E. E. SLICK.

ROTARY SHEARS.

APPLICATION FILED JUNE 14, 1909.

965,037. **Patented July 19, 1910.**

4 SHEETS—SHEET 1.

Fig. 1.

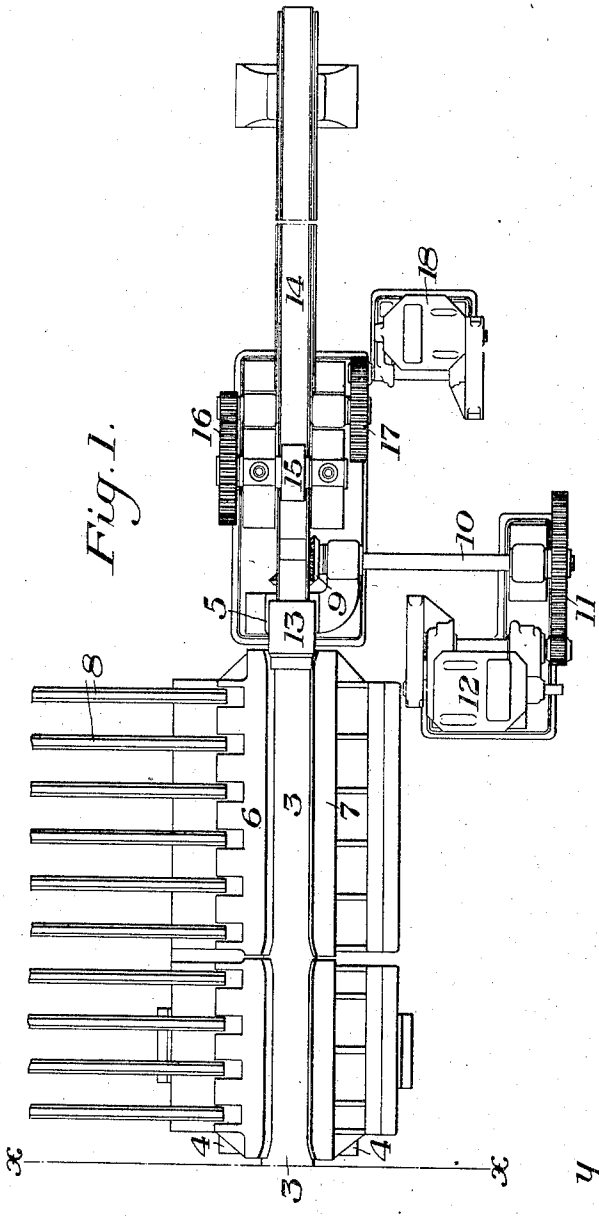
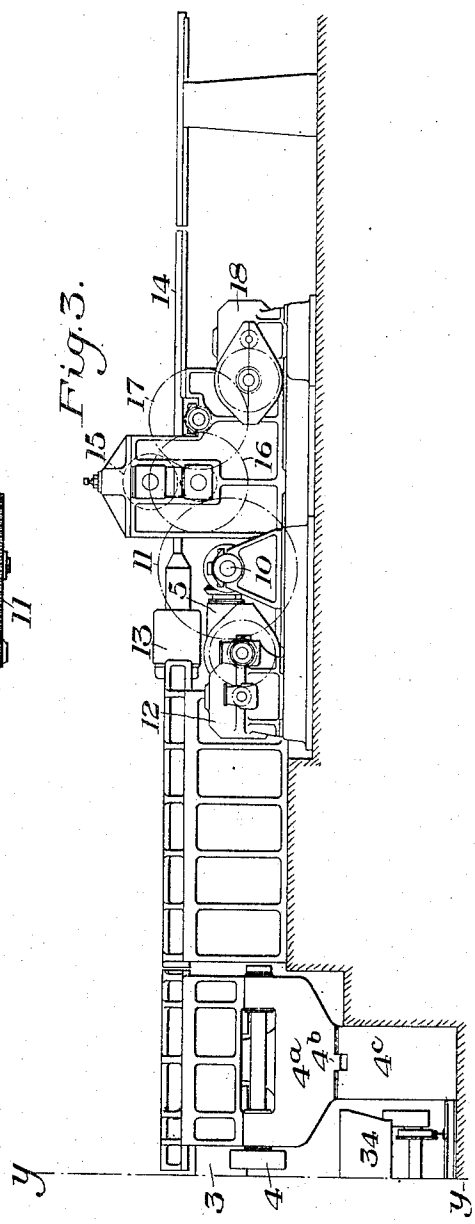


Fig. 3.



