(No Model.) 3 Sheets—Sheet 1.

M. SCHWÄRZLER.

FEED ATTACHMENT FOR DRILLING MACHINES.

No. 395,592. Patented Jan. 1, 1889.

Fig. 1.

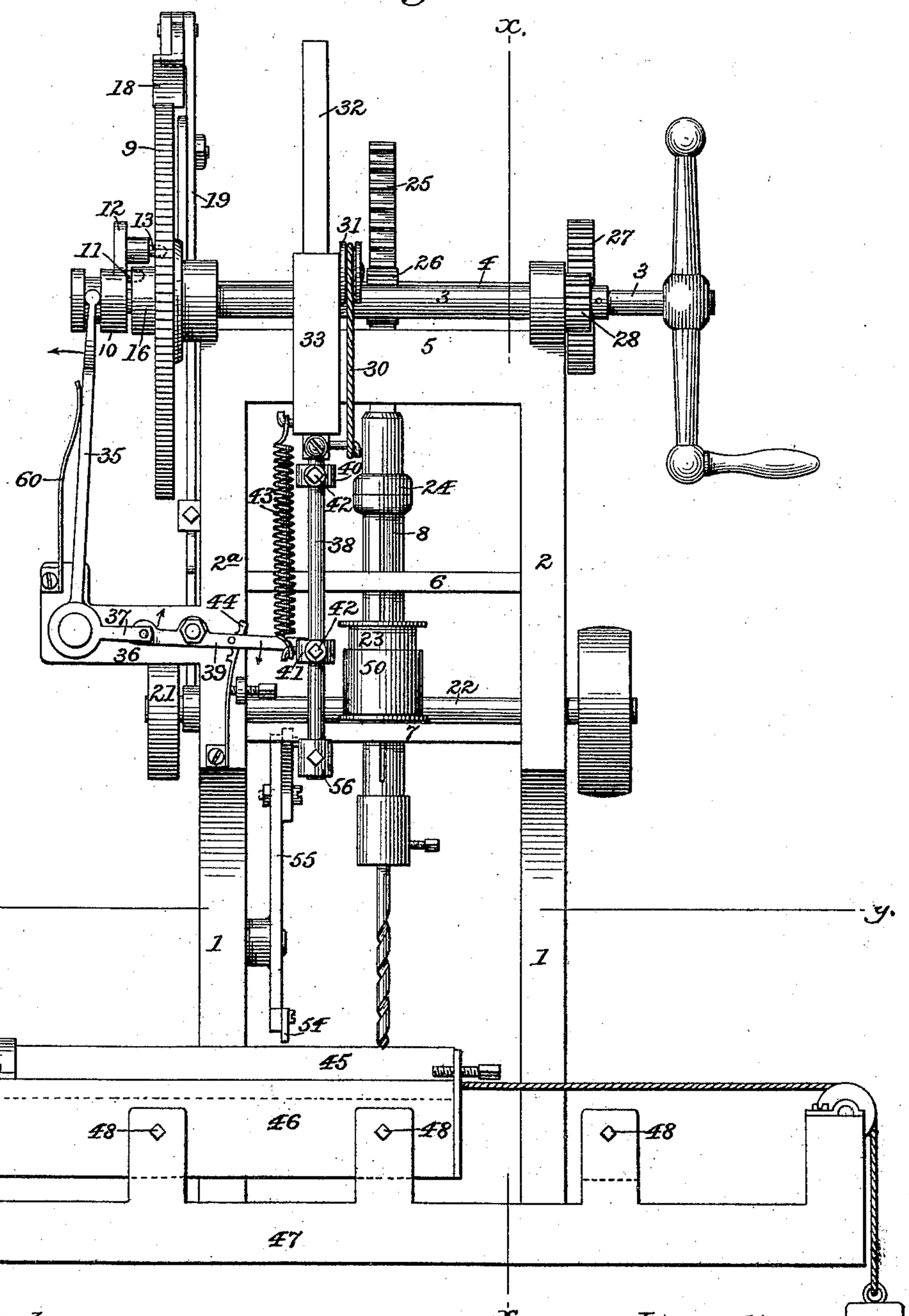

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Fig. 2.

