No. 665,966. Patented Jan. 15, 1901.

C. W. MILES.

MACHINE TOOL.

(Application filed Nov. 14, 1898.)

(No Model.) 2 Sheets—Sheet 1.

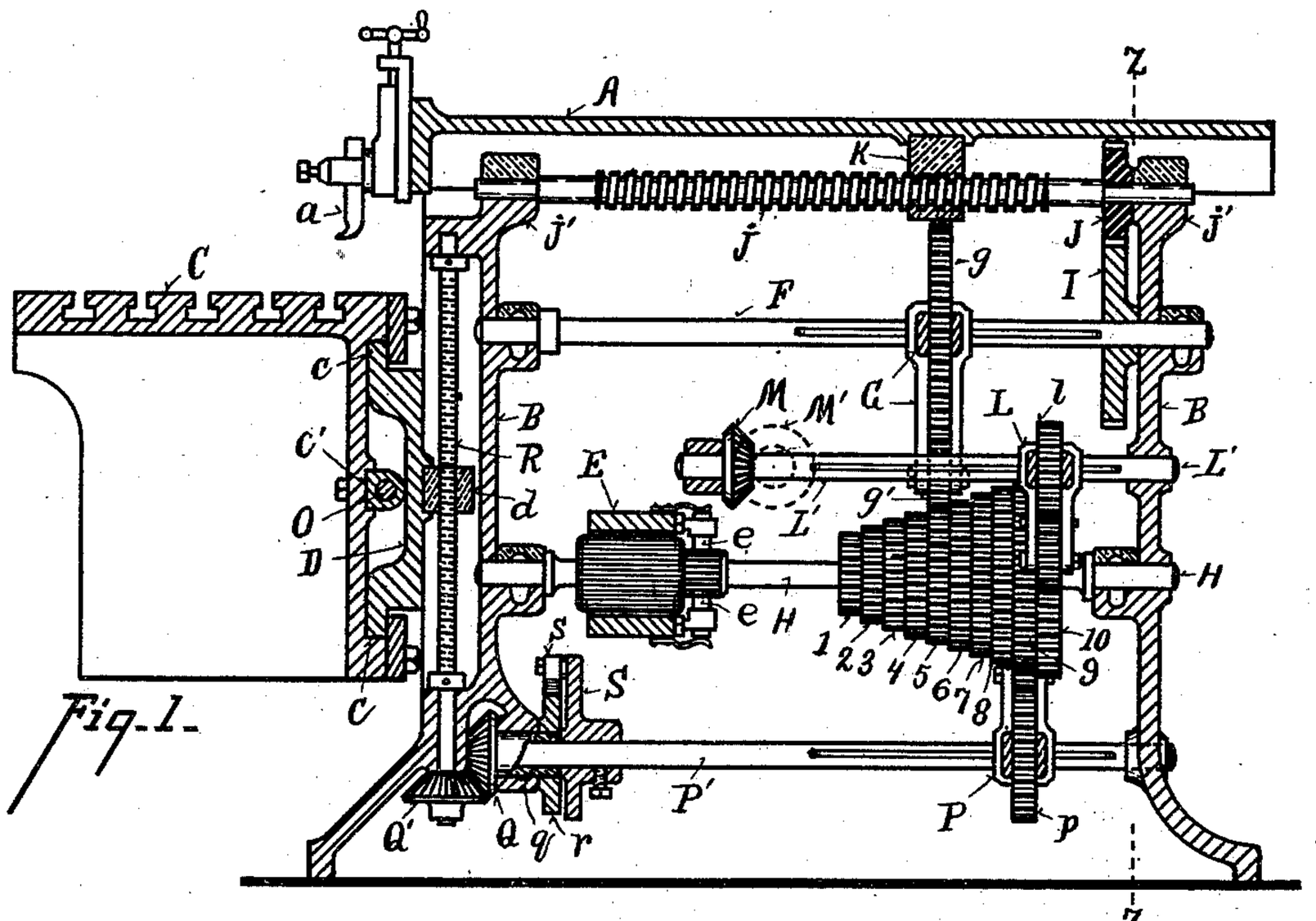

Fig. 1.

