D. H. LENTZ.

COMPOSITE ROLLS FOR FORMING TIE PLATES.

APPLICATION FILED DEC. 4, 1909.

983,379. Patented Feb. 7, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

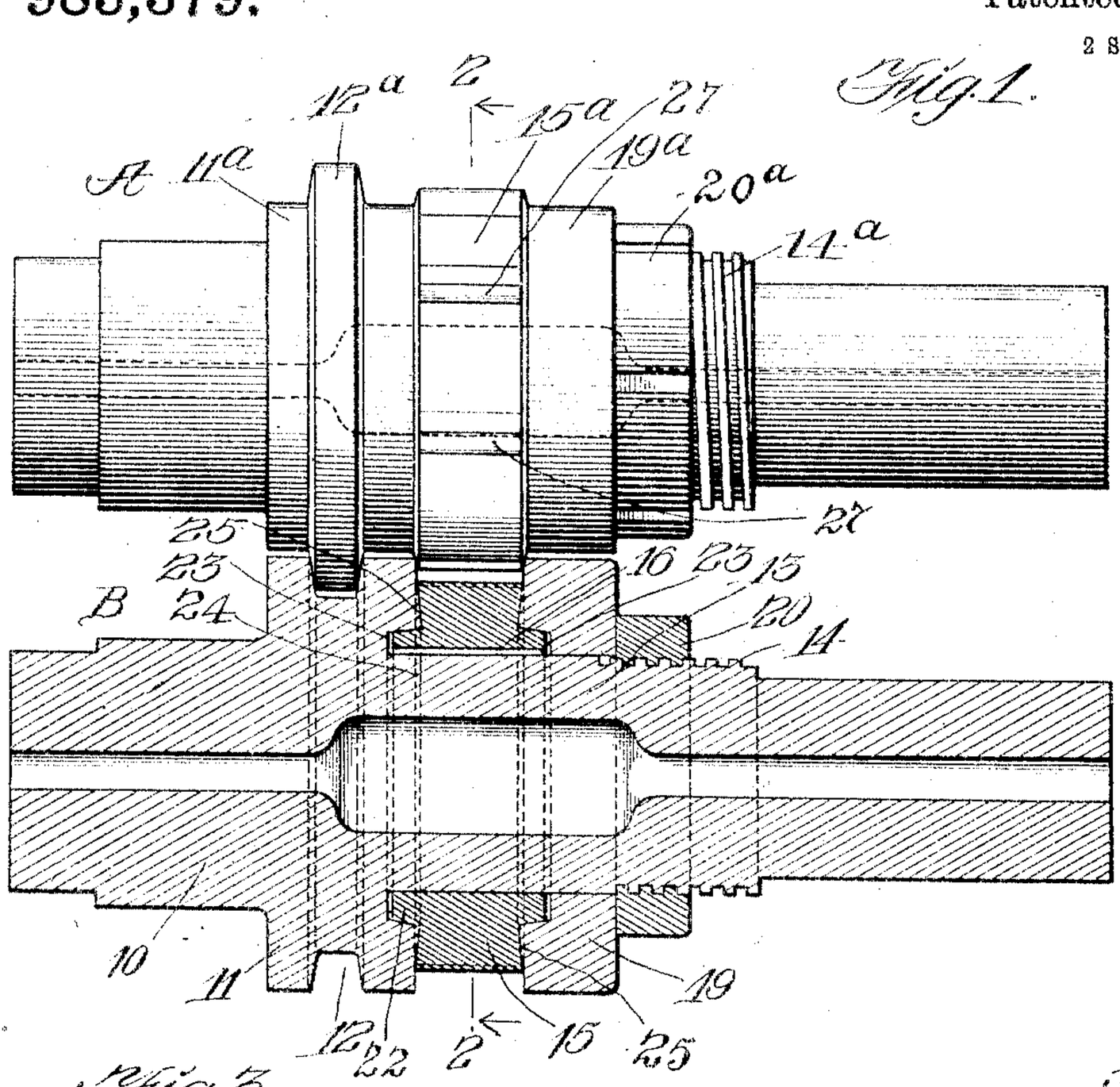


Fig. 5.

