No. 698,242.

Patented Apr. 22, 1902.

S. A. BAKER.

DRILLING MACHINE.

(Application filed Aug. 17, 1901.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.

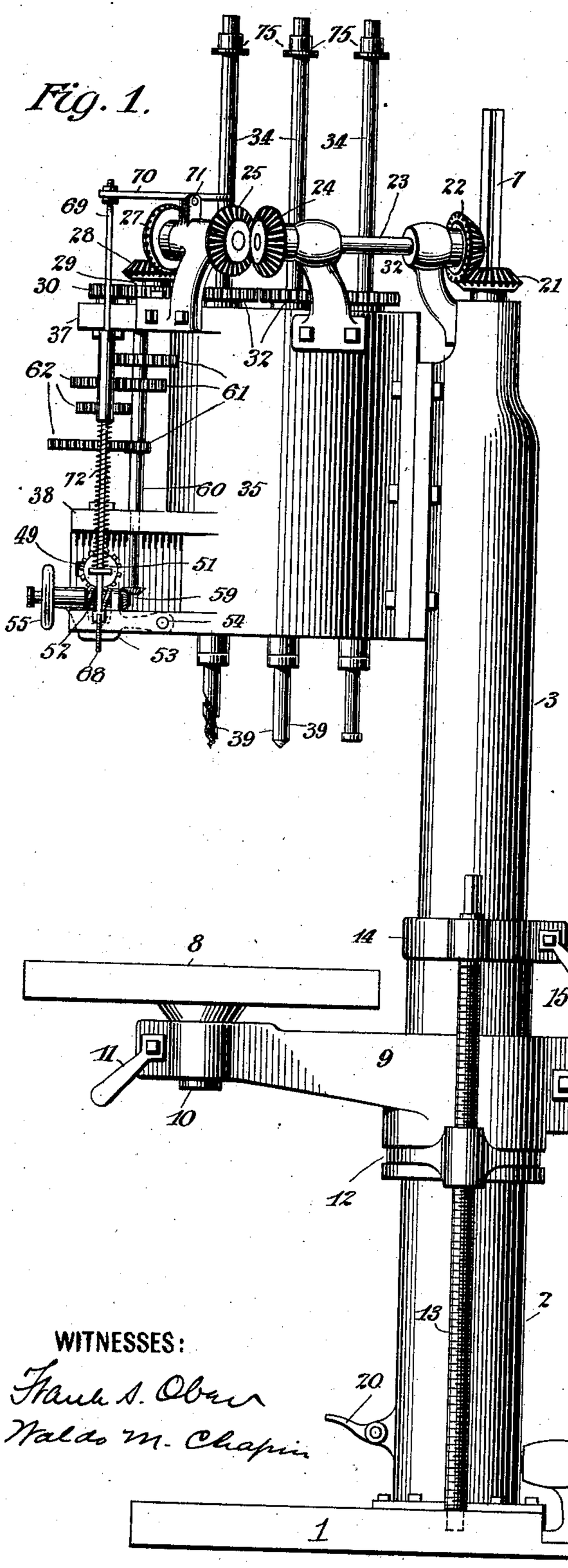


Fig. 6.

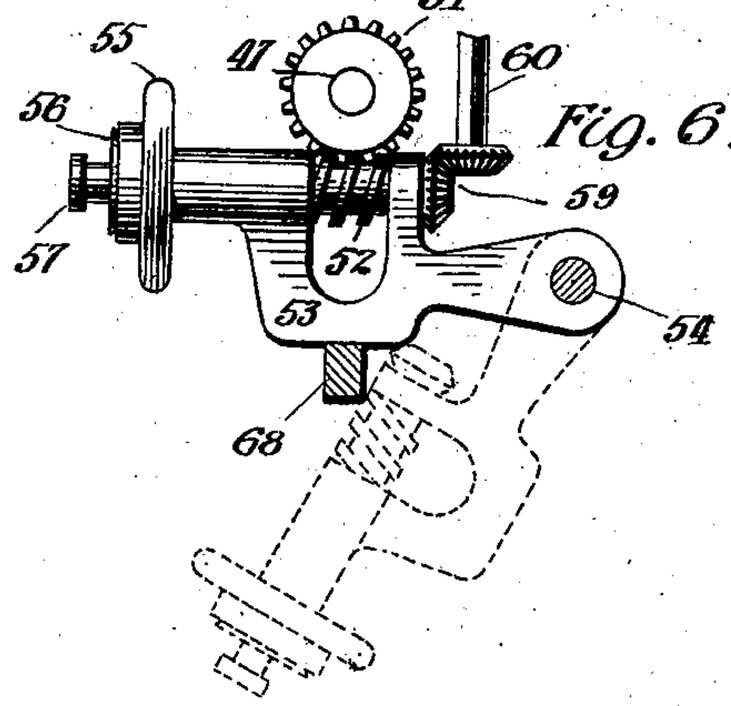


Fig. 2.

