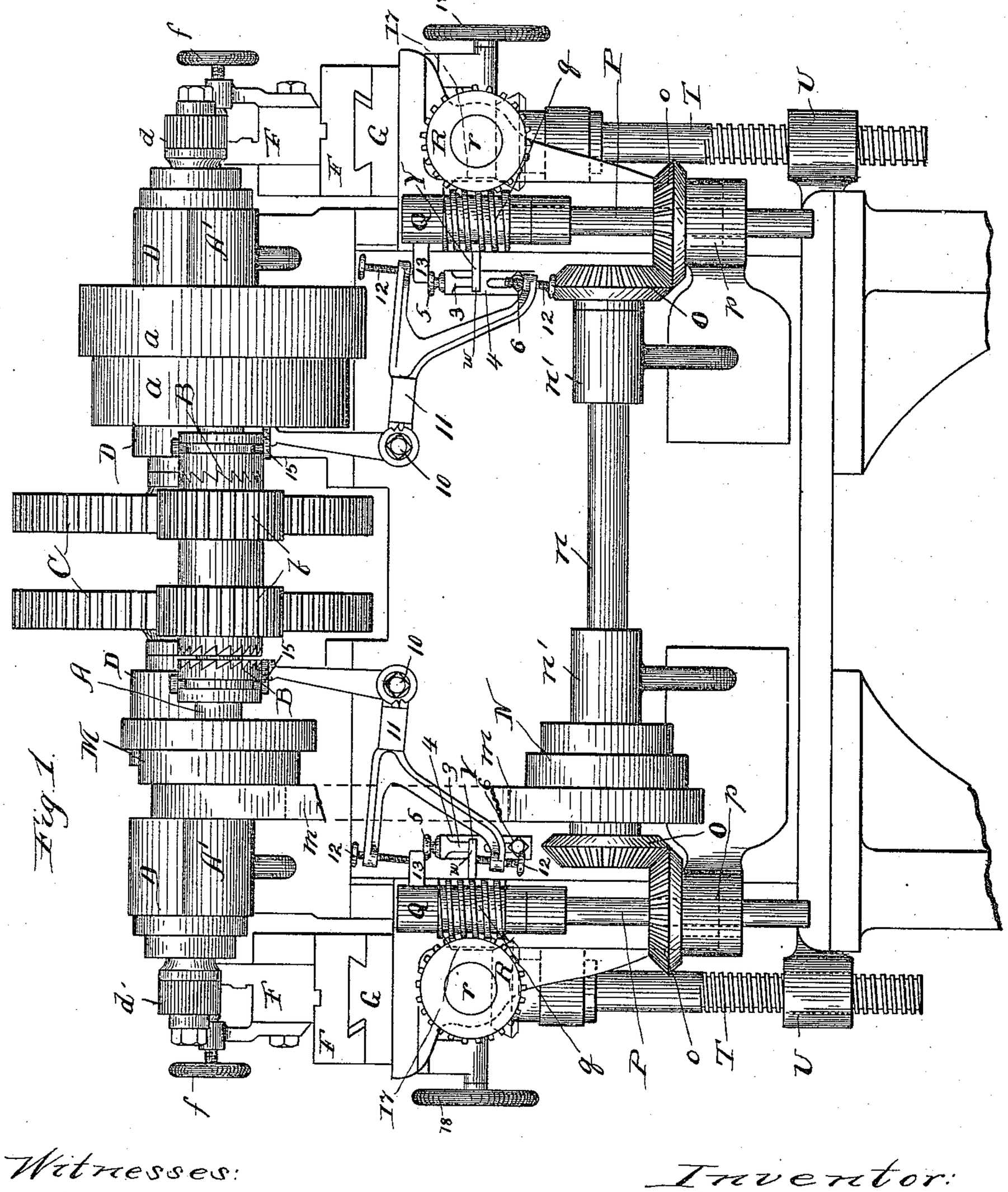
(No Model.) 3 Sheets—Sheet 1.

A. HOLMQUIST.

MILLING MACHINE.

No. 442,681. Patented Dec. 16, 1890.



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His Attorneys.

(No Model.) 3 Sheets—Sheet 2.

