W. L. HAYNES.

MACHINE TOOL.

APPLICATION FILED MAR. 24, 1908.

915,856.

Patented Mar. 23, 1909.

3 SHEETS—SHEET 1.

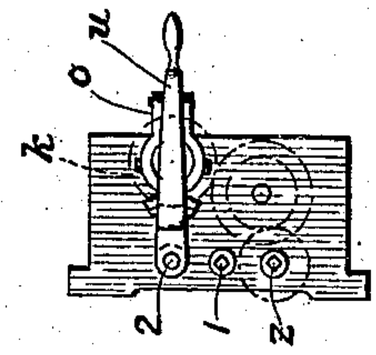

FIG. 3.

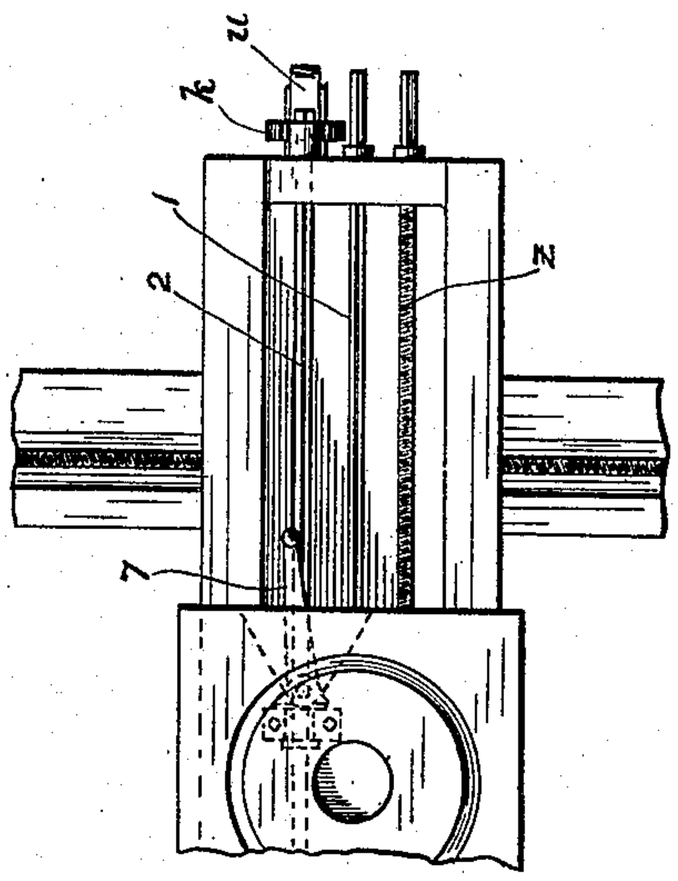

FIG. 2.

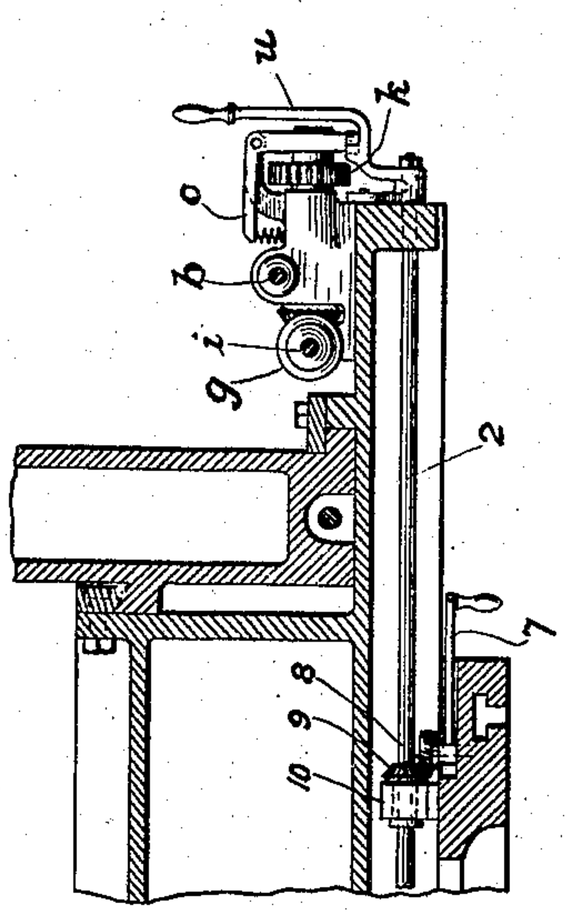

FIG. 4.

