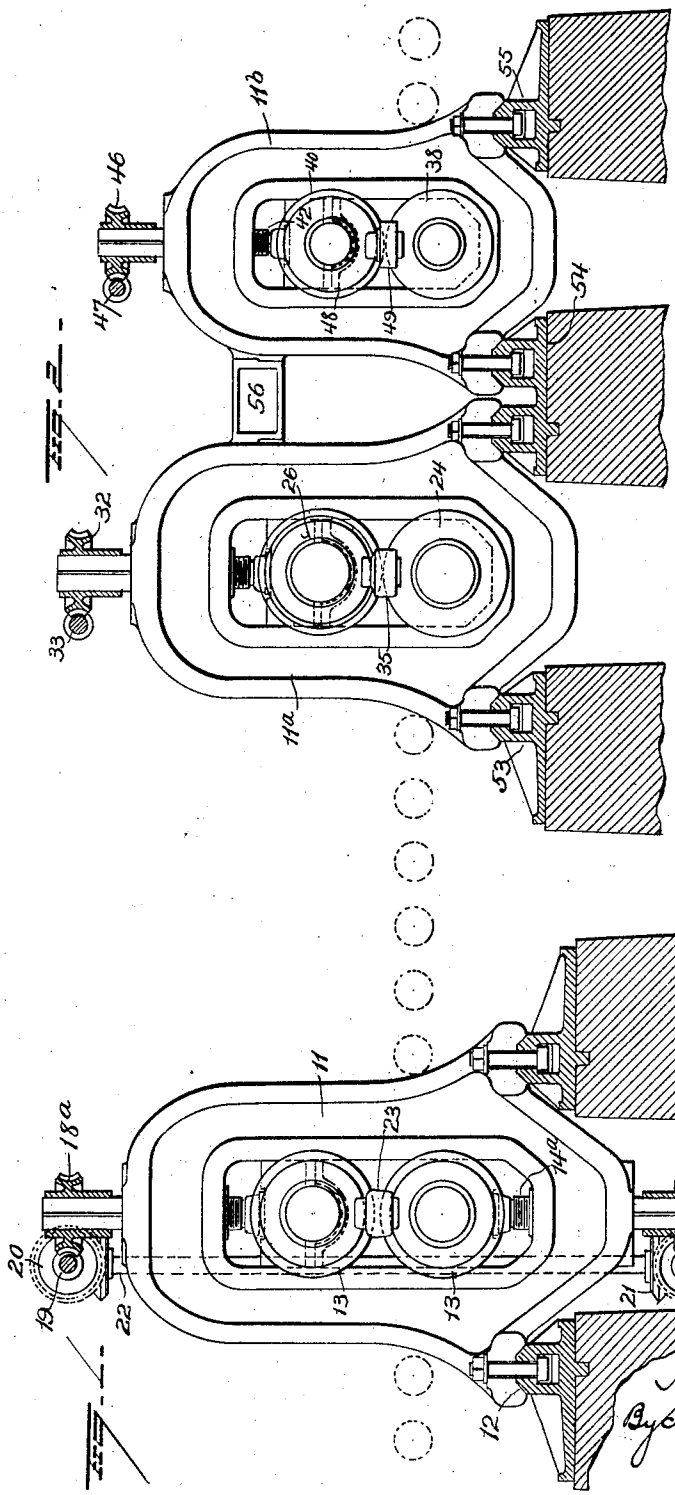
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UNIVERSAL MILL.

APPLICATION FILED JAN. 15, 1920.

