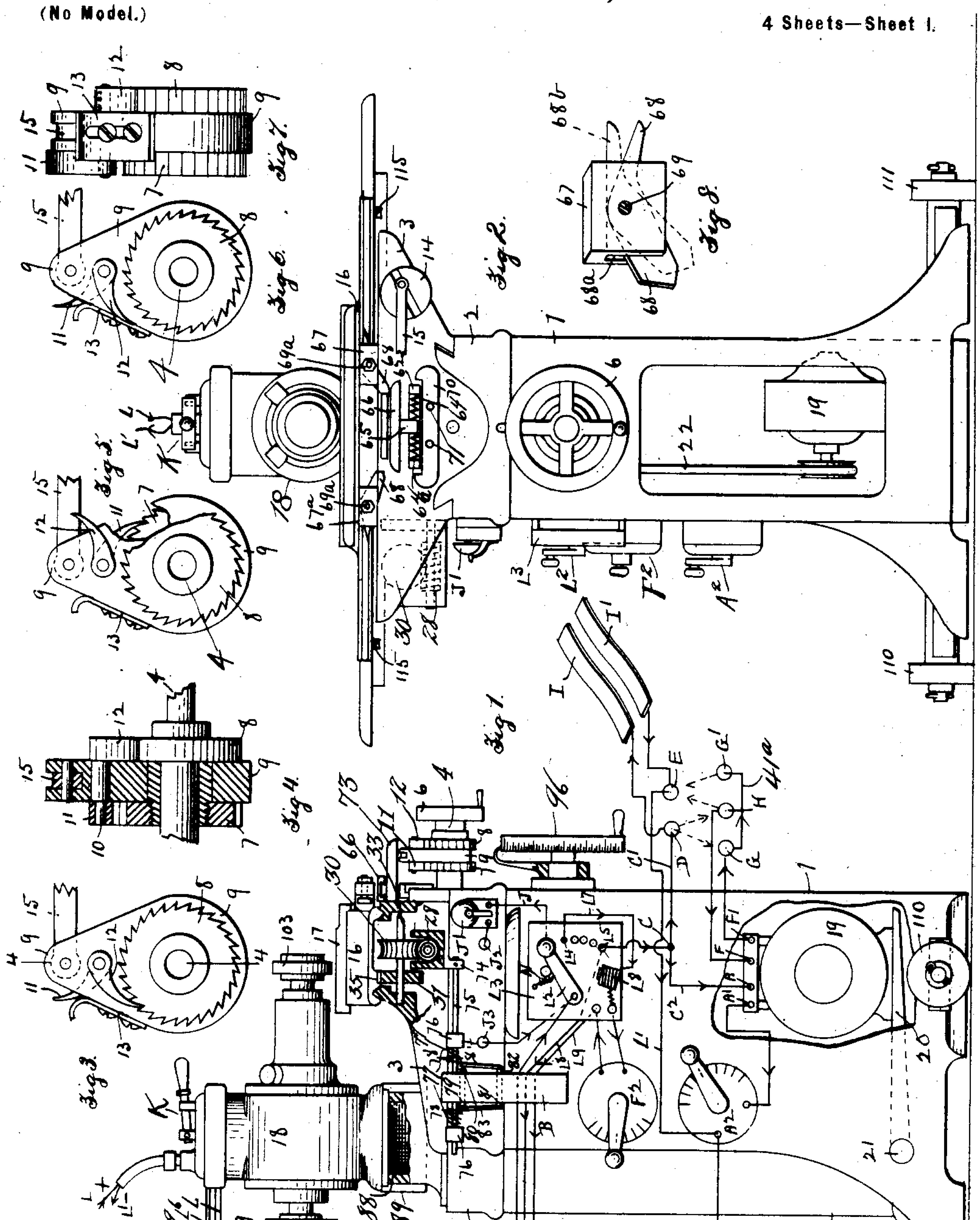
No. 712,871. Patented Nov. 4, 1902.

O. S. WALKER.

GRINDING MACHINE.

(Application filed Aug. 12, 1901.)

(No Model.) 4 Sheets—Sheet 1.



Witnesses:

