No. 742,356. PATENTED OCT. 27, 1903.

D. ROBERTS.

MACHINE TOOL.

APPLICATION FILED SEPT. 2, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 6.

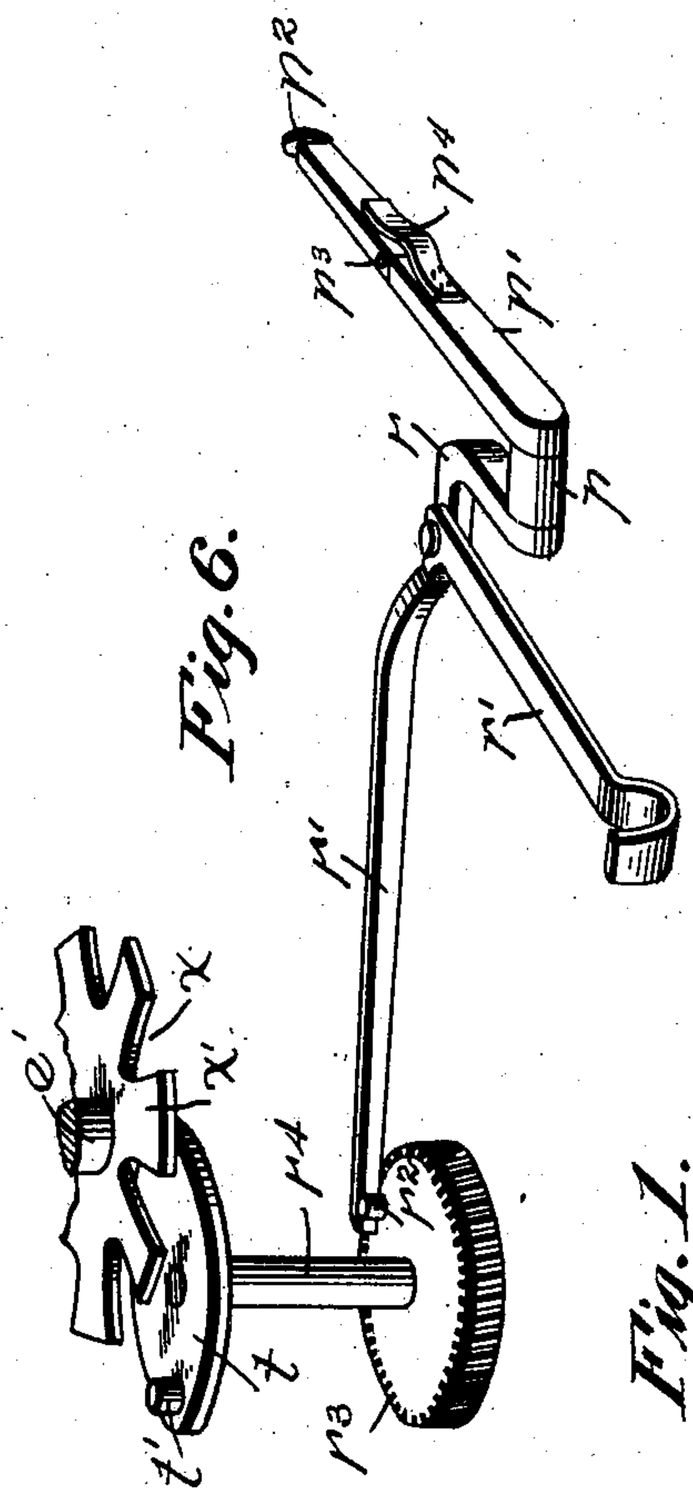
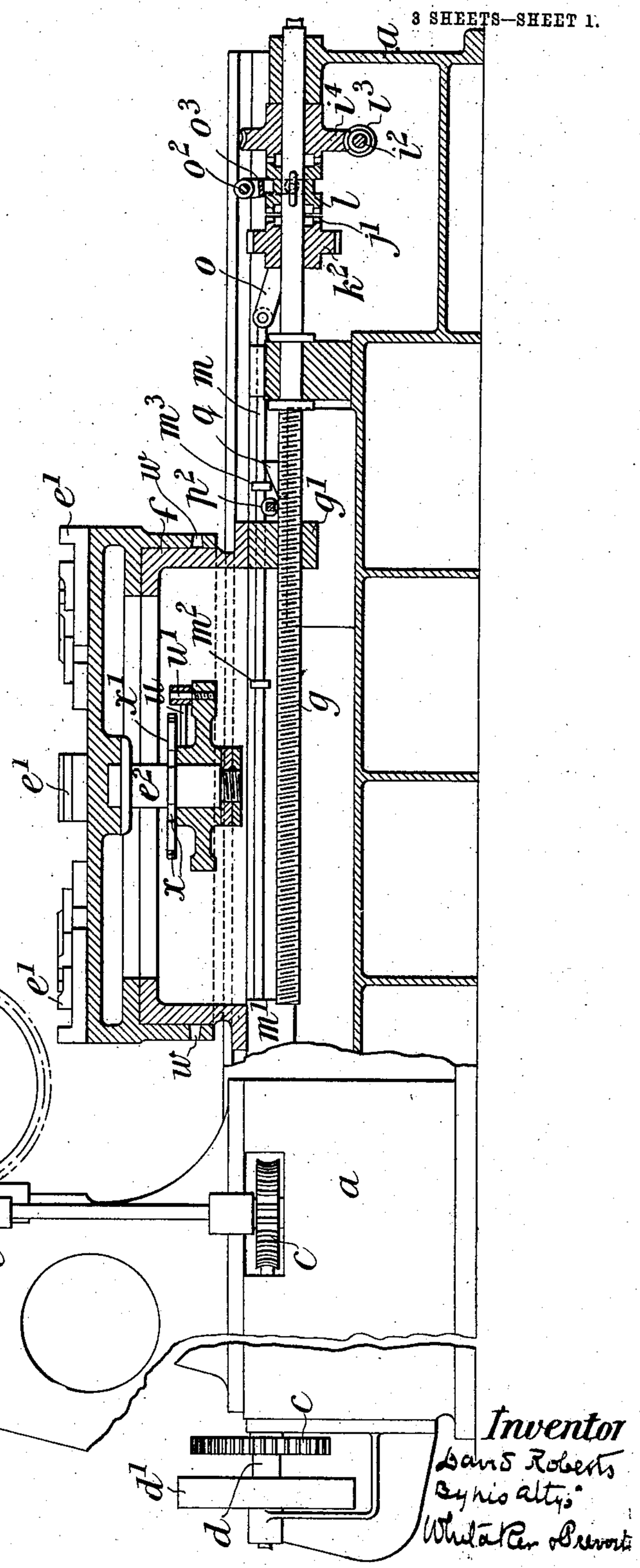


