J. PUPPE.

ROLLING MILL.

APPLICATION FILED AUG. 30, 1911. RENEWED AUG. 4, 1915.

1,154,884.

Patented Sept. 28, 1915.

3 SHEETS—SHEET 1.

Fig. 1

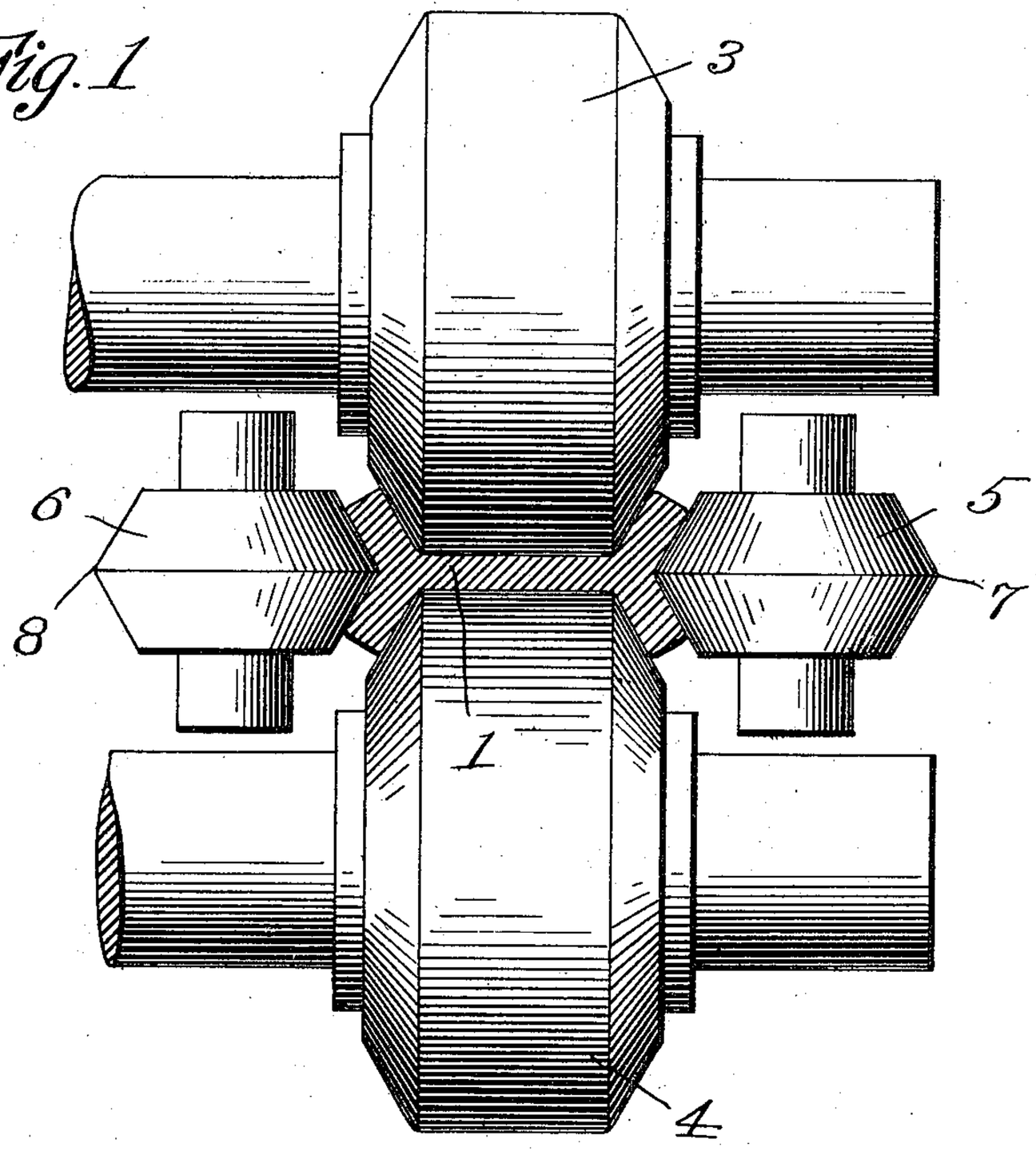
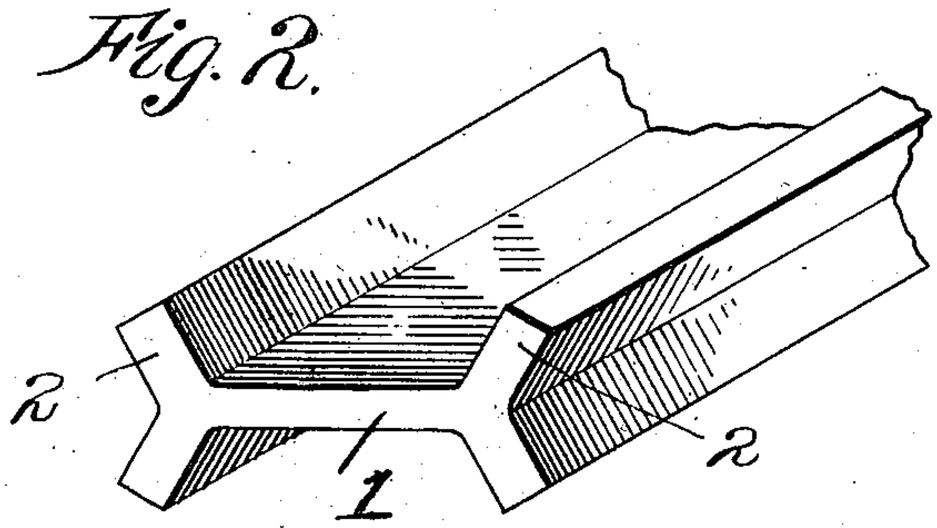