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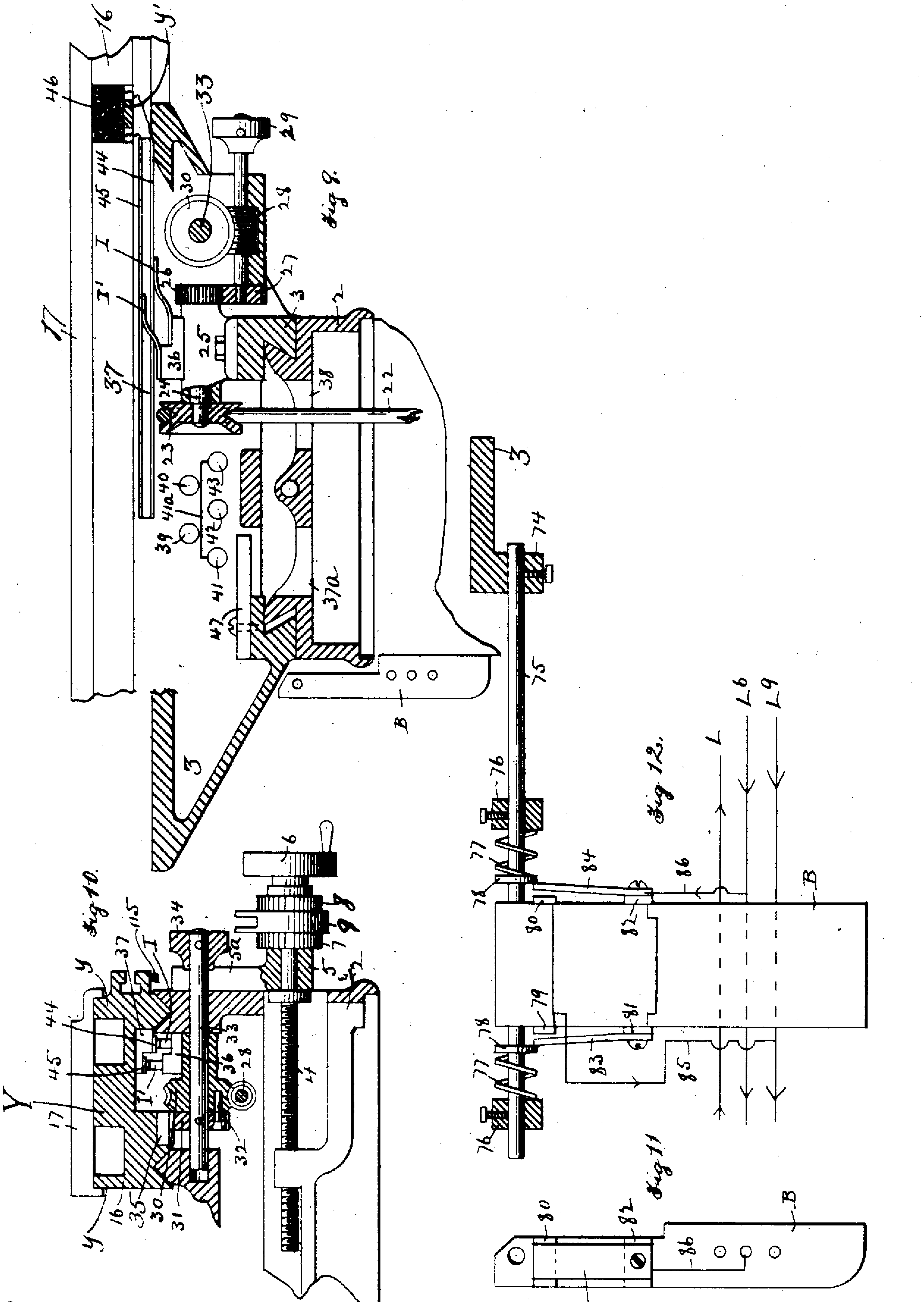

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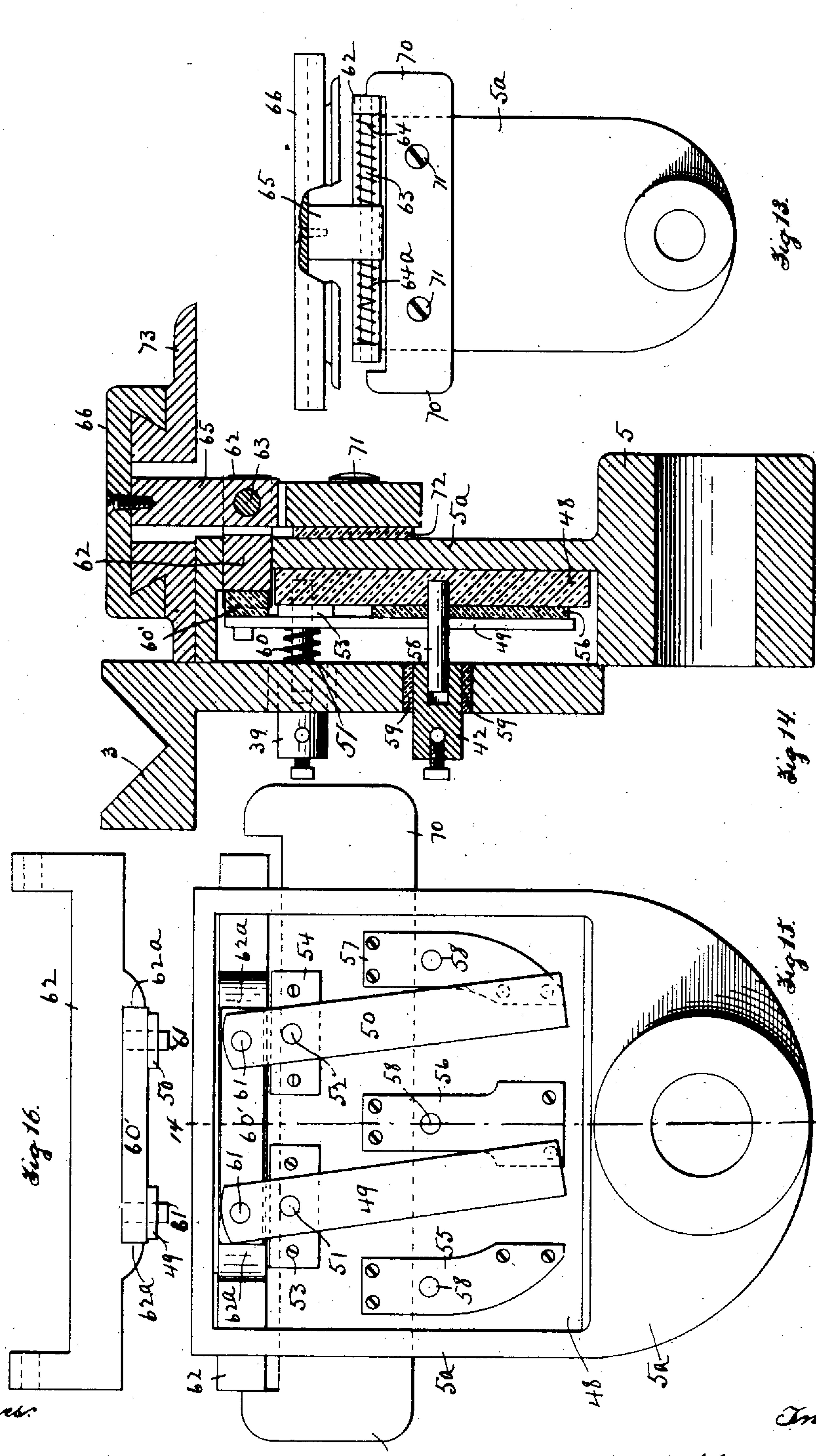

