No. 726,137. PATENTED APR. 21, 1903.

J. W. BROWN, JR.

AUTOMATIC DRILLING MACHINE.

APPLICATION FILED AUG. 3, 1899.

NO MODEL. 4 SHEETS—SHEET 1.

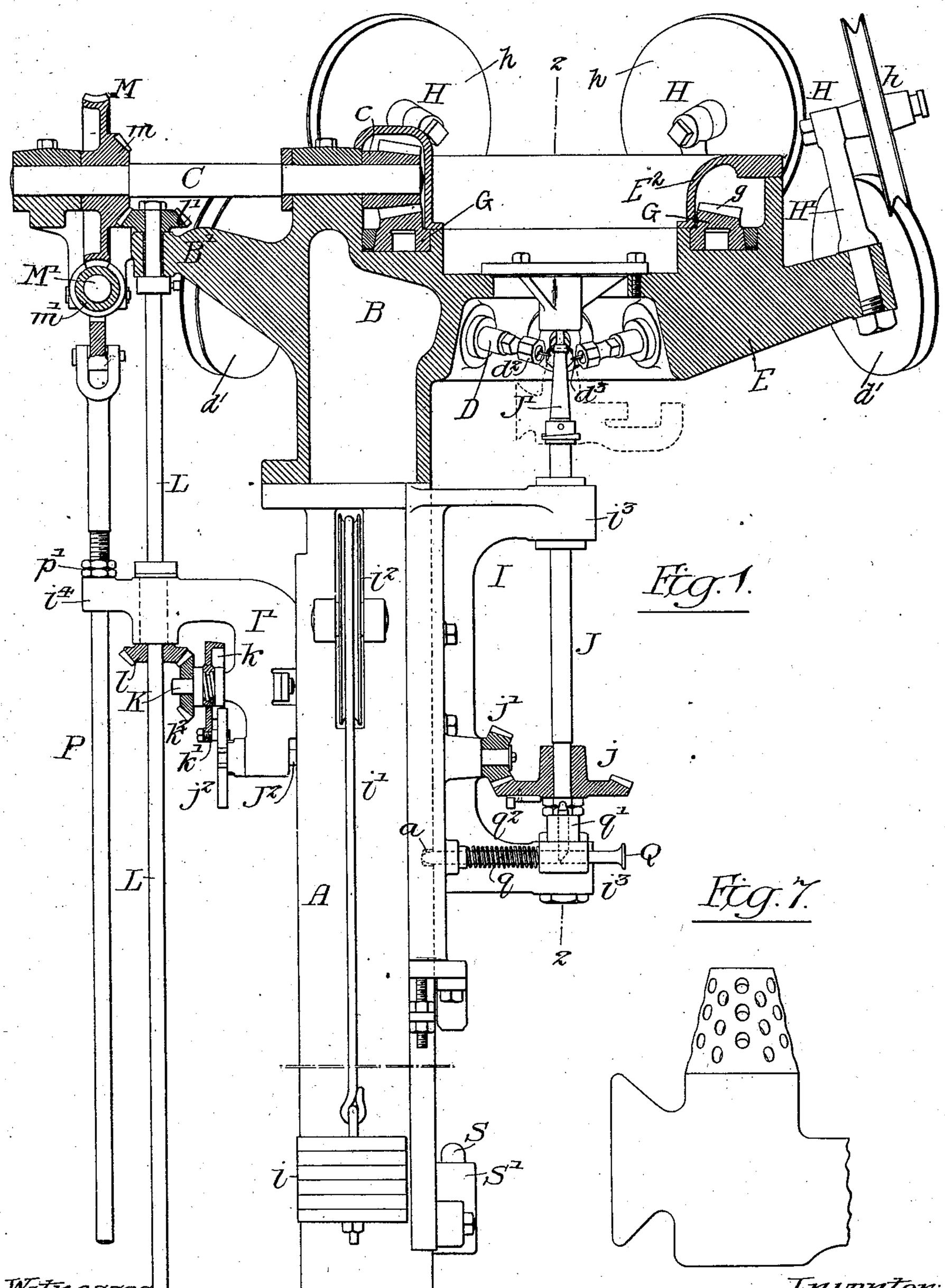

Fig. 1.

Fig. 7.

