No. 666,019. Patented Jan. 15, 1901.

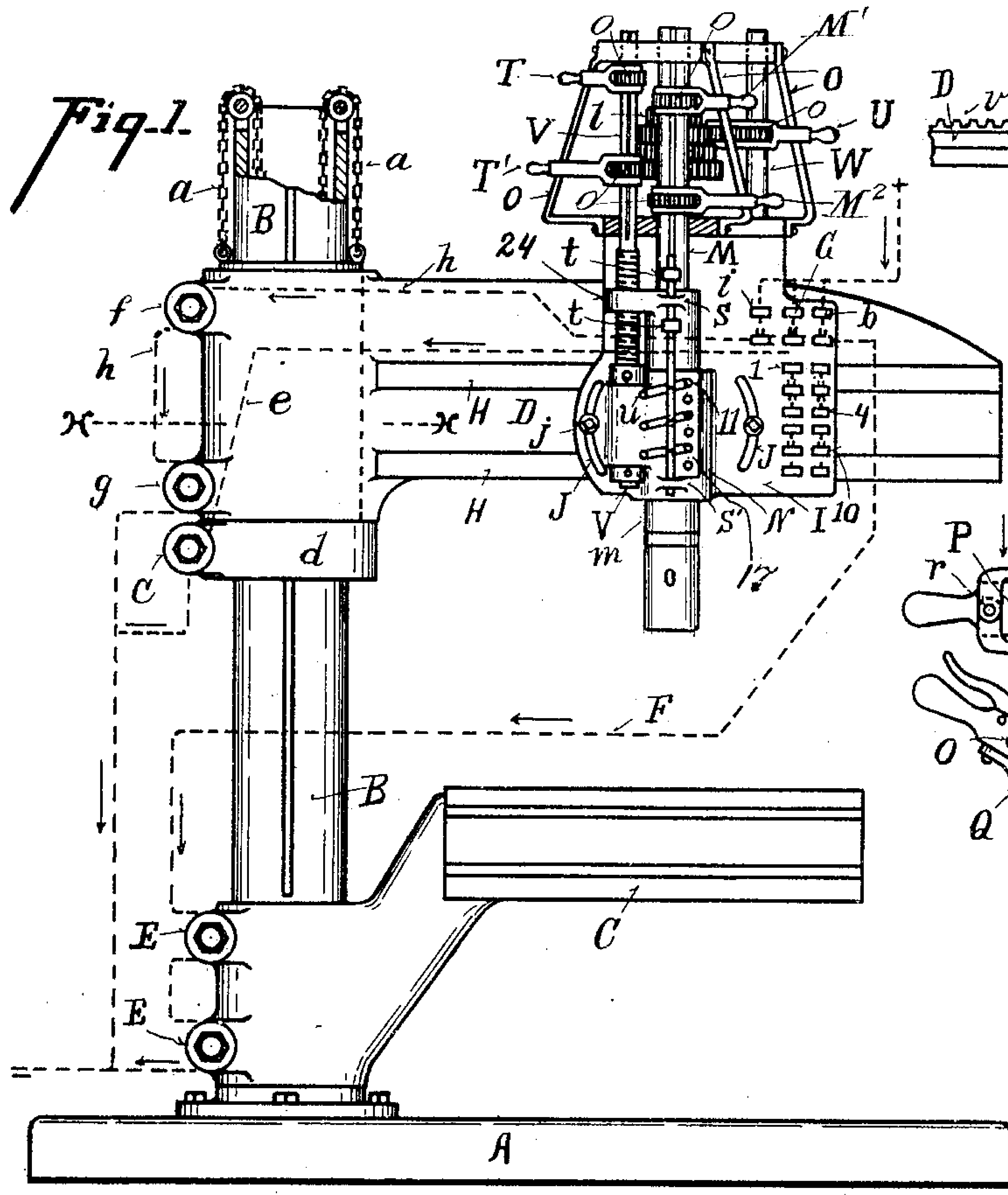
C. W. MILES.

DRILLING MACHINE.

(Application filed Apr. 10, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig-1.



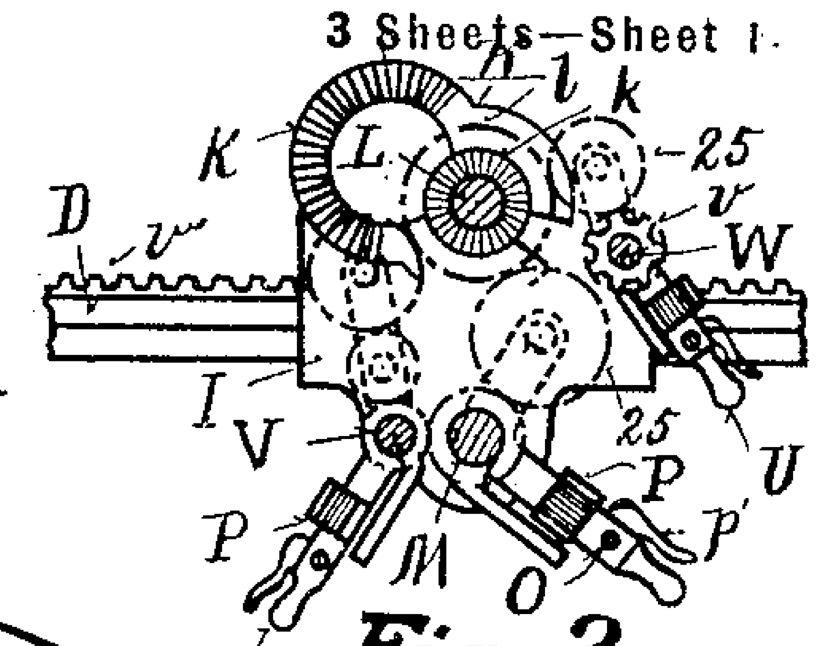


Fig-2.

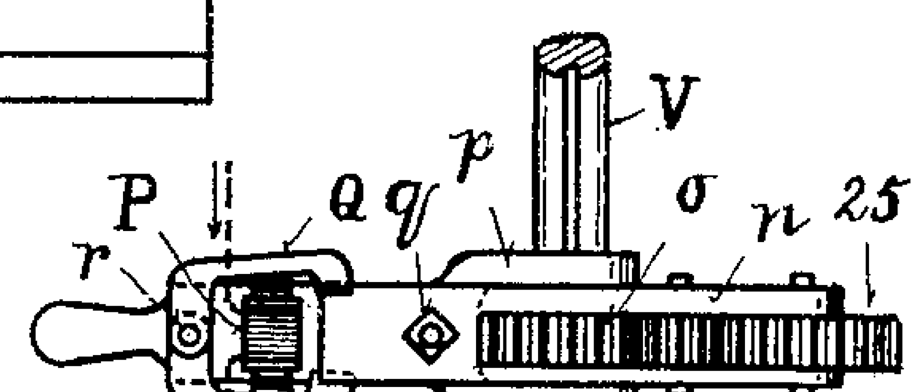


Fig-3.

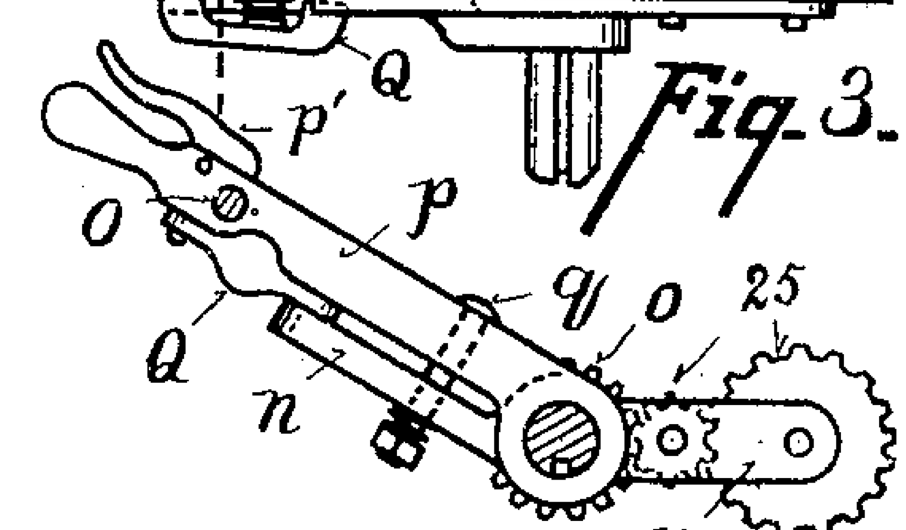


Fig-4.