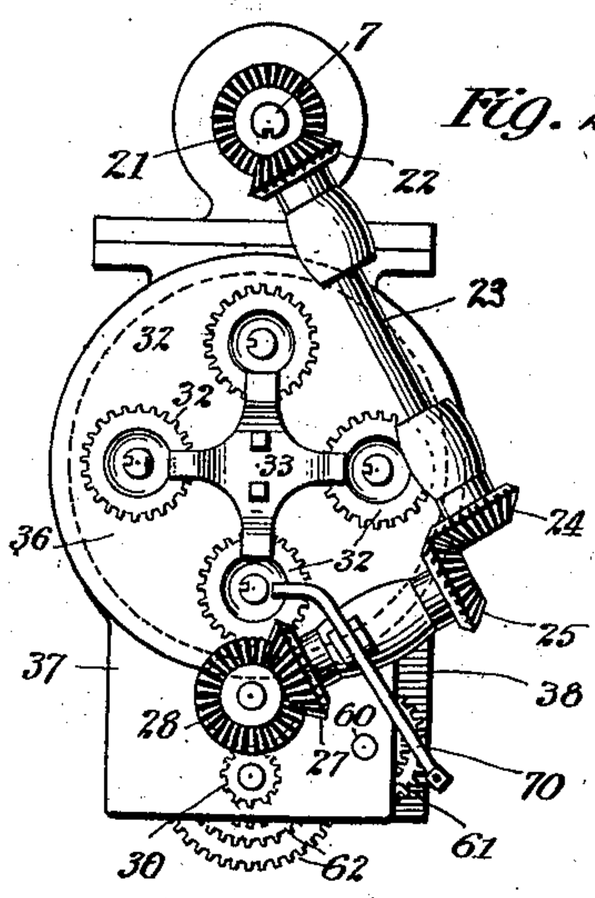
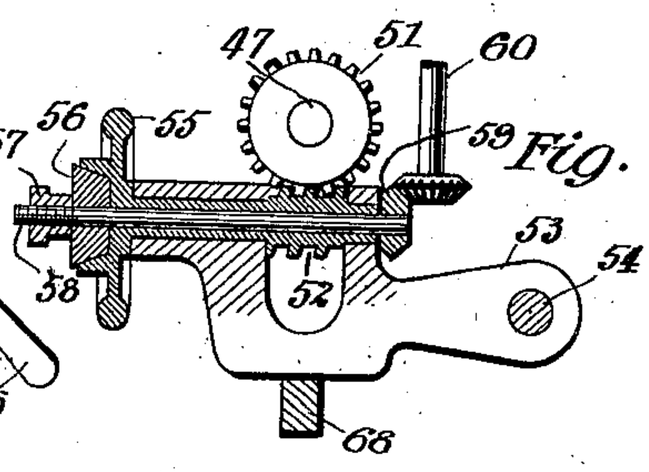


Fig. 7.



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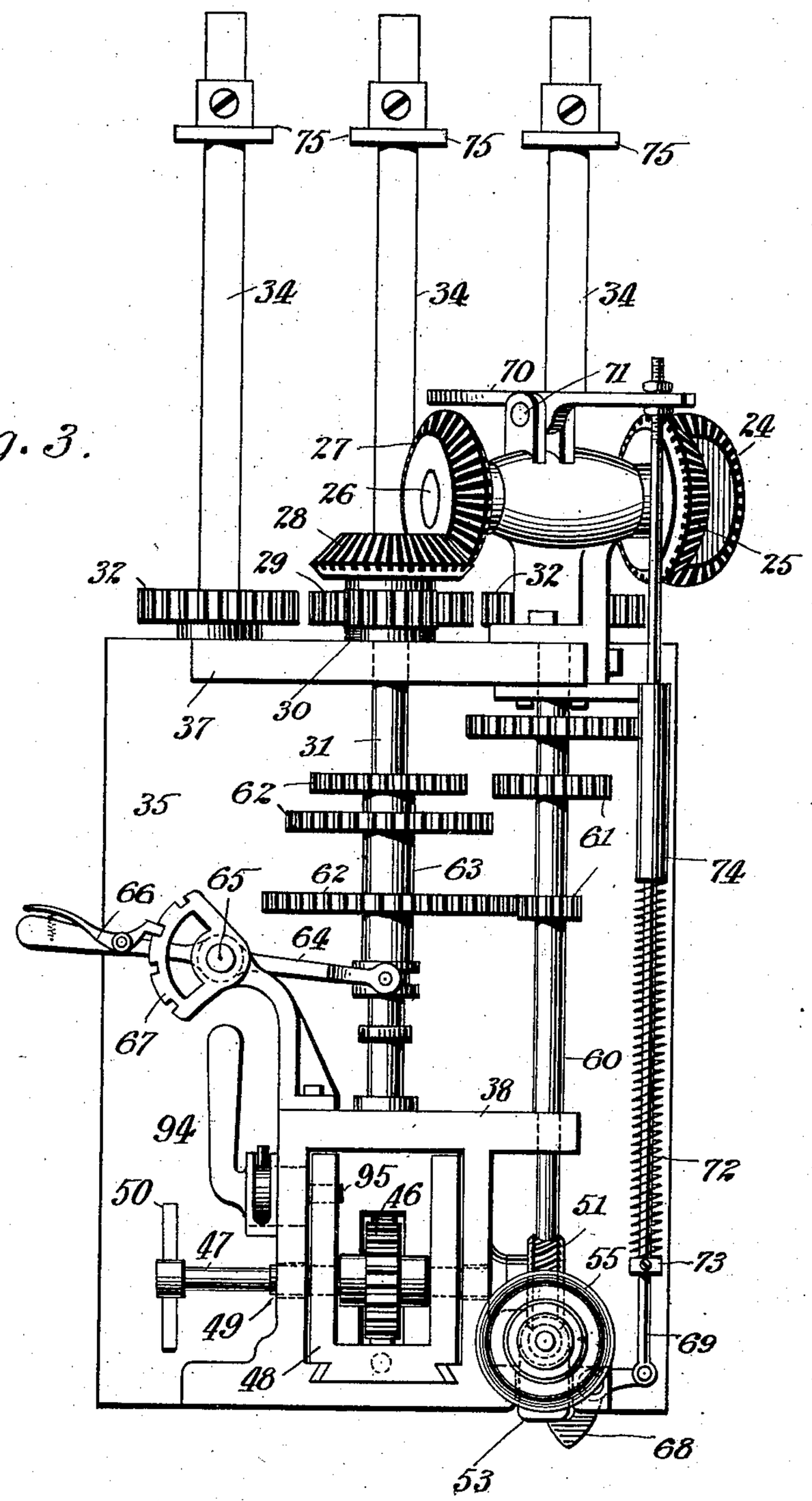
(No Model.) 4 Sheets—Sheet 2.