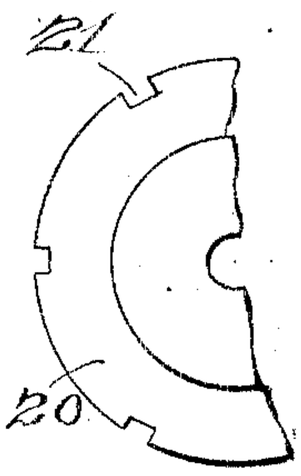


Fig. 3.

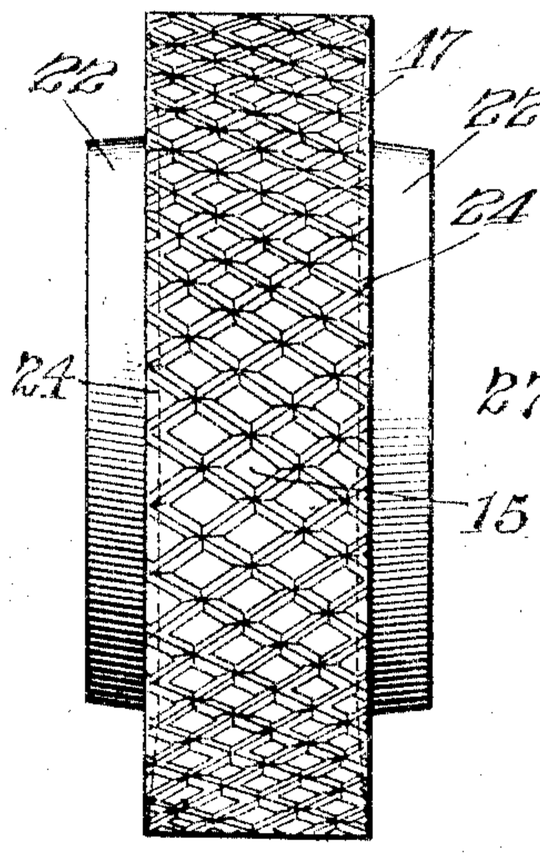


Fig. 2.