1,385,644. **Patented July 26, 1921.**

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

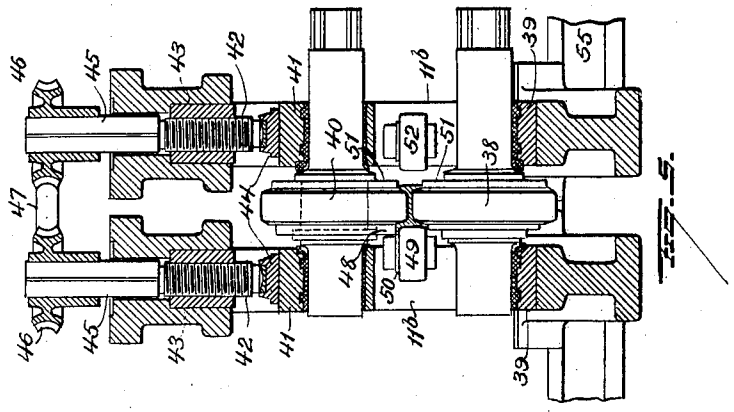


FIG. 5.

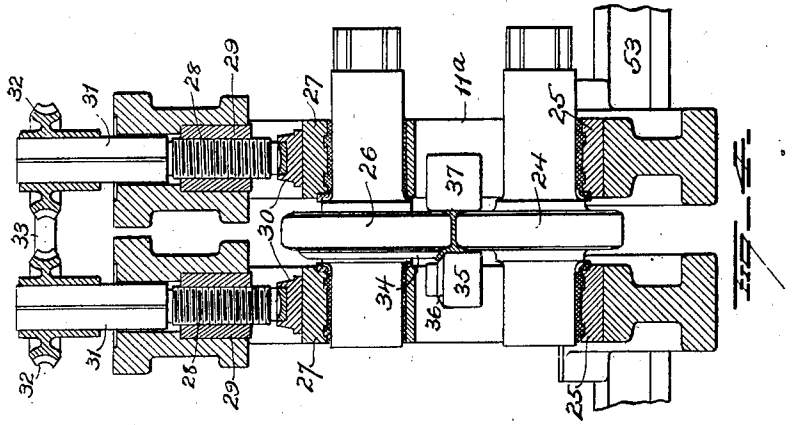


FIG. 4.

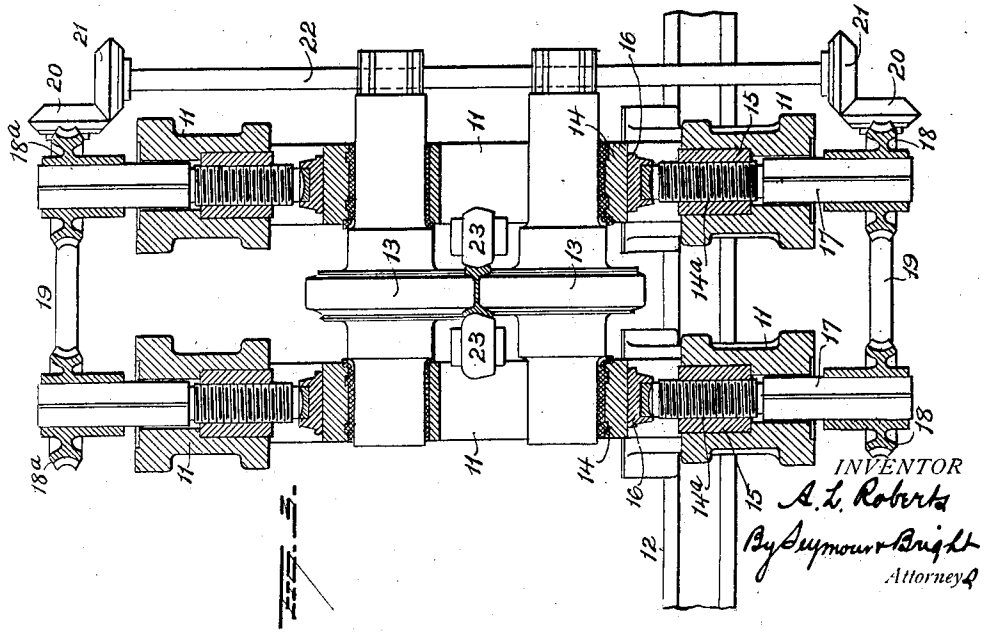


FIG. 3.

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3 SHEETS—SHEET 3.

FIG. 6.

