W. D. EYNON.

MACHINE FOR ROLLING METAL FORMS.

APPLICATION FILED JUNE 23, 1906.

924,329.

Patented June 8, 1909.

2 SHEETS—SHEET 1.

Fig. 1

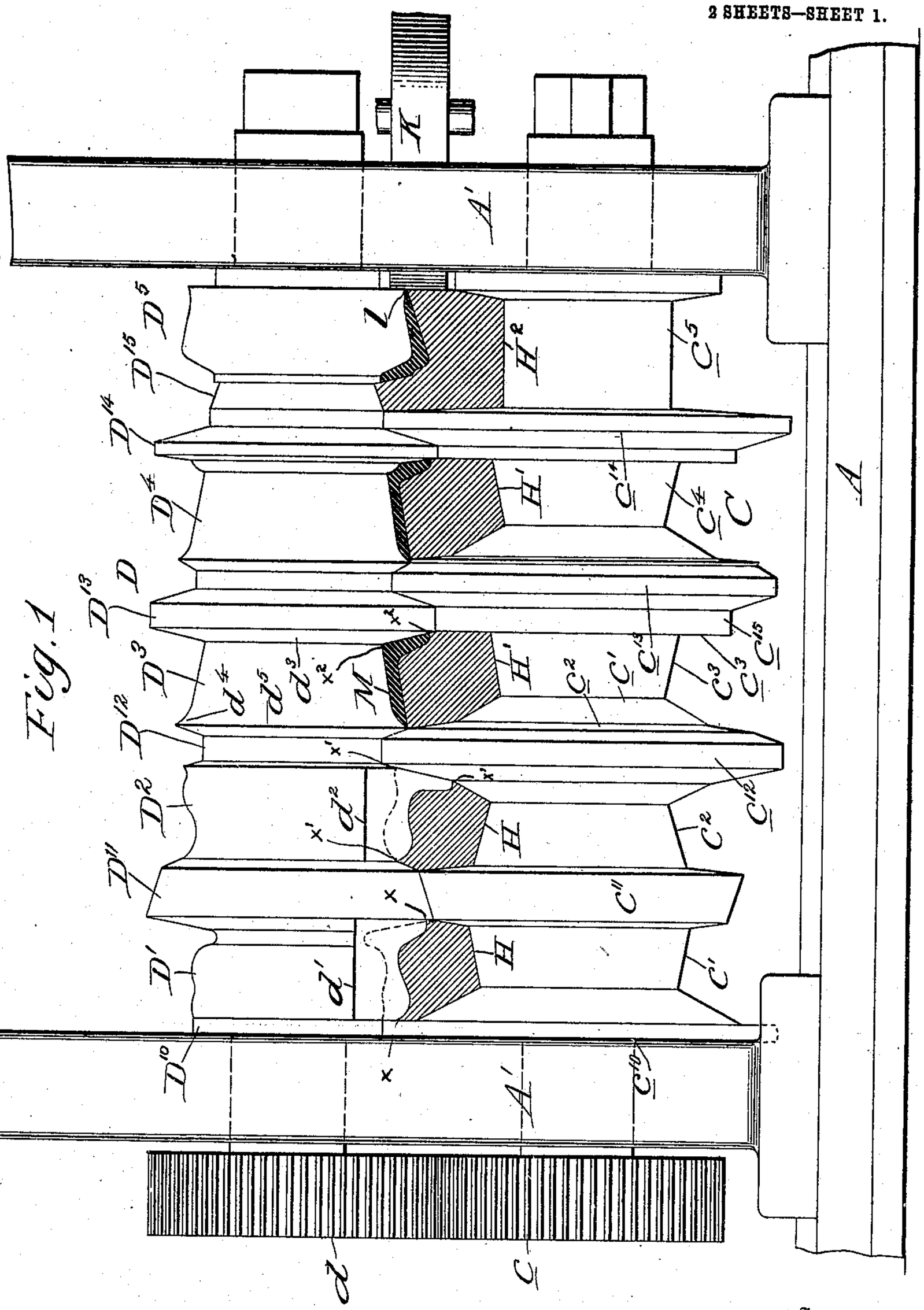

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Fig. 2

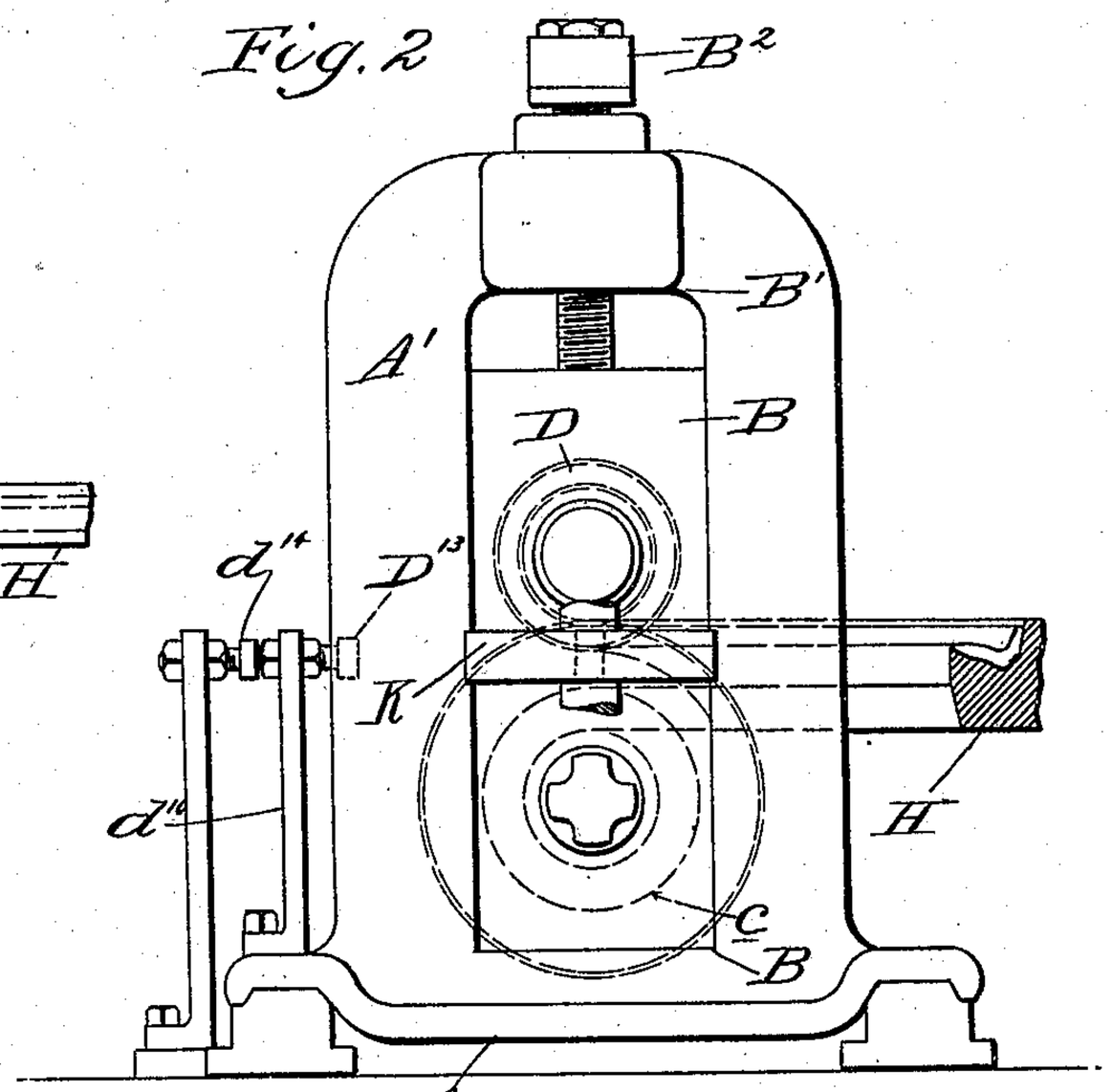


Fig. 4.