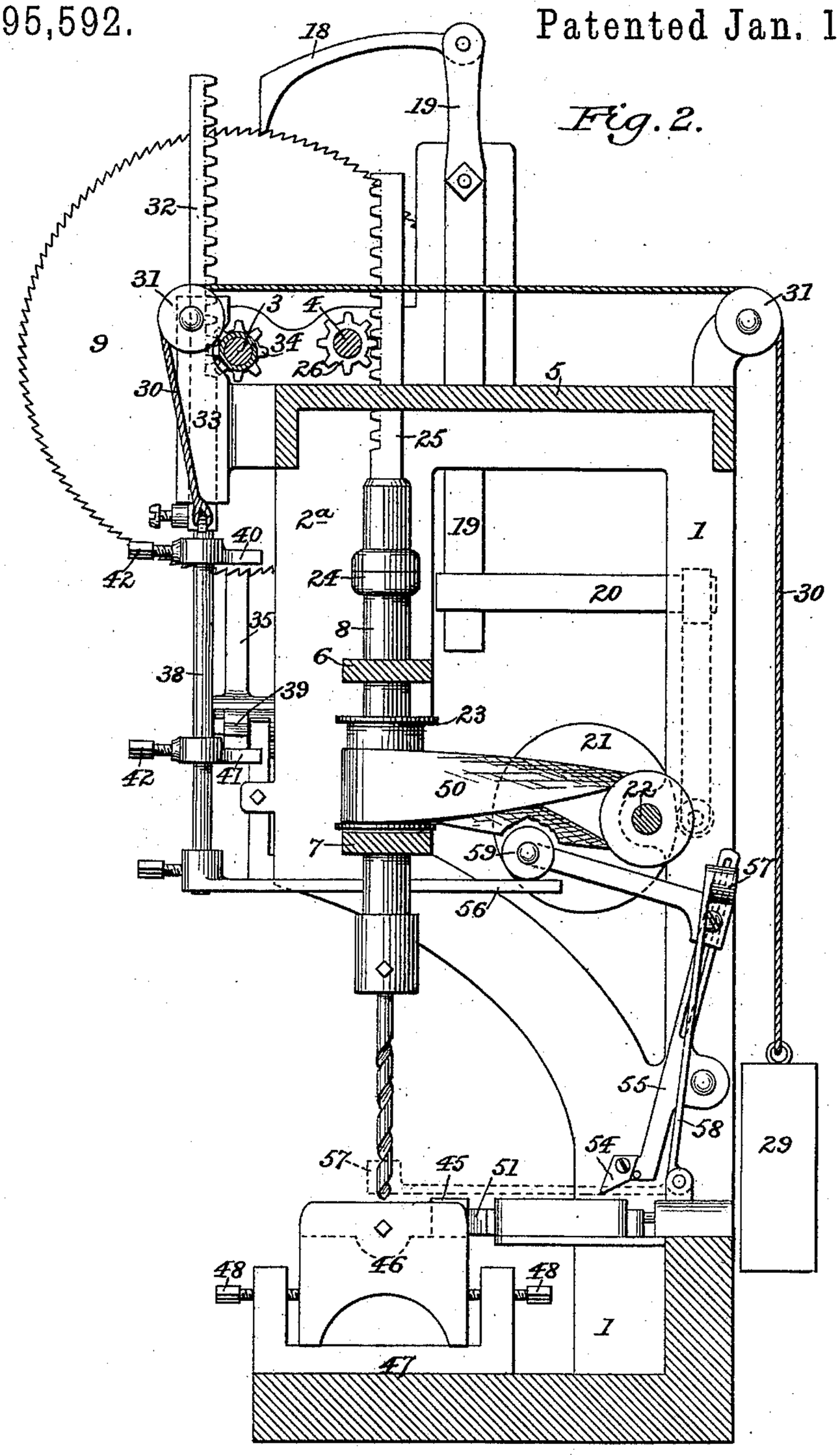

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