Fig-5.

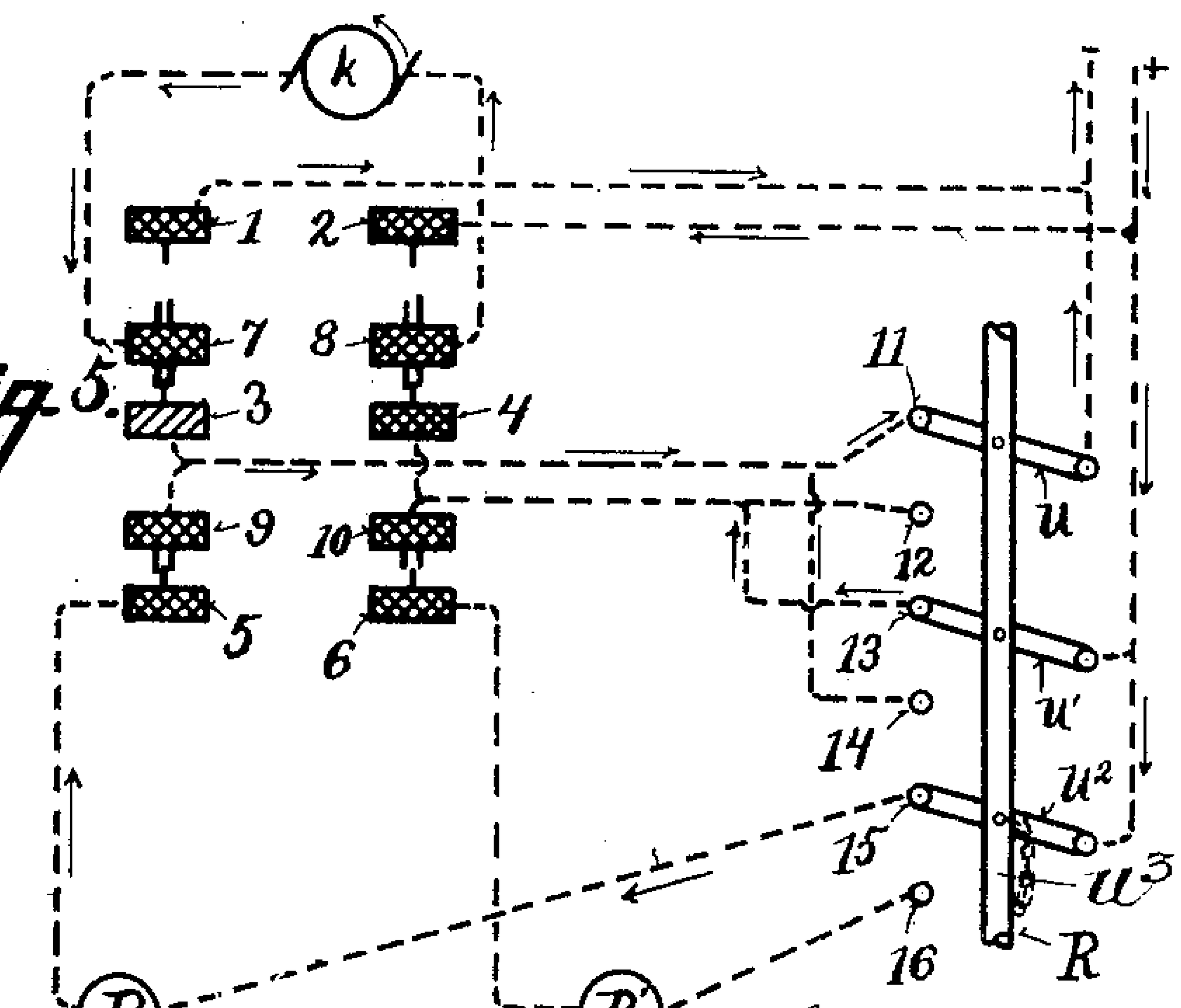


Fig-6.

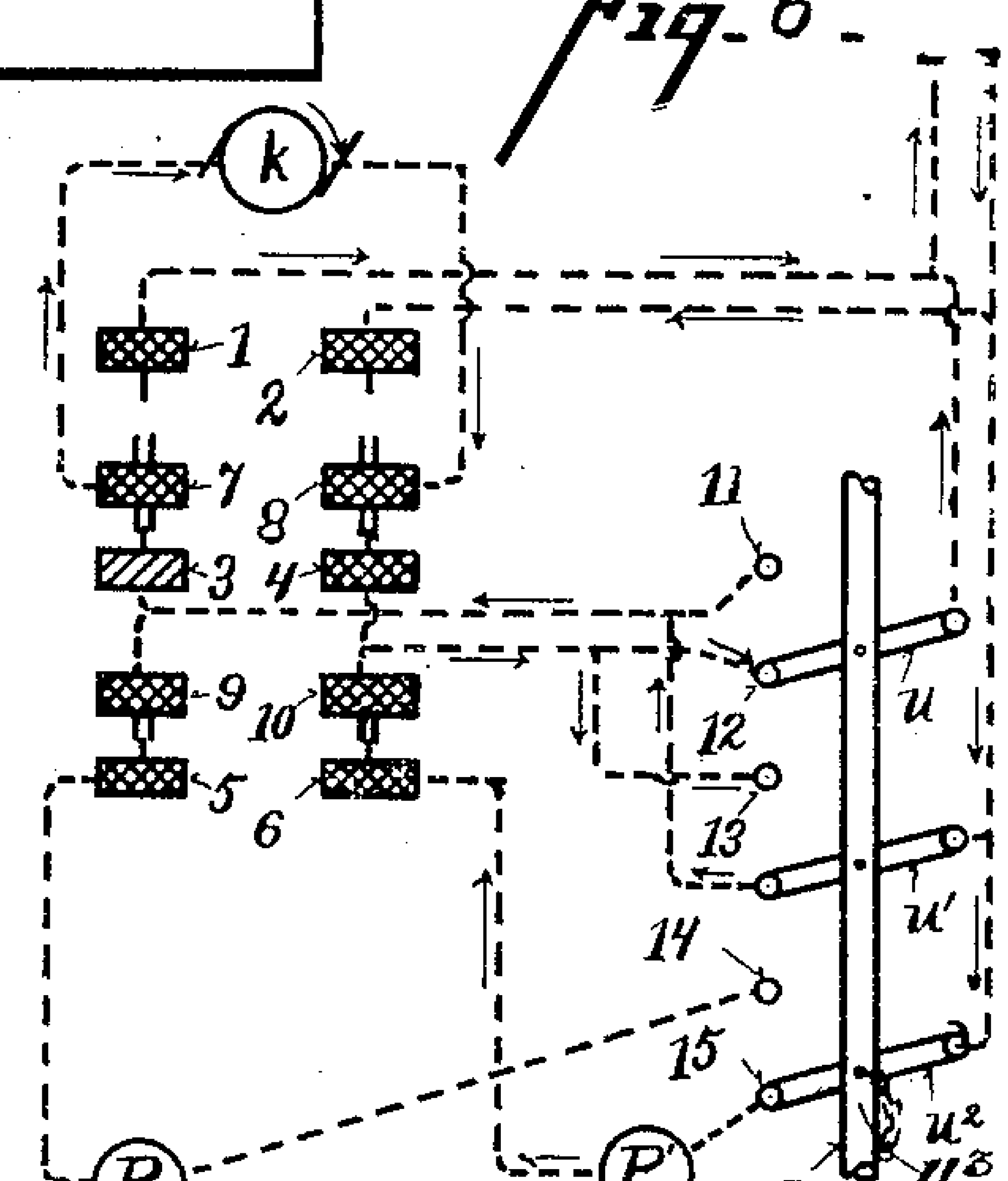
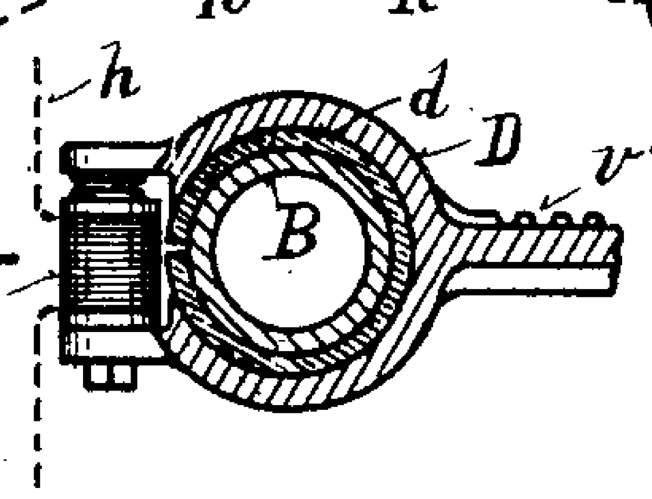


