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ROLLING MILL.

No. 344,383. Patented June 29, 1886.

Fig. 1.

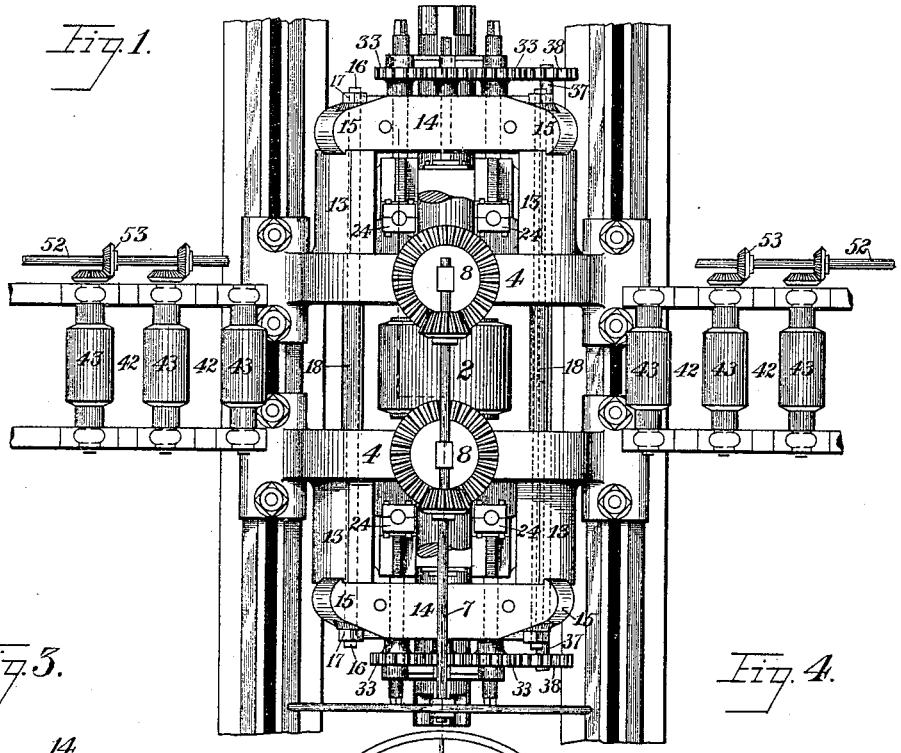

Fig. 3.

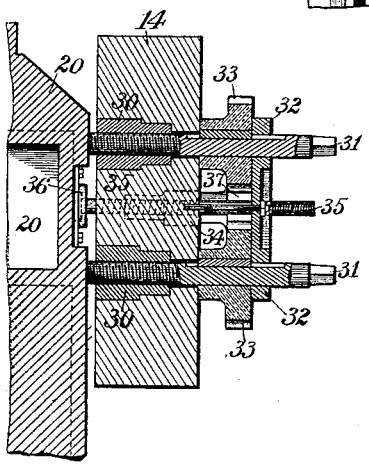

Fig. 4.

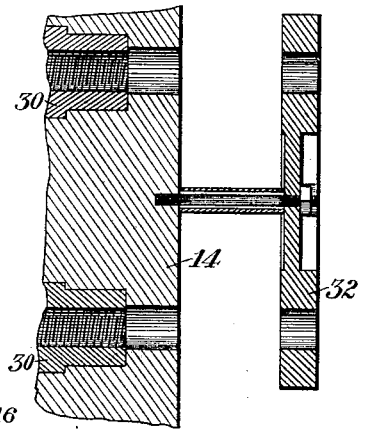

Fig. 2.

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Fig. 9.

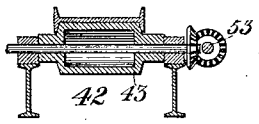

Fig. 6.

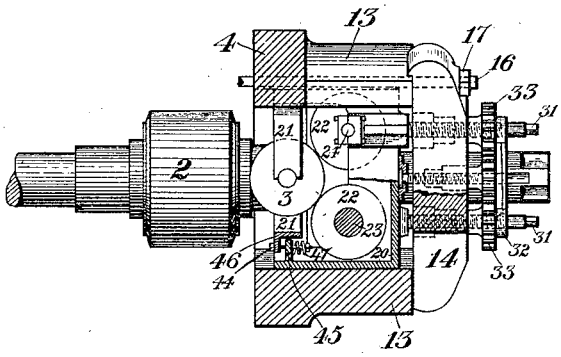

Fig. 7.

