April 10, 1928. 1,665,823

J. W. SMITH

METHOD AND APPARATUS FOR FEEDING ROTATING DISK FORMING MACHINES

Original Filed May 24, 1923 2 Sheets-Sheet 1

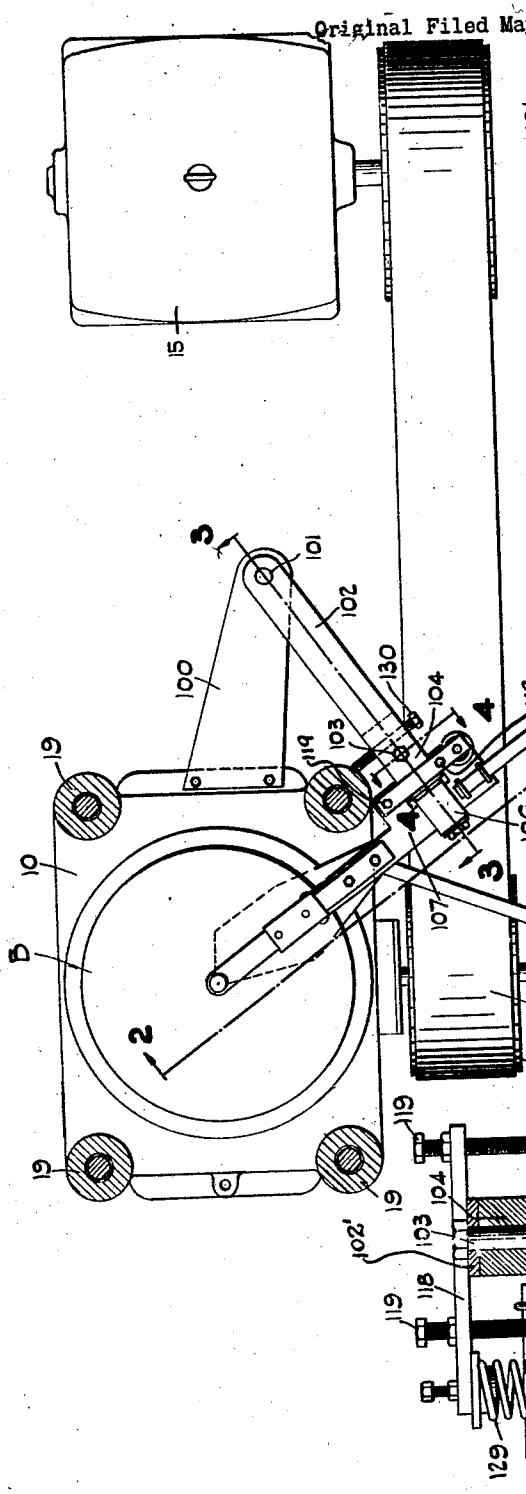


FIG. 1

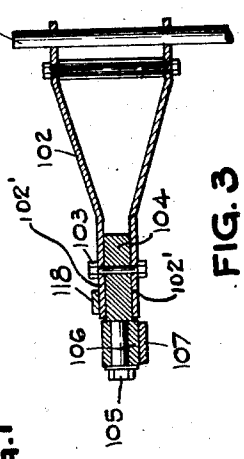


FIG. 3

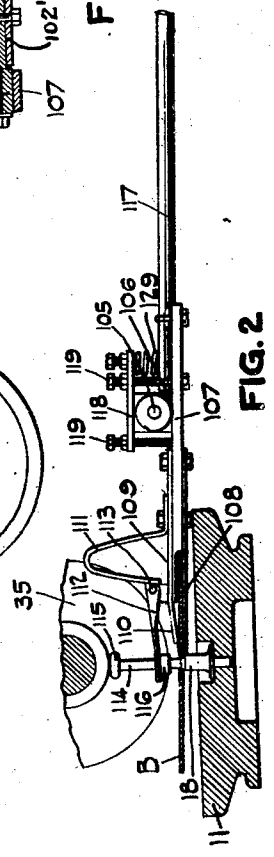


FIG. 2



FIG. 4

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METHOD AND APPARATUS FOR FEEDING ROTATING DISK FORMING MACHINES

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FIG. 5

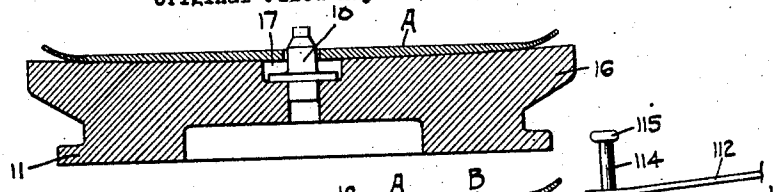



FIG. 6

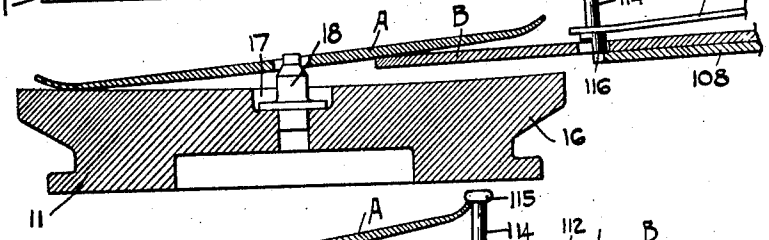



FIG. 7

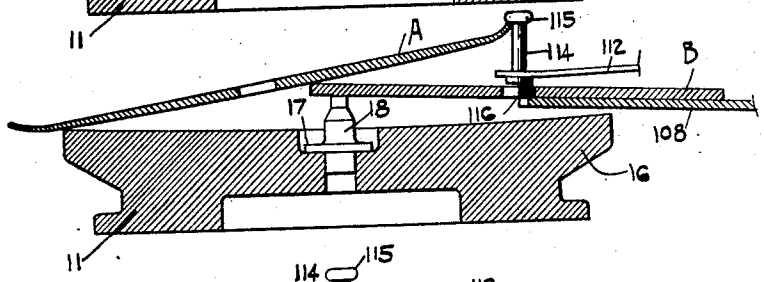



FIG. 8

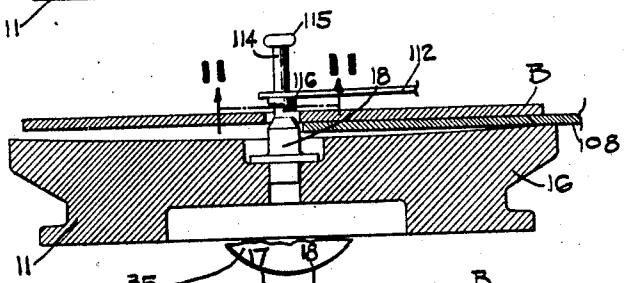
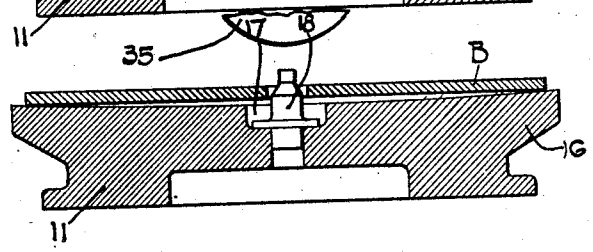



FIG. 9



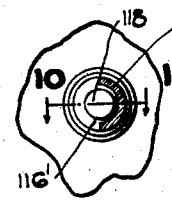
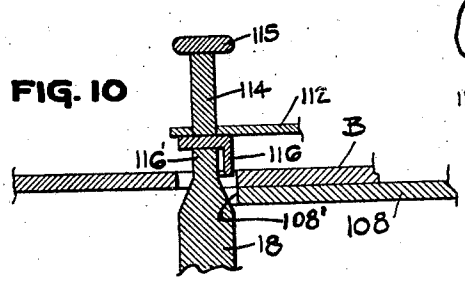




FIG. 11

FIG. 10




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Patented Apr. 10, 1928.

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# UNITED STATES PATENT OFFICE.

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## METHOD AND APPARATUS FOR FEEDING ROTATING DISK-FORMING MACHINES.

Original application filed May 24, 1923, Serial No. 641,240. Divided and this application filed March 2, 1925. Serial No. 12,631.

The rolling mill feeding device of my invention which primarily relates to feeding flat plate blanks to a machine for rolling metallic disks was the subject of my application, Serial No. 641,240, filed May 24, 1923. This application is a division of that application, in which the feeding device was first disclosed. While specifically related to this machine and of a type adapted for the feeding of flat disk or plate-like blanks to a machine making tapered wheel disks, while the working elements of the machine are in rotation, the apparatus contains a number of fundamental features which will be found of utility in connection in other fields than the making of tapered wheel disks. Indeed, the apparatus but carries out a fundamental method of my invention. The method is applicable in general to the feeding to a determinate working position of any blanks which are to be worked upon through their rotation.

