N. F. FRETTER.

TOOL FOR CUTTING TUBES AND THE LIKE.

APPLICATION FILED APR. 29, 1918.

1,348,636.

Patented Aug. 3, 1920.

3 SHEETS—SHEET 1.

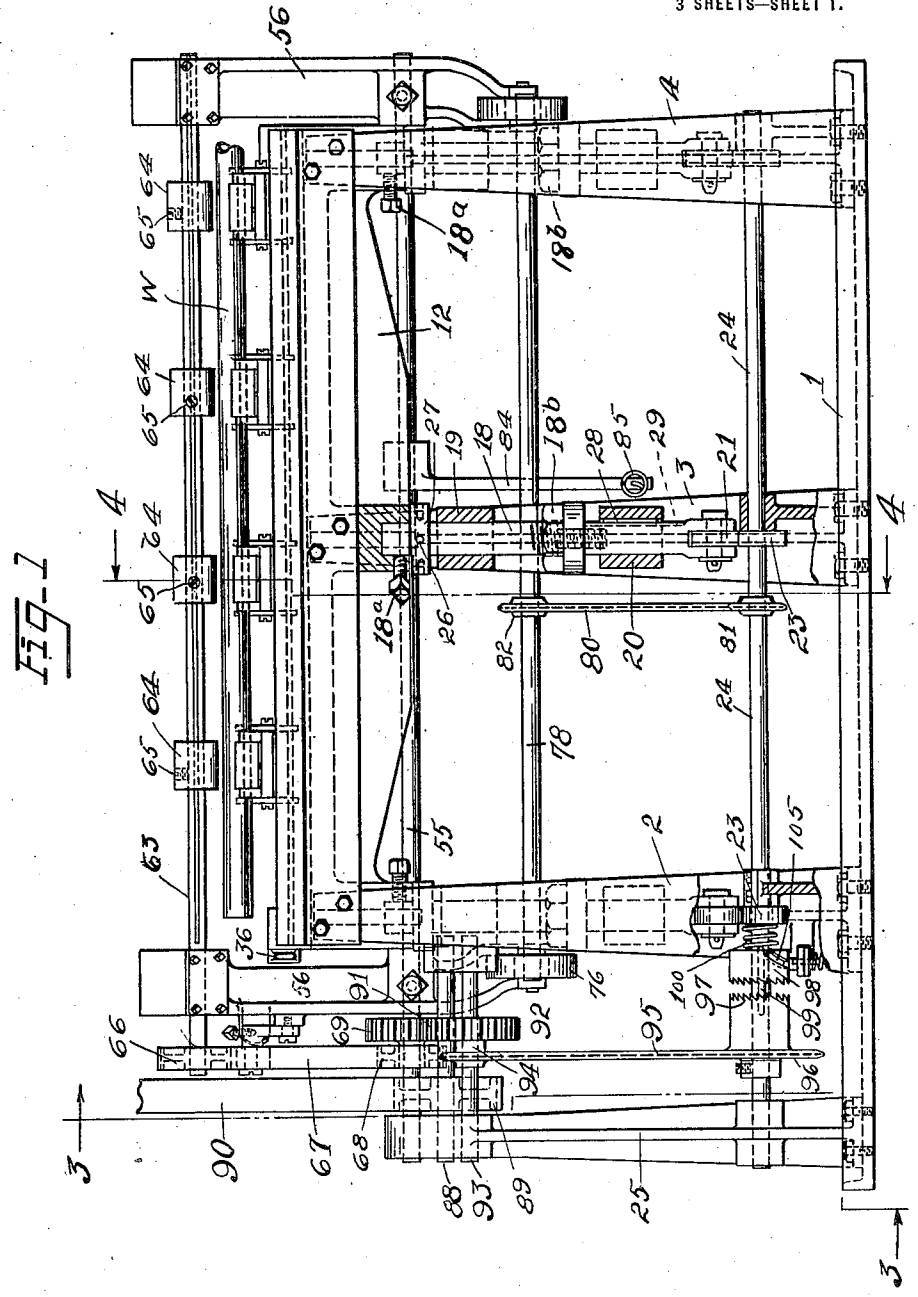


Fig. 1

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