Fig-7.



Witnesses

N. K. Wood.

Oliver B. Kaiser

Inventor

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No. 666,019. Patented Jan. 15, 1901.

C. W. MILES.

DRILLING MACHINE.

(Application filed Apr. 10, 1899.)

(No Model.) 3 Sheets—Sheet 2.

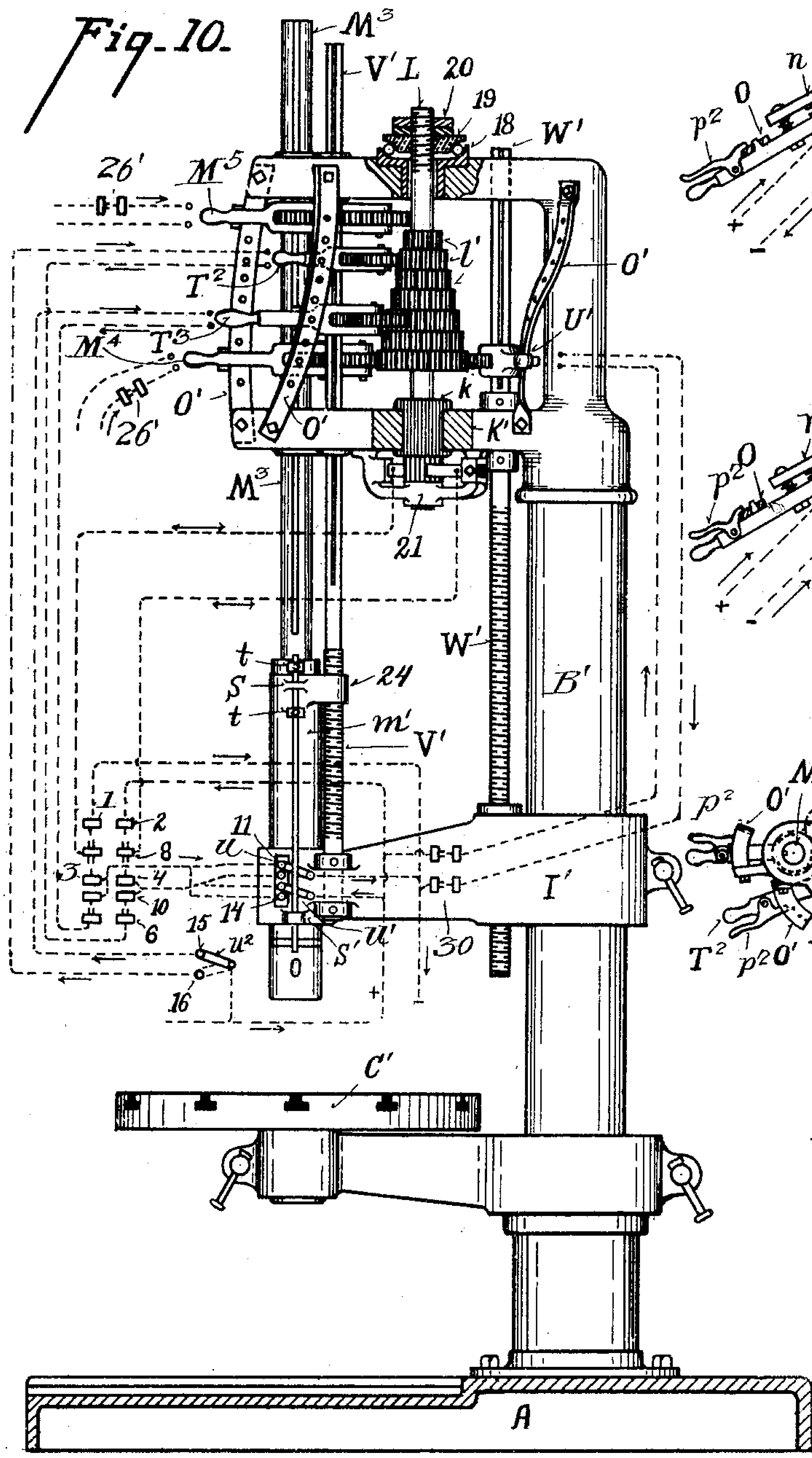

Fig. 10.

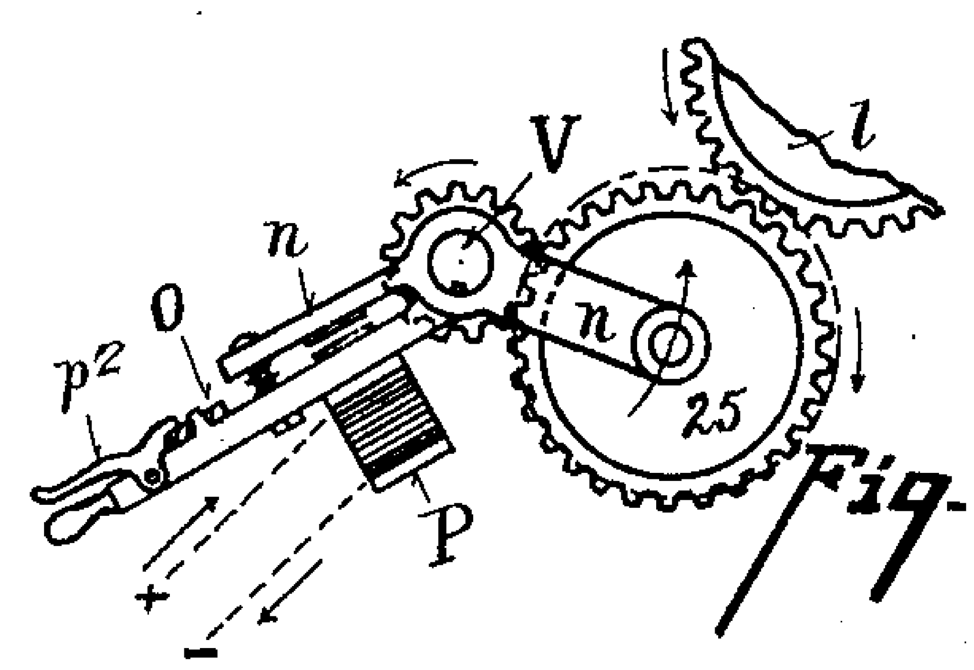

Fig. 8.