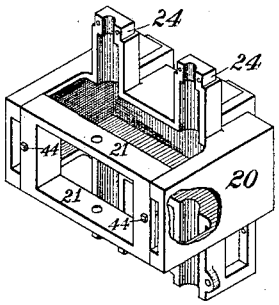

Fig. 5.

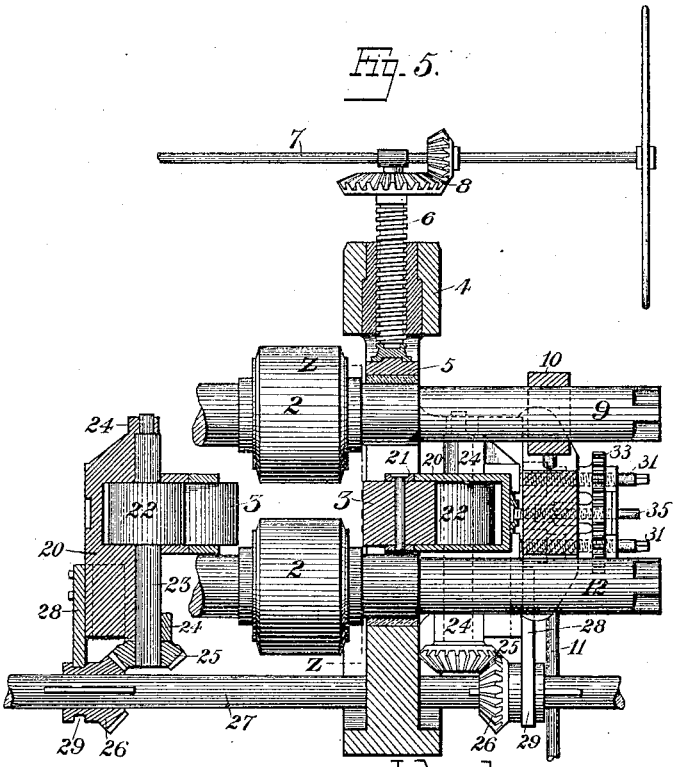

Fig. 8.

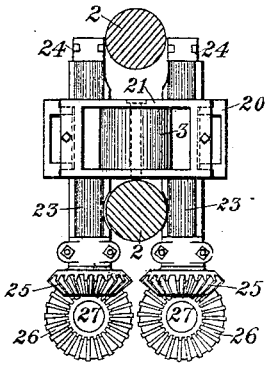

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Fig. 10.

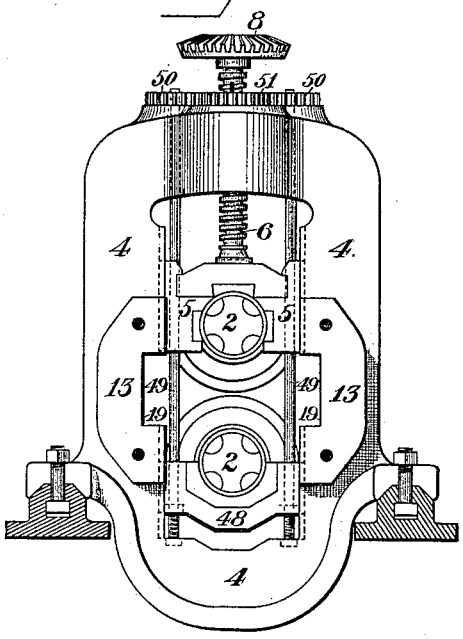


Fig. 11.

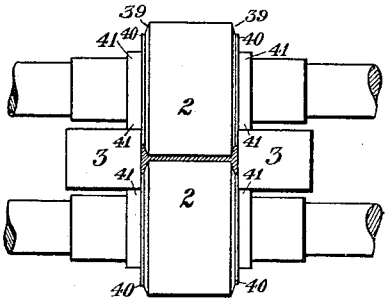


Fig. 12.