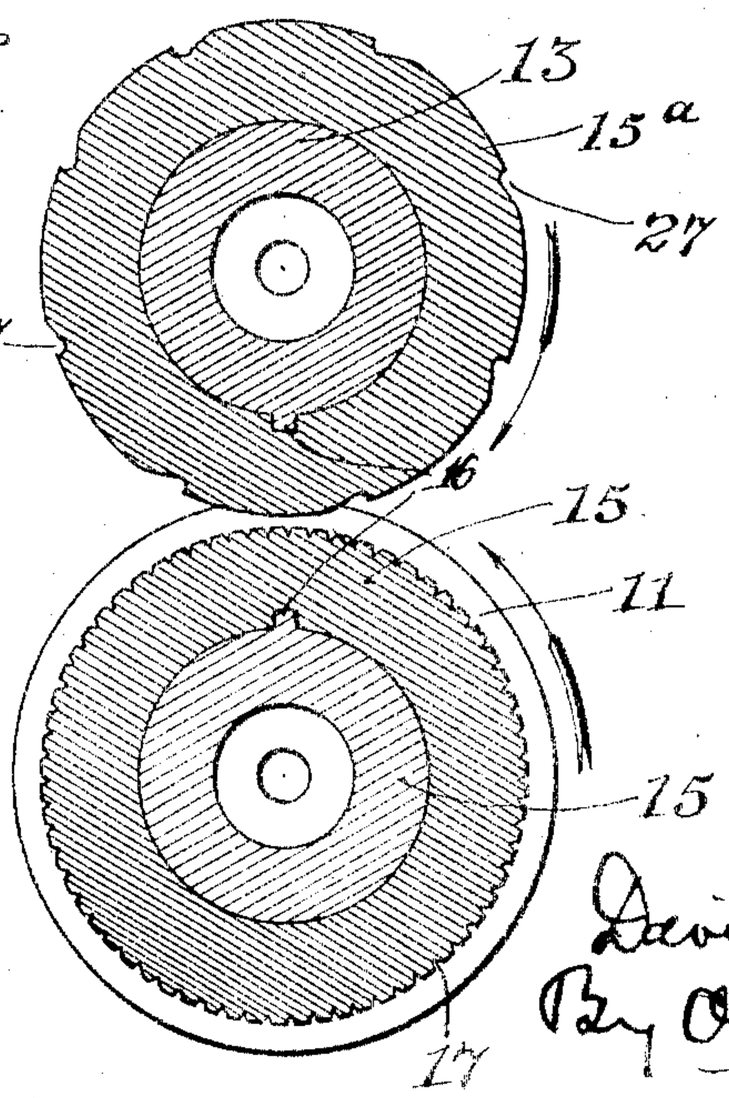
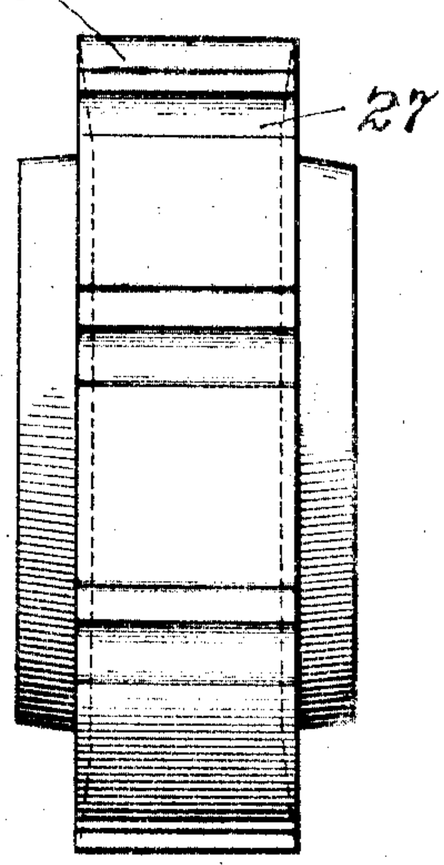


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 6.

