Dec. 1, 1925. 1,563,714

L. V. BLUE

HANDLE POLISHING MACHINE

Filed Dec. 18, 1922 5 Sheets-Sheet 1

Fig. 1.

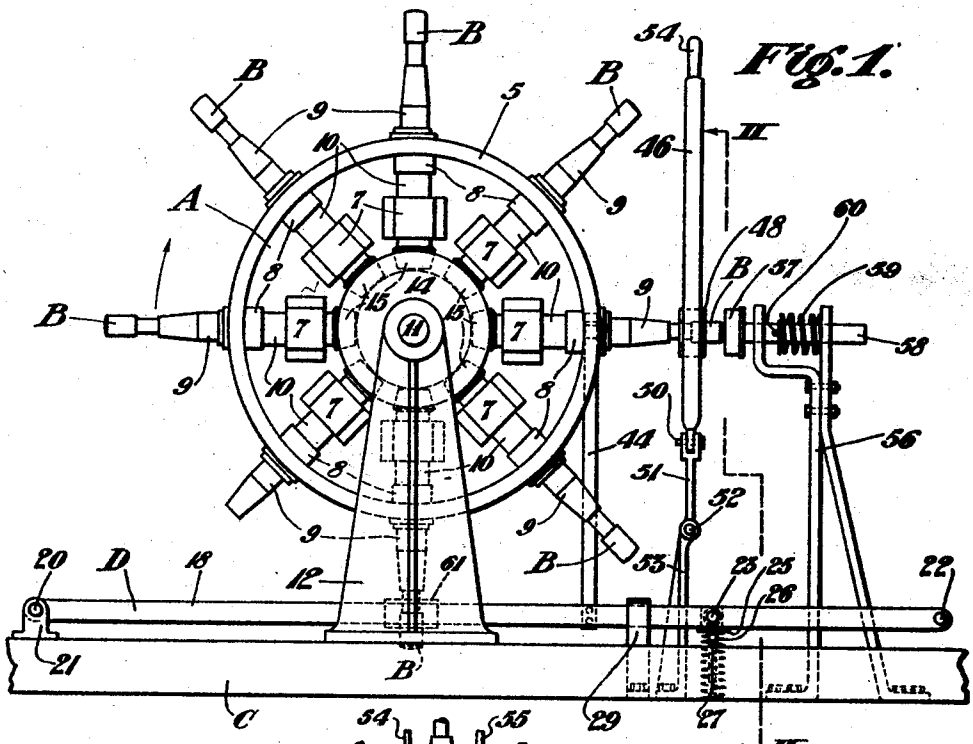


Fig. 2.

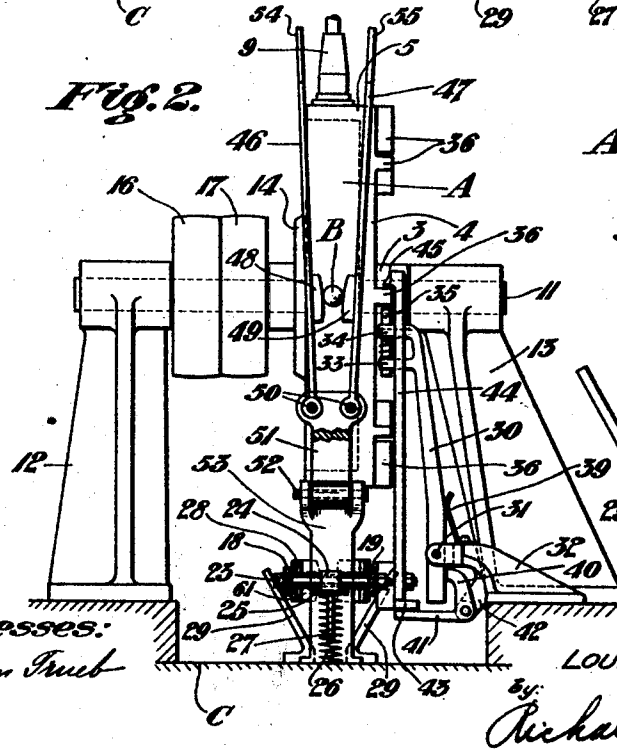
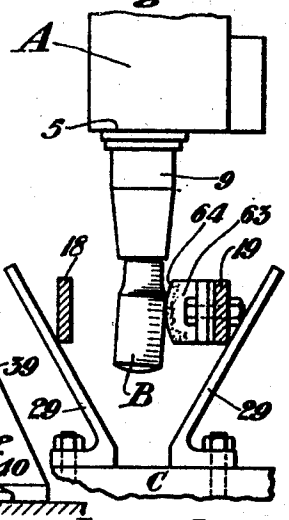


Fig. 5A



Witnesses:
Edwin Trueb

Inventor:
LOUIS V. BLUE,
By: Richard D. Little
his Attorney

Dec. 1, 1925. 1,563,714

L. V. BLUE

HANDLE POLISHING MACHINE

Filed Dec. 18, 1922 5 Sheets-Sheet 2

Fig. 4.

