Dec. 17, 1929. E. A. NELSON 1,739,854

BLANK SERVING APPARATUS FOR ROLLING MILLS

Filed April 9, 1925 3 Sheets-Sheet 1

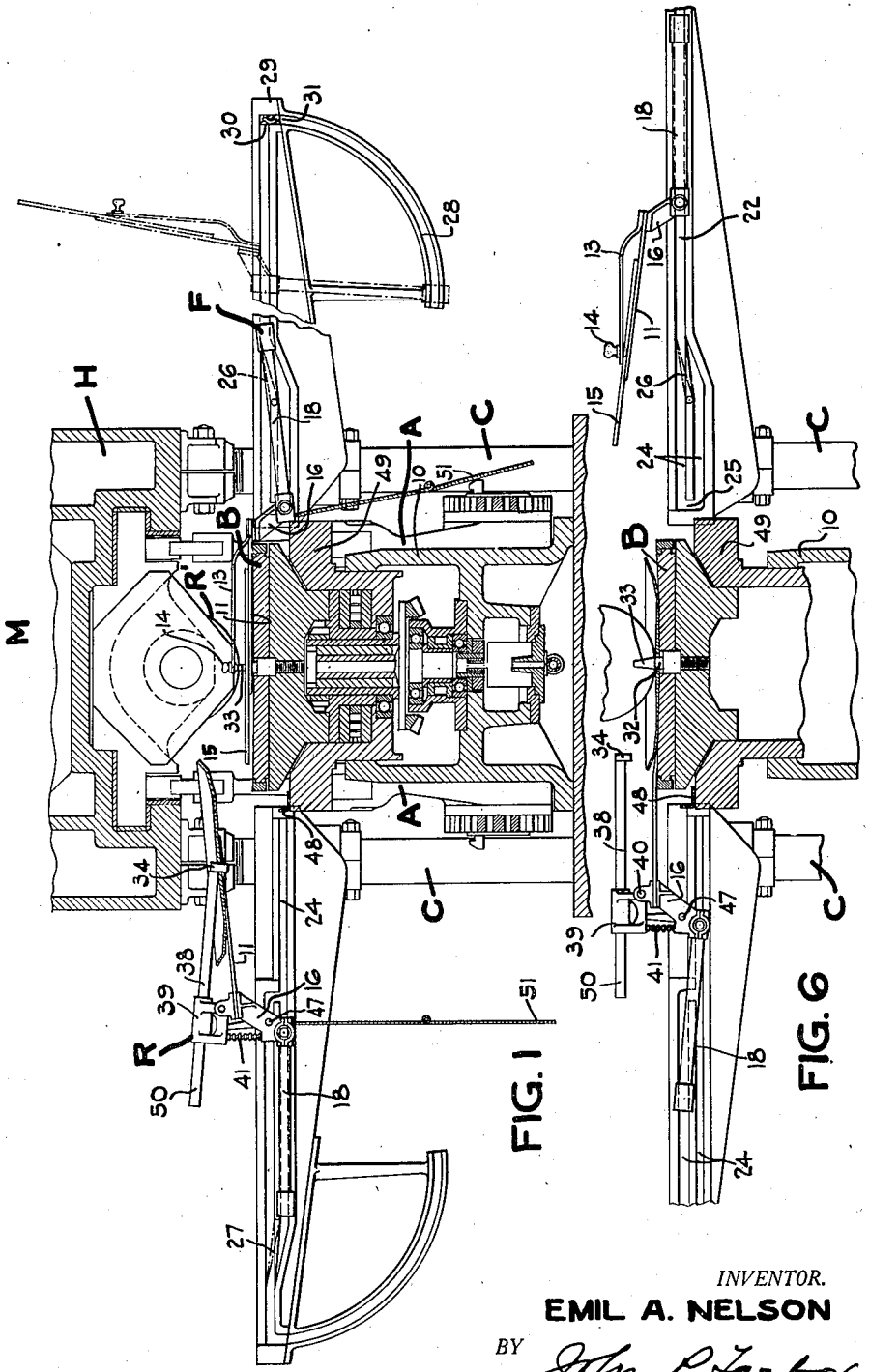


FIG. 1

FIG. 6