WITNESSES

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4 SHEETS—SHEET 2.

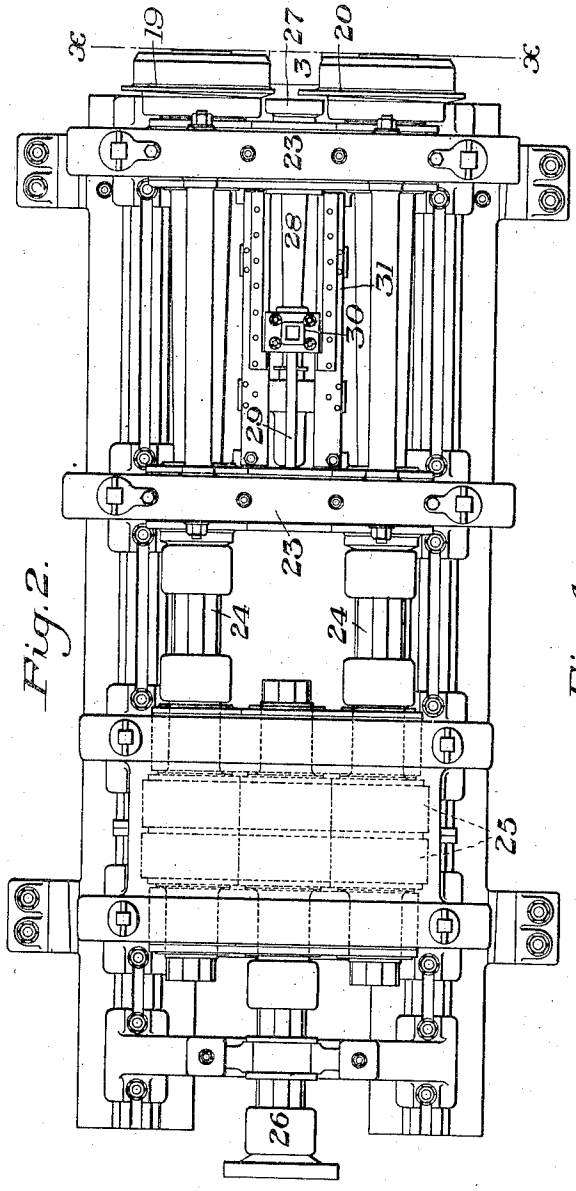

Fig. 2.