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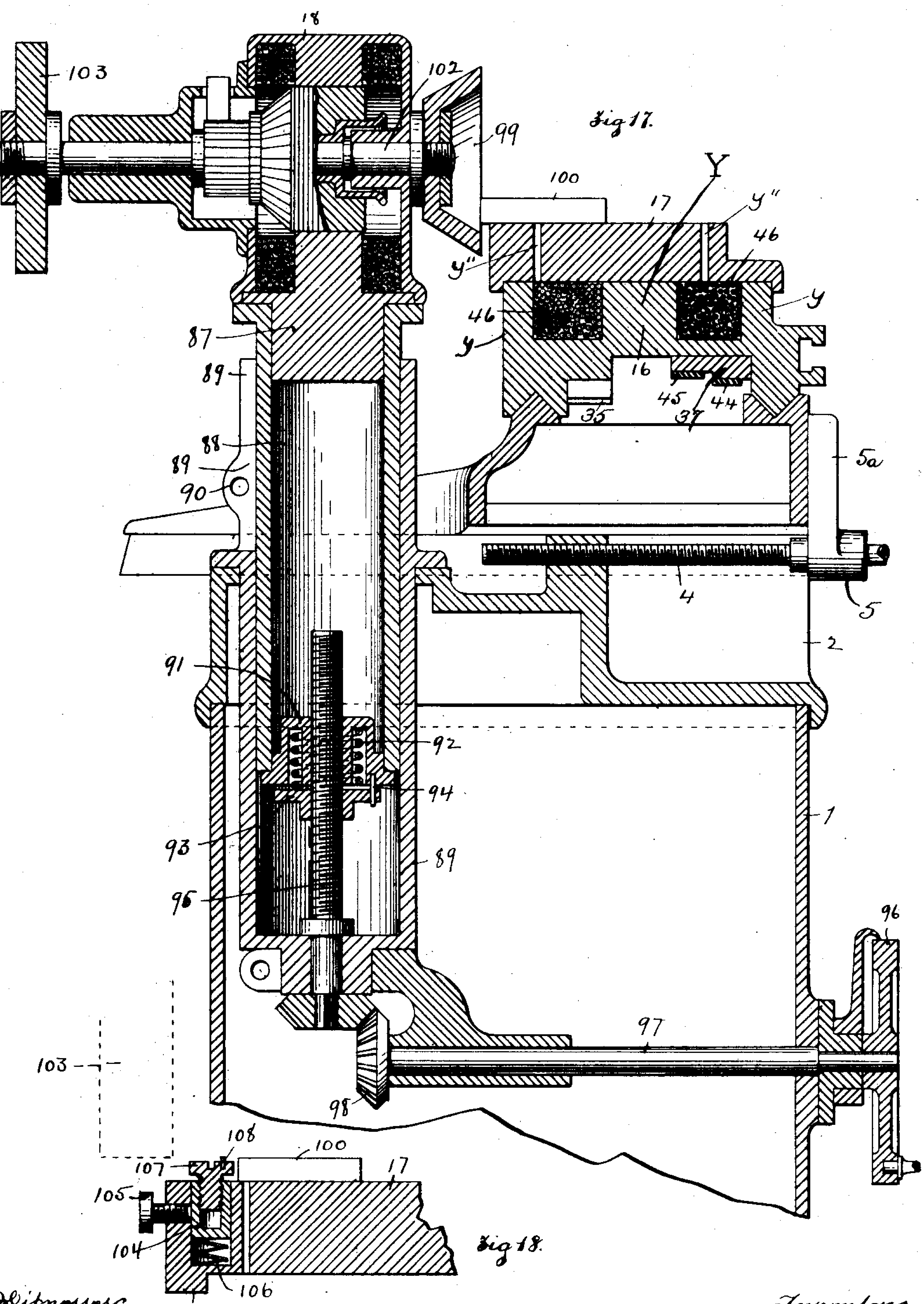

Fig 17.

Fig 18.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

OAKLEY S. WALKER, OF WORCESTER, MASSACHUSETTS.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 712,871, dated November 4, 1902.