In general, the method consists in establishing a blank to be fed upon a feeding position laterally of the working position desired, relatively moving the feeding and working positions into substantial coincidence, and thereupon setting up the working rotation of the blank as a result of such movement. Other features in the method consist in establishing the feeding position in a plane axially disposed from the working position, then relatively moving the feeding and working positions to axial coincidence, and thereafter relatively moving them axially into full or plane coincidence. The blank in feeding position is held in a non-rotating position and as a result of movement into working position is set into rotation during work upon a blank. Its periphery is worked upon to provide an axial inclination thereof. The feeding mechanism engages a blank to remove it through this inclination. In general, this inclination amounts to a displacement of the periphery of the worked blank. Specifically, I engage the worked blank by injecting the blank being fed beneath the displaced periphery and thereupon exerting first an axial thrust and then a lateral thrust upon the worked blank.

The apparatus by means of which this method is carried out is possessed in common with the method of a number of advantages. Machines for making tapered wheel disks very commonly comprise a rotating working element associated with a determinate working axis upon which the work being operated upon is rotated. Either the working element or the axis, or both, are maintained continuously in rotation. By this method and apparatus the blanks can be fed to and from the rotatable working element without stopping rotation of either the element or the working axis. In carrying out the method I establish the feeding position laterally of the working axis by locating there a blank supporting and centering means. I provide guiding means for this blank centering and supporting means pre-establishing a path of movement laterally toward and from the working axis, and axially along that axis. This guiding means through stops or equivalents associated with or embodied in the guiding means terminates the path of lateral movement with the parts in axial coincidence and through such devices inhibit the axial movement to a fixed degree. The blank centering means is constituted a releasable locking device to hold the blank being fed or removed upon the support. There is provided a releasing means operated when the blank centering means has been moved to axial coincidence to release the blank from the support. The working rolls engage the released blank and effect its rotation. The blank support is made relatively thin and with the blank being fed can be inter-leaved between the rotatable working element and the blank worked upon to impart the axial and lateral movements necessary to removal.

Numerous other features of my method and apparatus contribute to their advantage and refinement. These points will be disclosed in the following specification and drawings.

The drawings delineate that form of my apparatus best known to me when I filed my application recited above.

Of the drawings, Fig. 1 is a plan view

of the apparatus showing the base and rotatable platen of the machine in the parent application.

Fig. 2 is a vertical, sectional elevation of a portion of this apparatus showing the rotatable platen or working element in vertical section on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section of a supporting arm of the apparatus taken on line 3—3 of Fig. 1.

Fig. 4 is a vertical section taken substantially on line 4—4 of Fig. 1.

Figs. 5 to 9 are vertical, central sections of the rotatable platen or working element and the blank supporting and centering means showing blanks in various positions of the blank feeding and removing operations and the parts in corresponding relation.

Fig. 10 is an enlarged central vertical section of the parts as illustrated in Fig. 8 taken substantially on line 10—10 of Fig. 11.

Fig. 11 is a transverse section and in approximate horizontal plane of the blank centering means in the position shown in Fig. 8 and line 11—11 thereof.

A disk placed upon continuously rotating table 11 is rolled and spun to tapered form by radially traversed rolls 35. Figs. 2 and 9.

In this embodiment of my invention, the feeding device consists of an arm, 102, pivoted, at 101, to a bracket, 100, projecting from the base, 10, of the machine. A block, 104, is journaled on a vertical pin, 103, at the end of the arm, 102, and this block carries a horizontal stud, 105, on which is journaled a block, 106, which is fastened to a lever, 107. A blank-supporting plate, 108, is fastened to the forward end of this lever and is shaped having a concave recess, 108′, at its end, to fit the centering stud, 18, of the table, 11. This plate is adapted to support a blank to be rolled, as shown in Fig. 10. A strip, 109, is fastened to the upper surface of the lever, 107, and has its end bent downwardly toward the plate, 108, so as to yieldingly engage the upper surface of a blank supported on said plate. The blank supported by said plate is held centered with respect thereto by means of an arm, 112, which is pivoted, at 113, to a bracket carried by the lever, 107, and which carries a rod, 114, at its free end, having an enlarged collar, 116, at its lower end, adapted to fit in a central opening formed in the blank. This rod has a handle, 115, and it is held yieldingly in position by a spring, 111, which engages the member, 112, at the hinge joint, 113. A handle, 117, is fastened to the lever, 107, by means of which the device may be tilted and swung from one side to the other, as may be necessary in ejecting a finished disk and feeding a new blank to the machine. A strip, 118, which is fastened to the arm, 102, carries two set screws, 119, which contact with the lever, 107, and limit its tilting movement about the stud, 105. A spring, 129, interposed between the plate, 118, and the lever, 107, serves to help counterbalance the weight of the blank supported in the device so as to make it easier to manipulate. A set screw, 130, carried by arm, 102, engages one of the columns, 19, of the machine and limits the swinging movement of the device, about the pivot, 101, toward the machine. This set screw may be so set that the swinging movement will be stopped when the rod, 114, is in line with the centering stud, 18, in which position the new blank may be discharged from the device and deposited upon the rotating table, 11.