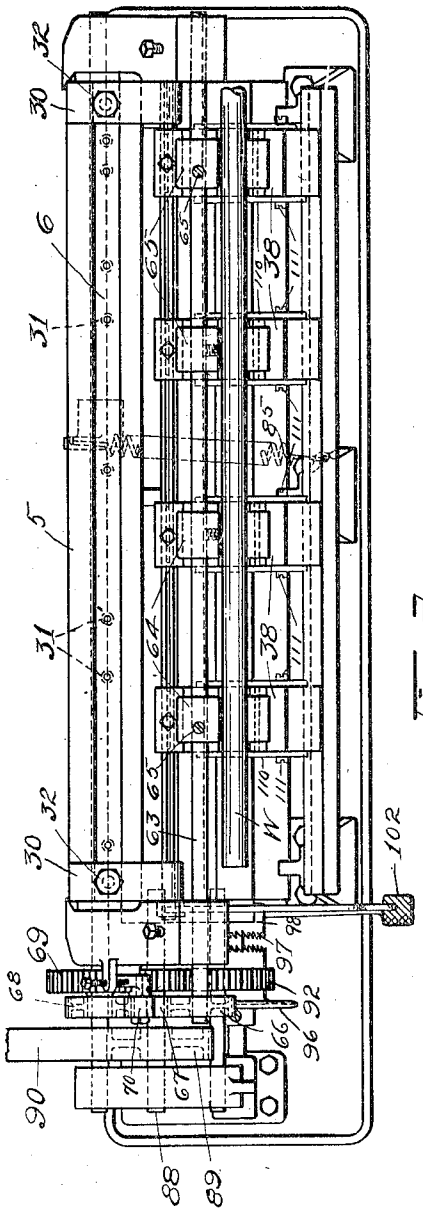


Fig. 2

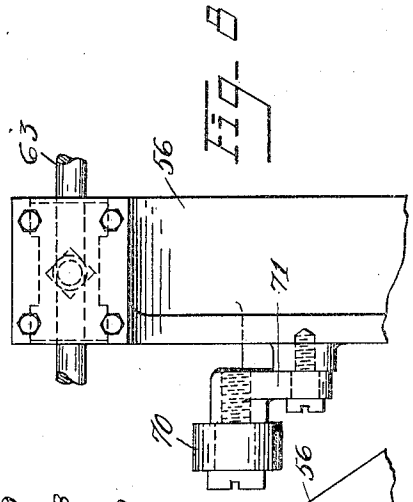


Fig. 8

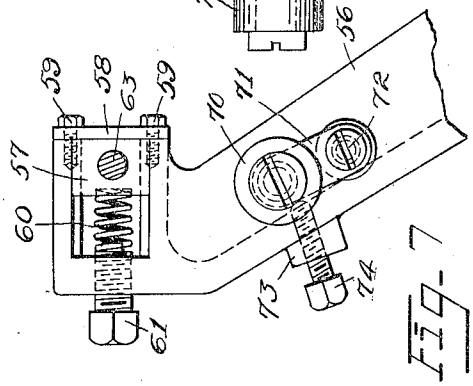


Fig. 7

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3 SHEETS—SHEET 3.