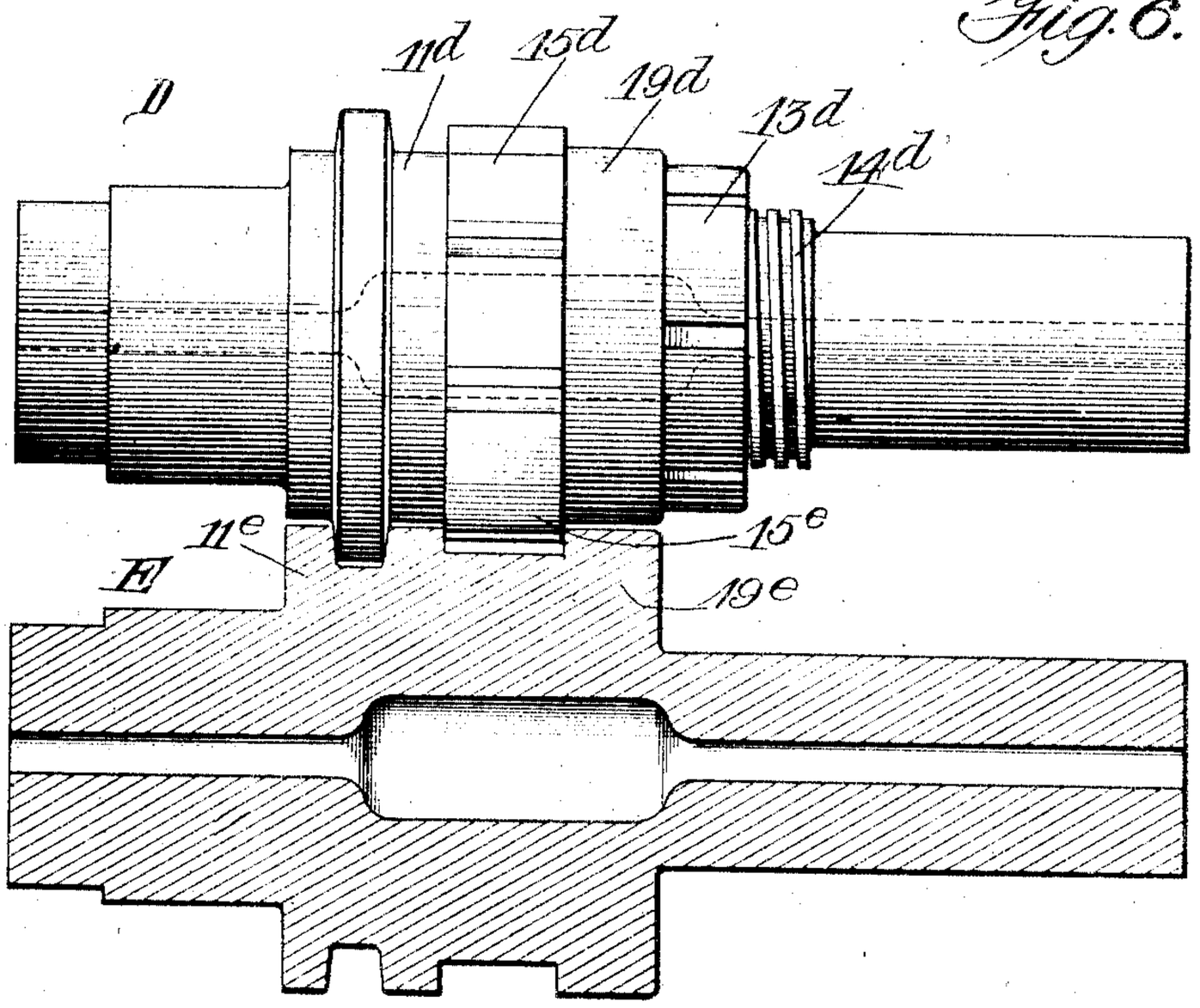


Fig. 7.

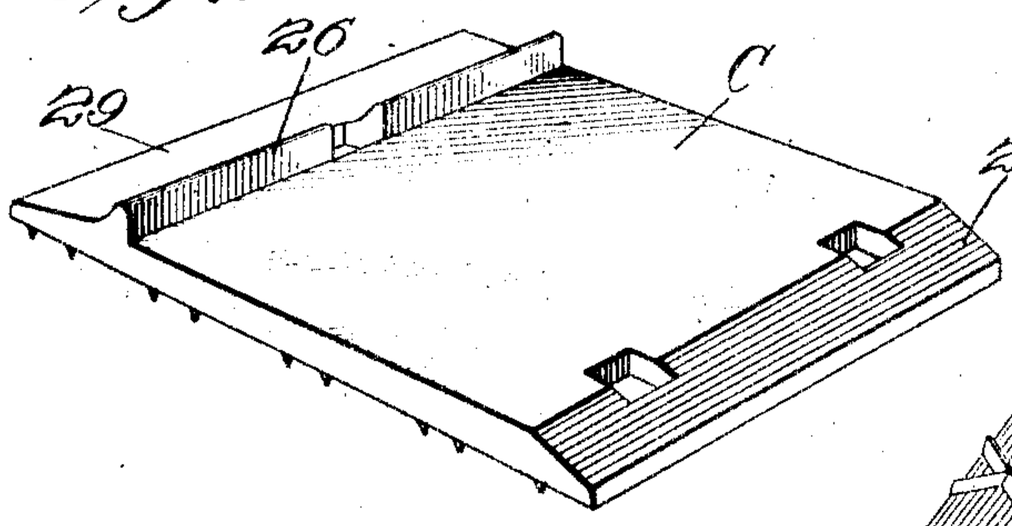


Fig. 8.