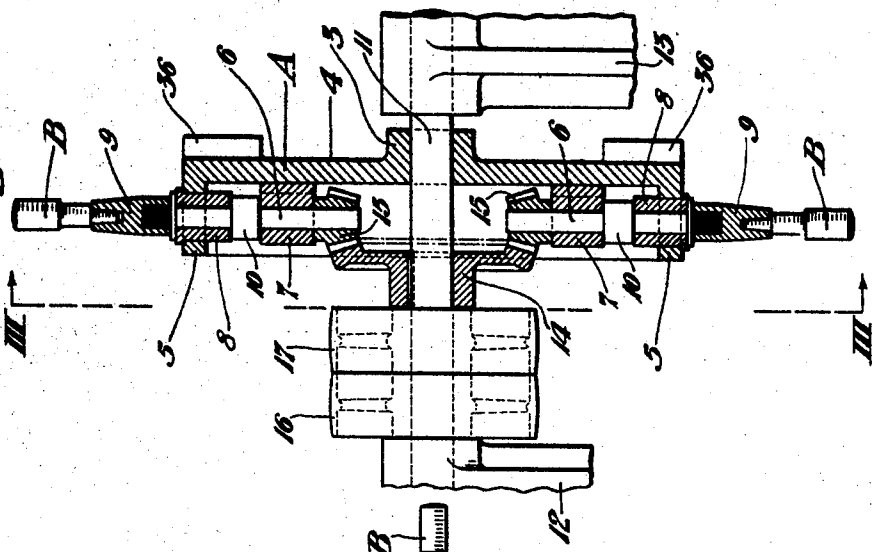
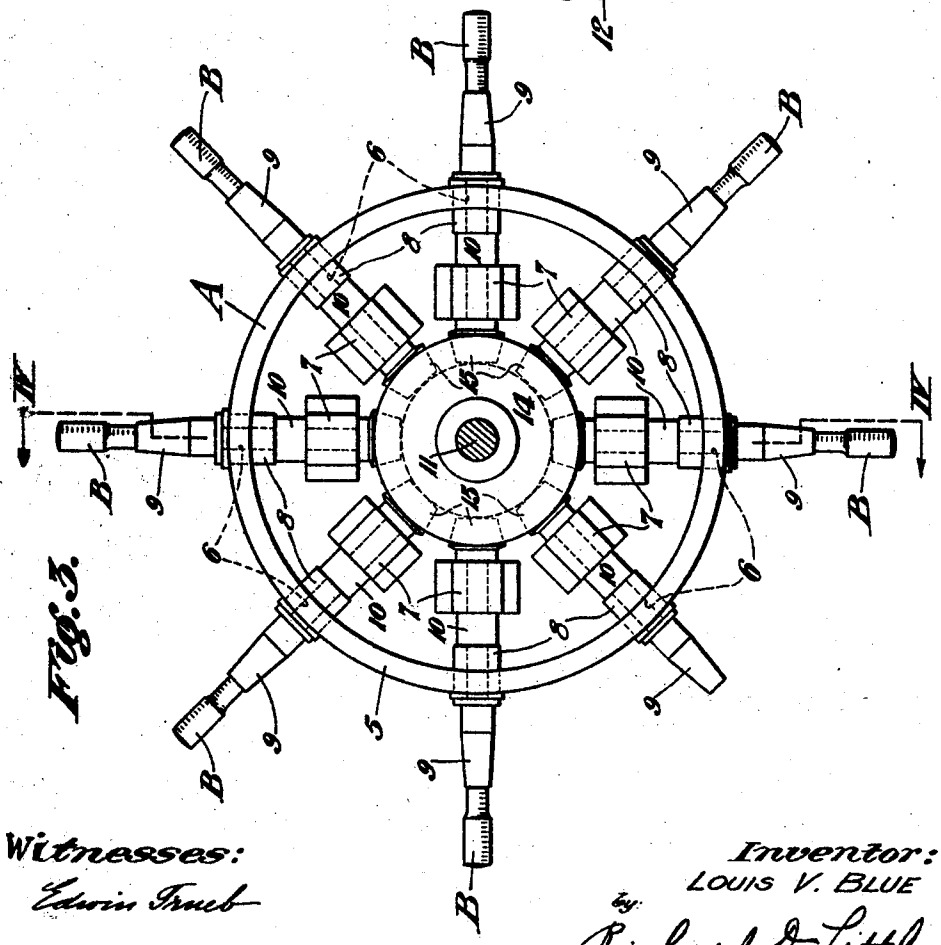


Fig. 3.



Witnesses:
Edwin Trueb

Inventor:
LOUIS V. BLUE
by
Richard D. Little
his Attorney.

Dec. 1, 1925. 1,563,714

L. V. BLUE

HANDLE POLISHING MACHINE

Filed Dec. 18, 1922 5 Sheets-Sheet 3

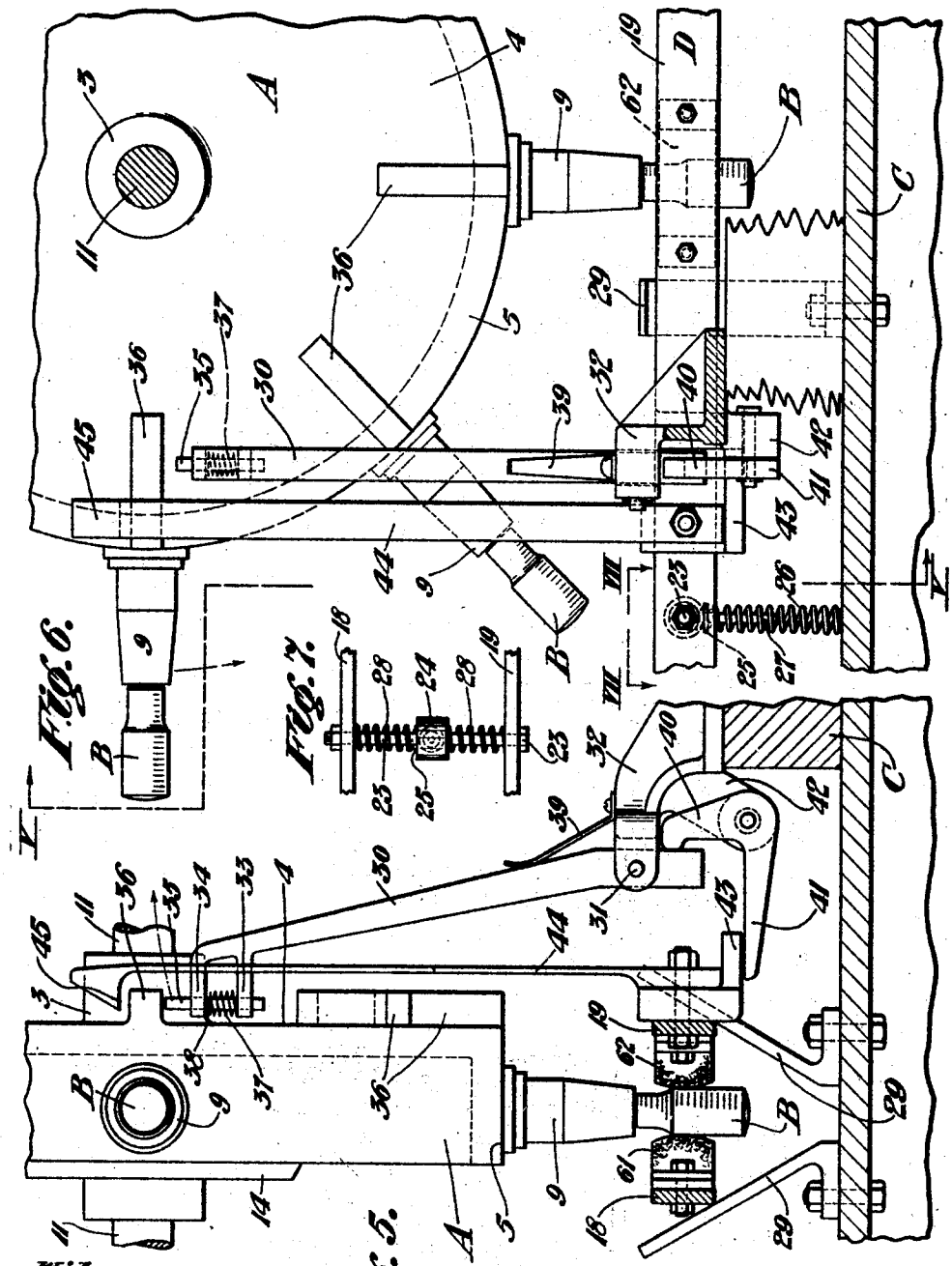


Fig. 6.

Fig. 7.

Fig. 5.