Fig. 3.



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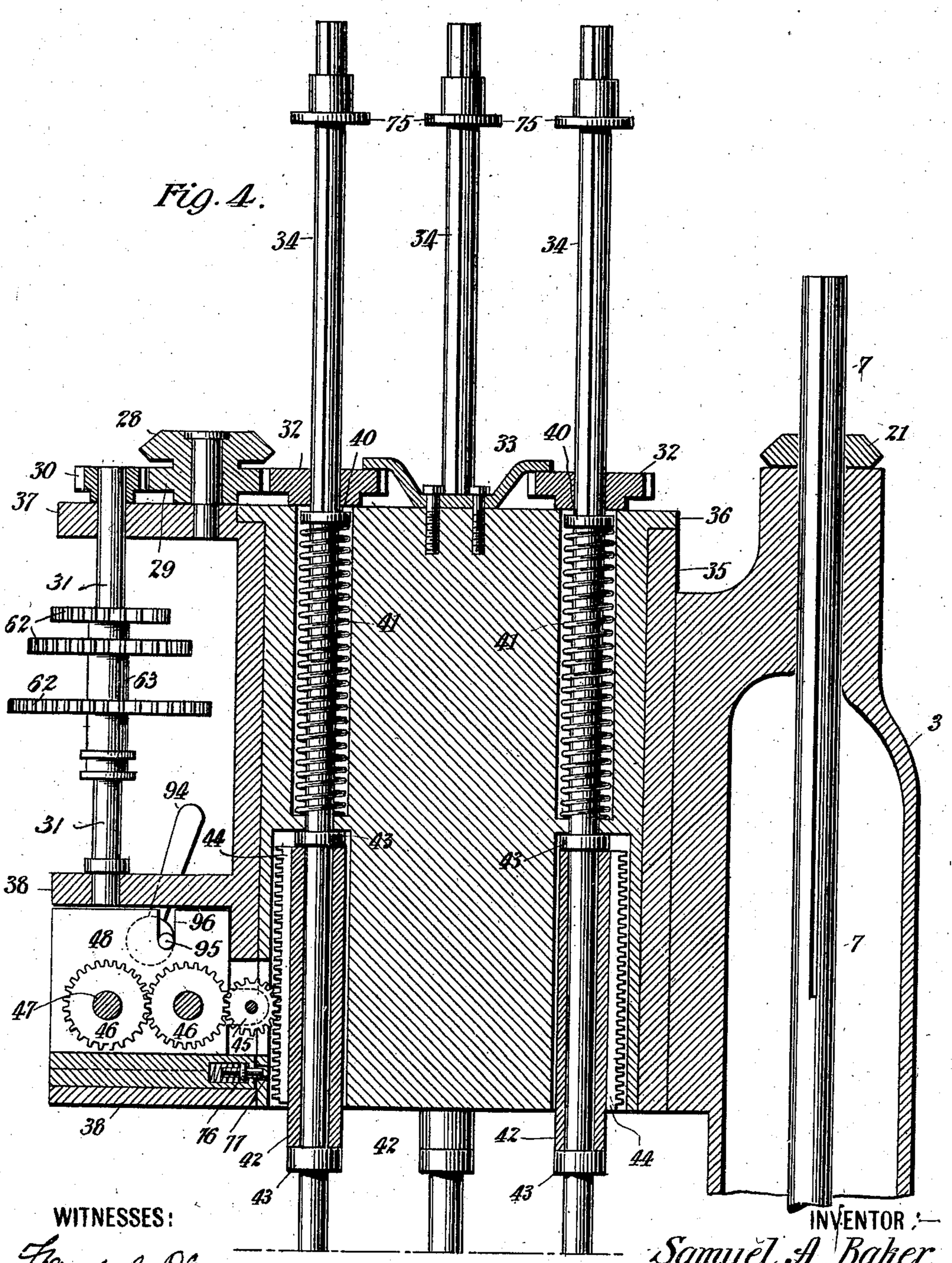
(No Model.) 4 Sheets—Sheet 3.