Fig. 7.



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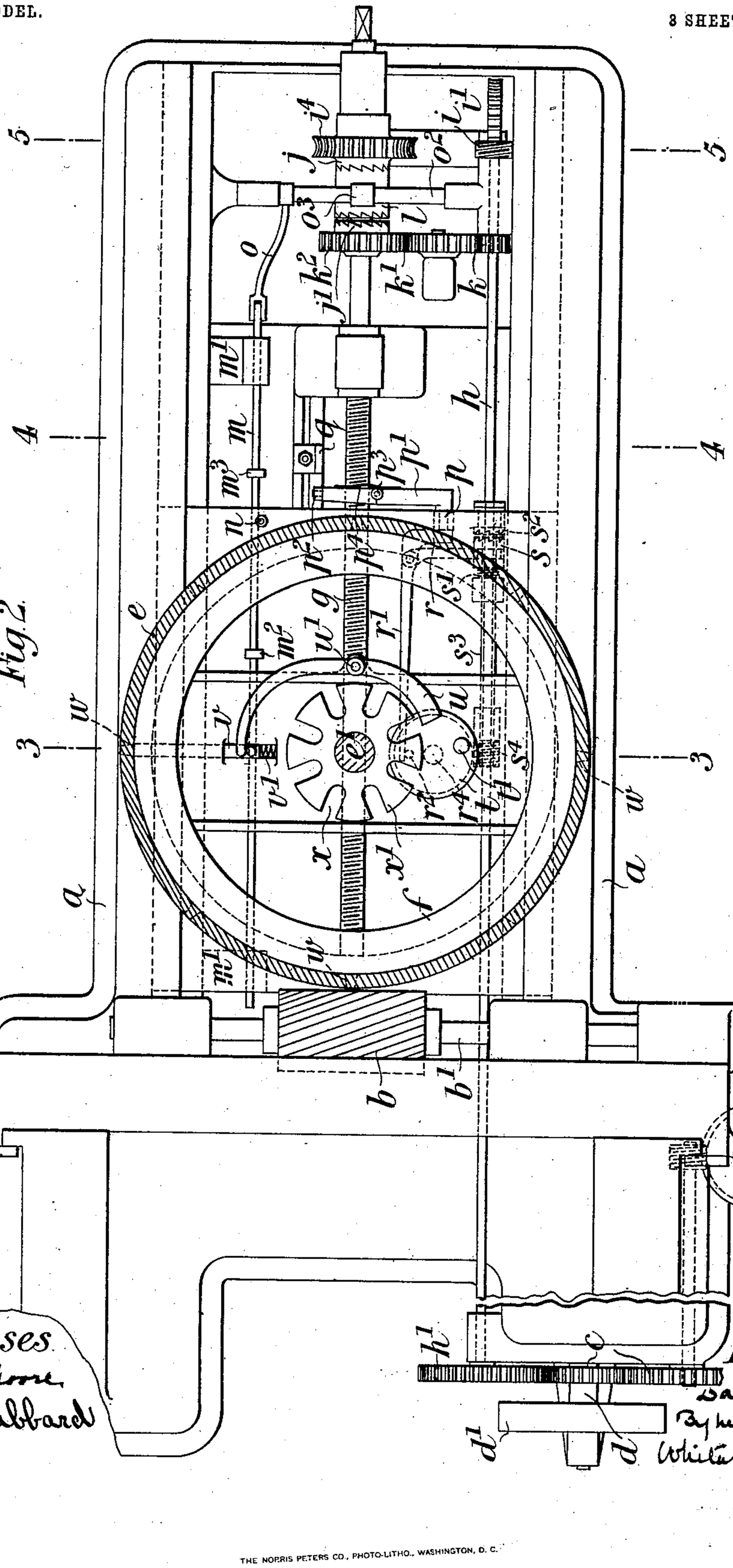
NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3

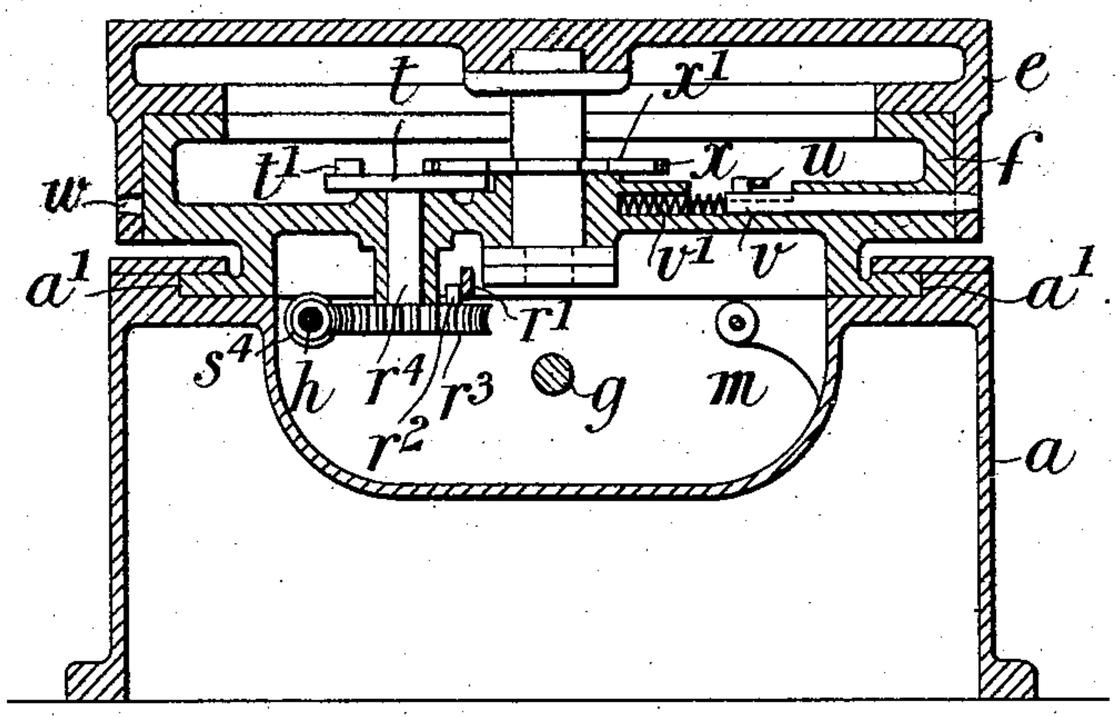


Fig. 4.