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BLANK SERVING APPARATUS FOR ROLLING MILLS

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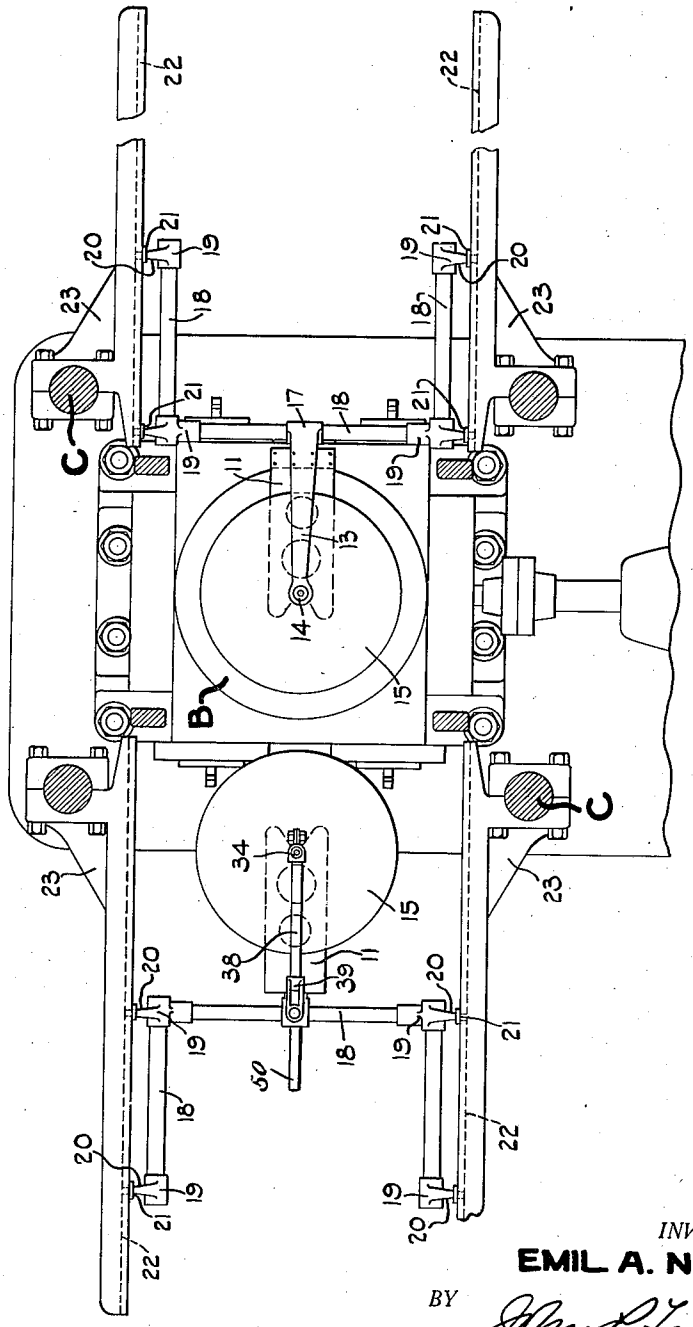


