No. 739,501. PATENTED SEPT. 22, 1903.

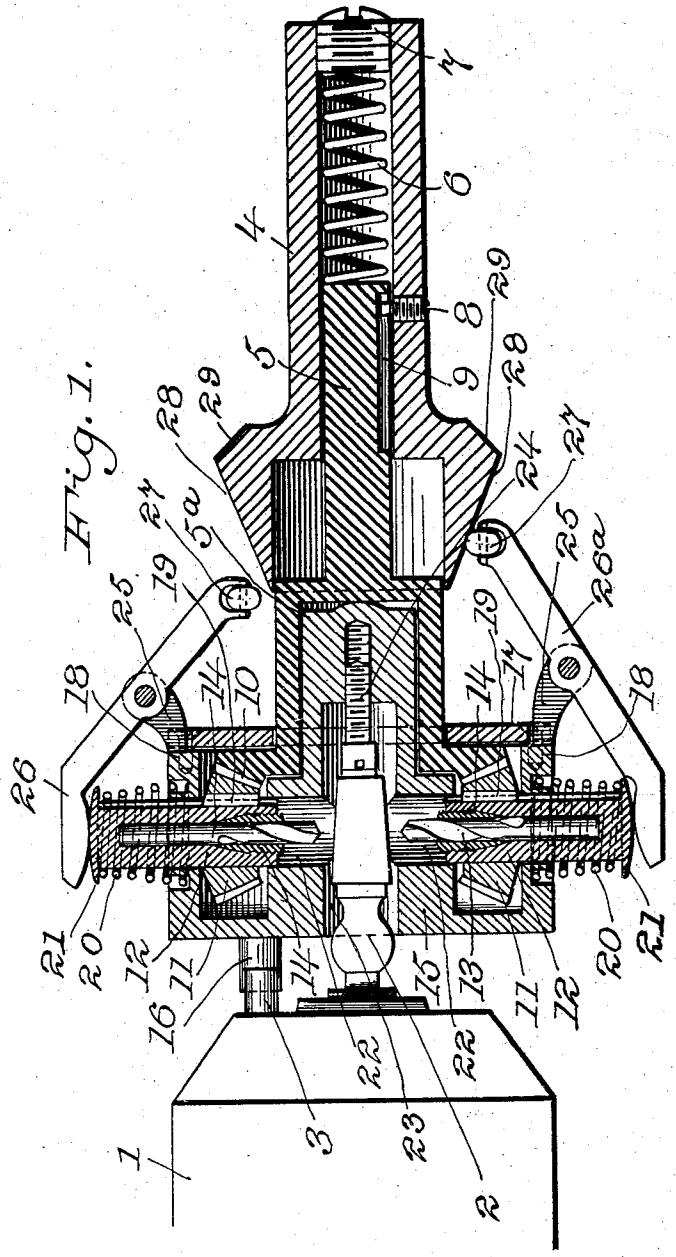
J. MEYERS.

DRILL.