Fig. 2.



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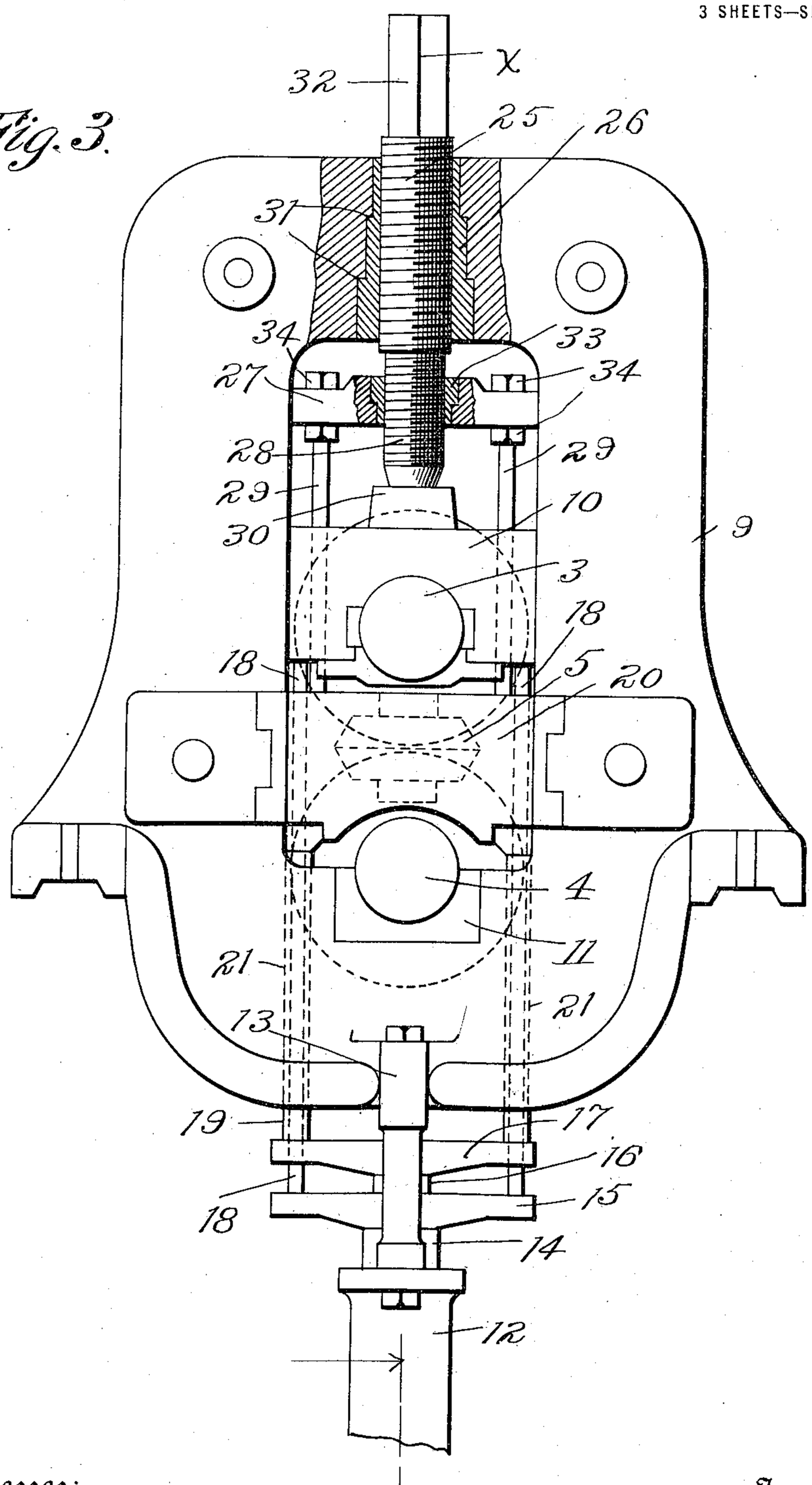
3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4

