(No Model.) 3 Sheets—Sheet 1.

W. WATTIE.

MACHINE FOR TURNING AND DRILLING METAL.

No. 425,556. Patented Apr. 15, 1890.

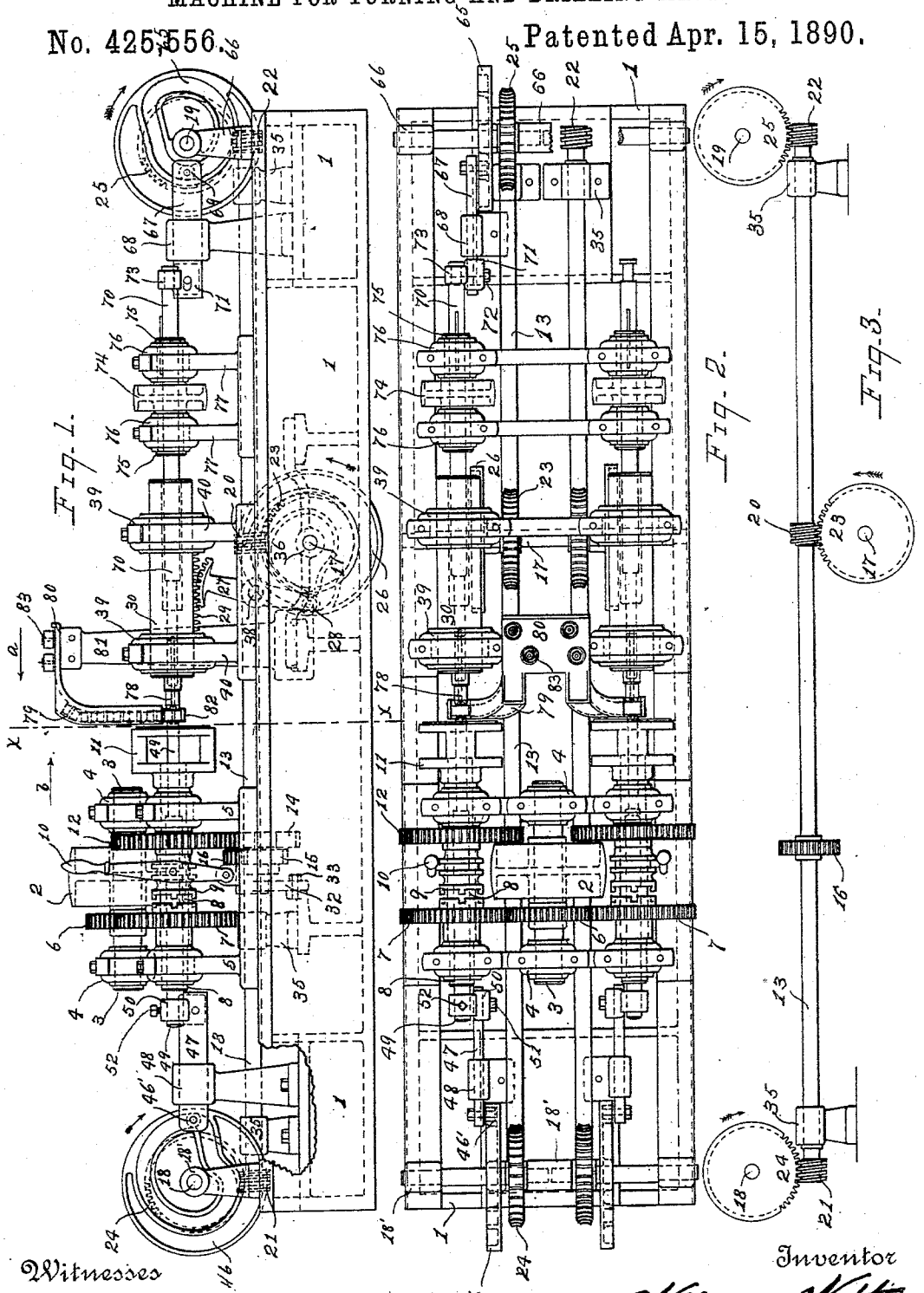


Fig. 1.

Fig. 2.

Fig. 3.