APPLICATION FILED NOV. 18, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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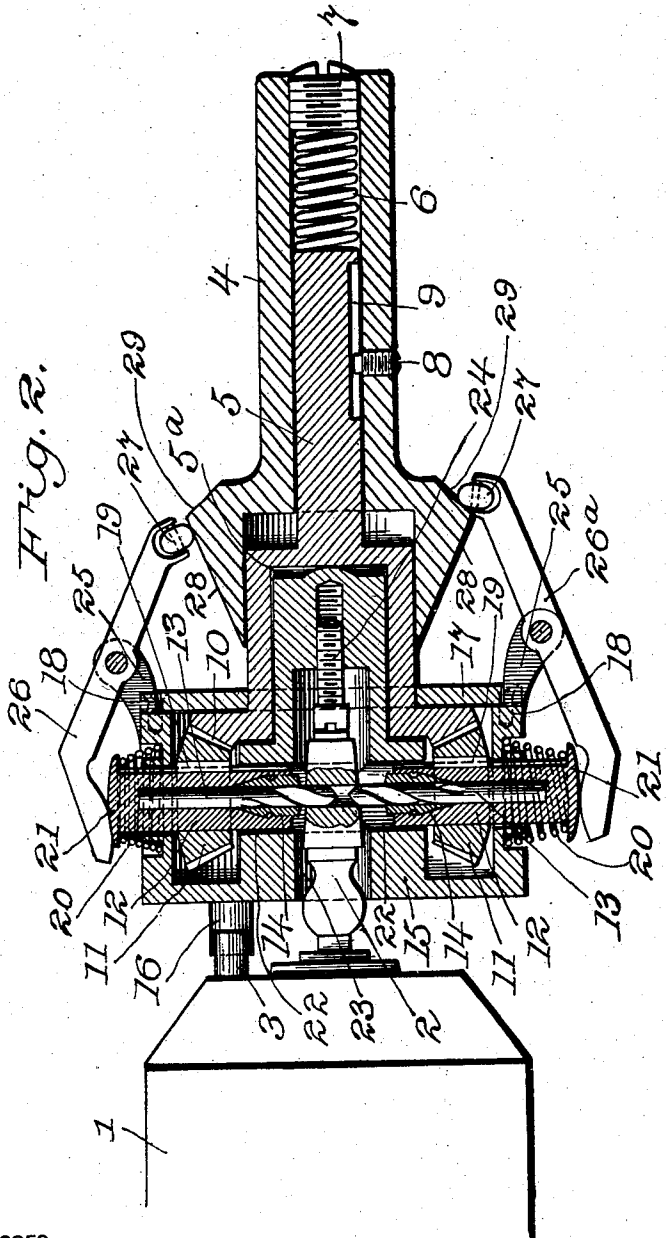
NO MODEL. 2 SHEETS—SHEET 2

Fig. 2.



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No. 739,501. Patented September 22, 1903.

UNITED STATES PATENT OFFICE.

JACOB MEYERS, OF PHILADELPHIA, PENNSYLVANIA.

DRILL.

SPECIFICATION forming part of Letters Patent No. 739,501, dated September 22, 1903.

Application filed November 18, 1902. Serial No. 131,829. (No model.)

To all whom it may concern:

Be it known that I, JACOB MEYERS, a citizen of the United States of America, and a resident of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Drills, of which the following is a specification.

My invention relates generally to drilling apparatus, and more specifically consists of an improved tool for cross-drilling small articles which have been chucked in what is commonly known as a "turret-head lathe."

As is well known, the turret-head lathe consists of a rotating chuck or live-spindle and a tool-carriage in the shape of a revoluble turret capable of being fed toward and from the live-spindle and having means for carrying a series of tools projecting from said turret-head and capable of being brought into operation upon the blank carried by the live-spindle one after the other as the turret-head is advanced, withdrawn, partially rotated, and advanced again. The specific form of my invention, illustrated in the accompanying drawings, consists of a small tool designed to be mounted in one of the holders of such turret-head and capable of automatically cross-drilling the blank carried by the live-spindle whenever the tool is brought into line therewith and the turret-head fed forward so as to bring the drills into the proper position with reference to the blank. In my construction continued forward pressure of the turret-head after the drills have come into action feeds them up to their work, and the withdrawal of the turret-head automatically disengages the drills from the work.

The preferred form of apparatus embodying my invention as above outlined is shown in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the tool, showing a portion of the live-spindle of the lathe and the blank being operated upon in side elevation, the parts being in the position assumed just before the drills are fed forward to their work. Fig. 2 is a similar view showing the parts in the position after the drills have done their work and just before they are permanently withdrawn.

Throughout the drawings like reference-figures indicate like parts.

1 represents the lathe-chuck or live-spindle, and 2 is the blank carried thereby, which in this case represents the plug of a small valve.

3 is a projection from the lathe-chuck, designed to engage a projection 16 on the rotating drill-carrying frame, and thereby cause the same to rotate in unison with said lathe-chuck or spindle.

