March 1, 1932. J. W. AMES 1,847,857

APPARATUS FOR UTILIZING WASTE AND SCRAP METAL IN THE PRODUCTION OF COMMERCIAL BARS

Filed Oct. 8, 1929 2 Sheets-Sheet 1

Fig. 1.

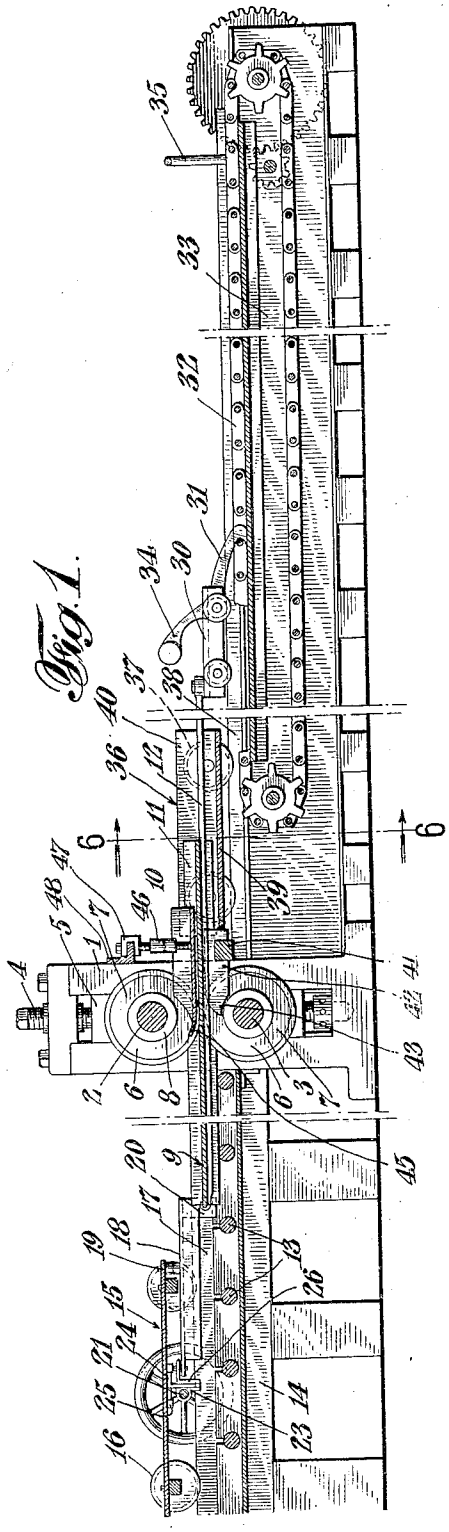
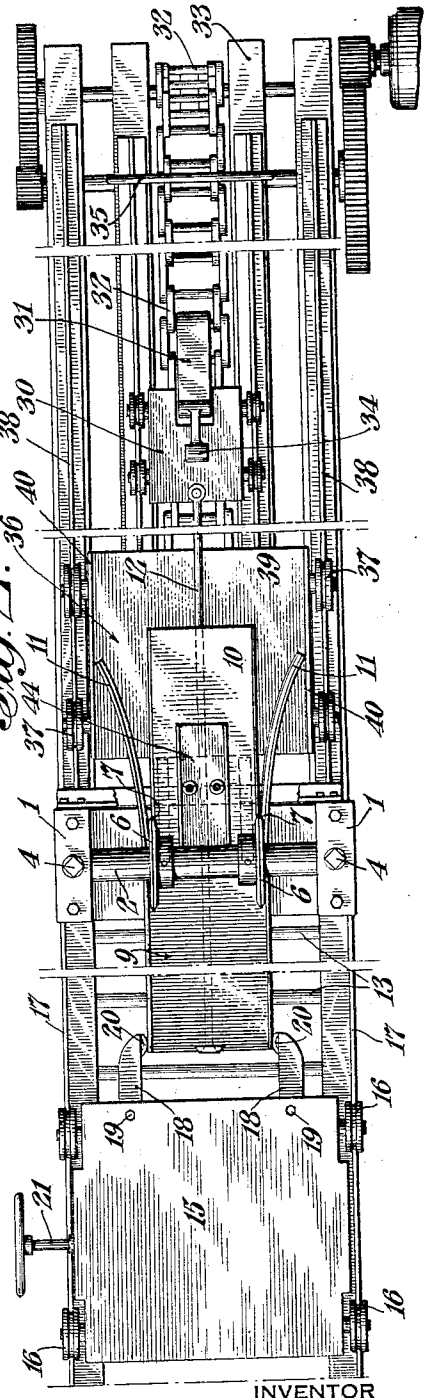


