Feb. 6, 1934. T. W. HAND 1,946,070

ROLLING DISCUS METAL BLANK

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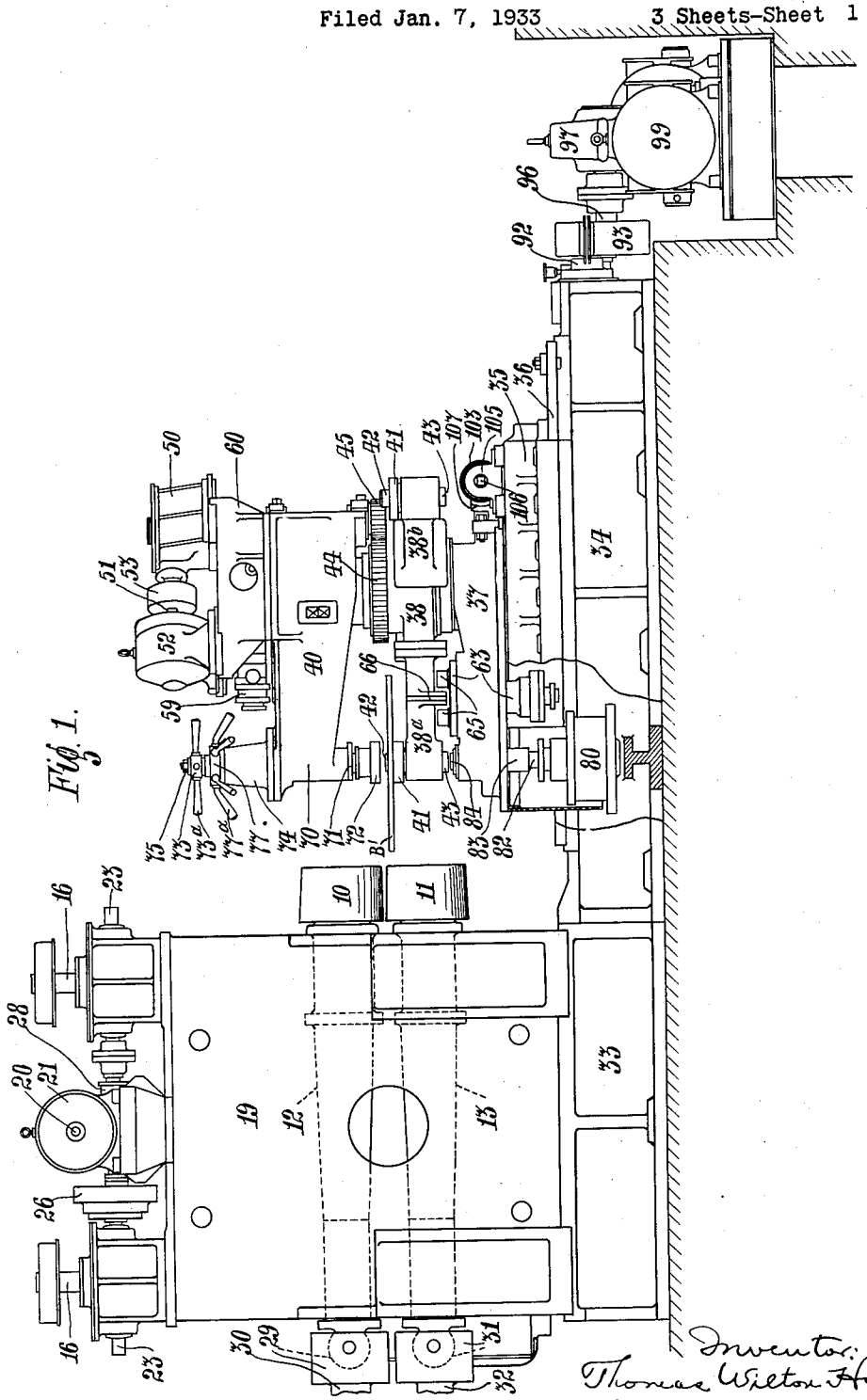


Fig. 1.

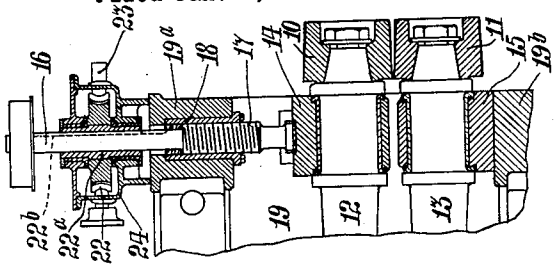
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Fig. 4.