FIG. 2

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BLANK SERVING APPARATUS FOR ROLLING MILLS

Filed April 9, 1925 3 Sheets-Sheet 3

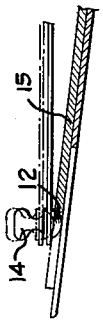


FIG. 5

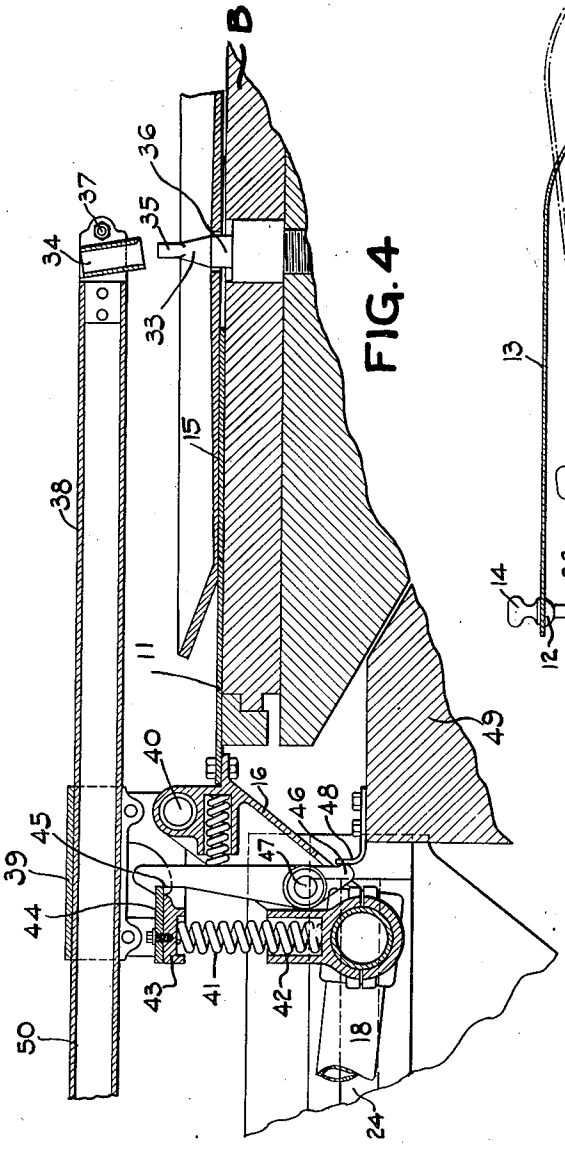


FIG. 4

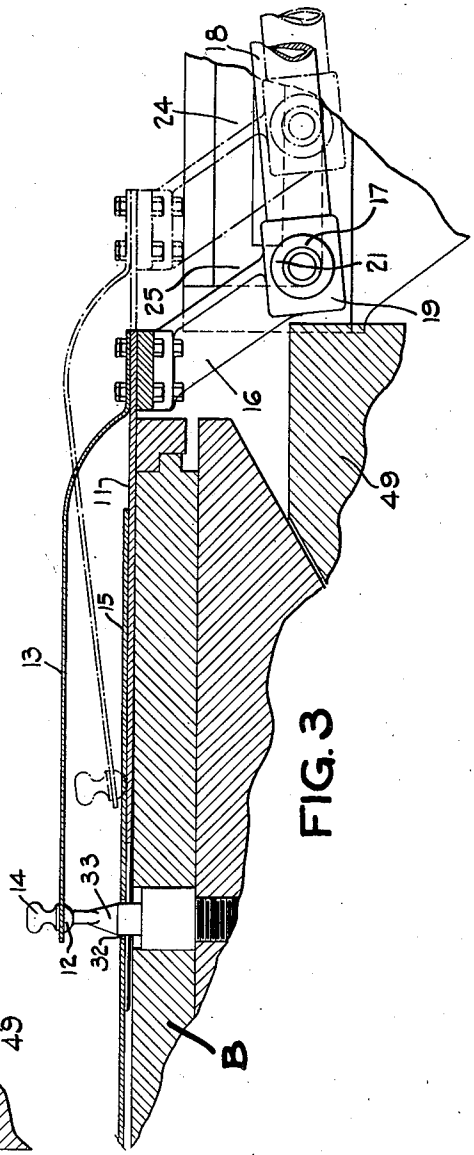


FIG. 3

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UNITED STATES PATENT OFFICE

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BLANK-SERVING APPARATUS FOR ROLLING MILLS

Application filed April 9, 1925. Serial No. 21,798.

My invention relates to blank-serving apparatus adapted especially to feed substantially flat blanks to the rotatable working elements of tapered disc forging machines of the type disclosed in my copending application Serial No. 21,797, filed April 9, 1925. In these machines a substantially flat blank is centered upon a rotating working element, and is tapered by engaging it under pressure by traversing rolls which spin and roll the blank to tapered form by radial traversing movement from the center outwardly in engagement with the blank. In operating according to production requirements, the rotating working element is maintained in rotation continuously. But the engagement of the traversing rolls with the blank is periodic, the machine containing devices to effect a periodic movement of relative approach and separation of the traversing rolls and the rotating blank support. The worked blank is removed from and a fresh blank is fed to the rotating working element just before and during the separated relation of the same to the traversing rolls. While of this especial adaptation, however, my invention will doubtless be found to have other adaptations in related fields.