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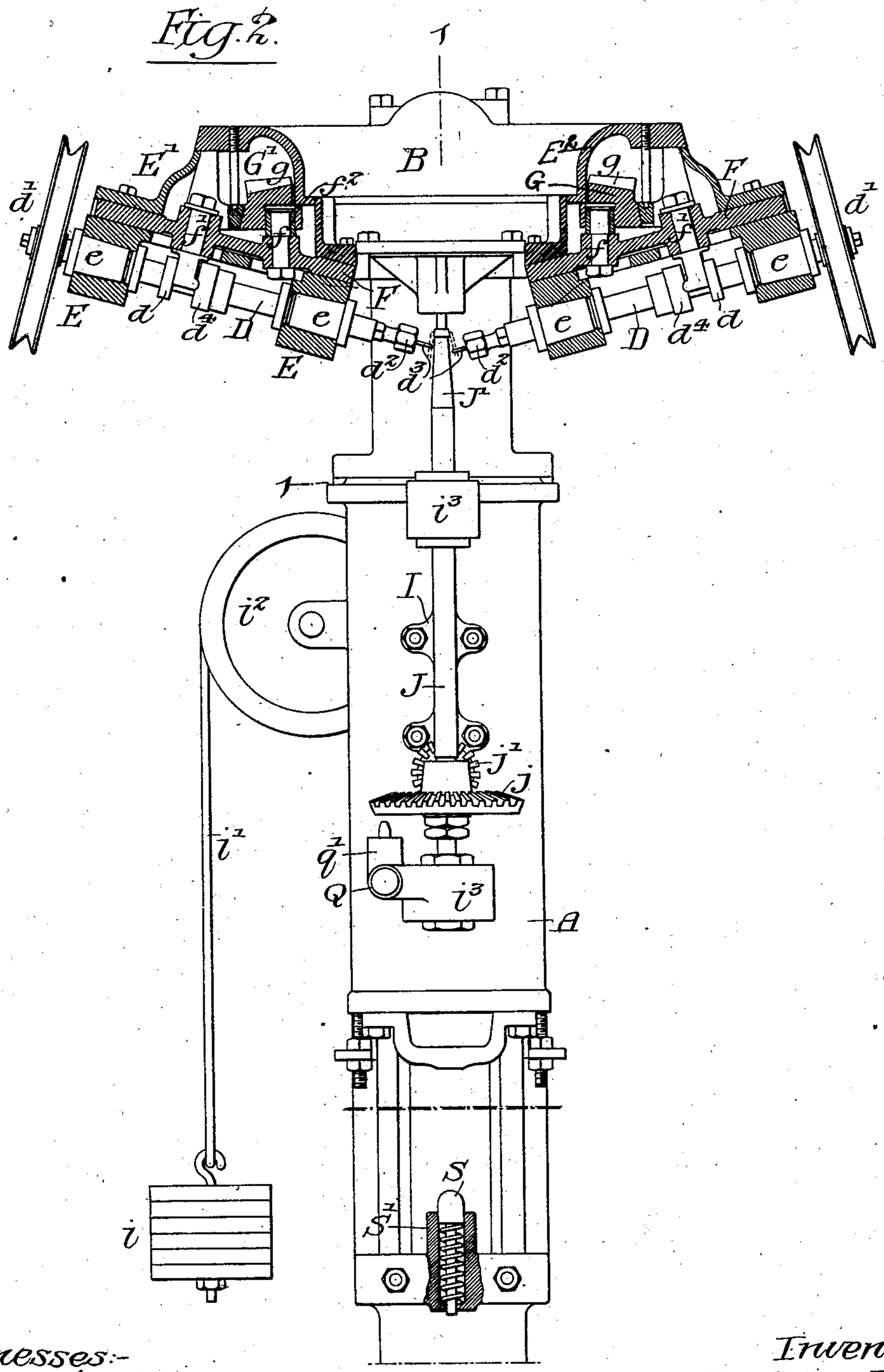
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



Witnesses:-
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Fig. 5.