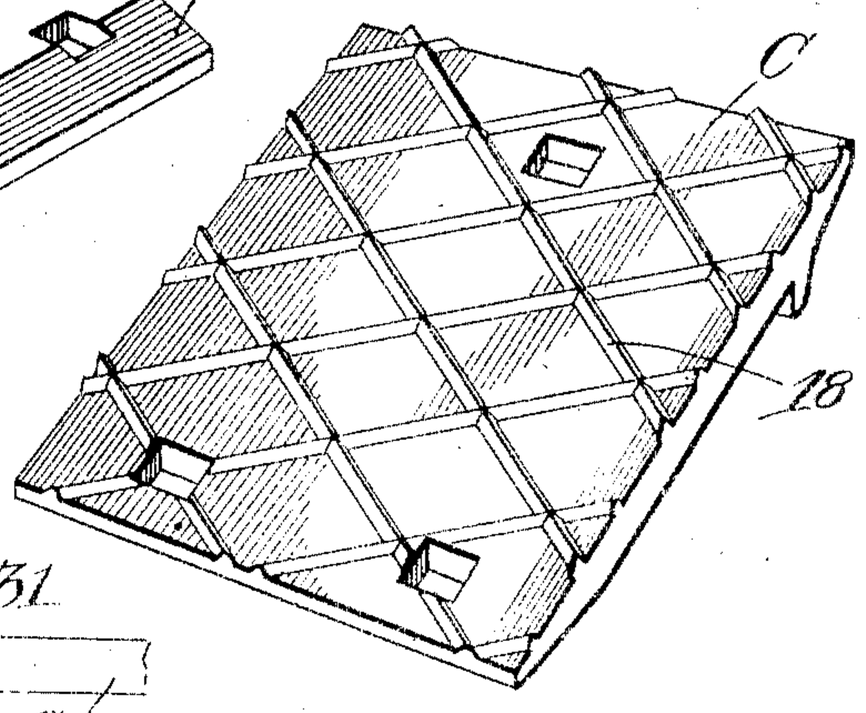
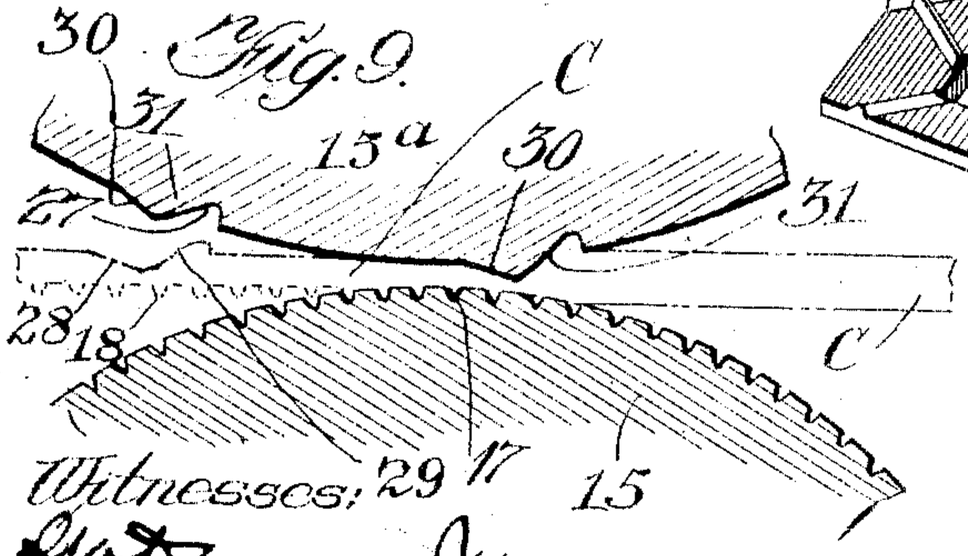


Fig. 9.



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UNITED STATES PATENT OFFICE.

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COMPOSITE ROLLS FOR FORMING TIE-PLATES.

983,379. Specification of Letters Patent. Patented Feb. 7, 1911.

Application filed December 4, 1909. Serial No. 531,471.

To all whom it may concern:

Be it known that I, DAVID H. LENTZ, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Composite Rolls for Forming Tie-Plates, of which the following is a specification.

My invention relates to rolls intended particularly for forming railway rail plates; and has for its object to provide a new and improved construction of roll of composite character, consisting of a body-part of iron or other relatively inexpensive metal, and a part formed of high carbon steel which is securely fastened to the iron body, but so that it may be removed therefrom when occasion demands.

