No. 753,905. PATENTED MAR. 8, 1904.

F. J. NUTTING.

AUTOMATIC MULTIPLE DRILLING MACHINE

APPLICATION FILED JAN. 13, 1902.

NO MODEL 6 SHEETS—SHEET 1.

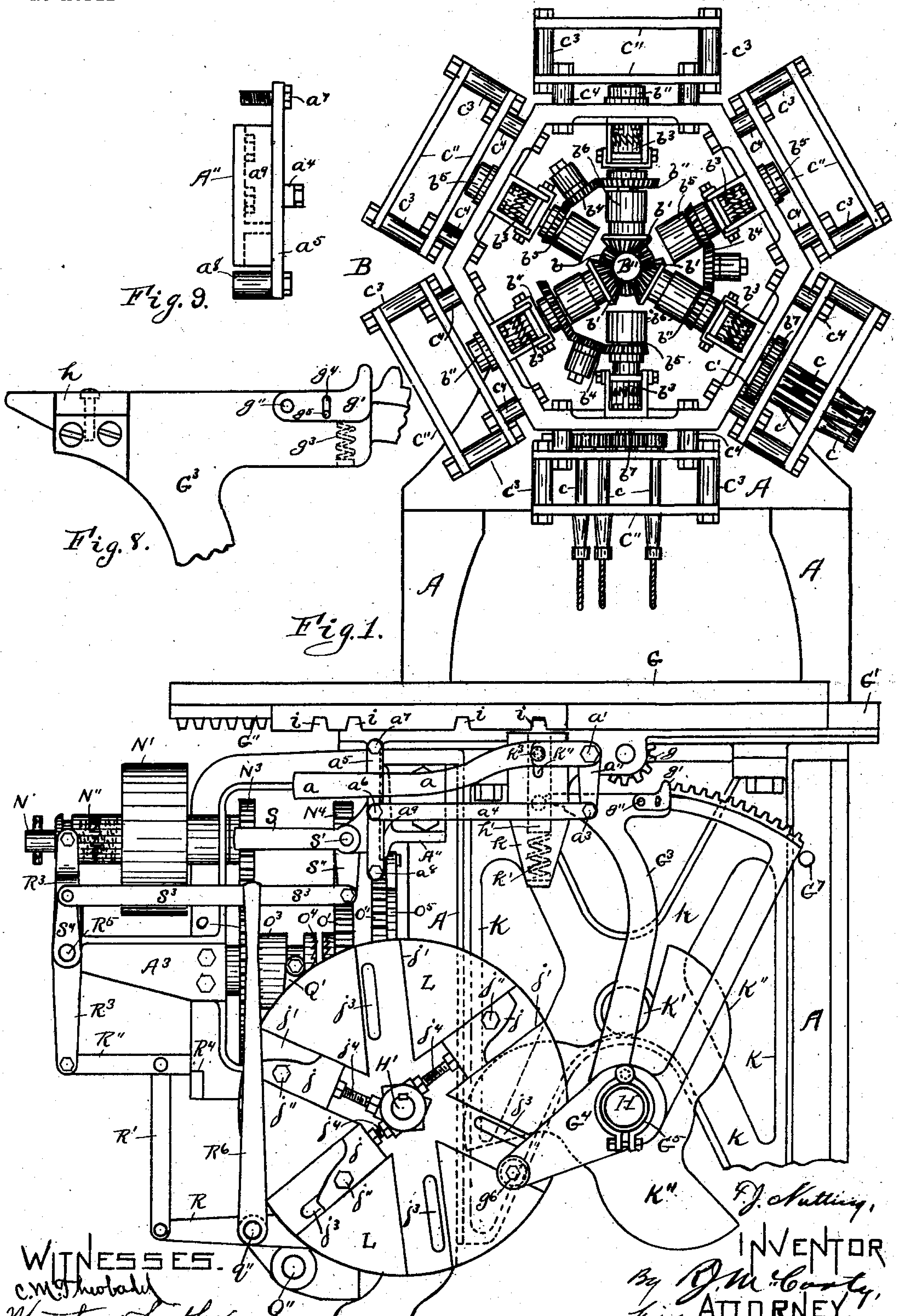

Fig. 9.

Fig. 8.

Fig. 1.

WITNESSES.
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Matthew Sabler.

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NO MODEL. 6 SHEETS—SHEET 2.

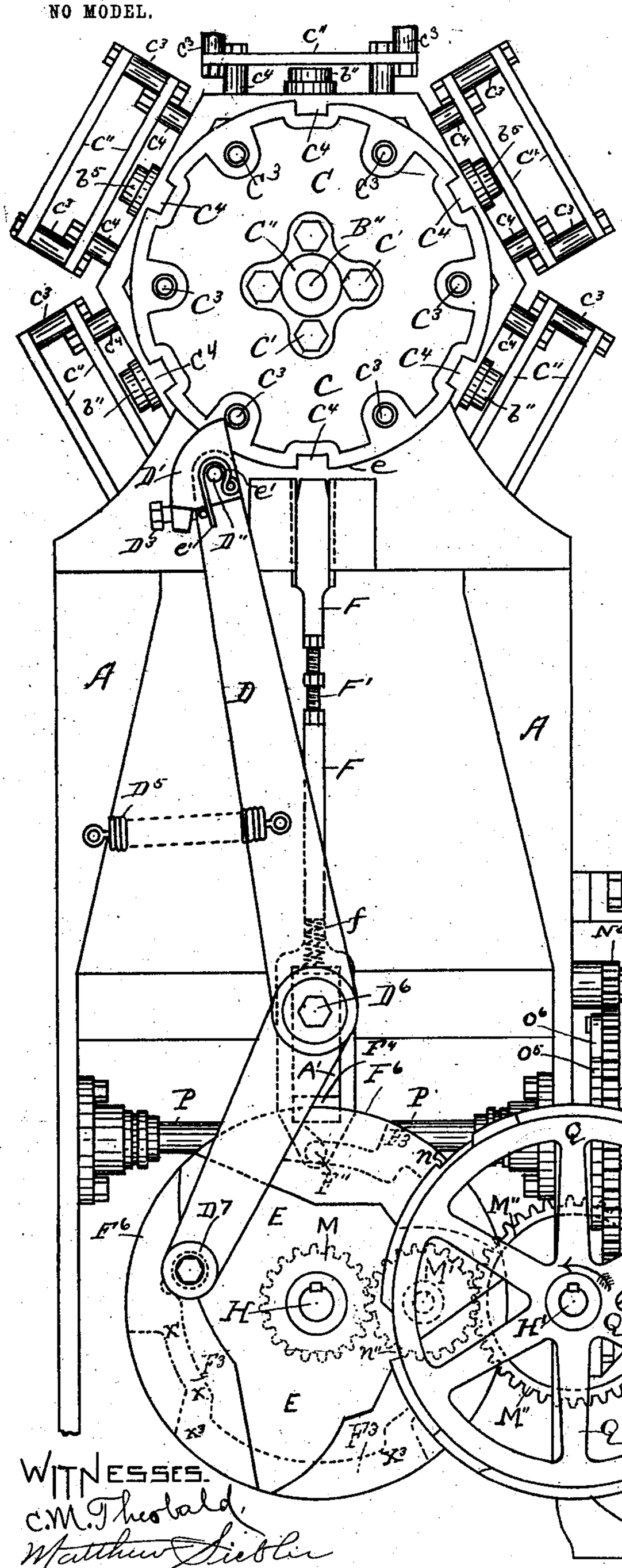
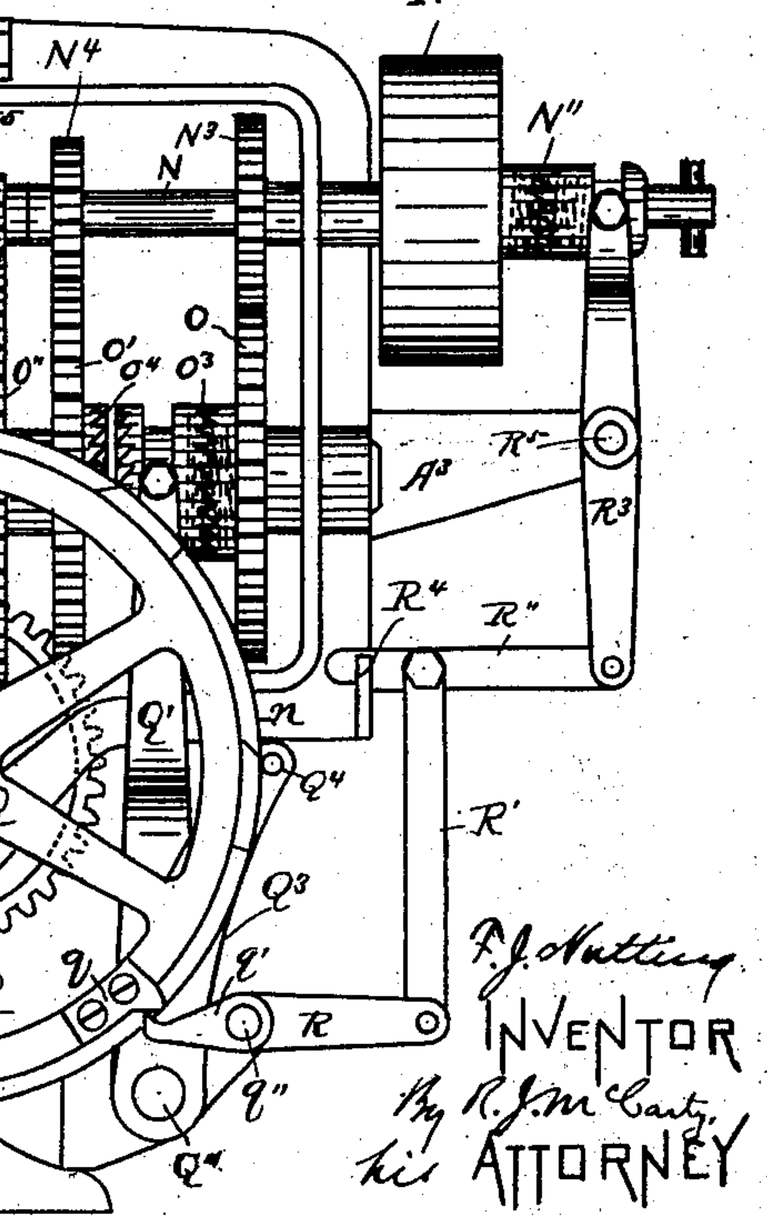