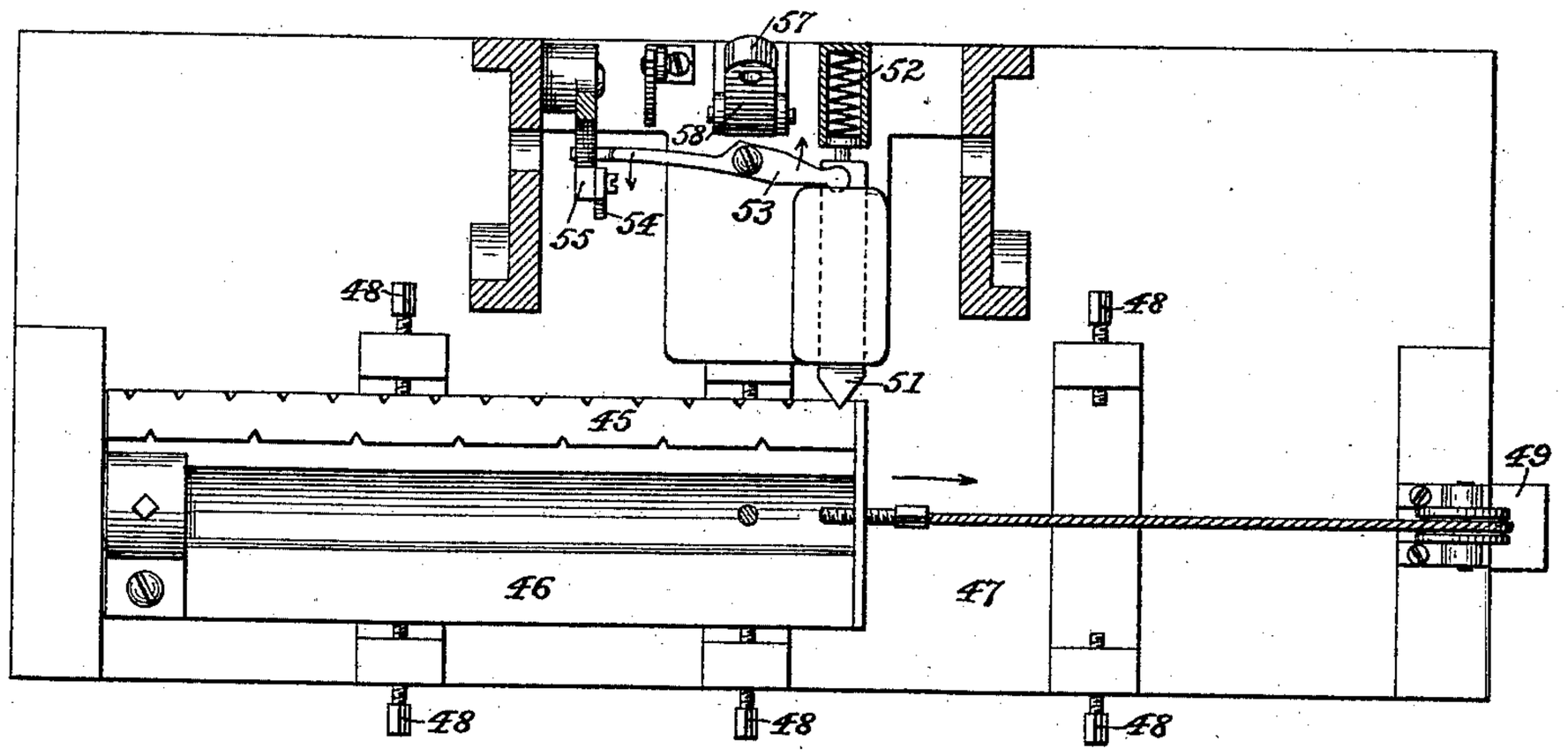
Fig. 3.