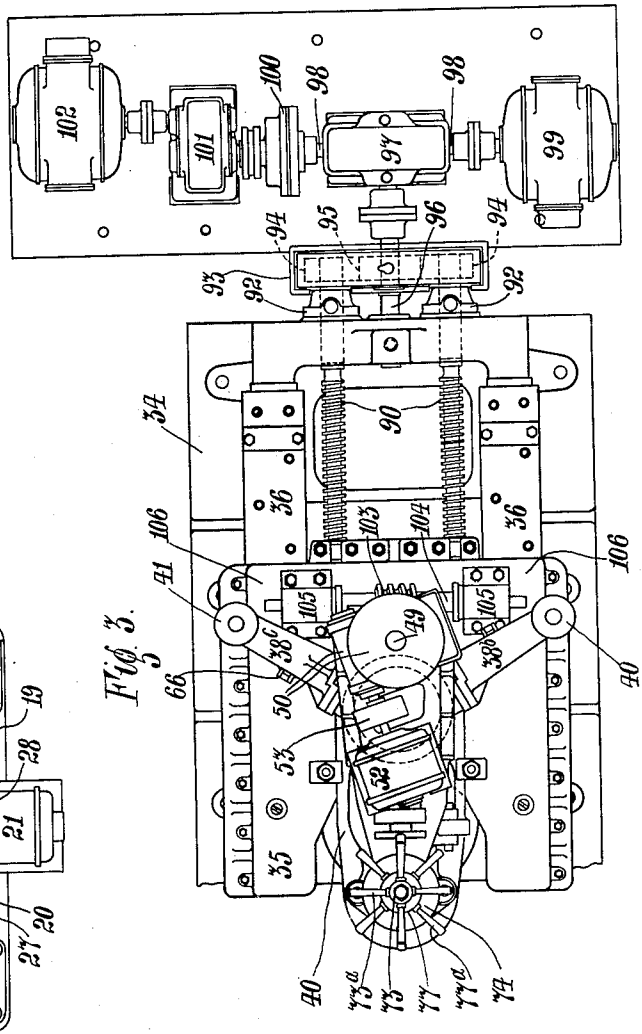


Fig. 3.

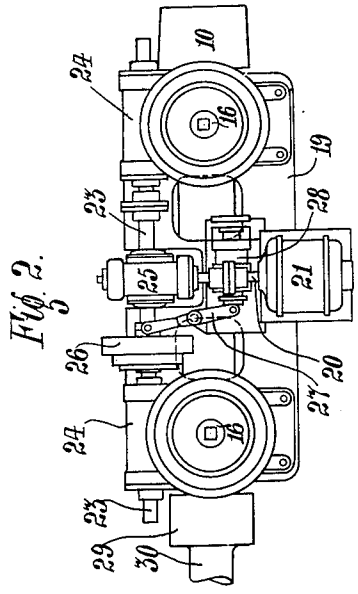


Fig. 2.

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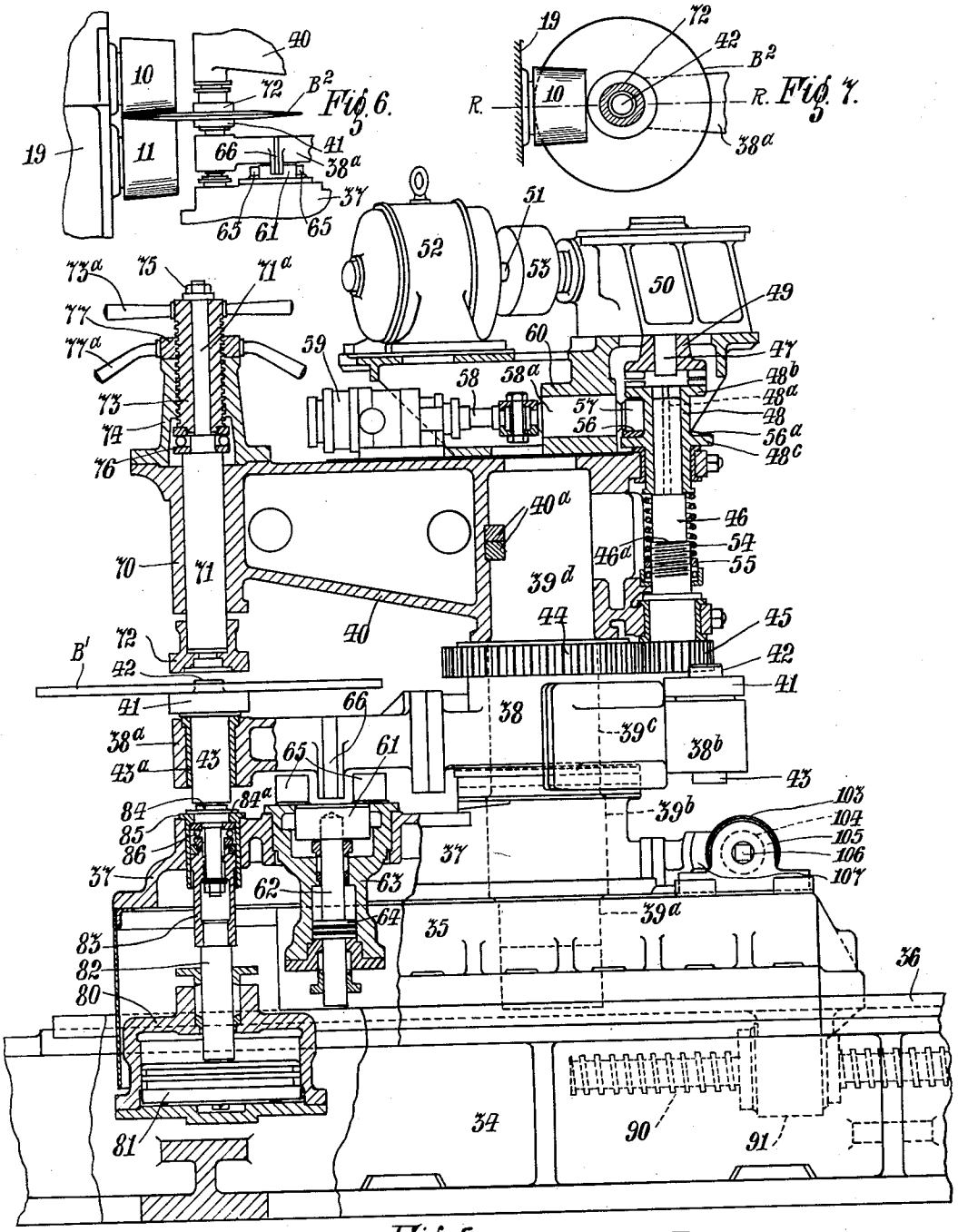


Fig 5.