Fig. 2.



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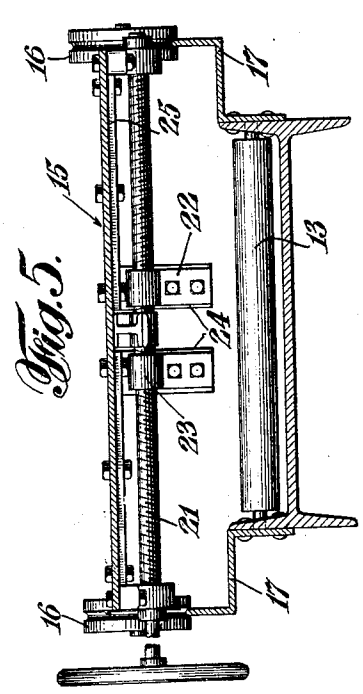


Fig. 5.

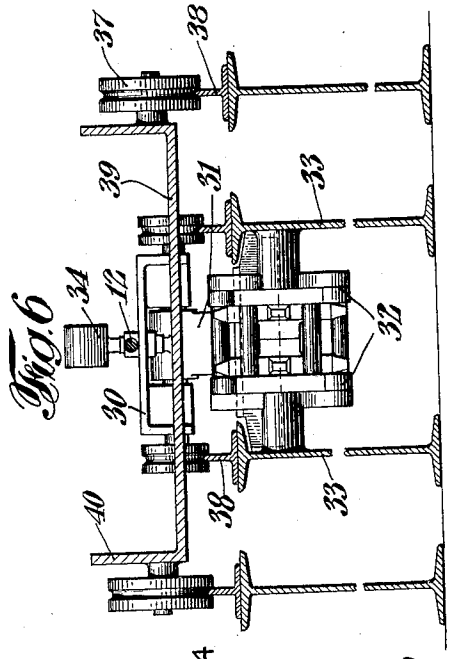


Fig. 6.

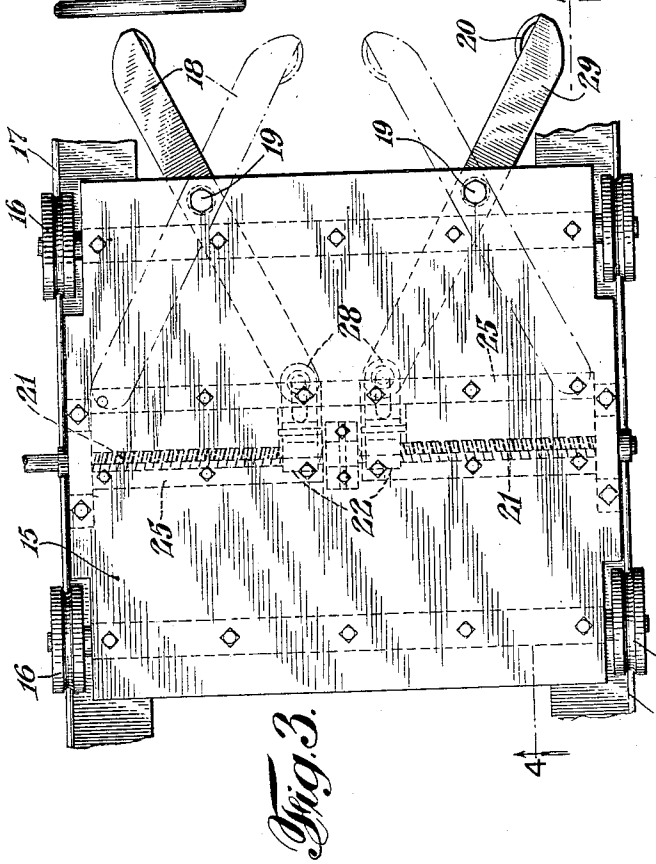


Fig. 3.