Fig. 4.



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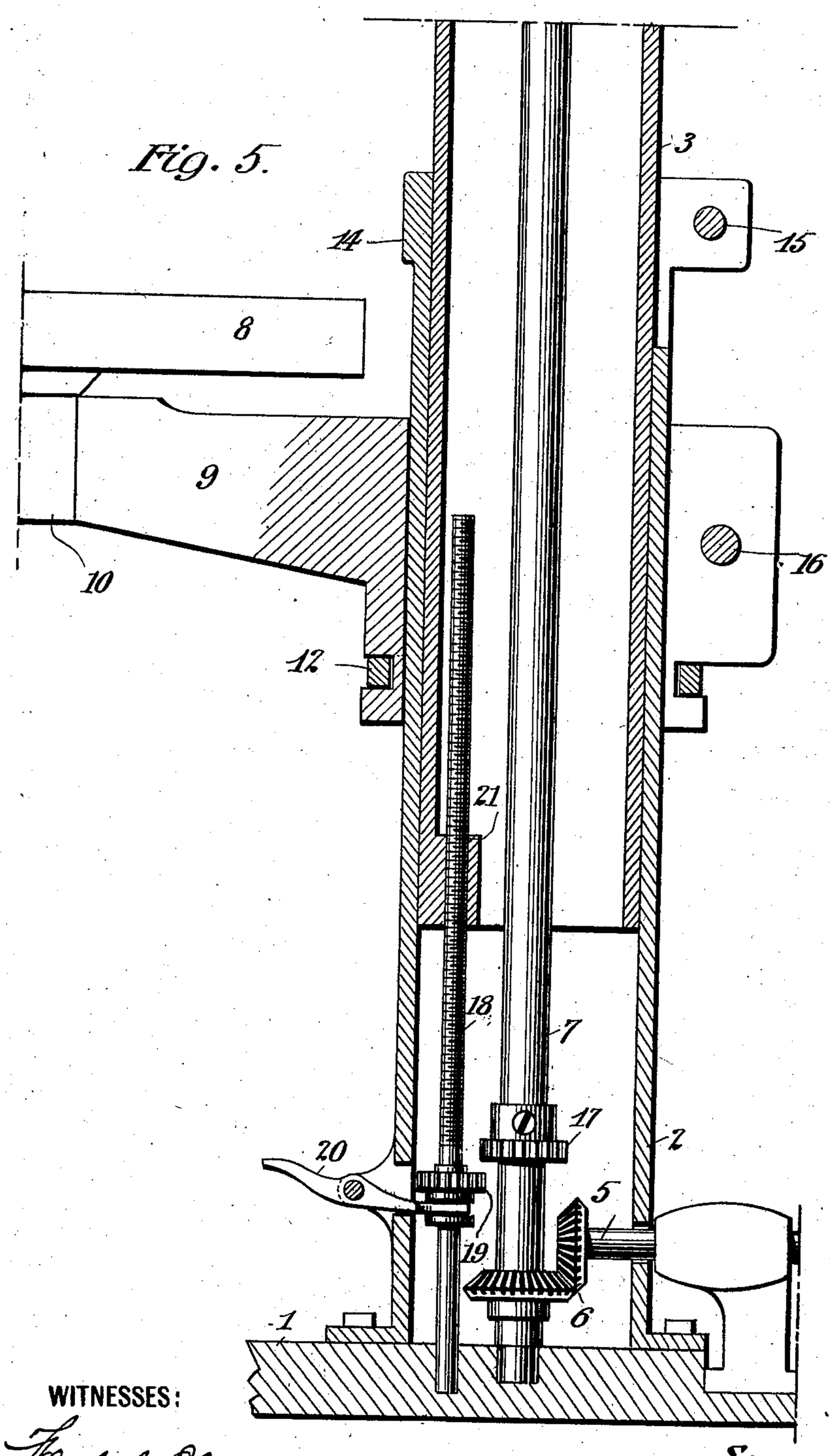
4 Sheets—Sheet 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

SAMUEL A. BAKER, OF SPRINGFIELD, VERMONT.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 698,242, dated April 22, 1902.