Fig 6.

Fig 7.

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UNITED STATES PATENT OFFICE

1,946,070

ROLLING DISCUS METAL BLANK

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20 Claims. (Cl. 80—16)

This invention relates to machines for rolling discus metal blanks, more particularly blanks whose finished form is such that, viewed in radial section, they vary uniformly in thickness. For example, blanks originally of uniform thickness may be rolled down with an outer zone of tapering thickness. Such discus blanks of tapering thickness are commonly used for ultimate formation into vehicle wheels.

An object of the present invention is to provide improved means whereby blanks are efficiently and expeditiously fed to the rolls and removed therefrom.

Another object is to provide improved means for exerting the requisite clamping pressure on the blanks.

Other objects of the invention will appear from the following specification.

A machine according to the invention comprises a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, blank-clamping means including a number of rotatable mountings for the blanks, means for displacing said mountings in sequence from a blank-receiving position into a working position adjacent to the open end of the blank-receiving space, and means for displacing to-and-from said rolls that mounting which is temporarily in the working position.

A preferred construction of the machine includes what may be termed "turret feed mechanism"; that is, feed mechanism including a rotatable turret having a number of arms each carrying a blank-supporting clamp member, the arrangement being such that when the turret is rotated to bring one clamp member into the working position with respect to the rolls, another clamp member is moved into a position in which the previously rolled blank can be removed, and yet another clamp member is moved into a position in which to receive a fresh blank.

A machine according to the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is an elevation of the machine, parts thereof being broken away.

Fig. 2 is a top plan of that portion of the machine which comprises what may be termed the "mill unit"; i. e. the portion which includes the rolls.

Fig. 3 is a plan of that portion of the machine which comprises the turret-feed unit whereby the blanks are supported and fed to the rolls.

Fig. 4 is a view in vertical section of a part of the mill unit.

Fig. 5 is a view of the turret-feed-mechanism, the view being partly in elevation and partly in section, and being drawn to a larger scale.

Fig. 6 is a fragmentary elevation showing a blank fed fully between the rolls of the mill unit; and Fig. 7 is a corresponding fragmentary sectional plan.

Referring first of all to the mill unit, this portion of the machine comprises essentially two rolls 10 and 11 which, in the construction illustrated, are each of slightly tapered contour; and they are so arranged that a tapered blank-receiving space is afforded between them. The rolls 10, 11 are respectively secured to adjacent ends of two power-driven shafts 12 and 13 which are journalled one above the other near their ends in bearings, the bearings at the roll-ends of both shafts being shown in Fig. 4 and being denoted by 14 and 15. The upper-shaft bearing 14 has a suspensory connection with a vertical rotatable shaft 16, a portion of which consists of a screw 17 in screw-threaded engagement with an internally screwed sleeve 18, which is stationarily secured to a member 19^a constituting a part of a frame or housing generally denoted by 19. It will be seen that the rolls 10, 11 are disposed beyond the frame 19 so that there is an open entry to the blank-receiving space between them. The lower-shaft bearing 15 is stationarily supported on a member 19^b also constituting a part of the frame 19. The opposite ends of the shafts 12 and 13 are borne in the same manner as above described with reference to Fig. 4.

It will thus be clear that, if one or each of the shafts 16 is rotated, its screw 17 will rise or fall through a sleeve 18, with the result that one or each end of the upper-shaft 12 will correspondingly rise or fall, and the relationship between the rolls 14 and 15 will be altered. The alteration in relationship may be such that, if both shafts 16 are rotated, only the distance between the axes of the shafts is altered, parallelism or slightly inclined relationship between the axes being maintained; or, alternatively, if only the one shaft 16 is rotated, the axes are relatively moved slightly out of, or into, parallelism, thereby altering the taper of the space between the rolls.

Mechanism for adjusting the heights of the ends of the upper-shaft 12 will now be described. The said mechanism, which is driven from the shaft 20 of a reversible electric motor 21 mounted on the frame 19, comprises mainly worm-reduction-gearing, the terminal worm-wheels of which each have a boss 22^a having a feather-and-groove connection 22^b with a shaft 16, one of these

worm-wheels shown in Fig. 4, being denoted by 22. Each worm-wheel 22 is rotatable by a worm-shaft 23 which is journalled at its ends in casings 24 each housing one of the said worm-wheels. The worm-shaft 23 is itself driven by worm-reduction gearing (not shown) housed in a casing 25 on the frame 19 and driven by the shaft 20 of the aforesaid electric motor 21.

In order that opposite ends of the upper roll shaft 12 can be adjusted as aforesaid to different heights, the shaft 23 is divided into two portions which can be coupled together by a friction clutch 26. This clutch is operated by a lever 27 which is itself operated by a pneumatic cylinder-and-piston device 28 under the control of an operator, the arrangement being such that the operator can at will render the clutch either operative or inoperative as a coupling between the two portions of the shaft 23. It will be clear that, when the clutch 26 is operative and the motor 21 started, both portions of the shaft 23 will be rotated, and the shaft 12 will be bodily raised or lowered at both ends. If, on the other hand, the clutch 26 is inoperative, the motor can only raise or lower the right-hand end of the shaft 12. Thus, by appropriately manipulating the clutch and manœuvring the motor, the operator can vary the positional relationship between the rolls 10 and 11, as desired.

