May 23, 1933. G. L. FISK 1,910,889

ROLLING MILL

Filed Jan. 30, 1929 4 Sheets-Sheet 1

Fig. 1.

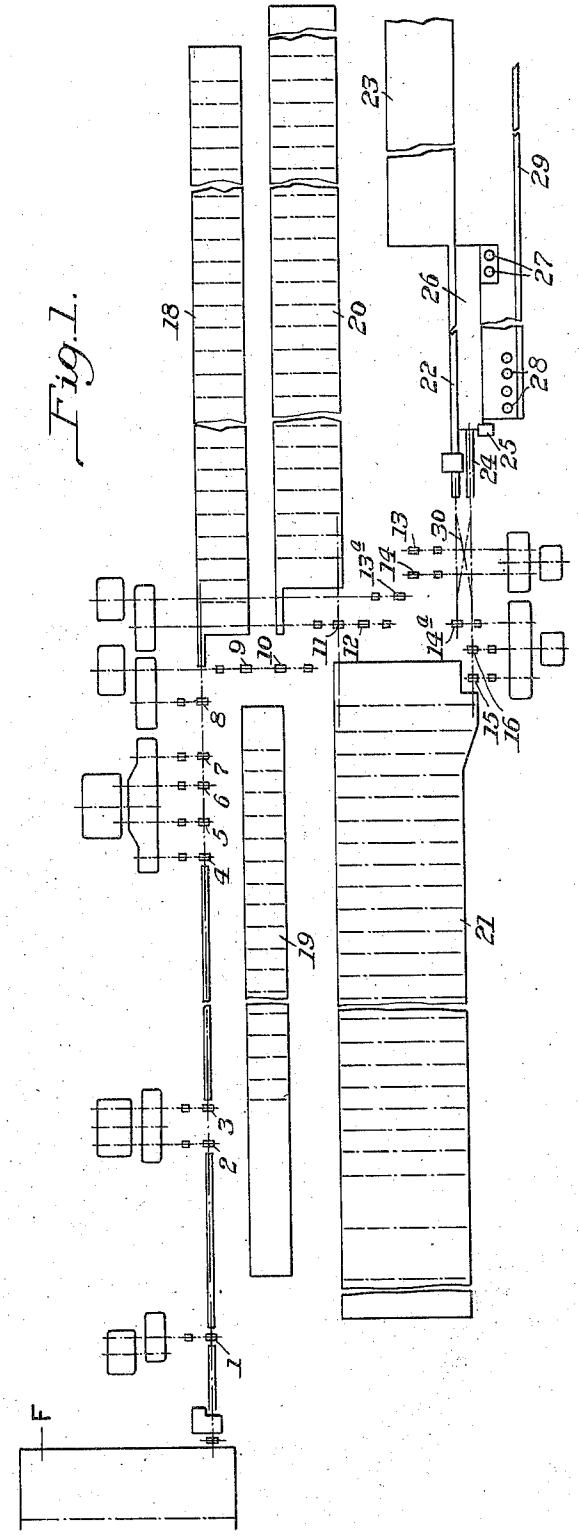
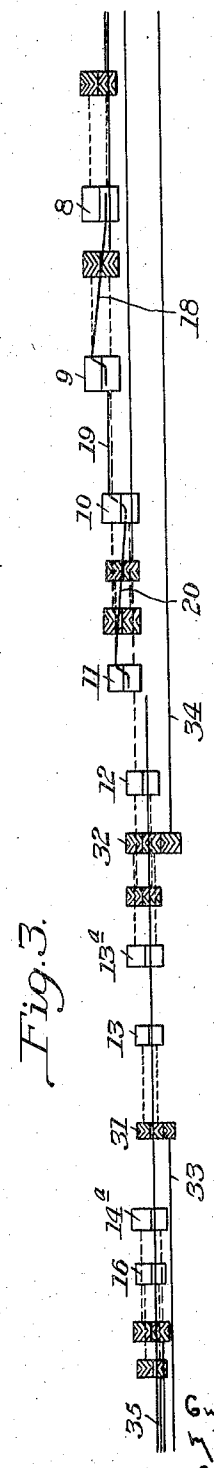


Fig. 3.