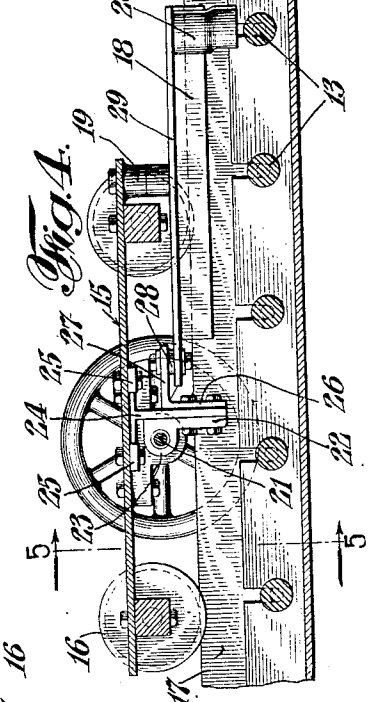


Fig. 4.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR UTILIZING WASTE AND SCRAP METAL IN THE PRODUCTION OF COMMERCIAL BARS

Application filed October 8, 1929. Serial No. 398,130.

This invention relates to the utilization of waste or scrap metal such as steel beams of various kinds, metal tubing, etc. to produce bars, rods and various structural shapes and the like, and it includes an apparatus as well as a novel method or process whereby substantial metal elements, ordinarily treated as waste or scrap, may be cut into elongated, flat pieces in a cold condition so as to be usable in that condition or to be converted by heating and rolling into commercial rods, bars or various structural shapes, as well as various other purposes.

One object of the invention is the provision of an apparatus which will carry out my method or process of cutting the metal while in a cold condition in an efficient and expeditious manner, the resultant parts being available for cutting, slitting and rolling treatment for conversion into various commercial forms with a minimum expenditure of time, labor and material.

The apparatus of this invention provides a draw bar in association with rotatable cutters whereby a metal element is drawn through the cutters to be severed while in a cold condition, suitable mechanisms being provided for properly holding and guiding the metal element until the cutting operation is complete.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, this invention consists in the construction, combination and arrangement of parts hereinafter described and then sought to be defined in the appended claims, reference being had to the accompanying drawings forming a part hereof and which show, merely for the purpose of illustrative disclosure, a preferred embodiment of my invention, it being expressly understood, however, that various changes may be made in practice within the scope of the claims without digressing from my inventive idea.

In the drawings—

Figure 1 is a vertical longitudinal section of an apparatus constructed to embody my invention and carry out my method and process.

Figure 2 is a top plan view of the apparatus shown in Figure 1.

Figure 3 is a top plan view of the guiding and holding means for the feeding operation, different positions of certain of the parts being indicated in dotted lines.

Figure 4 is a vertical longitudinal section taken substantially on line 4—4 of Figure 3.

Figure 5 is a vertical transverse cross section taken substantially on line 5—5 of Figure 4.

Figure 6 is a vertical transverse cross section taken substantially on line 6—6 of Figure 1.

I have elected in the accompanying drawings and in the following description to disclose my invention as adapted to treat or convert I-beams and other similar structural shapes into elongated elements or parts suitable for conversion into various commercial forms; it is to be expressly understood that the invention is not to be restricted to treating this class of material only, but that the apparatus and the method is adaptable to treating and handling other forms of metal.