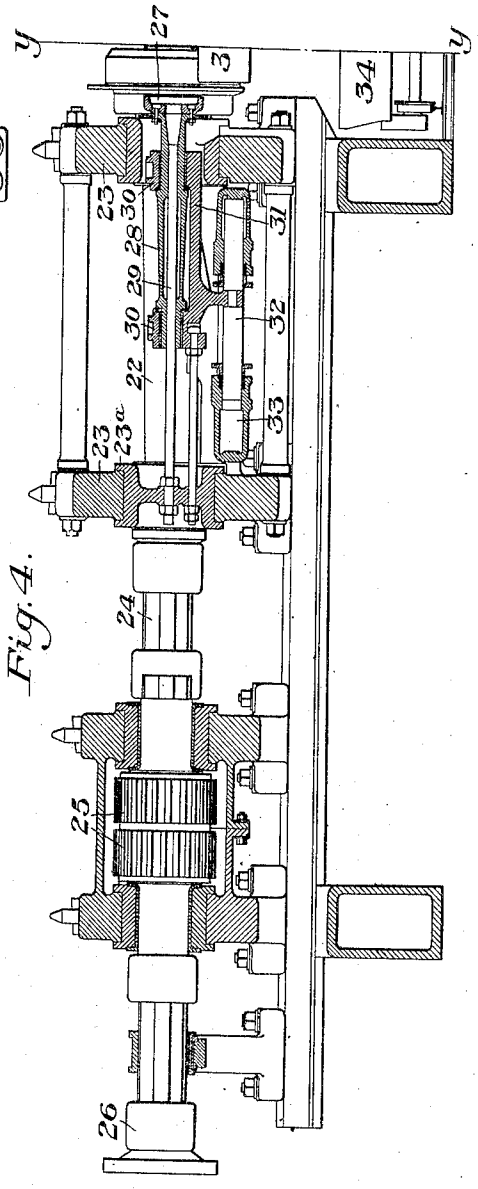

Fig. 4.

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4 SHEETS—SHEET 3.

Fig. 5.

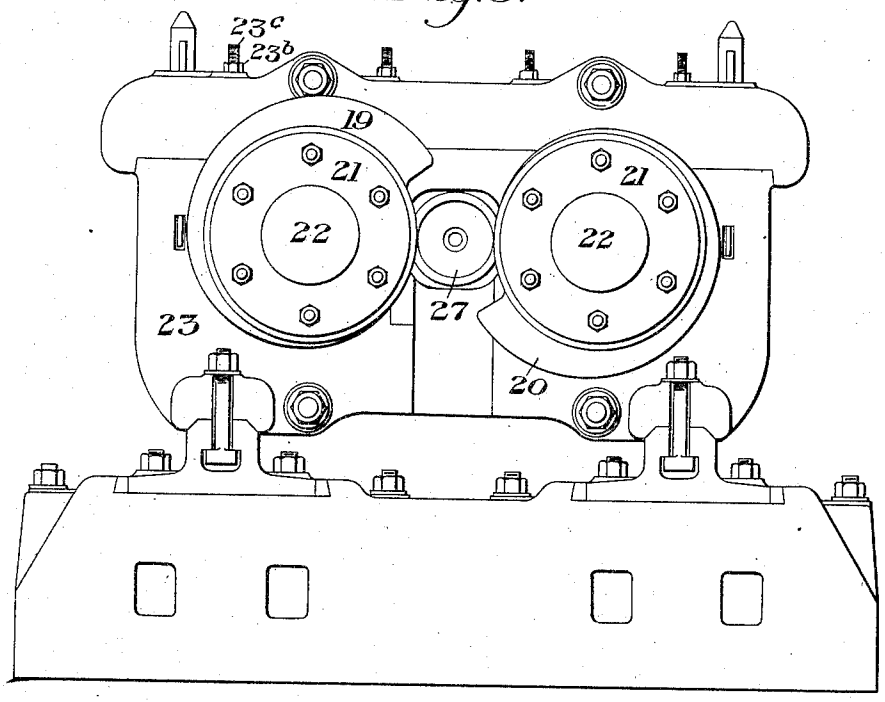
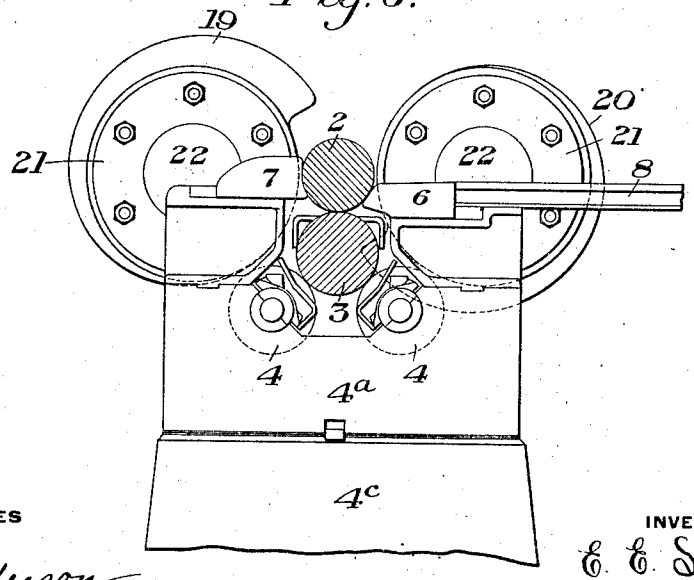


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 8.