Witnesses:
Edwin Fruet

Inventor:
LOUIS V. BLUE,
by: Richard D. Little
his Attorney

Dec. 1, 1925. 1,563,714

L. V. BLUE

HANDLE POLISHING MACHINE

Filed Dec. 18, 1922 5 Sheets-Sheet 4

Fig. 8.

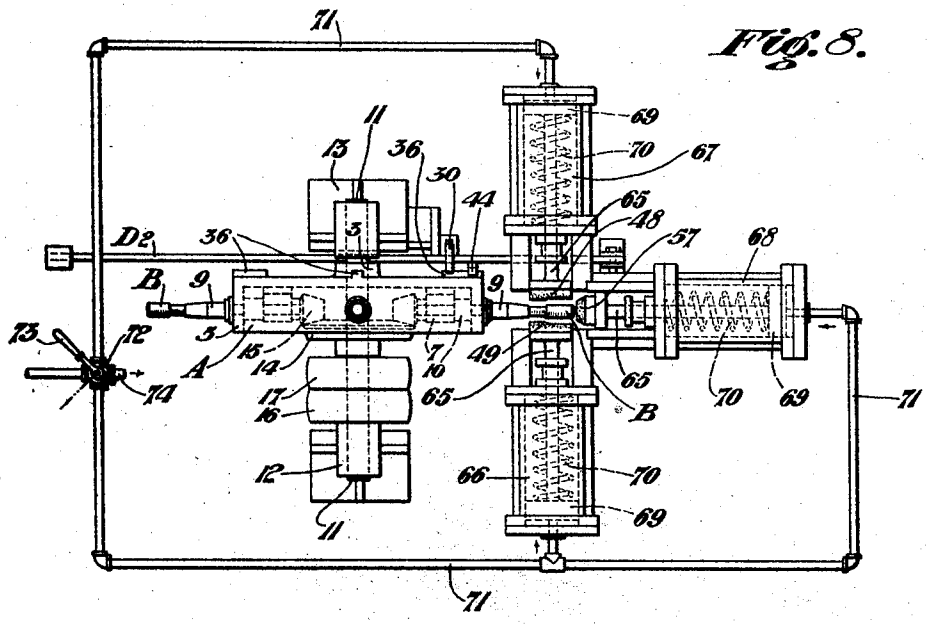
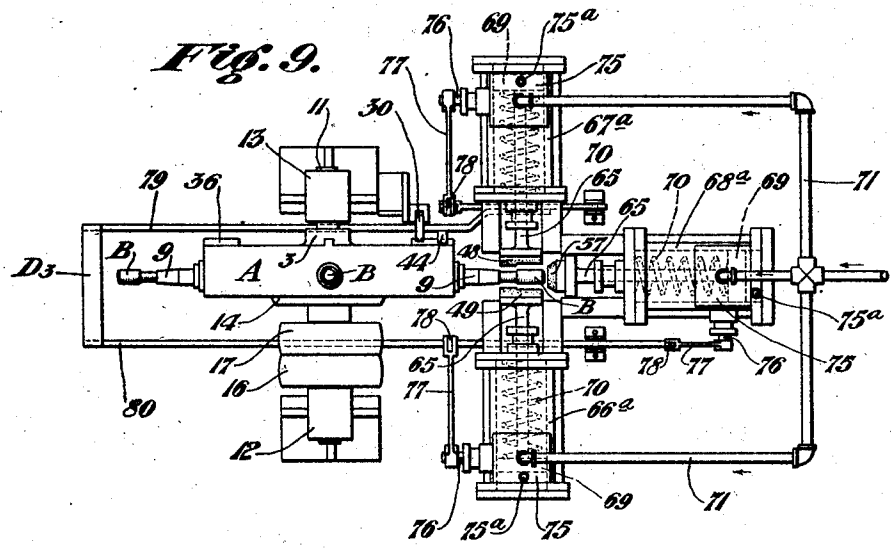



Fig. 9.




Witnesses:
Edwin Trueb

Inventor:
LOUIS V. BLUE,
by Richard D. Little
his Attorney

Dec. 1, 1925. 1,563,714

L. V. BLUE

HANDLE POLISHING MACHINE

Filed Dec. 18, 1922 5 Sheets-Sheet 5

Fig. 10.

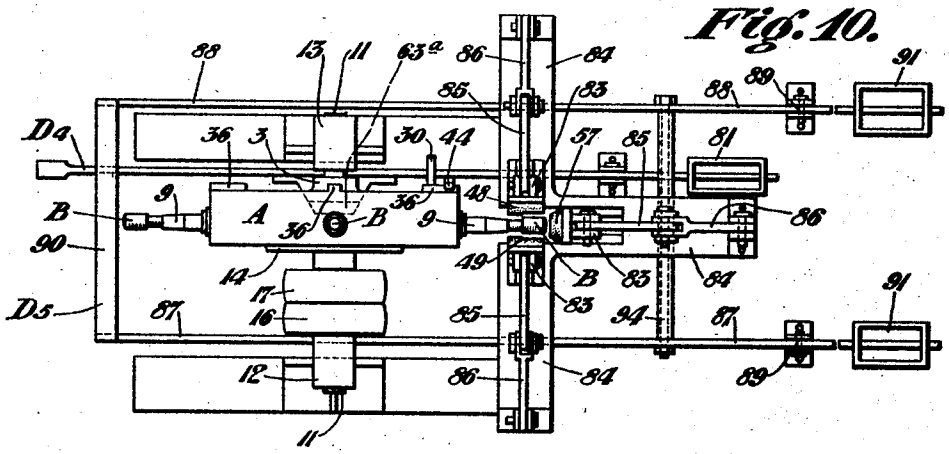



Fig. 11.

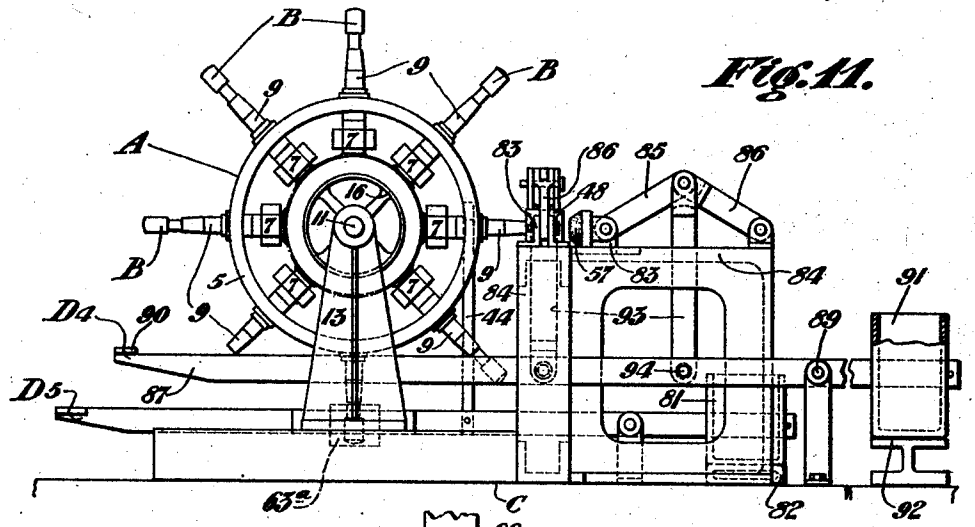
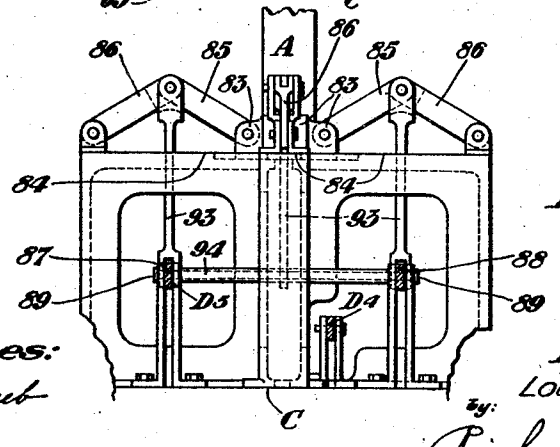