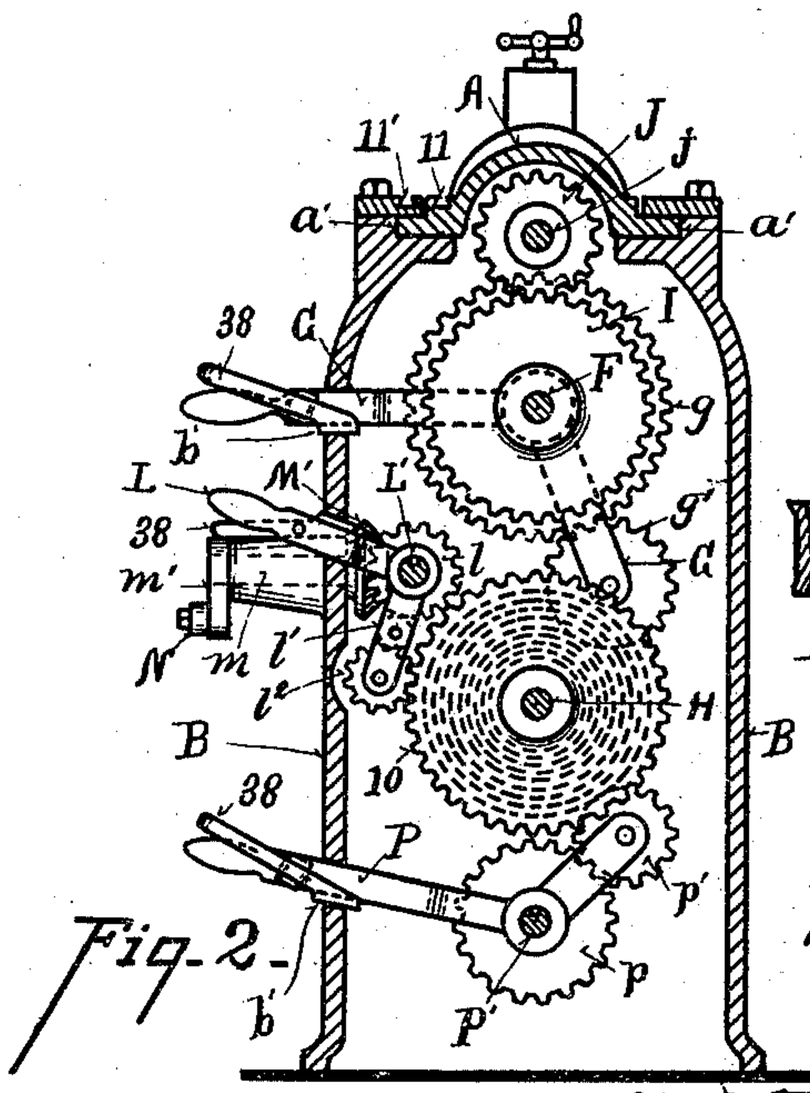

Fig. 2.

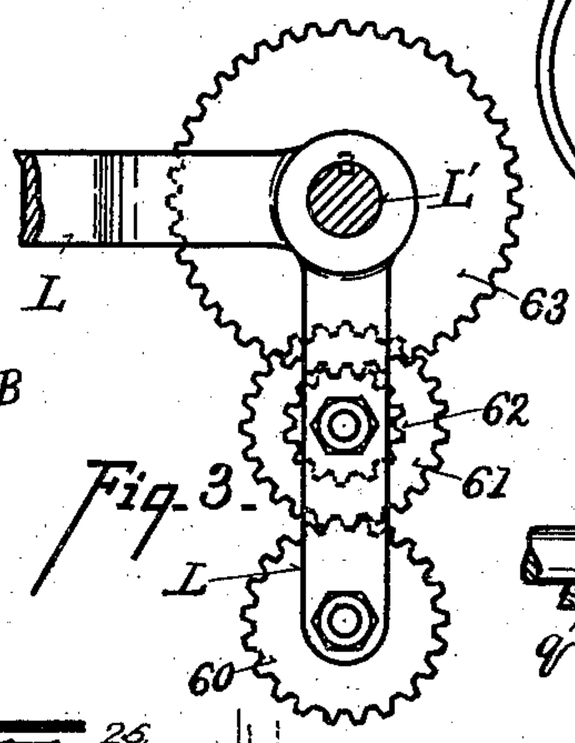

Fig. 3.

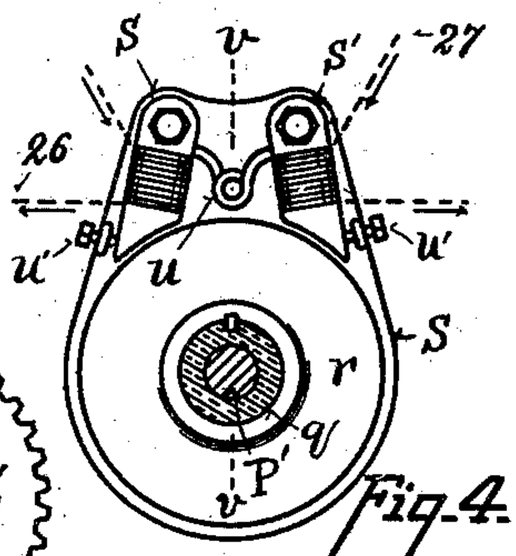

Fig. 4.