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Fig. 2.

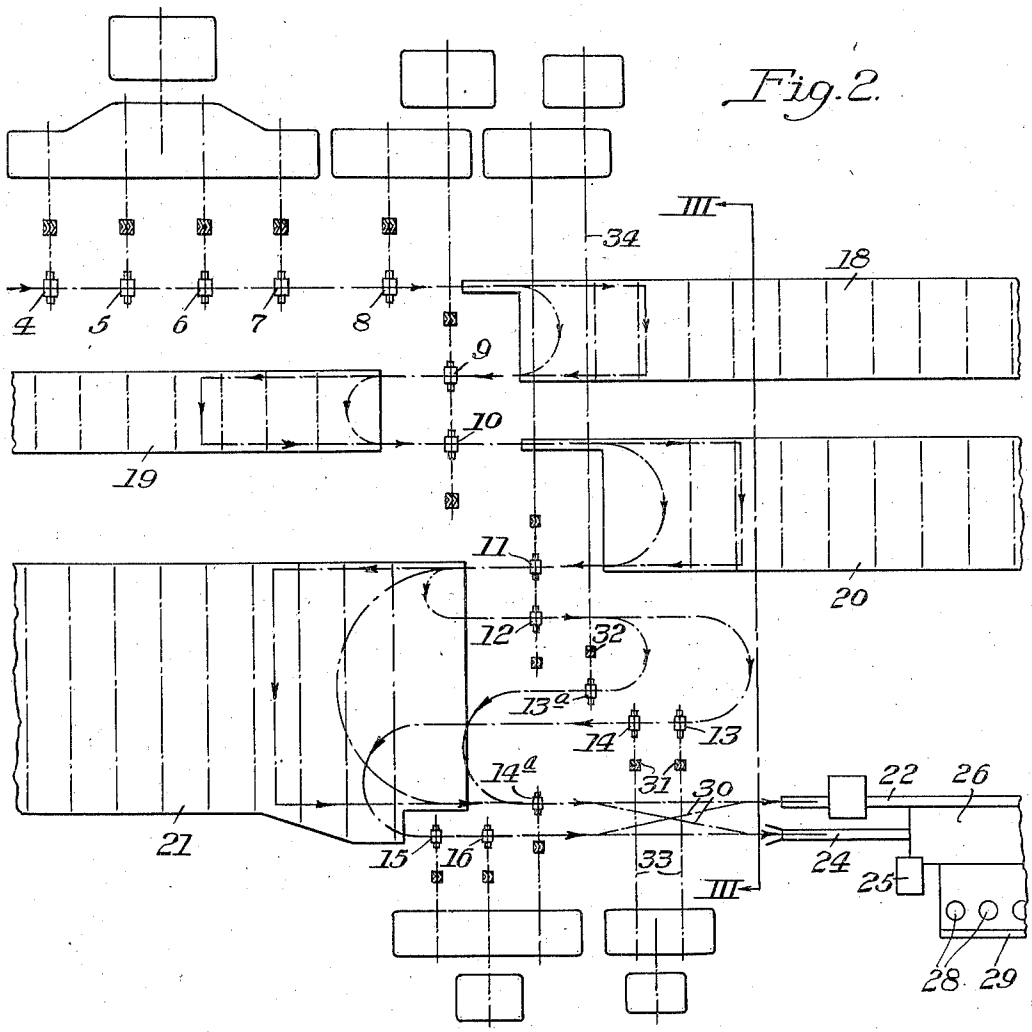
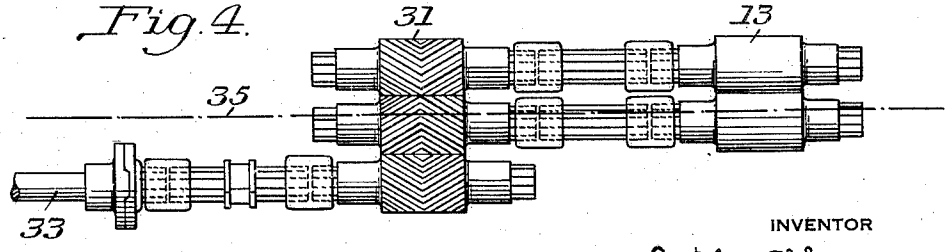