Witnesses
Clinton Atwood
Joseph T. Cox

Inventor
William Wattie,
By his Attorney
John C. Dewey.

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(No Model.) 3 Sheets—Sheet 2.

W. WATTIE.

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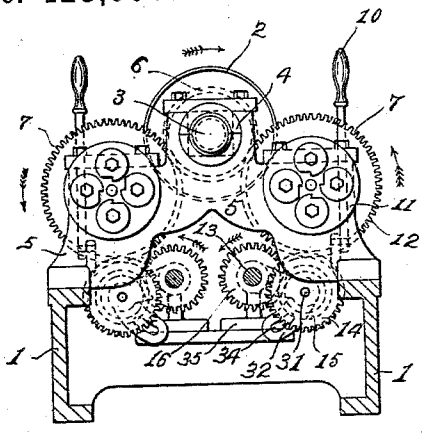


Fig-4-

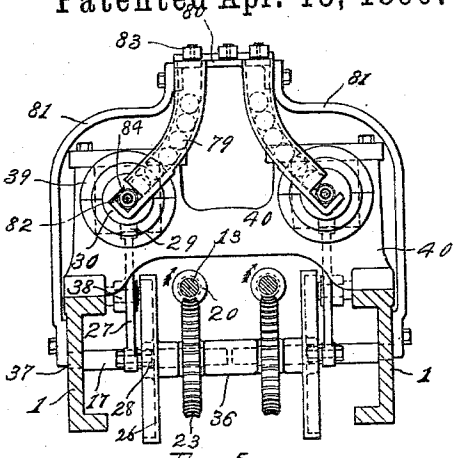


Fig-5-

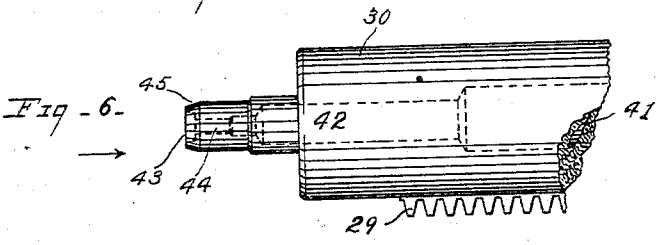


Fig-6-

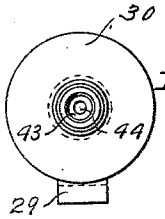


Fig-7-

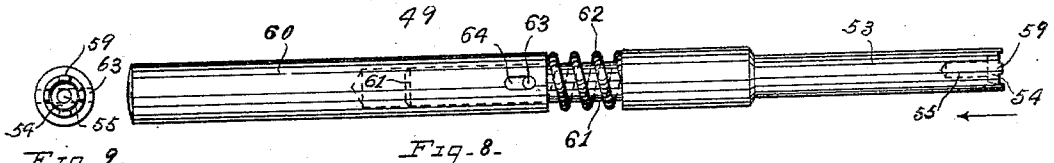


Fig-9-

Fig-8-

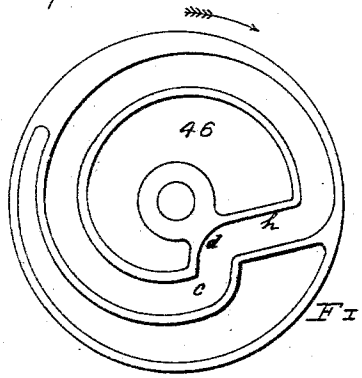


Fig-10-

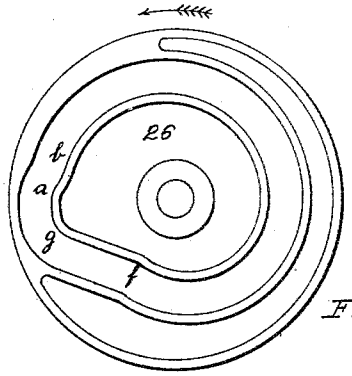


Fig-11-

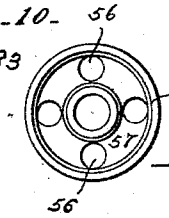


Fig-12-

Witnesses

Clinton Atwood

Joseph T. Cyr

Inventor

William Wattie,

By his Attorney John C. Dewey

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W. WATTIE.