Application filed August 12, 1901. Serial No. 71,737. (No model.)

To all whom it may concern:

Be it known that I, OAKLEY S. WALKER, a citizen of the United States, and a resident of Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Grinding-Machines, of which the following is a specification, accompanied by drawings forming a part of the same, in which—

Figure 1 is a side elevation with a portion of the column broken away to disclose the chamber containing the motor for operating the carriage. Fig. 2 is a front elevation. Fig. 3 is a detached view of the ratchet feeding mechanism for actuating the cross-feed. Fig. 4 is a central vertical sectional view on line 4 4, Fig. 3. Fig. 5 is a detached view of the ratchet feeding mechanism for actuating the cross-feed with the actuating-pawls shown as moving the ratchets in the opposite directions from that shown in Fig. 3. Figs. 6 and 7 are the front and side views, respectively, of the ratchet feeding mechanism with the pawls thrown out of engagement. Fig. 8 is an enlarged front view of one of the carriage-dogs for actuating the reversing-switch. Fig. 9 represents in sectional view portions of the carriage and platen supported thereon with a portion of the actuating mechanism for imparting a feeding motion to the platen. Fig. 10 is a transverse sectional view of the platen with a portion of its actuating mechanism. Figs. 11 and 12 show, on a larger scale, details of the automatic stopping mechanism for stopping the cross-feed of the carriage. Fig. 13 is a partial front elevation of the reversing-switch. Fig. 14 is a sectional view on line 14 14, Fig. 15. Fig. 15 is a rear view of the reversing-switch. Fig. 16 is a plan view of the sliding bar for operating the reversing-switch. Fig. 17 is a central vertical section of the upper part of the machine. Fig. 18 is an adjustable safety device for preventing the undue grinding of the work.

Similar reference letters and figures refer to similar parts in the different views.

1 denotes the supporting-column of the machine, and 2 a detachable top provided with transverse ways, upon which is mounted the carriage 3, operated by a cross-feed screw 4, journaled in a bearing 5, which is fastened to the carriage 3 and engaging a fixed nut in the top 2 and provided with a hand-wheel 6. The cross-feed screw 4 carries the right and left hand ratchet-wheels 7 and 8, separated by an oscillating arm 9, journaled on the feed-screw 4 and carrying a stud 10, rotatably held in the arm 9. Rigidly fastened to the stud 10 are two ratchet-pawls 11 and 12, with their working ends on the same side of the vertical axis of the stud 10, so that each pawl will act as a weight to hold the other in engagement with the teeth of the ratchet-wheel.

13 is a slotted sliding rest adjustably held by screws on the edge of the oscillating arm 9.

In Figs. 3 and 4 the rest 13 is in its lowest position, allowing the pawls 11 and 12 to be thrown to right or left into engagement with their respective ratchet-wheels.

In Figs. 3 and 4 the pawl 12 engages the wheel 8, and an oscillating movement of the arm 9 will rotate the feed-screw 4 in one direction, and in Fig. 5 the pawl 11 engages the wheel 7 and will move the feed-screw 4 in an opposite direction, thus feeding the carriage 3 in or out, as desired.

In Fig. 6 the slide 13 is in its upper position, and the pawls 11 and 12 are represented as thrown to the left, with the pawl 11 in contact with the rest 13 and holding the pawl 12 from engaging with the wheel 8, leaving the feed-screw 4 free to be turned by hand.

14 is the frictionally-driven disk, operated by the movement of the mechanism inside the carriage 3 and capable of a free motion through a partial revolution until it comes in contact with a stop (not shown) and causes a slipping action of its driving mechanism, which is of a well-known construction and in common use in metal planing and shaping machines, and therefore not shown. The crank-disk 14 is connected by a rod 15 with the oscillating arm 9, and the reason for stopping the crank-disk 14 is to allow it to move more quickly at the beginning of each stroke of the platen and to stop any feeding action of the screw 4 during the time that the grinding-wheel is operating upon the work, the feeding action taking place after the work has passed under the wheel and before the beginning of the next cut.

16 is a magnetic platen, and 17 the detachable magnetic polar face of the same. The magnetic platen is similar to that for which

Letters Patent of the United States were granted me on the 28th day of January, 1902. This magnetic platen consists, briefly, of a central upstanding rib or core Y, surrounded by a shell or casing y, the angular continuous space extending between the core and the casing adapted to receive and contain the magnetizing-coil 46 of insulated wire. This coil may rest upon wooden blocks y', as shown in Fig. 9. Air-inlets y'' y'' (shown in Fig. 17) may be formed through the detachable magnetic polar face leading to the space containing the magnetizing-coil 46. By means of this magnetic platen the machine is enabled to operate upon narrow or thin pieces of work, either steel or iron or other conductive metal, which is securely held in position without the use of clamps or mechanical work-holders, which have a tendency to lift the work to a certain degree. The method, however, of applying an electric current to this magnetic platen I believe to be novel and consists in attaching the terminals of the electric coil of the magnetic platen to the insulated strips or rods running longitudinally beneath the platen and fastened thereto. The electric current is delivered to these terminal strips by means of insulated brushes I I, fastened in the carriage 3 in electric connection with a dynamo and controlled by electrical devices to be described later.