Fig. 4.



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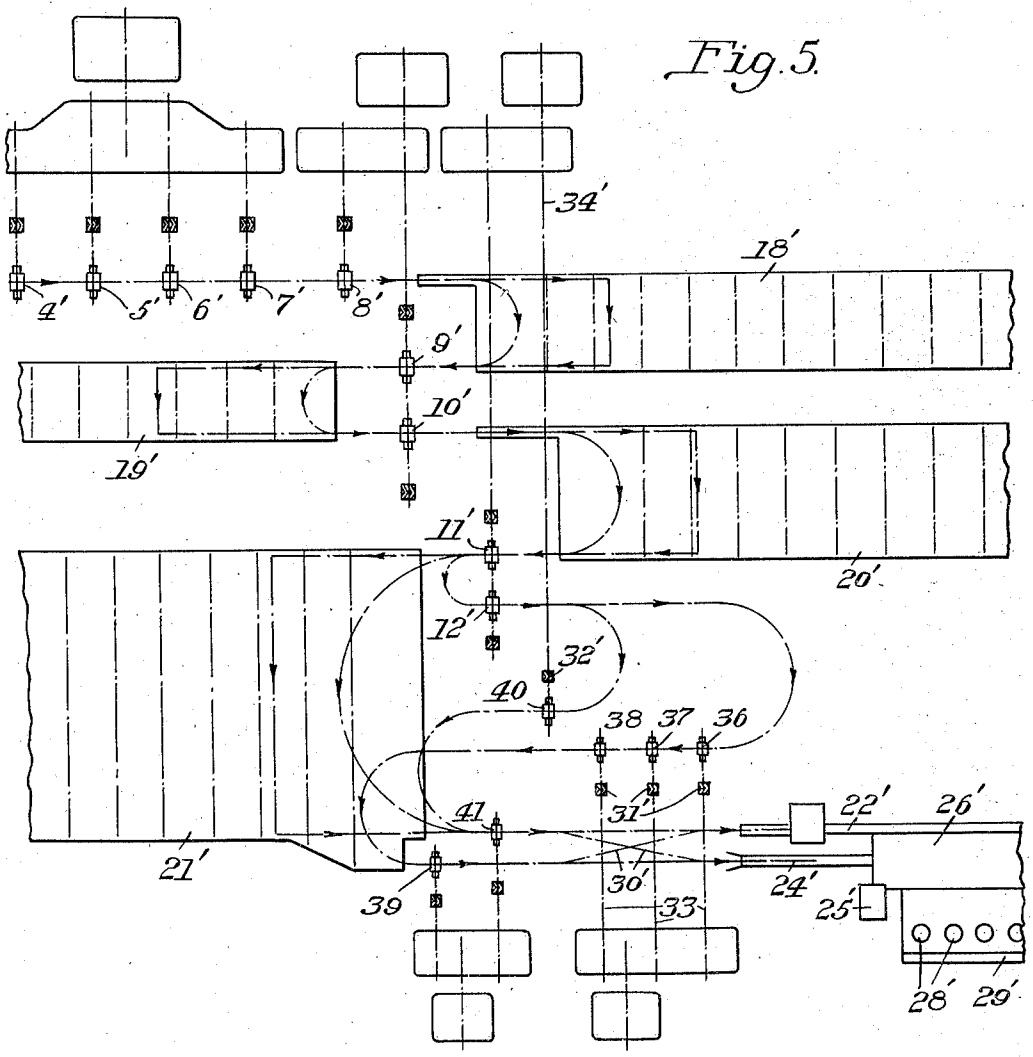
Byrnes, Stetson & Pamela

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ROLLING MILL

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Fig. 5.