A. HOLMQUIST.

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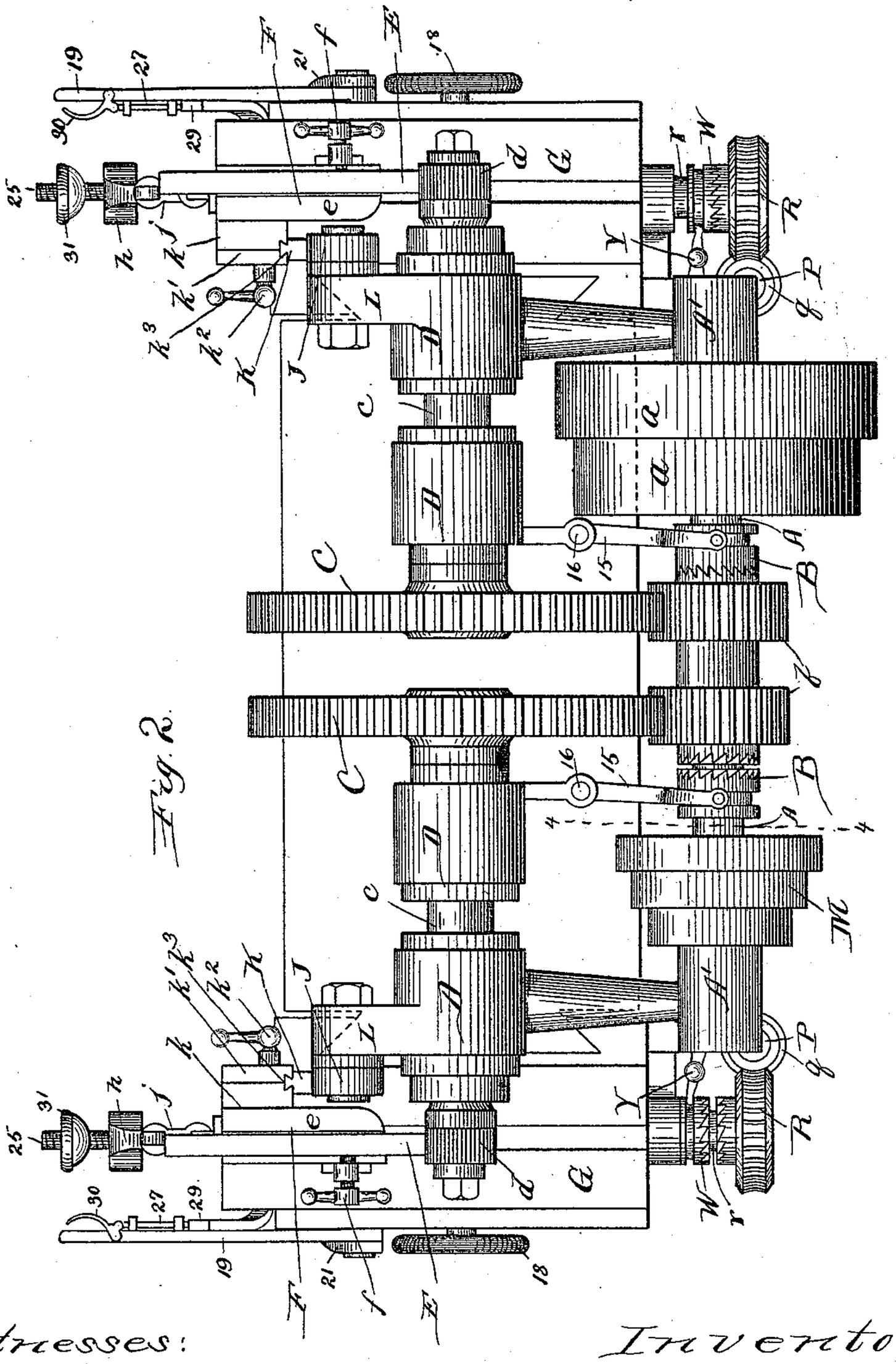

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

A. HOLMQUIST.

MILLING MACHINE.

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Fig. 3.