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UNITED STATES PATENT OFFICE.

MARTIN SCHWÄRZLER, OF NEW YORK, N. Y.

FEED ATTACHMENT FOR DRILLING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 395,592, dated January 1, 1889.

Application filed July 3, 1888. Serial No. 278,944. (No model.)

To all whom it may concern:

Be it known that I, MARTIN SCHWÄRZLER, of the city, county, and State of New York, have invented certain new and useful Improvements in Feed Attachments for Drilling-Machines; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification, in which—

Figure 1 is a front elevation of my improved automatic feed-drill; Fig. 2, a vertical section in line *x x* of Fig. 1, and Fig. 3, a horizontal section in line *y y* of Fig. 1.

Similar numbers indicate like parts in all of the figures.

My invention relates to an improved automatic drill-retracting attachment and carriage-feeding device for machine-drills, and specially for the class of drills having the rack-and-pinion feed mechanism described in the Letters Patent granted to me June 15, 1886, No. 343,734.

It consists in the combination of devices, as hereinafter fully described, and set forth in the claims, whereby the clutch by which the ratchet-wheel and the shaft in the drill-feeding mechanism are coupled together is automatically moved and released at the moment the feed has progressed far enough, so that the feed is thereby arrested and the drill left free to be carried upward by means of its retracting spring or weight, and also whereby simultaneously with the automatic retraction of the drill a catch controlling the movement of the carriage upon which the work is mounted is momentarily released from one of a series of notches in a gage-bar on the carriage, thereby allowing the carriage to move automatically forward under the influence of a weight or spring until arrested by the engagement of the catch with the next notch, all as hereinafter specified.

In the accompanying drawings, 1 1 are the pillars or standards of the machine, to which are fitted the lateral brackets 2 2ª. In the upper ends of the two brackets are journaled the two parallel shafts 3 and 4 (see Fig. 2) for the feed mechanism of the drill, and the brackets are connected by a top plate, 5, and by two parallel bars, 6 and 7, beneath it, which furnish suitable bearings for the vertical drill-spindle 8.

The feed mechanism for the drill is constructed substantially as described in my patent, No. 343,734, of June 15, 1886. It consists of a large ratchet-wheel, 9, mounted loosely upon the shaft 3. This ratchet-wheel is connected and disconnected from said shaft by means of a clutch, 10. (See Fig. 1.) This clutch 10 consists of a disk formed with a radial arm, 12, from which projects a lateral pin, 13, which is adapted to engage any of an annular series of holes in the side of the ratchet-wheel, while a second parallel pin, 11, projecting from the disk, is adapted to engage simultaneously any of an annular series of holes in the outer flange, 16, of the shaft 3. Thus by moving the clutch inwardly its two pins, 11 and 13, engage the shaft and ratchet-wheel and connect them; but by moving it outwardly they are disconnected and the ratchet-wheel moves freely.

The ratchet-wheel 9 is made to revolve with an intermittent movement by means of a pawl, 18, pivoted to the upper end of a vibrating lever, 19, (see Fig. 2,) whose lower end terminates in a bent arm, 20, which is brought into contact with an eccentric, 21, upon the driving-shaft 22 of the machine.

The drill-spindle 8 is journaled to rotate freely in the two transverse bars 6 and 7, and is driven by means of a belt, 50, carried over a pulley, 23, feathered on said spindle, as shown in Fig. 2, and extending thence to the driving-pulley on the main shaft. The drill-spindle is coupled at its upper end by a suitable coupling device, 24, of the customary form, which will permit a free rotation of the spindle to a vertically-reciprocating rack-bar, 25, mounted in the top plate, 5, A pinion, 26, upon the shaft 4 meshes with the rack-bar, and a large spur-wheel, 27, (see Fig. 1,) upon said shaft 4, meshing with a small pinion, 28, upon the shaft 3, gears them together, so that the rotation of the shaft 3 serves to vertically reciprocate the drill-spindle.