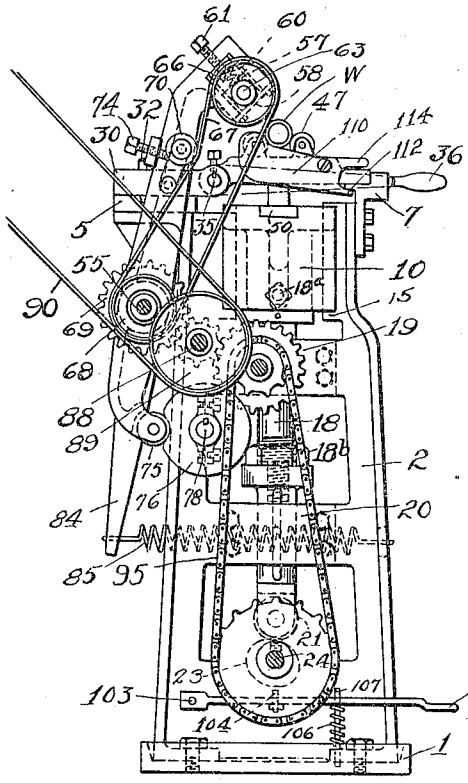


Fig. 3

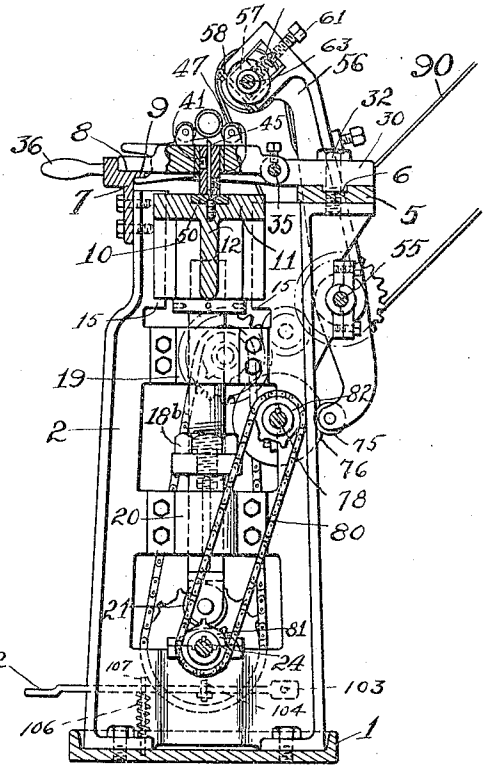


Fig. 4

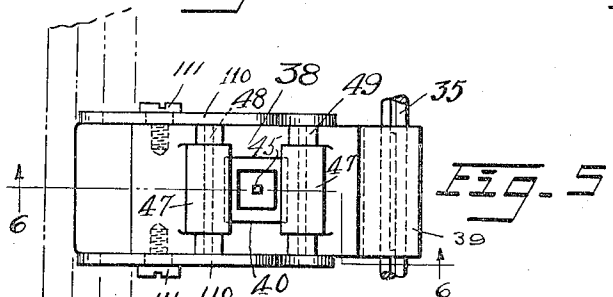


Fig. 5

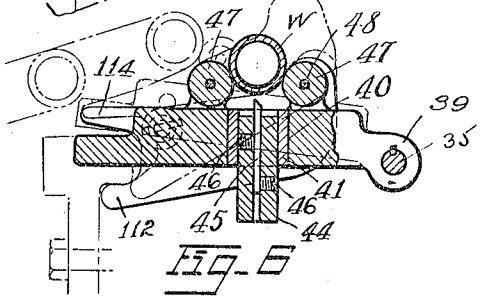


Fig. 6

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UNITED STATES PATENT OFFICE.

NATHAN F. FRETTER, OF CLEVELAND, OHIO.

TOOL FOR CUTTING TUBES AND THE LIKE.

1,348,636. Specification of Letters Patent. Patented Aug. 3, 1920.

Application filed April 29, 1918. Serial No. 231,525.

To all whom it may concern:

Be it known that I, NATHAN F. FRETTER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Tools for Cutting Tubes and the like, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to improvements in cut-off machines of the general character disclosed in my former application, Serial No. 174,459, and which have as their purpose the cutting of tubes, bar stock or the like into pieces of desired lengths, a particular instance of their use being found in the cutting of bushings from tubes.