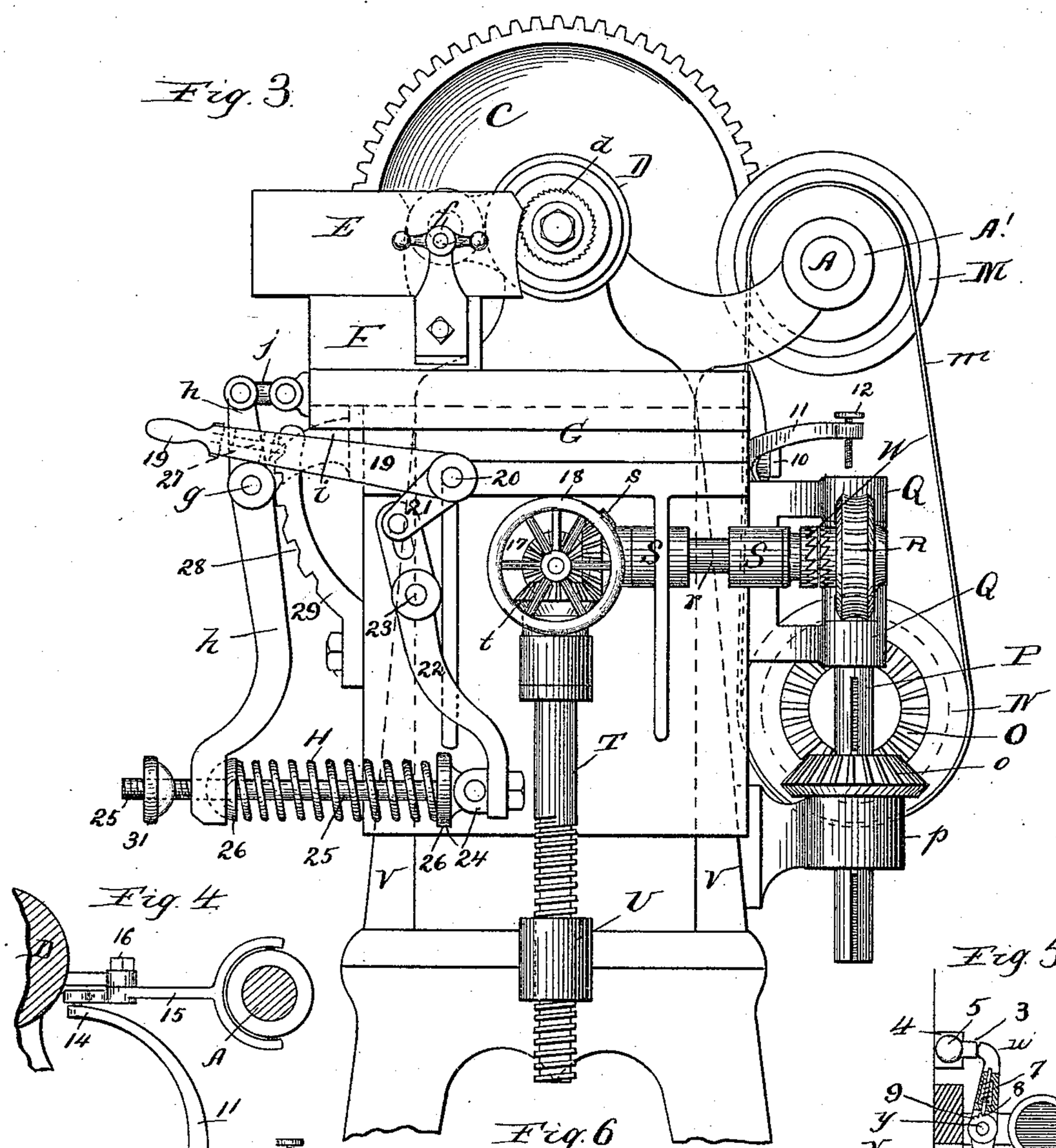


Fig. 4.

Fig. 6.

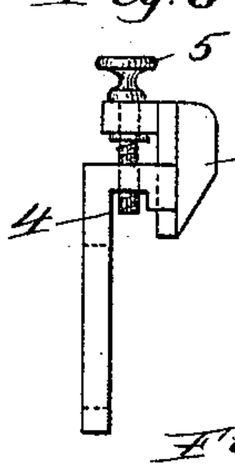


Fig. 7.

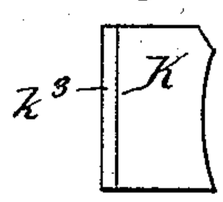


Fig. 8.