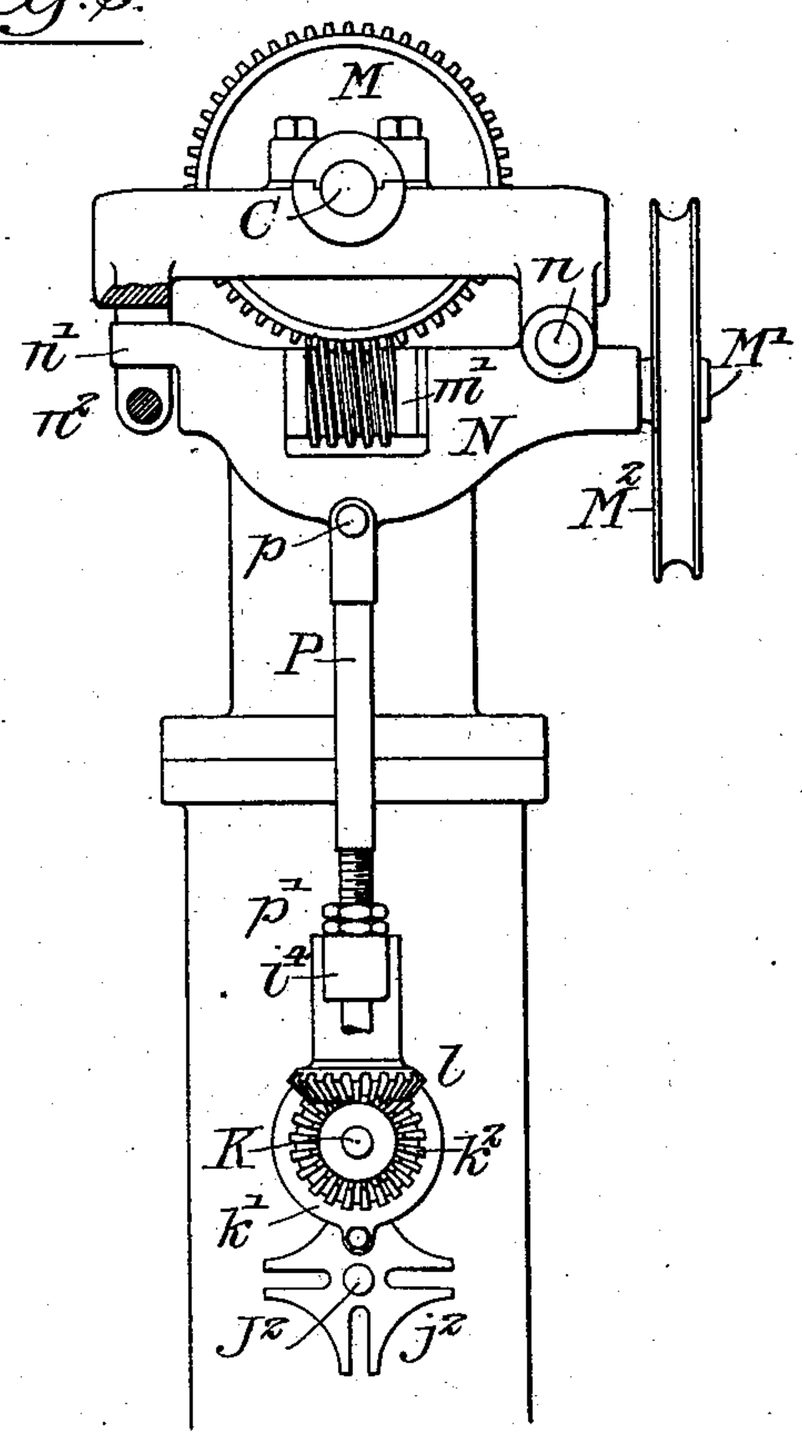
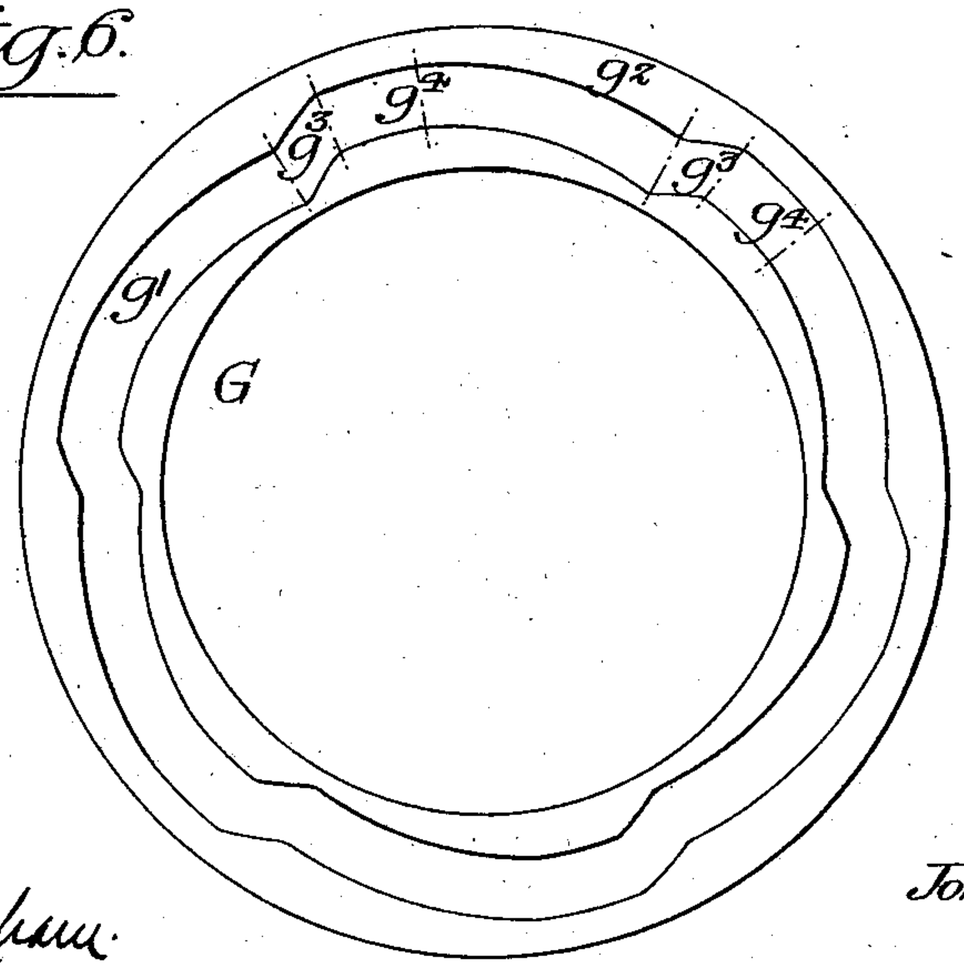