The invention has for further objects such other new and improved constructions in rolls for forming tie-plates and the like as will be described in this specification and particularly specified in the claims appended thereto.

The accompanying drawings illustrate a preferred embodiment of my invention, together with a modification of the same.

In these drawings—Figure 1 shows a pair of rolls adapted for the making of tie-plates and embodying my invention, the upper roll being shown in elevation and the lower roll in section. Fig. 2 is a section on line 2—2 of Fig. 1 looking in the direction of the arrows. Fig. 3 is a circumferential elevation of the hard steel member or collar of the lower roll. Fig. 4 is a corresponding view of the hard steel collar of the upper roll. Fig. 5 is a fragmentary end elevation of the retaining nut employed to secure the hard steel collar against the abutting face of one or other of the rolls. Fig. 6 is a view similar to Fig. 1, illustrating a modified construction. Fig. 7 is a perspective view of a tie-plate such as may be manufactured by use of the rolls of my invention, showing the upper surface of the plate. Fig. 8 is a similar view showing the under surface of the plate; and Fig. 9 is a fragmentary enlarged section through the rolls illustrating the formation of the tie-plates.

Like characters of reference indicate like parts in the several figures of the drawings.

The strains put upon tie-plates when in use are such as to tend to break them on transverse lines, that is, lengthwise of the rails. It has, therefore, been found expedient to roll tie-plates lengthwise so that the grain of the metal will be transverse to the rails. Such plates are ordinarily formed with ribs or abutments on their upper surfaces of considerable height relative to the thickness of the plates, the purpose of these abutments being to engage the flanges of the rails sustained on the plates. A plate of this character is shown in Figs. 7 and 8 of the drawings. When such a plate is rolled lengthwise in the manner shown in Fig. 9, the rolling surfaces are subjected to tremendous strains, and particularly the surface which forms the upstanding rib or abutment on the upper face of the plate, these strains tending to wear down the rolling surfaces very rapidly unless the latter are composed of very hard metal. If the rolls, for example, are made of iron or low carbon steel, the rolling surfaces very soon become so worn as to change the configuration of the plates. For example, if the rolls wear appreciably or are returned, as a result of wear, the diameters of the walls are decreased, which results in making the plates shorter. On the other hand, if the rolls are made entirely of high carbon or other hard steel, not only are they very expensive but in case of wear or other injury to the rolling surfaces, the whole roll has to be thrown away.

The principal object of my present invention is to provide a roll, suitable for rolling tie-plates of the sort described, of a composite character, the body of which may be relatively cheap metal, the rolling surface alone being of hard or high carbon steel, and to provide novel means whereby the hard steel member may be securely fastened to the body in such a way that the composite structure may withstand the very great strains to which it is subjected and so that there may be no wear between the body of the roll and the attached part causing looseness; while at the same time the attachment shall be of such a nature as to allow the hard steel member to be easily removed from the body of the roll when occasion demands. A composite roll of this character has another advantage, in that the removal of the hard steel member from the body of the roll facilitates cutting the

pattern on the hard steel part. With rolls of integral structure it is often difficult to get at the rolling surface of the roll for this purpose.