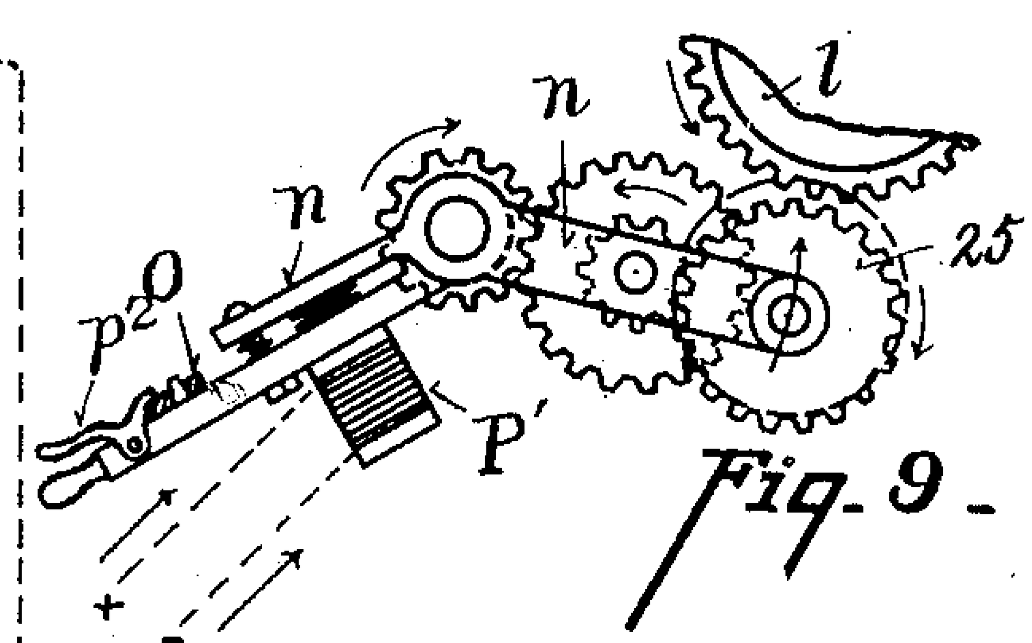

Fig. 9.

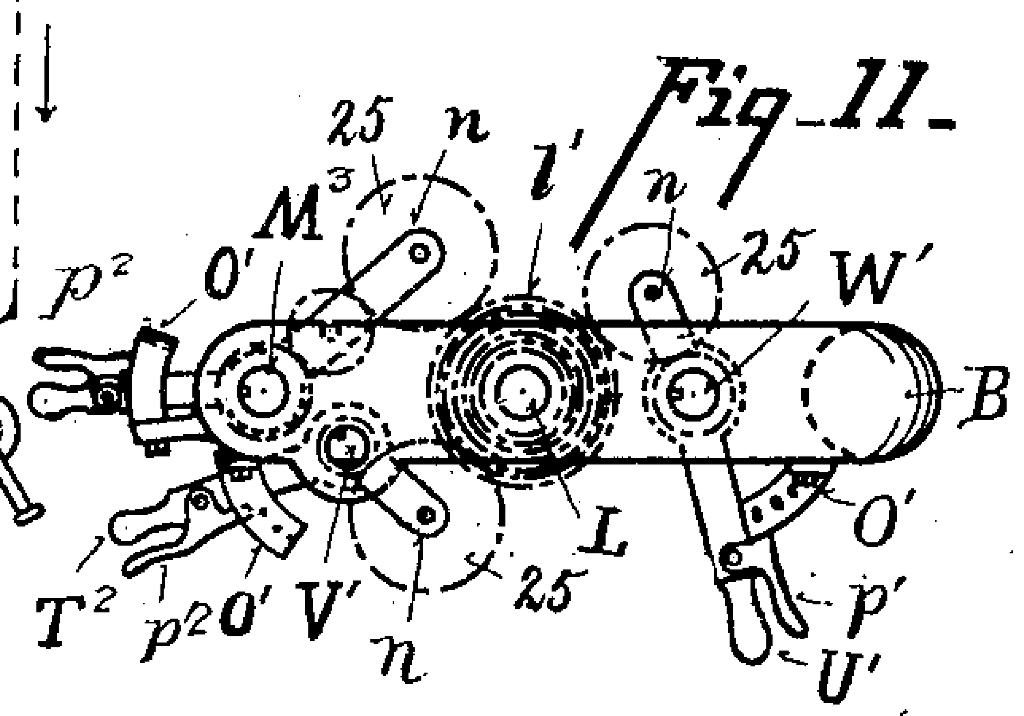

Fig. 11.

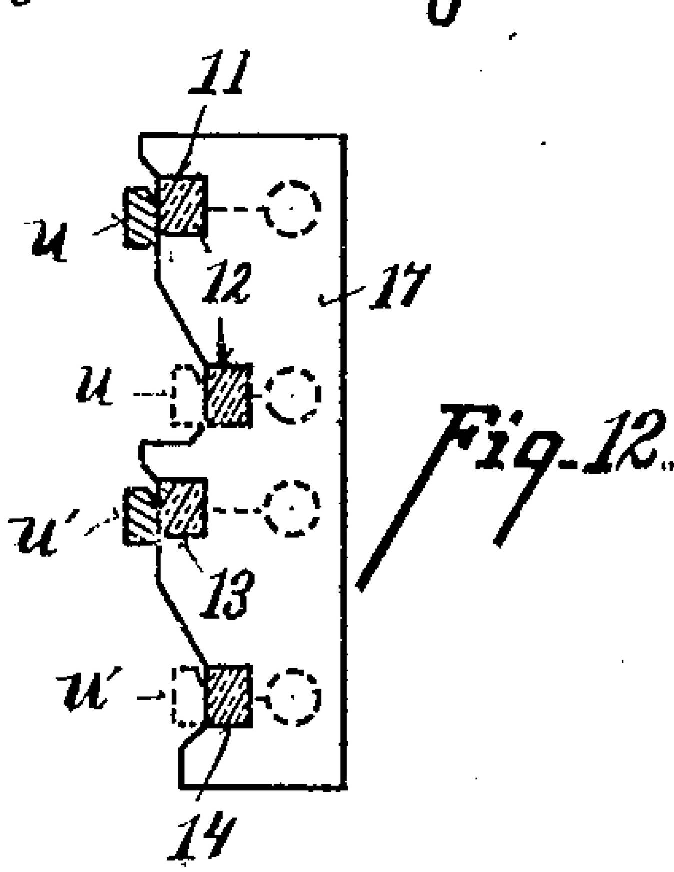

Fig. 12.

Witnesses

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No. 666,019. Patented Jan. 15, 1901.

C. W. MILES.

DRILLING MACHINE.

(Application filed Apr. 10, 1899.)

(No Model.) 3 Sheets—Sheet 3.