Referring now to the drawings 1 designates a housing of any suitable or appropriate form and 2 and 3 designate shafts supported and mounted in said housing, adjustment being provided by the screws 4 operating journal boxes 5 for the shafts. Cutters 6 are secured to each of said shafts in opposed relation. The form of cutters shown is of disc shape with the bevelled cutting edge 7 and attached to the shafts by means of the unitary hub 8. For slitting an I-beam 9 such as illustrated, by way of example, it is necessary to use two sets or pairs of such cutters, two on the top shaft and two on the lower, and to adjust these cutters on the shafts so as to cut or slit the web 10 of the beam 9 as close as possible to the flanges 11 thereof. This almost entirely eliminates a rib or web unitary with the flanges when the latter are separated from the web and thereby produces flanges without a rib and also a flat plate member of the maximum width from the waste or scrap metal element.

As shown in Figure 1 of the drawings, the shafts 2 and 3 are parallel and spaced apart

a sufficient distance to enable the draw bar 12, to be presently described, to move freely in the space between said shafts and also between the two pairs of cutters. These cutters are fixedly and adjustably secured to the shafts so as to rotate therewith and perform the sole function of slitting or grooving the metal. To that end they are mounted idly so that they do not operate to feed the metal, the feed being accomplished by the pull of the draw bar 12 on the rear end of the metal element being treated.

In the feeding operation this metal element 9 is supported for proper movement upon a plurality of transverse rollers 13 suitably mounted between elongated frame members 14. These rollers are mounted in such a position as to support the metal element 9 by its flanges to present the same properly to the cutters for the cutting action. This has reference to the horizontal plane of operation. Of course, it is necessary that the metal element be presented to the cutters in proper line or in proper alignment and to that end I provide a feeding carriage 15. This is supported by grooved wheels 16 to move freely and idly along the tracks 17 which may be formed as part of the frame. This carriage carries on its under side a pair of clamping and holding arms 18 pivotally mounted to the carriage as at 19 and provided on their outer ends with the rounded holding or engaging members 20. As indicated in dotted lines, these arms are adapted to be moved from open to closed position simultaneously and to the same degree. These arms engage the sides of the metal element 9 being treated and, therefore, position the same centrally of the apparatus and in proper alignment to the cutters. In order to accomplish this simultaneous and uniform movement of the two arms 18, I provide elongated screw member 21 suitably supported beneath the carriage and having box members 22 provided with screw-threaded portions 23 to engage the right and left-hand threads of the screw 21 and to be moved thereby in opposite directions and to the same degree when the screw 21 is rotated. These box members have T-shaped guiding elements 24 connected thereto which slide between the spaced guides 25 suitably secured to the under side of the carriage so that the box members will always move in a straight line transversely across the carriage. To each guiding element 24 I attach angular bracket 26 having a horizontal flange 27 to receive the pivot element 28 which connects the rear or inner end 29 of arms 18 to said bracket 26 and, therefore, to said sliding box member 22. It is seen, therefore, that by rotation of the screw 21 the arms 18 will be opened and closed simultaneously and uniformly whenever necessary. These parts are operated to clamp the sides of the metal element 9, being treated, with sufficient friction so as to move or pull the carriage as a whole along with the metal element as it passes through the cutters.

The draw bar 12 is connected to a suitable travelling carriage 30 on which is pivoted a dog 31 which is adapted to engage the links of a chain 32 suitably mounted and driven on the draw bench 33. This dog has the projecting arm 34 which is adapted to engage the trip member 35 when the draw bar reaches the outer limit of its movement so as to automatically release the draw bar from the driving chain.