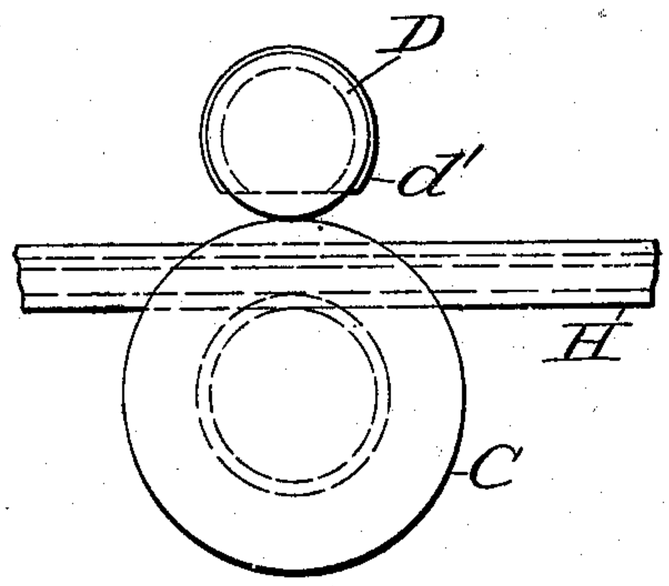
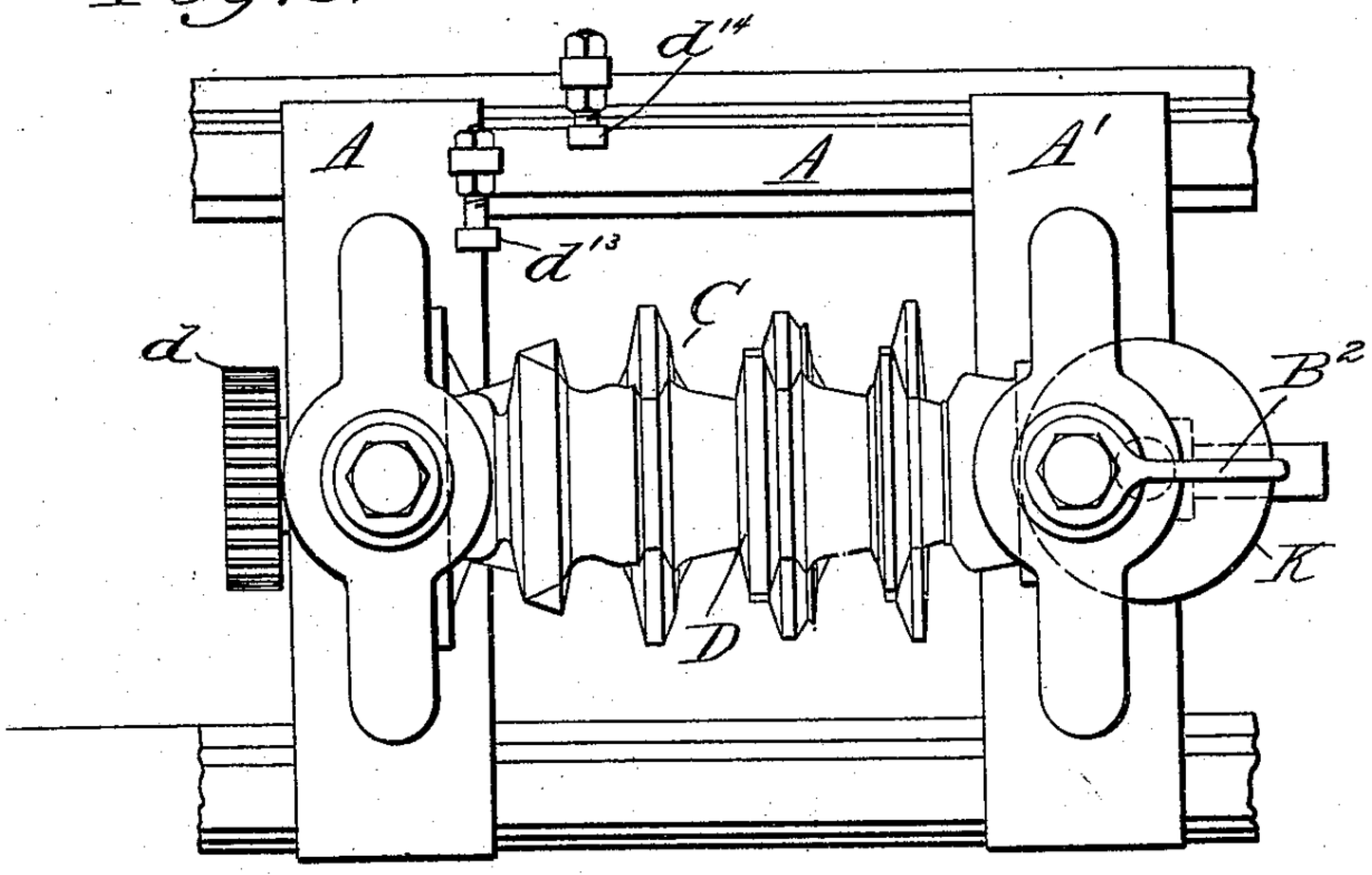