Application filed August 17, 1901. Serial No. 72,390. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL A. BAKER, a citizen of the United States, residing at Springfield, in the county of Windsor and State of Vermont, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

My invention relates to drilling-machines, and more particularly to that class of drilling-machines wherein is employed a movable turret or head designed to carry a series of tools—such as taps, drills, reamers, &c.—which are brought into operative position successively or as may be desired.

My invention consists in the construction and arrangement of parts as hereinafter described in the specification and finally pointed out in the claims.

In the drawings forming a part of this specification, Figure 1 is a perspective view of a turret-drill embodying my improvements. Fig. 2 is a top view thereof. Fig. 3 is a front view, on an enlarged scale, of the upper part of the drill and the connected parts. Fig. 4 is a vertical sectional view, on an enlarged scale, of the upper part of the drill, taken through the turret. Fig. 5 is a vertical sectional view, on an enlarged scale, of the lower part of the machine, showing the parts contained within the lower supporting-column. Figs. 6 and 7 are detail views, upon an enlarged scale, showing respectively in perspective and in section the connections for imparting an automatic feed to the spindles.

As shown in the drawings, the main frame of the drill consists of the flat base-piece 1 and the hollow tube or column 2, bolted thereon. Mounted telescopically above the column 2 and partly within it is a second hollow tube or column 3, which carries the turret and other operative parts. The top of the column 2 is formed as a split ring 14, provided with a bolt and wrench 15, the said ring 14 embracing the column 3 in such manner that when tightened thereon by means of the bolt and wrench 15 the said column 3 will be held in adjusted position with reference to the column 2. The platen-bracket 9 is provided with a split ring in such manner as to embrace the column 2 and to be held in adjusted position thereon when tightened by the bolt and wrench 16. The platen 8 is mounted revolubly in a split ring at the other end of bracket 9, so that it may be pivotally turned to adjusted position and firmly held there by means of the bolt and wrench 11, arranged to tighten the split ring about the cylindrical lower portion 10 of the platen. The platen 8, together with its bracket 9, is vertically adjustable upon the column 2 by means of the screw-threaded shaft 13, journaled at its bottom in the base-plate 1 and at its top in the ring 14 of the column and passing through a screw-threaded aperture in the ring 12, which is seated in a correspondingly formed groove in the lower part of the bracket 9. It will be obvious that by rotating the shaft 13 by means of a wrench or other instrument the bracket 9 may be adjusted vertically to any desired position with reference to the column 2 and fastened in its adjusted position by turning up the wrench 16. It will be further seen, because of the arrangement of the ring 12 seated loosely within the groove in the bracket 9, that the said bracket 9 may be radially adjusted or may be given a partial rotation, so as to swing the bracket and the platen 8, supported thereby, entirely out of operative position, as shown in Fig. 1. This latter operation is desirable in case the work to be operated upon is too large to be supported by the platen and it is desired to place it upon the base-piece 1.

The main operative shaft 7 of the machine is located within the hollow columns 2 and 3 and is journaled at its lower end in the base-piece 1 and at its upper end in the top of the column 3, through which it passes freely, so as not to interfere with the longitudinal movement of the said column 3. Power is imparted to the counter-shaft 5, suitably mounted at the base of the machine, by means of a loose pulley arrangement 4 or in other suitable manner, the said power being imparted from the counter-shaft 5 to the main shaft 7 by means of bevel-gears 6, located within the column 2, as shown in Fig. 5.

In order to provide an automatic means for raising and lowering the column 3, together with its attached parts, I have provided the lower portion of the column 3 with a lug or projection 21, having a screw-threaded aperture for engagement with the screw-threaded shaft 18, placed within the column 2 and jour-

naled at its lower end in the base-piece 1. The shaft 18 has a key or feather and is provided with a spur-gear 19, splined thereto. The hub of the gear 19 has a groove, which is engaged by the bifurcated end of the foot-lever 20 in such manner that when the foot-lever 20 is operated the gear 19 will be brought into engagement with the gear 17 upon the main shaft 7, thereby rotating the screw-shaft 18 and raising the column 3 and its attached parts to the desired position, where it may be firmly secured by tightening the split ring 14 in the manner already described. When the desired elevation has been given to the column 3 and the foot-lever 20 is no longer operated, the weight of the gear 19 is sufficient to disengage it from the gear 17 and to restore it to its normal position. It will be obvious that the upper column and attached parts may be lowered similarly by reversing the motion of the main shaft 7.