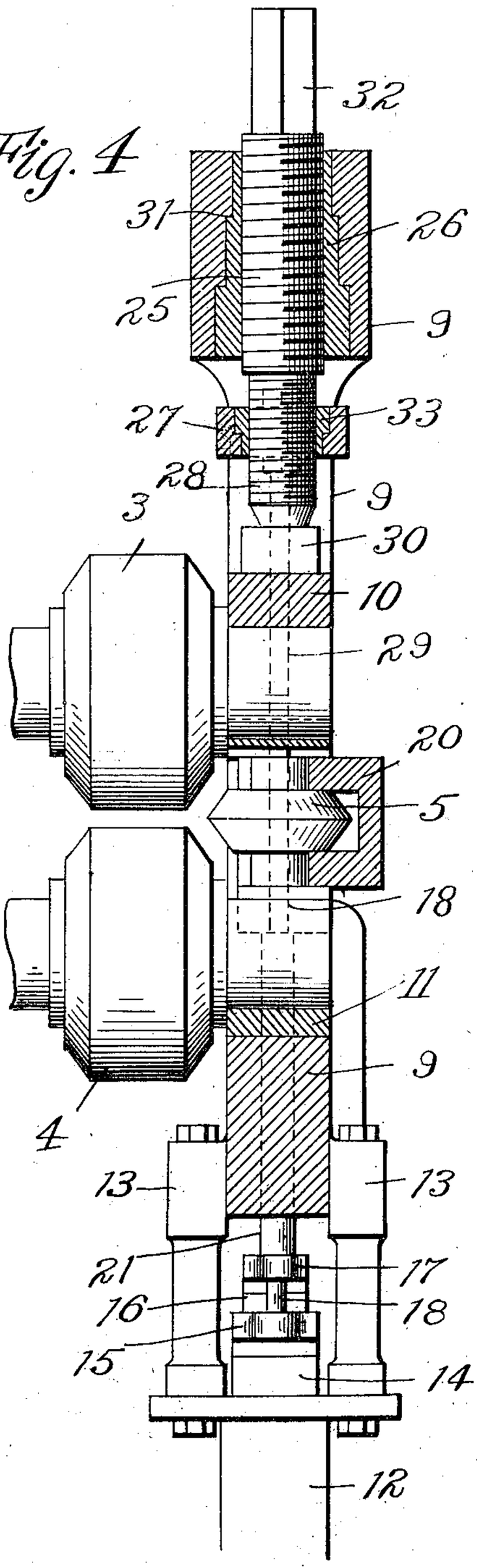
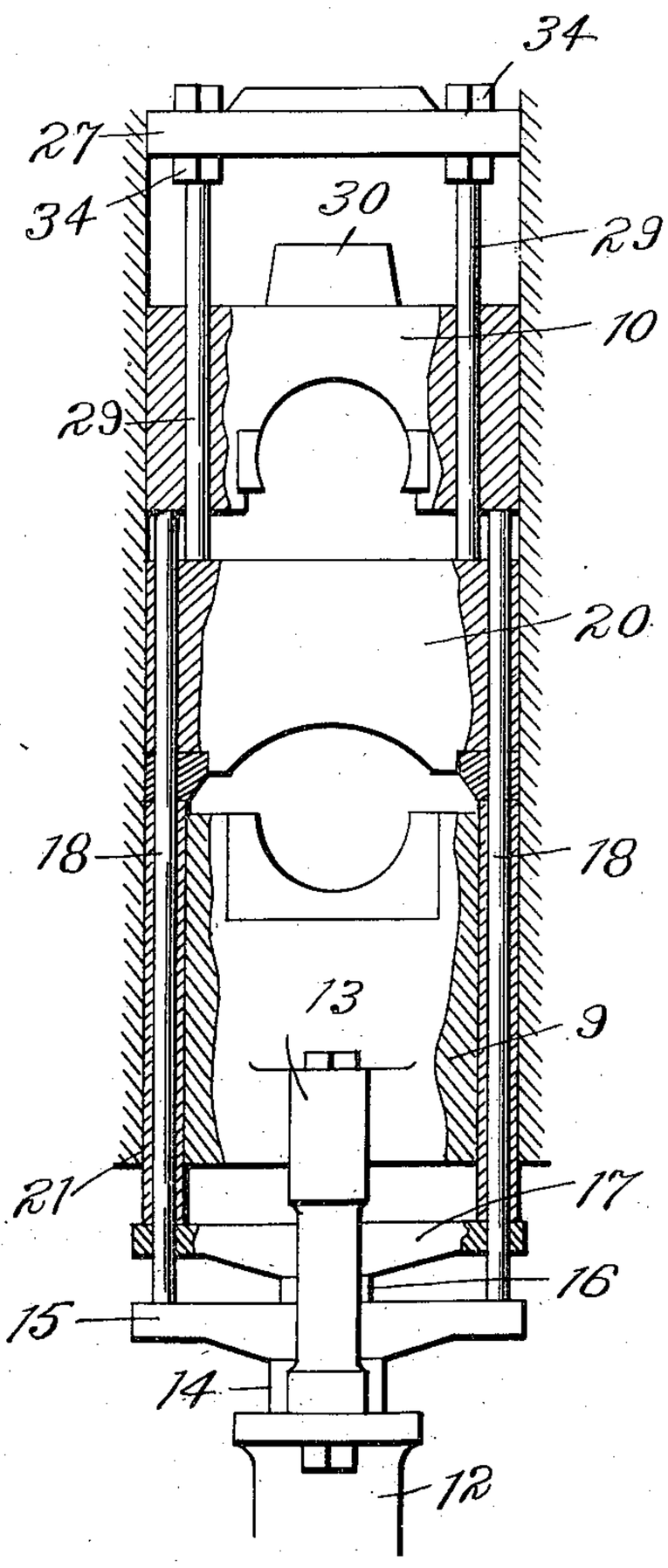