The fundamental difference between my present machine and that constituting the subject matter of my former application above referred to, is that, in the present instance, I use what are known as cutting tools, whereas in the former, I employed rotary, or disk, cutters. In cutting a tube with a disk or rotary cutter, the several edges are cut on an angle—or are beveled so to speak—corresponding to the shape of the cutter; and furthermore the edges are peened inward by the action of the cutter, making it necessary to subsequently square-off the ends of the bushings before they are ready for use. These results do not occur when using the present type of tool.

Therefore, the present invention may be said to have as its primary object the production of a machine for cutting tubes or the like into pieces having ends in planes at right angles to their longitudinal axes and without their edges being peened inward.

Further objects are to provide a machine of the above nature that is adjustable to adapt it to the cutting of tubes or bars of different diameters; that is adjustable or produce pieces of different lengths; wherein the depth of cut of the tool may be regulated for the different speeds resulting from the changing radius of the surface being cut; that is convenient of operation and comparatively simple of construction; and which may be readily supplied with a greater or less number of tools and associated work supports, thereby to alter the capacity of the machine.

A further object is to provide the machine with a novel throw-off mechanism for discharging the cut pieces from the front of the machine.

The foregoing objects, and others which will become apparent as this description proceeds, are attained in the machine illustrated in the drawings accompanying and forming a part hereof, and wherein Figure 1 is a front elevation of the machine, parts being broken away to reveal certain structural features; Fig. 2 is a plan view of the machine; Fig. 3 a sectional left hand end elevation, the plane of section being indicated by the line 3—3 of Fig. 1; Fig. 4 is a section on the lines 4—4 of Fig. 1 looking in the direction of the arrows; Fig. 5 is an enlarged plan view of a work support and ejector; Fig. 6 is a section on the line 6—6 of Fig. 5; and Figs. 7 and 8 are details of the upper end of one of the rocker arms which support the work rotating shaft.

The frame of the machine consists of a base 1, and standards 2, 3 and 4 which rise therefrom and are connected at their upper ends, at the rear, by a top plate 5 having a longitudinal groove 6 in its upper surface, and, at the front, by a member 7 that is formed to provide a ledge 8 terminating at its rear edge in a lip 9.

What I shall term a table 10 is mounted for vertical movement within the upper ends of the standards 2, 3 and 4. This table consists of a top 11, braced longitudinally by a central depending flange 12, and provided in the plane of each standard with a transverse web having its front and rear edges of channel formation to provide guideways that are slidable along the opposed guides 15 of the adjacent standard.

A plunger, 18, shown as composed of an upper and a lower section that are screw threaded together to provide an adjustment of its length, is guided within vertically disposed bearings 19 and 20 of each standard 2, 3 and 4. The upper end of each plunger is swiveled within the table 10, while its lower end is provided with a roller 21 arranged to transverse the periphery of one of a series of cams 23 that are secured to a shaft 24 journaled in the standards 2, 3 and 4, and projecting a distance beyond the former where its end is supported in a bracket 25, that rises from the base 1. The upper section of each plunger 18 may be turned by means of a suitable instrument adapted to be inserted in the holes 26 of a

flange 27 that constitutes a part of the upper section and is located immediately below the table; while the lower section is held against turning, and with its roller 21 in proper relation to the respective cam 23, by a key 28 carried by a lower bearing 20, and occupying a key-way 29 in the lower section of the plunger. The upper section may be held against turning with respect to the table, by a set screw 18^a; and with respect to the lower section, by means of a nut 18^b.

Brackets 30 will be observed in Figs. 2 and 4, as being located adjacent the ends of the top plate 5, although they are adapted to be shifted therealong to various positions according to the location of holes 31 which are designed to receive the cap screws 32 whereby the brackets are secured to the top plate, each bracket having a tongue that fits within the groove 6 to hold the bracket against turning. A shaft 35, which I shall term the ejector shaft, is journaled within the brackets 30, and at its left hand end is equipped with an operating handle 36 by means of which it may be rocked.