18 is an adjustable motor for the grinding-spindle, details of which are shown in Fig. 17.

19 is the driving-motor for operating the magnetic platen and the feeding mechanism. It is held on a platform 20, which is hinged on trunnions 21, passing through holes in the base of the column 1.

The weight of the motor 19 and the platform 20 may be supported by the driving-belt 22, connecting the motor with the driven pulley 23 on the geared feed-shaft 24 in the carriage 3.

In Fig. 9 is shown the method of transmitting power from the motor by the belt 22 to the shaft 24, which runs in a box 25 and is geared to a shaft carrying a worm 28 by the gears 26 and 27. The worm 28, which runs in oil, has its shaft extended and provided with a knob or wheel 29 for obtaining a fine adjustment of the platen by hand. 30 is a worm-gear driven by the worm 28 and is loosely mounted on a pinion-shaft 33. 31 is the platen-driving pinion, which is fastened on the shaft 33 and engages the platen-rack 35, Fig. 10. The worm-gear 30 and pinion 31 are placed adjacent on the shaft 33, and they are shown coupled together by means of the pin 32, fastened in the worm-gear 30, but having a projecting end loosely fitting a hole in the pinion 31. The shaft 33, carrying the pinion 31, has considerable end play, and the shaft is provided at its outer end with an external knob 34 for the purpose of moving the shaft 33 longitudinally to connect and disconnect the pinion 33 and worm-gear 30. Mounted on the journal-box 25 is an insulating-block 36, to which are attached the brushes I I', which deliver an electric current to the coil in the magnetic platen 16 by their contact with the brass strips 44 and 45, fastened to an insulating-block 37 beneath the magnetic platen 16 and electrically connected to the terminals of the coil 46 in the magnetic platen.

39, 40, 41, 42, and 43, Fig. 9, indicate diagrammatically the position of binding-posts in the inside of the carriage 3, which communicate with a reversing-switch, hereinafter described.

47, Fig. 9, is an insulating-block fastened inside the carriage 3 for supporting the electric wires which pass up through the slot 37^a in the column-top 2 to the binding-posts above mentioned.

The slot 38 in the column-top provides an opening for the driving-belt 22, Fig. 9. Figs. 13, 14, 15, and 16 represent, on an enlarged scale, the reversing-switch, which is supported by a flange 5^a of the feed-screw bearing 5 on the front of the carriage 3. The flange 5^a is recessed upon its inner face for the reception of an insulating-block 48, preferably of vulcanized fiber and attached to the flange 5^a by screws. (Not shown.)

Upon the block 48 is pivotally mounted the switch-fingers 49 and 50, swinging on pins 51 and 52, projecting from metal plates 53 and 54, which are attached to the insulating-block 48. Below the plates above mentioned and also fastened to the insulating-block 48 are contact-plates 55, 56, and 57. The plates 53, 54, 55, 56, and 57 correspond electrically to the contact-points D, E, G, H, and G' in regular order, as shown in Fig. 1. The plates 55, 56, and 57 also have projecting pins 58, one of which is shown in detail in Fig. 14, together with its binding-post 42 in section, and an insulating-bushing 59 between the binding-post and the carriage 3. The pin 58 has a sliding electric contact in a recess in the binding-post 42, as shown, and all the above-mentioned pins have similar connections with other binding-posts, the positions of which are indicated by 39, 40, 41, and 43 in Fig. 9, where is also shown a wire 41^a, connecting electrically posts 41 and 43. The electric current is delivered to and received from the reversing-switch through the binding-posts 39 and 40 and by their respective pins 51 and 52 is communicated through the switch-fingers 49 and 50. It will also be seen that by means of the sliding contact of the pins with the binding-posts the bearing 5 and flange 5^a can be removed at any time without disturbing the wiring. Coiled springs, one of which is shown at 60, Fig. 14, press the switch-fingers 49 and 50 against the plates 53 and 54 and also insure the contact of their lower ends with the contact-plates 55, 56, and 57.

In Fig. 1 I have shown a diagrammatic arrangement at one side of the supporting-column 1 of the system of wiring and of the relative position of the contact-points made by the plates 53, 54, 55, 56, and 57, which are in

Fig. 1 represented diagrammatically by the contact-points D, E, G, H, and G′, respectively. The switch-fingers 49 and 50 are in permanent contact with the plates 53 and 54 and correspond with the contact-points D and E, respectively.

Referring to Fig. 1, the point D, corresponding to the switch-finger 49, is connected to the armature-terminals A of the motor 19 by the wires C′ C^2, and the point E is connected to the other armature-terminal A′ by a wire L′ through the rheostat A^2, so that as the switch-fingers 49 and 50 swing from side to side they make electrical connections alternately with the field-terminals F F′ of the motor 19, which are electrically connected with the contact-points G, H, and G′, corresponding with the contact-points 55, 56, and 57, causing the motor 19 to rotate in either direction and by means of its operative connection with the platen 16 cause it to move back and forth according as the switch-fingers are moved.