Fig. 6.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 4.

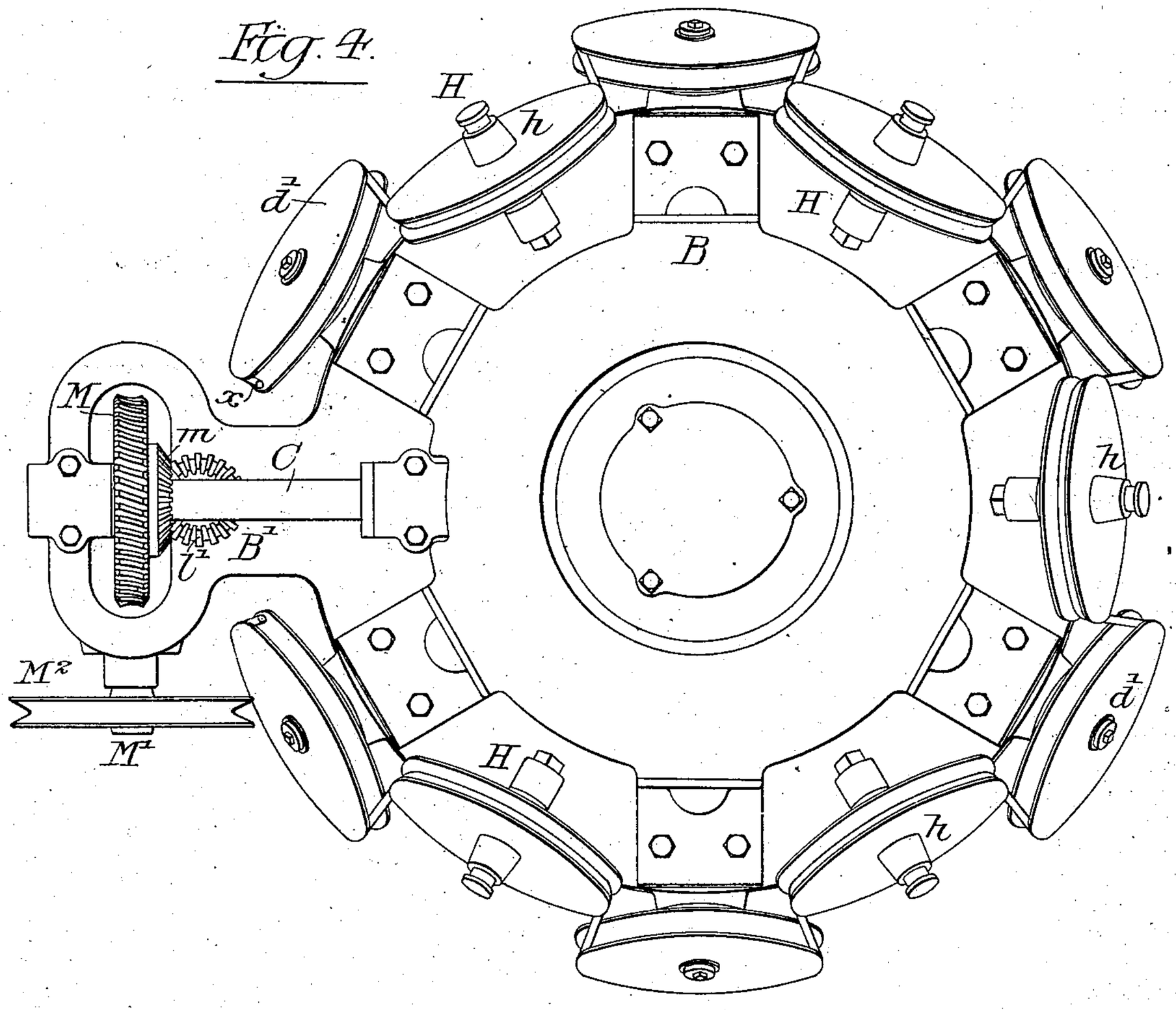
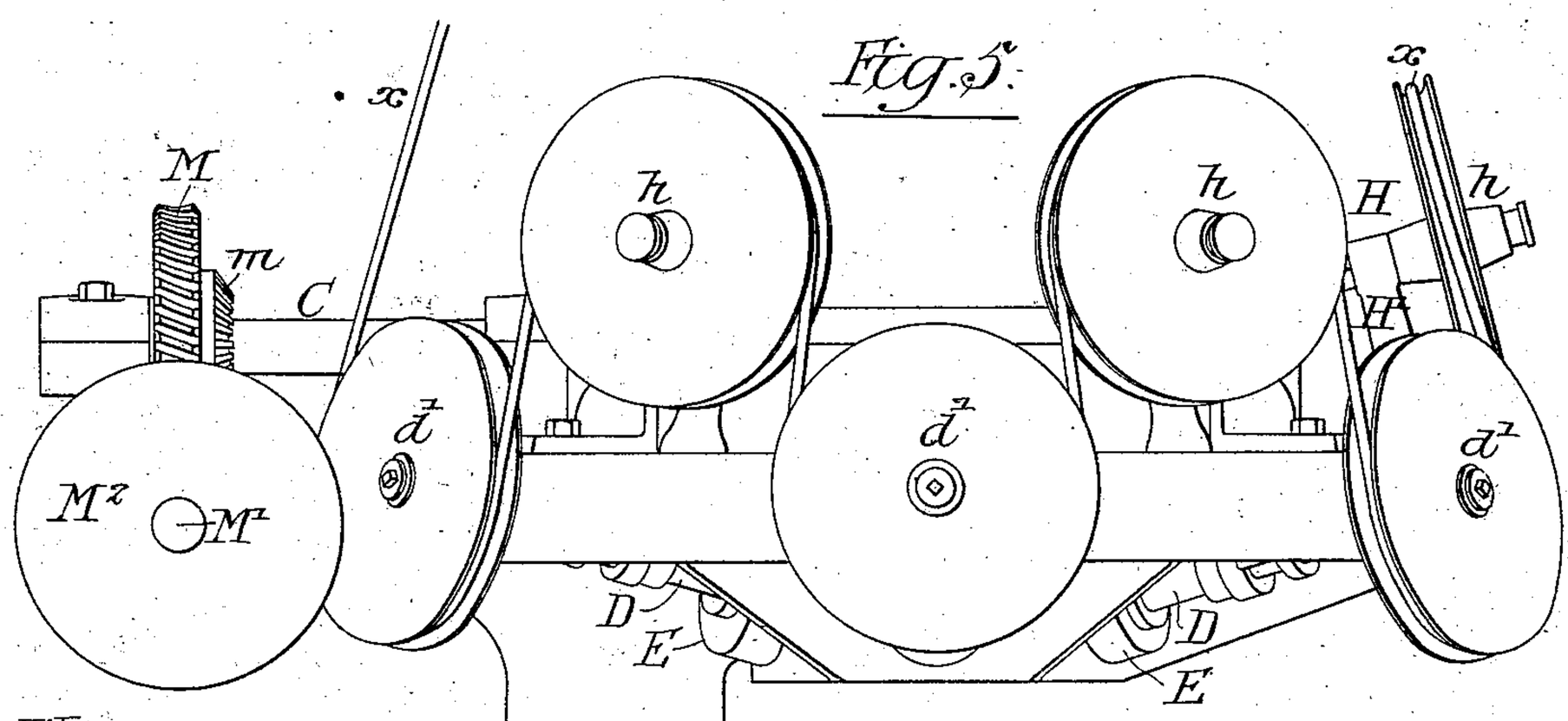