Work holders 38 are distributed along the top of the machine and each comprises a frame having a hollow boss 39 at its rear end that is splined to the ejector shaft 35, and having its forward end resting upon the ledge 8. Within a central and preferably square aperture 40, of the frame is a bushing 41, and a tool holder 44 is reciprocable with the bushing and supports a tool 45, the same being adjustable within the holder and adapted to be held in any adjusted position by the screws 46. Work supporting rollers 47 are situated in front and to the rear, of the aperture 40, and are journaled upon pintles 48, supported by ears 49 that rise from the frame. These rollers serve to sustain a tube or other article to be cut in proper relation to the tool. The tool holders rest upon the table top, where the latter is provided with a hardened insert 50 in the form of a strip extending throughout the length of the table, and are raised and lowered by the vertical reciprocation of the table as will be hereinafter explained.

The work is held down into contact with the work supporting rollers 47 in opposition to any lifting tendency of the tools, by means which I shall now describe.

A rock shaft 55 is journaled within the upper rear portions of the standards 2, 3 and 4, and in the upper end of the bracket 25, and outside each of the end standards this shaft has fixed to it a rocker arm 56. The upper end or head of each arm is constructed in the form of a guide within which a bearing block 57 is slidable, the same being retained against withdrawal from the guide by a plate 58 that is secured to the open end of the head by screws 59. A compression spring 60, interposed between the bearing block 57 and an adjusting screw 61, that is threaded through an opposed portion of the head, tends to hold the bearing block at the outer end of the guide. A work rotating shaft 63 is journaled within the bearing blocks 57, and carries rollers 64 that are splined to the shaft and adapted to be locked thereto by screws 65, one above each of the work holders 38. The left hand end of the work rotating shaft is equipped with a pulley 66 that is driven, through a belt 67, from a pulley 68 that is fixed to a gear 69, loosely mounted on the before mentioned rock shaft 55. The tension of the belt 67 may be adjusted by a tightener comprising a roller 70 that bears upon the belt and is carried by the free end of an arm 71, pivoted at 72 to the side of the adjacent arm 56, said arm having also a lug 73 through which an adjusting screw 74 is threaded for contact with the free end of the arm 71, thereby to rock it upon its pivot and adjust the pressure of the roller 70 upon the belt. The lower ends of the rocker arms 56 carry rollers 75 which engage cams 76 that are keyed, or otherwise secured, to the ends of a shaft 78 that is journaled within the standards 2, 3 and 4. A driving connection is provided between shafts 78 and 24 by a chain 80 that is engaged over the sprockets 81 and 82, secured to the respective shafts 24 and 78. An arm 84 is fastened to the rock shaft 55, the same being shown as located to the right of the standard 3. The lower end of the arm has connected to it one end of spring 85, while the opposite end of the spring is anchored to the front of the standard 3, as shown in Figs. 2 and 3. Thus the spring 85 tends to rock the shaft 55 in a direction to engage the rollers 75, carried to the lower end of the rocker arms 56, with the cams 76 and remove the rollers 64 from the work.

Power is introduced into the machine through a shaft 88 that has its ends journaled within the upper end of the bracket 25 and an opposed portion of the standard 2, the shaft being shown, in the present embodiment of my invention, as equipped with a pulley 89 over which a driving belt 90 is engaged. The shaft 88 has secured to it a pinion 91 which meshes with the aforesaid gear 69, and also with a gear 92 that is carried by a shaft 93, journaled in opposed bearings of the brackets 25 and standard 2, and the gear 92 has fixed to it a sprocket wheel 94 over which a chain 95 is engaged, said chain also passing about a sprocket wheel 96, loose upon the shaft 24. The hub of the sprocket wheel 96 is provided with a clutch face 97 wherewith the complementary face of a clutch member 96 is adapted to be engaged, the clutch member being splined to the shaft 24, as indicated at 99. A spring 100, that is compressed between the rear face

of the clutch member 98 and an abutment provided by the adjacent cam 23, tends to force the clutch member toward the clutch face of the sprocket wheel. A foot lever or pedal 102 is pivoted at 103 to the standard 2 and projects forwardly beneath the clutch member, the pedal having a projection 104 adapted to enter an inclined slot 105 of the clutch member, when the pedal is elevated by a spring 106, compressed between the pedal and the base 1, and mounted upon a post 107 that rises from the base and extends through an aperture in the pedal, thereby to constitute a guide to hold the pedal against lateral movement.