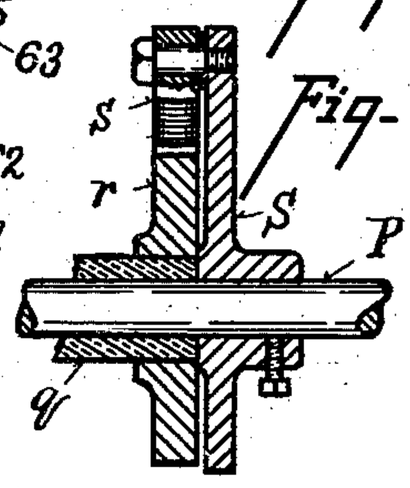

Fig. 5.

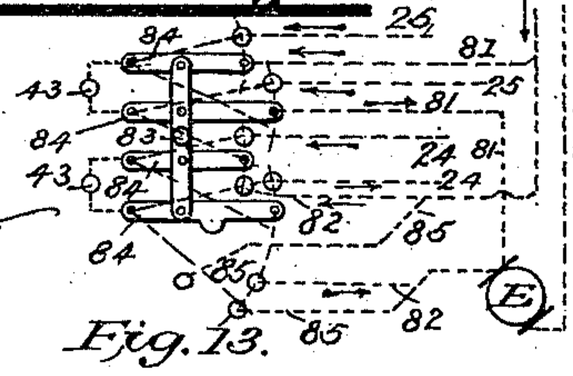

Fig. 13.

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MACHINE TOOL.

(Application filed Nov. 14, 1898.)

(No Model.) 2 Sheets—Sheet 2.