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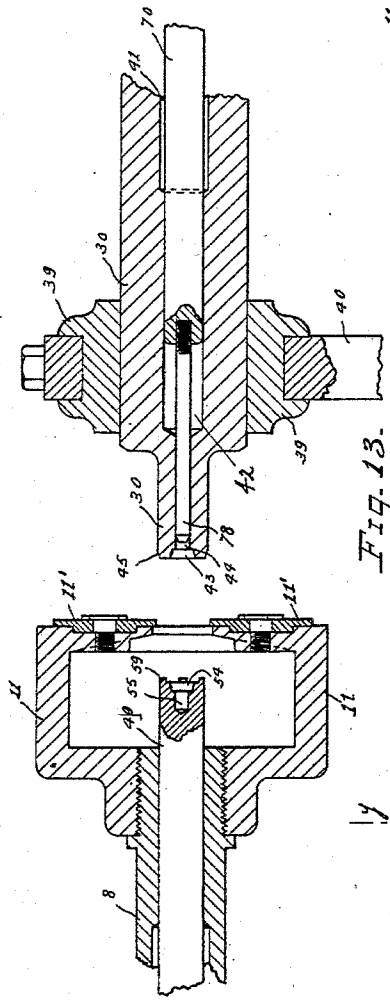


Fig. 13.

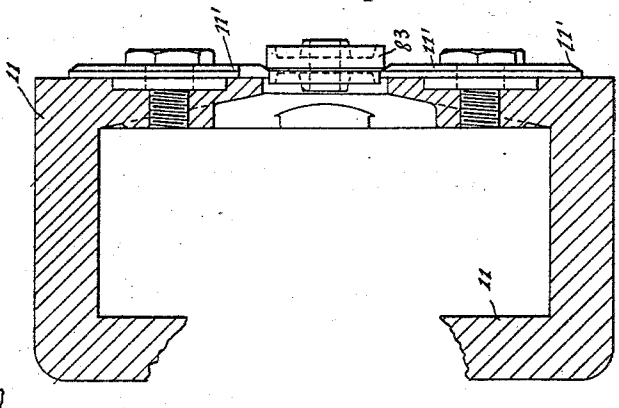


Fig. 15.

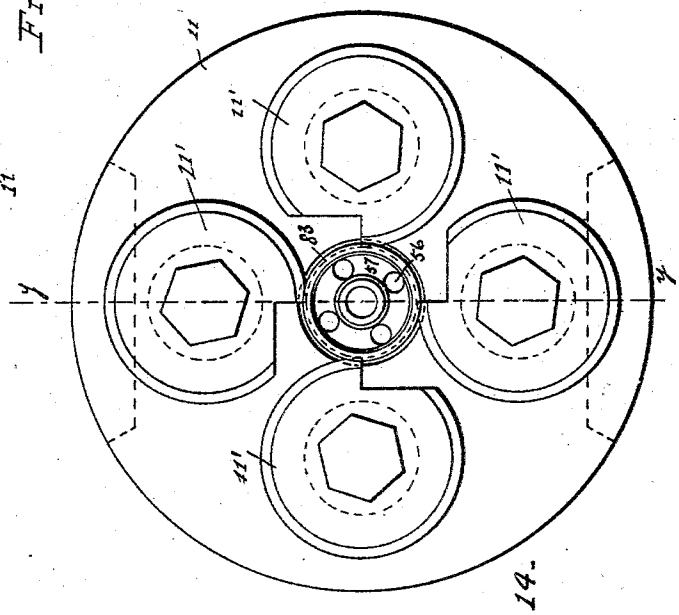


Fig. 14.

Witnesses
Clinton Atwood.
Joseph T. Cyp.

Inventor
William Wattie,
By his Attorney
John C. Dewey

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM WATTIE, OF WORCESTER, MASSACHUSETTS.

MACHINE FOR TURNING AND DRILLING METAL.

SPECIFICATION forming part of Letters Patent No. 425,556, dated April 15, 1890.

Application filed October 24, 1889. Serial No. 328,044. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WATTIE, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Turning and Drilling Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, which, in connection with the drawings making a part of this specification, will enable others skilled in the art to which my invention belongs to make and use the same.