From the foregoing description the operation of the machine will be readily understood. A tube or other piece of work, indicated at W, may be placed upon the supporting rollers of the work holders, and the foot lever or pedal 102 depressed to disengage the projection 104 from the slot of the clutch member 98, allowing the spring 100 to engage the clutch member with the rotating sprocket wheel 96, thereby to impart rotation to the shaft 24. As this shaft is rotated, its motion will be transmitted through the chain 80 to the shaft 78 and thereby revolve the cams 76 to swing the rocker arms 56 in a direction to depress the rollers 64 into contact with the work W to hold the work down upon the work supporting rollers, the springs 60 yielding to permit the rollers to adapt themselves to the diameter of the work. The shaft 63, with its rollers 64, is rotated through the belt 67 and gearing previously set out, thereby to cause the work to be rotated; and as it is rotated, the tool will be raised into cutting contact with the work through the elevation of the table occasioned by the rotation of the cams 23.

It may be explained that the pedal 102 is promptly released after its depression so that the projection 104 will engage the periphery of the clutch member and enter the inclined slot 105 when the latter is brought into register with the projection, and because of the inclination of the slot, the clutch member will be withdrawn from engagement with the clutch face of the sprocket wheel 96 and the operation of the machine will cease, except for the constantly driven parts geared directly to the drive shaft 88.

I have previously referred to the ejector shaft 35 to which the work holders 38 are splined, and which is equipped with the operating handle 36. It is obvious that by lifting the handle 36, the shaft will be rocked in a direction to lift the forward ends of the work holders from the ledge 8. This would tend to throw the pieces of work toward the rear of the machine. In order to direct the cut pieces toward the front (where they may be caught by any suitable chute or receiver, not shown) I provide ejector plates 110 that are pivoted upon screws 111, threaded into the sides of the frames of the work holders near their forward ends, the plates having projections 112 which engage beneath the lip 9 of the member 7. It will be seen from this that when the ejector shaft is rocked as above described, the ejector plates 110 will be swung in a direction reverse to that of the work holders, as indicated in dot and dash lines in Fig. 6 so that the work will be thrown forward off the work supporting rollers and allowed to ride downward along the plates and toward the front of the machine, the plates having extensions 114 for carrying the work substantially clear of the work holders.

It is obvious from the construction herein described that the work is rotated continually at the same speed, while upon reflection it will be appreciated that the speed of the surface whereon the tool is operated is gradually growing less by reason of the ever-changing or lessening radius of the cut portion of the work. To obtain the best results, the advancement of the tool should be accordingly increased so that its speed of penetration will always bear a substantially fixed relation to the surface speed of the work and maximum cutting capacity of tool. This result is accomplished by making the cams 23 of a shape that will elevate the table, and consequently the tools, at a gradually increasing speed.

Having thus described my invention, what I claim is:—

1. In a machine of the character set forth, the combination of a work support, a tool, one of said elements being movable toward and from the other, means for obtaining such movement, driving means shiftable into engagement with the work for moving it with respect to the tool, thereby to cause the tool to operate on the work, and means operating automatically for shifting the driving means.

2. In a machine of the character set forth, the combination of a work support, a tool, one of said elements being movable toward and from the other, means for obtaining such movement, yielding driving means shiftable into engagement with the work for moving it with respect to the tool, thereby to cause the tool to operate upon the work, and means operating automatically for shifting the driving means.