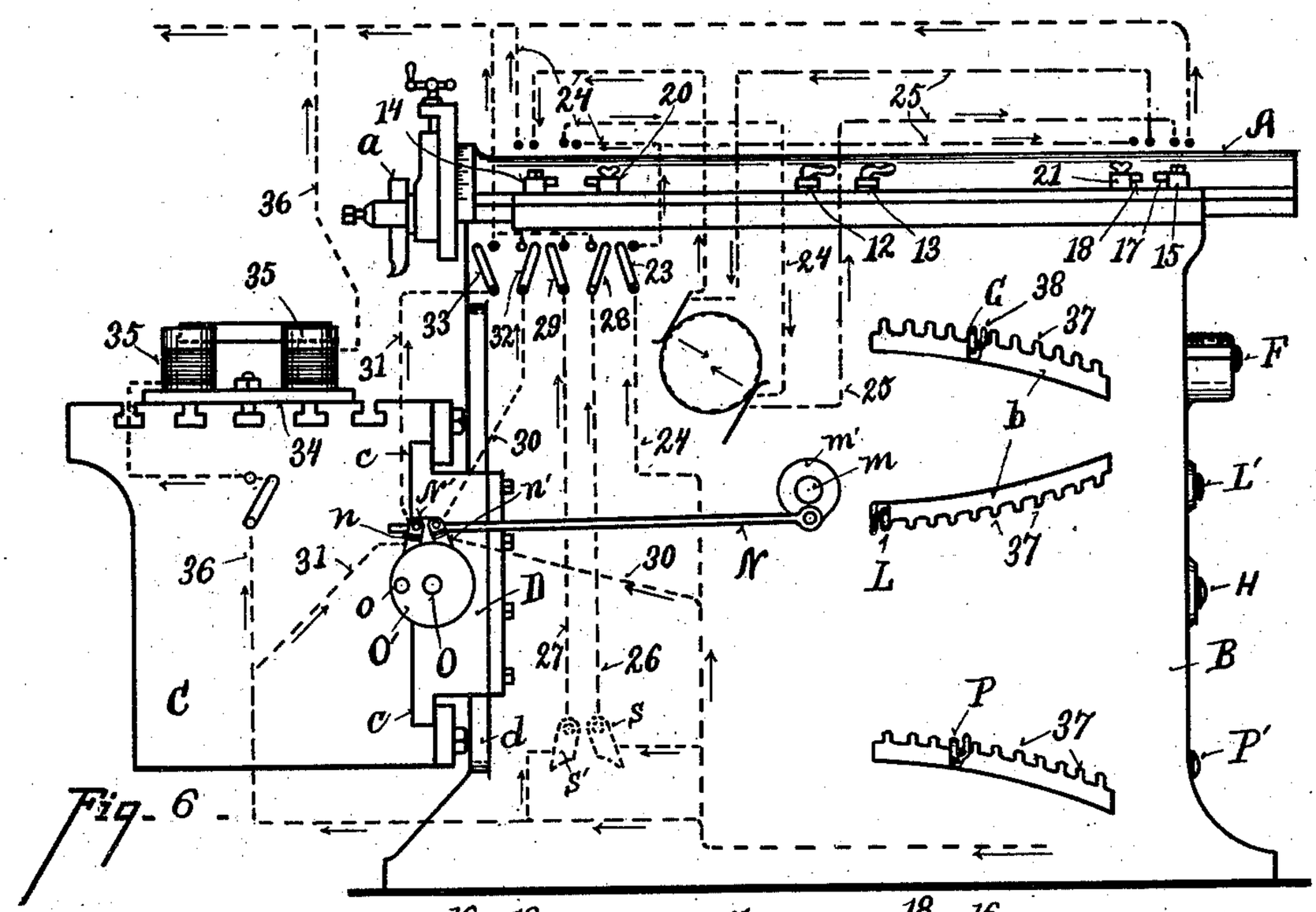

Fig. 6.

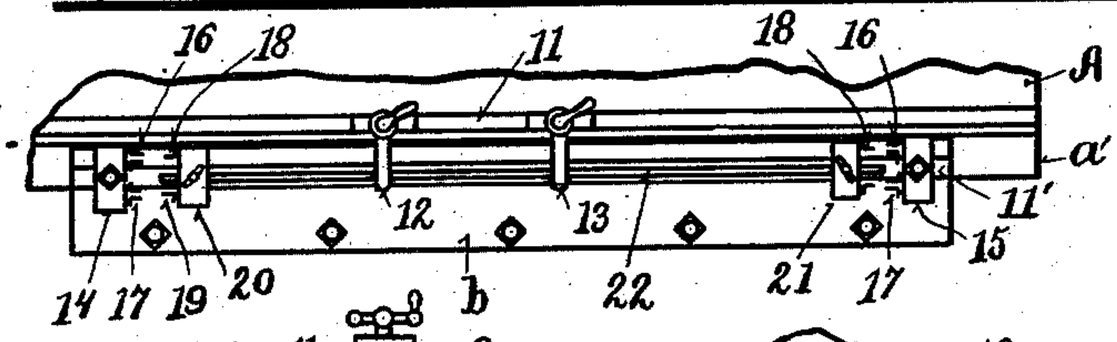

Fig. 7.

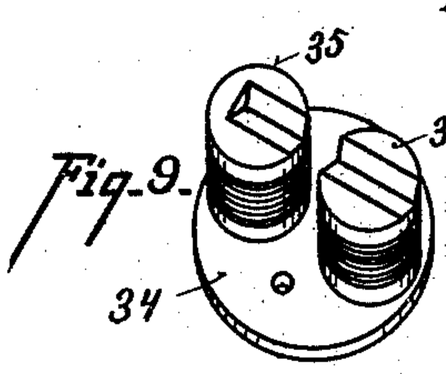

Fig. 9.

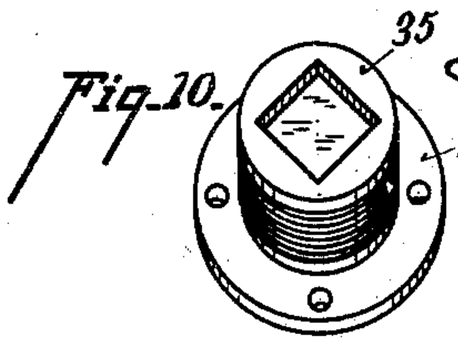

Fig. 10.

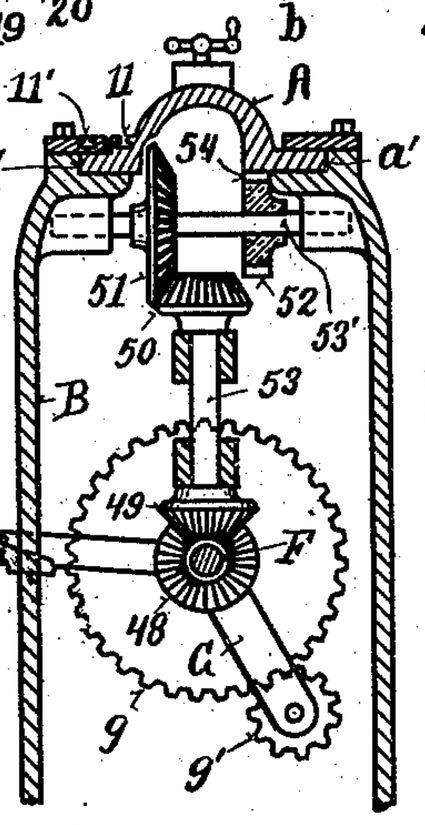

Fig. 11.