The rack-bar 25 and attached drill-spindle 8 are automatically carried up to their highest position when the shaft 3 is free and disengaged from the ratchet-wheel 9 by means

of a weight, 29, suspended from a cord, 30, (see Fig. 2,) carried over suitable pulleys, 31 31, and attached to a parallel vertically-reciprocating rack-bar, 32, mounted in a bracket, 33, (projecting from the top plate, 5,) and which meshes with a pinion, 34, upon the shaft 3. The movements of this parallel rack-bar 32 are necessarily synchronous with the movements of the rack-bar 25, carrying the drill-spindle, but owing to the difference in gear are more rapid.

To obtain an automatic control of the movements of the clutch 10, the clutch is engaged by a fork at the upper end of the vertical arm of a bell-crank lever, 35, pivoted to an offset, 36, projecting from the frame of the machine beneath the clutch, (see Fig. 1,) so that the shorter horizontal arm, 37, of the lever projects toward a vertical tripping-rod, 38, fitted in the lower end of the rack-bar 32. The shorter end of a horizontal lever, 39, jointed to the front edge of the bracket 2^a, is pivoted to the end of said arm 37, while its longer end projects into proximity to the tripping-rod 38 in position to be struck by either of two adjustable fingers, 40 and 41, projecting from collars fitted upon the rod 38, and secured thereon when properly adjusted by means of set-screws 42 42. A flat spring, 60, operates to throw the clutch automatically into engagement with the ratchet-wheel and the flange on the shaft to couple them.

A spiral spring, 43, secured at one end to the rod 38 and at the other to the bracket 33 on the frame of the machine, (see Fig. 1,) serves to quicken the upward start of the tripping-rod when it is set free, and also operates to re-enforce the action of the spring 60 in producing an engagement of the clutch. A spring-actuated catch, 44, engaging a pin on the side of the long end of the lever 39, serves to hold the lever and keep the clutch back after the lever has been depressed by the upper finger, 40, and until it is moved back by the lower finger, 41.

The tube or other piece of work to be drilled is mounted upon a suitable carriage, 46, sliding horizontally in ways formed upon the bed-plate 47 of the machine immediately under the drill-bar. This carriage is adjusted laterally in its ways by means of set-screws 48 48. It is automatically carried in one direction by means of a weight, 49, attached by a cord to one end thereof, and is arrested in its automatic movement by means of a lateral catch-bar, 51, Figs. 2 and 3, fitted to slide horizontally at a right angle to the line of movement of the carriage into and out of engagement with a series of notches formed in the side of a detachable gage-bar, 45, secured on the proximate top side edge of the carriage. The front end of the catch 51 is beveled from both sides to a sharp angle, (see Fig. 3,) and the engagement of this angle with the several notches in the gage-bar 45 is enforced by means of a spring, 52, inserted back of the catch, as shown in Fig. 3.

The gage-bar 45 is preferably rectangular in cross-section, and is adapted for ready detachment from the carriage and admits of reversal, so that any one of its four sides may be presented to the catch, each side having a different system of notches formed thereon, (see Fig. 3,) severally distinguished by the different intervals between the notches.