3. In a machine of the character set forth, the combination of a work support, a tool, one of said elements being movable toward and from the other, means for obtaining such movement, driving means shiftable into engagement with the work, and mechanism for obtaining movement of one toward the other of the tool and work and for automatically engaging the driving means with

the work for moving it with respect to the tool, thereby to cause the tool to operate on the work.

4. In a machine of the character set forth, the combination of passive means for supporting a piece of work for free movement, a tool, one of said elements being movable toward and from the other, a driving member adapted to be brought into engagement with the work for moving it on the supporting means, mechanism operating automatically for obtaining movement one toward the other of the tool and work supporting means, and means for engaging the driving member with the work.

5. In a machine of the character set forth, the combination of passive work supporting rollers, a tool, one of said elements being movable toward and from the other, driving means adapted to be brought into engagement with the work for rotating it as it rests upon the supporting rollers, mechanism operating automatically for obtaining movement of one toward the other of the tool and work, and mechanism for moving the driving means into contact with the work.

6. In a machine of the character set forth, the combination of passive work supporting rollers, a tool movable along a straight course and in a plane between and perpendicular to the axes of the rollers toward and from the work supported thereby, means for so moving the tool, and driving means for engaging the work to rotate it.

7. In a machine of the character set forth, the combination of a frame, a work rest surmounting the frame, a table movable within the frame toward and from the rest, a tool sustained by the table in operative relation to work supported by the rest, means adapted to be brought into engagement with the work to retain it against the rest while being acted upon by the tool, and mechanism for moving the aforesaid table and for actuating the work retaining means.

8. In a machine of the character set forth, the combination of a frame, a work rest surmounting the frame, a table movable vertically within the frame beneath the rest, a tool sustained by the table in operative relation to work upon the rest, a rocking element pivotally sustained by the frame adapted to be swung into engagement with the work upon the rest, a cam, operative connections between the cam and table for elevating the same upon the rotation of the cam, a cam for actuating the rocking element, and driving mechanism for the cams.

9. In a machine of the character set forth, the combination of a frame, a work rest surmounting the same, a table movable vertically within the frame beneath the rest, a tool sustained by the table in operative relation to the work upon the rest, a roller carrying shaft that is movable toward and from the work, means for driving the shaft, means for moving the shaft toward and from the work, and mechanism for elevating the table to present the tool to the work.

10. In a machine of the character set forth, the combination of a frame, a table movable vertically within the frame, a plurality of work supports sustained by the frame above the table and adjustable therealong, tool holders guided within said supports and resting upon the table, a rocking element pivotally supported by the frame, a shaft sustained thereby, rollers carried by the shaft for engagement with the work when the tilting element is actuated, and mechanism for tilting said element to engage the rollers with the work and for elevating the table thereby to project the tool holders in operative relation to the work.

11. In a machine of the character set forth, the combination of a main frame, a plurality of work supporting frames adjustable along the top of the main frame, work sustaining rollers carried by the supporting frames, a table situated beneath the work supporting frame and movable vertically within the main frame, tool holders guided within the work supporting frames and resting upon the table, a shaft, cams thereon, operative connections between the cams and table, a tilting element, a shaft yieldingly supported thereby, rollers carried by said shaft and arranged for engagement with the work when the element is tilted, cams for tilting said element to present the last mentioned rollers to the work, a shaft whereon said cams are mounted, and means for driving the aforesaid shafts.

12. In a machine of the character set forth, the combination of a frame, work supports surmounting the frame and arranged to support work for free rotation thereon, tools sustained by the frame in operative relation to the work, means for moving the tools toward and from the work, a shaft journaled within the frame, arms secured to said shaft in spaced relation to each other, a shaft supported by the free ends of said arms, rollers on said shaft, a driving element supported upon the first mentioned shaft, driving connections between said element and the second mentioned shaft, cams for rocking the aforesaid arms in a direction to present the rollers to the work, and means tending to move the arms in opposition to said cams.