In order that the upper roll-shaft 12 will be free to be inclined slightly, a universal coupling 29 is interposed between it and a power-driven shaft 30 from which it derives its rotation. The lower roll-shaft 13 is also driven through the intermediary of a universal coupling 31 by a power-driven shaft 32, the shafts 30 and 32 being rotated in well known manner in opposite directions.

By referring to Fig. 1, it will be seen that the frame 19 is mounted on a base 33 which is connected to another base 34 adapted to support the turret-feed unit. This unit includes a table 35 which is mounted upon guides 36 in such a manner that the table can be slid along them towards and away from the mill unit. The table 35 supports a structure 37 which in its turn supports the turret, the latter consisting mainly of a boss 38 and three arms 38^a, 38^b and 38^c spaced 120° apart. The structure 37 is angularly adjustable with respect to the table 35, for which purpose the structure 37 is secured at 39^b (see Fig. 5) to a strong vertical pivot-post whose lowermost portion 39^a is journalled in the table 35.

The turret 38 is rotatable with reference to the structure 37, being journalled on a portion 39^c of the pivot-post, the topmost portion 39^d of which is keyed at 40^a to a super-structure 40 located above the turret 38. The structure 37 and super-structure 40 therefore constitute a rigid body, which is angularly adjustable on the table 35 by means hereinafter described.

It will be observed that each arm of the turret 38 carries near its end a clamp 41 having on its top face a blank-centering projection 42, which is adapted to pass through a central hole in each blank. The clamp 41 is provided with a downwardly extending journal 43 rotatably and slidably mounted in a bush 43^a secured to the respective turret arm. The arrangement is such that a discus blank B′ can be placed upon the clamp 41 and, when so placed, is free to rotate with the clamp relatively to the supporting arm.

Mechanism for rotating the turret 38 includes a large gear-wheel 44 meshing with a pinion 45 secured to a clutch-shaft consisting of two portions 46, 47, the reduction ratio between the wheels 45 and 44 being 3 to 1. The upper shaft-portion 47 is connected through worm-reduction-gearing (not shown) housed in a casing 50 to the shaft 51 of an electric motor 52; the motor, casing and clutch-shaft all being supported by the super-structure 40. The shaft 51 is provided with a frictional slip-coupling 53, the purpose of which will be hereinafter explained. The clutch of the clutch shaft 46, 47 comprises two elements 48 and 49, the former of which has a feather-and-groove connection at 48^a with the shaft 46, and the latter of which is fixed to the shaft 47. Provision is made whereby the operator can cause the clutch-element 48 to be applied to the clutch-element 49; also, provision is made whereby the clutch-element 48 is automatically retracted at a timed instant in the cycle of operations of the turret feed-unit: and the means for and manner of applying and retracting the clutch element 48 will be hereinafter described.

The parts of the turret feed-unit so far described operate in the following manner:—

Assuming that the motor 52 is running and that the operator has applied the clutch element 48, thereby coupling the shaft portions 46 and 47 together, the shaft 46 is forced to rotate at slow speed and so still slower rotational movement is transmitted to the turret 38 through the intermediary of the gear 45, 44. The shaft 46 only rotates through one complete revolution, at the termination of which the clutch element 48 is automatically retracted. Accordingly, the turret 38 is rotated through 120°, with the result that each of the arms is rotated into precisely the same position as was occupied by its predecessor in the direction of rotation; thus, an arm occupying the position of the arm indicated by 38^b in the drawings moves into the position occupied by the arm 38^a. This latter position, which is hereinafter termed the "working position" of each arm, is the position in which the blank B′ shown is held in readiness for movement between the rolls 10 and 11.

The means for and manner of operating the clutch-element 48 will now be described:—

As shown in Fig. 5, the clutch-element 48 is continuously pressed towards the clutch-element 47 by a spring 54, which re-acts against a ball-thrust-bearing 55 adjustably mounted on a screw-threaded portion 46^a of the shaft 46. The element 48 is formed with upper and lower collars 48^b and 48^c between which is an annular space, the upper face of the collar 48^c being provided with what may be termed a scroll cam 56, which has a single drop, or fall, where indicated by 56^a. The cam 56 co-operates with a roller 57 adapted to enter the aforesaid annular space, the roller 57 being carried at one end of a rod 58 forming part of a pneumatic cylinder-and-piston device denoted by 59, this device being under the control of the operator. The rod 58 has an enlarged portion 58^a which is guided for movement through a bracket 60 constituting the support of the casing 50 and motor 52. With the motor 52 running, the operator actuates the pneumatic cylinder-and-piston device 59 in such a manner that it pulls the rod 58 towards the left of Fig. 5, thereby withdrawing the roller 57 from engagement with the cam 56. In consequence, the spring 54 immediately forces the element 48 into engagement with the element 49, the clutch being thereby applied, and the shaft 46 commences to rotate. The operator then reverses the direction of actuation of the pneumatic device 59,

so that it presses the roller against the rim of the now raised cam 56, which prevents the roller from entering the annular space between the collars 48b, 48c. When, however, the shaft 46 has rotated to the position in which the drop 56a registers with the roller 57, the latter is immediately pressed by the device 59 into the said annular space; and, immediately thereafter, the cam 56 moves below the roller 57, which therefore depresses the cam, thereby retracting the element 48 from engagement with the element 49. Accordingly, the shaft 46 is uncoupled from the driving motor 52. It will thus be clear that the shaft 46 is only permitted to perform one complete revolution, the operation being manually initiated but automatically terminated.