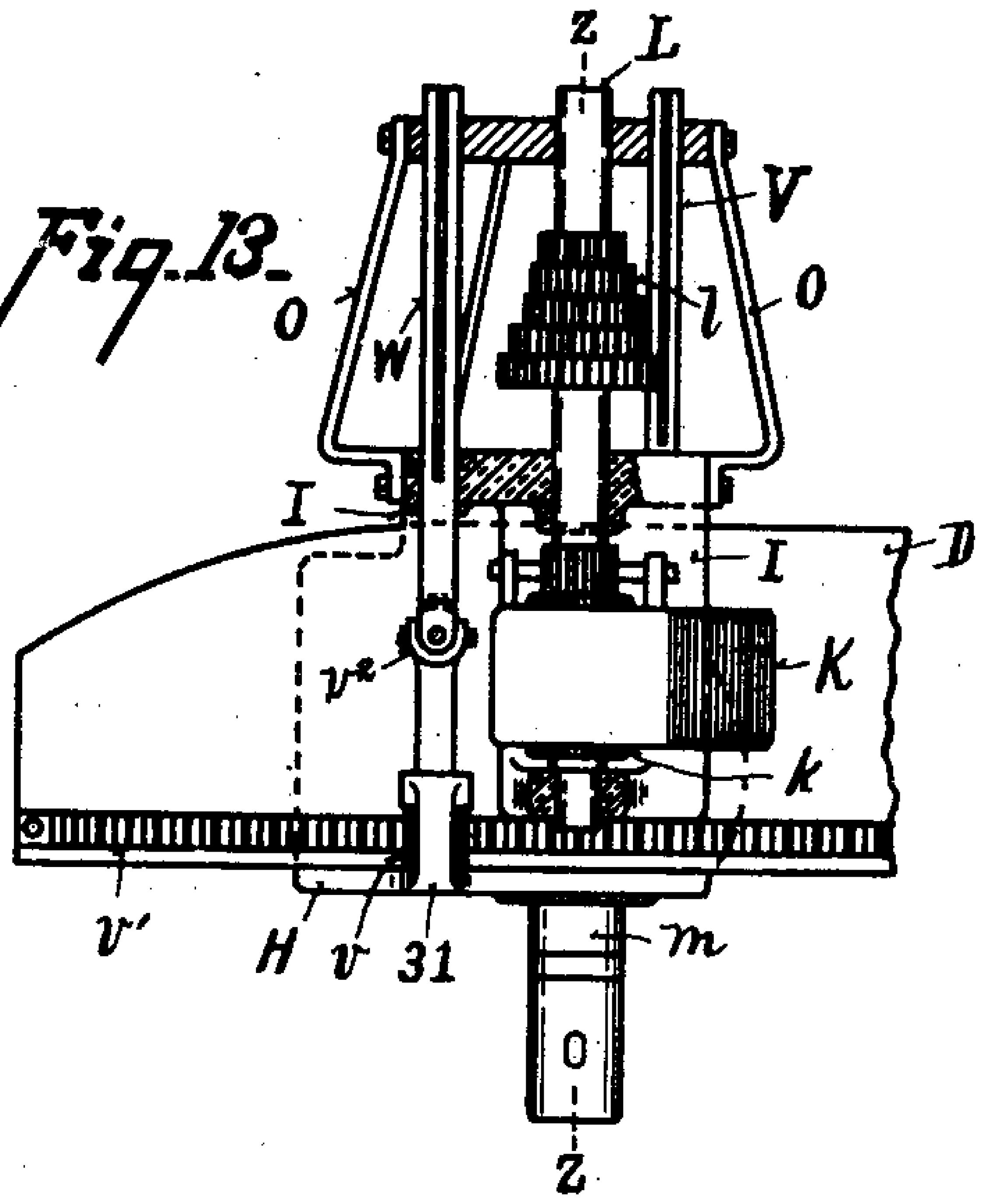

Fig. 13.

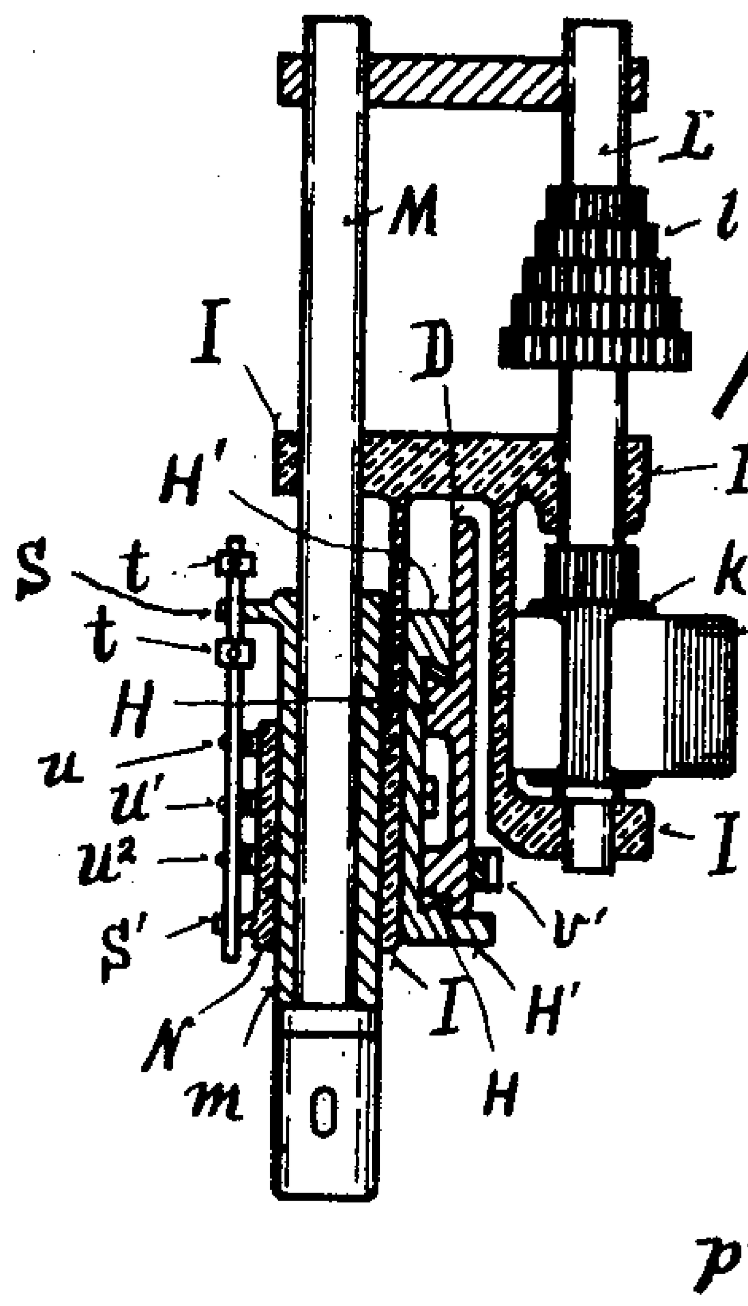

Fig. 14.

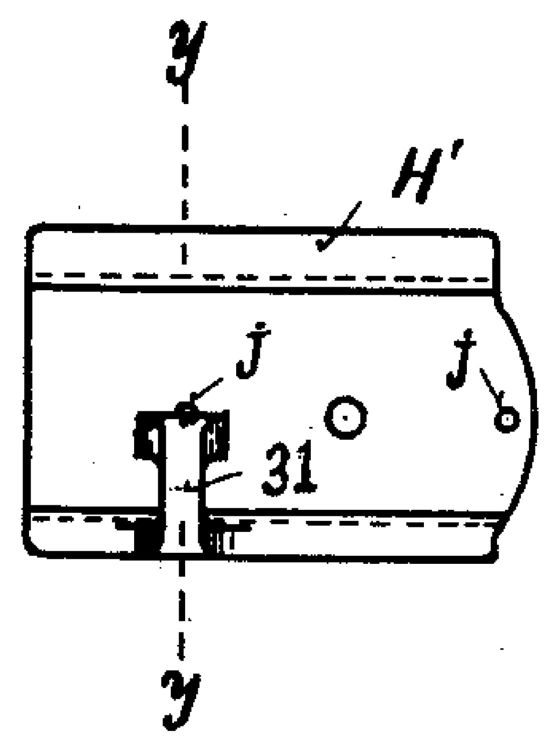

Fig. 15.

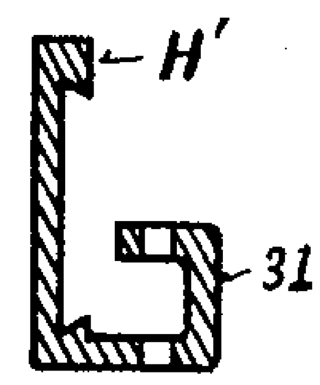

Fig. 16.