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM D. EYNON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO JAMES J. FISHER, OF PHILADELPHIA, PENNSYLVANIA, ONE-FOURTH TO PELHAM HARDING, OF NARBERTH, PENNSYLVANIA, AND ONE-FOURTH TO DAVID LLOYD EYNON, OF PATERSON, NEW JERSEY.

MACHINE FOR ROLLING METAL FORMS.

No. 924,329. Specification of Letters Patent. Patented June 8, 1909.

Application filed June 23, 1906. Serial No. 323,021.

To all whom it may concern:

Be it known that I, WILLIAM D. EYNON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Rolling Metal Forms, of which the following is a specification.

The invention to be hereinafter described relates to machines for rolling metal forms and more particularly to such machines for rolling switch points and similar articles. Heretofore, such articles have been shaped in various ways, among which may be mentioned the ordinary process of rolling with grooved forms or rolls, and more recently, attempts have been made to produce articles, such as switch points, by helical rolls, that is, a series of rolls carrying on their faces grooves and flanges which gradually change their shape, thus compressing the metal more and more as the rail passes through the mill. The peculiarity of the helical rolls is that instead of the rail to be treated being passed through the mill by what are known as "successive passes," each pass further compressing the metal until it reaches the proper shape, the helical rolls not only pass the rail between the rolls, but cause the rail to move progressively transverse of itself as it passes between the rolls by virtue of the helical or screw disposition of the compressing elements. Several difficulties have developed in the use of these prior devices and defective products have often resulted. In the first place where a rail of reasonable length was to be shaped by the helical rolls, the necessary pitch of the screw and the separating flanges required that the rolls be of considerable length, thus involving great weight in the rolling mill and corresponding increase of power to drive the rolls. In the next place, difficulty arose in the application of the helical rolls to the formation of tapered articles, such as switch points, from rails, because in each case it was necessary to destroy by compression the head and flange of the rail on one side, so that it might fit into what is known as the "stock rail," and this compression between the surfaces of the helical rolls tended to shear the rail at the point where the flange and the rail join the web. This difficulty was due to the great pressure required and the comparatively small point of support for the opposite side of the rail which was not to be materially changed. Attempts have likewise been made to roll some tapering articles from especially formed blanks by placing the blank upon a table or matrix and passing the two between compression rolls, but in such cases, the compression roll acting upon the blank not only would draw the metal lengthwise but also spread it widthwise or form a side bur or fin.