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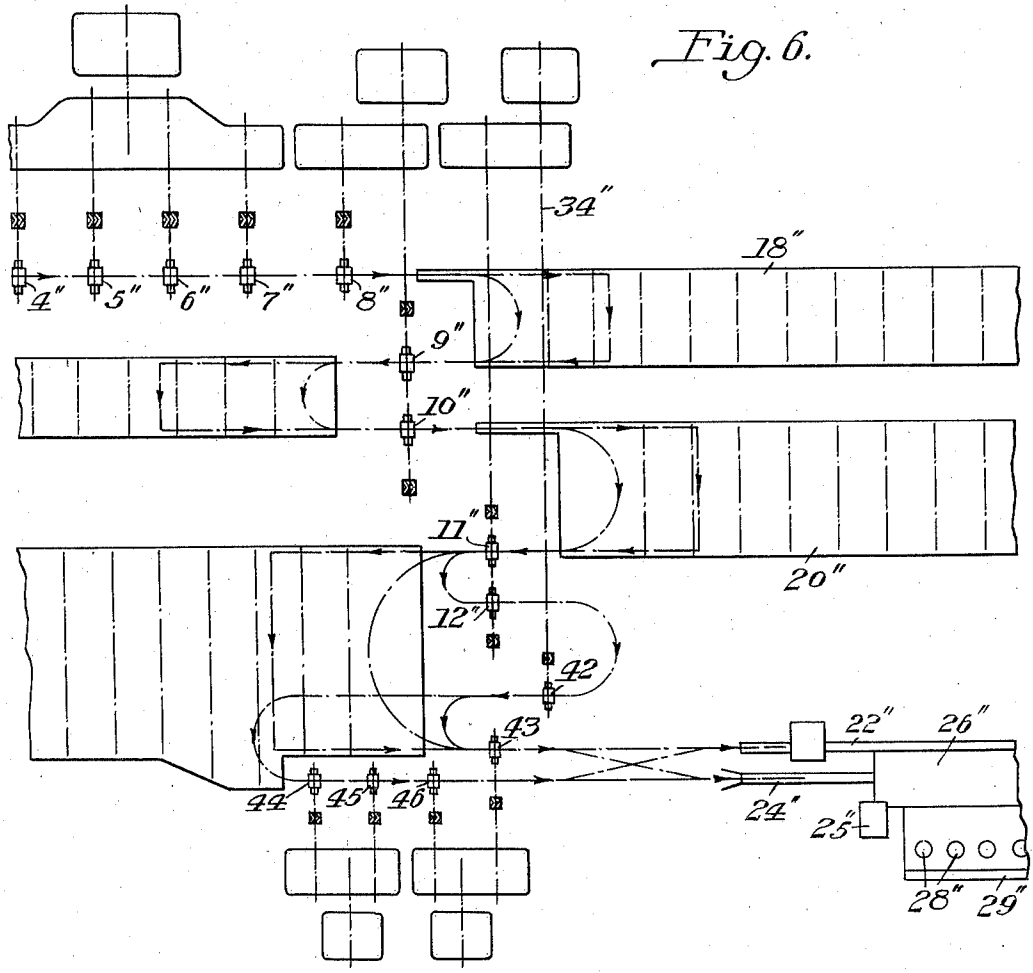
Byrnes, Stetting & Parmelee

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ROLLING MILL

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Fig. 6.



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Patented May 23, 1933 1,910,889

UNITED STATES PATENT OFFICE

GUSTAF L. FISK, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO MESTA MACHINE COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

ROLLING MILL

Application filed January 30, 1929. Serial No. 336,096.