The turret-holder 35 is bolted to the column 3 near its top and is formed with an elongated cylindrical space within, so as to embrace the correspondingly-shaped cylindrical head or turret 36, which is supported in the turret-holder 35 by means of a circular flange formed at the top of the turret in such manner as to hold it in position, but to permit of its manual rotation within the turret-holder. (See Fig. 4.) Mounted within the turret 36 are a series of vertical spindles 34 34 for the operation of the tools 39 39, which are attached to the bottom of these spindles in the customary manner. I have shown four of these spindles in the drawings; but it will be obvious that this number may be increased or diminished, as desired. The spindles 34 are mounted in the turret concentrically in such manner that when the turret is rotated any selected one may be brought into operative position at the front of the machine. Each spindle 34 is normally maintained in its highest position by means of a spring 41, surrounding the spindle and seated within the turret and pressing at its upper end against a collar or washer 40, attached to the spindle. Each spindle 34 is also provided with a rack 44, formed upon the side of a sleeve 42, through which sleeve the spindle passes and within which it is free to rotate. The said sleeve 42 is, however, embraced between two collars 43 43, formed upon the spindle 34 in such manner that when the rack 44 is actuated by the pinion 45 in the manner hereinafter to be described the spindle 34 is fed downward in the desired manner. The springs 41 and sleeves 42 are contained within suitably-formed recesses in the turret 36, as clearly shown in Fig. 4, and the racks 44, formed upon the sleeves 42, project into adjoining recesses in the turret 36, thus permitting the rotation of the spindle 34 within the sleeve 42, but preventing the rotation of the box itself.

The required movements are imparted to the various operative parts from the main shaft 7 through the bevel-gear 21, which is located at the top of column 3 and splined upon the shaft 7 to secure its rotation thereby. Motion is imparted from the bevel-gear 21 to the bevel-gear 22 on the shaft 23, suitably mounted upon the column 3 and turret-holder 35, and the shaft 23 is provided at its other end with a second bevel-gear 24, which in turn meshes into bevel-gear 25 upon the shaft 26, carried in suitable supports upon the turret-holder. The shaft 26 is provided at its farther end with the bevel-gear 27, which meshes into bevel-gear 28, supported on a stud upon the projecting piece 37 of the turret-holder 35. (See Fig. 4.) Integral with the bevel-gear 28 and beneath it is the spur-gear 29, from which motion is imparted to the spur-gear 30, fixed upon the short vertical shaft 31, which is journaled at its lower end in the projecting piece 38 of the turret-holder 35 and near its upper end in the projecting piece 37. From the shaft 31 motion is imparted to the automatic mechanism for feeding the spindles longitudinally in the manner hereinafter to be described. The spur-gear 29 meshes at its other side into the pinion 32, mounted upon one of the spindles 34, and thereby imparts the rotary movement to the said spindle. Each of the spindles 34 has splined to it such a pinion 32, and as each spindle is brought into and locked in its operative position its pinion 32 is caused to engage with the actuating spur-gear 29, thereby effecting the rotation of the spindle, the splined connection permitting at the same time the longitudinal movement of the spindle. The pinions 32 are held against upward movement by means of a stop or bearing piece 33, attached to the turret and bearing upon the top of the pinions.

As previously indicated, the downward feed of the spindle 34 is effected through the medium of the rack 44, connected thereto, which rack is moved by the pinion 45 when in engagement therewith.

Located at the front of the turret-holder and between its two projecting portions 38 38 is a movable box 48, capable of a limited sliding movement in and out, which sliding movement is imparted to the box by means of the pivoted hand-lever 94, provided with the eccentrically-located pin 95, which engages with a groove 96, formed in the side of the box 48. The sliding box 48 is further provided with a spring-seated pin 76, which pin enters and engages with one of the series of holes 77, formed in the turret, so as to hold the turret firmly in position when the selected tool is brought into operative position. The play of the spring-seated pin 76 is less than the throw of the box 48, and the spring is employed to permit of a slight yield of the pin 76 to secure accurate adjustment and to avoid jamming and the breakage of parts when the turret is being rotated. It will therefore be obvious that the inward movement of the hand-lever 94 effects a double function—namely, that of engaging the pinion 45 with the rack 44 and of locking the