With the above general considerations in view, the object of the present invention is to provide compression means for acting upon one face of a blank whereby tapering articles may be directly formed by drawing the metal of the blank on one side lengthwise thereof without side spreading of the metal or the formation of burs or fins; and the particular object of the present embodiment of my invention is to provide such means for the production of switch points direct from a standard rail.

The invention consists of the parts and combinations hereinafter more fully described in connection with the accompanying drawings and then definitely pointed out in the claims.

In the drawings:—Figure 1 represents in front elevation a device embodying my present invention in a form for the production of switch points, the table and rail being shown by sections in successive positions passing between the rolls. Fig. 2 is a side elevation of the device on a smaller scale, the end of the table being represented in section and turned 90° from its longitudinal axis to show its cross-sectional character. Fig. 3 is a plan view of the device with the table omitted, and Fig. 4 is a detail side elevation of the rolls showing more particularly the contour and character of the first section thereof to the left of Fig. 1.

In the drawings, A represents any usual or desired character of supporting base, upon which the two standards A′A′ are erected. Each of the standards A′A′ is provided with a recess for bearing blocks B, in which the two rolls, hereinafter to be described, are properly journaled, the upper one of the bearing blocks being preferably adjustable in a vertical direction by means of the adjusting screw B′ manipulated by a suitable

hand lever B^2, whereby the proper adjustment of the upper roll carried by the upper bearing block B may be secured.

The lower roll, which, as a whole, may be designated by the letter C and which is properly journaled in the lower bearing block B, is formed with a plurality of circumferential grooves and flanges, more particularly shown in Fig. 1. These grooves in the lower roll C are not all of the same shape, for a reason that will presently appear. The upper roll, which, as a whole, may be designated as D, also consists of a series of grooves and flanges of the character to be more fully described, and the two rolls are disposed vertically one above the other, as shown. The two rolls are operatively connected together by means of gears *c* and *d*, see Fig. 1, whereby they rotate under the actuation of suitable means in unison. The lower roll C, which, for identification, I will refer to as the resisting roll, is provided with deep grooves, five being shown in the present illustration of the invention, each of which is adapted to receive and support a resisting table, said table being adapted to be passed at different transverse inclinations between two or more sections of the upper and lower rolls in a manner to be hereinafter described, and said table being provided on its upper surface with a properly shaped groove extending longitudinally thereof and appropriate to the particular character or shape of the article to be produced.

It will be noted that the surfaces of the resisting rolls are in certain cases disposed in different angular relation to the axis of the compression roll in order to position the working face of the table so that the material may be given a further drawing and be shaped as desired.

Referring to the upper roll in detail, it comprises in the present illustration of the invention five circumferential grooved sections. The first and second of these sections D' and D^2 are so shaped as to give to the standard rail, which is laid upon a table H a preliminary shape. As a matter of practice, it is undesirable to force the rail at once, and without any trimming or preliminary shaping, into the full compression throughout its extent, therefore, each of the sections D' and D^2 of the upper roll has a segment cut therefrom on the line d' d^2 respectively, as shown in Figs. 1 and 4, and disposed upon the base of the machine and, projecting upward therefrom in a horizontal line, passed between the sections D' D^2 and their lower coöperating sections of the roll C, are the stops d^{13} d^{14}, the stop d^{13} being nearer the axis of the roll than the stop D^{14} for a purpose that will presently appear. The remaining circumferential sections, D^3, D^4 and D^5 of the upper roll D are continuous and appropriately shaped to secure the desired contour of the switch point and bring it to its final tapering shape.

The sections C', C^2, C^3, C^4 and C^5 of the lower roll C are continuous and form appropriate supporting surfaces for a table, as said table with its supported rail is passed between the upper and lower rolls. It will be noticed that the sections, C' and C^2, of the lower roll are for supporting portions substantially similar in contour, but are differently inclined with respect to the axis of the compression roll, so that when the table H and the rail are passed between these successive sections of the opposing rolls, the table may be inclined transversely in one or the other direction to enable the sections of the upper roll to give to the upper surface of the rail the desired tapering formation. The table supporting surfaces of the sections C^3 and C^1 are similar to each other but are so positioned relative to the compression roll as to permit successive reducing upon a blank carried by the table H^3.