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN WILSON BROWN, JR., OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 726,137, dated April 21, 1903.

Application filed August 3, 1899. Serial No. 725,986. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILSON BROWN, Jr., a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Automatic Drilling-Machines, of which the following is a specification.

The object of my invention is to so construct an automatic multiple drilling-machine as to quickly and accurately effect the drilling of a number of holes in an object, the holes being drilled in successive groups, each group of holes being drilled simultaneously and the series of groups being completed at one operation of the machine, as fully described hereinafter.

In the accompanying drawings, Figure 1 is a sectional elevation of my improved automatic drilling-machine, the section being taken on the line 1 1, Fig. 2. Fig. 2 is a section on the line 2 2, Fig. 1. Fig. 3 is a rear view with a portion broken away. Fig. 4 is a plan view. Fig. 5 is a side view of the head. Fig. 6 is an inverted plan view of the cam-ring for feeding the drills to and from the work. Fig. 7 is an outline view of sufficient of one of the articles drilled on the machine, showing the arrangement of the holes after being drilled by my improved automatic machine.

My invention is intended mainly for drilling a number of holes accurately in a conical or cylindrical body, such as that shown in Fig. 7, which illustrates the perforated end of a food-cutter casing, and in this class of work it is essential that the work should be accurately, quickly, and cheaply drilled. With this object in view I designed the herein-described automatic multiple drilling-machine in which the piece to be drilled, such as that shown in Fig. 7, is placed on a carrier and moved into position and the drills set in motion, and as they move forward they will drill a given number of holes, and while the drills are out of contact with the article the said article will be turned so as to be in position to have another set of holes drilled, and so on until the desired number of holes are drilled. As soon as all the holes are drilled the carrier will be withdrawn and the machine will stop, so as to allow the operator to replace the drilled article with another.

It will be understood that while my invention is especially designed for drilling special casings, as shown in Fig. 7, with a slight alteration and readjustment of the parts other articles than that shown in Fig. 7 may be drilled without departing from my invention.

A is a standard, on which is mounted the carrying-head B for the drills. In the present instance there are six drill-spindles, so that there will be six holes drilled simultaneously. These drill-spindles D are mounted in suitable bearings *e* on the frame E, forming part of the head B. Each of the spindles has a grooved belt-wheel d' at one end and a chuck d^2 at the opposite end for a drill d^3. The drill-spindles are arranged in the present instance at an angle, so that they will drill a hole at right angles to the line of the taper of the casing to be drilled and are so set that the holes will be drilled on a spiral line, Fig. 7 illustrating an article which has been drilled by a machine constructed according to my invention, the drills in this case, however, having been so placed as to make a spiral line of holes extending but part way around said article.

Adapted to slide in ways between the caps E′ and E^2 of the head B are slide-plates F, having bifurcated projections f', which span the drill-spindle D between the collars d d, so that any motion toward and from the center of the slide will be imparted to the drill-spindle. Mounted in the head is a cam-ring G, (clearly shown in Fig. 6,) and on the under side of this cam-ring is a cam-groove, and on the upper surface of this cam-ring are gear-teeth *g*, with which mesh the teeth of a pinion *c* on the shaft C.

On each slide F is a pin *f*, having in the present instance a friction-roll f^2. This pin projects into the cam-groove g' on the under side of the cam-ring G, and there are six steps to to this cam, as shown in Fig. 6, and as there are six pins and six slideways coupled to the six drill-spindles at each revolution of this cam-ring the six spindles will be moved to and from the work six times. The steps of the cam correspond to the number of spindles, so that the drills will move toward and from the work simultaneously.