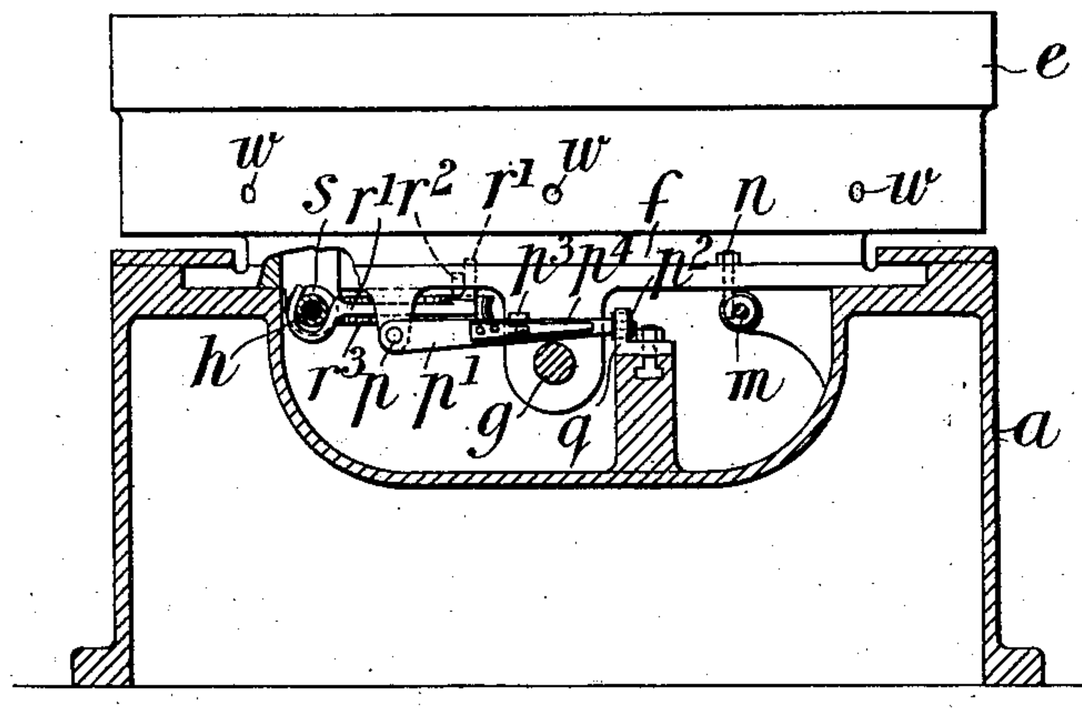
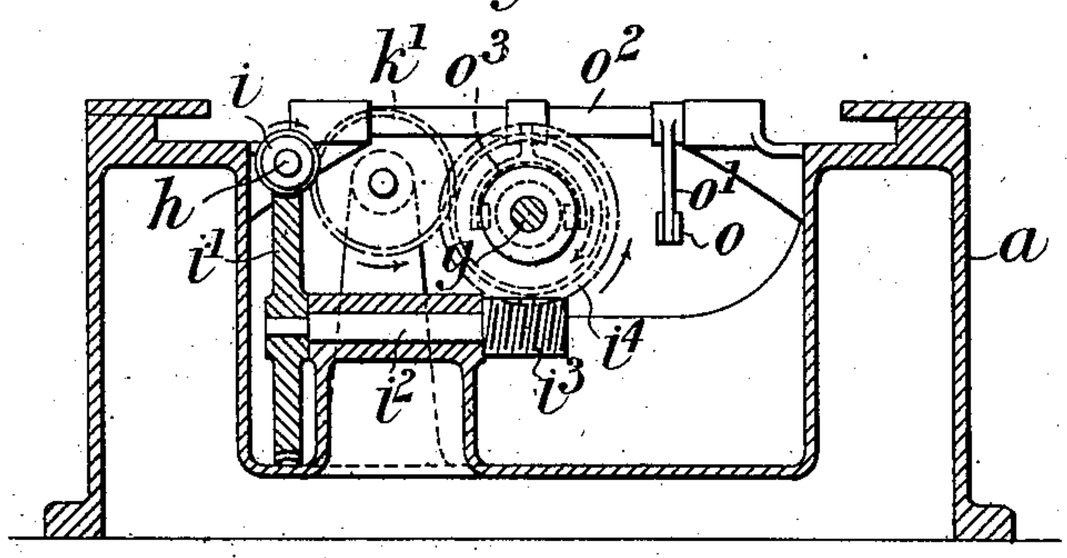


Fig. 5.