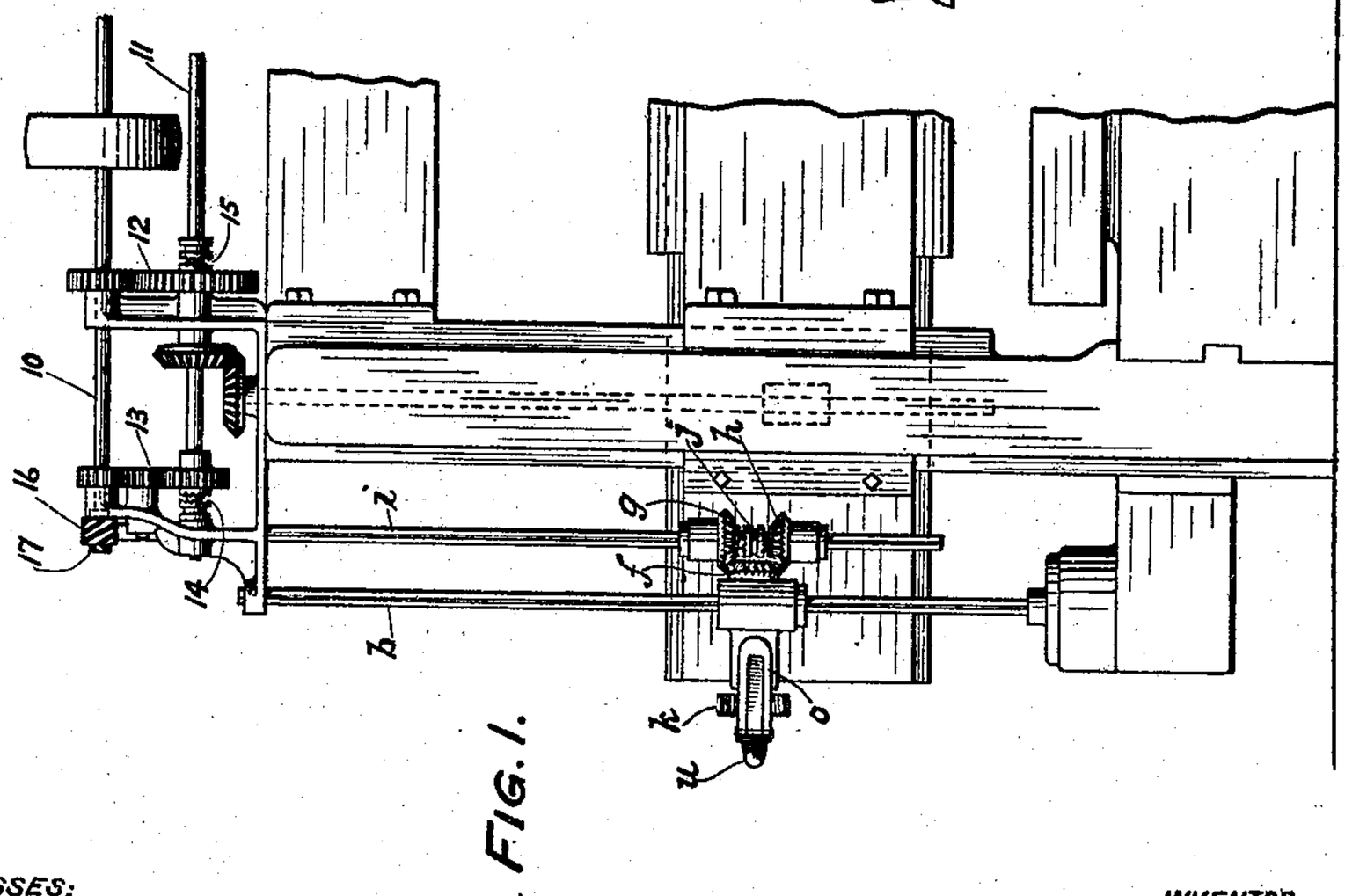

FIG. 1.