My invention relates to turning and drilling machines in which the pieces to be turned and drilled are fed to the machine through a magazine; and the object of my invention is to provide a machine for turning and drilling pulleys and other metal pieces which shall be automatic in its operation; and my invention consists in certain novel features of construction and operation of a turning and drilling machine, as will be hereinafter fully described, and the nature thereof indicated by the claim.

Referring to the drawings, Figure 1 is a side elevation of a machine embodying my improvements. Fig. 2 is a plan view of the same. Fig. 3 is a detail view of the worm-shaft and its accompanying worm-gears. Fig. 4 is a cross-section on line *x x*, Fig. 1, looking in the direction of the arrow *a*, same figure. Fig. 5 is a cross-section on line *x x*, Fig. 1, looking in the direction of the arrow *b*, same figure. Fig. 6 is an enlarged detail drawing of the feed-plunger. Fig. 7 is an end elevation of the same, looking in the direction of the arrow, Fig. 6. Fig. 8 is an enlarged detail drawing of the grip-bar. Fig. 9 is an end elevation of the same, looking in the direction of the arrow, Fig. 8. Fig. 10 is an enlarged detail drawing of the grip-cam. Fig. 11 is an enlarged detail drawing of the feed-cam. Fig. 12 represents a roll or pulley after the same has been turned and drilled by my machine. Fig. 13 represents, on an enlarged scale, a detached central longitudinal section of that portion of the machine in the space about one inch wide on either side of section-line *x x*, Fig. 1. Fig. 14 represents, on an enlarged scale, a front view of the cutter-head and a pulley in position therein being operated on; and Fig. 15 is a central section on line *y y*, Fig. 14.

I have shown in the drawings my machine made double; but as one side of the machine is just the reverse of the other, the description of one side will describe the other side. Therefore it will only be necessary to describe one side of the machine.

In the accompanying drawings, 1 is the bed of my machine, upon which the head-stocks and stands for holding the various parts of my machine are secured.

2 is the driving-pulley, which is fast to the shaft 3, running in the boxes or bearings 4 of the head-stock 5, and receives its motion from a belt and counter-shaft overhead. (Not shown.) The gear 6 is fast on the shaft 3, and, revolving with the driving-pulley 2, imparts motion to the two gears 7.

The gear 7 on one side of the machine, receiving motion from the gear 6, turns freely on the shaft 8, and has the face of its hub cut into teeth to receive the teeth of the clutch-sleeve 9, which slides freely on the shaft 8 by means of the handle 10, and is kept from revolving about the shaft 8 by a key or feather. (Not shown.) When the teeth of the clutch-sleeve 9 are engaged with the teeth in the face of the hub of the gear 7, the shaft 8 will revolve in the bearing in the head-stock 5 in a direction opposite to that of the shaft 3, and the velocity of rotation of the shaft 8 will be to the velocity of rotation of the shaft 3 as the number of teeth in the gear 6 is to the number of teeth in the gear 7. The mill or cutter head 11, of any ordinary construction and having the cutters 11′ secured on the face thereof, is fast to the shaft 8 and rotates with it. The gear 12 is fast to the shaft 8 and gives motion to the worm-shaft 13 through the system of gears 14, 15, and 16. (See Fig. 4.) The gears 14 and 15 are fast together and turn freely on the pin 31, fast in the arm 32, which turns freely on the worm-shaft 13, and is held rigid to the bed 1 by the screw 33, Fig. 1. The velocity of the worm-shaft 13 can be altered by changing the gear 14 for one of greater or less number of teeth, and the slot 34 in the swinging arm 32 is to allow for change of position in bringing the two gears 12 and 14 into mesh.

The rotation of the worm-shaft 13 in the

bearings 35 causes the revolution of the three cam-shafts 17, 18, and 19 by the worms 20, 21, and 22, fast on the shaft 13, (22 being shown in Fig. 2 by the removal of some parts of the machine,) meshing, respectively, with the worm-gears 23, 24, and 25, which are fast, respectively, on the shafts 17, 18, and 19.