Fig. 5.



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ROLLING-MILL.

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Application filed August 30, 1911, Serial No. 646,856. Renewed August 4, 1915. Serial No. 43,706.

To all whom it may concern:

Be it known that I, JOHANN PUPPE, a subject of the German Emperor, and residing at Breslau, Germany, have invented certain new and useful Improvements in Rolling-Mills, of which the following is a full and clear specification, illustrated in the accompanying drawings, the particular novel features being more fully pointed out in the annexed claim.

My invention relates to means for shifting the rolls in rolling mills for adjusting them in proper position to roll the material fed between them to proper size.

In particular my invention relates to means for shifting the vertical and horizontal rolls in rolling mills for rolling structural iron with double V shaped flanges, which form is used in the art for producing I beams with parallel sided flanges.

In the accompanying drawings Figure 1 is a view of the rollers shown in their relative position when the material runs through them. Fig. 2 shows a portion of the finished rolling product with V shaped flanges. Fig. 3 is a side elevation of the rolling mill frame. Fig. 4 is a vertical section through the frame shown in Fig. 3 on the line x—x. Fig. 5 is a view of the frame similar to that shown in Fig. 3 with portions broken away.

The form of the material produced by the mill, and shown in Fig. 2, consists of the web 1 and the flanges 2, the latter having V shape, and they are straightened out by a suitable rolling process not shown in this application, to complete the form of an I beam with parallel sided flanges, that is to say flanges which do not taper at their inner faces toward the edge.