Referring first to Figs. 1 to 5 inclusive, A and B represent respectively, the upper and lower composite rolls taken as a whole. The rolls are identical in construction, except as will be hereinafter noted, so that it will be necessary to describe in detail only one of them. Roll B, for example, consists of a body-part of cast iron, low carbon steel or other suitable, inexpensive metal, provided with a boss 11, grooved at 12, and a preferably integral shaft 13 threaded at 14. 15 represents the removable hard steel member or collar which fits over the shaft 13, the latter being preferably formed with a feather 16. As shown in Figs. 2 and 3, suitable grooves 17 are cut in the surface of the collar 15 to produce the ribs 18 on the other side of the tie-plate C, (Fig. 8). The collar is held between boss or integral flange 11 and a ring or removable flange member 19 against which is screwed a nut 20, preferably provided with notches 21 for a spanner. In the operation of rolls of this sort a very great strain is put upon the collars which provide the rolling surfaces, and therefore, if these collars depended upon a direct engagement with the shaft or spindle portions of the rolls, such an engagement, for example as is provided by a feather or the like, the torsional strain between the hard steel collars and the soft metal spindles would soon result in a looseness undesirable in itself and injurious or destructive to the soft metal spindles. I therefore provide, preferably, an arrangement by means of which the strains are diminished, and which moreover makes it possible to take up any looseness which may occur. In the structure shown in Figs. 1 to 5 inclusive, the collar is formed with two beveled integral hubs or annular wedge-shaped projections 22 which fit into correspondingly tapered recesses 23 in the boss 11 and ring 19. By screwing up the nut 20, these wedge-shaped projections are forced into the recesses, with the result that the parts 11 and 19 relieve the feather of a great deal of the strain which would otherwise be exerted against it. If any looseness is developed it may be taken up by a further tightening of nut 20. Fig. 1 shows the coengaging parts of the lower roll B in close engagement. It will be understood, however, that the engagement as between the collar and the clamping members on either side of the same is such as to allow wedge action between the annular projections 22 and the grooves in which they fit, the drawing in other words showing the parts when tightened up to the fullest extent. By this arrangement the fit between the collar and the shaft may be relatively loose, so that the collar may be easily slipped on and off. The end surfaces of the collar may be concaved as indicated by the dotted lines 24 in Figs. 1 and 3, and the corresponding surfaces on the parts 11 and 19 convexed, as shown particularly at 25 in Fig. 1. Roll A is in general construction like roll B. Its boss 11^a is, however, of smaller diameter than boss 11, and instead of being grooved is provided with a rib 12^a. The other clamping member 19^a is smaller in diameter than ring 19. Besides this, the surface of the hard steel collar 15^a of the upper roll is, of course, formed with a pattern appropriate for producing the upper surface of the tie-plate C. Thus the rib 26 on the upper surface of the plate C, (Fig. 7) is formed by one of a number of grooves 27 on collar 15^a, the bevels 28 and 29 being produced by the surfaces 30, 31 respectively, as will be best seen in Fig. 9. The clamping member 19^a is held in position by the nut 20^a on the threaded part 14 of the roll. The collar 15^a, it will be seen, forms what may be termed a tongue which fits into the groove between the boss 11 and the ring 19. While in the drawings I have shown both rolls of sectional construction, it would be possible to use one of the sectional rolls of my invention with a suitably formed roll of integral construction.

It will be understood that my invention is not limited to rolls so conformed as to produce the particular sort of plate shown in Figs. 7 to 9. Plates of different configuration might be produced by varying the contours of the rolling surfaces.

In Fig. 6 I have shown a simplified form of construction, which, while it does not possess all of the advantages of the structure of Fig. 1, embodies some of the desirable features of my invention. In this figure the roll D is of similar form to rolls A of Fig. 1, except that the hard steel collar 15^d is not dished nor provided with hubs and the clamping members 11^d and 19^d are formed with plain surfaces at right angles to the axis of the roll. A nut 13^d on the threaded part 14^d clamps the collar between the integral boss 11^d and the collar 19^d. I have shown the lower roll E as of integral construction. That is, instead of the loose collar 19^d the roll is formed with the integral boss or flange 19^e. It will be seen that the bosses or flanges 11^e, 19^e form a slot in the lower roll into which projects the collar or tongue 15^d of the roll D. The part of the periphery of rolls E included between the bosses 11^e and 19^e will, of course, be suitably formed for producing the desired configuration of the lower surface of the tie-plate.