Fig. 12.




Witnesses:
Edwin Trueb

Inventor:
LOUIS V. BLUE,
by: Richard D. Little
his Attorney.

Patented Dec. 1, 1925. 1,563,714

# UNITED STATES PATENT OFFICE.

LOUIS V. BLUE, OF ELKTON, MARYLAND.

## HANDLE-POLISHING MACHINE.

Application filed December 18, 1922. Serial No. 607,671.

*To all whom it may concern:*

Be it known that I, LOUIS V. BLUE, a citizen of the United States, and resident of Elkton, in the county of Cecil and State of Maryland, have invented a certain new and useful Handle-Polishing Machine, of which the following is a specification.

My invention relates to apparatus for polishing slender or elongated articles of cylindrical or approximately cylindrical cross-section and made of wood or other material. The invention, while not limited thereto, more particularly relates to a polishing machine for polishing wooden handles of the type used on hand-tools, such as screw-drivers, files, wrenches, the handles applied to certain grades of cutlery and similar articles.

Such handle polishing operations, in so far as I am aware, have always been carried out entirely by hand, the handles being successively picked up and held in operative engagement with a rapidly rotating wheel by a workman during the handle polishing operations.

It is the usual practice in finishing or polishing such handles to first apply a coat of paint or of varnish or mixture of paint and varnish thereto, and to then polish the coated handles, the polishing operation generally being carried out without waiting for the coating to dry. In such polishing operations the coated handle or other article is manually held against a polishing wheel that is mounted on a rapidly revolving shaft or spindle, commencement of this operation removing any excess coating and the polishing wheel then drying and finally polishing the article by frictional contact therewith.

Wooden handles, particularly those applied to the grade of articles or tools sold in bulk, and at a small margin of profit, to five and ten cent stores, department stores, hardware stores and the like, are retailed at a low price. The profit in making a handle of this class is very small, so that anything that increases production or lessens the cost of manufacture, is an important factor to the manufacturer.

One object of my invention is to provide a polishing machine of novel construction having improved means for mechanically handling the articles during the polishing operations, whereby the number or quantity completed in a given time is very materially increased and whereby the labor cost of polishing a given number or quantity is materially lessened.

Further objects of my invention will be made apparent hereinafter in reading the detailed description of the apparatus included in this specification.

Referring now to the drawings, forming part of this specification, Figure 1 is a side elevation showing a multiple spindle polishing machine constructed and arranged in accordance with my invention. Figure 2 is a sectional side elevation of the apparatus of Figure 1, the section being taken on the irregular line II—II of Figure 1. Figure 3 is a sectional plan on a larger scale, taken on the line III—III of Figure 4 and showing details in the construction of the polishing machine table or turret. Figure 4 is a sectional side elevation on the line IV—IV of Figure 3. Figure 5 is a sectional end elevation on the irregular line V—V of Figure 6, showing details of the polishing machine and its operating mechanism. Figure 5A is a detail sectional end elevation showing a modified apparatus for automatically removing the polished handles from the handle holding chucks without interruption of the polish operations. Figure 6 is a sectional side elevation of the apparatus shown in Figure 5. Figure 7 is a plan looking in the direction indicated by the arrows VII—VII in Figure 6.

Figure 8 is a plan showing a modified form of polishing machine constructed in accordance with my invention.

Figure 9 is a plan showing another modified form of polishing machine embodying my invention.

Figure 10 is a plan showing still another modified form of polishing machine made in accordance with my invention.

Figure 11 is a side elevation of the apparatus shown in Figure 10. Figure 12 is an end elevation of the apparatus shown in Figures 10 and 11.

In the accompanying drawings, referring now particularly to Figures 1 to 7, which show one embodiment of my invention, the letter A, in a general way, designates the rotary table or turret of the polishing machine. This turret comprises a central hub

3, a web 4, and an annular flange 5 forming a peripheral rim which extends outwardly on one side of the turret web 4.

Mounted on the turret A is a series of lengthwise radial, axially rotatable shafts or spindles 6. Each spindle is secured in bearings 7 and 8, the bearings 7 being fastened to one face of the web 4 and the bearings 8 being screwed into radial, internally threaded holes in the rim 5 of the turret. As shown, eight spindles are employed, the particular number used, which may vary, being dependent largely upon the diameter of the rotary turret A and size of the handles or other articles to be polished or finished on the machine.

The spindles 6 project through the bearings 8 to a point beyond the perimeter of the turret A and on the threaded outer end of each spindle is a chuck 9 which is adapted to engage with and hold the handles B or similar articles, by one end, while the handles are being moved from the position at which the handles are attached to the chucks, into position to be polished; while being polished; and also while being moved into position where the polished handles are automatically removed from the chucks.

My improved polishing machine being primarily intended for use in polishing wooden handles having a frusto-conical end, a chuck of the simplest construction, such as that shown, may be used for engaging the tapering ends of the handles, in temporarily attaching them by one end, to the rotary spindles. The chucks 9, as shown, comprise a cylindrical body having an internally threaded recess in one end, by which the body is secured on the threaded outer ends of a spindle 6, and a frusto-conical recess in its outer end, of the same taper as the ends of the handles B. (See Figure 4). However, it will be obvious that the chucks may be of any of various known designs when constructed in a manner suitable for grasping and holding the particular articles to be polished.

Each spindle 6 has an enlarged portion 10, formed integrally thereon as shown but which may be separate from and detachably secured on the spindles. The enlarged portion 10 is made long enough to form shoulders which neatly fit between the adjacent ends of the pair of bear ngs 7 and 8 in which each spindle is mounted, so as to prevent lengthwise movement of the rotating spindles when the polishing machine is in operation.

The turret A is mounted on a shaft 11 so as to turn thereon or not as required, and the shaft 11, which drives the spindles 6, is rotatably secured in the bearings on the upper ends of the pedestals or bearing stands 12 and 13. The bearing stands are rigidly mounted on a suitable frame or base, designated in a general way by C, which is secured to the factory floor or to a foundation at or about the floor level of the factory.