The principal object of my invention is to produce an automatic mechanism to effect transfer of the blank being served to and from the work-rotating axis. In devices heretofore used, this transfer has been manually effected. The automatic mechanism of my invention enables a machine to be fed not only more reliably, but also with far greater speed and safety to the operator.

Other objects of the invention are the production of a blank-serving device of that great sturdiness which this heavy work requires, which will operate unfailingly over long periods of time without attention for adjustment, alignment or repairs.

Another object is the production of a blank-serving device which enables the operator to handle the blanks with a maximum of convenience.

A still further object is a serving device which will handle the blank served after being worked in a manner insuring the preservation of the surface perfections of the blank and keep the served blank under guard during all its movements. Certain other mechanisms which have been produced have released the blank to gravitational control over irregular passageways which introduced an undesirable marring of its surface.

Of the drawings—

Fig. 1 is a central section in the longitudinal plane of symmetry of a machine for forging tapered discs in which the blank-serving mechanism of my invention has been embodied.

Fig. 2 is a horizontal plan view of the blank-serving mechanism taken in a plane just above the rotatable platen or working element of the machine being served.

Fig. 3 is an enlarged vertical section of the feeding-in portion of the mechanism in its position of transfer of the fed blank.

Fig. 4 is a similar section of the blank-removing portion of the serving mechanism in a position to effect transfer from the working axis to the removing device.

Fig. 5 is a detail of the centering means of the feeding portion of the apparatus.

Fig. 6 is a partial view of the section of Fig. 1 showing the parts in different relations.

The machine for forging tapered discs itself is designated in general M. It is described in full in my co-pending application aforesaid. Suffice it to say here that it comprises a rotatable working element B in the form of a blank-supporting platen upon the top of which the blanks served are to be laid and removed, and co-acting traversing rolls R′ supported in their coacting positions respectively by sub base 10 and roll head H connected together through the columns C. And further, that the movement of approach and separation is effected by axial movement of the blank support B through mechanism A comprised of a group of toggles which, when set, raise the rotatable working element B to engage the blank with the rolls R′, and when released, permit the working element B to drop away from the rolls R′. It is just before and during the separated relation of the working element B and traversing rolls R′ that the blanks to be formed into tapered discs

are to be fed to and removed from the machine.

The blank-serving apparatus of my invention comprises two upper portions, the one F the feeding-in portion, and the other R the blank-removing portion. In many respects they are alike. They both embody the automatic features of my invention.

The feeding-in mechanism comprises an expansive blank supporting plate 11 horizontally arranged, as shown clearly in Fig. 2, of sufficient expanse to support a blank in gravitational balance with ease irrespective of the shifting of center of gravity of the blank within moderate ranges and irrespective of the degree of rapidity of movement within moderate range. This expansive supporting plate 11 is supplemented by a blank centering pin 12 carried by a resilient arm 13 anchored to the outer end of the blank-supporting plate 11, and through its resiliency yieldingly biased to the body of plate 11. The pin 12 overlies the outer end of the supporting plate 11 and is provided with a knob 14 by means of which it may be raised and lowered from and to the face of the plate 11 at its inner extremity. The outer end of plate 11 is forked and the crotch of the fork is of substantially circular form co-axial with the axis of pin 12. Having no blank between them, the parts occupy the relation shown in Fig. 5. Here it will be noted that the bottom end of pin 12 is well rounded. The result is that a blank 15 to be fed into the machine may by its edge be insinuated between the rounded end of pin 12 and the upper face of the blank support 11 and moved laterally therebetween until the preformed aperture in its center is engaged by the pin 12, whereupon the inserted blank is locked in position upon the feeding-in device and centered thereby. Or else the pin 12 may be lifted by the knob 14 and the insertion made by a free passage of the blank between the forked end of plate 11 and the pin until the preformed central aperture is aligned with pin 12, and upon release of knob 14, engaged thereby.