The switch is automatically operated as follows: The upper ends of the switch-fingers 49 and 50 are connected by an insulating-bar 60, from which project short pins 61, passing through holes in said fingers. The insulating-bar 60 is operated by the sliding bar 62, which has lugs 62^a embracing each end of the bar 60, as shown in Fig. 16. A slot is formed in the flange 5^a for the reception of the sliding bar 62, one side of which enters the slot in the flange and embraces the bar 60, and the opposite side of the bar 62 is provided at its ends with projecting lugs supporting a rod 63, which passes through a lug 65, depending from a reciprocating slide 66, which is operated by dogs 67 and 67^a, adjustably attached to the platen 16 and moving the slide 66 in either direction as the platen reciprocates. The rod 63 carries a pair of spiral springs 64 and 64^a between the lug 65 and the projecting lugs of the sliding bar, so that the reciprocating movement of the slide 66 serves to alternately compress the springs 64 and 64^a, by which stored energy is obtained to assist in carrying the switch-fingers past their central position and a yielding connection is secured between the driving-lug 65 and the bar 66, thereby overcoming a part of the momentum of the moving parts. It has been found in practice that when the platen is moving very slowly the springs 64 and 64^a do not always throw the switch-fingers past their central position and destructive arcing occurs. To obviate this, I attach to the rear side of the flange 5^a, Figs. 13, 14, and 15, a magnet 70, held by the screws 71 and insulated by the packing 72. The poles of this magnet project past the ends of the sliding bar 62 with exactly sufficient clearance to allow for the reciprocating movement of the sliding bar, which comes in contact with the magnet at the end of each movement, the attraction of the magnet serving to prevent a rebound of the bar 62 and holding it against reverse movement until the springs 64 are sufficiently compressed to throw the switch-fingers to their extreme position.

Referring to Fig. 17, the grinding-spindle motor 18 is recessed at the base for the reception of a field-piece 87, which in turn projects into a sleeve 88, to which it is fastened by screws, (not shown,) thus providing a detachable motor that may be replaced by another at any time, or a belt-driven spindle may be mounted in its stead. The sleeve 88 is held in an aperture in the split post 89 and can be clamped therein at pleasure by a bolt in the clamping-lugs 90. The grinding-spindle 102 of the motor is adapted to have secured to the opposite ends thereof a disk-shaped or regular surface-grinding wheel 103, and the cupped grinding-wheel 99, respectively, and the head in which is carried the spindle 102 and motor 18 may be rotated in the sleeve 88 to bring either wheel to bear upon the surface to be operated upon. To the bottom of the sleeve 88 is fastened a nut 91, recessed for the coil-spring 92, which impinges on a second nut 93, held from independent rotation by the pin 94, connecting the nuts 91 and 93. The lower end of the post 89 is provided with a hollow hub, forming a journal-bearing for a vertical feed-screw 95, fitted with a beveled gear at its lower end and operated by a beveled gear 98, shaft 97, and hand-wheel 96. The tension of the spring 92 is greater than the weight of the motor 18, connected thereby, and its tension serves to press the nuts 91 and 93 apart and exert a pressure on opposite sides of the threads of the feed-screw 95, and all slack motion is thereby obviated.

Fig. 8 represents, on a larger scale, one of the dogs 67, adjustably attached to the platen 16 in a T-slot and clamped by the bolt 69 and nut 69^a. Pivoted loosely in a groove 68^a in the under side of the dog 67 is a lever 68, with its inner end normally in position to strike the end of the slide 66 as the platen reciprocates and operate the reversing-switch. When it is desired to obtain temporarily a longer movement of the platen, the lever 68 is swung by hand to the position shown by the broken lines 68^b, in which position it passes over the slide 66. When either of the levers 68 are raised, the movement of the platen is limited by means of pins 115, (shown in Fig. 2,) projecting from the under side of the platen and arranged to strike the slide 66 and operate the reversing-switch.