Fig. 2.



WITNESSES.
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NO MODEL. 6 SHEETS—SHEET 3.

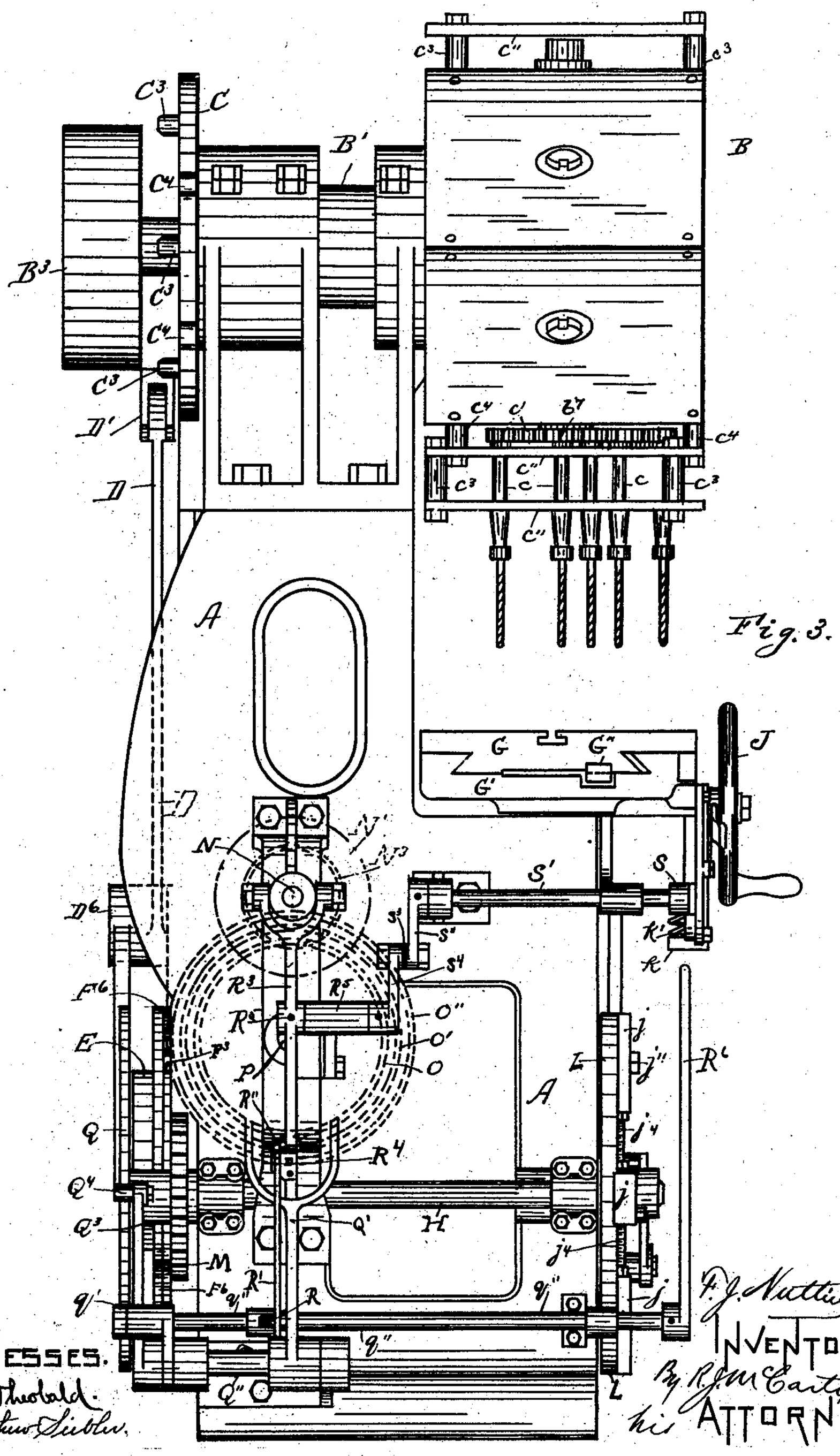

Fig. 3.

WITNESSES.
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AUTOMATIC MULTIPLE DRILLING MACHINE.

APPLICATION FILED JAN. 13, 1902.

NO MODEL. 6 SHEETS—SHEET 4.