A bevel gear 14 is keyed or otherwise fastened on the shaft 11 so as to rotate therewith, and keyed or otherwise secured on the inner end of each of the series of radial spindles 6 is a small bevel pinion 15, these pinions meshing with and being positively driven by the bevel gear 14, when the shaft 11 is rotated.

Preferably the spindles 6 and handles B held on the ends thereof by the chucks 9 will be rotated at a speed approximating two thousand revolutions per minute. The bevel gear 14, being much larger than the bevel pinions 15, will rotate at much less speed.

A fast pulley 16 and loose pulley 17 on the shaft 11, which are connected to a driving motor or other prime mover by an endless belt, (not shown) provide means for driving the polishing machine and when desired, for stopping the machine.

Being loosely mounted on the shaft 11, the turret A can be held against rotation while the shaft turns and the spindles 6 are being rotated on the turret. The turret also can be turned on the shaft at any desired speed or through any required part of a revolution, and when not held against such rotative movement, it, at a slow, gradually increasing speed, will automatically start to turn, because of the frictional engagement of its hub 3 by the rotating shaft 11 and the tendency of the gears 14 and 15 and spindles 6, when rotating, to cause the turret to revolve on the shaft 11.

Beneath the turret A and extending lengthwise from one end to the other thereof, is a foot operated rocking lever D formed of two parallel bars 18, 19, this foot lever controlling the intermittent turning movement of the turret on the shaft 11. The pivoted ends of the bars 18, 19 are connected by a bolt or rod 20 to angle brackets 21, 21, which are fastened by one leg to the base C of the machine. (See Figure 1). The swinging ends of the bars 18, 19 are loosely connected by a rod or bolt 22, which extends through registering holes therein, these ends of the bars being movable toward and away from each other on the rod 22 and the rod being conveniently used as a treadle for depressing the foot lever in operating the machine. The bars 18, 19, at an intermediate point in the length thereof, also are loosely connected by another rod or bolt 23 and secured on this rod is an eyebolt 24 having a collar 25, which engages one end of a helical spring 26, the lower end of which engages with the base C. The eyebolt has a shank 27 which projects downwardly into the spring 26, this spring acting to lift and yieldingly hold the swinging end of the foot lever D

in raised position, (that shown in Figures 1 and 2). Also secured on the rod or bolt 23, one on each side of the eyebolt 24 are helical springs 28, 28 which yieldingly maintain the bars 18, 19 forming the foot lever in spread apart position, when the foot lever is in its raised position. (See Figures 2 and 7).

Guide brackets, which are fastened by one leg to the base C, have upwardly and outwardly inclined legs 29, 29 arranged to engage with the sides of the bars 18, 19 of the foot lever D so that when this lever is depressed by the foot of the machine operator, the free or swinging ends of the bars 18, 19 are moved toward each other, as well as being depressed, such movement compressing the springs 28, 28 on the bolt 23. When the foot lever is released and thereby allowed to be lifted by the spring 26 on the shank of the eyebolt 24, the compressed springs 28, 28 expand and act to spread the bars and yieldingly hold them in engagement with the inclined legs 29, 29 of the guide brackets. (See Figures 2, 5, and 7.)

A lever 30 forms means for stopping and holding the intermittently moving turret A against rotation on the shaft 11, during the time intervals required for each successive handle polishing operation, and a starting arm 44 is provided for quickly bringing another spindle 6, having an unpolished handle thereon, into position to be polished, at the completion of each successive handle polishing operation. In the apparatus of Figures 1 to 7, a lengthwise vertical lever 30 pivoted near its lower end by a pin 31 to a bracket 32 forms the particular stopping means used, the bracket 32 being fastened to the base C. The swinging or upper end of the lever 30 has prongs 33, 34 forming a fork which projects outwardly, substantially at right angles to the length of the lever and the ends of the prongs are provided with registering holes in which a short pin 35 is mounted to move lengthwise. The upper end of this pin is adapted to successively engage with each of the series of eight short radial lugs 36 on the adjacent face of the turret A and, in conjunction therewith, form a cushioning stop, by which turning movement of the turret is arrested and is prevented, in bringing and holding the spindles 6 successively into handle polishing position. The yielding pin 35 is held in extended position on the upper end of the lever 30 by means of a coil spring 37. The lower end of the spring 37 engages the lower prong 33 on the lever 30 and its upper end engages with the ends of a pin 38 which extends through a transverse hole in the pin 35 at a point between the prongs 33, 34 so as to normally hold the pin or stop 35 in raised position.

A leaf spring 39, fastened by one end to the bracket 32, has its free end in operative engagement with the lever 30, so as to move and yieldingly maintain it in the path of the lugs 36 on the rotary turret A. The lower end of the lever 30 is operatively engaged by one arm 40 of a bell crank, which is pivotally connected to a lug or ear 42 on the bracket 32. The free end of the other arm 41 of the bell crank extends outwardly into position to engage with and be actuated by a lug or projection 43 on the bar 19 of the pair of bars 18, 19 forming the foot lever D, so that when the foot lever is depressed, the arm 40 of the bell crank engages the lower end and swings the upper end of the stop lever 30 and stop pin 35 out of the path of the lugs 36 on the side of the turret A.

To accelerate the starting movement of the turret A, after each time it is stopped, a lengthwise vertical arm 44 is secured by its lower end to the bar 19 of the foot lever D. The lever 30 has a hook 45 on its pointed upper end, which normally projects into the path of the stop lugs 36 on the side of the turret, so that when the foot lever D is depressed, as is done at the completion of each handle polishing operation, the hook 45 engages and pulls downwardly on one of the lugs 36 and thereby starts or accelerates rotative movement of the turret A and causes another handle to be quickly moved into position to be polished. The body of the arm 44 is made thin enough to rapidly spring outwardly when its pointed upper or hook end 45 is engaged by the end of a lug 36 on the rotating turret and in this way permit the lug 36 to pass the hook 45 and move into engagement with the yielding stop 35 on the swinging stop lever 30. (See Figures 5 and 6.)

Positioned in front of one end of the turret A are polishing levers 46, 47 having oppositely facing polishing pads 48 and 49 thereon, which embrace the body of the handles B and by which the body of the rotating handles are polished when held in polishing position by the spindles 6. The lower ends of the polishing pad levers 46, 47 are pivotally mounted on pins 50, 50 so as to be movable toward and away from each other. The pins 50 are secured to the upper end of the pivoted arm 51 which in turn is pivotally mounted at its lower end on a pin 52 which is secured to the upper end of a bracket 53, the bracket 53 being rigidly secured to the base of the machine. (See Figures 1 and 2.) The upper ends of the levers 46, 47 have handles 54, 55 by which they are manipulated by the operator of the polishing machine in the handle polishing operations.