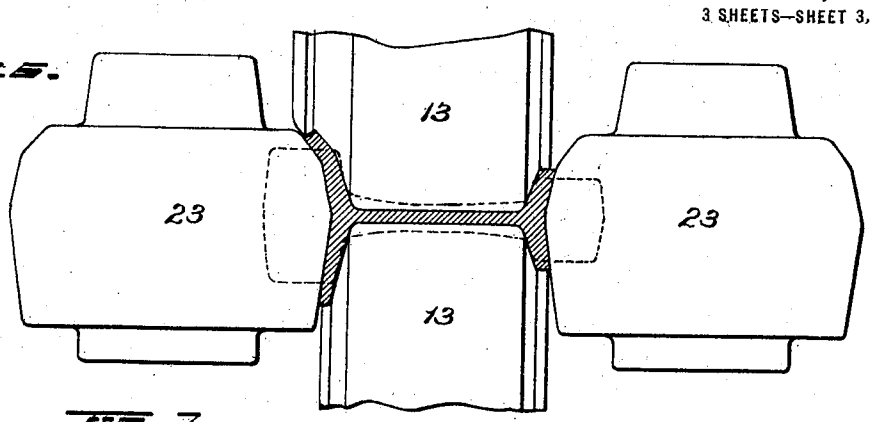


FIG. 7.

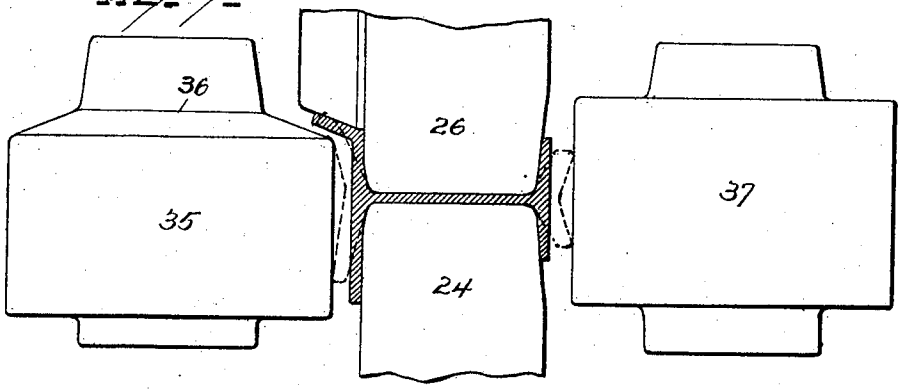


FIG. 8.

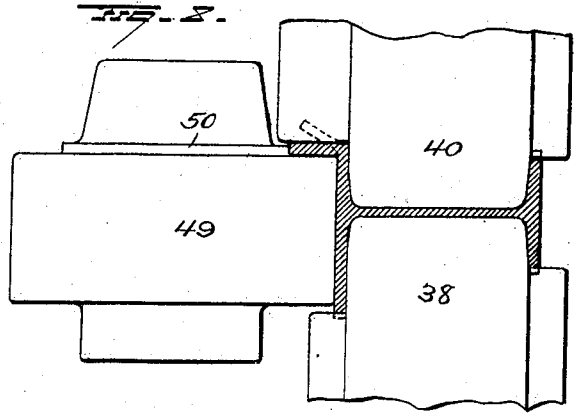


FIG. 9.

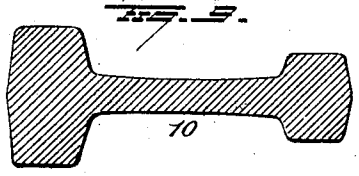
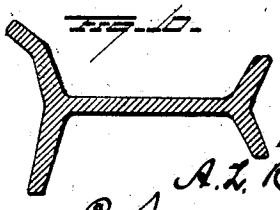


FIG. 10.



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UNITED STATES PATENT OFFICE.

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UNIVERSAL MILL.

1,385,644. Specification of Letters Patent. Patented July 26, 1921.

Application filed January 15, 1920. Serial No. 351,630.