The feed-cam 26 is fast on the shaft 17, held in the bearings 36 and 37, Fig. 5, and by its rotation in the direction of the arrow, Fig. 1, gives motion to the segment-gear lever 27, hung freely on the pin 38 by the roll 28 at the lower end of the segment-gear lever 27, traveling freely in the groove of the cam 26. The segment-gear meshes with the rack 29 in the feed-plunger 30, carried in the bearings 39 of the head-stock 40 and parallel with the shaft 8, causing the feed-plunger 30 to move in accordance with the shape of the cam 26, the rack 29 answering for a key or feather by passing through the bearings 39, and so preventing any rotating movement of the feed-plunger 30.

Figs. 6 and 7 show an enlarged detail drawing of the feed-plunger 30. The plunger 30 is hollow, and the central part of the chamber 41 is so large that the drill-carrying spindle will not touch it, but will bear only at the end of the feed-plunger toward the mill or cutter head at the smaller part 42 of the chamber, thus giving small friction-surface. The extreme end of the plunger 30 has a recess 43, of such a size as to freely admit the hub of the pulley to be turned and drilled, while the smallest part of the chamber 44, which opens into the recess 43, is just the size of the drill used and is perfectly concentric with the outside of the plunger. The beveled end 45 of the plunger 30 is intended to fit into and fill the inside edge of the rim of the pulley to be turned and drilled, and when the pulley is pressed upon the plunger 30 by the grip-bar the rough pulley is centered by the inside edge of the rim and the hole is bound to be drilled concentric with this inside edge, and consequently with the outside surface after the plunger has fed the pulley through the cutter-head 11. Therefore the result must be a concentric and well-balanced pulley.

The grip-cam 46 is fast on the shaft 18, held in the bearings 18′, and revolves in the direction of the arrow, Fig. 1. The roll 46′ travels freely in the groove of the cam 46, and imparts the motion of the cam 46 to the slide-bar 47, which slides freely in the bearing 48 in a direction parallel to the shaft 8 and the plunger 30, and the motion is conveyed from the slide-bar 47 to the grip-bar 49 through the fastening 50, made fast to the slide-bar 47 by the screw 51, Fig. 2, and holding the grip-bar 49 by the set-screw 52. The grip-bar passes through the hollow center of the shaft 8, and has a bearing only at the end near cutter-head 11 to give as little friction-surface as possible.

Figs. 8 and 9 show an enlarged detail drawing of the grip-bar. The end 53 has a recess 54 at the extreme end, of such a size as to freely admit the hub of the pulley to be turned and drilled, and a still deeper recess 55 to receive the end of the drill when it shall have passed through the pulley. The extreme end of the part 53 is provided with notches 59, which fit loosely into the holes 56 in the web 57 of the pulley, Fig. 12, and prevent any tendency on the part of the pulley to rotate, the diameter of the end of the bar 53 being small enough to press against the web 57 of the pulley without touching the rim 58 of the pulley. The part 60 of the grip-bar is chucked out to freely receive the end 61 of the bar 53. The coil-spring 62 is put on under compression, and is held so by the pin 63, driven fast into the end 61 and passing through the slot 64 in the piece 60. The spring 62 can now no longer expand, but the slot 64 will allow a certain amount more of compression. The grip-cam 46 is timed to somewhat compress the spring 62 every time the pulley is gripped and centered, and this compression will be greater or less, according to the imperfections in the different pulleys of a certain class and size.

The drill-cam 65 is fast on the shaft 19, held in the bearings 66, and revolves in the direction of the arrow, Fig. 1. The roll 69 travels freely in the groove of the cam 65 and imparts the motion of the cam 65 to the slide-bar 67, which slides freely in the bearing 68 in a direction parallel to the shaft 8 and the plunger 30. The motion of the slide-bar 67 is conveyed to the drill-carrying spindle 70 through the connection 71, made fast to the slide-bar 67 by the screw 72, Fig. 1, and forked at the hub 73, so as to allow the spindle 70 to turn freely within the fork.

The drill-pulley 74 is fast on the shaft 75, which is carried by the bearings 76 in the head-stock 77. The shaft 75 is hollow, and the spindle 70 is of a size to slide freely backward and forward through it on a feather or key, so that the spindle 70 will revolve when the pulley 74 revolves. The drill 78 is fast on the end of the spindle 70 and has a bearing in the part 44, Fig. 6, of the chamber within the plunger 30.