I provide an automatic stop for the cross-feed of the machine, as follows: To one side of the column 1 I attach an insulating-block B. (Shown in Fig. 1 and on a larger scale in Figs. 11 and 12.) Through the block B, I pass the electric wires L, L^6, and L^9, and through the top end of the block B a stop-rod 75 passes, held rigidly and adjustably at one end by a bracket 74, attached to the carriage 3. The rod 75 slides loosely through a hole in the block B and carries a pair of adjustable stop-collars 76 76, coil-springs 77 77, and the insulating-washers 78 78, Figs. 11 and 12. On opposite sides of the block B and near its upper end are fastened the metal plates 79, 80, 81, and 82. The plates 79 and 80 have mutual electric connections, and also the plates 81 and 82. To the plate 81 is attached a spring contact-plate 83, normally out of contact with plate 79, as shown in Fig. 12, but which can be brought into contact therewith by means of the washer 78 and spring 77 and stop 76 when the rod 75 is moved toward the right. To the plate 82 is attached a spring contact-plate 84, which similarly is brought into contact with the plate 80 by means of the washer 78, spring 77, and collar 76 when the rod 75 is moved toward the left. The rod 75 is carried by the carriage 3, and the springs 77 77 provide a yielding pressure between the collars 76 76 and plates 83 and 84. As the rod 75 is moved to the left plates 80 and 84 contact and when moved to the right plates 79 and 83 contact, in each case making a short circuit across the wires L^6 and L^9, as shown by Figs. 11 and 12, thereby weakening the force of a magnet L^8, Fig. 1, which is placed in the circuit of the electric wires L^6 and L^9, and as the force of the magnet L^8 is employed to hold a spring-actuated switch-lever L^2 in operative position to close the circuit to the motor 18, as hereinafter described. The weakening of the magnet L^8 allows the spring N of the switch-lever L^2 to operate and break the circuit. The electric current enters the machine through the wire L, passes through a switch K and the insulating-block B to the contact-lever L^2 of the starting-rheostat L^3 (shown in Fig. 1) in the out-of-contact position. The purpose of this automatic stop is to break the operative circuits, which furnish the primary impulses to the actuating mechanism of the machine, and as a result thereof to stop all work performed thereby. For instance, the automatic stop mechanism is set to break the operative circuits after the grinding-disk has passed over and operated upon two inches, say, of the work undergoing treatment, either for inspection by the operator or because a shoulder is to be or has been formed on the piece of work at such a distance from the edge. The carriage 3 is fed transversely of the length of the machine by means of the ratchet-wheels 7 and 8 and pawls 11 and 12 in the manner hereinbefore stated, and as it is fed forward the rod 75 is forced to the left in Fig. 12, let us suppose, owing to its rigid connection 74 with the carriage, until the contact-spring 84 is forced against plate 80, which will deflect a portion of the current flowing through wires L^6 L^9, as before set forth, which practically has the effect of throwing more resistance into the circuit and weakening it to such an extent that the magnet L^8 is unable to retain the switch-arm L^2 against the tension of spring N, which latter now operates to withdraw the lever-arm to its limit of movement in one direction, breaking the operative circuits, but making the independent bell-circuit to call attention to the fact that the engine has stopped. This is a great advantage, as the operator, who generally has a number of machines to attend to, can set the work in position, adjust the automatic stopping mechanism to operate when a desired amount of the work-surface has been ground, start the machine, and then attend to other machines or other work, well knowing that he will receive due notice when the machine has operated upon the necessary amount of work-surface, and can then return to it for an inspection of the work and to reset the machine. As the lever L^2 is moved downward it makes electric connections with variable-resistance contact-points L^4 until it finally rests on the contact-point L^5. The electric current by means of suitable wiring now branches in three directions, a portion going by two paths back to operate the motor 18 and the third portion to operate the feed-motor 19. The latter course will be traced first. From L^5 the current is led to C, when it again branches, one portion passing to the right through a wire C′ and another portion to the left through a wire C^2. The current through C^2 passes to the armature-terminal A of the motor 19, thence through the armature to A′, thence to the variable rheostat A^2, through which it passes to the wire L′, through the switch K to the supply-main, and thus completes one electric circuit through the armature of the motor 19. The current that passes through the wire C′ is led to the reversing-switch, (diagrammatically shown by the contact-points D, E, G, and H in Fig. 1,) the arrow-points indicating the swinging switch-fingers moved in unison, as heretofore explained, and alternately making electric connections D to H, E to G′, and D to G, E to H, reversing the motor 19 by changing the relative connections between its field and armature-terminals. The electric current from wire C′ passes, Fig. 1, from D to H, thence to F, one of the field-terminals of motor 19, thence through the field-coils to F′, thence to G and G′, thence to E and to the wire L′, completing a second electric circuit through the fields of the motors 19. The electric current from the wire C′ also branches at D and passes to the brush I of the magnetic table 16, thence through the coils of the magnetic platen to the brush I′, thence to E and L′, completing a third electric circuit. Returning now to point L^5 of the starting-rheostat L^3, the course of the current to the motor 18 is as follows: From the contact-point L^5 the electric current passes to the armature of the motor 18 and through its armature and the switch K to the return-wire L′, completing a fourth electric circuit. The electric current from L^5 also flows back through the resistance-points L^4, thence to the wire L^7 to the automatic release-magnet L^8, thence through the coils of this magnet to the variable rheostat F^2, through the same to the wire L^9, thence to one of the field-terminals of the motor 18 through its field-coils, and finally through the switch K to join the return-wire L' and complete a fifth electric circuit. Inside the column 1 I place an electric battery, (not shown,) wires to and from which lead through holes J^2 and J^3 in the column-top 2. A battery-wire passing through J^3 connects with the arm L^2, and separate contact, thence through wire J to the electric bell J', thence through the hole J^2 to the aforesaid battery, forming an independent circuit for ringing the alarm-bell J' whenever the lever L^2 is in the position shown in Fig. 1, lever L^2 in this position resting on a separate contact-point connected to wire J. The starting-rheostat L^3 is of the well-known no-load release type, the lever L^2 being thrown into the position shown in Fig. 1 by the tension of the spring N whenever the magnet L^8 is demagnetized, thus cutting out all electric circuits on the machine and bringing the machine to a state of rest, at which time an alarm is rung by the bell J' to notify the operator.

It will be seen from the foregoing that when the lever L^2 of the rheostat L^3 is swung into position in electric connection with the contact-points L^4 the motor 18 is energized and at the same time the motor 18 automatically starts the motor 19, the platen 16 starts in motion, and the magnetic force of the platen also is automatically brought into action, and when the electric supply fails for any cause or when contact is made between plates 83 and 79 or plates 84 and 80, Fig. 12, thereby weakening the magnet L^8, the machine automatically stops.