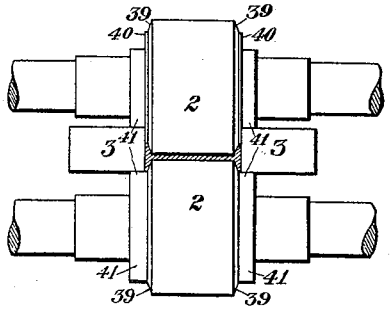
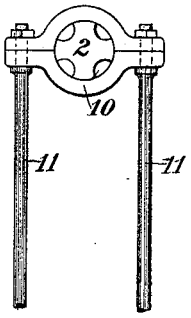


Fig. 13.



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UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF PITTSBURG, AND HENRY AIKEN, OF ALLEGHENY, PA.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 344,383, dated June 29, 1886.

Application filed February 12, 1886. Serial No. 191,687. (No model.)

To all whom it may concern:

Be it known that we, JULIAN KENNEDY, of Pittsburg, and HENRY AIKEN, of the city of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Universal Mills for Rolling Structural Shapes; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention in universal mills for rolling I-beams and other forms of structural metallic beams relates particularly to the construction, arrangement, and adjustment of the vertical or side rolls, but includes also improvements in other parts of the mill.

To enable others skilled in the art to make and use our invention, we will now describe it by reference to the accompanying three sheets of drawings, in which—

Figure 1 is a plan view of the mill. Fig. 2 is a side elevation. Figs. 3 and 4 are sectional views showing details of construction. Fig. 5 is a vertical section on the line *x x*, Fig. 1, showing the side rolls and their appliances, the adjusting devices being omitted on one side. Fig. 6 is a plan view, partly in section, of the housing and adjusting devices of one of the side rolls. Fig. 7 is a perspective view of one of the vertical roll-housings. Fig. 8 is a vertical section on the line *z z* of Fig. 5, showing one of the vertical rolls and its driving-connections. Fig. 9 is a view of one of the rollers of the feed-tables. Fig. 10 is a side elevation of the horizontal rolls and housing with the vertical roll and its appliances removed, both rolls being adjustable. Fig. 11 is a front elevation of the rolls. Fig. 12 is a front elevation of the rolls slightly modified. Fig. 13 is a view of one of the carriers of the upper horizontal roll of Fig. 5.

Like symbols of reference indicate like parts in each.

The mill has two horizontal rolls, 2 2, and two vertical rolls, 3 3. The horizontal rolls are mounted in a suitable housing, 4. The lower roll is journaled in fixed or non-adjustable bearings, and the upper one in adjustable bearings 5, Figs. 2 and 5, and is adjusted by adjusting-screws 6, by means of the shaft 7 and bevel gearing 8, in the usual way. This roll may be counterbalanced, if desired, in any of the well-known ways; but as neither the counterbalancing nor the way in which it is done forms any part of our invention we have not illustrated it further than to show in Fig. 5 the neck 9 of the upper roll 2 extended beyond the housing and resting in a carrier or bearing, 10, sustained on rods 11, which reach down to counterbalancing devices situated in or under the foundation of the mill. The construction of the carrier 10 is plainly shown by Fig. 13.

The power to drive the rolls 2 is applied to one or both the rolls in the usual way, the necks 9 and 12 of which are extended, as shown in Fig. 5, for that purpose.

Cast on each side of the housing 4 is a pair of strong heavy side frames, 13, Figs. 1, 2, 6, and 10, for containing and supporting the housings of the vertical rolls, and at the outer or open ends of these frames is a heavy casting, 14, having four arms, 15, extending to the corners of the frames 13, where they are fastened by four long bolts, 16, extending across the mill from side to side, through holes in the arms 15, frames 13, and housing 4, and secured by nuts 17. Where these bolts cross between the uprights of the housing 4 they are covered by the tubes 18, which act as distance pieces between the two housings. In the sides of the box formed by the frames 13 and end piece, 14, are slideways 19, Figs. 2 and 10, in which the movable housing 20 of each vertical roll is placed. The housing 20 has a rectangular frame, 21, at its inner end, in which the vertical roll 3 is journaled, Figs. 5, 6, 7, and 8, and back of the frame 21 it contains two vertical driving-rolls, 22 22. The axes of the rolls 22 are in different vertical planes from that in which the axes of the rolls 3 and 2 lie, and their faces bear against the rear side of the roll 3, so that the latter is nested between and driven and supported by them. The rolls 22 are mounted on vertical shafts 23 in bearings 24, Figs. 1, 5, 6, and 7, and each shaft is connected by beveled pinions 25 26, Figs. 5 and 8, with a separate power-shaft, 27. The pinions 26 are connected with their shafts 27 by a feather and spline, Fig. 5, so as to be movable axially thereon, and are moved with the sliding housing 20 by straps or bars 28, bolted to the housing and provided with forked lower ends which enter the grooves 29 in the sides of the pinions.