It will be seen by reference to Figures 1 and 2, that the polishing levers 46, 47 not only are manually swung toward and away from each other on the arm 51, but also that

the arm 51 forms an extension to the levers 46, 47, which enables them being rocked or swung toward and away from the axis of the turret and in this way enable polishing the pads 48, 49 to be moved along the length of the handles when they are held by a spindle of the polishing machine, when held so as to extend horizontally in handle polishing position. By pivoting the lower ends of the levers 46, 47 to the upper end of the arm 51 instead of at a lower point, the power or force necessary in manually operating the levers 46, 47 to hold them in polishing engagement with the handles, is very materially reduced, owing to the lessened length of the part of levers between the pads 48, 49 and the pivot pins 50 and much greater length between the pads 48, 49 and the handles 54, 55 on the upper ends of the levers 46, 47.

Secured to the base of the machine in front of one end of the turret A is a stationary bracket 56 and mounted on the upper end thereof, in position to engage with one end of the handles and polish such end when the handle is in its polishing position is a third polishing pad 57. This pad is secured to one end of a slidable rod 58 which extends through suitable holes in the upper end of the bracket. A coil spring 59 on the rod 58 has one end engaging the bracket 56 and its other end engaging with a pin 60 extending transversely through a hole in the rod 58, so as to yieldingly hold the pad 57 in engagement with the end of the handles B while the body of each handle is being polished by the pads 48, 49. (See Figure 1.)

Secured to the inner faces of the bars 18, 19 forming part of the pivoted foot lever D, at a point immediately below the turret driving shaft 11, are oppositely facing pads 61 and 62. These pads are separated sufficiently to permit handles to swing between them in the operation of the polishing machine. (See Figure 5.) At the same time the bars 18, 19 are such distance apart that when, as has been explained, the foot lever D is depressed, the inclined legs 29, 29 of the guide brackets engage with and cause a relative approach sidewise of the two bars 18 and 19. At the commencement of this approaching movement of the bars 18 and 19 the pads 61, 62 move sidewise into gripping engagement with a handle B when it reaches the position in which it hangs vertically downward, and further downward movement of the foot lever D causes the pads 61, 62, now gripping a handle B without necessarily preventing its rotation, and pulls it from the chuck 9 by which the handle it attached to a spindle of the turret A.

In the modified handle removing mechanism shown in Figure 5A, a pad 63 having a curved face 64 is secured on the bar 19 of the foot lever, this pad extending inwardly between the two bars forming the foot lever, so that its curved face will engage with the side of the handle B when such handle swings into a vertically downward position. When in this position the handle B will be engaged by the pad 63 and will be shifted in the chuck 9, in which it is held, sufficiently to move it out of alinement with the axis of the chuck, and in this way, on account of its being caused to rotate in an axially conical path, the handle will loosen and automatically drop out of the chuck 9 and drop to the floor or into a receptacle located beneath the turret.

In the modified apparatus shown in Figure 8, the turret A is constructed as shown in Figures 3 and 4, and a foot lever $D^2$ having a stop lever 30 and accelerating lever 44 made as shown in Figures 5 and 6 also will be employed for regulating and controlling movement of the turret A on the shaft 11. The polishing pads 48, 49 of the machine of Figure 8 are mechanically operated, instead of manually, as in the machine of Figures 1 and 2. As shown, the opposite polishing pads 48, 49 and the polishing pad 57 are secured on the projecting ends of piston rods 65 in the single acting fluid pressure cylinders 66, 67, and 68, the inner ends of these rods being fastened to pistons 69 within the cylinders. The cylinders being single acting as shown, a helical spring 70 having one end in engagement with the piston 69 provides means in each cylinder for moving the piston, its rod and the polishing pad on the outer end of the piston rods backwardly into retracted position. The rear end of each piston has an inlet and outlet port which is connected by piping 71, and a valve 72 with a source of fluid pressure supply. (Not shown). A handle 73 on the valve enables the operator to open the valve and thereby admit fluid pressure through the piping 71 to the cylinders and cause the pistons 69 therein to compress the springs 70 and simultaneously move the polishing pads 48, 49 and 57 forwardly into handle polishing position. When, by turning the valve handle 73, the supply of fluid pressure is shut off from the cylinders the exhaust outlet 74 on the valve opens and permits the compressed springs 70 to elongate and, by forcing the pistons 69 backwardly, to retract the polishing pads on the ends of the piston rods 65.

The construction shown in Figure 9 is very similar to that of Figure 8, the turret and turret controlling mechanism and the operating mechanism for the polishing pads 48, 49, and 57 being the same. Instead of controlling the fluid pressure supply to the pad operating cylinders by a single hand controlled valve as in Figure 8, each of the

single acting cylinders $66^a$, $67^a$, and $68^a$, is provided with a valve chest 75 and each valve chest has a valve operated by its valve stem 76. The outer ends of each valve stem is provided with a rocking lever 77 and the swinging ends of the levers 77 are connected by links 78 to one or another of the parallel bars 79, 80 forming the foot lever $D^3$, so that when the foot lever reaches the end of its depressed position the valves are opened, and fluid pressure thereby admitted to the cylinders causes the polishing pads 48, 49 and 57 to advance into handle polishing position. Each downward movement of the foot lever $D^3$ causes the turret A to move an unpolished handle B into position to be polished and also moves a polished handle into position to be removed from its holding chuck, as well as bring an empty chuck into position to have an unpolished handle inserted therein, in the same way as has been described in connection with the machines of Figures 1 and 2, and Figure 8.

In the modification shown by Figures 10, 11, and 12, the turret A is the same as shown in Figures 3 and 4, being loosely mounted on the shaft 11, which is supported in pedestal bearings 12 and 13 and is adapted to be rotated by the shaft driving pulley 16. The shaft 11 has a bevel pinion 14 fastened thereon which meshes with and positively rotates bevel pinions 15 on the inner ends of the radial spindles 6. The spindles 6 are mounted in bearings 7 and 8 and have chucks 9 on the outer ends thereof as shown by Figures 3 and 4. The foot lever $D^4$ for controlling the intermittent turning movement of the turret A is operatively connected by a bell crank to the lower end of a cushioned stop lever 30 and is provided with a turret accelerating lever 44. (See Figures 5 and 6.)

A pad $63^a$ secured on one side of the foot lever $D^4$ as shown in Figure $5^A$ supplies means for automatically detaching the polished handles from the chucks by which they are held and are rotated in the turret A.

The foot lever $D^4$ is provided on one end with a counterweight 81 by which it is lifted and held in its raised or inoperative position, (that shown in Figure 10). A support 82 limits the downward movement of the counterweight.