While the rolls, 35, are operating upon a blank placed upon the table, 11, to increase its diameter and reduce its thickness by a combined spinning and rolling action, the operator places a new blank upon the feeding device, which has been swung to one side. The blank, B, rests upon the supporting plate, 108, and extends between said plate and the strip, 110, which yieldingly engages the upper surface of the blank. The blank is so located upon the plate that the notch, 108′, at the end of the supporting plate, is in line with an opening formed in the center of the blank. After the blank has been placed in proper position on the supporting plate, the arm, 112 is swung down so that the collar, 116, on the lower end of the rod, 114, enters the central opening in the blank and cooperates with the notched end, 108′, of the supporting plate to hold the blank centered. The collar, 116, is cut away, at 116′, on the side opposite from the end of the lever, 107, for a purpose which will presently appear. The blank is positioned upon the supporting plate of the feeding device in the manner thus described, while the machine is operating to roll out a blank which has previously been placed upon the table. The rolling operation raises its periphery (see Fig. 5). As soon as the rolling operation has terminated and the rolls, 35, rise from the table, 11, the operator swings the feeding device carrying a new blank toward the table to eject the rolled disk, A, and deposit the blank, B, in working position upon the rotating table. The operation of ejecting a rolled disk and feeding a blank to the table is shown very clearly in Figs. 5 to 9 inclusive. Fig. 5 shows the rotating table, 11, with a rolled disk, A, thereon. Fig. 6 illustrates the beginning of the operation of ejecting the rolled disk. The edge of a blank, B, mounted on the feeding device, is inserted between the table, 11, and the raised periphery of disk, A, and may be shoved between these two parts until the rod, 114, of the feeding device, engages the periphery of the disk, A. With the blank, B,

in this position, the operator may pry the disk, A, from the table by tilting the lever, 107, about the horizontal stud, 105. This serves to lift the disk, A, so that the central opening in such disk clears the centering stud, 18, of the table. The operator continues to move the feeding device so as to bring the central opening of the blank, B, into line with the centering stud, 18, of the table and, since the periphery of the rolled disk, A, is engaged by the rod, 114, of the collar, 116, carried by it, this movement of the feeding device forces the rolled disk, A, from the table and discharges it from the opposite side thereof, at the same time that the blank, B, is centered with respect to the table. This operation is clearly illustrated in Fig. 7. When the blank has been brought to centered position, the notch, 108′, of the supporting plate, 108, engages the centering stud, 18, of the table and by tilting the lever, 107, the blank is allowed to drop to working position on the table and in this movement the end of the centering stud, 18, engages the notch, 116′, formed in the collar, 116, of the rod, 114, and lifts the collar, 116, from the central opening of the blank. This position of the parts is shown in Fig. 10. The operator now withdraws the feeding device because the centering stud, 18, engages in the central opening in the blank. The supporting plate, 108, is moved from between the blank, B, and the table, 11, and the blank, B, drops to working position upon the table. The collar, 116, being cut away, at 116′, at the side opposite the lever, 107, permits this withdrawal movement. At the same time, the cutaway portion, 116′, of the collar, 116, engages with the centering stud, 18, when the blank is moved to centered position and helps the operator to guide the device and center the blank properly. Fig. 9 shows the blank in working position upon the table after the withdrawal of the feeding device. The operation of ejecting the rolled disk and feeding the new blank to the table can be readily performed by what is practically one continuous movement of the feeding device. The operator can do this very easily and quickly so that the rolled disk can be ejected and a new blank fed to the table during the interval in which the machine mechanism holds the rolls, 35, in elevated position. The table, 11, may rotate continuously during this feeding operation and it is not necessary to stop the rotation of the table since an operator may easily discharge the rolled disk and feed a new blank to the table during the interval in which the rolls are held raised in the normal operation of the machine.