The driving of the pulley 74, and consequently the rotating motion of the drill 78, is effected by a belt from a counter-shaft overhead, (not shown,) and is entirely independent of the motion of the main driving-pulley 2, while the longitudinal motion of the drill 78 and spindle 70 is directly through the medium of the pulley 2.

The rolls or pulleys 83 are fed to the machine by means of the magazine or feed-chamber 79. Used in connection with the magazine, and made as large as practicable, is the receiving-table 80, which is supported by the stands 81, Fig. 5, both of which are removed in Fig. 2 and only one of them shown in Fig. 1. At the lower end of the magazine 79 is the shelf 82, which is in a position to

bring the roll or pulley resting upon it in a line with the plunger 30 and grip-bar 49.

The operation of the machine is as follows: Supposing the drill-pulley 74 to be running and the magazine filled, as represented in the drawings, by the pulleys 83, the feed-plunger 30 in its extreme rearward position, which allows a pulley to drop onto the shelf 82 between the plunger 30 and the grip-bar 49, which is advancing toward its extreme forward position. The pulley as it rolls from the end of the magazine is kept from falling onto its side by the pressure of the light flat spring 84, (see Fig. 5,) under which it has run by its own momentum, and which is fastened to the shelf 82 of the magazine. The cam-shaft 17 turns in the direction indicated by the arrow and the plunger 30 advances and moves the pulley toward the cutter-head 11. The cam-shaft 18 turns in the direction indicated by the arrow and the grip-bar 49 advances to its extreme forward position and grips the pulley firmly against the plunger 30, thereby centering it with the cutter-head. The spring 62 in the grip-bar 49 is somewhat compressed, and thus allows for any variation in thickness of the different pulleys. The plunger 30 starts forward rapidly at first, as the roll 28 on segment-gear lever 27 passes from the point *a* to the point *b* on the cam 26, Fig. 11, and the pressure of the flat spring 82 maintains the pulley in its upright position. The several cams are so timed that the grip-bar 49 arrives at its extreme forward position just before the cam-roll 28 reaches the point *b* on the cam 26, and the firm gripping and the centering of the roll and the compression of the coil-spring 62 are the consequence. The plunger 30 and the grip-bar 49 now move together toward the cutter-head, carrying the roll firmly between them, and in passing through the cutter-head the pulley is turned to the required size. Meanwhile the shaft 19 has been turning in the direction indicated by the arrow, and the cam 65 is so timed that the drill 78 is advanced just as the pulley is gripped by the grip-bar 49. The shape of the drill-cam 65 is much steeper than the feed-cam 26, causing the drill to overtake the pulley and pass through it, drilling a uniform hole concentric with the turned surface. The drill passes through the pulley and is withdrawn just as the pulley passes wholly through the cutter-head and drops down. When the roll 45 on the slide-bar 47 reaches the point *c*, Fig. 10, in the cam 46, the grip-bar 49 is rapidly withdrawn as the roll passes down the steep incline of the cam to the point *d*, and the finished pulley is allowed to drop below through the cutter-head into a box placed for its reception. The roll 28 of the cam 26 now passes from the point *f* to the point *g*, bringing the plunger 30 to its original position, and the roll 46′ advances to the point *h* on the cam 46, and the operation is completed.

My machine above described is especially adapted for turning and drilling the rolls used on the pattern-chains of looms, one of which is shown full size in Fig. 12.

It will be understood that the details of construction of the several parts of my machine may be varied from what is shown and described and equivalent devices used without departing from the principle of my invention.

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

In a turning and drilling machine, the combination, with mechanism for gripping and centering the rolls or pulleys and mechanism for feeding them to the cutter-head, and means for operating said mechanisms, of mechanism for drilling the center hole in said rolls or pulleys and mechanism for turning the exterior surface thereof, and means for operating said mechanisms, all combined together and operated substantially as set forth.

WILLIAM WATTIE.

Witnesses:
JOHN C. DEWEY,
EDMUND F. SEYMOUR.