To guard against the danger of grinding the work too thin by a careless operator, I provide the adjustable safety device shown in Fig. 18, in which 103 is the regular surface-grinding wheel and 17 a portion of the magnetic face of the platen. A hole is drilled in one side of the platen near the edge for the reception of the internally-threaded stud 104, held in place by the thumb-screw 105. A spring 106 in the bottom of the hole tends to eject the stud when the screw 105 is loosened. Tightly fitting the internal screw-thread of the stud 104 is the screw 107, slotted in the usual manner for a screw-driver and fitted with a hard carbon point 108. The screw 107 is adjusted to bring the carbon point 108 at the height corresponding to the finished surface of the work to be ground. As the platen having the work is moved under the grinding-wheel, the latter first encounters the carbon point 108, and if for any reason said wheel has been lowered too far as the carbon passes under it acts as a turning-tool and dresses the wheel to the proper size to suit the work, so that it becomes impossible to grind the same lower than the said carbon point. It is evident that this safety device could be applied to the edge of the platen-top 17 and perform its functions on the cupped grinding-wheel 99 in the operation shown in Fig. 17. The supporting-post 1 is mounted on three wheels 109, 110, and 111, the two latter turning loosely on trunnions at each side of the column 1, and the wheel 109 is a caster-wheel swiveled in a bracket 112, bolted to the rear side of the column 1. The upper end of the bracket 112 is tapped for the reception of the adjusting thumb-screw 113, which impinges on the end of the swiveled stem of the caster-wheel, which has an adjustable end movement and can be depressed until the rear of the column 1 is raised from the floor, as shown in Fig. 1, and the machine moved to suit the convenience of the operator.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a grinding-machine, the combination of a grinding-wheel spindle, means for rotating said spindle, a reciprocating platen, means for reciprocating said platen comprising an electric motor, and means for automatically reversing said motor controlled by the movement of said platen, substantially as described.

2. In a grinding-machine, the combination with a reciprocating platen, and an electric motor for driving said platen, of a switching mechanism by which the electric current to said motor is controlled, and means for automatically operating said switch as determined by the movement of said platen, substantially as described.

3. In a grinding-machine, the combination of the reciprocating platen, an electric motor for driving said platen, a switch by which the electric current to said motor is controlled, and a pair of dogs adjustably attached to said platen and arranged to operate said switch to reverse said motor, substantially as described.

4. In a grinding-machine the combination of a motor for driving the platen, a reciprocating platen driven by said motor, a switch for reversing said motor, adjustable dogs carried by said platen and arranged to operate said switch and pins held in said platen and arranged to operate said switch when the dogs are out of operative contact therewith, substantially as described.

5. In a grinding-machine the combination of a reciprocating platen, an electric motor by which said platen is driven, a switch by which the current to said motor is controlled, and means determined by the movement of the platen for reversing said switch and comprising a yielding spring-actuated member, whereby the pressure required to reverse the switch is temporarily stored, substantially as described.

6. In a grinding-machine, the combination of a reciprocating platen, an electric motor for driving said platen, a switch for controlling the current to said motor, a sliding bar by which said switch is operated, and means

for applying a yielding pressure to said sliding bar determined by the movement of the platen, substantially as described.

7. The combination with an electrically-driven platen, of a reversing-switch and a magnet by which the movement of the switch is retarded, substantially as described.

8. The combination with a reciprocating platen and an electric motor for moving said platen, of a sliding bar by which said switch is reversed, means for applying a yielding pressure to said bar and a magnet by which said bar is temporarily held at the beginning of its movement, substantially as described.

9. In a grinding-machine, the combination with a hollow supporting-column, a reciprocating platen held thereon, a motor by which said platen is reciprocated, a belt connection between said motor and the platen-actuating mechanism and a swinging platform supporting said motor, whereby the weight of the motor is utilized to hold said belt connection taut, substantially as described.

10. In a grinding-machine, the combination of a reciprocating platen, an electric motor for driving said platen, and means for automatically breaking the circuit to said motor, substantially as described.

11. In a grinding-machine, the combination of a grinding-wheel, an electric motor for rotating the same, a reciprocating platen, an electric motor for driving said platen, an electric circuit including both of said motors and means for automatically breaking said circuit, substantially as described.

12. In a grinding-machine, the combination of a grinding-wheel, an electric motor for said wheel, a reciprocating platen, an electric motor for said platen, an electric coil inclosed in said platen, an electric circuit including said motors, and said platen-coil and means for automatically breaking said circuit, substantially as described.

13. In a grinding-machine, the combination of a reciprocating platen, an electric coil inclosed in said platen, whereby said platen is rendered magnetic, insulated contact-strips carried by said platen and electrically connected with said coil and brushes forming the terminals of an electric circuit held in contact with said contact-strips, substantially as described.

14. In a grinding-machine, the combination with one or more motors for actuating the operative parts of the machine, of a suitable lever for making and breaking a circuit, a magnet for holding said lever in position to close said circuit, a spring acting to draw said lever away from said magnet and means automatically actuated by the operative parts of the machine for varying the energy of said magnet to effect a release of said lever and break the circuit, substantially as described.

15. In a grinding-machine, the combination of a grinding-wheel, a reciprocating platen, a motor for driving said platen, a motor for driving said grinding-wheel, an electric circuit including said motors, independent contacting members whereby said electric circuit is short-circuited and means for automatically making said contact, substantially as described.

Dated this 29th day of July, 1901.

OAKLEY S. WALKER.

Witnesses:
VIRGIL K. KELLOGG,
ANDREW J. DEWEY.