It will be noted that the feeding device is pivoted on a pin, 103, carried by the arm, 102, and that the arm, 102, is also pivoted, at 101, on a vertical axis. In the usual movements of the feeding device, it swings around the axis, 101. In case the rolls, 35, should descend and engage the blank before the feeding device has been withdrawn, the action of the rolls upon the blank would tend to turn the feeding device around the axis, 103, so that it would be swung away from the table without doing any harm. The block, 104, which carries the stud, 105, on which the lever, 107, of the feeding device is pivoted, is frictionally connected with the arm, 102, so that, ordinarily, it does not turn around the axis, 103, although it may do so in case extra stress is put upon it. This frictional connection is effected by forming the arm, 102, of two spaced straps, 102′, between the outer ends of which the block, 104, is located. The pin, 103, is carried by the outer ends of these straps and passes through the block, 104, as shown in Figs. 3 and 4. A bolt, 103, connects the two straps adjacent the block, 104, and draws them toward each other so that they engage the block, 106, frictionally, and tend to hold it against turning movement upon the pin, 103. This arrangement acts as a safety device in case the rolls should descend before the feeding device has been withdrawn.

So my method and apparatus enable me to obtain the object of my invention to eject the finished disk from and feed a new blank to the machine without stopping, so that the operation may be made substantially continuous. The method employed is seen to be susceptible to be carried out by a very simple apparatus. The rotatable working element is the table, 11. The working position is defined by it and the cooperating rolls, 35. Its determinate working axis is its axis of rotation. The blank centering means associated with it is the pin, 18. The blank supporting and centering means of the feeding device is comprised of plate, 108, and the centering pin, 114. Together they establish the feeding position laterally of the working position and its axis. The guiding means is comprised of the arm, 102, and its mounting on axis, 101, establishing the arcuate path of movement of the supporting and centering means, 108, 114, toward and from the axis represented by pin, 18. The termination of this path of movement is effected by stop means comprised of the adjustable screw, 130, engaging the standard, 19, and also by the notched end, 108′, of the support, 108, and the notched end, 116, of the pin, 114, or by any of them. The means defining the relative axial movement is the horizontal axis support, 105, 106. When coincidence is reached, the stop means, 130, 108′ and 116 preclude any but axial movements except return movement on the path. Stop means fixing the degree of the axial movement is found in the adjustable screws, 119.

The apparatus possesses great simplicity and sturdiness, yet the method is most effectually and reliably carried out by it. The blank to be worked upon has its periphery laterally displaced as shown in Figs. 5 and 6, the relatively thin and expansive supporting plate, 108, holds the new blanks in gravitational balance, while the spring pressed centering pin, 114, releasably locks it thereon. The new blank, B, and the thin support, 108, are inter-leaved between the working position and the under side of the blank worked upon by very reason of their thinness. As the lateral movement approaches the axes toward coincidence, the axial and lateral thrusts are imparted to the blank to be removed successively by successive axial and lateral movements of the fed blank and the support, 108. Further lateral movement achieves axial coincidence in a plane above the working plane, and the ensuing axial movement, through coaction of the pins, 18 and 114, which are in axial extension of each other, effects transfer of the fed blank to the rotatable working element, 16, and thereby coincidence of the feeding and working positions. As a result of such movement, the fed blank is released from the supporting and centering means 18 and 114 and these means may be thereupon laterally shifted away from the axis to receive a new blank.

Despite its simplicity the apparatus of my invention, as I have found, has been susceptible of embodiment in a wide variety of forms, each of them carrying out effectually the method of my invention. Three such forms are known to me to have been built and operated. The annexed claims are intended to cover all varieties of the steps of the method and the apparatus by which it is practiced which rightly fall within the generic spirit thereof.

I claim:

1. The method of feeding to a determinate working position blanks to be worked upon through their rotation, which consists in working upon a blank in working position to space its periphery from working position, the while establishing a blank to be fed upon a feeding position laterally of the working position, relatively moving the feeding and working positions to enter the fed blank in the peripheral space formed through the working of the worked blank, removing the worked blank, thereupon establishing substantial coincidence of the working and feeding positions, and then rotating the fed blank to be worked upon.