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No. 742,356. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

DAVID ROBERTS, OF LINCOLN, ENGLAND.

MACHINE-TOOL.

SPECIFICATION forming part of Letters Patent No. 742,356, dated October 27, 1903.

Application filed September 2, 1902. Serial No. 121,900. (No model.)

To all whom it may concern:

Be it known that I, DAVID ROBERTS, a subject of the King of Great Britain, residing at Spittlegate Iron Works, Grantham, Lincoln, England, have invented new and useful Improvements in Machine-Tools, of which the following is a specification.

This invention relates to improvements in engineers' machine-tools of the kind wherein the article operated on is attached to a table either fixed or movable and the cutting-tool is fed to the work or the table moves to the tool.

According to my invention the work instead of being fixed direct to the table is attached to a revolving plate or cylinder mounted on the table, and when one set of operations is completed the cutting-tool or table is automatically returned to its initial position while the plate or cylinder is automatically turned through a predetermined angle and presents to the cutting-tool other parts of the same article or other articles to be operated upon, the only manual labor required being the fixing and removing of the articles.

In carrying out the invention I make use of any of the usual automatic reversing-gears, the said gear being applied to the cutting-tool or table and being actuated at one end of the travel by a tappet-striker which engages with a lever, the gear first unlocking the revolving plate or cylinder, then turning the plate or cylinder to the required angle, and finally locking it in position.

In the accompanying drawings, Figure 1 is a sectional side elevation of a machine-tool made according to the invention. Fig. 2 is a sectional plan thereof; and Figs. 3, 4, and 5 are sections on the lines 3 3, 4 4, and 5 5, respectively, of Fig. 2. Fig. 6 is a detail perspective view, drawn to an enlarged scale, of a portion of the mechanism for imparting an intermittent movement to the work-holding table.

a is the bed of the machine, and b is an ordinary milling-cutter mounted on the shaft b', held in bearings in the bed a and adapted to be driven by the worm and toothed gear c from the main shaft d, operated by the pulley d'.

e is the revolving plate or cylinder, which is provided with clamping-vises e' e' for the work and is mounted upon a pivot e^2, supported in the table f and is locked to the said table, as hereinafter described. This table is adapted to be reciprocated in guides a' a' in the bed a through the medium of the screw g, which is mounted in the said bed a and engages a nut g' upon the under side of the table. The actuating-screw g is rotated from the shaft d and pulley d' through the medium of a shaft or spindle h, which is rotatably mounted in bearings in the bed a and is driven from the shaft d through the medium of the gearing h'. The movement of the shaft or spindle h is transmitted to the screw g, so as to turn it in the direction to advance the table f to the milling-cutter by means of the worm i, which gears with the worm-wheel i', Fig. 5, mounted upon a spindle i^2 and carrying at its other end a worm i^3, which engages a worm-wheel i^4, loose upon the screw g. This worm-wheel i^4 is provided with clutch-teeth j, by which it can be locked to the screw g through the medium of a clutch part controlled as hereinafter described. To turn the screw g in the opposite direction—that is to say, in the direction to bring the table away from the milling-cutter b—the screw g is actuated directly from the shaft h through the medium of the toothed gear-wheels k' k' and k^2, the last-mentioned wheel k^2 being loosely mounted upon the screw g and provided with clutch-teeth j'. When the aforesaid clutch part is brought into gear with the clutch-teeth j' the said wheel k^2 can be locked to the screw.