My invention relates broadly to the art of metal rolling, and more especially to so-called merchant mills, the invention being particularly useful when it is desired to produce a wide range of sizes on a single mill.

One of the objects of the invention is to provide a mill for the economical rolling of a great variety of sections varying in area, for example, from about that of a quarter inch (¼″) round up to that of about a two and one-half inch (2½″) round.

Another object of the invention is to make it feasible to change rolls in a finishing roll train for the smaller sizes rolled on the mill, while another finishing roll train is employed in rolling the heavier sizes; or vice-versa.

Another object of the invention is to provide roughing and intermediate roll trains, common to a plurality of finishing roll trains, and to selectively deliver the product of either finishing train to a cooling bed or to coiling apparatus, which, also, are common to such finishing trains.

Still another object of the invention is to make the finishing roll trains readily accessible for roll changing and other purposes.

The above and other objects are accomplished by the novel arrangement and disposition of the various roll trains of the mill, and by the arrangement of shafting and pinions driving the several stands of rolls, as hereinafter described with reference to the accompanying drawings in which certain preferred embodiments of the invention are illustrated.

In the drawings:—

Figure 1 is a diagrammatic plan view of a mill embodying my invention;

Figure 2 is an enlarged plan view of a portion of the arrangement of Figure 1, intended to show more clearly the novel arrangement of the roll stands of the finishing trains with respect to roughing train, intermediate train, cooling bed and coiling apparatus;

Figure 3 is a further enlarged elevation on line III—III of Figure 2, and shows a preferred arrangement of rolls, driving pinions and drive shafts;

Figure 4 is a still further enlargement of part of the elevation shown in Figure 3 and shows a preferred arrangement of rolls, pinions and drive shafting for a roll stand of a finishing train, all with respect to mill floor level;

Figure 5 is a plan view showing an alternate arrangement of one of the finishing trains; and

Figure 6 is a plan view showing another alternate arrangement of the finishing trains.

Referring particularly to Figure 1, I have indicated a portion of a heating furnace F from which hot billets are delivered to a roughing train, shown in this case as having eight stands of rolls numbered 1 to 8 inclusive. At least a portion of this roughing train is made continuous to reduce the heat loss and thus to maintain the temperature of the metal within workable limits when rolling small sizes. The grouping and number of roll stands may be varied to suit various requirements but a preferred arrangement of the roughing train is shown in Figure 1.

Roll stands 9, 10, 11 and 12 constitute an intermediate non-continuous roll train in which the lighter sections rolled may be looped with relatively small loss of heat. Associated with these stands are transfers 18, 19 and 20 which serve for the transfer of stiffer sections, not subject to looping, from the line of delivery of the roughing train to the first stand of the intermediate train; from stand 9 to stand 10, and from stand 10 to stand 11.

The travel of the material in process of rolling is indicated by arrows in Figures 2, 5 and 6.

The size of rolls of the intermediate roll train may be varied to suit the product of the mill, but I prefer fourteen inch (14″) diameter rolls for stands 9 and 10, and twelve inch (12″) diameter rolls for stands 11 and 12, when utilizing the mill for the range in size of product given above by way of example, the sizes of the rolls obviously being subject to change for the best results with any given range of products.

My invention calls for the use of a plurality of independent finishing trains, including a finishing train with relatively large diam-

eter rolls and another finishing train with relatively small diameter rolls. The number of stands in each finishing train may be varied, but the preferred arrangement, as shown in Figures 1, 2 and 3, comprises four stands of rolls, numbered 13, 14, 15 and 16, as constituting one finishing train. In the particular case given by way of example this finishing train will preferably have ten inch (10″) diameter rolls. Referring to the same figures, there is another finishing train comprising roll stands 13^a and 14^a with rolls preferably twelve inches (12″) in diameter. The travel of the material in process of rolling, through the finishing trains, is indicated by arrows in Figure 2, from which it is apparent that the finishing mill including stands 13, 14, 15 and 16 is a semi-continuous mill, while the one including stands 13^a and 14^a is a non-continuous one.