To all whom it may concern:

Be it known that I, ALVIN L. ROBERTS, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Universal Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in apparatus for rolling metallic beams, columns, girders and the like, and comprises three stands of rolls, each consisting primarily of a pair of suitably-rotated parallel rolls arranged horizontally, one above the other, and in the same vertical plane, and adapted to roll the web and inner sides of the flanges of the column, beam or girder, and a pair of upright rolls arranged centrally between the axes of the two horizontally arranged rolls and at opposite ends respectively of the horizontal rolls, and adapted to roll the outer sides of the flanges of the column, beam or girder.

All three mills are of the usual two-high reversing type in which the piece to be rolled is passed back and forth between the rolls to reduce its cross-sectional area, and at the same time lengthen it, and in which the rolls are caused to approach each other the direction of rotation of the rolls being reversed between each pass.

In the accompanying drawings; Figure 1 is a view in transverse vertical section of the preliminary or roughing mill; Fig. 2 is a similar view of the main finishing mill and supplementary finishing mill; Fig. 3 is a vertical longitudinal section through the center of the roughing mill showing the rolls in elevation; Fig. 4 is a similar section of the main finishing mill; Fig. 5 a similar section of the supplementary finishing mill; Fig. 6 is a diagrammatic view showing the arrangement of the roughing mill rolls; Fig. 7 is a similar view of the rolls for the main finishing mill; Fig. 8 a similar view of the rolls for the supplementary finishing mill; Fig. 9 is a view in cross section of the blank as it comes to the roughing mill and Fig. 10 is a view of the rolled member as it leaves the roughing mill.

The blank 10 from which the section is rolled is produced in a mill which forms no part of this invention, and is of substantially the shape shown in Fig. 9 before it is operated upon by the roughing mill and after it has been reshaped in the roughing mill it is passed to the finishing mill which comprises two stands of rolls adapted to be driven by the same motor or engine and sufficiently close to each other that the beam being operated upon will enter between the rolls of one finishing mill before it leaves the rolls of the other finishing mill.

The finishing mill, Figs. 2, 4 and 5 consists of two stands of rolls placed near together and adapted to be driven by means of gearing not shown, by the same motor or engine, and arranged sufficiently near to each other as shown in Fig. 2, to cause the beam being rolled to be operated upon by either one of said finishing mills before it has left the other.

Besides being adapted to roll all the ordinary well-known shapes of beams, columns or girders, consisting of a central web with parallel straight flanges at each end of the web, this mill will also produce various sections in which the edge of one or both flanges are turned outward at various angles, one of which is illustrated by the accompanying drawings, the shape of beam as completed in the main finishing mill being shown in section in Fig. 4 and the beam as completed in the supplementary mill in Fig. 5.

In Figs. 1 and 3 the frames or housings 11 of the roughing mill are supported in the usual manner on shoe plates 12. The horizontal rolls 13, are supported by bearings 14, in the housings 11. The screws 14^a operating in nuts 15 in the housings, bear against blocks 16 placed in recesses in the bearings 14. The outer ends of the screws 14^a, are made of square section 17, and each screw has mounted thereon a worm gear 18, the top pair 18^a being driven by a worm shaft 19 and a similar worm shaft driving the bottom pair. At one end of each worm shaft 19, is attached a bevel gear 20 in mesh with a similar bevel gear 21, the last bevel gears being attached to shaft 22, so that if either worm shaft is rotated to advance the screws and the corresponding roll, the opposite pair of screws and roll will be advanced a like amount, thus maintaining at all times the center of web of beam accurately on the same center line of the vertical side rolls.

The vertical side rolls 23, which are provided with double inclined surfaces are ar-

ranged to be moved toward or away from each other in similar manner as the horizontal rolls, and by similar screws and gearing not shown.

In the main finishing mill, Figs. 2 and 4, the bottom horizontal roll 24 is supported by fixed bearings 25, and the top horizontal roll 26 is supported by movable bearings 27, similar to bearings 14 in the roughing mill. The screws 28 operate in nuts 29 in the housings 11[a] and bear against blocks 30. They have a square portion 31, at their upper ends on which are mounted the worm gears 32, driven by the worm shaft 33.