It is essential in securing a proper product by the described rolling action that no bur or fin be formed upon the rail at any portion of its length and that the entire drawing action of the metal under the compression rolls shall be endwise of the rail and at one side only. Therefore, while one side of the rail is supported by the extended surfaces of the table H, H' or H^2 the other side thereof is acted upon by the sections of the upper roll D, which, for identification, may be known as the compression roll. During the compressing action of the compression roll the metal will tend not only to draw lengthwise, but also widthwise of the rail being compressed, and to guard against this defective action in the rolling of such article, I have so formed the flanges D^{10} to D^{15} of the compression roll and the flanges C^{10} to C^{14} of the resisting roll C that the edges of these flanges shall inclose laterally the resisting table and the rail therein. For instance, viewing Fig. 1 and the sections D^3 and C^3 of the compression and resisting rolls, it will be noted that the flange C^{12} of the resisting roll has its surfaces c' c^2 inclosing one side of the table H' while the other side thereof is inclosed by the vertical wall c^3 of the flange C^{13}. In the case of the upper section D^3 of the compression roll, it will be noted that the inclined surface d^3 of the flange D^{13} incloses the base portion of the rail M, and extends a short distance below the lower edge of said base portion of the rail into biting contact with the circular portion c^{15} of the flange C^{13}. Likewise, on the opposite side or top portion of the rail M the curved surface d^4 incloses the rail M and its top edge d^5 comes into biting contact with the surface of the flange C^{12} of the lower or re-

sisting roll. Thus, not only the table, but the rail itself is inclosed on all sides, passes between the rolls and the metal is compelled to flow in the direction lengthwise of the rail only, all side flow of the metal being resisted by the inclosing character of the flanges on the compression and resisting rolls. This feature of providing the rolls with extended flanges is an important one in that under a rolling operation the flanges have a tendency to work the material laterally and thereby prevent the formation of a bur or fin at the joint.

It is well understood that switch points are about $\frac{5}{8}$ of an inch less in height than the rail in connection with which they are used and that this decrease in the height of the switch point extends approximately six feet in the length thereof. In order to effectively produce the finished product without further treatment, I have devised the last section D^5 of the compression roll somewhat narrower than the other sections and have provided a side compression roll L, Fig. 1, so that, as the rail passes along with the resisting table H^2 between the resisting roll C and the section D^5 of the compression roll and receives its final shape, the upper edge *l* thereof, Fig. 1, is depressed laterally by the side of the compression roll L to the desired extent. The edge *l* is the top of the switch point, and, in order to bring this edge adjacent the side of the compression roll L, I preferably provide a different form of resisting table for passing the rail through its final compression and reverse the position of the rail on the table, as clearly indicated by a comparison of the tables and rails shown in the last two sections to the right in Fig. 1. This, however, is a mere matter of expedience and the rail might be otherwise treated to bring it to the proper relation to the main rail on which it is to be used.

In operation, a rail of standard character of formation is placed upon the table H and the end of such table with the rail thereon is quickly inserted between the section C′ of the resisting roll and the removed segmental portion *d′* of section D′ of the compression roll until the end of the table strikes the stop d^{13}. The extent of the rail thus inserted between the two rolls may vary from two to three or four feet. The rotation of the upper roll then causes its shaping surface to act upon the upper surface of the rail and move the rail and table outward from between the rolls, at the same time drawing the metal of the rail endwise thereof. The table H, still supporting the rail as it comes from between sections C′, D′ of the rolls, is then inclined or tilted transversely somewhat and inserted in such inclined or tilted position between the section C^2 and the removed segmental portion d^2 of the section D^2, until the end of the table strikes the stop d^{14}, whereupon the acting surface of the section D^2 moves the table and rail outward from between the rolls and simultaneously compresses and draws the upper surface of the rail, causing the metal to flow or draw toward the end thereof. Attention is directed to the fact that after the table and rail have passed between sections C′ D′ of the rolls and before they are introduced between sections C^2, D^2, the table is inclined or tilted transversely, thereby changing the relation of the rail to the upper section, so that the portion of the rail that was before subjected to the possible formation of a bur or fin is, in the second pass, brought againt a solid wall which has the effect of compressing any bur or fin back into the body of the rail. This tilting or inclination of the table is permitted by the table supporting portions of the section C^2, which, while like the table supporting portions of section C′, are adapted to the shape of the under part of the table, are differently inclined, as will be evident from Fig. 1.