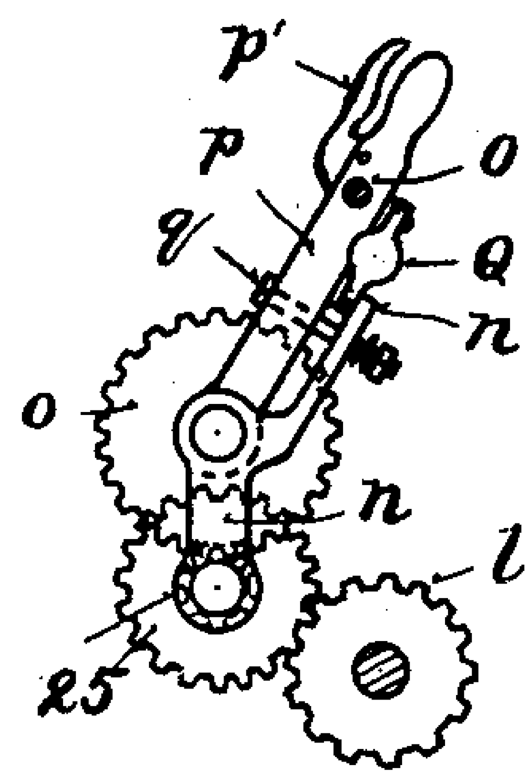

Fig. 19.

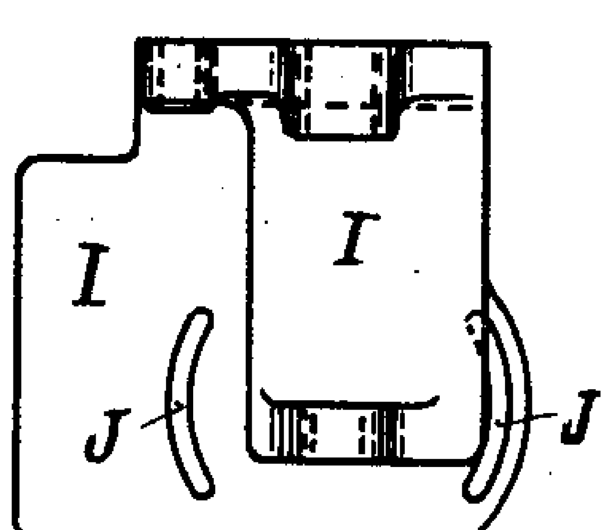

Fig. 17.

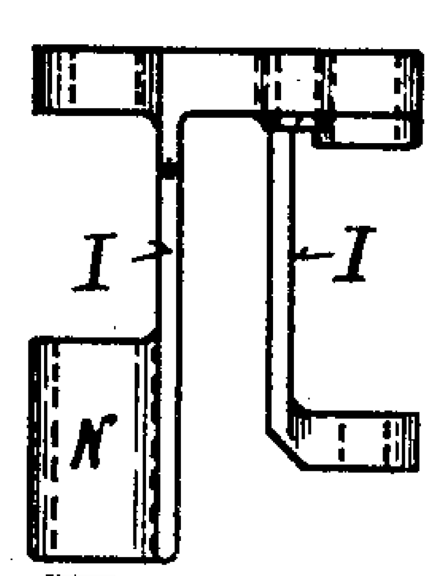

Fig. 18.

Witnesses

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UNITED STATES PATENT OFFICE.

CASPER W. MILES, OF CINCINNATI, OHIO.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 666,019, dated January 15, 1901.

Application filed April 10, 1899. Serial No. 712,379. (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 Drills, of which the following is a specification.

My invention relates to improvements in drills. One of its objects is to provide a drill the various operating mechanisms of which may be controlled by the operator from his position in front of the drill to effect the various changes in speed, automatic trip, reversal, throwing in or out of clamps and clutches, &c.

Another object is to provide a wide range of speeds.

Another object is to provide a simple, economical, and improved drill feeding and actuating mechanism.

Another object is to provide a simple and improved drill feeding and actuating mechanism which, with the substitution of interchangeable setting-lever mechanism either in the factory or subsequently, can be readily adapted to a wide range of different classes of work without altering the main structure.

Another object is to provide electrically-operated clamping devices which can be operated from a conveniently-located switch at a distance from the clamping device.

Another object is to provide electrically-operated mechanism whereby the several forward and reverse gears and fast and slow speed gears may be severally or alternately brought into operation by operating the appropriate switches.

Another object is to provide improved automatic tripping and reverse mechanism for drilling or tapping.

My invention also consists in certain details of combination and construction, all of which will be fully set forth in the description of the accompanying drawings, in which—

Figure 1 represents a front elevation of a radial drill embodying my improvements. Figs. 2 is a diagram showing the drill-stock in top plan. Figs. 3 and 4 are detail views of one form of electrically-controlled change-gears. Figs. 5 and 6 are diagrams showing the manner of connecting the several operating mechanisms in electrical circuit. Fig. 7 is a section through the column and radial arm on line *x x*, Fig. 1. Figs. 8 and 9 are details of modifications of the change-gear mechanism. Fig. 10 is a side elevation showing my improvements applied to a stationary drill-frame. Fig. 11 is a diagram showing the operating mechanism of the modification, Fig. 10, in top plan. Fig. 12 is a detail sectional view of the automatic trip. Fig. 13 represents a rear elevation, partly in section, of the radial arm and drill-carriage of Fig. 1. Fig. 14 is a section on line *z z*, Fig. 13. Fig. 15 is a rear plan view of the plate to which the drill-carriage is pivoted. Fig. 16 is a section through the same on line *y y*. Fig. 17 is a rear elevation of the drill-carriage. Fig. 18 is a side elevation of the same. Fig. 19 is a detail view of one of the electrically-controlled change-gears arranged for slow speed.

Referring to Fig. 1, A represents the bed-plate, B the column, and C a drill-table swiveled on the column. D represents a radial arm swiveled upon a split sleeve *d*, which is splined to the column and counterweighted by means of a weight hung upon the chains *a a* and within the column to balance the weight of the sleeve *d*, arm D, and parts carried thereon, so that the drill can be readily raised or lowered. The split sleeve *d* is provided with an electrically-controlled clamping device, preferably an electromagnet *c*, included in the electric circuit *e*, controlled by switch G, so that the sleeve *d* may be clamped upon the column at any adjusted position by throwing the switch G and as readily released.

The arm D is split where it encircles the sleeve *d* (see Fig. 7) and is provided with electrically-operated clamping devices, preferably electromagnets *f g*, included in circuit *h*, controlled by switch *i*. E represents similar clamping devices included in circuit F and controlled by switch *b*, whereby the drill-table is clamped upon the column, so that these several devices may be unclamped, adjusted, and reclamped by the operator without leaving his position in front of the drill.

Mounted upon ways H on the radial arm D is a plate H′, to which is pivoted the drill-carriage I, which is preferably adapted to swivel thereon in order to drill at an angle, being locked in the adjusted position by means of the bolts j, traveling in curved slots J. This drill-carriage is preferably of the yoke form, embracing both sides of the arm D, as shown in Figs. 13, 14, 16, and 17. Upon the dependent arm of the drill-carriage, at the rear of the radial arm D, is mounted an electric motor consisting of the field-magnets K and armature k, mounted upon the main driving-shaft L. Mounted upon the shaft L is a series of gears l, preferably in the form of a cone.

M represents the drill-spindle, swiveled in a vertically-adjustable sleeve m, sliding in a socket N in the drill-carriage.

The drill-spindle is driven from one or other of the gears l by means of a setting-lever mechanism of the character shown in Figs. 3, 4, 8, 9, and 19, in which a gear o is splined upon the drill-spindle and receives motion through one or more planetary gears journaled in the arms of a setting-lever n.