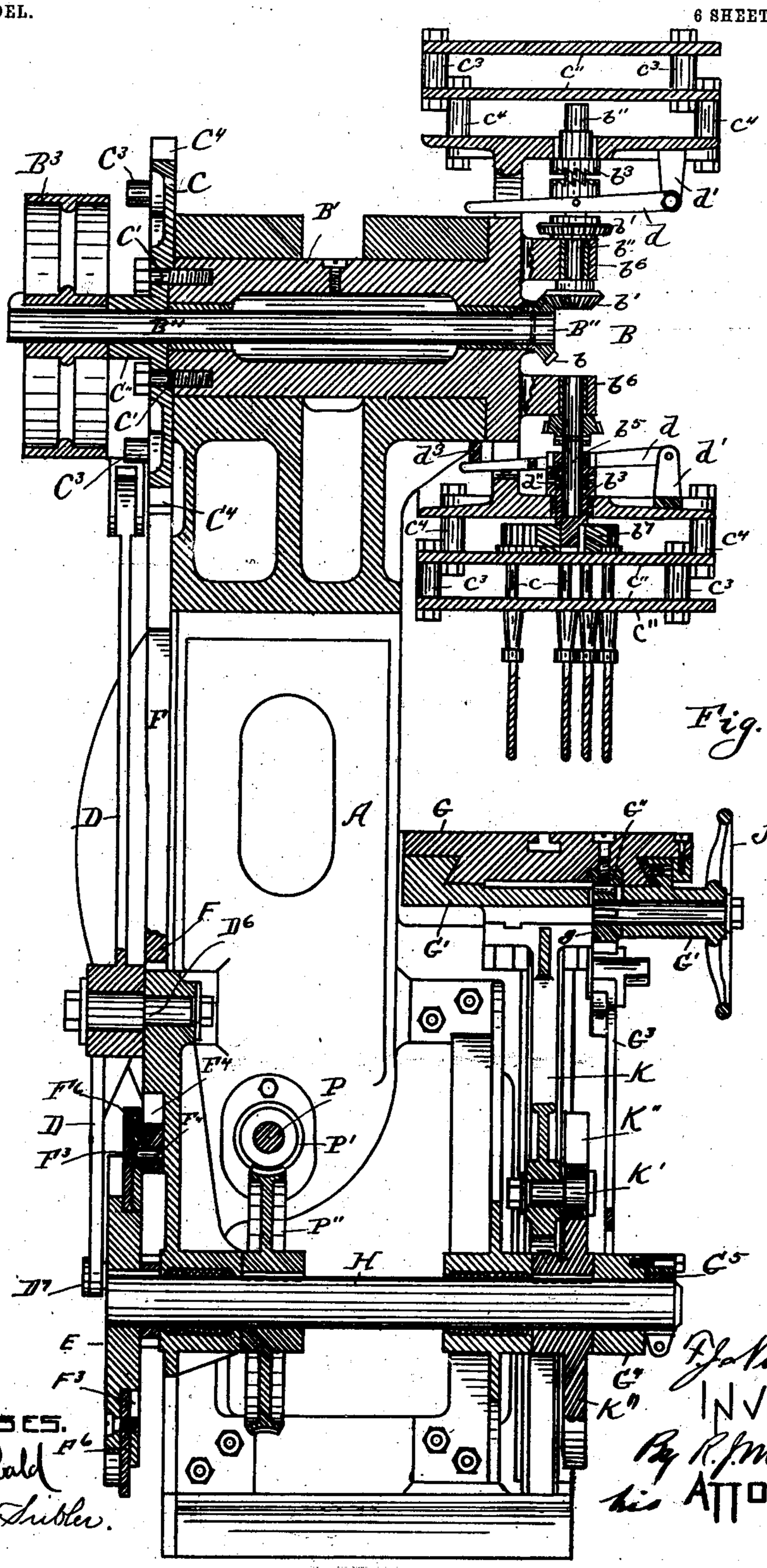

Fig. 4.

WITNESSES.
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AUTOMATIC MULTIPLE DRILLING MACHINE.

APPLICATION FILED JAN. 13, 1902.

NO MODEL. 6 SHEETS—SHEET 5.

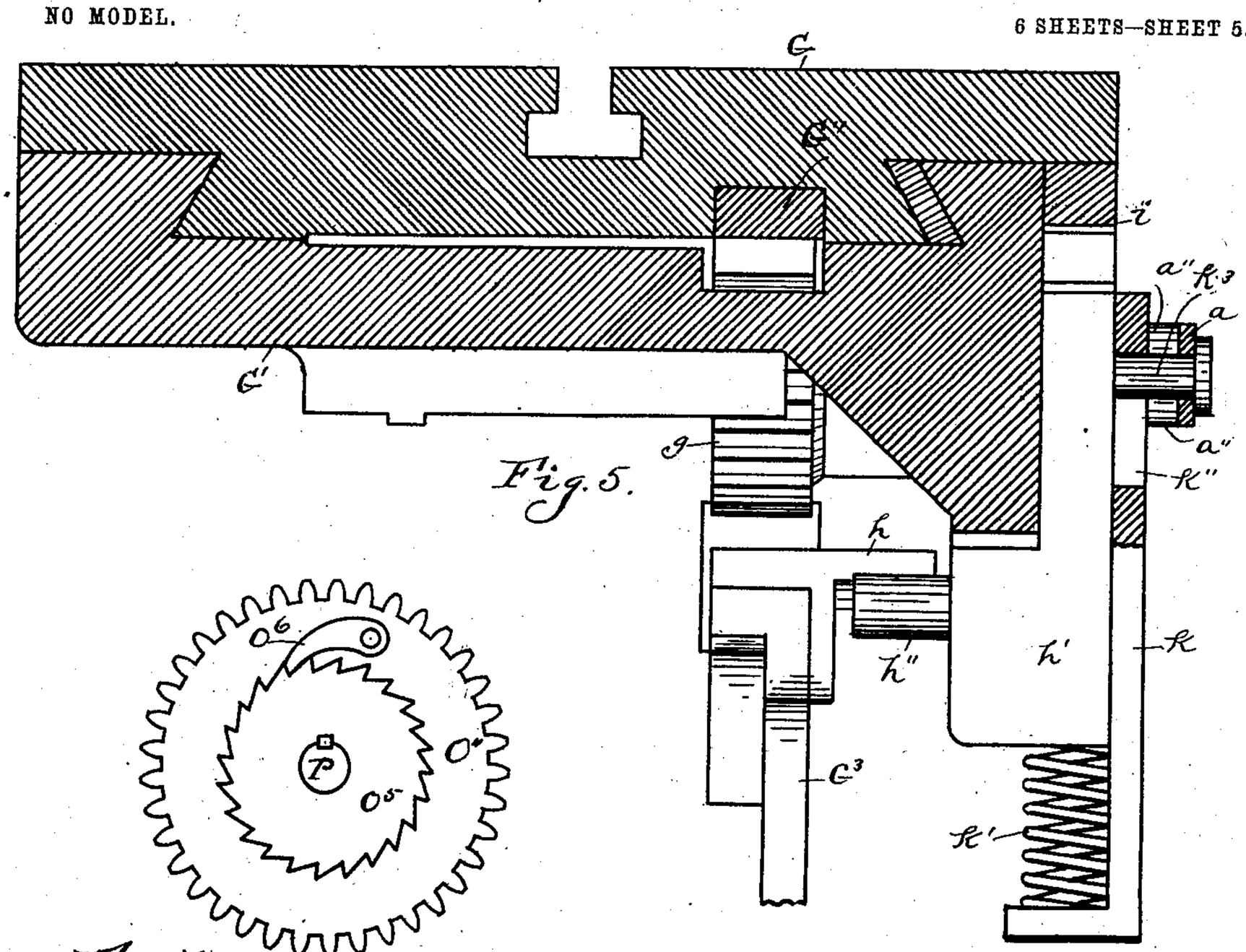

Fig. 5.

Fig. 7.

WITNESSES.
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No. 753,905. PATENTED MAR. 8, 1904.

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AUTOMATIC MULTIPLE DRILLING MACHINE.

APPLICATION FILED JAN. 13, 1902.