Each of the finishing roll trains has a stand of finishing rolls, such as stand 16 for small sizes, and stand 14^a for large sizes, of product. Stands 15 and 13^a contain the respective small and large size rolls for the leading passes. By "leading pass" I mean the pass producing the section delivered to the finishing stand for further reduction to the section of the product rolled.

The finishing stands of the respective roll trains are placed in close proximity to one another, but staggered so that the product of either one does not run through the other stand. Both finishing stands deliver to a hot runout table 22 which in turn delivers the product to a cooling bed 23. Either of the finishing stands will also deliver independently to another runout 24, leading to vibrator 25, strip conveyor 26, and strip reels 27, or leading direct to coilers 28. Conveyor 29 is shown for the removal of coiled products.

It will be noted that in the particular layout shown in Figures 1, 2 and 3 there is a total of sixteen roll passes available for the rolling of small size products, using stands numbered 1 to 16 inclusive and finishing on the 10″ finishing mill, using stands 15 and 16 for leading and finishing passes respectively. When less passes are required in finishing relatively small sizes on the 10″ finishing train, two of the four stands for this roll train, for example, stands 14 and 16, may be omitted. I may thus roll in a total of fourteen passes using stands 13 and 15 for leading and finishing passes, respectively, and dummying through stands 14 and 16. The number of passes, when rolling sizes which are finished on the ten inch (10″) roll train, may also be reduced by dummying through some of the rolls in the roughing train, as may be desired.

Rolling on the ten inch (10″) finishing train is predicated on looping from stand 11 to 12, from 12 to 13 and from 14 to 15, as indicated in Figure 2.

In rolling heavier sections which are finished on the 12″ finishing train, there is a total of fourteen roll stands available for use, with stands 13^a and 14^a serving as leading and finishing stands, respectively. The use of this number of stands calls for looping at least from stand 11 to 12, from 12 to 13^a, and from 13^a to 14^a, as indicated in Figure 2. In case less passes are required in rolling relatively heavy sections, which are finished on the 12″ finishing train, the number of passes can be reduced by omitting stands 12 and 13^a and by looping direct from stand 11 to stand 14^a. In this case the leading and finishing passes will be located in stands 11 and 14^a respectively. The number of passes when finishing on the 12″ roll train may be further reduced by dummying through any desired stands in the roughing mill, as before referred to in connection with finishing on the 10″ train.

In rolling the heaviest sizes, which are not subject to looping, I obtain a maximum of twelve passes, using stand 11 as a leading stand and transferring by means of transfer 21 direct to the 12″ finishing stand 14^a. The number of passes for heavy sections can be further reduced by dummying through stands in the roughing train.

It will be apparent from the above description that the number of passes can be varied at will to suit the requirements in rolling either heavy, medium or light sections. At the same time two finishing trains of different size are provided, one to accommodate the heavier sizes and the other for the rolling of the lighter sizes. Furthermore, transfers serve for the broadside movement of bars, not subject to looping, and looping facilities are provided to meet the requirements for the lighter sections.

It will further be noted that when relatively heavy sections are rolled using stands 13^a and 14^a for leading and finishing passes respectively, or when the heaviest sections are rolled using stands 11 and 14^a for leading and finishing stands respectively, the stands of the 10″ finishing train are not in use, and no bars pass through these stands. This arrangement, therefore, affords the opportunity of roll changing on the 10″ finishing train while the 12″ finishing train is employed in rolling. Likewise, when rolling on the 10″ finishing train, there are no bars passing through the leading and finishing stands 13^a and 14^a of the 12″ finishing train which stands, therefore, are free for roll changing. The time loss in roll changing, which is an important item, particularly in mills intended to roll a great variety of products, is thus very materially reduced, since most of the roll changes are confined to the finishing trains. These finishing trains are in turn so arranged and operated as to permit roll changing while part of the mill is in operation for the production of other shapes or sizes.