13. In a machine of the character set forth, the combination of a work support, a tool, one of said elements being movable toward and from the other, means for obtaining such movement, further means for moving the work upon the support thereby to create relative movement between the work and tool so that the tool will operate upon the work, means for moving the support beyond

the limit of movement of the tool, and ejector mechanism actuated by such movement of the support for throwing the work off the support.

14. In a machine of the character set forth, the combination of work supporting rollers adapted to be sustained at a given elevation, a tool movable in a plane between and perpendicular to the axes of the rollers toward and from the work supported thereby, means for so moving the tool, means for moving the supporting rollers beyond the limit of movement of the tool, and ejector mechanism actuated by such movement of the rollers for throwing the work off the rollers.

15. In a machine of the character set forth, the combination of a work support, a tool arranged to operate upon work supported thereby, an ejector element pivoted to said support and normally reposing below the work supporting surface thereof, means for elevating the work support, and means preventing the elevation of one end of the ejector element wherefore it will be caused to rock upon an elevation of the support and remove a piece of work from the support.

16. In a machine of the character set forth, the combination of a work supporting frame, work sustaining rollers carried thereby, a rock shaft to which said frame is fixed against rotary movement, a ledge whereon the free end of the frame normally rests, a tool arranged to operate upon the work supported by said rollers, an ejector plate pivotally connected to the aforesaid frame and normally reposing below the work supporting surfaces of the rollers, said plate having a projection extending beneath the aforesaid ledge, and means for rocking the aforesaid shaft to tilt the frame and thus swing the ejector plate to remove a piece of work from the roller.

17. In a machine of the character set forth, the combination of means for supporting a piece of work for free rotation, a tool, one of said elements being movable toward and from the other, means for rotating the work on the supporting means, and mechanism for moving with gradually diminishing speed one toward the other of the tool and work supporting means.

18. In a machine of the character set forth, the combination of a work rest whereon a piece of work is adapted to be supported for free rotation, means for rotating the work at a substantially constant speed, a tool movable in operative relation to work upon the rest, and mechanism for moving the tool into operative relation to the work at a gradually increasing speed.

19. In a machine of the character set forth, the combination of means for supporting a piece of work for free rotation, means for rotating the work at a substantially constant speed, a tool movable into cutting engagement with work sustained by the supporting means, and a cam for so moving the tool, said cam being so shaped as to move the tool with gradually increasing speed.

20. In a machine of the character set forth, the combination of a frame, a work rest surmounting the frame, and whereon a piece of work is adapted to be supported for free rotation, means for rotating the work at a substantially constant speed, a table movable vertically within the frame beneath the rest, a tool sustained by the table in operative relation to work upon the rest, a cam, and operative connections between the cam and table for elevating the same upon the rotation of the cam, the cam being so shaped as to move the table with a gradually increasing speed.

21. In a machine of the character set forth, the combination of a work rest whereon a piece of work is adapted to be supported for free rotation, means for rotating the work at a substantially constant speed, a tool movable in operative relation to the work upon the rest, and mechanism for moving the tool with variable speed into operative relation to the work.

22. In a machine of the character set forth, the combination of a frame, a work rest surmounting the frame, a table movable vertically within the frame beneath the rest, a tool sustained by the table in operative relation to the work upon the rest, a work rotating device that is movable toward and from the work, means for driving said device, means for moving the device toward and from the work, and mechanism for elevating the table to present the tool to the work.

23. In a machine of the character set forth, the combination of a work support, a tool, one of said elements being movable toward and from the other, means for obtaining such movement, further means for moving the work upon the support thereby to create relative movement between the work and tool so that the tool will operate upon the work, and means for moving the support beyond the limit of the tool.

24. In a machine of the character set forth, the combination of a work support, a tool, one of said elements being movable toward and from the other, means for obtaining such movement, further means for moving the work upon the support thereby to create relative movement between the work and tool so that the tool will operate upon the work, and ejector mechanism for throwing the work off the support.

In testimony whereof, I hereunto affix my signature.

NATHAN F. FRETTER.