It will be understood that in slitting metal shapes of this character the side flanges will have a tendency to flare or bend outwardly and take up a considerable space. In order to prevent this I provide the guiding carriage 36 which is supported upon grooved wheels 37 to run upon the tracks 38. The carriage is in the form of a channel 39 of sufficient width to support metal elements of the maximum size and having the side flanges 40 of sufficient height to properly hold the spreading and bending side portions, as indicated in Figure 2 of the drawings. In operation, this carriage is positioned adjacent the cutting discs so that when the flanges of the metal element are severed and spread outwardly, the ends thereof will engage the side flanges 40 of the carriage 36 and move the carriage along its tracks 38, whereby the carriage constitutes a movable holding means for the severed flanges of the metal element. The side flanges of the carriage are formed or provided with grooves or recesses or projections or any suitable form of irregularity against which the ends of the cut material engage so as to positively move the carriage.

In starting the operation, the beam 9 is placed upon the transverse rollers 13 and the draw bar 12 is connected to the rear end of the same, the arms 18 being clamped against the sides of the rear end of the beam. Power being applied to the draw bar, the bar is moved into cooperative relation to the cutters and the side flanges severed therefrom, the carriage 15 moving along with the I-beam. The severed flanges spread out and cause the movement of the carriage 36 as previously described.

The cold metal is moved between the rotary cutters by a travelling draw bar attachable to the metal, said draw bar acting solely to draw the metal with a travelling motion between the rotary cutters. The cutters are idle in their mountings and they are rotated on their axes by frictional engagement with the moving metal. The draw bar is independent of the rotary cutters, and it is attachable to the metal regardless of the character or dimensions of the metal to be severed and separated. Said draw bar is operated by appropriate pulling means independently of

the idle motion of the rotary cutters, and said pulling means imparts motion to the draw bar with respect to both the rotary cutters and to the pressure mechanism. The drawbar is attachable either to structural shapes or compacted tubes or to any other kind of preused cold metal adapted for treatment in the machine; in fact, the draw bar operates on metal of any appropriate character and independently of the adjustments or positions of the rotary cutters in adapting them for service on diverse characters of metal to be slitted and separated.

In my invention I do not use rolls for effecting the feed motion of the metal. For cutting reliance is placed upon disc-like cutters spaced relatively to each other on a shaft with which the cutters are rotatable, and this shaft is mounted for rotation idly in appropriate bearings of a housing. It is preferred to use two sets of rotary cutters, the cutters of each set being above and below the path of the moving metal, and the two sets of cutters are spaced relatively to each other on the respective shafts. The shafts are relatively adjustable to accommodate the cutters to metal of varying cross sectional sizes, and said cutters are shiftable on the shafts to regulate the distance between parallel slits produced on the metal by the rotary action of the cutters, whereby the cutters may be changed in positions to suit the material to be operated upon and which adaptation is effected regardless of the feed motion to be given to the metal by the travel of the draw bar.

As shown in Figures 1 and 2, I provide means for supporting and guiding the web of the I-beam passing through this apparatus. This means includes the transverse bar 41 which is connected to and supported by housing 1. Mounted upon this bar 41 are a plurality of spaced arms 42 extending rearwardly therefrom and having their ends curved or arcuate in shape as at 43, to fit over a cylindrical spacer between the cutting discs. The top surface of these bars is of substantial extent so as to support the web 10 especially after the flanges 11 are severed therefrom. A holding and positioning member is provided above these guiding bars in the form of a channel shaped member 44 having its rearward end extended beyond the plane of the axes of the slitting discs and slightly turned upward as at 45 to receive the web 10 thereunder and between members 42 and 44. This member 44 is adjustably held in position by means of the screw element 46 connected to the yoke member 47 slidably mounted upon the angle member 48, which is connected to the opposite housings 1. Member 44 is, therefore, adjustable sidewise and also may be raised and lowered, depending upon the thickness of the web. Members 42 are adjustable sidewise and with relation to each other. This provides a very simple and effective means of supporting the web and preventing it from curling up or being deformed in the operation of the machine.

This application is an improvement upon my co-pending application filed July 8, 1927, Serial No. 204,205 for method of and apparatus for utilizing waste metal in the production of commercial bars.