turret 36 in adjusted position by means of the engagement of the pin 76 with the hole 77. The pinion 45 is suitably mounted in the box 48 and gears into a chain of gearing 46 46. The outside gear of the series 46 is fast upon a transverse shaft 47, which is mounted in the box 48, and the ends of which pass through and beyond the box and also through and beyond slots 49 in the framing which supports the box 48 and which slots 49 permit the movement of the shaft 47 due to the sliding of the box 48. (See Fig. 3.) At one end of the shaft 47 is the worm-gear 51, and at the other end of the shaft 47 is the handle or lever 50 to enable a quick return motion to be given to the shaft 47 when desired. Motion is given to the worm-gear 51 by the worm 52. The worm 52 is mounted in a bracket 53, pivoted at 54 to the front of the machine, which bracket 53 is swung upward (see Fig. 6) at the desired time in such manner that the worm 52 is brought into engagement with the worm-gear 51, the bracket being then held in operative position by reason of the spring-pressed pawl or catch 68, hereinafter to be more fully described. When the turret has been turned to the desired position, the box 48 is moved inwardly by means of the hand-lever 94, thereby engaging the pinion 45 with the rack 44, and at this time the bracket 53 is swung upward, so as to engage the worm 52 with the worm-gear 51, and the desired rotation may be manually imparted to the worm-gear 51 by means of the handpiece 55, attached to the worm 52, (see Fig. 7,) the actuation of the worm-gear 51 through the shaft 47, the gears 46 46, the pinion 45, and the rack 44 imparting to the spindle the desired feed or downward motion. I have provided, however, a means for imparting to the worm 52 an automatic operation as distinguished from the manual operation just described. The worm 52 is hollow and has passing through it a shaft 58, (see Fig. 7,) screw-threaded at one end and provided with a filling-piece 56 and a screw-threaded nut 57, forming, in effect, a clutch in connection with the handpiece 55, so that when the nut 57 is turned up the shaft 58 is tightened within the worm 52 in such manner that its rotation causes the rotation also of the worm 52. At its other end the shaft 58 is provided with a bevel-gear 59, meshing into a similar bevel-gear upon the vertical shaft 60, which shaft 60 is journaled at its upper end in the projecting piece 37 of the turret-holder 35 and also near its lower end in the projecting piece 38. The shaft 60 has fast upon it near its upper end a series of speed-gears 61, the members of which are adapted to be severally engaged by the corresponding members of a series of speed-gears 62, carried by a sleeve 63, which sleeve is splined to the vertical power-shaft 31, previously described, in such manner that the speed-gears 62 are compelled to rotate therewith, but are capable of longitudinal adjustment thereon. The longitudinal adjustment of the speed-gears 62 upon the shaft 31 is effected by a hand-lever 64, pivoted at 65 and engaging with a groove in the sleeve 63. The hand-lever 64 is also provided with a spring-pressed catch or detent 66, adapted to engage with the holding-notches of a rack 67, which notches are so arranged as to insure the selection and engagement of any desired pair of speed-gears or of their complete disengagement if it be desired to feed the spindle by hand. It will therefore be obvious that by clutching the shaft 58 to the worm 52 in the manner previously described and by the engagement of any selected pair of the speed-gears 61 and 62 the desired speed may be automatically given to the pinion 45 and the desired downward feed of the spindle 34 secured. I have found it desirable in connection with these devices for effecting an automatic feed of the spindles to provide a stopping device whereby the feeding mechanism may be thrown out of engagement when the desired extent of feed has been secured. I have previously referred to the spring-actuated catch or pawl 68, which is employed to hold the bracket 53 and worm 52 in operative position and which when removed permits the bracket 53 to drop by gravity (see dotted lines, Fig. 6) and break the connection between the worm 52 and the worm-gear 51. This catch or pawl 68 is pivoted, as shown in the drawings, and provided with a beveled surface to permit the upward passage past it of the pivoted bracket 53 and formed to engage it when in operative position. Attached to the opposite end of this pivoted catch 68 is an arm 69, which passes through a supporting-collar 74, formed upon the turret-holder. At its upper end the rod 69 is attached to the trip-lever 70, which is pivoted at 71 to the upper frame of the turret-holder. Interposed between the supporting-collar 74 and a fixed projection or washer 73 upon the arm 69 is a spiral spring 72, so arranged as to cause a constant downward pressure upon the washer 73 in such manner that the pivoted catch or pawl 68 and the lever 70 will be normally held in the positions shown in Fig. 3. Each of the spindles 34 is provided with an adjustable stop or projection 75, which may be adjusted at any desired height upon the spindle and which in the downward feed of the spindle engages with the inner end of the lever 70. By the suitable location of this stop upon the spindle it will be seen that the lever 70 may be tripped at any desired point during the downward movement of the spindle. The contact of the stop 75 with the end of the lever 70 and its further downward movement causes the elevation of the outer end of the lever, the elevation of the rod 69, and the tripping of the pivoted catch 68, which permits the dropping of the pivoted bracket 53 and the disengagement of the worm 52 from the worm-gear 51, thereby arresting the downward feed of the spindle.

I have herein described a form of drilling-machine embodying my improvements; but it will be obvious that many changes and variations may be made therein without departing from the spirit of my invention.

Having thus described my invention, what I desire to claim and secure by Letters Patent of the United States is as follows:

1. In a drilling-machine, the frame comprising a base-piece, a hollow column secured thereto, and a second hollow column telescopically arranged with reference to the first, a suitably-actuated main shaft located within the hollow columns, and a screw-threaded shaft similarly located and in engagement with the upper column, together with means for gearing the screw-threaded shaft to the main shaft.

2. In a drilling-machine, the combination with the frame comprising a base, a hollow column secured thereto and a second hollow column telescopically arranged with respect to the first, and provided with means for raising and lowering it, of a main shaft located within the two hollow columns, stepped at its lower end in said base, passing through the upper end of the upper sliding column and there provided with a splined transmitting-gear, and means for rotating the main shaft; substantially as described.