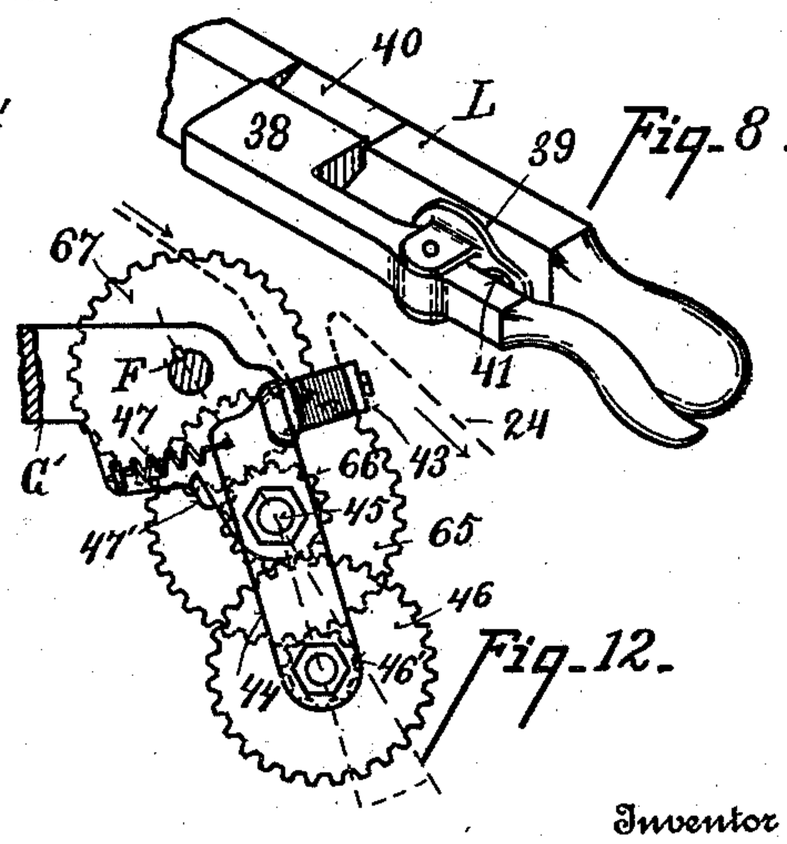

Fig. 8.

Fig. 12.

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UNITED STATES PATENT OFFICE.

CASPER W. MILES, OF CINCINNATI, OHIO.

MACHINE-TOOL.

SPECIFICATION forming part of Letters Patent No. 665,966, dated January 15, 1901.

Application filed November 14, 1898. Serial No. 696,391. (No model.)

To all whom it may concern:

Be it known that I, CASPER W. MILES, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Machine-Tools, of which the following is a specification.

My invention relates to improvements in machine-tools.

One of the objects is to provide a machine-tool having a contained motor and appropriate transmitting-gear, whereby the use of shafting and belting to drive the machine is dispensed with.

Another object is to provide improved change and unshipping gear, whereby the several feed movements may readily be shifted to change the speed or relative speed and also to disconnect and stop any one of the feeds without interfering with any of the others.

Another object is to provide improved tripping and shifting mechanism, whereby the application of power to the driving mechanism is tripped or stopped and the acquired momentum exhausted and utilized before the reverse movement is commenced.

Another object is to provide improved adjusting-lever gearing, setting, and locking mechanism.

Another object is to provide improved chucks for holding certain classes of work.

It also consists in certain details of construction and arrangement of parts, all of which will be more fully set forth in the description of the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a central vertical section through a tool embodying my improvements. Fig. 2 is a section on line *z z*, Fig. 1. Fig. 3 is a detail view of a modification of one of the transmitting and setting or change levers and its gears. Fig. 4 is a detail view of one of the feeding-clutches. Fig. 5 is a section on line *v v*, Fig. 4. Fig. 6 is a side elevation of the tool shown in Figs. 1 and 2. Fig. 7 is a detail view of the shifting or reversing mechanism. Fig. 8 is a detail view of the setting-lever-locking mechanism. Fig. 9 is a perspective view of one of the chucks. Fig. 10 is a perspective view of another form of chuck. Fig. 11 shows a modification of the transmitting mechanism between the motor and the reciprocating carriage. Fig. 12 is a detail view of one of the setting-levers employed to produce a quick return movement of the carriage. Fig. 13 represents a switch for controlling the setting-levers, Fig. 12.