When the bloom enters the rolls and is gradually rolled to size the upper horizontal roll 3, Fig. 1, is usually lowered after each pass of the material until the bloom, for instance in this case the I beam, has the desired thickness of web and flanges. The construction of the mill is in this case such that the lower horizontal roll 4 remains stationary relatively to vertical movement. To produce the intermediate product of an I beam of the form shown in Fig. 2 two vertical rolls 5 and 6 are simultaneously employed, of the form shown in Fig. 1, and they may be moved toward and away from the material by suitable means to produce the desired size, in any suitable manner not shown here. Now during the rolling process and when the upper horizontal roll 3 is lowered it is necessary that the vertical rolls 5 and 6 be lowered also a suitable distance so as to keep the ridge 7 and 8 of these rolls always in line with the middle line of web 1 of the beam, since otherwise the flanges 2 would not be rolled of uniform thickness above and below the web. Thus in this particular instance the vertical rolls 5 and 6 must be lowered after each pass a distance equal to one half of the amount which the upper horizontal roll 3 is being lowered after this pass. To obtain this in an accurate and convenient manner is the principal object of the invention.

In Fig. 3 which represents a side elevation of one of the side frames of the mill structure, 9 is the main frame or yoke in which the rolls are journaled. The lower horizontal roll 4 rests in fixed journal box 11, whereas the upper roll 3 is disposed in journal box 10 slidingly disposed in frame 9. Underneath frame 9 is disposed a hydraulic cylinder 12 bolted to frame 9 at 13, which cylinder contains two pistons 14 and 16 concentrically disposed one within the other. Piston 14 carries cross arm 15, to the outer ends of which supporting rods 18 are fastened which extend upward as shown, and support journal box 10 of roll 3, and thus roll 3. Vertical rolls 5 and 6 (of which only 5 is shown in Figs. 3 and 4) are each supported in a bearing block 20 also slidingly disposed in yoke 9 and supported by supporting rods 21, which are carried by cross arm 17 of piston 16. The arrangement is preferably such that rods 18 are disposed within rods 21 as clearly shown in Fig. 5.

The downward adjustment and thus the downward pressure of upper horizontal roll 3 is controlled in the following manner: As will be seen from Fig. 3 in the upper part of yoke or frame 9 is disposed pressure screw 25, threaded into a suitable bushing 26 which has the proper number of shoulders 31 to distribute the pressure evenly over the whole length of the bushing and thickness of the yoke. This screw bears with its lower end against a bolster 30 integral with upper journal block 10. By turning the screw at its upper, squared end 32 any suitable pressure may be exerted upon upper roll 3 and it may be moved any suitable distance downward against the hydraulic piston 14 and toward lower roll 4.

Now in order to move bearing blocks 20, which carry the vertical rolls 5 and 6, one half the distance which roll 3 is moved when screw 25 is operated, I have provided the following means: The lower end of screw 25 is threaded at a pitch equal to one half of the pitch at which the portion of screw 25 within bushing 26 is threaded. This smaller pitch is indicated at 28 and, as shown in Fig. 3, this screw portion is threaded into a bushing 33 disposed in cross arm 27. The ends of arm 27 are guided in yoke 9 and to each end is fixed a rod 29, both rods extending freely through bearing block 10, as clearly shown in Fig. 5, and bearing against bearing block 20 of vertical roll 5. The small pitch screw being cut in the same direction as the large pitch screw it will be seen that when screw 25 is turned to move roll 3 down a certain distance roll 5 will move down exactly one half of this distance.

By attaching cross arm 27 to rods 29 by means of nuts 34 between which the arm is held in position, roll 5 may be easily initially adjusted before the rolling of the material, so that its ridge stands exactly in the middle between horizontal rolls 3 and 4 for the reasons previously stated. It is obvious that any other suitable proportion of movement between the upper horizontal roll and the vertical rolls may be produced by suitably proportioning the pitches of screw portions 25 and 28.

What I claim is:

A rolling mill of the character described, having a frame, two horizontal rolls disposed one above the other in said frame, the lower roll having a fixed journal, the upper roll adapted to slide in said frame toward and away from the lower roll, vertical rolls disposed laterally on each side of said horizontal rolls and adapted to slide vertically in said frame, adjustable supports for said upper horizontal roll and said vertical rolls, a screw threaded in said frame and adapted when operated to positively move said journal of the upper horizontal roll downward, the lower end of said screw being threaded into a cross arm connected with said vertical rolls, the pitch of said lower end being suitably proportioned to the pitch of the screw portion in said frame to cause said screw to move said vertical rolls downward with said upper horizontal roll in fixed speed relation thereto.

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