NO MODEL. 6 SHEETS—SHEET 6.

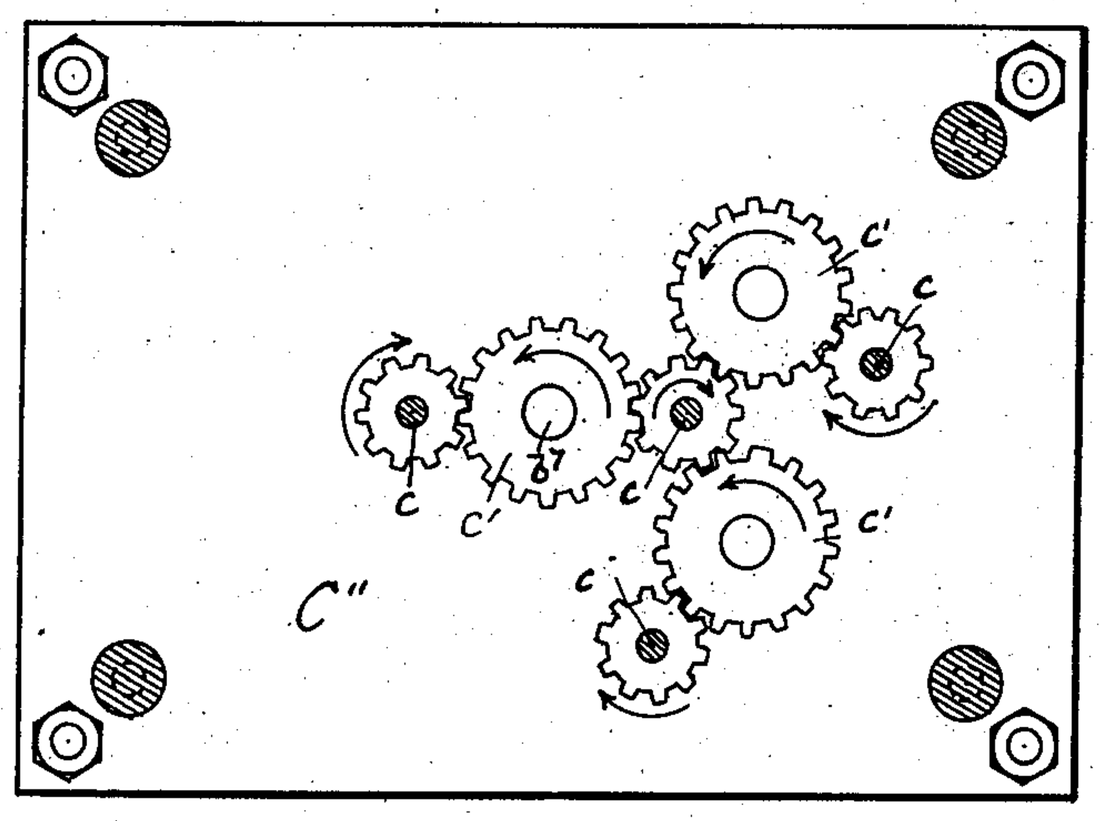

Fig. 6.

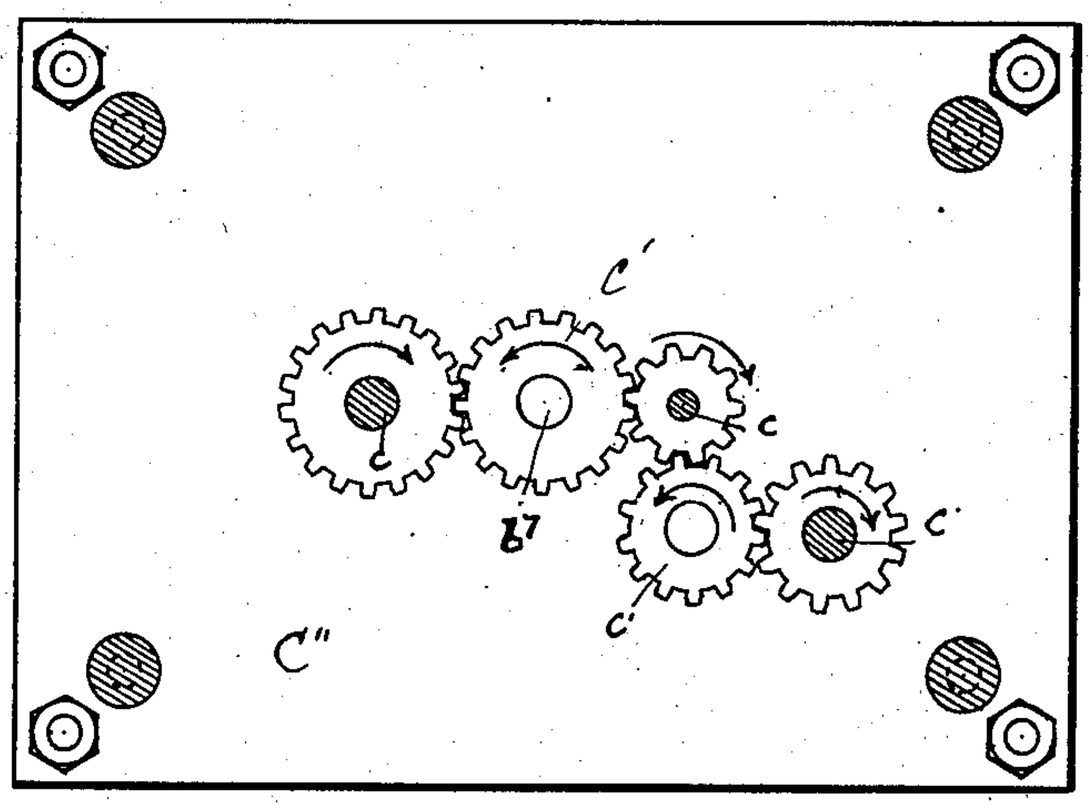

Fig. 6a

WITNESSES.
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Her ATTORNEY.

No. 753,905. Patented March 8, 1904.

UNITED STATES PATENT OFFICE.

FREDERICK J. NUTTING, OF DAYTON, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE NATIONAL AUTOMATIC TOOL CO., OF DAYTON, OHIO.

AUTOMATIC MULTIPLE DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 753,905, dated March 8, 1904.

Application filed January 13, 1902. Serial No. 89,568. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK J. NUTTING, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Automatic Multiple Drilling-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention comprises an automatic multiple drilling-machine.

The object of the invention is to provide a machine of the above type which has a capacity for drilling a multiplicity of holes of varying or uniform diameters and of varying or uniform distances apart and for transmitting to the several groups of drills the proper cutting speeds while in use.

A further object of my invention is to provide mechanisms for automatically indexing the turret-head and the feed table or platen simultaneously, the platen at uniform or varying distances or the turret-head independently of the feed table or platen, and for elevating the platen at varying speeds.

Preceding a detail description of my invention reference is made to the accompanying drawings, of which—

Figure 1 is a front elevation of my invention. Fig. 2 is a rear elevation. Fig. 3 is a side elevation. Fig. 4 is a vertical sectional elevation through the center of the turret-head and the lower mechanism. Fig. 5 is a sectional view through the platen on the line 1 1 of Fig. 1. Figs. 6 and 6^a are detached plan views of one of the plates by means of which the groups of drill-spindles are supported on the sides of the turret-head. These figures show means for driving the drill-spindles of a group at uniform or equal speeds and at unequal or different speeds, also the means for mounting the drill-spindles of a group at equal or unequal distances apart. Fig. 7 is a plan view of a portion of the speed combination. Fig. 8 is an enlarged elevation of a portion of the segment-gear. Fig. 9 is an elevation of a portion of the mechanism for locking the platen shot-bolt.