In Figs. 3, 4, 8, 9, and 19 I have shown several modifications of this setting-lever and planetary-gear mechanism, two or more of which, M' M^2, may be and preferably are located upon the drill-spindle to give a greater range of speeds and may be used alternately to change from slow to fast speeds or to reverse the direction of the spindle. These planetary gears are adapted to be thrown into and out of engagement with the gears l in the following manner: O represents a rod along which the outer end of the lever p slides, so as to bring it opposite the desired gear l on shaft L, whereupon the lever p is locked in position in any approved manner, preferably by means of a lock-lever p', as shown in Figs. 4 and 8. In the modification, Figs. 3 and 4, when the lever p is locked in position the planetary gear is brought nearly into engagement with the gear l, but is held out of engagement by means of a coiled spring on the bolt q. P represents an electromagnet secured to arm p. Q represents armatures therefor pivoted at r and with their free ends wedge-shaped and adapted when the magnet is energized to wedge the arms n p apart and cause the gear 25 to engage one of the gears l. In Figs. 8 and 9 the magnet P' is employed to draw the arms n p together, and thereby bring the planetary gear into engagement. One or more gears may be journaled in the fork of the arm n, depending upon the use to which it is to be put—namely, high or low speed, forward or reverse movement—as illustrated in the several modifications, Figs. 4, 8, and 9. I also provide a blank space at each end of the cone-gears l, so that either lever n may be retired to this blank space, if desired.

V represents the drill-feeding shaft, which is swiveled at its lower end in the wall of the socket N and screw-threaded for a short distance above to engage internal screw-threads in the ear 24 of the sleeve m, which it feeds up and down.

T T' represent two separate setting-lever mechanisms, such as are shown in Figs. 4, 8, and 9, one of which feeds the drill forward and the other feeds it in the reverse direction. U represents a similar setting-lever mounted on the feed-shaft W, on which shaft two setting-lever mechanisms may also be employed, if desired.

R represents a rod passing through ears S S', projecting, respectively, from the sleeve m and the drill-carriage.

t represents adjustable collars on opposite sides of the ear S, by means of which the rod R is automatically tripped by the engagement of the ear S with one or other of these collars to throw the switch-levers u u' u^2, which switch-levers are employed for a variety of purposes, such as reversing the motor for tapping, reversing the drill-feed at a predetermined point, and for providing a slow direct feed and quick reverse feed of the drill.

In Figs. 5 and 6 I have illustrated the manner of utilizing this automatic tripping mechanism. 1 2 3 4 5 6 represent stationary switch-blocks located on the drill-carriage or other convenient position. 7 and 8 represent movable switch-blocks adapted to be thrown into engagement with either blocks 1 and 2 or with 3 and 4. 9 and 10 represent movable switch-blocks adapted to engage or be disengaged from 5 and 6. 11 and 12 represent contact-points alternately in contact with the movable end of arm u. 13 14 represent contact-points contacting with arm u', and 15 16 represent points contacting with arm u^2. The levers u u' u^2 are also preferably made detachable from the rod R, as indicated at u^2, Figs. 5 and 6, where the lever u^2 is shown pivoted to the rod R by means of a removable pin u^3. The points 11 to 14 are preferably arranged, as shown in Fig. 12, upon an insulating-block 17, secured to the drill-carriage and having an incline between each pair of points, the object of which is to carry the arms u u' automatically down the inclines in one direction, bringing the arms u u' into contact with the points 12 14 to reverse the drill-feed. When the ear S strikes the upper collar t, the arms u u' are moved in the opposite direction up the inclines a sufficient distance to break the contact with the points 12 14, when the feed stops until such time as the operator is ready to drill or tap another hole and resets or pushes the automatic trip by hand up the incline to its original position, with the arms u u' in contact with the points 11 13. As arranged in Fig. 5 the drill may be used for tapping, in which case the arm u^2 is disconnected and adjusted by hand in contact with either point 15 or 16, as desired, which gives a current through magnet P of one of the setting-levers—say T' on the feed-shaft V—leaving the magnet P′ of the other setting-lever T upon the same shaft idle. The magnets of the setting-levers on the drill-spindle are energized through separate lines and switches. (Not shown in Fig. 1, but shown as 26 26′ in Fig. 10.) The arms u u' are set by hand to the position indicated in full line, Fig. 12, and the current is turned on at the main switch and passes as indicated by arrows in Fig. 5, driving the drill-spindle and tap in proper direction to tap the hole, the forward feed continuing until the lever R is tripped by the ear S striking the lower collar t, breaking the contact at 11 and 13 and causing the arms u u' to slide down the inclines on the block 17 and take the position Fig. 6, with the exception of the arm u^2, which, being disconnected from the rod R, would remain on the point 15. The effect of this change would be to reverse the motor, and thereby the drill-spindle and the drill-feed shaft V, retracting the tap, after which the rod R would be tripped in the opposite direction, causing the arms u u' to break contact with 12 and 14, but not to make contact with 11 and 13 until thrown up the inclines by hand by the operator when ready to tap another hole. Another manner of using this automatic trip would be to throw 7 and 8 into contact with 1 and 2, which would cause the motor to revolve continuously in the forward direction. The arm u^2, being connected to rod R, could then be employed to alternately energize the magnets P P′ of the two setting-levers T T′, both in engagement with gears l. Say the setting-levers shown in Figs. 8 and 9, respectively, were employed and mounted on the feed-shaft V, which could then be set so as to feed the drill slowly down and when tripped at a predetermined point reverse and rapidly feed the drill in the opposite direction until retracted from the hole, and then be tripped to stop the feed until the operator was ready to drill another hole. The switch-blocks 7 and 8 may also be thrown to an intermediate position, and thereby utilized to stop and start the motor.

The shaft W is adapted to feed the drill-carriage. In Figs. 1 and 2 it is provided with a gear v, meshing with a rack v' on the radial arm. Where the drill-carriage is adapted to be adjusted at an angle, this shaft is provided with a universal joint v^2 near the gear v to permit the angular adjustment of the carriage, the shaft below the universal joint being journaled in a bracket 31, projecting from the plate H′, which serves to hold the gear v in engagement with the rack.

In Fig. 10 I have shown a modification in which the operative parts are mounted on a stationary frame instead of on a movable frame on the radial arm. In this modification A′ represents the frame, B′ the column, and C′ the table. M^3 represents the drill-spindle, m' the sleeve, and I′ the drill-carriage, adjustable vertically on the column by means of a screw on the lower end of shaft W′. The parts S S′ t u u' u^2 1 2 3 4 5 6 7 8 9 10 are the same as in Figs. 1, 5, and 6. V′ represents the drill-feed shaft, and T^2 T^3 the setting-levers thereon. l' represents the cone-gears; k', the electric motor; K′, the field-magnets; U′, the setting-lever on the shaft W′, and 30 a switch to be thrown by hand to control the same. L′ represents the motor-shaft. The guide-rods O′ are rectangular in cross-section and provided with perforations opposite the respective gears of the cone into which pins project, when the lever is locked in position by the latch-levers p^2, as shown in Figs. 8 to 10. M^4 M^5 represent the setting-levers on the drill-spindle, and 26 26′ the switch-controlled circuits for operating them, the operation being substantially the same as described in connection with Fig. 1. Fig. 10 also shows the manner of journaling and supporting the motor armature and shaft. 18 represents a cup set in the drill-frame and adapted to receive a set of balls. 19 represents a cone preferably screw-threaded to the shaft and resting on the balls in the cup 18. 20 represents lock-nuts. 21 represents a yoke-bearing supporting the lower end of the armature-shaft, leaving the upper bearing to support the weight of the shaft and armature.

The magnets P and their circuits may be dispensed with on the setting-lever mechanism of the spindle M and feed-shaft W, as shown in Fig. 11, without departing from the principle of my invention or materially affecting its utility for certain classes of work by locking the arms n and p together and setting and locking them to the bar O by hand.

Having described my invention, what I claim is—

1. In a drill, a driving-shaft carrying a series of gears of various sizes, a drill-spindle carrying a setting-lever mechanism of the character described adapted to be shipped endwise along the spindle and locked to the adjusted position and adapted to be brought into engagement with and be driven from one of the gears on the driving-shaft, a shaft adapted to feed the drill-spindle forward and backward, a similar setting-lever mechanism mounted on said feeding-shaft engaging the gears on the driving-shaft and transmitting motion to the feed-shaft, substantially as specified.