In order to ensure that the turret 38, during each rotational movement, will move no further than necessary for one of its arms to occupy precisely the working position, a stop device is provided. This device includes a stop member 61 secured to a piston-rod 62 forming a part of a pneumatic cylinder-and-piston device, whose cylinder and piston are respectively denoted by 63 and 64. This pneumatic device, whose cylinder 63 is mounted in the structure 37, is adapted to effect raising and lowering of the stop member 61 under the control of the operator. The cylinder 63 is provided with guide abutments 65 against which the stop member can bear when in its raised position, and each arm of the turret has a depending striker 66 which, when the turret rotates, moves in a path crossed by the member 61 when the latter occupies its raised position. The arrangement is such that, immediately after the operator has actuated the pneumatic device 59 to initiate rotation of the turret, he actuates the pneumatic device 63, 64 to raise the stop member 61 from the lowered position in which it is shown in Fig. 5 into its raised position, in which it bears against the abutments 65 and crosses the path of the strikers 66. Immediately after the clutch-element 48 is automatically retracted, one of the arms of the turret, which continues to rotate under its momentum, moves into the working position, and there its striker moves against the stop member; and the turret comes to rest.

The frictional slip-coupling 53 is provided for the contingency that the operator might inadvertently actuate the pneumatic device 59 while the stop 61 is raised, or that the clutch-element 48 might not be fully retracted when the turret-arm concerned reaches its working position. On the occurrence of either of these contingencies, the coupling 53 will slip so that breakage of the parts comprising the drive between the motor 52 and the turret 38 will be obviated.

The super-structure 40 is arranged to overhang the arm of the turret 38 which, for the time being, occupies the working position; and the super-structure is provided with a bearing 70 through which passes a journal 71 having at its lower end a clamp 72 adapted to co-operate with the clamp 41 on the aforesaid arm. The journal 71 has an extension 71a which passes rotatably through, but is lengthwise anchored in, an externally screwed sleeve 73 in screw-threaded relationship with an internally screwed pillar 74 attached to the super-structure 40 above the bearing 70. A nut 75 at the top end of the extension 71a suffices to support the journal 71 and clamp 72 when the latter is inactive, as shown in Fig. 5, and a ball-thrust-bearing 76 serves to withstand clamping pressure on the clamp 72 when such pressure is applied as hereinafter explained. The sleeve 73 has hand-members 73a whereby it can be turned in order to adjust the clamp 72 to accord with the level of the blank-receiving space between the rolls 10 and 11 of the mill unit. A jam-nut 77 with hand-members 77a serves as a means of locking the sleeve 73 in its position of adjustment.

In order that clamping pressure can be applied to the blank B', the structure 37 is provided beyond the pneumatic cylinder-and-piston device 63, 64 with another such device, which is also under the control of the operator, and the cylinder and piston of which are denoted by 80 and 81 respectively. The piston-rod 82 of this pneumatic device has an extension 83 with a rotatable head 84, which is formed with a collar 84a resting upon a bush 85, which is slidably mounted in the structure 37. A ball-thrust-bearing 86 is provided to transmit the clamping pressure from the extension 83 to the rotatable head 84.

The aforesaid parts 82 to 85 and the upper clamp parts 71, 72 are permanently co-axial, and they all register accurately with the lower clamp parts 41, 43 of any turret arm which happens to occupy the working position for the time being. The arrangement is such that, when a turret-arm (say the arm 38a) loaded with a blank B' occupies the working position, the operator operates the pneumatic device 80, 81 to force the head 84 upwards so that it engages and raises the journal 43 and thereby causes the blank to be securely clamped between the clamps 41, 72, which in conjunction with the blank constitutes a freely rotatable rigid assembly.

The turret-feed unit includes mechanism for moving the table 35 and blank-holding parts thereon quickly towards and away from the rolls 10 and 11, and also for advancing and withdrawing said table and parts slowly when the blank is engaged between the rolls. The said mechanism comprises two parallel feed-screws 90 located in the base 34 and which each pass through a feed-nut 91 (Fig. 5) secured to the table 35, the feed-screws being journalled at adjacent ends in bearings 92 attached to the base 34 (Fig. 3). The bearings 92 support a gear case 93 containing two driven gear-wheels 94 and an intermediate driving gear-wheel 95, the wheels 94 being secured to the screws 90 and the wheel 95 being secured to a shaft 96. This shaft 96 is rotated through worm-reduction-gearing (not shown) contained in a gear-case 97. The said worm-gearing is driven by a worm-shaft 98, one end of which is coupled directly to a variable-speed reversible electric motor 99, and the other end of which is coupled through the intermediary of a magnetic clutch 100 and reduction gearing (not shown, but housed in a gear case 101) to another similar electric motor 102. It will thus be clear that, when the motor 99 is operative and the motor 102 and magnetic clutch 100 are inoperative, the shaft 96 will be rotated at the greater of two available possible speeds, or two available ranges of speed. On the other hand, when the motor 102 and clutch 100 are operative and the motor 99 is inoperative, the shaft 96 will be rotated at the lesser of its two speeds, or speed ranges, the motor 99 being meantime forced to turn idly at slow speed. It will also be clear that, when the shaft 96 is rotated, the feed-screws 90 will rotate in unison and will cause the table 35 and the parts supported thereon to advance or retire quickly or slowly according to which of the motors 99 and 102 is in operation.

One cycle of operations of the machine will now be described:—

The rolls 10, 11 are set in rotation and the electric motor 52 is started.

A rough discus blank B′ is placed on the clamp 41 of that turret-arm which occupies the position of the arm marked 38^b in the drawings. This position may be termed the "loading position".

The operator actuates the pneumatic device 63, 64 to lower the stop member 61 temporarily out of the way of the striker 66 of the arm occupying the working position.