l is the clutch part, which is in the form of a sleeve keyed upon the screw g in such a manner that it can be moved axially thereon between the two clutch parts j and j' and being provided with teeth upon either end, so that when moved upon the said screw it can be caused to engage with either of the said parts. This clutch is operated by the following mechanism. A rod m is mounted in bearings m' m' in the bed a and is provided with two shoulders m^2 and m^3. The table f is furnished with a downwardly-projecting pin n between these two shoulders m^2 and m^3, so that as the said table is moved forward by the rotating screw g toward the milling-cutter it eventually strikes the stop or shoulder m^2, so as to pull forward the rod m. The rear end of the rod

m has pivoted to it one end of a link o, the other end of which is pivoted to a lever o', keyed upon a rocking shaft o^2, transversely mounted in the bed a and carrying a fork o^3, which engages the aforesaid clutch l. When, therefore, the rod m moves in the direction above indicated, the clutch l is moved so as to disengage it from the teeth j and to bring it into engagement with the teeth j', thus reversing the direction of motion of the screw g, whereby the table f begins to move backward, the gearing k' and k^2 being so designed that the return movement is more quick than the forward feeding movement. On the return movement the pin n eventually strikes the shoulder m^3, and so pushes back the rod m, thereby disengaging the clutch l from the teeth j' and causing it to reëngage the teeth j, whereby the direction of rotation of the screw g is again reversed, and the table is fed forward. As the table f reaches the end of its return stroke the revolving plate e is unlocked from the said table, partially rotated, and again locked to bring a fresh surface or a fresh piece of the work which is clamped to it under the milling-cutter b. This is effected by the following arrangement. Pivoted to the table at p is an arm p', the end of which is provided with a roller p^2, adapted as the table f is effecting its return movement to come into contact with and slide up an inclined block q. As the roller slides up the block q, which is fixed to the bed a, the arm p' is turned upon its pivot p and through the medium of the arm r raises a bell-crank lever r', pivoted to the end of the said arm r and bearing with its free end against a pin r^2 upon a worm-wheel r^3, keyed upon a spindle r^4, mounted in the table f. The short arm of the lever r' is provided with a yoke which engages a clutch part s, which slides upon the shaft h, upon which is coiled a spring s', normally tending to force the said clutch part s into engagement with the clutch part s^2, keyed upon the said shaft h. The clutch part s is keyed upon one end of a sleeve s^3, loosely mounted upon the shaft h and carrying at its other end a worm s^4, gearing with the aforesaid worm-wheel r^3. Normally, however, the clutch part s is held out of engagement with the clutch part s^2 (thereby preventing the worm-wheel r^3 from being rotated) by the aforementioned lever r', the end of the long arm of which, as above mentioned, is in contact with the pin r^2, and thus holds the clutch part s in the position shown in the drawings. When, however, the roller p^2 upon the arm p' rides up the inclined block q, the long arm of the bell-crank lever r' is raised above the pin r^2, so that the clutch part s is shifted into engagement with the clutch part s^2 by the spring s', whereby the rotation of the shaft h turns the worm-wheel r^3. The rotation of the worm-wheel r^3 also moves a disk t, which is keyed upon the spindle r^4 of the said worm-wheel r^3 and carries an upwardly-projecting pin t', which as the said disk t is turned first strikes one end of a lever u. This lever is pivoted at u' to the table f, and its other end engages with a bolt v, lying in a hole in the table f and normally held by a spring v' in engagement with one of a number of taper peripheral holes w in the revolving plate e, so as to lock it in a particular position. When now the pin t' strikes the end of the lever u, the bolt v is withdrawn by the said lever against the action of the said spring, so as to unlock the plate e from the table f. The further rotation of the disk t causes the pin t' to enter one of the peripheral recesses x in a circular plate x', which is keyed upon the pivot e^2 of the revolving plate e, and thus turns the said plate through a portion of a circle. As soon as a fresh hole w in the revolving table is brought opposite the spring-bolt v the latter is shot into the said hole by the spring v', and thus again locks the table in its new position. The continued revolution of the worm-wheel r^3 and disk t after giving the intermittent movement to the table, as above described, causes the pin r^2 to engage the long arm of the bell-crank lever r', and thus causes the other arm of said lever r' to move the clutch s out of engagement with the clutch member s^2 and to compress the spring s', leaving the parts in position to be again put in motion by the raising of the trip-lever arm p', as before described. In the drawings I have shown the wheel or disk x' provided with eight peripheral recesses x, thus insuring that the revolving plate e is turned through one-eighth of a revolution at the beginning of each forward movement.

To enable the lever p' to pass the block q in its forward movement, it is jointed at p^3 and provided with a spring p^4 at the joint.