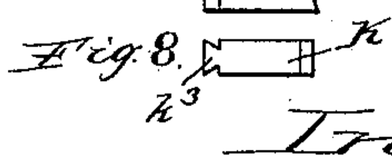
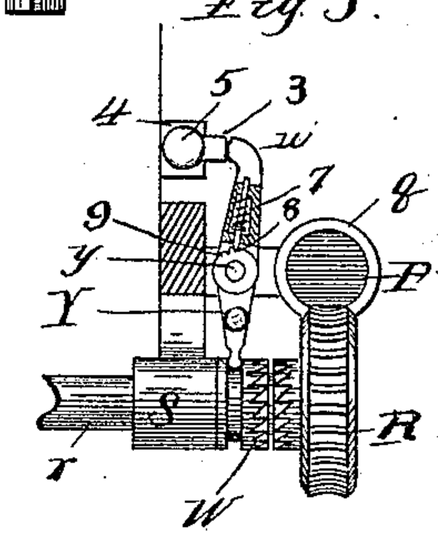


Fig. 5.



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UNITED STATES PATENT OFFICE.

AUGUST HOLMQUIST, OF CHICAGO, ILLINOIS, ASSIGNOR TO CHARLES H. DURPHY, OF SAME PLACE.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 442,681, dated December 16, 1890.

Application filed July 12, 1890. Serial No. 358,526. (No model.)

To all whom it may concern:

Be it known that I, AUGUST HOLMQUIST, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Milling-Machines, of which the following is a specification.

This machine has been devised for the purpose of forming upon those parts of horseshoe-nail-forging machines commonly called the "anvils" the operative faces against which the horseshoe-nails are rolled. The invention may obviously, however, be used in performing other milling operations upon irregular surfaces.

The nature of the invention is fully set forth in the description here given, and will be understood by reference to said description and the accompanying drawings, forming part thereof, in which latter.

Figure 1 is a side elevation of the machine. Fig. 2 is a plan. Fig. 3 is a partial end view. Fig. 4 is a detail section on the line 4 4 of Fig. 2. Fig. 5 shows the clutch mechanism for actuating the feed-screw. Fig. 6 is an elevation of the cam for releasing said clutch. Figs. 7 and 8 are side and edge views of one of the templets.

I have shown in the drawings a double machine—that is, two milling-cutters—each with devices for holding and feeding the article to be milled and both driven from the same shaft. Inasmuch, however, as these two milling-machines are exactly alike a description of one will describe the other, and hence in setting forth the invention I shall confine my description to one side of the machine, it being understood that wherever the same letter of reference appears it indicates the corresponding parts in the two machines.

In said drawings, A represents the drive-shaft supported in bearings A′ and *a* the drive-pulley mounted thereon. A clutch B, which is automatically moved, as hereinafter explained, engages with suitable teeth at the side of the gear *b*, and when thrown into engagement with said teeth said clutch actuates said gear with the drive-shaft. The gear *b* meshes with a large gear C upon the end of the spindle *c* of the milling-cutter. This spindle is supported in bearings D D, and the milling-tool is shown at *d*.

The anvil E or other article to be cut is supported upon a table F, which is capable of movement in a line at right angles to the axis of the milling-tool and is yieldingly pressed toward the mill while the latter is cutting, as hereinafter set forth. The anvil is clamped against a stationary piece *e*, rigid upon the table by a hand-screw *f*. Table F moves horizontally and in the direction stated upon another table G, and, as already intimated, it is yieldingly pressed toward the milling-tool by pressure created by the spring H and transmitted to the table by the lever *h*, pivoted at *g* upon the arm *i*, extending outwardly from table G, and a link *j*. This pressure upon the table F keeps the anvil in cutting-contact with the tool, and it is controlled by the contact of the templet or former K with a stationary guide-roller J. The templet K at the side which bears against the guide-roller is fashioned with the exact form which it is desired to impart to the anvil, and it is clamped between a stationary holder *k* and a movable holder *k′*, caused to grip the templet by a hand-screw k^2. The templet is preferably provided with a dovetail k^3, which will enter corresponding recesses formed in the two parts of the holder, and thus serve to position the templet accurately as well as hold it securely. The roller J is sustained upon an arm L, extending horizontally from one of the bearings D. The table G has a movement also at right angles to the axis of the milling-tool and at right angles to the sliding movement of the table F, and it is through the movement given to this table that the anvil is fed past the cutter. This feeding movement is imparted by means which I will now describe. Upon the drive-shaft is a cone-pulley M, which, by means of the belt *m*, carries motion to the pulley N and its shaft *n*, sustained in bearings *n′*. The end of this shaft *n* carries a miter-gear O, meshing with another miter-gear *o* upon the vertical shaft P. The latter shaft is sustained at one end in a stationary bearing *p* and at its other end in bearings Q Q, moving with the table G. The gear *o* has a spline-connection to shaft P, as illustrated