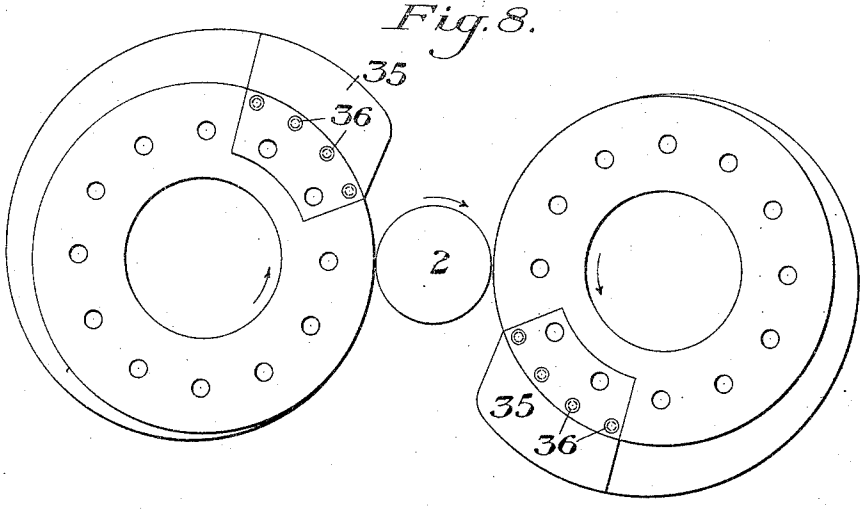


Fig. 7.

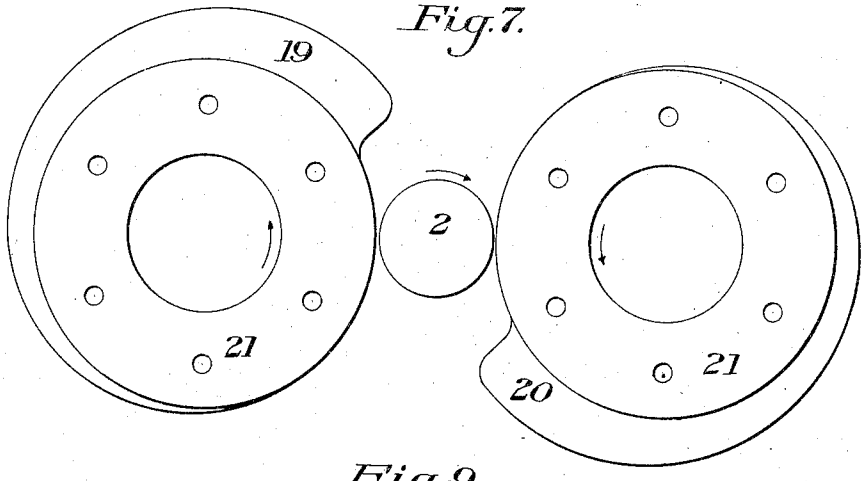


Fig. 9.

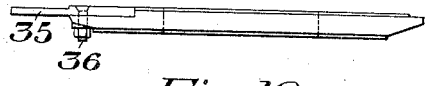
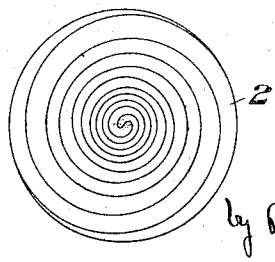


Fig. 10.



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UNITED STATES PATENT OFFICE.

EDWIN E. SLICK, OF PITTSBURG, PENNSYLVANIA.

ROTARY SHEARS.

965,037. Specification of Letters Patent. **Patented July 19, 1910.**

Application filed June 14, 1909. Serial No. 502,017.