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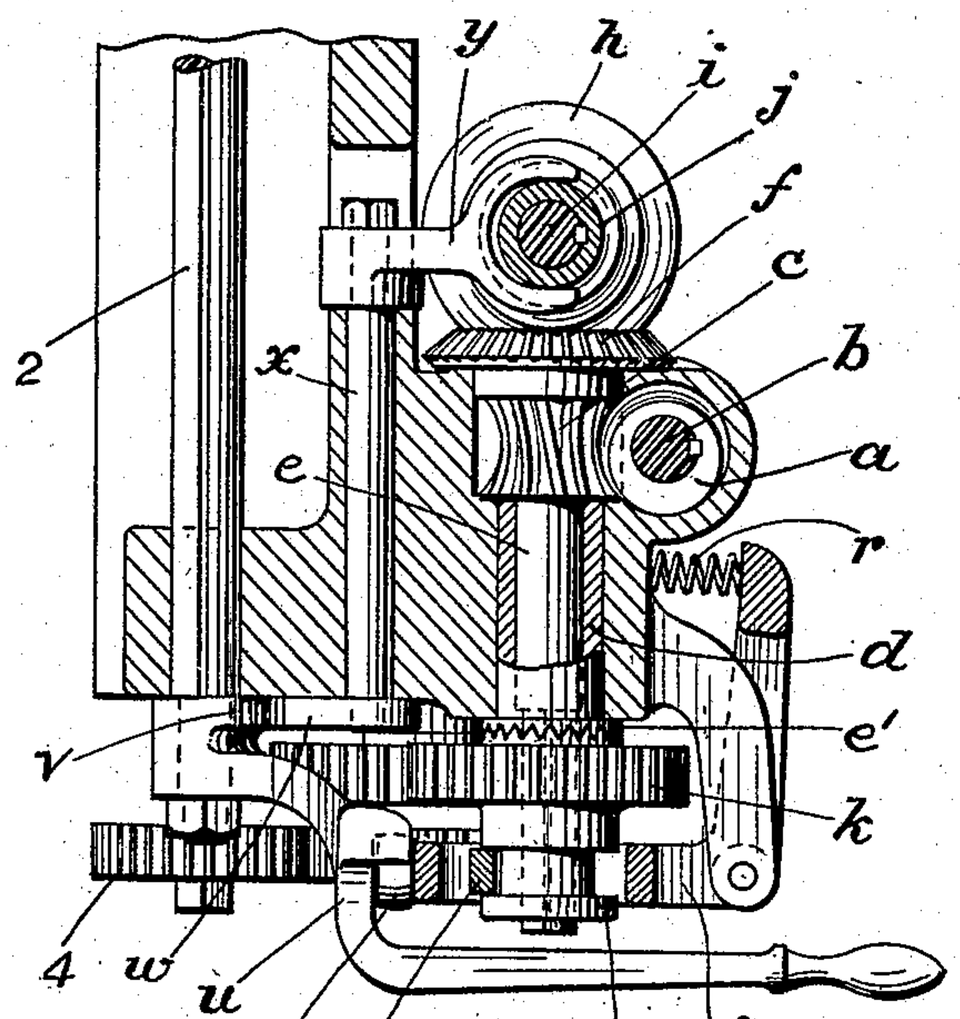


FIG. 6.