at Fig. 3, but the shaft is free to move vertically and follow the movements of table G. The shaft P also carries a worm *q*, meshing with a wheel R upon the end of a horizontal shaft *r*, and supported in bearings S. A miter-gear *s*, upon the end of this shaft, meshes with a corresponding gear *t* upon the upper end of the vertical feed-screw T, having a threaded engagement with a stationary box U. It will be seen from what has just been described that motion will be carried from the drive-shaft to the feed-screw T, and the actuation of said feed-screw will cause table G to rise with a slow steady movement. In this movement said table G slides upon ways V. A clutch is interposed between the feed-screw and the motive power, and the movable part of said clutch is shown at W. When it is desired to start the machine, said clutch W is thrown into engagement with the stationary part of the clutch by a hand-lever Y, which is pivoted at *y*.

It is desirable to stop the feed as soon as the cut is completed, and I therefore provide the machine with devices whereby this may be done automatically. These means are the following: At 3 is a cam, which is preferably adjustable in its supporting-bracket 4 by a set-screw 5. Said bracket 4 is secured to a stationary part of the machine by one or more screws 6, and it is so located as that the end *w* of lever Y will come in contact with said cam 3 when the cut has been completed. This contact of lever Y with the cam swings the lever and causes the movable part of the clutch to release its engagement, and thereby the feed is stopped. Lever Y is also preferably held in position both when the clutch is operating and when it is not. For this purpose a spring-detent 7 is inserted in the lever Y with freedom to slide longitudinally therein, and it is caused to engage notches 8 on the stationary ring 9, one notch holding it with the clutch open and the other with the clutch closed. It is also desirable to stop the motion of the milling-tool as soon as the cut has been completed, and this may be brought about as follows: At 10 upon the stationary frame is pivoted an elbow-lever 11. One end of this elbow-lever is forked and provided with set-screws 12, which are alternately engaged by an arm 13, projecting out from the upper bearing Q when the limits of travel of the feed-table have been reached. This elbow-lever is joined at 14 to the yoke-lever 15, by which the movable part B of the clutch driving the milling-tool is controlled. Said yoke-lever is pivoted at 16, and the elbow-lever is joined thereto, it will be noticed from Fig. 4, at the farther side of said pivot, so that the motion of the elbow-lever communicated to the yoke-lever is reversed in direction. With this mechanism the clutch is caused to release its engagement when the upper limit of travel has been reached, and it is thrown into engagement when the lower limit is reached. The points at which this is done may of course be regulated by the set-screws 12.

In order to return the table G and the parts carried thereby to their normal position ready for the commencement of the cutting operation, I provide a small pinion 17, meshing with the gear *t* upon the feed-screw, and operate said pinion by the hand-wheel 18 upon the same shaft therewith.

It may be desirable to regulate the tension of spring H, and this I do as follows: At 19 is a hand-lever journaled at 20 upon table G and provided with a rigid arm 21. At 22 is another lever journaled at 23 upon the table G and connected to arm 21 of lever 19. Lever 22 at its lower end is joined to a rocking-block 24 upon the end of the rod 25, which runs through the spring and carries a collar 26, between which and lever *h* the spring is confined. If now lever 19 be depressed, the lower end of lever 22 will be forced outward, thereby giving increased tension to the spring and forcing the table against the milling-tool and roller with increased power. The tension thus acquired is held by the engagement of the pawl 27 with the notches 28 of the segment 29, bolted to table G, and said pawl is controlled by the trigger 30. A reverse movement of lever 19 will tend to bring the table away from the milling-tool. A nut 31 is threaded on the outer end of rod 25 as a limit to the inward movement of carriage F.