These parts are carried in combination at the upper end of an upwardly and inwardly extending bracket 16 anchored centrally to the front member 17 of the tubular supporting frame 18 of the feeding-in device. This frame, while rectangular, is open on its rear side and therefore U-shaped. The workman can therefore stand within the borders of the frame or reach therein easily gripping the side members of frame 18 with his hand and shove the frame back and forth toward and from the rotating working element B of the machine. The frame is made strong and rugged by the employment of corner brackets 19 of rolled or cast construction, preferably brazed or welded in place. These corner brackets are each provided with a lateral extension 20 bearing an anti-friction roller 21 upon which the frame is supported, and upon which it moves on its path of movement.

The path of movement is established by horizontally-extending trackways 22 in the form of arms secured to the columns C of the machine by means of brackets 23 removably and adjustably bolted therearound. These trackways contain on their inner faces laterally opening grooves 24 into which the rollers 21 project. These grooves 24 are comprised of upper and lower branches of different lengths. In the case of the feeding-in portion of the mechanism, the upper branch of groove 24 extends throughout the length of the upper portion of the trackway, whereas the lower branch extends from the inner end of the trackway to a point intermediate the ends of the trackway. At the inner ends, the grooves are connected together by a vertically-extending shunt groove 25, and at the intermediate point by a switch groove and switch point 26 and 27, respectively. At its outer end the groove 24 is provided with a downwardly and inwardly extending branch 28 in the form of an arc drawn from a center a distance from the outer end equal to the distance between the inner and outer rollers 21 of frame 18, and on a radius equal to the same distance.

When the frame 18 is moved rearwardly to the end of the track, the outer rollers 21 abut the closed end 29 of the groove 24. Then the outer end of the frame may be swung downwardly, the rollers 21 passing in to the arc-shaped groove 28 as the frame 18 turns about the front rollers as a center until it approaches a substantially vertical position in which the entire assemblage of parts, particularly those at the inner end of the mechanism, are removed from immediate adjacency to the machine thereby to enable the operator or mechanic to stand between the trackways and between the mechanism and the side of the machine whereby to work more conveniently upon it in the case of needed adjustment and repairs. When it is not desired to have the groove 28 entered by rollers 21, as in case of the normal operation of the feeding-in mechanism, the means 30 in the form of a block inserted in a slot 31 transversely of the groove 28 are provided to prevent the outside rollers 21 from being entered in the groove 28 under pressure or other abnormal conditions, and so interfering with the normal operation of the device.

In normal operation, the operator draws the frame 18 outwardly to the end of the groove 24, the outer rollers 21 approaching or abutting the end wall 29. The inner rollers will then have passed through the switch 26 into the upper branch of groove 24, the excess of the length of the upper branch over the lower being greater than the distance between the inner and the outer rollers 21. Assuming the rotatable working element B to