It will be obvious, of course, that the number of recesses x may be varied to suit requirements, and it will also be clear that if it be required to miss any one of the bolt-holes this can be effected by increasing the length of the inclined surface q up which the roller p^2 rides to the required extent, thereby preventing the lever r' from dropping until the required distance has been moved through by the disk t.

My improved machine-tool enables several faces of a single piece of work or the faces of a number of similar articles to be machined automatically, the attendant only having to fix and remove the work.

Although in the drawings I have shown a milling-cutter for machining the work, it will be clear that a drill or any other machine-tool can be used in the same manner. Furthermore, the table can be fixed and the tool caused to reciprocate.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The combination with the supporting-bed, of a tool-holder supported thereby, a reciprocating carriage, mechanism for automat-

ically moving said carriage in both directions, a work-plate revolubly mounted on said carriage and provided with work-holding devices, mechanism for imparting an intermittent rotary motion to said plate, normally held out of operation, a clutch for throwing said mechanism into operation, mechanism including a part operated by the movement of said carriage, for throwing said clutch into operation, and means for releasing said clutch when the work-plate has been rotated a predetermined distance, substantially as described.

2. The combination with the supporting-bed, of a tool-holder supported thereby, a reciprocating carriage, mechanism for automatically moving said carriage in both directions, a work-plate revolubly mounted on said carriage and provided with work-holding devices, mechanism for imparting an intermittent rotary motion to said plate normally held out of operation, a clutch for throwing said mechanism into operation, a spring for throwing said clutch into operative position, a lever for holding said clutch out of operative position, a stop carried by a rotary part of said work-plate-operating mechanism, for engaging said lever and moving said clutch out of operative position, a trip-lever connected with said clutch-lever for disengaging the clutch-lever from the stop, and an adjustable trip on the bed of the machine in the path of said trip-lever, substantially as described.

3. The combination with a bed and tool-holder supported thereby, of a revoluble work-plate supported on said bed, a disk secured thereto and provided with a plurality of peripheral recesses, a rotary device provided with a part to enter said recesses to effect a partial revolution of said work-holder, and a stop-pin secured to said rotating device, driving mechanism for said rotary device including a clutch, a spring for throwing said clutch into operative position, a lever for normally holding said clutch out of operative position, having an arm in the path of said stop-pin on said rotary device for returning said lever to and holding it in normal position, a trip-lever for disengaging said arm from said stop-pin, said tool-holder and said work-plate being provided the one with mechanism for moving it toward and from the other in a direction parallel to the plane of said work-plate, and devices for operating said trip-lever by the said movement of said work-plate and tool-holder the one toward the other, substantially as described.

4. In a machine-tool, the combination with a bed and tool-holder, of a carriage on said bed movable toward and from said tool-holder, a rotary work-plate mounted on said carriage, a spring-actuated locking-pin for engaging said work-plate, mechanism for imparting an intermittent rotary movement to said work-plate including a clutch, a spring for normally throwing said clutch into operative position, a lever normally holding said clutch out of operative position, a trip-lever carried by the carriage for tripping the clutch-lever and permitting said spring to operate said clutch, a pivoted arm for withdrawing said locking-pin from said work-holder, an operating device for said arm carried by a part of said mechanism for imparting rotary motion to said work-plate, and a projection on said bed in the path of said trip-lever for actuating the same, substantially as described.

5. In a machine-tool, the combination with a bed and stationary tool-holder, of a sliding carriage, mechanism for reciprocating said carriage including a screw-shaft, devices for operating said shaft in both directions, and a double reversing-clutch on said shaft, a sliding rod mounted in said bed, connected with said clutch and provided with a pair of shoulders, a projection on said carriage for engaging said shoulders, a revoluble work-plate on said carriage, a spring-actuated locking-pin therefor, a disk secured to said work-plate and provided with peripheral recesses, a revoluble disk provided with a lug to engage said recesses and a stop-pin, driving mechanism for said disk including a clutch, a spring for throwing said clutch into operative position, a lever for disengaging said clutch having an arm in the path of said stop-pin on said revoluble disk, a trip-lever operated by the movement of the carriage for disengaging said arm from said stop-pin and a lever for retracting said locking-pin, having a part in the path of the lug on said revoluble disk, substantially as described.

DAVID ROBERTS.

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