The six steps of the cam-groove are divided each into three sections—viz., a long eccen-

tric portion g^2, which causes the drill to feed forward while drilling, a quick return g^3, and a concentric portion g^4, which allows the drill to dwell while the work is being shifted to another position.

The drill-spindles are driven by a belt x passing around the belt-wheels d' of the drill-spindles and around idlers h on studs H, carried by brackets H', secured to the head B, as clearly shown in Figs. 4 and 5, so that all the drills are rotated in the same direction and at the same speed from a common belt.

I is a bracket adapted to slide on the standard A. The bracket is counterbalanced by a weight i, attached to a cord i', which passes around a pulley i^2, adapted to bearings on the standard A. The cord is attached to a lug or other projection of the bracket. Adapted to bearings i^3 on the bracket is a shaft J, having at its upper end a mandrel J' of a suitable shape to receive the article to be drilled. Mounted on the lower portion of this shaft is a bevel gear-wheel j, meshing with a pinion j' on the shaft J^2, having at its inner end a slotted wheel j^2 of a "Geneva lock-gear."

On a stud K of an extension I' of the bracket I is a disk k, having a pin k', which engages with the slotted wheel j^2 and forms the other member of the Geneva lock-gear. Coupled to the disk k is a bevel-wheel k^2, meshing with a bevel-wheel l, splined on a shaft L, so that while it will turn with the shaft it can at the same time slide vertically thereon. This wheel l is adapted to bearings in an extension I' of the bracket. The upper end of the shaft L is adapted to a bearing B' on the head B and has at its upper end a bevel-pinion l', meshing with the bevel-wheel m, forming part of the worm-wheel M on the shaft C. The worm-wheel M meshes with a worm m' on a driven shaft M', having a driving-pulley M^2, so that as the shaft M' is turned motion will be imparted to the shafts C and L. The shaft M' is adapted to bearings in a frame N, pivoted at n to the fixed part of the machine. A lug n' has sufficient play between the fixed portion of the frame and the pin n^2, so that when the frame N is dropped down the worm m' is clear of the worm-wheel, but when the frame is forced up the worm is thrown into gear with the worm-wheel.

P is a rod pivoted at p to the frame N. This rod extends through the rear portion I' of the bracket, through a bearing i^4 on the extension I' of the bracket, and on the rod are nuts p', which can be adjusted thereon so that the bracket when it is elevated will carry with it the vertical rod P and the bracket N, so as to throw it into gear when the operator elevates the bracket I to place the work in position for drilling. As soon as the mechanism, which I will describe further on, trips the bracket it falls, and the worm is immediately thrown out of gear.

One object is to so arrange the mechanism that when the drilling operation on one piece is completed the machine will be automatically thrown out of gear, and the operator can then remove the piece and place another blank in position and raise the bracket, so that the operation of drilling will be repeated on the new blank.

In order to hold the bracket I up in position, I provide a bolt Q, having a spring q, which tends to force the bolt into a notch a in the face of the standard A. In order to move this bolt out of engagement with the standard A, I provide a second bolt q', having a beveled portion engaging the beveled portion of the bolt Q, and this bolt q' is actuated by a lug q^2 on a bevel-wheel j, so that at each revolution of this bevel-wheel the bolt q' is forced down and its beveled end will draw back the bolt Q and release the bracket, so that it will fall a certain distance, being stopped by a spring-cushion s, adapted to a casing s', secured to the standard A.

The operation of the machine is as follows: The article to be drilled in the present instance, as shown in Fig. 7, is mounted on the mandrel J' when the bracket I is in the position of rest. The operator then raises the bracket either by a treadle or by hand, the bolt Q, engaging with the opening in the standard, retaining the bracket in the elevated position, and the article is then in position to be drilled. On raising the bracket the extension I' lifts the frame N and throws the worm m' into gear with the worm-wheel M. Thus the drills are set in motion, and as the cam revolves the drills are fed forward, drilling the holes, six in the present instance, on a spiral line in the article carried by the mandrel. The slow forward feed of the drills is accomplished by the sections g^2 of the cams. After the drills are moved forward they are quickly returned by the sections g^3 of the cam G, and during the travel of the concentric sections g^4 of the cam the mandrel carrying the article to be drilled is turned a given distance and locked, so that when the drills move forward again another group of holes will be drilled. This operation is continued until the entire number of holes are drilled, when the lug q^2 on the bevel-wheel j of the mandrel-shaft J will draw back the bolt Q and the bracket I will fall clear of the drills, and as the bracket falls the frame N will drop a limited distance, throwing the worm m' out of gear with the worm-wheel M and will thus stop the feed and the rotation of the feed-spindles. The finished article is then removed and another placed in its stead and the above operation is repeated.