In a detail description of the invention the following method will be observed: I will first describe the turret-head and the interdependent or coöperating mechanisms thereof. I will next describe the mechanisms for indexing the turret-head. I will next describe the feed table or platen and the mechanisms coöperating therewith—to wit, the mechanism by means of which the platen is indexed simultaneously with the indexing of the turret-head and at uniform or varying distances. I will next describe the mechanism for actuating the feed table or platen into and out of operative relation with the drills on the turret-head. I will next describe the several cam movements upon which the operation of the machine is dependent. I will next describe the speed mechanisms through which varying speeds are obtained, and other details of construction will follow.

Throughout the specification similar reference characters indicate corresponding parts in the several views of the drawings.

A designates the several parts of an upright frame, in the upper portion of which a multisided turret-head B is mounted. In the present instance the turret-head is shown to have six sides; but the number of such sides may be varied. The hub B′ of the turret-head is journaled in the upper portion of said frame, as shown in Fig. 1.

B″ designates the main driving-spindle of the turret-head. The said spindle passes through the hub B′ of said turret-head and is driven from a pulley B^3. *b* is a bevel-gear mounted on said spindle at the axis of the turret-head. In mesh with this gear is a series of bevel-gears *b′*, which drive a series of spindles *b″*, which radiate from the center of the turret-head. (See Fig. 1.) On each of the spindles *b″* there is a clutch b^3 and a spring,

by means of which the said spindles are periodically and automatically thrown in and out of operation. Geared to the spindles b'' by trains of bevel-gears b^4 (which may be uniform or differential) is an additional number of spindles b^5, which are also controlled by clutches b^3 and springs, so that there are in the present instance a number of spindles driven from the center gear b which corresponds with the number of the sides of the turret-head. These several spindles b'' and b^5 and their respective gears are supported in a suitable number of bearings b^6, projecting from the face of the turret-head and encircling the center gear b, as shown in Fig. 1. The ends of said spindles project into the outer members of the clutches, which have bearings in the sides of the turret-head, and said spindles are provided with pinions b^7 of any desired diameter, according to the work to be performed by the drills. The pinion b^7, as shown in Fig. 6, is geared to a group of drill-spindles c, the individual spindles c being driven at uniform speeds through idlers or transmission-gears c'. In Fig. 6^a the pinion b^7 is shown geared to a group of drill-spindles c by differential transmission-gears c', so that the individual drill-spindles are driven at unequal or differential speeds. If the holes to be drilled in any particular piece of work are of varying diameters and varying distances apart, the drill-spindles c are set in plates c'' accordingly and are geared to the spindles driven from the center gear b by idlers c', according to their positions and the required speed. Each of the clutches b^3 has a shifting-lever d, which is fulcrumed on a bracket d', projecting from the inner sides of the turret-head. A coil-spring d'', inclosed within said clutches, normally maintains such clutches separated until they are brought in an operative relation by the action of a cam or projection d^3, which is fixed to a portion of the frame A in a lower position. This automatic operation of the clutch-levers occurs in the rotation of the turret-head by means of the turret-head-indexing mechanism, hereinafter described. (See Fig. 4.) The drill-spindles c are journaled in plates c'', which are secured to each other by distance-studs c^3, and are rigidly and detachably secured to the sides of the turret-head by bolts c^4 in a proper position for the gears to be driven from the pinions on the spindles b'' and b^5. Suitable openings in the plates c'' are provided, according to the number and positions of the drill-spindles.

It will be understood that the supporting-plates c'' for the drill-spindles c are not fixed and permanent parts of the turret-head, but that for each different job of work a separate set of these supporting-plates are supplied. In other words, as seen in Fig. 1, the turret-head is supplied with two groups of drill-spindles each of which has its own set of supporting-plates c''. The remaining four sides of the turret-head are supplied with sets of supporting-plates c'', which have no drill-spindles therein. In the event that six holes, for example, were required to be drilled in a particular job of work it is obvious that neither of the groups of drill-spindles shown in Fig. 1 could perform such work. It therefore would require an additional group of drill-spindles to be mounted upon the turret-head. If any one of the sets of supporting-plates c'' shown on the turret-head minus drill-spindles had the required number of holes to support six drill-spindles and such holes were in the proper positions, such set of plates might be utilized for that particular job of work; but if none of the said sets of plates had the required number of holes to support said six drill-spindles, or if the holes in said set of plates were not in proper positions, it is obvious that a new set of plates c'' suitable for the new set of drill-spindles would have to be supplied to the turret-head. This would require the removal of one of the sets of plates now shown in Fig. 1.

C is an indexing-plate, which is secured to the hub B′ of the turret-head by means of bolts C′ or otherwise. The hub C″ of this indexing-plate fits loosely on the driving-spindle B″. Projecting from the outer face of said indexing-plate are a series of roll-studs C^3, which correspond to the number of the sides of the turret-head. There are also a series of locking-recesses C^4 in the periphery of said indexing-plate, the number of such recesses also corresponding to the number of the sides of the turret-head. The periphery of the indexing-plate on one side of each of the locking-recesses is somewhat lower than the periphery on the other side of said locking-recesses. The lower points of said periphery are indicated by e. The object and purpose of this variation in the periphery of the indexing-plate is to prevent any overthrow of the turret-head under the momentum imparted thereto by the indexing-lever.

D designates a turret-head-indexing lever. D′ is the head of said lever, which has a pivotal connection D″ with the lever and is adjustable to make proper contact with the roll-studs C^3 by means of a screw D^3, which penetrates the lower projection of said head and stops against the indexing-lever.

e' is a coil-spring which controls the pivotal connection between the indexing-lever and the head thereof. The said head, it will be observed, has a curved side D^4. When the indexing-lever is returned to its normal position, as shown in Fig. 2, under the influence of spring D^5, the said curved surface comes in contact with the adjacent roll-stud C^3 and yields upon its pivot until it passes said stud, after which the spring e' causes it to assume its normal or straight position, as shown in Fig. 2. The lower portion of the turret-head-indexing lever has a pivotal connection

D^6 with the frame, and the extreme lower end has a roll-stud D^7, which rides upon the periphery of a three-pointed cam E and obtains the necessary throw therefrom.

F is the turret-head shot-bolt, which locks said head after each operation of indexing. The upper end of this bolt rides against the periphery of the indexing-plate C, and as the higher points of such periphery (which points lie on one side of each of the locking-recesses C^4) come in contact with the shot-bolt F the plate is stopped and therewith the turret-head. The shot-bolt at such times enters the recess C^4 in line therewith and locks the turret-head in each indexed position. The two parts of the shot-bolt F have an adjustable connection F', by means of which the upper member of said bolt may have a proper entrance into and out of the locking-recesses C^4 in the indexing-plate. As before stated, the purpose of this shot-bolt is to lock the turret-head in each indexed position, which it does by entering said recesses C^4 upon the termination of each movement imparted to the turret-head through the indexing-lever. The coil-spring *f* presses upwardly on the lower end of the shot-bolt and causes said bolt to enter said recesses C^4.

Referring to Fig. 2, it will be observed that the shot-bolt roll-stud F'' is in the lowest part of the cam-slot F^3, (the lowest portions of said slot extending from *x* to *x'*,) during which time the shot-bolt is held out of engagement with the indexing-plate. When said roll-stud moves out of such portion of said cam-slot and onto the higher portion from x^2 to x^3, the shot-bolt is permitted to enter a recess C^4 through the action of the spring *f*, the surface from x^2 to x^3 serving as additional means for maintaining the bolt in a locked position for the desired period. It will be understood that each movement imparted to the turret-head through said indexing-lever D is sufficient to bring one of the sides of the turret-head in the lower position, or in a position for a group of drills to operate on the material or stock on the feed table or platen, as hereinafter more fully described. The shot-bolt F is actuated to withdraw from a recess C^4 during the rotation of wheel F^6 prior to each operation of the indexing-lever D. The said shot-bolt has a slot F^4, which receives a projection A' on the frame, said projection being a guide which directs a proper movement thereof.