2. The method of feeding blanks having relatively thin peripheral portions to and from a support upon which they are worked, which consists in interleaving the thin peripheral portion of a fresh blank between a worked blank and its support to remove the worked blank from the support and replace it with a new one.

3. The method of feeding from a determinate working position blanks worked upon through their rotation, which consists in displacing a worked upon blank while in rotation through engagement therewith of a blank being fed to the working position.

4. The method of feeding from a determinate working position a blank worked upon through its rotation, which consists in feeding toward said working position a blank to be worked upon, and utilizing the feeding movement to displace the blank worked upon while it is yet in rotation.

5. The method of feeding from a determinate working position a blank worked upon through its rotation, which consists in feeding toward the working position a second blank to be worked upon, and during the feeding movement engaging the fed blank with the worked blank, exerting a thrust upon the worked blank along its axis of rotation, and thereafter a thrust laterally of its axis of rotation.

6. The method of feeding to a determinate working position blanks to be worked upon through their rotation, which consists in moving a blank to be fed in a stage preceding the working stage, to a feeding position in a plane axially displaced from the working position of rotation, moving said established feeding position to a position of substantial axial coincidence with the working position without changing its plane, and thereafter effecting a coincidence of plane of the feeding and working positions and imparting rotation to the blank so fed.

7. The method of feeding to a determinate working position blanks to be worked upon through their rotation upon a determinate working axis, which consists in establishing a blank to be fed upon a feeding position having an axis laterally displaced from the axis of the working position but substantially parallel thereto, relatively moving the feeding and working position into substantial coincidence, and setting up the working rotation of the blank when coincidence is reached.

8. The method of feeding to a determinate working position blanks to be worked upon through their rotation, which consists in initially forming the blanks to be fed to be self-centering, self-centering the blanks to be fed upon a position laterally removed from the working position, relatively moving the feeding and working positions into substantial coincidence, effecting a transfer of the fed blank from the feeding center to the working center through such movement to coincidence, and thereupon setting up rotation of the fed blank.

9. The method of feeding to a determinate working position blanks to be worked upon

through their rotation, which consists in establishing a blank to be fed upon a feeding position laterally of the working position desired, removing a blank worked upon by a path extending first axially and then laterally of the working position, and simultaneously shifting the position of the blank to be fed into working position toward that position by a path extending first laterally in a plane below the lateral extension of the blank being removed and then axially in a direction opposite to the axial movement of the blank being removed.

10. An apparatus of the character described comprising a rotatable working element, a blank feeding mechanism therefor including a blank centering means movable toward and from a position of axial coincidence with the working axis, and work transferring means actuated through movement of the feeding mechanism to the position of coincidence to transfer the blank from the blank centering means of the mechanism to the work rotating axis.

11. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, a blank supporting means movable on a path laterally extending from said work-rotating axis, a blank centering device co-acting with the support to lock thereon a blank to be fed against lateral displacement.

12. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, a blank centering means movable toward and from a position of axial coincidence with the working axis, and a second blank centering means associated with the rotatable working element and engageable by the first named blank centering means upon its movement to coincidence to effect transfer from the first named blank centering means to the second.

13. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, a blank centering pin associated with the work-rotating axis, a support for a blank to be worked movable laterally toward and from said work rotating axis, and a second blank centering pin associated with said support and movable therewith into a position of axial extension from said first-named pin, together with means to move the support axially to effect transfer from one blank centering pin to the other.

14. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, a blank centering means associated with said work-rotating axis to center the blank to be worked upon thereon, a second blank centering means movable from a position laterally of said axis to and from a position in axial alignment with said first named blank centering means, and means operative in said position of alignment of the two blank centering means to effect transfer of a fed blank from the laterally movable centering means to the other.

15. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, a blank feeding mechanism therefor comprising a blank support of sufficient lateral expanse to alone support the blank suitably in gravitational balance, blank centering means associated therewith, means to guide said centering and supporting means toward and from a position of axial coincidence with the working axis, and means to rotate a blank so moved into coincidence rendered operative through such movement.

16. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, and a blank feeding mechanism therefor comprising a relatively thin and expansive work moving element shiftable toward and from the axis, and guiding means for said support in its shifting movement adapting it to be intervened between the work and the rotatable working element.

17. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, a blank centering and supporting means movable toward and from a position of axial coincidence with the working axis, and also along said axis, guiding means for said supporting and centering means terminating the path of movement toward the axis when the supporting and centering means have reached the position of axial coincidence, and limiting the axial movement to a fixed degree sufficient to engage the blank with the rotatable working element.

18. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, a blank centering and supporting means movable toward and from a position of axial coincidence with the working axis, and also along said axis, guiding means for said supporting and centering means, said guiding means for said centering means on its path of movement including a stop device fixing the movement toward the axis at the position of coincidence, and a second stop fixing the degree of axial movement.

19. An apparatus of the character described comprising a working element associated with a determinate work-rotating axis, a blank feeding mechanism therefor comprising a blank centering means movable toward and from a position of axial coincidence with the working axis, and also

along said working axis, together with means confining the movement of the blank centering means to movement along the axis when a position of axial coincidence is reached.

20. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of a feeding device movable into and out of cooperative relationship with said table and including means for supporting a blank to be deposited on the table and means engaging the periphery of a blank on the table to eject the same from the machine.

21. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of a feeding device movable into and out of cooperative relationship with said table and adapted to support a blank and carry it to the table, said feeding device being adapted to eject a rolled blank from the table and deposit the blank carried by it thereon.

22. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of a feeding device movable into and out of cooperative relationship with said table and including a blank-supporting plate mounted to rock about a horizontal axis.

23. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of a feeding device movable into and out of cooperative relationship with said table and including a blank-supporting plate mounted to rock about a horizontal axis, and means for holding a blank in a predetermined position with respect to said blank-supporting plate.

24. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of a feeding device pivotally mounted to swing on a vertical axis and out of cooperative relationship with said table, said feeding device including a blank-supporting plate mounted to rock on a horizontal axis.

25. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of a feeding device movable into and out of cooperative relationship with said table and including a supporting arm, a blank-supporting plate mounted on said arm to rock about a horizontal axis, and means adapted to engage the periphery of the rolled blank to be discharged from the table.

26. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of a feeding device movable into and out of cooperative relationship with said table and including means for supporting a blank, means for actuating said blank to insert the same between the table and the rolled blank to be discharged therefrom, and means engaging the periphery of said rolled blank whereby movement of the feeding device to bring the blank to working position on the table ejects the rolled blank therefrom.

27. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of an arm pivotally mounted to swing on a vertical axis, a lever mounted on the end of said arm to rock on a horizontal axis, and a blank-supporting plate carried by said lever and adapted to be moved by the swinging of said arm into and out of cooperative relationship with said table.

28. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled, of an arm mounted to swing on a vertical axis, a lever mounted on the end of said arm to rock on a horizontal axis, a blank-supporting plate carried by said lever, a finger pivotally mounted on said lever, and a centering post carried by the end of said finger and adapted to engage a central opening formed in the blank.

29. In a machine of the class described, the combination with a rotating table adapted to support a blank to be rolled and having a centering stud passing through a central opening formed in said blank, of an arm mounted to swing on a vertical axis, a lever mounted at the end of said arm to rock on a horizontal axis, a blank-supporting plate carried by said lever, a finger hinged to said lever, and a centering post carried by said finger and adapted to engage in the central opening formed in the blank, the end of said blank-supporting plate and the corresponding portion of the centering post being notched for engagement with the centering stud of the table.

30. In a machine of the class described the combination with a rotating table adapted to support a blank to be rolled, of an arm mounted to swing on a vertical axis, a block carried by the end of said arm and movable about a vertical axis with respect thereto, means for causing a frictional engagement between the arm and said block, a stud carried by said block and extending horizontally, a lever journaled on said stud, and a blank-supporting plate carried by said lever.

31. An apparatus of the character described comprising a rotatable working element, a blank feeding mechanism therefor including a blank supporting device, and a yielding guiding means therefor adapted to give when a thrust is imparted by said working element or parts associated therewith either to the supporting device or to the blank while it is yet held thereon.

32. An apparatus of the character de-

scribed comprising a rotatable working element, a blank feeding mechanism therefor including a blank supporting and centering means for a blank to be fed, and also a blank supporting means for a blank to be removed.

33. In an apparatus of the character described, a base, a work support on the base, a blank feeding mechanism comprising a blank supporting plate shiftable toward and from the work support and a spring interposed between the base and the support to partly counterbalance the weight of the support.

In testimony whereof I hereunto affix my signature.

JOHN W. SMITH.