be holding a blank to be worked upon, a blank to be fed in is then insinuated by its thin outer edge between the under end of the centering pin and the supporting plate 11 (Fig. 6), the under end of pin 12 being suitably rounded to permit this insertion, and the resiliency of spring arm 13 being such as not to too strongly oppose it. Or else the arm 13 may as aforesaid be lifted slightly by grasping the knob 14. The blank so inserted is then slid along the expansive support 11 until its central preformed centering aperture 32 is engaged by the lower end of pin 12 which, through the resiliency of the arm 13, immediately releasably locks the inserted blank 15 in place. Thereupon the operator, during a separated relation of the working element B to the traversing rolls R', pushes the frame 18 forward, and the blank held in the upraised dotted line position shown in Fig. 5 is projected over the rotatable working element B until the centering pin 12, the blank 15 and the centering pin 33 of the rotatable working element are in axial coincidence. In this feeding-in operation, the forked outer end of blank support 11 has received the base of centering pin 33 and assisted the normal alignment of the guiding groove 24 in the centering function, the support 11 finally coming to bear against the sides of the centering pin 33 by the parallel side walls of the fork in the crotch. The proportions of the parts are such that the distance between the inner rollers 21 and the axis of centering pin 12 is equal to the fixed distance between the shunt groove 25 and the axis of the rotatable working element B. The result is that at the moment coincidence is reached, the inner rollers 21 reach the shunt groove 25 and automatically the fore end of the frame drops from the upper branch of groove 24 to the lower branch, rollers 21 passing through shunt 25. This axial dropping of the fed blank projects the fed blank 15 substantially on to the centering pin 33, the upper end of which is tapered for easy entry into the centering aperture 32. Automatically the upper end of this centering pin 33 engages the under end of the centering pin 12 of the feeding-in mechanism and raises it from the aperture 32 of the blank against the tension of the carrying arm 13, the pin 12 resting upon the top end of the pin 33, as shown in Fig. 3. Now the framework 18 is withdrawn, outer rollers 21 riding in the upper branch of groove 24 and inner rollers 21 riding in the lower branch of groove 24. Upon the initial movement, the centering pin 12 is withdrawn from the top of centering pin 33 and snapped down upon the face of the blank 15, now transferred to the centering pin 33. As the mechanism is retrogressed, it rides upon the flat face of the blank until the edge of the blank is reached when it re-enters its normal relation to the forked end of support 11. In this attitude, the expansive blank support 11 of the mechanism lies substantially in the plane of the working surface of the rotatable working element B, so that the fed blank 15 is substantially parallel to that face. Therefore, during the removal of support 11, the fed blank is set down flatly upon the face of the working element B and consequential rebound therefrom prevented. Pin 12 bears it down. The blank support 11 is illustrated in substantial parallelism to the working element B, yet this parallelism may be approached only to the practical degree found most desirable. The return movement continuing, the blank support 11 is removed entirely from the working zone, the roller 21 passing through switch 26, and again raising the front end of the frame 18 to the upper branch of groove 24 and elevating the blank support 11 to receive a fresh blank.

The removing mechanism R of serving apparatus is like the feeding-in mechanism in a number of substantial respects. In so far as these similarities exist, corresponding reference numerals have been used in designation of the parts. However, there exist substantial differences in the character and operation of the blank-centering pin and its supporting structure, and also of the proportions and arrangement of the upper and lower branches of the groove 24.

The centering pin of the removal mechanism, designated 34, instead of being slotted and having a rounded end, is tubular and open at its lower end, the interior diameter being sufficient to receive within itself the upper reduced end 35 of the centering pin 33 of the working element B. The outer diameter is preferably as shown somewhat less in diameter than the base of centering pin 36. Centering pin 34 is, too, angularly adjustable by means of the securing bolt 37 which clamps it to the end of its support.

The support instead of being a resilient arm is a rigid arm 38 carried in a rigid bracket 39, which latter, however, is pivotally mounted at 40 upon the bracket 16 which holds it along with the supporting plate 11 to the frame 18 carried in grooves 24. The arm and the centering pin which it carries are normally biased toward the blank support 11 by means of compression spring 41, seated in socket 42 in bracket 16 and bearing on the under side of a bridge piece 43 under the outer end of bracket 39. On its upper side this bridge piece 43 carries a removable dog 44 in the form of a plate. This dog is engaged by a trigger 45 pivoted at 47 to the body of bracket 16 and having a depending end 46 adapted at the inner extremity of movement of frame 18 to be engaged by the adjustable dog 48 carried by the cradle frame 49 which supports the blank holder B and moves up and down therewith during the approach and separation movements of the machine.

The grooves 24 of trackways 22 are provided with their longest branches extending from end to end of the trackways and with the shorter branch the upper branch. This branch, too, lies at the outer end of the trackway 22. Shunt groove 25 is therefore located intermediate the ends of the trackways, and the upwardly and outwardly-extending switch 27 at the outer end of trackway. The end-most branch 28 and pertinent parts are provided as in the other portion of the mechanism.