4 is the shank of the tool, which is to be grasped in any convenient clamping apparatus usually attached to the turret-head, (not shown,) and 5 is a portion of the holder which telescopes into the portion 4. These two parts form a telescoping holder for the drill-carrying frame, and the two telescoping parts are normally held in their outermost position of adjustment by means of the spring 6, confined between the end of the part 5 and the plug 7, screwed into the end of the part 4. The two telescoping parts are prevented from rotating one with reference to the other by means of the set-screw 8 taking into the slot 9, formed in the part 5, or by any other equivalent means.

The outer end of the part 5 is preferably enlarged and bored out centrally, as indicated at 5^a, and has a flaring rim on which are cut the teeth of a bevel-gear 10, and meshing with this bevel-gear are the beveled pinions 11 11, which are mounted on the drill-holders 12 12, in which the drills 13 13 are held by means of the split coned and screw-threaded chucks 14 14, as shown. These drill-carriers are journaled in the drill-carrying frame 15, which is journaled on the part 5^a of the holder, being held in place by means of the ring 17, which is held to the casing 15 by means of screws 18 18 or equivalent means. The drill-holders 12 12 are compelled to rotate with the beveled pinions 11 11, but are permitted to slide lengthwise therethrough by means of the key-and-slot connections 19 19 or equivalent means.

Springs 20 20, seated in the drill-carrying frame and having their outer ends bearing against the heads 21 21 of the drill-carriers 12 12, serve to normally withdraw the drills, so that their ends do not project out of the ra-

dial passage-ways 22 22 into axial chamber 2, formed in the casting 15. A set-screw 24, located in the closed end of the axial chamber 23, serves as an adjustable stop for the work-piece or blank 2.

The casting 15 or drill-carrying frame of which it is a part has projecting arms 25 25 or other pivotal bearings in which are mounted levers 26 and 26ª, the left-hand ends of which engage the outer ends of the drill-carriers, while their right-hand ends are provided with rollers 27 27, adapted to engage the faces of the feed-cone formed on the end of the shank 4. This feed-cone is a double cone having the oppositely-disposed faces 28 and 29. As before stated, 16 is a projection from the casting 15, which coöperates with the projection 3 on the live-spindle of the lathe.

The casting 15 and the ring 17 I will call the "drill-carrying frame," and the parts 4 and 5, with their extensions and connections, I will call the "holder" for said frame on or to which it is journaled.

The mode of operation of my invention is as follows: The drills being chucked in their holders and properly adjusted and the parts being in the position shown in Fig. 1, we will suppose the shank 4 of the holder to be fed forward until the end of the blank 2 strikes the adjustable stop 24. At or before that time the projections 3 and 16 will have engaged one another and the drill-carrying frame will be rotating with the live-spindle 1. The holder and beveled gear 10, formed thereon, being prevented from rotating, the beveled pinions 11 11 will roll around the circumference of the beveled gear and give the drills a rapid rotation around their respective axes. As the drills and the drill-carrying frame are rotating at the same speed as the blank 2, it is evident that if the drills are fed inward in the direction of the line of their axes they will drill into the blank 2. This feeding action results from further feeding to the left of the shank 4 of the holder, which compresses the spring 6 and brings the face 28 of the feed-cone into engagement with the rollers 27 on the levers 26 and 26ª, forcing the right-hand ends of said levers outward and the left-hand ends inward, the latter pushing before them the rotating drill-holders. Continued pushing forward of the shank 4 will obviously hold the drills up to their work until the rollers 27 have passed over the base of the cone-face 28 and onto the oppositely-inclined cone-face 29, when the drills will be withdrawn. As shown, the lever 26ª is made longer than its companion 26, so that the drill controlled by the lever 26ª will be fed up to its work in advance of the other drill. In the same way the outer end of this lever will pass over onto the other cone-face 29 in advance of the lever 26 and its drill will be withdrawn in advance of the other. By properly adjusting the drills so that they will never quite meet it is evident that the one controlled by the longer lever will pass just beyond the center of the blank 2 and then be withdrawn, leaving the other drill to follow it up and cut out the uneven or rough portion left by the first drill. The position of the parts just after this has been done is shown in Fig. 2.