Guide troughs 30 serve to direct the metal delivered from either finishing stand to the runout table 22 or to the runout 24 as the product may demand.

To provide accessibility and an unobstructed working floor around the finishing roll trains, I have shown three-high pinion stands 31 to drive the two-high roll stands 13—14, and also a three-high pinion stand 32 to drive the two-high roll stand 13a. This permits the drive shafting 33 and 34 for these roll stands to be located beneath the floor level 35, as indicated in Figures 3 and 4, and provides desired accessibility to the finishing trains.

Referring to Figure 5, in which parts corresponding to parts already described in detail are designated by the same reference characters having a prime (') affixed thereto, I have shown a small size finishing train with four stands of rolls 36, 37, 38, 39, and grouped in a different manner, stands 36, 37 and 38 being aligned for continuous rolling with looping of metal into the finishing stand 39. The other finishing train, with two sets of rolls of larger diameter, has a leading stand 40 from which the metal is looped into the finishing stand 41. The two finishing trains are operated entirely independently of one another and the metal in process of rolling never passes from one of these finishing trains to the other, although either finishing train may be used at will with the rest of the mill, and each finishing train has one stand of finishing rolls delivering to a cooling bed or other apparatus, which is common to both finishing trains.

Referring to Figure 6, in which parts corresponding with parts already described in detail are designated by the same reference characters having a double prime (") affixed thereto, I have shown the large size non-continuous finishing train with leading stand 42 and finishing stand 43. In this case stand 42 is also used in conjunction with stands 44, 45 and 46 having rolls of smaller diameters.

Again referring to Figure 6, it will be noted that there is a total of 16 roll passes available for the rolling of small size products, using stands 45 and 46 for leading and finishing passes respectively. When less passes are required in finishing relatively small sizes on the small finishing train two of the stands of this roll train may be omitted, using stands 42 and 44 for leading and finishing passes respectively. When rolling heavier sizes which are finished on the large size finishing train there is a total of 14 roll stands available for use, with stands 42 and 43 serving as leading and finishing stands, respectively.

The arrangement shown in Figure 6, therefore, permits of roll changing in stands 44, 45 and 46 when using the large size finishing mill, and in stand 43 when using the small size finishing mill.

From the foregoing it will be apparent that I have provided a mill having a roughing train for continuous rolling cooperating with an intermediate train for non-continuous rolling, and adapted to deliver at will to either of two finishing trains either or both of which may deliver to the same or different points of apparatus. I am thus enabled to select the desired finishing train in accordance with the characteristics of the metal being rolled, and during such time as one finishing train is being utilized I may make changes in the rolls of the other finishing train. In this manner the production of the mill is increased, as well as its ability to handle a wide variety of shapes and sizes.

The driving means for the various rolls may be selected to give the speeds desired, the arrangement preferably being as indicated to increase the free floor space in the vicinity of the finishing mills.

The drawings are illustrative only of certain preferred embodiments of my invention, it being understood that changes in the construction and arrangements therein illustrated may be made without departing either from the spirit of my invention or scope of my broader claims.

I claim:—

1. The combination with a continuous roughing mill, of a non-continuous intermediate mill, a non-continuous finishing mill comprising a leading stand and a finishing stand, and a semi-continuous finishing mill including a leading stand and a finishing stand, said finishing mills being both located on the same side of the non-continuous intermediate mill, and having the rolls of the respective mills in staggered relationship.

2. The combination with a continuous roughing mill, of a non-continuous intermediate mill, a non-continuous finishing mill comprising a leading stand and a finishing stand, and a semi-continuous finishing mill in close proximity to the first finishing mill and including a leading stand and a finishing stand in staggered relation to the stands of the first finishing mill, said finishing mills being selectively available to provide the leading and finishing passes for the material being rolled.

In testimony whereof I have hereunto set my hand.

GUSTAF L. FISK.