The operation of the rolls constructed as shown, will be as follows: The rolls, it will be understood, are suitably journaled and

provided with driving means. The rib 12ª (referring particularly to Fig. 1) of the upper roll extends into the groove 12 in the lower roll so as to act as a guide. The metal passing between the rolls is given the conformation shown in Fig. 9. Afterward, this strip of metal may be cut up to form plates of the sort shown in Figs. 7 and 8. When the rolling surfaces become worn or otherwise injured, the collars may be removed by unscrewing nuts 13. The fact that the collars are wedged between the clamping members 11 and 19 instead of depending upon a direct engagement with the shaft makes it possible to have a loose fit between the collars and the shaft, so that the collars may be easily taken off and put on. The collars may thus be renewed when occasion demands, without requiring the making of entirely new rolls. The collars are relatively small in comparison to the bulk of the rolls as a whole, which, of course, results in an economical construction, since the main portions of the rolls may be constructed of relatively cheap metal. The engagement between the collars and the means employed for clamping the collars on the rolls is such as is well calculated to withstand the great strains developed. These strains are very considerable due to the fact that a considerable amount of metal has to be displaced to form the ribs, and particularly to form the relatively thick ribs 26 on the upper surfaces of the plates. It is much easier to produce a plate of this sort by rolling it crosswise, that is lengthwise of rib 26; but, as has been stated, this method of manufacture makes the grain run the wrong way of the plate.

To produce the best results, the high carbon steel collar is preferably tempered like any other metal working tool, with the result that in my complete rolls I virtually have a highly tempered metal working tool of high carbon steel, that is the figured roll or rolls, combined with means for confining and feeding the heated metal blank or billet to such roll or rolls in such a manner that the plastic metal is reliably controlled and caused to flow in the required direction, so as to give the desired configuration, in which combination the particular part which bears the heaviest strains is readily replaceable and is so formed as to meet these strains with a minimum of wear and in such a manner as to reliably force the plastic metal into the form required. The blank while operated upon by the rolls is confined in the groove formed by the flanges on one of the rolls. Therefore, no fins are formed.

I do not limit myself to the exact devices, constructions and arrangements shown, as modifications might be devised which would come within my invention as defined by the claims.

While the composite rolls of my invention are particularly suitable for the formation of tie-plates, and while my invention has solved an important problem in the manufacture of tie-plates and has resulted in facilitating and cheapening the manufacture of the same, the invention might be employed in the construction of rolls to be used for rolling other metal plates of a similar character, where similar conditions prevail.

I claim:

1. A metal working roll comprising a body part provided with a shaft, a collar on said shaft, and clamping means on said shaft arranged at opposite sides of said collar, said clamping means and collar being formed with surfaces of contact substantially transverse to the axis of the roll and with co-engaging tapered recesses and wedging projections providing surfaces of contact having a slight inclination with respect to the axis of the roll.

2. Metal working rolls consisting of a roll having a body portion provided with an integral flange, a collar and clamping means on the other side of the collar from said integral flange, said flange and clamping means projecting beyond the surface of said collar; combined with a second roll having a removable tongue adapted to operate in said groove and substantially the same width as the groove to form a closed pass, said collar and tongue consisting each of a single body of high carbon steel having a pattern cut on its rolling surface, the body portions of said rolls being of soft metal.

3. Metal working rolls consisting of a roll having a body portion provided with an integral flange, a collar and clamping means on the other side of the collar from said integral flange, said flange and clamping means projecting beyond the surface of said collar; combined with a second roll having a removable tongue, an integral flange on one side of said tongue, clamping means on the other side thereof, said tongue being adapted to operate in said groove and substantially the same width as the groove to form a closed pass, said collar and tongue being formed with annular wedging hubs which project from the end faces of the same, and said flanges and clamping means being formed with tapered grooves substantially as described.

4. A metal working roll comprising in combination a body part, a collar provided with a rolling surface and clamping members provided with surfaces at substantially right angles to the axis of said roll which bear against corresponding end faces of said collar; said collar being formed with wedging hubs which project from its said end faces, and said clamping members being

formed with under-cut grooves which are tapered and receive the wedging hubs on said collar.

5. A metal working roll comprising in combination a body part, a collar provided with a rolling surface, a boss formed on said body part, a clamping ring, and means for clamping said collar between said clamping ring and said boss; said clamping ring and boss being formed with surfaces substantially at right angles to the axis of the roll and being formed with under-cut tapered grooves; said collar being formed with wedging hubs which project from its end faces into said under-cut grooves, substantially as described.

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