The cams F^6 and E may be integral or separate parts rigidly united. They are mounted on a shaft H, which I will hereinafter term the "cam-shaft," which is driven from a worm-shaft P, to be again referred to.

G and G' designate two parts comprising the feed table or platen, which parts have a dovetail connection that permits of the upper part G, or the platen proper, having a suitable longitudinal movement or movements, which I will term the "indexing movements," by which said platen may be indexed at uniform or varying distances with reference to the turret-head, as required by the character of the work to be performed. These indexing movements are obtainable through the following mechanisms:

G'' designates a rack extending approximately the length of the platen G. Adapted to mesh with this rack is a pinion *g*, which is mounted on the part G'.

G^3 is a segmental gear which at predetermined periods is actuated to engage with the pinion *g* to impart the indexing or longitudinal movement to the platen G. The entering tooth *g'* of this segment-gear is of a flexible character in order that the gear may properly engage the pinion. (See Fig. 8.) The said flexible tooth is pivoted at *g''*, and the pitch-line thereof is enabled to normally coincide with the pitch-line of the permanent teeth of said segment-gear by means of a spring g^3, which normally presses said tooth outwardly to the lower limit of the slot g^4 therein, there being a pin g^5 projecting from a side of the gear and passing through the slot g^4 in said flexible tooth, which limits the movement thereof. In advance of this flexible tooth the gear has a cam portion *h*, which engages with the platen shot-bolt *h'* by means of a pin *h''* on said shot-bolt to withdraw said shot-bolt from a locking engagement with the platen in the initial movement of the segment-gear. (See Figs. 1 and 4.) The segment-gear G^3 is mounted on the cam-shaft H and has an arm G^4, which supports a roll-stud g^6. The hub of this gear, from which the arm G^4 extends, has a friction-collar G^5, which surrounds shaft H and enables said gear to be moved by said shaft out of mesh with the pinion *g* after each indexing movement of said gear. A stop G^7, projecting from the frame of the machine, limits the outward movement of said gear, after which the rotation of said shaft does not affect the gear.

The shaft upon which the pinion *g* is mounted is provided with a hand-wheel J, by means of which the platen may be moved independently of the segment-gear G^3, such independent movement of the platen being necessary to place it in position for the pinion *g* to gear with the segment-gear at the commencement of an indexing operation.

The platen G is provided with a series of locking-recesses *i*, arranged therein at irregular or uniform distances and by means of which said platen may be indexed at uniform or varying distances with relation to the turret-head, depending upon the work to be performed. When such platen is indexed or brought to the proper position, it is locked in such position by means of the shot-bolt *h'*. This shot-bolt, which has been heretofore referred to, is mounted in a way on support *k*, which projects from a side of the part G' of the platen, and is seated upon a coil-spring *k'*,

which normally exerts an upward pressure thereon.

k'' is an oblong slot in the support k, through which projects a stud k^3, which is fast on the side of said bolt. This stud k^3 is connected to a hand operating-lever a, which has its fulcrum at a' on the lower platen G'. By means of this hand-lever a the shot-bolt h' may be lowered from any of the locking-recesses i prior to running the platen back by the hand-wheel J. There is also on pivot a' a bell-crank lever a'', one arm of which terminates in a fork which straddles the stud k^3 and the other arm of which has a pivotal connection at a^3 to a link a^4. The other end of said link a^4 is pivoted to an upright bar or link lever a^5 at a^6. The bar a^5 has a pivotal connection at a^7 to the platen G'. The lower end of the bar or link a^5 carries a roll-stud a^8, which moves against a vertical track or surface a^9 when the platen is elevated. (See Figs. 1 and 9.) The track a^9 is a surface of a bracket A'', which is bolted on the side of the frame. The function of this system of levers is to lock the platen shot-bolt h' in the index-recesses i, which is accomplished by the link a^5 being moved outwardly by the contact between the roll-stud a^8 and the track a^9 in each elevation of the platen. This action locks the bell-crank lever a'' on the pin k^3 and maintains such locking engagement. When the platen is lowered, this engagement is relieved and the shot-bolt h' is free to be tripped by the cam h on the segment-gear in the initial movements of such gear. The required movement is imparted to the segment-gear in indexing the platen by means of a plurality of cams j, which are adjustably mounted in ways j'' on the face of the wheel L. The number of these cams may correspond to the number of sides of the turret-head, and the platen may be indexed at uniform or varying distances, according to the positions and the number of such cams used. Each of said cams is secured in position by means of a bolt j''', which penetrates said cams and the oblong opening j^3 in the wheel L. The adjustments of said cams from and toward the axis of the wheel L is obtained by adjusting-screws j^4, which screw into said cams. These cams make proper contact with the roll-stud g^6, and thereby actuate the segment-gear to an extent corresponding to the positions and number of said cams. The wheel L is placed on the shaft H' and contains the cams that actuate the platen-indexing mechanism.

The platen G G' is mounted on a vertically-movable frame K, which is guided in its movement in V-shaped ways in the frame A of the machine. This movable frame has a roll-stud K', which rides upon the periphery of a suitable cam K'' on the cam-shaft H. The shaft H' lies parallel with the cam-shaft H and is driven from said shaft H through gears M M' M'', the shaft H' making one rotation to two rotations of the cam-shaft.

I will next describe the speed combination through which the shafts H and H' are driven at suitable speeds.

N designates the primary driving-shaft, through which power is transmitted to the machine. This shaft is driven from pulley N' and has a clutch N'', which will be again referred to. N^3 N^4 N^5 designate a series of differential spur-gears, which are rigidly secured to said shaft. The first-named gear—to wit, N^3—meshes with a gear O. The next-named gear—to wit, N^4—meshes with a gear O', and the last-named gear, N^5, meshes with a gear O''. The gears O O' O'' are mounted on an intermediate driving-shaft P, which drives the shafts H and H'. The gears O and O' have clutches O^3 and O^4. All the gears run loose on shaft P' and the clutches are splined on said shaft. Gear O'' has an adjacent ratchet-wheel O^5, which is rigidly mounted on shaft P.

O^6 is a ratchet-pawl which is pivoted to the wheel O'' and engages with the ratchet-wheel O^5 at predetermined periods to drive the shaft P at the minimum speed. The shaft P carries a worm P', which gears with a worm-wheel P'' on the cam-shaft H. When the clutch O^3 is in gear, as shown in Fig. 2, the shaft P is driven at its maximum speed. When the clutch O^3 is out of gear and the clutch O^4 is in gear, the shaft P is driven at the intermediate speed through the gears N^4 and O'. When the clutches O^3 and O^4 are both out of gear, the wheels O and O' are running idle, and the spur-gear O'' is alone driven from the spur-gear N^5. At this time the pawl O^6 engages the ratchet-wheel O^5, and thus the slowest or minimum speed is transmitted to the worm-shaft P. When either of the spur-wheels O and O' are driving said shaft P, the ratchet-wheel O^5 runs away from the pawl O^6. These variable speeds are obtained through the following mechanisms:

Q is a timing-wheel keyed to the shaft H'. The periphery of this wheel is provided with cam-surfaces n n' n''. The first named of these forms the outermost periphery of the wheel, the second—to wit, n'—forms the intermediate periphery of said wheel, and the last named—to wit, n''—forms the lowest periphery of said wheel.