2. In a drill, a driving-shaft, a series of gears of varying sizes mounted thereon, a drill-spindle, a drill-spindle-feeding shaft and a drill-carriage-feeding shaft, each parallel with the driving-shaft, a separate setting-lever mechanism of the character described for each shaft adapted to be adjusted endwise on the respective shafts to engage and transmit motion from the driving-shaft to the said shafts, substantially as specified.

3. In a drill, a driving-shaft, a series of gears mounted thereon, a drill-spindle and a drill-spindle-feeding shaft mounted parallel thereto, electrically-controlled setting-lever mechanisms mounted respectively upon said drill-spindle and feed-shaft and adapted to

transmit motion from the driving-shaft to the drill-spindle and feed-shaft and an automatically-tripped electric switch for throwing said setting-lever mechanism into or out of gear, substantially as specified.

4. In a drill, a driving-shaft, a series of gears mounted thereon, a drill-spindle receiving power from said driving-shaft, a drill-spindle-feeding shaft, lever mechanism of the character described mounted on said feed-shaft and adapted to be thrown into and out of gear with the driving-shaft by means of an electrical circuit through the electrical controlling mechanism, and setting-lever mechanism, a similar slow-speed electrically-controlled setting-lever mechanism also mounted on said feed-shaft, and adapted to be thrown into or out of gear with the driving-shaft by means of a circuit traversing the electrical controlling device of said setting-lever mechanism and an automatic tripping mechanism adapted to control the electrical circuits to bring said setting-lever mechanisms alternately into connection with the driving-shaft, substantially as specified.

5. In a drill, a drill-spindle, an electric motor adapted to drive said spindle in either direction, a drill-feed shaft also adapted to be driven from said motor in either direction, and an automatic trip adapted to control the electric current through the motor and reverse the same, substantially as specified.

6. In a drill, a drill-spindle, an electric motor adapted to drive said spindle in either direction, a drill-feed shaft also adapted to be driven in either direction from said motor, an automatic tripping mechanism consisting of the switch-levers adapted to convey the current alternately in a reverse direction through the motor, means for tripping said switch-levers when the drill has been fed a sufficient distance and one or more inclined surfaces down which the switch-levers slide when tripped to automatically reverse the motor, substantially as specified.

7. In a drill, in combination with a driving-shaft carrying a series of gears and a feed-shaft adapted to be driven therefrom, a setting-lever mechanism consisting of a lever journaled on the feed-shaft, said lever being adapted to slide longitudinally thereon and to be locked in its adjusted position, a gear splined to said feed-shaft and adjustable with said lever, one or more planetary gears adapted to be thrown into mesh with the gears on the driving-shaft, and an electrical controlling mechanism substantially as shown adapted to throw said planetary gears into or out of engagement with the gears on the driving-shaft, substantially as specified.

8. In a drill, an electrically-controlled reversing mechanism for tapping purposes consisting of an arm tripped by the machine to break the contact and stop the forward feed, means substantially as shown for automatically making contact for the reverse feed of the drill and a trip adapted to automatically break the contact and stop the reverse feed at a predetermined point, substantially as specified.

9. In a drill driven direct from an electric motor, an automatic tripping device controlling the forward and reverse movement of said motor, consisting of an arm tripped by the machine to break the contact and stop the forward feed, means substantially as shown for automatically making contact for the reverse feed of the motor and drill, and a trip adapted to automatically break the contact and stop the reverse feed at a predetermined point, substantially as specified.

10. In a drill an automatic tripping device controlling the forward and reverse feed of the drill consisting of an arm tripped by the machine to break the contact and stop the forward feed, means substantially as shown for automatically making contact for the reverse feed of the drill and a trip adapted to automatically break the contact and stop the reverse feed at a predetermined point, substantially as specified.

11. In a drill, in combination with an electrically-controlled slow forward feed, and an electrically-controlled fast return-feed, an automatically-reversing mechanism consisting of an arm tripped by the machine to break the contact and stop the forward feed, means substantially as shown for automatically making contact for the reverse feed of the drill and a trip adapted to automatically break the contact and stop the reverse feed at a predetermined point, substantially as specified.

12. In a drill, an upright column, a radial arm carrying a drill and its driving mechanism, an electrically-controlled clamping mechanism, substantially as shown adapted to be operated at a distance to clamp and unclamp said radial arm from the column by passing an electrical current through the clamp-controlling mechanism, substantially as specified.

13. In a drill, a driving-shaft carrying a series of gears of varying sizes, a drill-spindle provided with a setting-lever mechanism adapted to engage any one of said gears, a sleeve on the lower end of said drill-spindle supported in a drill-carriage, a shaft swiveled to the drill-carriage and screw-threaded to engage an ear on the drill-sleeve to feed the drill vertically and means for driving said feed-shaft alternately in opposite directions, substantially as specified.

14. In a drill, a drill-spindle, a sleeve on the drill-spindle sliding endwise in a drill-carriage to feed the drill, a screw feed-shaft parallel with said drill-spindle swiveled to the drill-carriage and engaging a screw-threaded ear on the drill-sleeve to feed the drill and a feed-shaft also parallel with the drill-spindle engaging and feeding the drill-carriage, substantially as specified.

15. In a drill, a driving-shaft, a drill-spindle parallel therewith and receiving motion therefrom a sleeve on the drill-spindle sliding endwise in a drill-carriage to feed and retract

the drill, a screw-drill-feed shaft parallel with the drill-spindle and adapted to be driven in either direction from the driving-shaft, said drill-feed shaft being swiveled to the drill-carriage and engaging a screw-threaded ear on the drill-sleeve to feed the drill and a drill-carriage-feeding shaft parallel with the drill-spindle and adapted to be driven in either direction from the driving-shaft to feed the drill-carriage in either direction, substantially as specified.

16. In a drill, in combination with a drill-spindle and means for driving and feeding the same, a drill-table swiveled to the drill-column, an electrically-controlled clamping device, substantially as shown for clamping and releasing said drill-table, and a conveniently-located switch mechanism for operating said clamping device, substantially as specified.

17. In a drill a counterweighted sleeve splined to and adapted to be clamped upon the drill-column, a radial arm supported and swiveled upon said sleeve and means for clamping said arm to its adjusted position and a drill and drill driving and feeding mechanism adjustably mounted on said radial arm, substantially as specified.

18. In a drill, a driving-shaft, a drill-spindle adapted to be driven therefrom, a screw-threaded drill-feeding shaft mounted parallel to the drill-spindle and adapted to be intermittently driven from the driving-shaft in either direction, substantially as specified.

19. In a drill, a driving-shaft, a drill-spindle adapted to be driven therefrom in either direction, a drill-spindle-feeding shaft mounted parallel to the drill-spindle, and adapted to be driven in either direction from the driving-shaft to feed the drill, substantially as specified.

20. In a drill, a drill-spindle, an electric motor adapted to drive said spindle in either direction, a drill-feeding shaft, also adapted to be driven in either direction from said motor, an automatic tripping mechanism consisting of switch-levers adapted to convey the current alternately in a reverse direction through the motor, means for tripping said switch-levers when the drill has been fed a sufficient distance, and automatically making contact to reverse the motor, substantially as specified.

21. In a drill, a driving-shaft, a drill-spindle, and a drill-feed shaft, each adapted to be independently driven from the driving-shaft, an electrical controlling mechanism adapted to throw said feed-shaft into or out of gear with the driving-shaft, substantially as specified.

22. In a drill, in combination with an electrically-controlled slow feed in one direction, and an electrically-controlled return-feed, an automatic reversing mechanism consisting of an arm tripped by the machine to break the contact and stop the feed, and means for automatically making contact for the reverse feed of the drill, substantially as specified.

In testimony whereof I have hereunto set my hand.

CASPER W. MILES.

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