The catch 51 is automatically withdrawn from its notch in the gage-bar at the moment the drill is withdrawn from the work, and instantly released to engage the next notch by means of a lever, 53, pivoted to vibrate horizontally in the plane of the catch-bar. (See Fig. 3.) This lever 53 is jointed at one end by a pivotal connection to the catch-bar, and its opposite end is brought into contact with a latch, 54, (see Fig. 2,) upon the lower shorter arm, adjustable in length, of a lever, 55, which is pivoted to vibrate in a vertical plane in line with the vertically-reciprocating tripping-rod 38, and whose upper longer arm is bent to curve forward into a horizontal plane, as shown in Fig. 2, so as to overlap a finger, 56, adjustably fitted by means of a collar and set-screw to the lower end of said rod 38. A friction-roller, 59, is fitted upon the end of this longer arm of the lever 55, so as to ease the frictional contact of the finger 56 with the lever and allow the latter to move freely over the former.

The latch 54 is so adjusted as that when the lower arm of the vertical lever 55 is swung backward the latch will swing up and slide back freely over the end of the horizontal lever 53, and then drop into position behind it to engage it; but when the arm swings forward the latch engages said lever, and thereby causes it to move so as to produce a retraction of the catch-bar 51 from the carriage, and in doing so to slip over and pass free from the lever.

A guide and support are provided for the drill to be used in starting it upon a curved surface, such as the periphery of a tube. It consists of a perforated head, 57, (see positive and dotted lines, Fig. 2,) adapted to the size of the drill and fitted upon the end of an arm, 58, pivoted to the frame to swing from an upright into a suitable horizontal position upon the piece of work immediately under the drill, so that the drill may pass through it. (See dotted lines, Fig. 2.) When not in use, it is swung up out of the way, as shown in positive lines in Fig. 2.

In the use of my invention, the work being properly secured upon the carriage under the drill, the carriage 46 is moved back so as to bring the drill in position for the first hole of the series, and in so moving it back the weight 49 is lifted. When thus moved back, the carriage is held in opposition to the influence of the weight 49 by the engagement of the spring-actuated lateral catch 51 with the first of the series of lateral notches in the gage-bar 45, secured to the carriage. The drill, being now actuated in the customary manner by means

of the belt 50, is also fed downward, as required, by the movement of the ratchet-wheel 9, actuated by the eccentric on the main shaft, and geared by means of the clutch 10 to the shaft 3, which is in turn geared mediately, as described, to the rack-bar 25, carrying the drill-bar 8. As the drill-bar 8 is thus fed downward, the rack-bar 32, geared directly to the shaft 3, is likewise fed downward, but at a more rapid rate, and by the time the drill has completed its required movement the upper finger, 40, on the tripping-rod 38, carried by said bar, (see Fig. 2,) is brought into contact with the end of the lever 39, and, tripping it, causes it to swing the upper arm of the bell-crank lever 35 outward, so as to withdraw thereby the clutch 10 from its engagement with the ratchet-wheel 9 and the flange 16 on the shaft 3. The feed of the drill will thereby be stopped, and the shaft 3, being left free, will no longer offer any resistance to the influence of the spring 43 and weight 29, so that the latter will come into play to quickly elevate both rack-bars 32 and 25. So soon as the bar 32 and tripping-rod 38 begin to move upward the finger 56, bearing against the friction-roller 59 on the upper end of the bent lever 55, will swing said lever and cause the latch upon its lower arm, engaging the outer end of the lever 53, to move said lever, and thereby withdraw the catch 51 from the notch in the gage-bar 45. As the lever 53 moves, its spring 52 is compressed, and as the lower arm of the lever 55 swings forward the latch 54 will be quickly lifted over the end of said lever 53, setting it free, so that its spring 52 will force it out to engage the next notch on the gage-bar, the carriage and gage-bar having in the meantime been carried forward by the operation of the weight 49. When the bar 32 has been carried up to the proper height by the descent of the weight 29, the finger 41 on the tripping-rod 38 will engage the end of the lever 39, and by throwing said end up will move the clutch 10 inward, and thereby connect once more the constantly-moving ratchet-wheel 9 with the shaft 3, so as to counteract the action of the weight 29 and cause the drill-rod 8 and tripping-rod 38 to move downward again. The movement of the clutch to gear the ratchet-wheel and shaft is made quick and sharp by the action of the springs 43 and 60, an accidental or false movement of the clutch-levers being prevented by means of the spring-actuated catch 44.