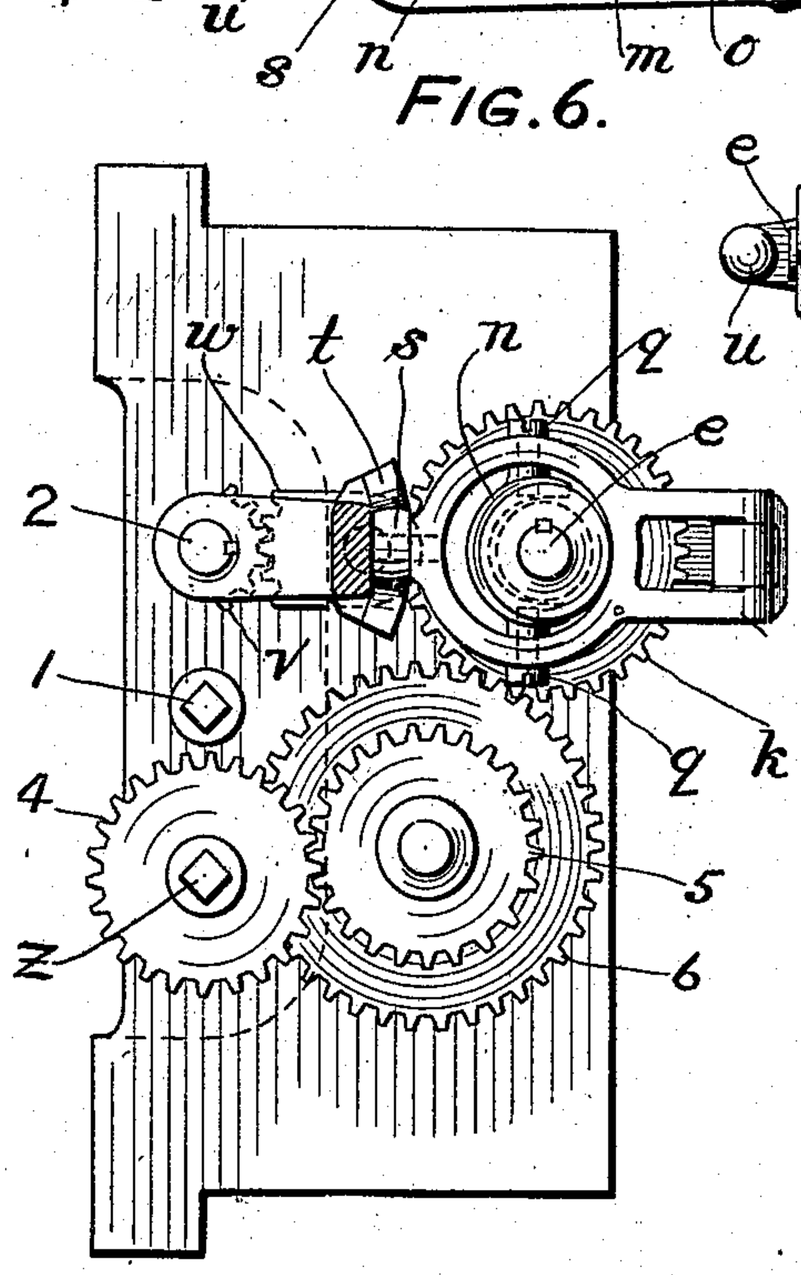
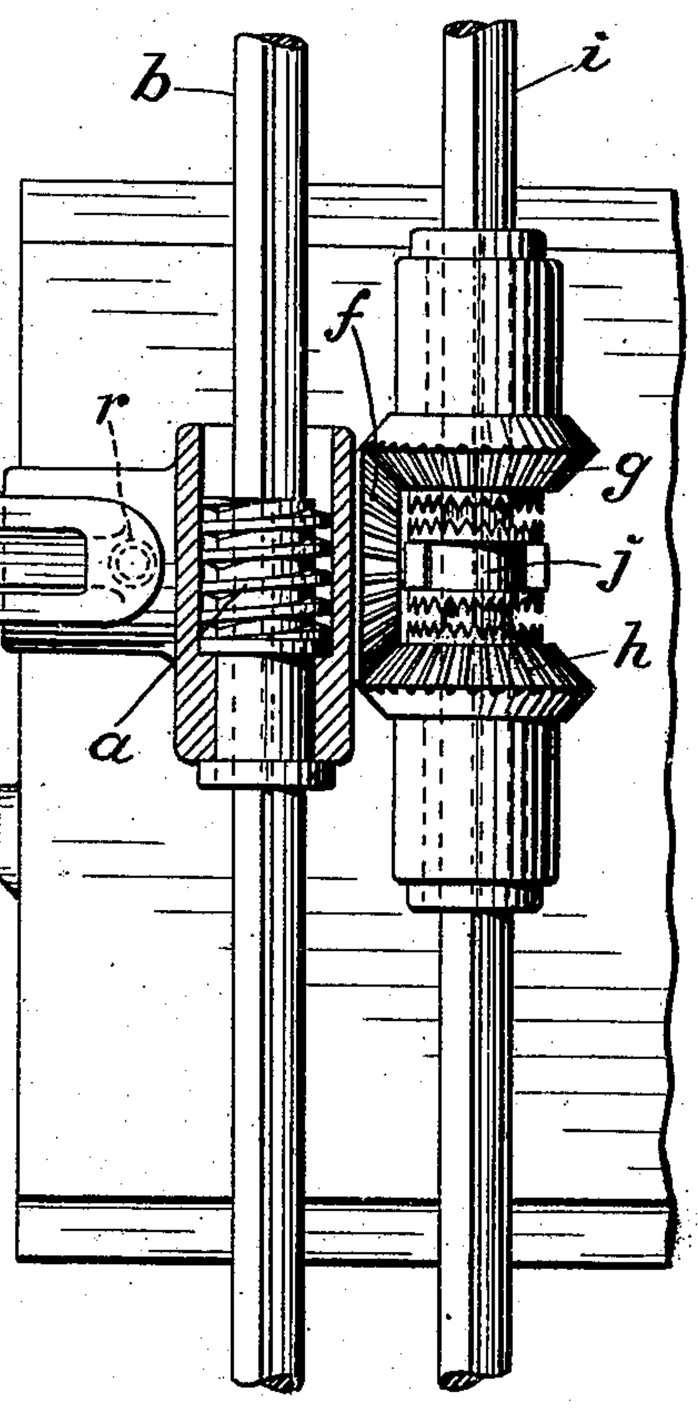


FIG. 7.

FIG. 5.



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3 SHEETS—SHEET 3.