It will be noted that the removed segment of the section D^2 is less than that of section D′. The end of the rail or switch point having thus been given preliminary formation, the rail is placed upon another table H′ corresponding in shape to the cross-section as shown between the third and fourth sections of the rolls, and the table with its contained rail is then passed successively through or between the sections C^3 D^3, and C^4 D^4, of the compression and resisting rolls respectively, the rail or switch point at such time being acted upon by the compression roll on one side, thus causing the metal at that side of the switch point to flow longitudinally thereof while the metal in contact with the table remains substantially unaffected. The rail is now turned over to bring its edge *l* outward and it is placed upon the table H^2 in the right of Fig. 1. The table and rail are then passed between the rolls as before, giving its final shape and decreasing its height to the proper extent. In these various manipulations of the rail, it is to be noted that the sections of the upper or compression roll have a contour suited to the shape of the finished article or switch point to be produced, that they act upon only one surface of the rail, causing the metal at that surface to flow longitudinally of the rail, and that any sidewise flow of the metal is prevented, as pointed out. It is obvious, of course, that some changes might be made in the general character of the rolls or the supporting table, and that the shape of the sections of the compression roll and the grooved resisting table might be varied to suit the particular article to be produced.

It is well known by those skilled in the art that when a piece of metal is passed between rolls, whether on a table or not, there will be side-spreading and the formation of a bur along the rolled metal at the line where the two rolls or the roll and table come together, as indicated at x, Fig. 1; and if the metal is repeatedly passed between the rolling elements in the same relation, as is usually practiced, this bur becomes emphasized, and eventually has to be trimmed off. By the device constituting the present invention, however, the point x, Fig. 1, where a bur would be formed in the pass between sections D′ and C′, is, in the second pass between sections D^2 and C^2, shifted to the position at x', where the solid wall of the table and the adjacent roll not only prevent the formation of the bur, but actually roll back into the metal any bur that might have been formed in the first pass. So also in the second pass the part x' of the rail at the bite of the upper and lower rolls where a bur would probably be formed is shifted in the third pass between sections D^3, C^3, so that the portion x^2 of the rail is now acted upon by the solid uninterrupted wall of the upper roll, and any bur that might have been formed at this portion of the rail in the second pass is rolled back into the metal in the third pass. The same is true of succeeding passes, so that the switch point comes from the mill without burs and ready for use without finishing or cutting to remove burs.

By the invention herein described, not only is the shearing action often present in metal rolling obviated, and the metal caused to flow along one surface of the rail, but all burs or other objectionable projections requiring finishing are avoided, as will be readily understood by those skilled in the art.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a device of the character described, the combination of a compression roll having a plurality of working portions, a resisting member opposed thereto having a plurality of supporting sections forming with said working portion a plurality of passes, and a table for carrying the article to be rolled, adapted for movement through said passes, said supporting sections having different angular relation to the axis of the compression roll to permit said table to work the material successively.

2. In a device of the character described, the combination of a compression roll having a working portion therefor, a table, a resisting roll having a supporting section adapted to support said table in coöperative relationship with the said working portion, and a flange on one side of said supporting section extending to the working portion and beyond the upper edge of said table.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM D. EYNON.

Witnesses:
JOHN THIEL,
A. KING DICKSON.