The polishing pads 48 and 49 and also the pad 57 by which the ends of the handles B are polished, are mounted each on a sliding head 83, and these heads are arranged to reciprocate on shears or ways 84 in moving the polishing pads into and out of polishing engagement with the handles B. Each of the heads 83 is pivotally connected to one end of a toggle link or lever 85 and the toggle levers 85 are pivotally connected to one end of co-operating toggle levers 86, the other end of the levers 86 being pivotally connected to the shears or ways 84 of the machine. (See Figures 11, 12). Below the turret A and the shears 84 is a second foot lever $D^5$ formed of two parallel bars 87, 88 which are pivotally secured, at an intermediate point in the length thereof, by links 89 to the base C of the machine. The bars 87, 88 are connected at one end by a cross bar 90 which serves as a treadle by which the lever $D^5$ is rocked by the foot of the operator. The other end of the bars 87, 88 is provided with counterweights 91 by which the lever is lifted and held in lifted position, (that shown in Figure 11), when not held in depressed position by the operator's foot. The stops 92 limit the downward movement of the counterweights 91.

The pivotally connected ends of the pairs of toggle links 85, 86 are connected by links 93 to the bars 87, 88 forming the foot lever $D^5$ and to the cross bar 94 which holds the bars 87 and 88 in spaced relation.

In the operation of the machine shown by Figures 1 to 7 rotation of the shaft 11 is started by shifting the driving belt to its fast pulley 16. The rotating shaft, through its bevel gear 14 and the bevel pinions 15, cause the spindles 6 to rotate on the turret A and the turret, by frictional engagement of its hub 3 with the shaft 11 gradually turns on the shaft (in the direction indicated by the arrow in Figure 1) until the stop pin 35 on the upper end of the stop lever 30 is engaged by one of the radial lugs 36 on the side of the turret.

Turning movement of the turret is then prevented until the stop 35 is moved out of engagement with the lugs 36. Whenever the turret A is held against turning movement, two diametrically opposite spindles of the series on the turret will extend horizontally while another will extend vertically downward. A handle B which has been coated is then inserted manually in the chuck 9 on the horizontal spindle at the rear or handle attaching end of the machine. The machine operator, who is stationed on the opposite or polishing end of the machine then treads on the foot lever D and thereby swings the lever 30 to move the stop pin 35 out of engagement with the contacting lug 36 on the turret A. The downward movement of the foot lever D also moves the lever 44 downwardly so as to cause its hook 45 on its upper end to engage the adjacent lug 36 on the turret and, by pulling on this lug, start and accelerate turning movement of the turret on the shaft 11 so as to quickly bring another spindle into position at the rear of the machine, to have a handle attached to the chuck 9 on the end of the spindle. When the operator's foot is removed, the foot lever immediately swings

upwardly and permits the stop lever 30 to swing into operative position.

The foot lever is depressed and released to turn the turret in the manner described to bring the successive spindles 6 into position for attaching the handles B to the chucks 9. When the turret A is brought to rest in position for the insertion of the fifth handle in a chuck 9, the handle first secured to the turret reaches a horizontal position at the front of the machine in which the handle is polished. As this handle moves into such position its outer end is yieldingly engaged by the spring pressed polishing pad 57 on the upper end of the bracket 56 and is thereby polished.

The machine operator then grasps the handles 54, 55 of the pivoted polishing levers 46, 47 and, by moving them toward one another brings the polishing pads 45, 49 into polishing engagement with the periphery of the rapidly rotating handle then positioned between the pads. At the same time the operator rocks the polishing levers 46, 47 toward and away from the turret and in this way causes the polishing pads 48, 49 to move along the length of the rotating handle and rapidly and effectively impart a polish to the coated surfaces of the handle.

The operator sees when the polishing operation is completed and then again presses the foot lever D downwardly and releases it. Such movement of the foot lever causes the turret A to move through another step of its intermittent turning movement and thereby brings another handle into horizontal position between the polishing pads and another spindle 6 into a diametrically opposite horizontal position in readiness for its chuck 9, to receive another coated but unpolished handle.

As the seventh spindle reaches the position at the rear of the machine at which its chuck 9 receives a handle, the handle first attached to the chuck will have reached a position in which it hangs vertically downward between the handle removing pads 61, 62 on the foot lever D. (See Figure 5). When the foot lever D is next depressed the handle then positioned between the pads 61, 62 will be frictionally grasped thereby and will be pulled from the chuck 9 by the downward movement of the foot lever and pads.

In the modified handle removing apparatus of Figure 5A the downwardly extending handle B will be engaged by the pad 63 on the bar 19 of the foot lever D, when this lever is depressed, and will thereby be forced slightly out of axial alinement with the rotary spindle 6 to which it is attached. Moving the handle sidewise in this way makes it rotate axially in a conical path, which causes it to quickly release itself from the holding chuck 9.

The operations as described above will then be repeated, a handle being inserted in a chuck 9 on one side and a rotating handle held by a spindle at the opposite side of the machine, each time the foot lever D is depressed, while the handle held in the downwardly extending spindle at such time will be loosened and will fall from its holding chuck 9.

In the operation of the modified apparatus of Figure 8, but one operator, stationed at the handle applying end of the machine, will be employed who will manipulate the foot lever D and operating valve 73, in addition to attaching the unpolished handles to the chucks 9. The handles B will be detachably connected to the chucks 9 and the step by step movements of the rotatable turret will transfer the handles successively to the opposite end of the machine into position to be polished and move the successively polished handles into downwardly depending position in which they are automatically removed from the chucks in the same way as has been described in connection with the operation of the machine of Figures 1 to 7.

The handles attached to the spindles extend horizontally between the polishing pads 48 and 49 when in position to be polished and when a handle B reaches this position the operator turns the handle 73 of the operating valve to admit fluid pressure to the cylinders 67, 68 and also the cylinder 69. Admission of fluid pressure to the cylinders causes the pistons to move forwardly in the cylinders, thereby compressing the helical springs 70 in the cylinders, and moving the opposite polishing pads 48 and 49 and the pad 57 into polishing engagement with the handle B then between the pads 48, 49.

The polishing pads are held in frictional engagement with the handle long enough to polish the handle.

When a handle B becomes polished the operator manipulates the valve handle 73 to shut off the fluid pressure and open the exhaust side 74 of the valve. The helical springs 70 in the cylinders then move the pistons backwardly so as to retract the polishing pads 48, 49 and 57. When the pads reach their retracted position the operator then treads on the foot lever $D^2$ so as to permit the turret to transfer another handle held thereon into position to be polished, in the manner just described, and the above described operations are repeated in operating the machine of Figure 8. The polished handles as moved by the turret into a downwardly depending position, are automatically removed from the holding chuck 9 in the manner described in connection with the polishing machine of Figures 1 to 7.

The apparatus of Figure 9 is operated in practically the same manner as that of Figure 8, the only substantial difference being in that the cylinder operating valves are

controlled by means of the foot lever $D^3$ which also controls the step by step turning movement of the handle holding turret A. The unpolished handles are attached to the turret and are moved into and held in position to be polished and the polished handles are automatically detached from the chucks in the same way as in the apparatus of Figure 8.