After the work is completed a withdrawal of the shank 4 by drawing back the turret-head will allow the spring 6 to expand, thereby forcing the telescoping parts 4 and 5 back into the position shown in Fig. 1 and permitting the springs 20 20 to withdraw the drills from engagement with the blank. Further withdrawal of the turret-head will result in carrying the tool bodily away from the blank 2, so that the same may be further treated by other tools or cut off, as may be desired.

The advantages of my invention comprise its accurate and automatic action, convenience and rapidity of use, and freedom from interference between a number of drills acting simultaneously. The great saving in time and increase of accuracy over the old processes of separately chucking and boring in a drill-press is evident.

It is clear that various changes could be made in the details of construction illustrated without departing from the spirit and scope of my invention. The number of drills and the angle of their inclination to the common axis of the chuck and tool-holder might be varied. The arrangement shown, in which the blank and the drill-carrying frame revolve while the holder does not revolve, might be reversed. The construction of the holder might be varied, other means for feeding the drills might be substituted, and many other changes in the form of the parts made without changing the essential principle of operation. It is evident also, of course, that while I have shown in the drawings and hereinafter mentioned in the claims drills as the particular form of tools to be operated by my invention other rotary cutting-tools might be substituted for said drills with the same advantages in the operation thereof. Such and other similar modifications I should consider still within the boundaries of my invention.

Having, therefore, described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of a rotatable drill-carrying frame, a non-rotatable holder on which the frame is journaled, a rotatable work-carrying chuck, means for locking the drill-carrying frame to the chuck, a drill mounted in said frame arranged at an angle to the common axis of the first three mentioned elements, means whereby the motion of the drill-carrying frame relative to the holder causes the rotation of said drill about its axis, and means for causing a feeding action of said drill along the line of its axis in the drill-carrying frame.

2. The combination of a rotating work-carrying chuck, a drill-carrying frame, a suitable holder on which said frame is journaled, the axis of the journal being in line with the axis

of rotation of the chuck, means for temporarily locking the drill-carrying frame to the chuck, a plurality of drills mounted in the frame arranged at an angle to the axis of its journal, means whereby the motion of the drill-carrying frame relative to the holder causes the rotation of said drills about their respective axes, and means for causing a feeding action of said drills along the lines of their respective axes in the drill-carrying frame.

3. The combination of a rotatable drill-carrying frame, a non-rotatable holder on which the frame is journaled, a rotatable work-carrying chuck, means for locking the drill-carrying frame to the chuck, a drill mounted in said frame arranged at an angle to the common axis of the first three mentioned elements, means whereby the motion of the drill-carrying frame relative to the holder causes the rotation of said drill about its axis, said means comprising a beveled gear on the holder, and a beveled pinion connected to the drill and meshing with the beveled gear.

4. The combination of a rotatable drill-carrying frame, a non-rotatable holder on which the frame is journaled, a rotatable work-carrying chuck, means for locking the drill-carrying frame to the chuck, a plurality of drills mounted in said frame arranged at an angle to the common axis of the first three mentioned elements, means whereby the motion of the drill-carrying frame relative to the holder causes the rotation of said drills about their respective axes and means for causing a feeding action of said drills along the lines of their respective axes in the drill-carrying frame, said last-mentioned means comprising a plurality of levers pivoted on the drill-carrying frame, one end of each lever adapted to move its corresponding drill toward the center of the frame, and a feeding-cone movable in the line of the axis of the drill-carrying frame and adapted to engage the other ends of the levers.

5. The combination of a rotatable drill-carrying frame having an axial chamber open at one end for the introduction of the blank to be drilled, a radial passage leading to said chamber, a drill journaled in said passage and means for feeding and rotating said drill, together with a holder on which the drill-carrying frame is rotatably mounted.

6. The combination of a rotatable drill-carrying frame having an axial chamber open at one end for the introduction of the blank to be drilled, a radial passage leading to said chamber, a drill journaled in said passage and means for feeding and rotating said drill, together with an adjustable stop located in the closed end of the chamber, together with a holder on which the drill-carrying frame is rotatably mounted.

7. The combination of a rotatable drill-carrying frame having an axial chamber open at one end, a plurality of radial passages leading to said chamber, drills journaled in said passages, beveled pinions rotating with said drills, a non-rotating beveled gear with which said pinions mesh, and means for rotating the drill-carrying frame.