The operation of the machine is as follows: An anvil E or other piece of metal to be cut is first duly positioned and clamped, and the table G is then lowered sufficiently to bring about contact between the lower fork of lever 11 and the arm 13, thereby throwing clutch B into operation and giving motion to the milling-tool. The attendant then moves lever Y and brings about engagement by the clutch W, and thereby the feed-screw T is also set in motion and lifts the anvil and its supporting-tables with a slow steady movement until the anvil has passed by and been cut by the milling-tool. In this movement the table F moves toward and from the milling-tool, according as it is controlled by the contact between the templet K and the guide-roller J, so that the end of the anvil which is being cut is made to describe the exact outline of the templet, and during these irregular movements of the table F the spring H maintains a constant pressure, tending to keep the anvil up to the cutter. When the cut has been completed, the arm 13 strikes the upper fork of lever 11 and throws out the clutch B. At the same time the cam 3 operates the lever Y and releases the clutch W, thereby stopping the feed. The attendant now returns the tables to an intermediate position between the limits of their travel, takes out the anvil just operated upon and replaces it with another, and he also replaces the templet, if necessary, after which he again lowers the tables until the lever 11 is actuated to

throw the clutch B into operation, when the operation is repeated.

I claim—

1. The combination, in a milling-machine, of a table provided with means for clamping the article to be milled and having a horizontal movement toward and from the milling-tool and at right angles to its axis, with a vertically-moving table supporting said first-mentioned table, means for moving said last-mentioned table, and a spring for pressing the first-mentioned table toward the tool, substantially as set forth.

2. In a milling-machine, the combination, with the milling-tool, of a horizontally-sliding table yieldingly pressed toward the milling-tool, devices for creating this pressure, a vertical moving feeding-table supporting said sliding table, and means for moving said feeding-table vertically, substantially as set forth.

3. In a milling-machine, the combination of a horizontally-sliding table yieldingly pressed toward the tool to maintain contact by the article being milled with said tool, a templet or former carried on said table and moving in contact with a stationary roller, and a feeding-table having a vertical movement and supporting said sliding table, substantially as set forth.

4. In a milling-machine, the combination, with the sliding table F and a support therefor, upon which it slides and by which it is fed past the cutter, of a templet or former secured to said sliding table, an opposing surface with which said templet or former may remain in contact and control the position of the table, and a spring or equivalent device for maintaining contact between said templet and said opposing surface, and thereby controlling the amount of metal removed by the milling-tool and also the form imparted thereby, substantially as set forth.

5. The milling-machine consisting of a milling-tool and its actuating devices, a sliding table F, movable to and from the milling-tool and at right angles thereto, a table G, moving at right angles to said first-mentioned table, spring-actuated devices for pressing table F toward the tool, a feed-screw actuating said table G, actuating devices for said feed-screw, and an automatically-released clutch for stopping said feed-screw when the cut has been completed, substantially as set forth.

6. The combination, with the milling-tool and the devices for actuating said tool, having a clutch-connection therewith, of moving supports adapted to carry the article to be milled past the cutter, devices for moving said supports, and devices set in operation by said supports for releasing said clutch-connection and stopping the tool at the completion of the cut, substantially as set forth.

7. The combination, with the milling-tool, of the tables F and G, the screw T for lifting table G, the clutch-driven gearing for driving said screw T, means for releasing said clutch automatically, and the hand-wheel 18 and pinion 17 for lowering said screw, substantially as set forth.

8. The combination, with the table F, of the lever *h*, joined to said table and pivoted at *g*, the spring H, acting upon said lever, and means for supporting and confining said spring, substantially as set forth.

9. The combination, with the spring H, the lever *h*, and table F, of lever 22, lever 19, and link 21, substantially as set forth.

10. The combination, with the spring H, the lever *h*, and table F, of lever 22, lever 19, link 21, pawl 27, and ratchet 28, substantially as set forth.

11. In a milling-machine, the combination, with the milling-tool, of a sliding table yieldingly pressed toward the milling-tool, devices for creating this pressure, a feeding-support carrying said sliding table and having a path at right angles to the axis of the tool, and devices, substantially such as described, for controlling the pressure upon the table according to the form desired for the article to be milled, substantially as set forth.

12. In a milling-machine, the combination, with the milling-tool, of a sliding table yieldingly pressed toward the milling-tool, devices for creating this pressure, a feeding-support carrying said sliding table, having a path at right angles to the axis of the tool, and means for moving said feeding-support, substantially as set forth.

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