What I claim is:—

1. In combination in an apparatus of the character described, a plurality of opposed slitting rolls mounted idly, means for engaging one end of a metal element to properly guide the same through said rolls, means for moving said metal element through said idly mounted slitting rolls, and means for holding and guiding the severed parts of said metal element after passage through said slitting rolls.

2. In combination in an apparatus of the character described, a plurality of opposed slitting rolls mounted idly, means for engaging one end of a metal element to properly guide the same through said rolls, said means comprising a travelling carriage and a plurality of adjustable arms thereon adapted to frictionally engage the end of said metal element, and means for moving said metal element through said idly mounted slitting rolls.

3. In combination in an apparatus of the character described, a plurality of opposed slitting rolls mounted idly, means for engaging one end of a metal element to properly guide the same through said rolls, said means comprising a travelling carriage and a plurality of adjustable arms thereon adapted to frictionally engage the end of said metal element, means for adjusting said arms simultaneously and uniformly, and means for moving said metal element through said idly mounted slitting rolls.

4. In combination in an apparatus of the character described, a plurality of opposed slitting rolls mounted idly, means for engaging one end of a metal element to properly guide the same through said rolls, means for moving said metal element through said idly mounted slitting rolls, and means for holding and guiding the severed parts of said metal element after its passage through said slitting rolls, said last-mentioned means comprising a freely movable carriage provided with upstanding portions adapted to be engaged by said severed parts of the metal element.

5. In combination in an apparatus of the character described, a draw bench including a draw bar and means for operating the same, a cold metal slitting mechanism positioned in alignment with said draw bar, a table for supporting a metal element, the draw bar being adapted to engage one end of the metal element and move the same through said slitting mechanism, a holding

and guiding carriage movably mounted upon said table and provided with means for engaging the rear end of said metal element, and another carriage movably mounted upon said draw bench and adapted to receive the severed portions of said metal element and be moved along the draw bench by the severed portions.

6. In combination in an apparatus of the character described, a draw bench including a draw bar and means for operating the same, a cold metal slitting mechanism positioned in alignment with said draw bar, a table for supporting a metal element, the draw bar being adapted to engage one end of the metal element and move the same through said slitting mechanism, a holding and guiding carriage movably mounted upon said table and provided with means for engaging the rear end of said metal element, said engaging means comprising a pair of arms pivotally connected to said carriage so that their free ends may engage the end of said metal element and means for moving said arms simultaneously and uniformly in both directions, and another carriage movably mounted upon said draw bench and adapted to receive the severed portions of said metal element and be moved along the draw bench by the severed portions.

7. In combination in an apparatus of the character described, a draw bench having a draw bar and means for operating the same, a slitting mechanism, a table for presenting an elongated metal element to said slitting mechanism and means movable upon said table for holding and guiding the rear end of said metal element and means movable upon said draw bench for holding and guiding the severed portions of said metal element as they leave said slitting mechanism.

8. In combination in an apparatus of the character described, a draw bench having a draw bar and means for operating the same, a slitting mechanism, a table for presenting an elongated metal element to said slitting mechanism and means movable upon said table for holding and guiding the rear end of said metal element and means movable upon said draw bench for holding and guiding the severed portions of said metal element as they leave said slitting mechanism, said last-mentioned means comprising a carriage having flanged portions with which the end of said severed portions of the metal element engage.

9. In combination in an apparatus of the character described, a plurality of opposed slitting rolls, means for engaging one end of a metal element for forcing said element through said slitting rolls and means associated with said slitting rolls and adapted to engage part of the metal element immediately after its passage beyond said slitting rolls to support and hold the severed parts of said metal element.

10. In combination in an apparatus of the character described, a plurality of opposed slitting rolls, means for engaging one end of a metal element for forcing said element through said slitting rolls and a plurality of means associated with said slitting rolls above and below the path of movement of said metal element and adapted to engage part of the metal element immediately after its passage beyond said slitting rolls to support and hold the severed parts of said metal element.