I claim as my invention—

1. The combination in an automatic multiple drilling-machine, of a standard, a head on the standard, a series of drill-spindles mounted on the head, mechanism for rotating and feeding the drill-spindles, a sliding bracket, a shaft mounted in said bracket and

adapted to carry the piece to be drilled, and means for intermittently rotating said shaft, substantially as described.

2. The combination in an automatic multiple drilling-machine, of a standard, a head on the standard, a series of drill-spindles mounted on the head, mechanism for rotating and feeding the drill-spindles, a sliding bracket, a shaft mounted on said bracket and adapted to carry the piece to be drilled, means for intermittently rotating said shaft, a lock for holding the bracket in its raised position, and automatic means for tripping the lock to allow the bracket to fall after the piece has been drilled, substantially as described.

3. The combination in an automatic drilling-machine, of a standard and overhanging head, a carrier for an article to be drilled, drill-spindles carried by bearings in said head, collars on the spindles, a cam-ring, a gear on the face of said ring, the other face of the ring being in a horizontal plane and having a slot, means for driving the ring, slides operating in bearings in the overhanging head, pins projecting from said slides at an angle thereto constructed to engage the slot in the cam-ring, and projections on the slides engaging the collars on the spindles, substantially as described.

4. The combination in an automatic drilling-machine, of a standard, an overhanging head mounted on said standard, a series of drill-spindles carried by said head, a bracket, a vertical shaft mounted in bearings in said bracket, means for driving said shaft, a bolt holding the bracket in its raised position, and automatic means for drawing the bolt to allow the bracket to fall so that the piece being drilled will fall clear of the drill, substantially as described.

5. The combination in an automatic drilling-machine, of a standard, a head, a series of drill-spindles mounted in bearings in the body of said head, having drills placed so that their operative ends lie in different horizontal planes, whereby they are adapted to drill successive and parallel series of holes in the object to be operated upon, a carrier for said object and means for intermittently rotating said carrier, substantially as described.

6. The combination of the standard, the head B mounted on said standard, a series of drill-spindles carried by said head, means for driving the said spindles in unison, a cam-ring G controlling the movement of the spindles toward and from a common center, a shaft C geared to the cam-ring, a driving-shaft M′, a worm on the driving-shaft gearing with the worm-wheel on the shaft C, a movable bracket carrying the piece to be drilled, a pivoted bearing N for the driving-shaft M′ controlled by the bracket I, so that when the bracket is raised, the worm on the driving-shaft will be thrown into gear with the worm-wheel, and when the bracket is lowered, the worm will be thrown out of gear thus stopping the movement of the drills toward and from a common center, and the rotation of the carrier-shaft, substantially as described.

7. The combination in an automatic drilling-machine, of a standard A, the head B, drill-spindles mounted in said head, means for driving the drill-spindles simultaneously, a cam-ring, a shaft C gearing with said cam-ring, the cam-ring controlling the movement of the drills toward and from an axis of the machine, a driven shaft M′ geared to the shaft C, a vertical shaft L geared to the shaft C, a movable bracket I, a carrier-shaft J on which the piece to be drilled is mounted, a shaft J^2, a bevel-wheel on the shaft J meshing with the bevel-pinion on the shaft J^2, a Geneva lock-gear through which the rotary movement of the shaft L is imparted to the shaft J^2, a bolt locking the bracket in its raised position, and a lug on the bevel-wheel of the shaft J adapted to draw the bolt and allow the bracket to fall, substantially as described.

8. The combination in a drilling-machine, of a series of radially-arranged drill-spindles, said spindles being placed to simultaneously bore a series of holes lying in an inclined line in an object operated upon, a carrier at the axis of the machine, means for rotating the same and mechanism for moving the drills toward and from said axis whereby successive inclined parallel lines of holes are formed, substantially as described.

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

JOHN WILSON BROWN, Jr.

Witnesses:

WILL. A. BARR,

JOS. H. KLEIN.