My invention is adapted for and is shown as applied to that class of machine-tools in which either the tool is mounted upon a reciprocating carriage and the work arranged to be fed vertically and horizontally or in which the work is mounted upon a reciprocating carriage and the tool arranged to be fed vertically and horizontally, and it is intended and may be used with slight change upon either.

As shown in the drawings, the tool *a* is mounted upon a reciprocating carriage A, sliding in ways *a'* on the frame B of the machine, while the work is to be secured upon a table C, sliding horizontally upon ways *c* upon a carriage D, which is vertically adjustable upon ways *d* on frame B.

The self-contained motor employed is preferably an electric motor E, the brushes *e* of which are so arranged that the current can be reversed through the motor and drive it alternately in opposite directions.

H represents the motor-shaft, journaled in bearings in the frame of the machine.

1 2 3 4 5 6 7 8 9 10 represent a cone of gears mounted on shaft H.

G represents a bifurcated lever journaled on shaft F, and *g* a spur-gear located between the arms of said lever and splined to shaft F, so as to revolve with it and so that said lever and gear can be slipped longitudinally along said shaft F to bring it into line with any one of the gears 1 2 3 4 5 6 7 8 9 10. I preferably employ a single gear *g'*, journaled between the arms of lever G, to transmit motion from the cone-gears to shaft F through gear *g*. The shaft F carries a gear I, meshing with gear J, mounted upon the screw-shaft *j*, journaled in bearings *j'* in the frame of the machine.

K represents a nut secured to the carriage A and engaging the screw *j* to reciprocate the carriage.

The table C and carriage D are fed vertically in the following manner:

P represents a setting-lever similar to lever G, carrying a gear *p*, splined to shaft P'.

p' represents a gear journaled between the arms of lever P and adapted also to engage any one of the cone-gears 1 2 3 4 5 6 7 8 9 10 by sliding the lever along the shaft P'.

Q represents a beveled gear transmitting motion through gear Q' to the shaft R, which engages a nut d on the carriage D to raise or lower the same. This gear Q has a sleeve q, which journals in the frame B, and it also serves as a journal for the shaft P'.

r represents a clutch-disk mounted rigidly on sleeve q, and S (see Figs. 4 and 5) a disk mounted on and rotating or oscillating with the shaft P' and carrying electromagnets $s\,s'$, pivoted to the face of the disk and adapted when energized to grasp the edge of the disk r and drive the shaft R by a step-by-step movement in either direction, depending upon which of the magnets is energized. Thus if the right-hand magnet, Fig. 4, is energized and the shaft carrying disk S is oscillated through part of a revolution the free end of the magnet will adhere to the edge of the disk r and when turned to the right will bind and turn the disk r with it; but upon being turned in the opposite direction the magnet will slide on the edge of disk r without moving it, ready to bind again as soon as moved again to the right.

u represents a spring the free ends of which engage the magnets $s\,s'$ and hold them, when the magnets are not energized, a slight distance from the face of clutch-disk r, and u' represents adjustable stops to limit this movement of the magnets.

To feed the table C horizontally, I provide a bifurcated lever L, carrying a gear l, which is splined to shaft L'.

l' l^2 represent gears journaled between the arms of lever L and adapted by sliding along the shaft L' to also engage any one of the cone-gears 1 2 3 4 5 6 7 8 9 10.

M represents a beveled gear transmitting motion through gear M' and shaft m to crank-wheel m', which reciprocates rod N, which in turn oscillates a disk N', journaled on the outer end of a screw-shaft O.

O' represents a clutch-disk rigidly mounted on shaft O and provided with a hand-lever o, by means of which the table can be adjusted by hand.

$n\,n'$ represent magnets pivoted to disk N' in a manner similar to that shown in Figs. 4 and 5 and adapted when energized to clutch the face of disk O' and rotate the shaft O to feed the table.

c' represents a nut secured to table C and engaging the shaft O, whereby the table C may be fed horizontally in either direction.