When a beam is to be produced with the edge of one or both flanges turned outward as shown in the drawing, the horizontal roll 26 should be provided with a tapered or conical portion 34, and the vertical side roll 35, with a corresponding conical portion 36, both adapted to produce the shape of section shown by their combined relation. When a plain flange is to be produced the vertical side roll 37 is made cylindrical throughout as shown. In this mill the vertical side rolls are operated in precisely the same manner as already described for the roughing mill.

In the supplementary finishing mill Figs. 2 and 5, the horizontal bottom roll 38 is supported by fixed bearings 39, and the horizontal top roll 40, by movable bearings 41. The screws 42 operate in nuts 43 in the housings 11[b] and bear against blocks 44 placed in recesses in bearings 41. The screws 42 have square portions 45 at their upper ends on which are mounted worm gears 46 driven by worm shaft 47.

When a beam is to be produced with the edge of one or both flanges turned outward as indicated on the drawing, the horizontal roll 40 is made with a parallel shoulder or collar 48, and the vertical side roll 49, with a squared recess 50, both adapted to produce the required shape of section by their combined action. When a plain flange is to be produced the horizontal rolls 38 and 40, are provided with parallel shoulders or collars 51, which are adapted to roll the edges of the flanges only, in which case the vertical side roll 52, is not used but is left idle or inoperative, by means of a movable clutch interposed in the shafting connecting the gear drive for the side rolls.

The finishing mill consisting of the two stands of rolls herein referred to as the main finishing mill and the supplementary finishing mill respectively, are mounted side by side on the shoe-plates 53, 54 and 55, and may be further supported against vibration by a tie-frame 56.

It will be noted that certain parts of these mills have been omitted and not described, as for instance the balancing mechanism for the top rolls, also the method of driving the rolls, but it is to be understood that the usual devices for such mills are to be incorporated in these mills, and that they form no part of my invention.

While I have described one method of operating the screw-adjusting devices, for the rolls both for the main finishing and supplementary finishing mills, it is to be understood that they may in each case be operatively connected or operated by entirely separate means.

As stated previously, the main and supplementary finishing mills, being mounted near each other, are to be driven by the same engine or motor by means of suitable gearing adapted to drive the rolls of the respective mills at approximately the same circumferential speed.

Having fully described my invention what I claim as new and desire to secure by Letters-Patent, is:

1. In a mill for rolling beams, columns and the like, the combination of a preliminary or roughing mill, consisting of one stand with two main horizontal rolls placed one above the other and so connected that each has an equal vertical adjustment toward or away from each other and vertical side rolls with doubly inclined faces, placed at opposite ends and in a plane passing between the main horizontal rolls, and their axes all in the same vertical plane; and a finishing mill, consisting of two stands of rolls, the first or main finishing mill having two main horizontal rolls placed one above the other, and one having a tapered collar at one end; vertical rolls placed at opposite ends and between the main horizontal rolls, one of said side rolls provided with a tapered or conical portion to coact with the conical portion on the horizontal roll; the second or supplementary finishing mill having two main horizontal rolls placed one above the other roll and having projecting shoulder or collar at one side of the central portion, with vertical side rolls placed at opposite ends and between the main horizontal rolls and adapted by their circumferential outline to produce the required shape of a rolled beam or column.

2. In a mill for rolling beams, columns and the like, the combination of a preliminary or roughing mill consisting of one stand with two main horizontal rolls placed one above the other and so connected that each has an equal vertical adjustment toward or away from each other, and vertical side rolls at opposite ends and in a plane passing between the horizontal rolls, and a finishing mill consisting of two stands of rolls so located that the beam being rolled may be engaged by either of said mills before it has left the other, the first or main finishing mill having two main horizontal rolls one having a tapered collar at one end;

vertical side rolls, the end of one of which is shaped to coöperate with the tapered collar on the horizontal roll, and the second or supplementary finishing mill having horizontal and vertical rolls the ends of which are shaped to complete the shape started in the two prior mills.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

ALVIN L. ROBERTS.

Witnesses:
GEORGE MARX,
C. C. HARDING.