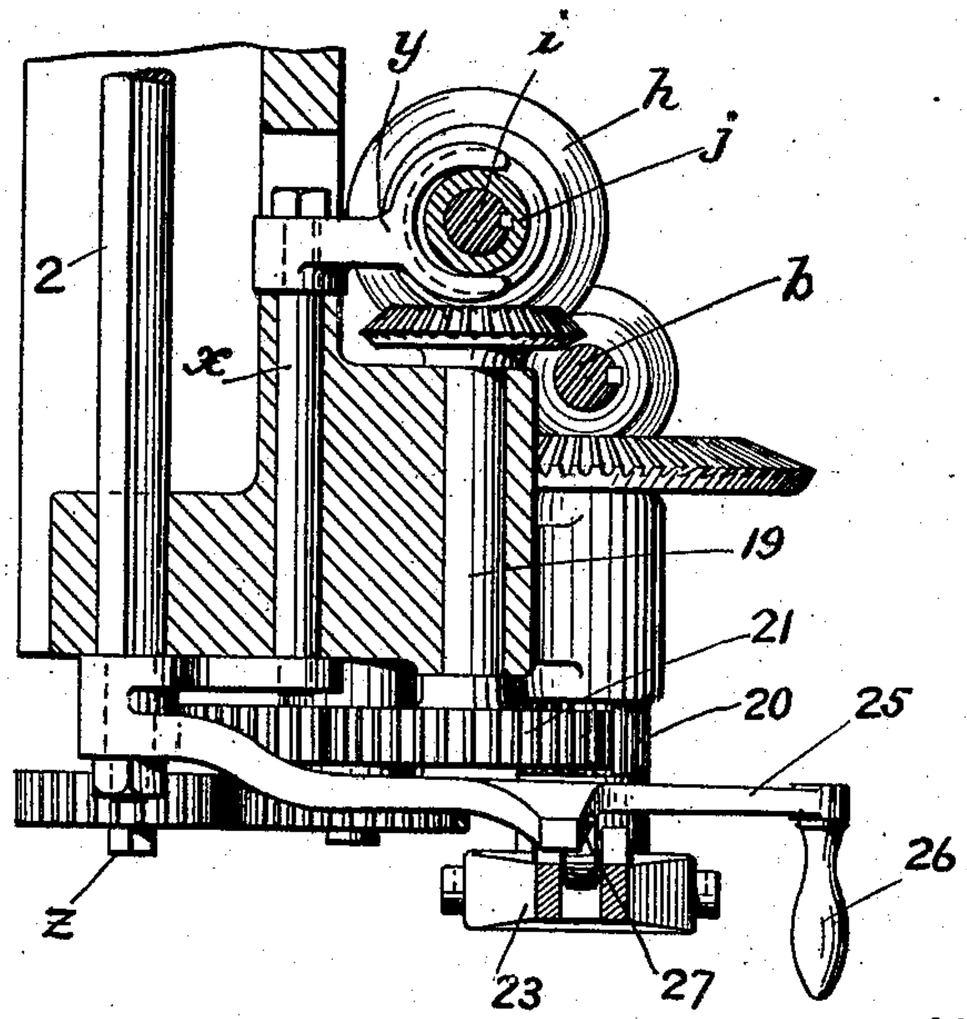

FIG. 9.