The housing 20 is moved inward in the ways 19 in the following manner: In the end plate, 14, Fig. 3, are four nuts, 30, and extending through the nuts are four right-hand screws, 31, the outer ends of which are supported by a plate, 32, bolted, as shown in Fig. 4, to the plate 14. Attached to each screw 31 by a feather and spline between the plates 14 and 32 is a pinion, 33. The inner ends of the right-hand screws 31 bear against the outer side of the housing 20. In the middle of the plate 14 is a nut, 34, and in this nut is a left-hand screw, 35, the inner end of which has a head turning in a box, 36, on the outer side of the housing 20. The outer end of the screw 35 is supported by the plate 32, and attached to it by a feather and spline between the plates 14 and 32 is a large pinion, 37, which meshes into the pinions 33 on the screws 31. The outer ends of the screws 31 are squared for use with a wrench. Thus constructed the devices just described operate to move the housing 20 as follows: A wrench being applied to one of the screws 31 is turned to the right, and as all the screws are geared together this causes them to force the housing inward, and move the roll 3 toward the end of the rolls 2. To retract the housing, the wrench is turned backward, and this causes the screws to recede, and as the screw 35 is connected with the housing 20 by the box 36 it draws the housing back with it.

The adjusting devices on the opposite ends of the mill are alike, with the exception that the screws on one end are right hand and on the other are left hand, and they may be connected together, so that both rolls 3 can be adjusted simultaneously and equally from either side of the mill in the following manner, viz: Journaled in the side frames, 13, either at the front or back side of the mill, is a shaft, 37, provided with a pinion, 38, at each end, which gears into one of the pinions 33. Then, when the adjustment is made at one end of the mill, it is communicated to the screws at the other end through the medium of the pinions 38 and shaft 37, and a like adjustment is caused to take place at both ends. The tendency of the pinions 33 and shaft 37 is to an end-thrust when the adjusting-screws are turned, and the main purpose of the plate 32 is to keep them in proper position.

The mill illustrated is designed for rolling I-beams, and consequently the edges of the rolls 2 are beveled, as at 39, Fig. 11, to give the proper shape to the inner sides of the flanges of the beam. The rolls are also provided with offsets 40, to square up the edges of the flanges, and with collars 41, between which the vertical rolls 3 work. In Fig. 12 the collar 41 of the lower roll is made of greater diameter, so as to form the lower side of the pass and square up the edge of the flange. In this case the height of the vertical rolls 3 is reduced correspondingly to the increased diameter of the collars 41. The feed-rollers 42 are made with a central section, 43, of increased diameter, the length of which is not greater than the width of the web of the beam, and the ends of which are beveled to correspond with the bevel of the flanges, so that the beam shall run out on its web, and its edges shall not come in contact with the rollers. (See Fig. 9.) The central section, 43, is preferably of the same size and shape as the channel of the beam, so that it shall be guided in a straight line as it comes from the rolls by its flanges coming in contact on both sides with the ends of the large central section, 43, of the rollers, and be prevented thereby from warping or twisting sidewise.

The rectangular frame 21, (see Figs. 6, 7, and 8,) in which each roll 3 is journaled, is connected with the movable housing 20 by bolts 44, extending through the flanges 45 on 20 and 46 on 21. On each bolt is a strong spring, 47, which bears against the head of the bolt and the rear side of the flange 45, Fig. 6. This construction is to compensate for wear, and to enable the rolls 3 to adapt themselves to the supporting-faces of the driving and supporting rolls 22, and to permit the passage between them and the rolls 22 of scale, which may adhere to their faces without injury to them and without putting a strain on their journals.