To all whom it may concern:

Be it known that I, EDWIN E. SLICK, of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Rotary Shears, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a partial plan view of my improved apparatus; Fig. 2 is a continuation of Fig. 1; Figs. 3 and 4 are views similar to Figs. 1 and 2, showing a sectional side elevation of the apparatus; Fig. 5 is a front elevation of the shear mechanism; Fig. 6 is a sectional end elevation of the supporting mechanism in front of the shears with the metal in place; Fig. 7 is an enlarged elevation of the cutters; Fig. 8 is a similar view showing a modified form; Fig. 9 is an edge view of the cutter or knife of Fig. 8; Fig. 10 is a diagrammatic end view showing the manner of cutting through the ingot.

My invention relates to the shearing of ingots and is designed to provide an improved apparatus therefor.

In the drawings, in which I show a preferred form of my invention, the ingot shown at 2 is arranged to be carried on a longitudinal positively driven roller 3, which, in turn, is carried at one end on two idle rollers 4, and on the opposite end by the bearing 5. The roller 3 is shown as extending the entire length of the ingot and in turn is supported on the pair of rollers 4 and the cap bearing 5. The roller 3 is arranged to be adjusted so as to support ingots of varying diameters in proper position relative to the shear knives. As shown in the drawings, this roller support 3 is raised and lowered vertically by inserting or removing the liners 4^b from between the roller supports 4^a of the base plate 4^c.

Along the sides of and above the supporting roller 3 are side guides 6 and 7, which are designed to engage with the sides of the ingot and hold it against sidewise movement while being moved endwise in feeding the ingot forwardly and during the cutting operation. The ingot may be fed into position between these guides over the skids 8. The roller 3 is positively driven by a bevel gear connection shown at 9, with a shaft 10, having slow motion gearing 11, which is actuated by an electric motor 12. The metal is pushed endwise or longitudinally of the roller 3 and between the guides 6 and 7 by means of a rotary pusher head 13, which is fastened to the front end of an arm or bar 14, so as to rotate on the bar with the ingot when in engagement with the end of the ingot. The arm 14 is engaged by a friction roller 15, driven through slow motion gearing connections 16 and 17, by an electric motor 18. The idle supporting rollers 4 may be either continuous rollers supported at each end in bearings, or may be in the form shown, namely, shafts having overhanging disks 4, mounted thereon.

The apparatus above described sits in front of and in line with the shearing mechanism proper, the lines X—X, Y—Y of Figs. 1 and 3 coinciding with the lines X—X and Y—Y of Figs. 2 and 4, to show the relative positions of the apparatus. This shearing mechanism consists of two eccentric knives or shear blades 19 and 20. In the form shown, these eccentric knives are formed as disks with eccentric edge portions clamped between collars 21, which secure them on the shafts 22. The collars 21 are adjustably held in their spaced apart position and serve to support and prevent sidewise movement of the ingot during the cutting operations. The shafts 22 with the knives 19 and 20 and the collars 21 are adjustable toward and away from each other, and are held in their adjusted position by the adjusting screws 23^c and lock nuts 23^b; and where changes in the size of the ingot are very great, collars of greater or lesser diameter are substituted. The shafts 22 extend within the bearings 23^a, in the housings 23, and are connected by spindle and coupling connections 24, with a stand of driving pinions 25, which receive motion from a driving shaft 26.

Beyond the eccentric shear blades and between them is located a rotary cup-shaped holder 27, arranged to engage with and hold the end of the ingot during the cutting operation and to hold the cut off portion. This holder is mounted on a tubular stem 28, which slides over a stationary rod 29, secured to the housing 23 at its rear end. The tubular support 28 is rotatably mounted

in bearings 30, which are carried on a sliding frame 31, connected to the intermediate portion of a double plunger 32, moving within single acting hydraulic cylinders 33. During the cutting operation, the holder 27 rotates with the ingot and after the cutting operation, it is retracted to allow the cut off section to drop. If the section sticks in the holder, the rod 29 acts to push it out as the holder is retracted. The cut off section drops down, preferably into a car 34, movable on a track extending below the shears.