8. The combination of a rotatable drill-carrying frame having an axial chamber open at one end, a plurality of radial passages leading to said chamber, drills journaled in said passages, beveled pinions rotating with said drills, a non-rotating beveled gear with which said pinions mesh, and means for rotating the drill-carrying frame, said means comprising a rotating chuck for the blank to be drilled, and a connection from said chuck to said drill-carrying frame.

9. The combination of a rotatable drill-carrying frame having an axial chamber open at one end, a plurality of radial passages leading to said chamber, drills journaled in said passages, beveled pinions rotating with said drills, a non-rotating beveled gear with which said pinions mesh, and means for rotating the drill-carrying frame, springs normally holding said drills so that their points are withdrawn from the axial chamber, and means for feeding said drills into said chamber in opposition to said springs.

10. The combination of a rotatable drill-carrying frame having an axial chamber open at one end, one or more radial passages leading to said chamber, drills journaled in said passages, beveled pinions rotating with said drills, a non-rotating beveled gear with which said pinions mesh, and means for rotating the drill-carrying frame, springs normally holding said drills so that their points are withdrawn from an axial chamber, and means for feeding said drills into said chamber in opposition to said springs, said last-mentioned means comprising levers pivoted to said drill-carrying frame and connected at one end to said drills, and a movable feed-cone engaging the other ends of said levers.

11. The combination of a rotatable drill-carrying frame, a non-rotatable holder on which the drill-carrying frame is rotatably mounted, drills mounted in said frame, means for rotating said drills, a longitudinally-movable, non-rotatable feed-cone mounted on said holder, and connecting mechanism between said feed-cone and said drills.

12. The combination of a rotatable drill-carrying frame, a non-rotatable holder on which the drill-carrying frame is rotatably mounted, drills mounted in said frame, means for rotating said drills, a longitudinally-movable, non-rotatable feed-cone mounted on said holder, and levers pivoted on the drill-carrying frame, having one arm connected to a drill and the other bearing on the feed-cone.

13. The combination of a rotatable drill-carrying frame, a non-rotatable holder on which the drill-carrying frame is rotatably mounted, drills mounted in said frame, means for rotating said drills, a longitudinally-movable, non-rotatable feed-cone mounted on said holder, and connecting mechanism between said feed-cone and said drills together with a

spring normally tending to force said feed-cone out of engagement with said connecting mechanism.

14. The combination of a drill-carrying frame, a holder on which it is rotatably mounted, drills mounted in said frame, a double-faced feed-cone movable with reference to said drill-carrying frame, and connecting mechanism between the drills and the feed-cone, which, when coöperating with one face of the cone, feeds the drills forward, and when coöperating with the other face, allows the withdrawal of said drills.

15. The combination of a drill-carrying frame, a holder on which it is rotatably mounted, oppositely-disposed drills mounted in said frame, a double-faced feed-cone movable with reference to said drill-carrying frame, and connecting mechanism between the drills and the feed-cone, which when cooperating with one face of the cone, feeds the drills forward, and when coöperating with the other face, allows the withdrawal of said drills, said connecting mechanism comprising a pair of levers pivoted to the drill-carrying frame, each lever connected at one end to a drill, and at its other end engaging the feed-cone, one of said pair of levers being arranged to engage the feed-cone in advance of the other member of the pair whereby the withdrawal of one drill is permitted in advance of the withdrawal of its opposite mate.

16. The combination of a drill-carrying frame, drills journaled therein, a holder on which the frame is rotatably mounted, said holder being made in two parts telescoping together along the line of the axis of the journal-bearing, a spring normally holding said telescoping parts at the limit of their outward adjustment, feeding apparatus for the drills, and means carried by the outermost member of the holder adapted to engage and operate said feeding apparatus when said member is pushed inward against the opposition of the spring.

Signed at Philadelphia, Pennsylvania, this 13th day of November, 1902.

JACOB MEYERS.

Witnesses:
FRANK DURSCH,
CHAS. M. STEINMULLER.