11. In combination in an apparatus of the character described, a plurality of opposed slitting rolls, means for engaging one end of a metal element for forcing said element through said slitting rolls and a plurality of means associated with said slitting rolls above and below the path of movement of said metal element and adapted to engage part of the metal element immediately after its passage beyond said slitting rolls to support and hold the severed parts of said metal element, said means being adjustable transversely of the apparatus.

12. In combination in an apparatus of the character described, a plurality of opposed slitting rolls, means for engaging one end of a metal element for forcing said element through said slitting rolls, and means located below the path of travel of the metal element to support the severed portion of the same, including a plurality of supporting bars adjustably mounted transversely of the apparatus and having extended bearing surfaces to hold and guide part of said severed metal element.

13. In combination in an apparatus of the character described, a plurality of opposed slitting rolls, means for engaging one end of a metal element for forcing said element through said slitting rolls, and means associated with said slitting rolls above the normal path of travel of said metal element, comprising an elongated member having one end extending between and beyond said rolls to guide part of said metal element before entering said rolls.

14. In combination in an apparatus of the character described, a plurality of opposed slitting rolls, means for engaging one end of a metal element for forcing said element through said slitting rolls, and means associated with said slitting rolls above the normal path of travel of said metal element, comprising an elongated member having one end extending between and beyond said rolls to guide part of said metal element before entering said rolls, and means for raising and lowering said last mentioned member.

15. In combination in an apparatus of the character described, a plurality of opposed slitting rolls, means for engaging one end of a metal element for forcing said element

through said slitting rolls, and means associated with said slitting rolls above the normal path of travel of said metal element, comprising an elongated member having one end extending between and beyond said rolls to guide part of said metal element before entering said rolls, and means for adjusting said last-mentioned member transversely of the apparatus.

16. In combination in an apparatus of the character described, a support, a plurality of opposed slitting rolls mounted idly thereon, means for adjusting said rolls, and means for engaging one end of a metal element to properly guide the same through said rolls, means for drawing said metal element through said idly mounted slitting rolls, and means for holding and guiding the severed parts of said metal element after its passage through said slitting rolls, said last mentioned means comprising a freely movable carriage provided with upstanding portions adapted to be engaged by said severed parts of the metal element.

17. In combination in an apparatus of the character described, a support, a plurality of opposed slitting rolls mounted thereon, means for engaging the rear end of a metal element for drawing said element through said slitting rolls, and means associated with said rolls and adjacent said rolls for supporting and guiding the metal element in its passage through the rolls, said means including an elongated member positioned above the normal path of travel of the metal element and having one end extending between and beyond said rolls.

18. In combination in an apparatus of the character described, a support, a plurality of opposed slitting rolls mounted thereon, means for engaging the rear end of a metal element for drawing said element through said slitting rolls, and means associated with said rolls and adjacent said rolls for supporting and guiding the metal element in its passage through the rolls, said means including an elongated member positioned above the normal path of travel of the metal element and having one end extending between and beyond said rolls, and means for holding and guiding the severed parts of the metal element after passage through said slitting rolls.

19. In combination in an apparatus of the character described, a plurality of opposed slitting rolls mounted idly, means for guiding a metal element through said rolls, means for moving said metal element through said idly mounted slitting rolls, and means for holding and guiding the several parts of said metal element after passage through said slitting rolls.

20. In a metal cutting machine, a combination of rotary cutters mounted for idle rotary movement, means for imparting a moving force to a metal element to move the same through and between said rotary cutters whereby movement of the metal element imparts rotary motion to said cutters, and means adjacent to and associated with said rotary cutters for supporting and guiding the metal element in its passage through said rotary cutters.

21. In combination in an apparatus of the character described, a draw bench having a draw bar and means for operating the same, a slitting mechanism, a table for presenting an elongated metal element to said slitting mechanism, and means movable upon said table for holding and guiding said metal element, and means movable on said draw bench for holding and guiding the severed portions of said metal element as they leave said slitting mechanism.

In testimony that I claim the foregoing, I have hereunto set my hand this 2nd day of October, 1929.

JAMES W. AMES.