Assuming the fed blank to have been worked upon, its removal is effected by this portion of the mechanism as follows: The outwardly extending end 50 of arm 38 is depressed, causing engagement of detent 44 by trigger 45, and the retention of arm 38 and centering pin 34 in the raised position with respect to the blank support 11, shown in Fig. 4. Frame 18, which until now has rested in the outer extremity of the guiding grooves 24, the outer rollers 21 in the upper groove, and the inner rollers in the lower grooves, is moved forward. At about the time the work being done upon the fed-in blank is completed, the outer edge of the blank being dished up by the spinning and rolling operation, the forked end of the blank support 11 is inserted beneath this upstanding edge and moved slowly forward. At the instant the rolling operation is completed, the motion of the frame 18 is accelerated suddenly projecting the blank support 11 until the crotch of its forked end strikes the sides of the centering pin 36, and at substantially the same moment the depending end 47 of trigger 45 strikes the adjustable dog 48. This trips the trigger 45 and arm 38 is released, carrying centering pin 34 suddenly over the end of the centering pin 33 of the working element. At the same moment, the sides of the frame 18 bear the endmost roller 21 through the shunt 25 into the lower groove, simultaneously lifting the inner end of the mechanism comprised by blank support 11 and centering pin 34 and lifting the blank bodily from centering pin 33. The relative weights of mechanism on opposite sides of horizontal axis defined by the front rollers is such that operation of lifting the blank takes place automatically as a result of the outer roller 21 reaching the shunt 25, both spring 41 and the action of gravity assisting in this automatic transfer initiated through the automatic release of the trigger 45. Frame 18 is immediately withdrawn, rollers 21 thus all passing through the lower branch of groove 24, until switch 27 is reached, whereupon the outer rollers 21 pass again to the upper groove. Pressing on the handle 50, the operator removes centering pin 34 from the blank and removes the blank by hand. In this act, the arm 38 is again set in raised position through the reengagement of trigger 45 over detent 44, and the device is ready for a reapproach for the removal of the succeeding worked blank.

Both the feeding-in mechanism F and the removing mechanism R of the serving apparatus bear a very definite relation to the face of the working element B which relation forms an essential part of my invention. Grooves 24 which form the guideways for the feeding-in mechanism F and the relations of the parts supported and guided thereby are such that blank support 11 and the blank being fed, when elevated during the feeding-in movement, and before the transfer has taken place, through the dropping of rollers 21 in shunt 25, are elevated above the face of the working element in its raised position, that is to say, its position of approach toward the rolls R'. Thereby fouling of the blank with working element or the blank to be removed is avoided, and the fresh blank may be fed all the way in between the traversed rolls R' before separation movement of the working element has taken place. This saves time. The relations of the parts are also such that when the rotatable working element is in its position of separation from the rolls R' illustrated in Fig. 3, and the automatic movement affecting transfer of the blank has taken place through shunt 25, the blank supporting plate lies at the proper elevation to effect proper transfer of the blank to the working element in its separated position under the conditions outlined above. In other words, the blank support 11 then occupies a position of substantial parallelism with the working face of the support. This relation may be adjusted to some extent through the height of bracket 16 as well as through the elevation of the tracks 22 upon the columns C. In any case, frame 18 is moved toward the machine horizontally disposed in the elongated upper branch of groove 24 and removed therefrom downwardly inclined by reason of return passage of one end guide in the fore shortened under branch of groove 24.

On the other hand, the removal portion of the mechanism frame 18 is moved toward the machine in the downwardly inclined position established by the movement of the outer rollers in the upper fore shortened branch of groove 24, and the inner rollers 21 in the elongated lower branch. Elevation of the blank support 11 adjusted by the same factors as in the case of feeding-in mechanism F is such that it occupies its plane of substantial parallelism to the face of the working element B when that working element is in its upper or approached relation to working base R. Thereby the automatic action of transfer above described may take place freely the moment traversing rolls have cleared the periphery of the worked blank. With proper adjustment of parts of the machine, the movement of separation takes place either simultaneously with the transfer operation

or just following the operation of transfer whereupon the automatic action of transfer and removal is still further assisted by very reason of the movement of separation, the rotatable working element B and its centering pin 33 dropping away from the blank being transferred and leaving it on support 11 in free space to be freely removed by the withdrawal of the frame 18 of the mechanism.