In order to stop and reverse the reciprocating carriage, I provide the following mechanism: 11 represents a slot in the side of the tool-carriage, in which are adjusted and clamped tripping-levers 12 13. (See Figs. 2, 6, and 7.) A similar slot or groove 11' is provided in the plate b of the frame B, in which are clamped the switch-plates 14 15, each of which carries two sets of contact-points 16 17, which are closed or opened by the insertion or retraction of the blades 18 19 of the sliding blocks 20 21. These blocks 20 21 are connected together by means of a rod 22, upon which they are adjustable to or from each other. Thus when contact is made at switch 23 in line 24 the motor is started and the carriage travels forward until the stop 12 strikes sliding block 20, which by means of rod 22 breaks the contact between the points on block 15 and shuts off the current from the motor, when the machinery travels along under its acquired momentum until block 20 reaches and makes contact at the points on block 14 through line 25, when the motor is reversed and travels in the opposite direction until lever 13 trips the block 21 and breaks contact at block 14 and then makes contact again at block 15.

26 27 represent branch circuits controlled, respectively, by switches 28 and 29 to energize magnets $s\,s'$, and 30 31 represent branch circuits controlled, respectively by switches 32 33 to energize magnets $n\,n'$.

As shown in Figs. 2, 6, and 8, the ends of the setting-levers G, L, and P project through slots b' in the side of the frame B.

37 represents a series of notches in one side of slots in line with the respective gears 1 2 3 4 5 6 7 8 9 10, into one of which the edge of the setting-lever must enter before the gear on the setting-lever is brought into mesh with the gears of the cone. In order to hold or lock these setting-levers in their adjusted position, I provide a short lever 38, pivoted to a journal-block 39, which is itself swiveled to the setting-lever. The inner end of this lever 38 is beveled and rides up and down an inclined notch 40 on the setting-lever, thereby wedging and locking the said setting-lever into the notch 37, to which it has been adjusted.

41 represents a spring to automatically hold the lever 38 in place.

I preferably provide one more notch 37 than there are gears in the cone, in which extra notch the setting-lever is adjusted to unship the particular feed controlled by that lever.

In Fig. 3 I have shown a modified arrangement of the gears on one of the setting-levers by which power is transmitted, respectively, through gears 60 61 62 63 to the shaft on which the setting-lever journals, whereby a slower feed may be obtained than can conveniently be secured by the use of only two gears on the setting-lever.

In Figs. 6, 9, and 10 I have shown an improved form of chuck which can be advantageously employed to hold a large class of work, such as parts of guns, sewing-machines, &c., of which a large number are required, and which are difficult on account of size and shape to hold in ordinary chucks. My chuck consists, as shown, of a base-plate 34, adapted to be clamped to the table, and one or more electromagnets 35, having offsets or recesses

cut or formed on the face thereof to receive or interlock with the work and assist in holding it in place when the magnet is energized. By the employment of this chuck the work is quickly secured in and released from the chuck by making and breaking contact through the switch in the branch circuit 36.

In this class of machinery it is often desirable to feed the carriage forward slowly and retract it rapidly. This I accomplish by providing two setting-levers G′ of the form shown in Fig. 12, which are journaled on the shaft F, in line, respectively, with a large and small gear of the cone, and the magnet 43 on one of said setting-levers is included in the circuit 24 to feed the carriage forward, while magnet 43 of the other or companion setting-lever is included in circuit 25 to feed the carriage backward. The magnets 43 are mounted rigidly on the levers G′.

44 represents an armature-lever, pivoted at 45 and carrying gears 46 46′.

47 represents a spring for retracting the armature against stop 47′ and automatically throwing the gear 46 out of engagement with the cone-gear, while the magnet when energized draws the armature-lever toward it and causes the gear 46 to mesh with the cone-gear and transmit motion to shaft F through the respective gears 46, 46′, 65, 66, and 67. By having two of these levers G′ upon the shaft F, with their respective magnets in the forward and return circuits of the motor, the gears are automatically shifted to feed the carriage forward at a slower rate than it is returned.

In Fig. 13 I have shown a switch to be employed in connection with the setting-levers, Fig. 12, for controlling the movements thereof. This switch consists of four arms 84, each pivoted at one end and adapted to be simultaneously shifted by means of the knob 83 to any one of five positions, as indicated by dotted lines. The first or upper position is such as to pass the current from the circuits 24 and 25, respectively, alternately through the magnets 43 of the setting-levers, as heretofore described. The second position (shown in full line) passes the current through line 81, through the upper one of the magnets 43, and also through the motor E. The third position is such as to pass the current through the lower magnet 43 and through the motor E by way of line 82. The fourth position directs the current through the motor alone by way of the line 85. By throwing the switch still lower all the connections can be broken, thereby stopping the motor.