In Figs. 8 and 9, I show a modified form of shear knives, in which the portions 35 of the eccentric shear blades are removable, so that when they are worn, they may be replaced. I have shown these detachable sections as attached by countersunk bolts 36, to the cutter disk, which disk is then secured to the shaft in the same manner as before.

In the operation of the device, an ingot which is preferably cylindrical in form is rolled over the skids on top of the roller 3 and between the guides 6 and 7. The roller 3 is then positively rotated and the cutting knives are rotated in a counter-clockwise direction, looking at Fig. 5. As the knife shafts rotate, the eccentric knives will gradually sever the ingot from diametrically opposite sides by a succession of cuts, the cutting action being illustrated in Fig. 10. During this time, the ingot is being rotated both by the frictional action of the eccentric knives and also by the frictional driving action of its supporting roller, which is positively driven. The driving of the rotary supports for the ingot is of importance, especially toward the end of the operation, since the friction on the knives at such time is hardly sufficient to turn the piece being cut. During this operation, the holder keeps the end of the piece in proper position and holds it after it is severed from the main body. The collars 21 stiffen the shear knives 19 and 20, and also serve to maintain the body portion of the ingot in position and prevent its sidewise movement on the support 3 during the cutting operations. The holder is then retracted and the severed disk or cheese-like section drops into the car. The pusher 13 is then actuated to move the ingot forwardly a proper distance for the next severing operation. During this interval, the ingot slides between the disks carrying the eccentric knives, which knives are then in the position shown in Fig. 5. This pushing is continued until the end of the ingot is again received in the holder, which, in the meantime, has been moved forward into the desired position. The holder, therefore, also acts as a gage.

In order to cut different sized ingots, shear knives of different sizes may be substituted, and if desired, the degree of eccentricity of the knives may be varied.

The advantages of my invention result from the simplicity of the apparatus and the rapidity of operation. The blank is sheared off flat on one face and slightly conical on the opposite face, with very little upsetting action at its edges.

Changes may be made in the form and operation of apparatus without departing from my invention.

I claim:

1. In rotary shear mechanism, a support for a cylindrical article, consisting of a rotary surface or surfaces on which the article rests during shearing, a pair of opposed eccentric rotary shear blades, connections for positively rotating the said shear blades, and connections for positively rotating the rotary element or elements on which the article rests, substantially as described.

2. In rotary shear mechanism, a rotary element or elements on which the article is mounted, side-supporting guides for the article, a pair of eccentric rotary shear blades, connections for positively rotating the shear blades, and connections arranged to positively drive the rotary element or elements on which the article rests, substantially as described.

3. In rotary shear mechanism, a rotary support, connections for positively rotating the same, a pair of eccentric shear blades, connections arranged to rotate the shear blades, and an end pusher arranged to move the metal longitudinally on its rotary support, substantially as described.

4. In rotary shear mechanism, a rotary support, mechanism for positively rotating said support, and a pair of opposed rotary shear blades arranged to act upon the metal while mounted upon said support, substantially as described.

5. In rotary shear mechanism, a rotary support, mechanism for positively rotating said support, a pair of opposed rotary shear blades arranged to act upon the metal while mounted upon said support, and means for positively rotating the shear blades, substantially as described.

6. In rotary shear mechanism, a rotary support for the metal, mechanism for positively rotating the support, a rotary end holde. arranged to receive one end of the metal, and a pair of rotary shear blades, substantially as described.

7. In rotary shear mechanism, a rotary support for the metal, mechanism for positively rotating the support, a rotary end holder arranged to receive one end of the metal, a pair of rotary shear blades, and

means for positively rotating said shear blades, substantially as described.

8. In a rotary shear device, a rotary support and a rotary holder arranged to receive and support the end of the metal being severed during the cutting operation, substantially as described.

9. In a rotary shear device, a rotary support and a rotary holder arranged to receive and support the end of the metal being severed during the cutting operation, and mechanism for reciprocating the same, substantially as described.

10. In a rotary shear device, a rotary support and a rotary holder arranged to receive and support the end of the metal being severed during the cutting operation, mechanism for reciprocating the same, and an ejector arranged to push out the cut piece when the holder is moved endwise, substantially as described.