3. The combination with the cylindrical casing or holder, having an opening at one side, and feed-gearing exterior to the casing or holder with one of its gears at said opening, of a cylindrical turret mounted in said casing and provided therethrough with a circularly-arranged series of longitudinal bores, each opening laterally out through the outer side of the turret to register with the single opening in the casing, a series of spindles extending through said bores and provided adjacent to the side openings thereof with feed-racks, adapted to be engaged by the feed-gear at the casing-opening, driving-gears splined to the spindles at the top of the turret, driving-gearing with which any of the spindle-gears may mesh for continuous rotation and means for normally holding the spindles raised; substantially as described.

4. A drilling-machine comprising a telescopic column or standard, a main drive-shaft extending up through the standard and provided with a transmitting-gear splined thereon above the upper member of the column, a cylindrical turret holder or casing mounted on the said upper column member and provided with a lateral opening through one side, feed-gearing mounted on the turret-holder with one of its gears adjacent to said opening, a cylindrical turret mounted in said holder and having a series of lateral openings leading from said bores to register with the opening in the turret-holder, spring-raised spindles in the said bores, feed-racks mounted loosely on the spindles within said bores and exposed through the lateral openings for operation by the said feed-gearing when brought into register therewith; substantially as described.

5. The combination with the cylindrical turret-holder having an opening through one side, feed-gearing mounted adjacent to said opening, a cylindrical turret mounted in the holder, and having a circularly-arranged series of bores, each having a lateral opening to register with the opening in the turret-holder, a series of spindles mounted in said bores and having feed-racks at the lateral openings for engagement with said feed-gear when brought into register therewith, drive-gears splined on the spindles at the top of the turret, a main drive-shaft, a common driving-gear mounted on top of the holder for engagement with any one of the spindle-gears, and gearing mounted on the holder and connecting said common driving-gear to the main drive-shaft; substantially as described.

6. A turret-drill comprising, a cylindrical holder or casing, a cylindrical turret mounted to turn therein, and provided with a series of drill-spindles extending through it and each provided at the top of the turret with a splined drive-gear, feed-gearing mounted at the side of the turret-holder and adapted to engage each spindle to feed the same when brought into register therewith, a common drive-gear mounted on top of the holder for operating the spindles as their drive-gears are brought into mesh therewith, a main drive-shaft, gearing connecting said main shaft with said common gear, a vertically-disposed feed-operating shaft also geared at its upper end to said common gear, means for operatively connecting the lower end of the vertical shaft to said feed-gearing for driving the same automatically and means for operating the feed-gearing by hand; substantially as described.

7. The rotatable turret, a series of spindles mounted therein, each of the said spindles having a rack connected to it, and means for imparting rotary motion to any selected spindle, in combination with a movable box carrying a suitably-actuated pinion for engagement with the rack and a pin adapted to engage a hole in the turret when the box is given its operative position.

8. The rotatable turret, a series of spindles mounted therein, each of said spindles having a rack connected thereto, and means for imparting rotary motion to any selected spindle, in combination with a movable box carrying a pinion for engagement with the rack and also gearing connected to the said pinion, together with means for manually operating the said gearing when the box is in its operative position.

9. The rotatable turret, a series of spindles mounted therein, each of the said spindles having a rack connected thereto, and means for imparting rotary motion to any selected spindle, in combination with a movable box carrying a pinion for engagement with the rack and also a worm-gear geared to the pin-

ion, together with a worm mounted so as to engage with the worm-gear when the box is in its operative position, and means for operating the worm.

10. The rotatable turret, a series of spindles mounted therein, each of the said spindles having a rack connected thereto, and means for imparting rotary motion to the selected spindle, in combination with a movable box, a pinion carried thereby for engagement with the rack, and a worm-gear also carried in the box and geared to the pinion, together with a pivoted bracket, and a suitably-actuated worm mounted in said bracket whereby the worm may be caused to engage the worm-gear when the movable box is in its operative position.

11. In a drilling-machine, the combination with a spindle, of means comprising a tubular worm which may be manually operated for feeding the spindle, together with a constantly-actuated shaft passing freely through the worm and normally not connected thereto, but provided with a clutch whereby the manual feed of the spindle may be changed to an automatic feed.

12. In a drilling-machine, the combination with a spindle and its feed-gearing, of a tubular worm for operating said gearing, a hand-wheel connected to said worm and provided at one side with a clutch-surface, a constantly-actuated shaft passed through the worm and provided with a clutch member at one end and means for engaging the clutch member with that on the hand-wheel; substantially as described.

13. In a drilling-machine, the combination of a spindle, and means for imparting a rotary motion thereto, with gearing mounted in a movable box for imparting an automatic feed to the spindle, an actuating member normally engaging the said gearing when the box is in operative position, a pivoted bracket carrying the said member, and a catch for maintaining the bracket in position, a rod connected to the catch, a spring pressing upon the rod, and a pivoted lever attached at the other end of the rod, together with a stop attached to the spindle whereby in the descent of the spindle the bracket and member carried thereby may be released from operative position.

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

SAMUEL A. BAKER.

Witnesses:
ARTHUR D. BAKER,
L. B. HURD.