In both branches of the mechanism, the approach is by a confined path of a rectilinear form until the position of axial coincidence is established, and then as a result of the establishment of this position of coincidence, the transfer of the blank is effected automatically, a blank moving initially along the path of the working axis, and in case of removal subsequently along the rectilinear path aforesaid.

A very useful minor feature of the mechanism is a depending metallic apron 51 hung transversely of the tracks pivotally or flexibly from the transverse member of frame 18. This metal apron not only protects the operator from grease thrown from the machine, but also from an accidently displaced blank which might be thrown or fall beneath the mechanism.

My invention is capable of many modifications without departing from its generic spirit. All such modifications are believed to fall within the purview of the annexed claims.

I claim:

1. An apparatus of the character described comprising a rotatable working element associated with a determinate work-rotating axis, means for supporting and centering a blank laterally of the work-rotating axis, guiding means for said supporting and centering means establishing a path of movement thereof toward and from axial coincidence of the centering means with the work-rotating axis, work-centering means associated with the work-rotating axis, and automatic means to transfer a blank from one centering means to the other actuated through the projection of the blank-supporting and centering means to a position of axial coincidence with the work-rotating axis.

2. An apparatus according to claim 1 in which the means supporting and centering the blank is adapted to receive an unworked blank and to effect its transfer to the rotatable working element.

3. An apparatus according to claim 1 in which the blank supporting and centering means is adapted to automatically effect transfer of a blank from the rotatable working element to itself and to remove it from the machine.

4. An apparatus according to claim 1 in which the automatic transferring device comprises a direction-changing device for the path of movement.

5. An apparatus according to claim 1 in which the guiding means establishing the path of movement of supporting and centering means is a trackway and the direction-changing device is embodied in the trackway.

6. An apparatus according to claim 1 in which the automatic transferring mechanism comprises an adjunctive guide means for the blank-supporting and centering means, and a device for transferring the guiding function from one of said guiding means to the other.

7. A machine according to claim 1 in which the guiding means are trackways at different elevations having shuttle connections with each other.

8. An apparatus according to claim 1 in which the blank-supporting and centering means is carried by a frame bodily movable in an horizontal plane toward and from the rotatable working element, and the automatic transferring mechanism embodies automatic means to change the angularity of the supporting frame when the position of axial coincidence is reached.

9. A machine according to claim 1 in which the guiding means bearing the supporting frame is a trackway in an horizontal plane, and the automatic transferring mechanism comprises an adjunctive trackway paralleling the first-named trackway and interconnected therewith by a shuttle through which a portion of the supporting frame passes when the position of axial coincidence is reached, and also a switch through which the supporting frame is returned to its initial position.

10. An apparatus according to claim 1 in which the automatic transfer mechanism includes a blank-centering means spaced from the blank support during the approach to the position of axial coincidence, automatically lowered to the support when axial coincidence is reached.

11. An apparatus according to claim 1 in which the blank-centering means is yieldingly biased toward the support, and provided with means to retain it spaced from said support against its bias but automatically released when the position of axial coincidence is reach.

12. In combination, a rotatable blank-working element, and an automatic blank-serving apparatus projectible into and out of axial coincidence with said rotatable working element and embodying a transfer device automatically operated through the projection of the mechanism into coincidence.

13. A blank-serving apparatus comprising co-acting holding members, means to move the holding members apart to release the held blanks, and locking means automatically operated through such movement to retain the

holding members apart ready to receive a fresh blank.

14. A blank-serving apparatus comprising co-acting holding members, means to move the holding members apart to release the held blanks, locking means automatically operated through such movement to retain the holding members apart ready to receive a fresh blank, and means responsive to a feeding movement of the parts to release the lock and thereby permit the parts to take hold of a fresh blank.

15. A blank-serving apparatus comprising a pair of spaced trackways, a U-shaped frame, reciprocable in said trackways, opening outwardly to accommodate an operator between its arms, and a blank-support carried from the transverse member of said frame.

In testimony whereof I hereunto affix my signature.

EMIL A. NELSON.