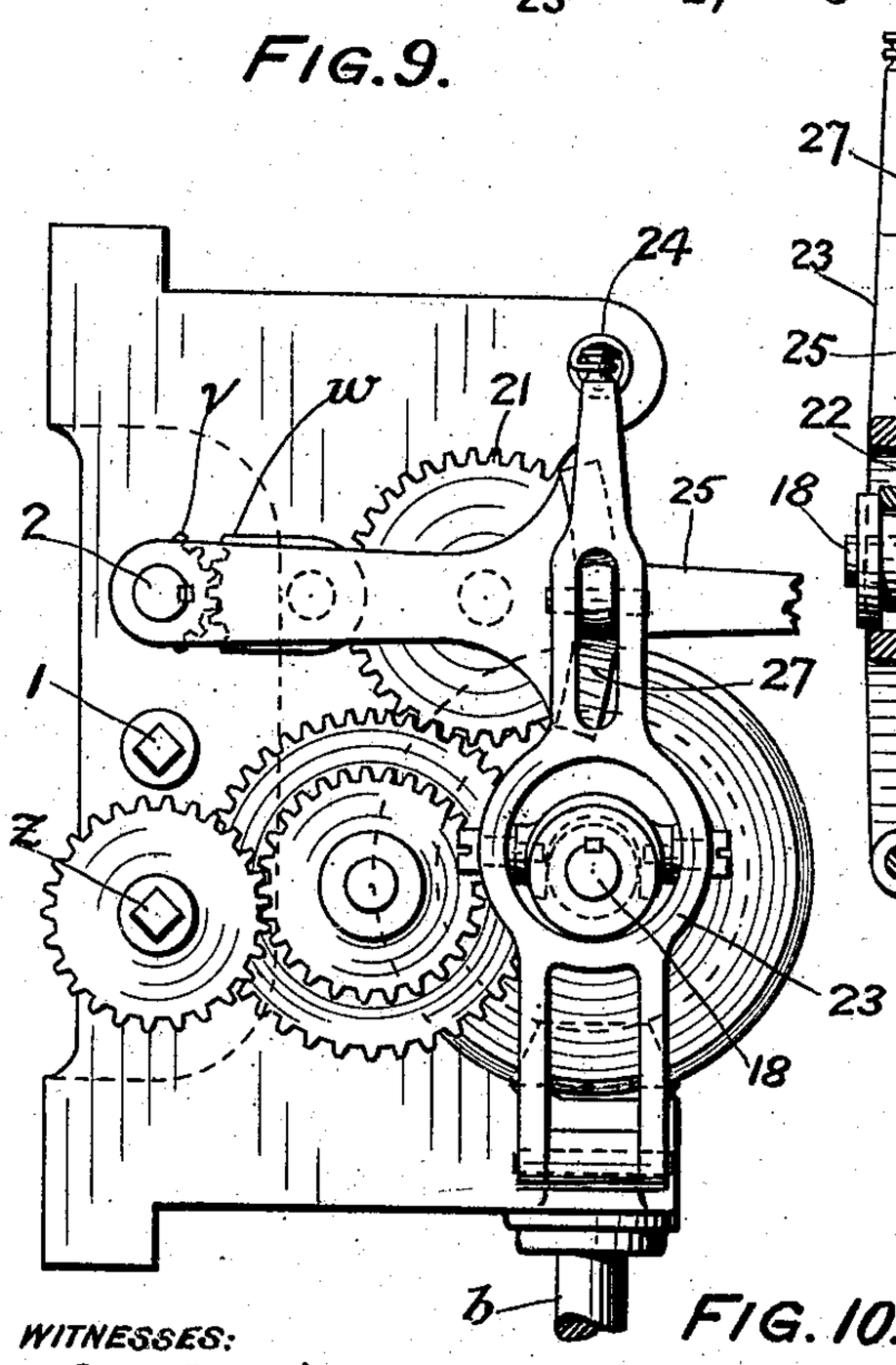

FIG. 8.

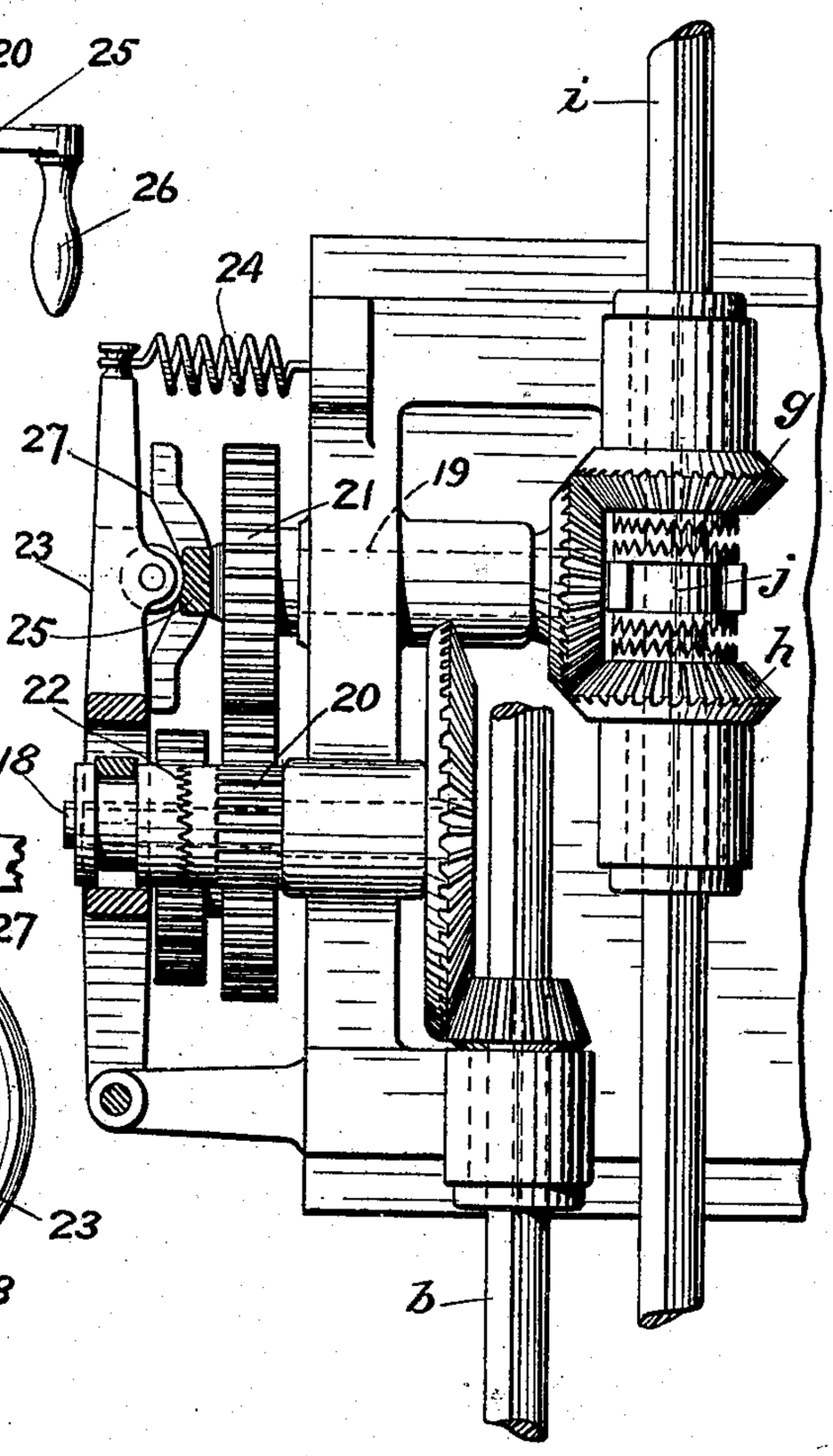

FIG. 10.