It will be noted, however, that the cylinder controlling valves, being operatively connected to the foot lever $D^3$ are opened and closed by movement of the foot lever. When the foot lever is depressed the stop lever 30 is moved to permit the accelerating arm 44 to move the turret so as to bring a handle into position to be polished and as the foot lever reaches the end of its downward movement the valves on the valve stems 76 are moved so as to admit fluid pressure to the rear ends of the cylinders $67^a$, $68^a$ and $69^a$ and cause the polishing pads 48, 49 and 57 to move into and stay in polishing engagement with the rotating handle B. The foot lever, when released, lifts and thereby turns the valve stems 76 so as to shut off fluid pressure from the cylinders, and open the exhaust outlets $75^a$ on the valve chests 75 and permit the compressed helical springs 70 to expand and thereby move the polishing pads 48, 49 and 57 backwardly into retracted position.

In the operation of the machine of Figures 10, 11 and 12 the turret A is manipulated and the handles B are attached and detached in the same way as in the other machines, the polishing pads 48, 49 and 57 being moved into polishing engagement with the handles by means of the foot lever or treadle $D^5$ and a single operator attaching the handles and operating the turret controlling foot lever $D^4$ and pad operating lever $D^5$. When a rotating handle in the turret A reaches its position between the polishing pads 48, 49 the operator, by treading on the foot lever $D^5$ causes the pairs of toggle levers 85, 86 to advance the polishing pads 48, 49 and 57 into polishing engagement with the handle. When the polishing operation is completed the operator releases the lever $D^5$ and its counterweights 91 lift the lever and through the toggle levers retract the polishing pads 48, 49 and 57. The operator then depresses the other foot lever $D^4$ which moves the stop lever 30 and causes the accelerating lever 44 to move the turret A so as to bring another handle into position and then by releasing the foot lever $D^4$ permits the stop lever to swing into turret holding position.

As the polished handles are moved into position to depend vertically they engage with the pad $63^a$ on the side of the foot lever D and thereby being moved slightly out of alinement with the axis of the spindle to which they are attached, are automatically released from the holding chuck 9.

The advantages of my improved apparatus will be apparent to those skilled in the art. Many modifications may be made in the details of the apparatus without departing from my invention as defined in the appended claims.

I claim—

1. A handle polishing machine comprising an axially rotatable turret having a plurality of handle holding chucks rotatably mounted thereon, means for rotating said chucks on said turret in the handle polishing operations, means for turning said turret axially to move handles held by said chucks into position to be polished, polishing means adapted to be moved into operative engagement with the handles held in polishing position by said turret and means for actuating said polishing means.

2. A handle polishing machine comprising an axially rotatable turret having a plurality of handle holding chucks rotatably mounted thereon, means for rotating said chucks on said turret in the handle polishing operations, means for turning said turret axially to move handles held by said chucks into position to be polished, polishing means adapted to be moved into operative engagement with the handles held in polishing position by said turret, means for actuating said polishing means, and means for detaching the handles after completion of the polishing operation.

3. A polishing machine for polishing tool handles and like articles comprising a supporting structure, a main drive shaft journaled on said structure and adapted to be constantly driven, a turret rotatably mounted on said shaft and adapted to be turned frictionally thereby, means for holding said turret against rotation, manually controlled means for releasing said turret to permit rotation thereof by said drive shaft, a plurality of chucks rotatably mounted on said turret for holding articles being polished, means for rotating said chucks, a plurality of polishing members adapted to operatively engage with articles being polished, and means for holding said polishing means in operative engagement with the articles during the polishing operations.

4. A polishing machine for polishing tool handles and like articles comprising a supporting structure, a main drive shaft journaled on said structure adapted to be constantly driven, a turret rotatably mounted on said shaft and adapted to turn by frictional engagement therewith, means for holding said turret against rotation, manually operated means for releasing said turret to permit rotation thereof by said drive shaft, a plurality of chucks rotatably mounted on said turret for holding articles being pol-

ished, means for rotating said chucks, a plurality of polishing members adapted to operatively engage and polish articles held by said chucks, means for holding said polishing means in engagement with the articles during the polishing operations, and means adapted to automatically remove polished articles from said chucks.

5. A handle polishing machine comprising a supporting structure, a main drive shaft journaled on said structure adapted to be constantly driven, a turret rotatably mounted on said shaft and adapted to turn on said shaft by frictional engagement therewith, a plurality of handle holding chucks mounted on said turret, means for holding said turret against rotation, manually controlled means for releasing said turret to permit rotation thereof by said drive shaft in positioning successive handles to be polished, means for rotating said chucks on said turret, side and end polishing means adapted to engage the side and one end of the handles being polished, means for moving said side polishing means into and out of operative engagement with the side surfaces of said handles, and means for resiliently holding said end polishing means against the end of the handles during the handle polishing operations.

6. A handle polishing machine comprising a supporting structure, a main drive shaft journaled on said structure adapted to be constantly driven, a turret rotatably mounted on said shaft, a plurality of lengthwise radial handle holding chucks rotatably mounted on said turret, means for holding said turret against rotation, means for releasing said turret holding means, means for rotating said chucks, polishing means adapted to be moved into operative engagement with successive handles positioned for polishing by said turret, means for removing polished handles from said chucks, and a foot lever adapted to operate the means for releasing said holding means and said handle removing means.

7. A handle polishing machine comprising a supporting structure, a main drive shaft journaled on said structure and adapted to be constantly driven, a turret mounted on said shaft and having frictional engagement therewith, a plurality of handle holding chucks rotatably mounted on said turret, means for rotating said chucks during the operation of said machine and means for polishing said handles, said means comprising a pair of said polishing pads and an end polishing pad, said end polishing pad being resiliently mounted for automatically engaging the ends of said handles and said side polishing pads being provided with means for moving them into and out of engagement with the side surfaces of said handles.

8. A polishing machine for polishing tool handles and like articles, comprising a supporting structure, a main drive shaft journaled on said structure adapted to be constantly driven, a turret rotatably mounted on said shaft and having frictional engagement therewith, a plurality of radially disposed spindles mounted in said turret, an article holding chuck mounted on the outer end of each of said spindles, a bevel pinion secured to the inner end of each of said spindles, a bevel drive gear mounted on said drive shaft and meshing with said bevel pinions to simultaneously rotate said spindles and article holding chucks in operating the machine, a plurality of polishing members, means for moving said members into engagement with the articles in said chucks and means for holding said turret stationary while said polishing members are in operative engagement with an article.

9. A polishing machine for polishing tool handles and like articles comprising a supporting structure, a main drive shaft journaled on said structure and adapted to be constantly driven, a turret rotatably mounted on said drive shaft and having frictional engagement therewith, a plurality of radially disposed spindles mounted in said turret, a chuck mounted on the outer end of each of said spindles, a bevel pinion secured to the inner end of each of said spindles, a bevel drive gear mounted on said drive shaft and meshing with said pinions to simultaneously rotate said spindles and article holding chucks, a plurality of polishing members, means for stopping and locking the turret against rotation when turned to locate an article in polishing position, means for moving said polishing members into engagement with the article to be polished, and means for removing the polished articles from said chucks.

In testimony whereof I have hereunto signed my name.

LOUIS V. BLUE.