Q' is a clutch-lever connected to the movable members of the clutches O^3 O^4 in the usual manner. The lower end of this lever is rigid on a rock-shaft Q''. Also rigidly secured to said rock-shaft is a lever Q^3, which carries a roll-stud Q^4, that rides upon the cams n, n', or n'' on wheel Q at predetermined periods, according to the work. The cams n n' n'' are removable. When the greatest speed is transmitted to the worm-shaft P, the roll-stud Q^4 rides upon the highest periphery n, which throws into gear through the shifting-lever Q' the clutch O^3, as shown in Fig. 2. When such roll-stud Q^4 rides upon the cam-surface

n'', the clutch O^4 is thrown in gear and clutch O^3 out of gear, and the worm-shaft P is then rotated at the intermediate speed. When the roll-stud Q^4 rides upon the cam-surface n', both clutches O^4 and O^3 are out of gear, and the worm-shaft is driven at the minimum speed through gears N^5 and O'' and the ratchets O^5 and O^6.

q is a trip-piece secured to a face of a timing-wheel Q. At a complete rotation of said timing-wheel power is cut off automatically from the shaft N through this trip-piece and the following mechanisms:

q' is a trip-piece on a rock-shaft q''.

R, R', and R'' is a system of levers which are connected to a clutch-lever R^3, which controls the admission of power to the machine. When the clutch N'' is in gear, the horizontal lever R'' is locked in the latch R^4. When the rotation of the timing-wheel Q brings the trip-cam q in contact with the trip-piece q', the rock-shaft q'' is actuated. The lever R'' is thereby elevated and freed from engagement with the latch R^4, and the action of the spring inclosed within clutch N'' separates said clutch, and thus cuts off the power from the power-shaft N, the clutch-lever R^3 moving on its fulcrum R^5, which fulcrum is on a bracket A^3. There is also means for manually cutting off the power when such becomes necessary for any reason. This means is shown in Fig. 1 and consists of a hand-lever R^6, which is rigidly secured to the rock-shaft q''. In this operation of the lever the shaft q'' is actuated to release the lever R'' from the latch R^4. The machine is started by a hand-lever S, which is fast on a rock-shaft S', the said shaft also being connected to the clutch-lever R^3 through link-levers S'', S^3, and S^4, the shaft of the last-named lever being connected to the clutch-lever R^3 by a rock-shaft R^5, which is the fulcrum of said clutch-lever. (See Fig. 3.)

The movements imparted to the turret-head indexing-lever and the turret-head shot-bolt are not varied. In other words, the movements necessary to index the turret-head and lock it are always the same, said movements being such in each case as are necessary to present the sides of the turret-head in the lower plane, or that position which is parallel with the feed table or platen, and to lock said turret-head in such position; but, as hereinbefore stated, the indexing movements imparted to the feed table or platen G, being either of uniform or varying distances, require varying movements or uniform movements to be imparted to the segment-gear G^3. It will therefore be observed that the cams j' on the wheel L may be adjusted and limited in number to obtain through the segment-gear G^3 such movements of said platen. The cams j' being thus placed in their proper positions relative to the roll-stud g^6, power is introduced to the machine through the operating-lever S, the necessary speed being first regulated through the timing-wheel Q and the speed mechanisms coöperating therewith, as hereinbefore described. The required speed being first obtained, it is then transmitted to the worm-shaft P, thence to the cam-shaft H and the parallel shaft H'. The operations of indexing the turret-head and the feed table or platen are simultaneous, or, in other words, both operations are completed before the operation of elevating the platen begins.

It will be observed that owing to the construction of the turret-head and the several distinct groupings of drills I am enabled to run those drills only which are required for the work and to successively bring into operation other groups of drills at such times as they are needed.

The platen may be supplied with a number of different "jobs" or pieces of material which may be successively operated upon by separate groups of drills, drilling holes of uniform or varying diameters and at uniform or irregular distances apart.

I wish to claim, broadly, among other important features of my invention, the idea of means whereby drill-spindles may be assembled in groups and one or more of the different drill-spindles comprising each group driven at uniform speed or speeds or one or more of such drills driven at different speed or speeds. In other words, each specific drill-spindle of any group may be driven at its own required speed regardless of the speed or speeds of the remaining drills of such group or groups.

While I have shown and described a turret-head having a series of distinct sides or faces, I do not wish to limit myself to such identical form of turret-head, for the reason that it may be possible to utilize a round turret-head for the purposes of my invention—that is to say, by means of the supporting-plates c'' it may be possible to mount a plurality of groups of drill-spindles around the circumference of such turret-head. It may be stated, however, that the turret-head herein shown and described is of the much preferred construction.

Having described my invention, I claim—

1. In a multiple drilling-machine, a turret-head having a series of straight sides, a series of spindles mounted in said turret-head, means for driving said spindles, groups of drill-spindles, means for mounting said groups of drill-spindles on the sides of the turret-head, means for driving each group of drill-spindles, an indexing-plate on the turret-head, an indexing-lever coöperating with said turret-head to automatically index the turret-head to present each group of drill-spindles in an operative position.

2. In a multiple drilling-machine, a turret-head having a series of straight sides, a series of radial spindles therein, a center spindle to drive said radial spindles, a plurality of groups

of drill-spindles driven from said radial spindles, means for supporting each group of drill-spindles on the sides of the turret-head, means for throwing each group of drill-spindles in and out of gear with their respective actuating-spindle, an indexing-plate on the turret-head, an indexing-lever adapted to engage with said plate to rotate the turret-head, and means for automatically actuating said indexing-lever.

3. In a multiple drilling-machine, a turret-head having a series of straight sides, a series of radial spindles mounted in said turret-head, groups of drill-spindles driven from said radial spindles, means for mounting said groups of drill-spindles on the sides of the turret-head, means for driving the drill-spindles of each group, means for automatically throwing each group of drill-spindles in and out of gear with their driving-spindles, an indexing-plate on said turret-head, an indexing-lever adapted to actuate said turret-head to impart intermittent rotary movement to said turret-head whereby each group of drill-spindles is brought into an operative position, and means for actuating said indexing-lever.

4. In a multiple drilling-machine, a turret-head having a series of sides or faces, a series of spindles mounted therein, a center spindle from which said spindles are driven, a plurality of groups of drill-spindles geared to said driving-spindles, plates by means of which the groups of drill-spindles are mounted on the sides or faces of the turret-head, means for automatically throwing each group of drill-spindles in and out of gear with their respective driving-spindle, means for automatically indexing the turret-head, and means for locking said turret-head in each indexed position.

5. In a multiple drilling-machine, a turret-head having a series of sides or faces, a series of radial spindles therein, a central spindle for driving said radial spindles, groups of drill-spindles driven from said radial spindles, means for supporting each group of drill-spindles on the sides of the turret-head, means for automatically throwing each group of drill-spindles in and out of gear with their respective actuating-spindle, an indexing-plate on said turret-head, an indexing-lever to actuate the turret-head by engaging with said plate to present each group of drill-spindles in an operative position, a bolt to lock said turret-head in each indexed position, and means for actuating the indexing-lever and said bolt at the proper times.

6. In a multiple drilling-machine, a multi-sided turret adapted to receive groups of drill-spindles, groups of drill-spindles mounted thereon, means for driving said groups of drill-spindles, means for automatically throwing each group of drill-spindles into and out of operative relation with their driving-spindles, a feed table or platen, and means for indexing the turret and platen simultaneously.