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UNITED STATES PATENT OFFICE.

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MACHINE-TOOL.

No. 915,856. Specification of Letters Patent. Patented March 23, 1909.

Application filed March 24, 1908. Serial No. 422,873.

To all whom it may concern:

Be it known that I, WILLIAM L. HAYNES, a citizen of the United States, residing at Cynwyd, county of Montgomery, and State of Pennsylvania, have invented a new and useful Improvement in Machine-Tools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to new and useful improvements in boring and turning mills, and similar machine tools, in which the tool head is carried on a cross rail between housings. In such machines it is usual to provide a screw in the rail for moving the tool head horizontally, and a splined rod for moving the tool bar in the tool head or saddle in a vertical or angular direction. To produce the feeding motion, this screw and rod are rotated at the rate necessary to produce the required motion; but it has been found desirable to impart to the tool head and to the tool bar a more rapid movement for adjusting to position by power.

It is the object of my invention to provide a convenient traversing movement for the last mentioned, applicable to either the rod or the screw, and further, to so arrange the device that the rapid traverse can be engaged either at the end of the cross rail or at the tool head itself, and further, that when the rapid traverse is engaged with either the rod or the screw, the slow feeding motion shall be disengaged, and when the rapid traverse is disengaged, the feed motion will be automatically engaged.

Speaking generally, I provide two shafts, one for the slow feeding and the other for the rapid traversing movement. I also provide mechanism which operatively connects the feed shaft with, and disconnects the rapid traverse shaft from, (or vice versa) the tool head or tool bar driving mechanism. Finally, I carry this controlling mechanism upon the cross rail and provide connections so that it may be operated either at the end of the cross rail or at the tool head itself. This controlling mechanism is also such as to enable or cause the movement of the tool head and tool bar driving mechanism in either direction.

In the drawings: Figure 1 represents a back view of one housing, showing the rear side of the cross rail. Fig. 2 shows a front view of the cross rail with a portion of the tool head. Fig. 3 is an end view of the cross rail, tool head not shown. Fig. 4 is a plan view, in section, of the cross rail, the housing, and a portion of the tool head. Fig. 5 is an enlarged rear view of the end of the cross rail showing the feed shaft and the traverse shaft in their relative positions. Fig. 6 is an enlarged horizontal section through the mechanism which connects these shafts with the screw and rod. Fig. 7 is an outside end elevation of the same. Figs. 8, 9 and 10 are detail views corresponding to Figs. 5, 6 and 7, showing a modification of feed and traverse mechanism.

The worm *a* on the feed shaft *b* engages the worm wheel *c*, provided with a sleeve or hub *d*, loose on the shaft *e*. At the other end of the sleeve *d* is a half clutch *e'*. The shaft *e* carries, on one end, a bevel wheel *f* which is keyed to the shaft, and which engages with two bevel wheels *g* and *h* simultaneously, said bevel wheels running loosely on the traverse shaft *i*. *g* and *h* are each provided with a half clutch, and, between them, on the shaft *i* is a clutch member *j*, having a half clutch at each end, said member *j* being provided with a key sliding in a spline on the shaft *i*, so that it will partake of the motion of the shaft. By moving the clutch *j* into engagement with clutch on *g*, the shaft *e* is revolved in one direction. By moving the clutch *j* into engagement with clutch on *h*, the shaft *e* is revolved in the opposite direction. On the other end of the shaft *e* is a spur wheel *k* sliding loosely on a key. The wheel *k* has on its hub a half clutch capable of engaging with the half clutch *e'*. In the groove *m* on the hub of *k* is a trunnion ring *n*, the trunnions *q q* of which are connected with a bell crank lever *o* provided with a spring *r*, the spring tending to force the gear *k* into engagement with the clutch *e'*, and thus transmitting motion from the feed shaft *b* to the gear *k*. On the other end of the bell crank *o* is a roller *s* engaging with a cam surface *t* on a lever *u*. On the hub of the lever *u* is a segment of a spur wheel *v*, which engages with a segment of a spur wheel *w*, keyed fast to the end of a shaft *x*, at the other end of which shaft *x* is keyed the forked lever *y*, which en-

gages with the sliding piece *j*, on the traverse shaft *i*.

On the cross rail is a screw *z*, for transmitting horizontal motion to the tool head, a rod 1 for transmitting vertical motion to the tool bar on the tool holder, and a rod 2 for operating the rapid traverse shaft from the tool holder. On the outer end of which rod 2 is keyed the lever *u* above referred to. The lever *u* is pivoted on the rod 2 and this rod extends as far as the movement of the tool holder on the cross rail, so that by interposing or attaching to this rod a lever or levers, the control of the traverse may be had from the tool holder or from the side of the machine. On the end of the screw *z* and the rod 1, are the usual squares for receiving the crank handle (not shown) or the feed gears 4, which engage, through the idlers 5 and 6, with the driving wheel *k*.