It is evident that the spring 43 and weight 29 are equivalent devices, and that the one may be used in place of the other, or both used together, as shown. It is also evident that the above-described automatic reversing and feed mechanism may be applied to a gang of drills in like manner as to a single drill, the movement of the frame carrying the set of drills being obtained in the same way as that of the single drill-bar 8.

I claim as my invention—

1. In a feed mechanism for drills, the combination of the supporting-frame, the main driving-shaft, a rack-bar mounted to reciprocate vertically in said frame and terminating in a tripping-rod at its lower end, adjustable fingers on said rod, means, substantially as described, for automatically elevating said bar, a pinion on a counter-shaft meshing with said rack-bar, a ratchet-wheel revolving loosely on said counter-shaft, a clutch connecting the ratchet-wheel and shaft, a pawl operated by the main driving-shaft and engaging said ratchet-wheel, a second counter-shaft parallel with the first, a pinion thereon, a second vertically-reciprocating rack-bar parallel with the first and engaged by said pinion, a drill-spindle coupled to said second rack-bar, gearing coupling the two shafts, a bent lever actuating the clutch, and a second pivoted lever jointed to the outer arm of said clutch-lever and extended to contact with the pins on the vertically-reciprocating rod, all substantially in the manner and for the purpose herein set forth.

2. The combination, in a drilling-machine, with the vertically-reciprocating rod 38, the fingers 40 and 41 thereon, the clutch 10, and the interposed levers 35 and 39, of the spring-actuated catch 44, substantially in the manner and for the purpose herein set forth.

3. The combination, in a drilling-machine, with the vertically-reciprocating rod 38, the fingers 40 and 41 thereon, the spring 43, automatically elevating said rod, the clutch 10, and the interposed levers 35 and 39, of the auxiliary spring 60, bearing upon said lever 35, substantially in the manner and for the purpose herein set forth.

4. In a drilling-machine, the combination of its bed-plate and supporting-frame, the rack-bar 32, terminating in a tripping-rod, 38, and mounted to reciprocate vertically in said frame, a spring, 43, operating automatically to carry said rod upward, a finger, 56, projecting from the lower end of the rod, a counter-shaft meshing with said rack, a second rack-bar, to which the drill-spindle is coupled, gearing between the two rack-bars, means, substantially as described, whereby the counter-shaft is rotated and the rack-bars thereby fed downward, a carriage, 46, traversing upon the bed-plate under the drill-spindle, a weight, 49, to move the carriage automatically in one direction, a spring-actuated catch, 57, engaging the carriage to prevent said movement, a pivoted lever, 53, jointed to the catch, a second pivoted lever, 55, having one arm in position to contact with the finger 56 on the reciprocating tripping-rod, and a swinging latch, 54, on the opposite arm of said lever to engage and slide over the free arm of the catch-lever 53, all substantially in the manner and for the purpose herein set forth.

5. In a drilling-machine, the drill-spindle, the automatically-moving carriage 46 beneath it, the spring-actuated catch engaging the carriage to arrest its movement, the vertically-

reciprocating rod mounted parallel with the drill-spindle to move in synchronism with it, the gearing between the rod and spindle, an adjustable finger projecting from the rod, and means for disengaging the catch from the carriage by the movement of the finger, consisting of the interposed pivoted levers 53 and 55, all substantially in the manner and for the purpose herein set forth.

6. The combination, in a drilling-machine, of the carriage 46, the lateral spring-actuated catch 51, and the detachable, reversible, notched gage-bar secured upon the carriage to be engaged by the catch, substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARTIN SCHWÄRZLER.

Witnesses:
A. N. JESBERA,
E. M. WATSON.