In Fig. 10 we show both the rolls 2 adjustable. Here the journals of the upper roll are mounted in the adjustable bearings 5, as in Fig. 5, and the lower roll is mounted in adjustable bearings 48. Screw-rods 49, stepped in the base of the housing 4, extend up to the top of the standards of the same, where they are provided with pinions 50. These rods pass through nuts in the ends of the bearings 48, so that when they are turned the bearings, and consequently the lower roll, are caused to rise or fall according to the direction in which the rods are turned. Motion is communicated to the screw-rod 49 from the upper adjusting screws, 6, by means of a pinion, 51, mounted thereon, which meshes into the pinions 50, so that when the screws 6 are turned to depress the upper roll, the screws 49 are caused to turn in the opposite direction and raise the lower roll; hence the reduction of the pass is effected by an equal adjustment of both horizontal rolls. The feed-rollers 42 are driven by power-shafts 52 and gearing 53 in the usual way.

The operation of our improved mill will be evident to those familiar with the art from the preceding description of its construction.

The bloom or ingot, being properly heated, is put through the rolls 2 2 in the usual way until it has been partially elongated and reduced, and then the side rolls, 3 3, are adjusted inward by a gradual movement until the beam with its flanges are brought to a perfect form. When the operation is completed, the rolls occupy the relative positions shown in Figs. 11 and 12. The number of passes will vary according to the size of the bloom, the condition of the metal, and the character of the beam to be made.

We have described our invention as applied to the manufacture of I-beams; but we do not limit ourselves thereto, as it is also applicable to and designed for use in the manufacture of channel-bars and other forms of flanged beams, and other articles having longitudinal flanges, by changing the working faces of the rolls to conform to the shape desired.

We do not limit ourselves to the construction of the adjusting devices of the side rolls shown and described, nor in fact to any other detail of construction, so far as the generic features of our invention are concerned, because such details may be varied or changed in many respects to effect the same ends by any competent engineer or mechanic skilled in the art.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a universal mill for rolling flanged beams or other shaped bars, the combination of a pair of horizontal rolls for reducing and shaping a bloom or ingot with adjustable side rolls supported by auxiliary driving-rollers for shaping the outer sides of the flanges, the axes of said four rolls lying in the same plane, substantially as and for the purposes described.

2. In a universal mill for rolling flanged beams or other shaped bars, the combination of a pair of horizontal rolls with a pair of adjustable driven side rolls having their axes in the same vertical plane as the axes of the horizontal rolls, substantially as and for the purposes described.

3. The combination of the side rolls with driving friction-rolls arranged outside of the same, which support and drive the side rolls, substantially as and for the purposes described.

4. The combination of the side rolls and supporting and driving friction-rolls arranged behind the same with a movable housing carrying said rolls, power-shafts for driving the friction rolls, and beveled gearing connecting the friction-roll shafts with the power driving-shafts, substantially as and for the purposes described.

5. The combination of the side rolls mounted in compensating frames with supporting and driving friction-rolls arranged behind the side rolls and mounted in fixed bearings, substantially as and for the purposes described.

6. In combination with the housings of a pair of horizontal rolls, side frames provided with housings for vertical rolls sliding in said frames, each carrying a driven reducing-roll, and a pair of driving and supporting rollers, substantially as and for the purposes described.

7. In combination with the adjustable housing of the side rolls, a series of adjusting-screws for forcing the housing inward, and a screw turning in the opposite direction and connected with the housing for retracting it, said screws being connected together by gearing, whereby the turning of one of the screws will turn the others and effect the desired movement of the housing, substantially as and for the purposes described.

8. In a universal mill having adjustable side rolls, the combination of the adjustable housings of the side rolls and their adjusting-screws with a shaft extending across the mill and connected by gearing with the adjusting-screws of each roll, whereby the adjustment of both rolls may be effected simultaneously from either side of the mill, substantially as and for the purposes described.

9. In combination with a mill for rolling flanged beams or other shaped bars, feed-rollers having an enlarged central section not longer than the width of the web-forming face of the rolls, substantially as and for the purposes described.

10. In combination with a mill for rolling flanged beams or other shaped bars, feed-rollers having an enlarged central section of the shape and size of the channel-forming face of the rolls, substantially as and for the purposes described.

In testimony whereof we have hereunto set our hands this 6th day of February, A. D. 1886.

JULIAN KENNEDY.
HENRY AIKEN.

Witnesses:
W. B. CORWIN,
THOMAS W. BAKEWELL.