The operator actuates the pneumatic device 59 to apply the clutch-element 48, thereby initiating a rotational movement of the turret 38 through 120° (clockwise, as viewed in Fig. 3).

The operator reverses the actuation of the pneumatic device 59, thereby setting the associated automatic cut-out means in condition to withdraw the clutch-element 48 at the proper time.

The operator actuates the pneumatic device 63, 64 to raise the stop member 61 again across the path of the striker 66 of the now oncoming arm.

As the turret approaches the end of its rotational movement, the clutch element 48 is automatically retracted, and the turret comes to rest with the blank-carrying arm in the working position.

The operator actuates the pneumatic device 80, 81 to clamp the blank securely between the rotatable clamping parts 41, 72.

The operator opens the magnetic clutch 100 and starts the motor 99 in the direction which causes the table 35 quickly to advance.

As the blank approaches the rolls 10, 11 the operator stops the motor 99, closes the magnetic clutch 100 and starts the motor 102, so that the table continues to advance but at slow speed, and forces the blank between the rolls, the blank meantime rotating freely in conjunction with the clamping parts. The position at this stage in the cycle of operations is illustrated in Figs. 6 and 7. It will be seen that the rolls 10, 11 reduce the blank (indicated by B^2) to such a shape that it consists of a thick central portion and an outer tapered portion which reduces uniformly in thickness from the aforesaid portion to a thinner peripheral edge.

The operator stops the motor 102, opens the magnetic clutch 100 and starts the motor 99 in the reverse direction, so that the completely rolled blank is withdrawn quickly between and away from the rolls; or, alternatively, the operator may cause the blank to be slowly withdrawn between the rolls by first of all reversing the motor 102, and when the blank is withdrawn he can stop the motor 102, open the clutch 100 and start the motor 99 in the reverse direction.

Finally, the operator actuates the pneumatic device 80, 81 to lower the clamp 41, the blank thus becoming unclamped.

The above sequence of steps constitutes a cycle of operations, and in the commercial working of the machine the above cycle is continuously repeated. In each successive cycle, the newly rolled blank is carried through 120° from the working position into the position occupied by the arm marked 38^c in Fig. 3, this being the "unloading position". At the same time, an empty clamp 41 moves into the loading position, and a rough blank is carried into the working position.

As previously mentioned, the structure 37 and superstructure 40 are angularly adjustable as a rigid body on the table 35 around the axis of the pivot post 39^{a-d}. The structure 37 is normally locked in place by a worm 103 on a worm-shaft 104, which is journalled in bearings 105 secured to the table 35 and which has extensions 106 of polygonal form, the worm engaging with a worm wheel segment 107 secured to the structure 37. The arrangement is such that, when the operator engages one or other of the polygonal ends 106 with a spanner or other tool and rotates the worm 103, the stucture 37 is angularly adjusted about the axis of the post 39^{a-d}. The ultimate result of this adjustment is that the stop member 61, the upper clamp 72 and the rotatable head 84 are adjusted in unison, and so the working position (in which the blank is supported by each of the lower clamps 41 in turn) is correspondingly adjusted.

The degree of angular adjustment of the structure 37 and super-structure 40 may be such that, when a blank is fed slowly between the rolls and they exercise upon it a rolling action which moves inwards from its outer periphery, the said action may move either in a truly radial direction (represented by the line R—R in Fig. 7) or in a direction spaced from, but parallel to, the truly radial direction. Accordingly, the action of the rolls in stretching or extending the metal of the blank can be carefully controlled, thereby making it possible to avoid distortion of the blank while undergoing change of form. Desirably, in practice, the precise setting of the line of action of the rolls with reference to the blank would be determined for any given conditions by careful preliminary experiment.

It is to be understood that modifications can be made in features of construction and in the mode of operation without departing from the scope of the invention. For example, provision may be made for performing by power means various of the manual operations hereinbefore described.

I claim:—

1. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a number of rotatable mountings for the blanks, said mountings being co-planar with said space, means for displacing said mountings in sequence laterally from a blank-receiving position into a working position which is adjacent the blank-receiving space, means for linearly displacing to-and-from said rolls that mounting which is temporarily in the working position, and means for adjusting the line of displacement of said mounting relatively to said rolls.

2. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a construction mounted for movement to-and-from said rolls, a single blank-clamp rotatably mounted in said construction and in a working position which is in substantial alignment with the blank-receiving space, a turret rotatably mounted in said construction, a series of blank-clamps rotatably mounted in said turret and individually registrable with said single blank-clamp in the working position, means for rotating said turret in steps to bring its blank-clamps in sequence into the working position, means on said construction for forcing one of the last-mentioned blank-clamps at the conclusion of each of said steps to exert clamping pressure in conjunction with the single blank-clamp, and

means for moving said construction to-and-from said rolls between successive steps of the turret.

3. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a construction mounted for linear movement in guides to-and-from said rolls, a single blank-clamp rotatably mounted in said construction and in a working position which is in substantial alignment with the blank-receiving space, a turret rotatably mounted in said construction, a series of blank-clamps rotatably mounted in said turret and individually registrable with said single blank-clamp in the working position, a device on said construction to locate the turret in said working position, means in said construction for varying the location of said device to adjust said location relatively to the rolls, clutch-mechanism for rotating said turret in steps to bring its blank-clamps in sequence into the adjusted working position, means on said construction for forcing one of the last-mentioned blank-clamps at the conclusion of each of said steps to exert clamping pressure in conjunction with the single blank-clamp, and means for advancing and withdrawing said construction along its guide between successive steps of the turret.

4. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a structure mounted for movement to-and-from said rolls, a super-structure mounted on said structure and movable therewith, a single blank-clamp rotatably mounted in said super-structure and in a working position which is co-planar with the blank-receiving space, a turret rotatably mounted between said structure and super-structure, a series of blank-clamps rotatably mounted in said turret and individually registrable with said single blank-clamp in the working position, a retractable stop on said structure to locate said turret in said working position, clutch-mechanism for rotating said turret in steps to bring its blank-clamps in sequence into the working position, means on said structure for forcing one of the last-mentioned blank-clamps at the conclusion of each of said steps to exert blank-clamping pressure in conjunction with the single blank-clamp, and gearing for linearly moving said structure to-and-from said rolls at different speeds between successive steps of the turret.

5. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a table mounted for linear movement in guides to-and-from said rolls, a structure mounted for angular adjustment on said table, a super-structure mounted on said structure and adjustable therewith, a single blank-clamp rotatably mounted in said super-structure and in a working position which is co-planar with the blank-receiving space, a turret rotatably mounted between said structure and super-structure, a series of blank-clamps rotatably mounted in said turret and individually registrable with said single blank-clamp in the working position, a retractable stop in said structure to locate said turret in said working position, clutch-mechanism for rotating said turret in steps to bring its blank-clamps in sequence into the working position, means on said structure for forcing one of the last-mentioned blank-clamps at the conclusion of each of said steps to coact with the single blank-clamp to exert blank-clamping pressure, gearing for moving said table along its guides at different speeds between successive steps of the turret, and means for angularly adjusting said table to vary the line of movement of the temporarily co-acting blank-clamps relatively to the blank-receiving space between the rolls.

6. A machine for rolling discus metal blanks and comprising a pair of tapered pressure rolls presenting between them a tapered open-ended blank-receiving space, substantially parallel rotary shafts at adjacent ends of which said rolls are secured, a number of rotatable mountings for the blanks, said mountings being co-planar with said tapered space, means for displacing said mountings in sequence laterally from a blank-receiving position into a working position which is adjacent the blank-receiving space, and means for linearly displacing to-and-from said rolls that mounting which is temporarily in the working position.

7. A machine for rolling discus metal blanks and comprising a pair of tapered rolls presenting between them a tapered open-ended blank-receiving space, substantially parallel rotary shafts at adjacent ends of which said rolls are secured, means for pressing one of said shafts towards the other to cause said rolls to exert a rolling pressure, a construction mounted for movement to-and-from said rolls, a single blank-clamp rotatably mounted in said construction and in a working position which is in substantial alignment with the blank-receiving space, a turret rotatably mounted in said construction, a series of blank-clamps rotatably mounted in said turret and registrable in sequence with said single blank-clamp in the working position, means for rotating said turret in steps to bring its blank-clamps in sequence into the working position, means on said construction for forcing one of the last-mentioned blank-clamps at the conclusion of each of said steps to exert in conjunction with the single blank-clamp clamping pressure on a blank, and means for moving said construction to-and-from said rolls between successive steps of the turret so as to advance the blank into the tapered space and withdraw it therefrom.

8. A machine for rolling discus metal blanks and comprising a pair of tapered rolls presenting between them a tapered open-ended blank-receiving space, substantially parallel rotary shafts at adjacent ends of which said rolls are secured, means for pressing one of said shafts towards the other to cause said rolls to exert a rolling pressure, a table mounted for linear movement in guides to-and-from said rolls, a structure mounted for angular adjustment on said table, a super-structure mounted on said structure and adjustable therewith, a single blank-clamp rotatably mounted in said super-structure and in a working position which is in substantial alignment with the blank-receiving space, a turret rotatably mounted between said structure and super-structure, a series of blank-clamps rotatably mounted in said turret and individually registrable with said single blank-clamp in the working position, a retractable stop in said structure to locate said turret in said working position, clutch-mechanism for rotating said turret in steps to bring its blank-clamps in sequence into the working position, means on said structure for forcing one of the last-mentioned blank-clamps at the conclusion of each of said steps to coact with the single blank-clamp to exert clamping

pressure on a blank, gearing for moving said table along its guides between successive steps of the turret, and means for angularly adjusting said table to vary the line of movement of the temporarily co-acting blank-clamps relatively to the tapered blank-receiving space between the rolls.

9. In a machine for rolling discus metal blanks and comprising a rolling mill unit and a blank-feeding turret adapted to support a number of blanks, feed them one at a time to a working position, and advance them into and withdraw them from rolling engagement with the said unit, during which engagement they freely rotate, stop means defining said working position and serving to locate said turret therein, mechanism for transmitting power to turn said turret step-by-step into engagement with said stop means, and clutch means for interrupting the transmission of power to the turret at the end of each step.

10. In a machine for rolling discus metal blanks and comprising a rolling mill unit and a blank-feeding turret adapted to support a number of blanks, feed them one at a time to a working position, and advance them into and withdraw them from rolling engagement with the said unit, during which engagement they freely rotate: a stop movable between positions in which it is operative and inoperative respectively, said stop when operative defining said working position and serving to locate said turret therein, and mechanism for rotating said turret step-by-step while said stop is inoperative, said mechanism comprising a divided clutch-shaft, power means for rotating said shaft, means for transmitting rotational movement from said shaft to said turret, clutch-elements on said shaft, one of said elements being withdrawable to interrupt the transmission of rotation, a cam connected to and rotating with the withdrawable clutch-element, and a withdrawable pressure member cooperating with said cam and acting to engage and displace said cam and thereby withdraw the clutch element at the end of each step of said turret.

11. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a construction mounted for movement to-and-from said rolls, a single blank-clamp rotatably mounted in said construction and in a working position which is in substantial alignment with the blank-receiving space, a turret rotatably mounted in said construction, a series of blank-clamps rotatably mounted in said turret and individually registrable with said single blank-clamp in the working position, a stop movable between positions in which it is operative and inoperative respectively, said stop when operative defining said working position and serving to locate said turret therein, mechanism on said construction for rotating said turret step-by-step while said stop is inoperative to bring its blank-clamps in sequence into the working position, means on said construction for forcing one of the last-mentioned blank-clamps at the conclusion of each of said steps to exert clamping pressure in conjunction with the single blank-clamp, and means for moving said construction to-and-from said rolls between successive steps of the turret, the said mechanism comprising a divided clutch-shaft, power means for rotating said shaft, means for transmitting rotational movement from said shaft to said turret, clutch-elements on said shaft, one of said elements being withdrawable to interrupt the transmission of rotation, a cam connected to and rotating with the withdrawable clutch-element, and a withdrawable pressure member cooperating with said cam and acting to engage and displace said cam and thereby withdraw the clutch element at the conclusion of each step of said turret.

12. In a machine for rolling discus metal blanks and comprising a rolling mill unit and a blank-feeding construction adapted to support said blanks and linearly advance them into and withdraw them from rolling engagement with the said unit, during which engagement they freely rotate, the said construction comprising a movable structure and an armed turret mounted thereon for angular movement: blank-supporting means comprising an upper clamp member rotatably mounted in said structure and in said working position, lower clamp members mounted for rotation and vertical movement in arms on said turret, and means in said structure for forcing one of said lower members upwards while in the working position to clamp a blank against the upper member.

13. In a machine for rolling discus metal blanks and comprising a rolling mill unit and a blank-feeding construction adapted to support said blanks and linearly advance them into and withdraw them from rolling engagement with the said unit, during which engagement they freely rotate, the said construction comprising a movable structure, an armed turret mounted thereon for angular movement and a supporting table for said structure: blank-supporting means comprising an upper clamp member rotatably mounted in said structure and in said working position, lower clamp members mounted for rotation and vertical movement in arms on said turret, means in said structure for forcing one of said lower members upwards while in the working position to clamp a blank against the upper member, and means on said table for imparting sidewise adjustment to said construction to adjust the line of advance of the clamped blank relatively to the rolling mill unit.

14. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a number of rotatable mountings for the blanks, means for displacing said mountings in sequence laterally from a blank-receiving position into a working position which is adjacent the blank-receiving space, a rotatable clamping member located in the working position and adapted to register there with each of said mountings in turn, and means for linearly displacing to-and-from said rolls the rotatable clamping member and that mounting which temporarily registers with it in the working position.

15. A machine for rolling discus metal blanks and comprising a pair of rotary pressure rolls presenting between them an open-ended blank-receiving space, a number of rotatable mountings for the blanks, means for displacing said mountings in sequence laterally from a blank-receiving position into a working position which is adjacent the blank-receiving space, a rotatable clamping member located in the working position and adapted to register there with each of said mountings in turn, a rotatable axially movable member spaced from but coaxial with said rotatable clamping member, the said movable member and said clamping member constituting with that mounting which temporarily occupies the working position a clamping assembly, means for dis-

placing said movable member to exert clamping pressure, and means for linearly displacing to-and-from said rolls the clamping assembly.

16. In combination with a rolling mill unit for producing discus metal blanks; a feed unit comprising a number of rotatable mountings for the blanks, which mountings are displaceable in sequence to-and-from a working position adjacent said mill unit, and a rotatable clamp located permanently in said position and adapted to cooperate there with said mountings in turn in order to clamp the individual blanks; and means for feeding said feed unit to-and-from said mill unit.

17. In combination with a rolling mill unit for producing discus metal blanks; a feed unit comprising a number of rotatable mountings for the blanks, which mountings are displaceable in sequence to-and-from a working position adjacent said mill unit, a rotatable clamp located permanently in said position and adapted to cooperate there with said mountings in turn in order to clamp the individual blanks, and means permanently located in the working position for applying clamping pressure between said clamp and mountings; and means for feeding said feed unit to-and-from said mill unit.

18. A machine for rolling discus metal blanks and comprising a pair of pressure rolls presenting between them an open-ended blank-receiving space, a number of rotatable mountings for the blanks, means for displacing said mountings in sequence laterally from a blank-receiving position into a working position, which is adjacent the blank-receiving space, and thence into an unloading position spaced apart from said blank-receiving position, blank-clamping means located permanently in the working position and adapted to register there with each of said mountings in turn, and means for linearly displacing to-and-from said rolls the clamping means and that mounting which temporarily registers with it in the working position.

19. In combination with a rolling mill unit for producing discus metal blanks; a feed unit comprising a number of rotatable mountings for the blanks, which mountings are displaceable in sequence from a blank-receiving position into a working position and thence into an unloading position, said working position being adjacent said mill unit, and a rotatable clamp located permanently in said working position and adapted to cooperate there with said mountings in turn in order to clamp the individual blanks; and means for feeding said feed unit to-and-from said mill unit.

20. In combination with a rolling mill unit for producing discus metal blanks; a feed unit comprising a number of rotatable mountings for the blanks, which mountings are displaceable in sequence from a blank-receiving position into a working position and thence into an unloading position, said working position being adjacent said mill unit, a rotatable clamp located permanently in said working position and adapted to cooperate there with said mountings in turn in order to clamp the individual blanks, and means permanently located in the working position for applying clamping pressure between said clamp and mountings; and means for feeding said feed unit to-and-from said mill unit.

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