In Fig. 11 I have shown a modification of the transmitting mechanism between the shaft F and carriage, in which by means of gears 48, 49, 50, 51, and 52 on shafts F 53 53′ the carriage is driven by means of a rack 54 on the under side of the carriage in place of the screw-shaft *j* and nut K. (Shown in Fig. 1.)

It will be observed that the feed of the reciprocating carriage may be unshipped through lever G and that then the sliding blocks 20 21 can be shifted by hand to revolve the motor in either direction to feed the table, through either lever L or P, to the desired extent, also, that when all three of the feeds are employed the relative feed through levers L P may be regulated to plane or dress surfaces at varying angles to the horizontal. It is my intention to shield the exposed magnets and contact-points from flying chips, &c., which shields are not shown.

While I have shown my improved transmitting mechanism driven direct by a motor and prefer to so employ it, yet it will be apparent that said shaft might be driven by belt and mechanical clutches employed in place of the electrical clutches, Figs. 4 and 5, and I do not wish to limit myself, except as specifically set forth in the claims, as to the manner of driving the cone-gear shaft and form of transmitting mechanism between the setting-levers and the carriages or tables to be driven, as I believe I am the first to employ a cone of gears in a machine-tool, with two or more feeding movements radiating therefrom, with means for independently connecting or disconnecting said movements with the several gears of the cone.

Having described my invention, what I claim is—

1. In a machine-tool a power-driven shaft carrying a cone of gears, two or more feeding mechanisms driven by said cone of gears, each provided with a setting-lever, whereby said several feed mechanisms may be independently connected to any one of the several gears of said cone, substantially as specified.

2. In a machine-tool, a power-driven cone of gears; a tool-feeding mechanism; and a work-feeding mechanism, each separately driven from said cone of gears; and independent setting-lever mechanisms substantially as specified, whereby said feed mechanisms may be independently connected to and disconnected from said cone-gears, substantially as specified.

3. In a machine-tool in combination with a reciprocating carriage; a tripping and reversing mechanism composed of a series of electrical switches, substantially as shown, by means of which the application of power to the driving mechanism is first stopped, and the parts allowed to travel forward a distance by means of their acquired momentum, after which the power is automatically applied to reverse the movement of the carriage, substantially as specified.

4. In a machine-tool in combination with a reciprocating carriage a tripping and reversing mechanism consisting of adjustable traveling tripping-arms, stationary contact-points, reciprocating contact-points, a connecting-rod between said reciprocating contact-points, and means for adjusting said movable contact-points upon said connecting-rod, substantially as specified.

5. In a machine-tool in combination with a reciprocating carriage a tripping and reversing mechanism consisting of traveling tripping-arms; stationary contact-points, reciprocating contact-points, and a connecting-rod between the reciprocating contact-points, whereby the application of power to the driving mechanism is first stopped, and the parts allowed to travel forward a distance on their acquired momentum, after which power is automatically applied to reverse the movement of the carriage, substantially as specified.

6. In a machine-tool a power-driven shaft carrying two or more driving-gears, a shaft carrying two driven gears and driving a reciprocating carriage, and two electrically-controlled gears interposed between said driven and driving gears, and automatic reversing mechanism, substantially as shown, whereby said electrically-controlled gears are alternately engaged and disengaged in order to feed said carriage at different speeds in opposite directions, substantially as specified.

7. In a machine-tool the combination of a driving-shaft, a cone of gears mounted upon said shaft, two or more transmitting-shafts arranged circumferentially around said driving-shaft and in parallel planes therewith, the transmitting-shafts being respectively connected to the several feed mechanisms, each of said transmitting-shafts being provided with a pinion splined thereto, a transmitting-gear and a setting-lever, adapting said respective transmitting-shafts to be independently or conjointly engaged with any one of said cone-gears, substantially as specified.

8. In a machine-tool, in combination with a main driving-shaft; a series of feeding-shafts driven therefrom; each provided with an independent electrically-controlled clutch adapted to be operated through a controlling-switch for controlling the several feeds independently of the movements of the main driving-shaft, substantially as specified.

9. In a machine-tool in combination with a main driving-shaft; a work-feeding shaft driven therefrom; an electrically-controlled clutch adapted to be operated by the operator through a controlling-switch to stop and start the feed independently of the movements of the main driving-shaft, substantially as specified.

In testimony whereof I have hereunto set my hand.

CASPER W. MILES.

Witnesses:
OLIVER B. KAISER,
W. R. WOOD.