11. In mechanism for severing hot ingots, a rotary support, and rotary eccentric shear knives having a flat side portion arranged to enter the cut in the metal being sheared, said flat portion being substantially at right angles to the axis of the shear, substantially as described.

12. In rotary shear mechanism, a pair of opposed rotary eccentric shear blades having flat surfaces arranged to enter the cut in the metal being sheared, substantially as described.

13. In rotary shear apparatus, a pair of opposed rotary shear blades, mechanism for positively rotating the blades, and connections for rotating the ingot, substantially as described.

14. In rotary shear mechanism, a pair of opposed eccentric shear blades having flat surfaces arranged to enter the groove formed in the metal during the cutting operation, substantially as described.

15. In rotary shear mechanism, a pair of opposed rotary shear knives, shafts on which the knives are mounted, and clamping collars for securing the knives in place on said shafts, the collars being arranged to guide the metal during the cutting operations, substantially as described.

16. In rotary shear mechanism, a pair of opposed eccentric shear blades and clamping collars for the blades arranged to contact with and guide the metal during the cutting operations, substantially as described.

17. In ingot shearing mechanism having shear knives, a rotary ingot support, means for rotating said support, and means for adjusting the support relative to said shear knives, substantially as described.

18. In ingot shearing mechanism having shear knives, a horizontal rotary ingot-supporting roller, and means for adjusting said roller in a vertical direction relative to said shear knives, substantially as described.

19. In rotary shear mechanism, a pair of opposed eccentric shear blades and clamping collars for securing the blades in place, substantially as described.

20. In ingot-shearing mechanism, a support by which the ingot is turned in shearing, and means for adjusting said support relative to the shearing mechanism, substantially as described.

21. In rotary shear mechanism, a pair of opposed rotary shear knives, shafts on which the knives are removably mounted and detachable clamping collars for securing the knives in place on the shafts, the collars being arranged to guide the metal during the cutting operations; substantially as described.

22. In rotary shear mechanism, a pair of opposed eccentric shear blades, removable clamping collars for the blades arranged to contact with and guide the metal during the cutting operations, and means for securing the clamping collars in place; substantially as described.

23. In rotary shear mechanism, a support, on which the metal turns when being sheared, a pair of rotary shear blades and an end pusher arranged to move the metal endwise on its support, said pusher having a rotary end engaging with the end of the metal and adapted to revolve with said metal, substantially as described.

24. In a rotary shear device, a rotary holder arranged to receive one end of the metal during the cutting operation and mechanism for reciprocating the same, a pusher arranged to move the metal longitudinally and means for reciprocating the pusher, said pusher having a rotating head adapted to engage with and rotate with the ingot, substantially as described.

25. In shearing mechanism, a pusher arranged to contact with and move the metal endwise relative to the shear knives, said pusher having a rotary head thereon adapted to contact with and preventing endwise movement of the metal during the severing operations, substantially as described.

26. In a rotary shear device, a rotating stop arranged to contact and revolve with the metal during the cutting operation and prevent endwise movement of the metal while being severed, substantially as described.

27. In a metal shearing device, rotary stops arranged to contact with opposite ends of the metal and adapted to engage with and hold the metal in position endwise while being severed; substantially as described.

28. In a metal shearing device, rotary stops adapted to contact with opposite ends

of the metal and arranged to engage with and hold the metal in position endwise while being severed, and a rotary support on which the metal is turned during the severing operations; substantially as described.

29. In a metal shearing device, rotary stops adapted to contact with opposite ends of the metal and arranged to engage with and hold the metal in position endwise while being severed, a rotary support on which the metal is turned during the severing operations and means for positively rotating said support; substantially as described.

30. In a metal shearing device, rotary stops adapted to contact with opposite ends of the metal and arranged to engage with and hold the metal in position endwise while being severed, and means for moving said stops into and out of engagement with the metal; substantially as described.

In testimony whereof, I have hereunto set my hand.

EDWIN E. SLICK.

Witnesses:
R. D. LITTLE,
H. M. CORWIN.