The rod 2, which, in fact, is a rock shaft, is operated from the tool holder as follows: (See Figs. 2 and 4). A lever 7 pivoted to a rest on the back of the tool head, carries a bevel wheel segment 8 engaging with the bevel wheel 9 on the rock shaft or rod 2, and enables the operator, by the movement of lever 7, to vibrate the rock shaft 2 so as to engage or disengage the rapid traverse motion, and to determine the direction of motion. The bevel wheel 9 is provided with a long hub or sleeve in a bearing on the tool head, and is splined on the rock shaft 2.

Under normal operation the clutch *j* is disengaged and the clutch *e'* engaged and the tool bar and tool head driving mechanism are operated by the feed shaft. By the operation of lever *u* directly or by operating lever 7 the clutch *j* is engaged, the clutch *e'* disengaged and the tool bar or tool head driving mechanism is operated from the traverse shaft, determined by whether the feed pinion 4 is on rod 1 or screw *z*.

The vertical traverse shaft *i* is operated from a constant speed shaft 10 at the top or bottom of the machine, (as shown, at the top) usually from the shaft which is employed to operate the mechanism which raises and lowers the cross rail. A convenient arrangement is indicated in Fig. 1, in which the constant speed shaft is denoted 10, the driven shaft 11. Shaft 10 is connected to shaft 11 by a train of gearing 12, and a train of gearing 13 provided with a clutch 14. In the train 13 is an idler for changing the direction of motion, so that the shaft 11 can be rotated in either direction, as clutch 15 or clutch 14 may be engaged, and when both clutches are disengaged, shaft 11 will not rotate. On the end of the shaft 10 is a spiral gear 16 engaging with a similar spiral gear 17 on the end of the vertical traverse shaft *i*.

In Figs. 8, 9 and 10 is shown an alternative arrangement. In this case instead of using a sleeve, as the driven member from the feed shaft, and the shaft, surrounded by the sleeve, as the driven member from the traverse shaft, I use two independent shafts 18 and 19, and instead of one gear *k*, as in the previous figures, I use two independent gears, one 20 for shaft 18 and the other gear 21 for shaft 19. Both of these gears mesh with idlers 6. The gear 20 is loose on the shaft 18 and is operatively connected therewith by clutch 22 controlled by spring lever 23, the spring 24 normally holding gear and shaft connected. This lever 23 is operated by the double cam 27 on the lever 25, which may be operated by handle 26 or through rock shaft 2 and operates clutch member *j* as in the construction of Figs. 1 to 7.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:—

1. In a machine of the character described, the combination with the tool head and tool bar driving mechanism and the cross rail, of two driving shafts upon which the cross rail is vertically movable, mechanism adapted in its movement to successively connect one of said shafts with and disengage the other from said driving mechanism.

2. In a machine of the character described, the combination with the tool head and tool bar driving mechanism and the cross rail, of two driving shafts upon which the cross rail is vertically movable, mechanism, carried by the tool head, adapted in its movement to successively connect one of said shafts with and disengage the other from said driving mechanism.

3. In a machine of the character described, the combination with the tool head and tool bar driving mechanism and cross rail, of a feed shaft, a shaft driven by said feed shaft normally operatively connected with the said driving mechanism, a traverse shaft, a driven shaft, clutch mechanism connecting said traverse shaft and its driven shaft, said traverse shaft driven shaft being connected with said driving mechanism, and mechanism, carried by the tool head, adapted in its movement to operate said clutch mechanism to successively engage the traverse shaft driven shaft and the traverse shaft and to disengage the feed shaft driven shaft from the driving mechanism and vice versa, said driven shafts, traverse shaft clutch mechanism, and feed shaft driven shaft connecting means being carried by said cross rail.

4. In a machine of the character described, the combination with the tool head and tool bar driving mechanism and cross rail, of an independent traverse shaft, a shaft adapted to be driven by said traverse shaft and connection between the driving mechanism and said last mentioned shaft and controlling mechanism for connecting the traverse shaft and its driven shaft to rotate said shaft in

one direction or the other, said traverse shaft driven shaft and controlling mechanism being carried by said cross rail.

5. In a machine of the character described, the combination with the tool head and tool bar driving mechanism, of a feed shaft, an independent traverse shaft and controlling mechanism, normally maintaining connection between the feed shaft and driving mechanism, adapted when moved, to sever said connection and connect said traverse shaft and driving mechanism, and means, when said controlling mechanism is released, to return it to its initial position.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 18th day of March, 1908.

WILLIAM L. HAYNES.

Witnesses:
M. M. HAMILTON,
A. M. URIAN.