7. In a multiple drilling-machine, a multi-sided turret-head, groups of drill-spindles mounted on the sides thereof, means for driving said drill-spindles, means for throwing each group of such drill-spindles into and out of operative position, a feed table or platen, and means for simultaneously indexing said turret-head and platen, the platen at uniform distances.

8. In a multiple drilling-machine, a multi-sided turret-head, groups of drill-spindles mounted thereon, means for driving said drill-spindles, means for throwing each group of such drill-spindles into and out of an operative position, a feed table or platen, and means for simultaneously indexing the turret-head and the platen, the platen at uniform or varying distances.

9. In an automatic multiple drilling-machine, a turret-head having a series of sides or faces, groups of drill-spindles arranged on said sides or faces, means for driving said drill-spindles, means for throwing each group of drill-spindles into and out of operative position, automatic indexing mechanism for the turret-head, a feed table or platen, automatic indexing mechanism for said feed table or platen, means for timing or operating said mechanism to shift said feed table or platen into operative relation with the turret-head upon each indexing operation of the latter, and means for locking the turret-head and the feed table or platen in each indexed position, substantially as specified.

10. In a multiple drilling-machine, a multi-sided turret-head, a plurality of radial spindles mounted therein and driven from a center pinion, groups of drill-spindles mounted on said turret-head, means for throwing in operation each group of drill-spindles when required, an indexing-plate on said turret-head, an indexing-lever to actuate said plate and whereby the turret-head is automatically indexed, means for actuating said indexing-lever, a feed table or platen, means through which said feed table or platen is actuated to index the same at uniform or varying distances, and means for elevating said feed table or platen after each operation of indexing the turret-head and said platen.

11. In a multiple drilling-machine, a multi-sided turret-head, a plurality of groups of drill-spindles mounted thereon, means for driving each group of drill-spindles when required, the several drill-spindles of each group at uniform or varying speeds, a feed table or platen, means for indexing the turret-head to bring each group of drill-spindles in operative relation with said platen, means for indexing the platen simultaneously with the indexing of the turret-head, means for locking the turret-head and said platen after each op-

eration of indexing, a worm-shaft, cams driven therefrom through which the indexing mechanisms of the turret-head and the platen are actuated, and a speed combination by means of which said worm-shaft may be driven at varying speeds.

12. In a multiple drilling-machine, a multisided turret-head, groups of drill-spindles arranged on the sides thereof, means for driving each group of drill-spindles at predetermined times, means for automatically indexing said turret-head, a feed table or platen, means for automatically indexing said platen simultaneously with the indexing of the turret-head and at uniform or varying distances, and means for locking said turret-head and platen in each indexed position.

13. In a multiple drilling-machine, the combination of a multisided turret-head, groups of drill-spindles mounted on the sides thereof, means for driving the spindles of each group at predetermined times, means for indexing the turret-head, a feed table or platen, means for indexing said platen, a plurality of cams through which the indexing mechanisms of the turret-head and the indexing mechanism of the platen are actuated, means for elevating the platen after each operation of indexing, a timing-wheel, and mechanism interposed between said timing-wheel and the main power-shaft through which the power is cut off after each complete operation of the machine.

14. In a multiple drilling-machine, the combination of a multisided turret-head, a plurality of radial spindles mounted therein and driven from a center pinion, groups of drill-spindles mounted on the sides of the turret-head, clutches and springs controlling the connections between the drill-spindles and their driving-spindles, an indexing-plate on the turret-head, an indexing-lever, a pivotal head on such lever which engages said indexing-plate to rotate the turret-head, a cam for actuating said indexing-lever, a shot-bolt to lock the turret-head in each indexed position, a double cam to actuate said shot-bolt after each operation of the indexing-lever, and means for imparting varying speeds to the shaft upon which said cams are mounted.

15. In a multiple drilling-machine, the combination of a multisided turret-head, a plurality of radial spindles therein driven from a center pinion, groups of drill-spindles, clutches and springs controlling the connections of each group of drill-spindles with its respective driving-spindle, an indexing-plate on the turret-head, an indexing-lever having a pivotal head which actuates the indexing-plate in each indexed position, a shot-bolt to lock the indexing-plate, cams to actuate the indexing-lever and the shot-bolt at the proper times and to the proper extent, a worm-gear, a timing-wheel having removable cam-pieces and means interposed between said cam-pieces and said worm-gear, whereby the speed imparted to the worm-shaft may be regulated to any of the speeds required and at any fraction of a revolution desired.

16. In a multiple drilling-machine, the combination of a multisided turret-head, groups of drill-spindles arranged on the sides thereof, means for driving the drills of each group of drill-spindles as desired, indexing mechanism for said turret-head, cams for operating said indexing mechanism, a worm-shaft from which the cam-shaft is driven, a timing-wheel with suitable cam or cams thereon, means interposed between said cams and said worm-shaft through which the speed of the cam-shaft is regulated, and stop-levers actuated upon the completion of a movement of the timing-wheel and through which the machine is automatically stopped after each operation and means for actuating said stop-levers.

17. In a multiple drilling-machine, the combination of a multisided turret-head, groups of drill-spindles mounted thereon, mechanism for indexing the turret-head, means for actuating each group of drill-spindles after each operation of indexing the turret-head, a feed table or platen, mechanism for indexing said feed table or platen, cams through which the indexing mechanisms of the turret-head and platen are actuated, a worm-shaft through which the cam-shaft is driven, a speed combination through which varying speeds may be transmitted to the cam-shaft through said worm-shaft, a timing-wheel, mechanisms interposed between the speed combination and said timing-wheel and through which the speeds transmitted to the worm-shaft may be varied as desired, mechanism interposed between the main shaft and said timing-wheel through which the power is cut off from the machine at each complete operation thereof.

18. In a multiple drilling-machine, the combination of a multisided turret-head, groups of drill-spindles mounted on the sides thereof, mechanism for indexing the turret-head, means for actuating each group of drill-spindles after each operation of indexing the turret-head, a feed table or platen, mechanism for indexing said feed table or platen, cams through which the indexing mechanisms of the turret-head and the platen are actuated, a worm-shaft through which the cam-shaft is driven, a speed combination through which varying speeds may be transmitted to the cam-shaft, a timing-wheel, mechanism interposed between the speed combination and said timing-wheel through which the speeds transmitted to the worm-shaft may be varied as desired, mechanism interposed between the main power-shaft and said timing-wheel through which power is cut off from the machine at each complete operation thereof, and means for manually cutting off the power from the machine.

19. In a multiple drilling-machine, a feed-

table or platen, means for indexing said platen, means for locking such platen after each operation of indexing the same, and automatic means for elevating said feed-table.

20. In a multiple drilling-machine, a feed table or platen, mechanism for automatically indexing said feed table or platen at uniform or varying distances, means for locking said feed table or platen in each indexed position, and automatic means for elevating said feed-table after each indexing operation.

21. In a multiple drilling-machine, a feed table or platen, gearing adapted to impart indexing movements to said platen, means adapted to lock said platen in each indexed position, and means for elevating said platen after each indexing operation.

22. In a multiple drilling-machine, a feed table or platen, gearing adapted to impart indexing movements to said platen, a series of adjustable cams through which uniform or varying movements may be imparted to said gearing, a shot-bolt for locking said platen in each indexed position, and means for elevating said platen after each operation of indexing.

23. In a multiple drilling-machine, a platen, gearing for imparting indexing movements to said platen, a series of adjustable cams through which uniform or varying movements may be imparted to said gearing, a shot-bolt for locking said platen in each indexed position, and a system of levers through which said shot-bolt is maintained in an interlocked position with the platen during an operation.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK J. NUTTING.

Witnesses:
R. J. McCarty,
John J. Schaeffer.