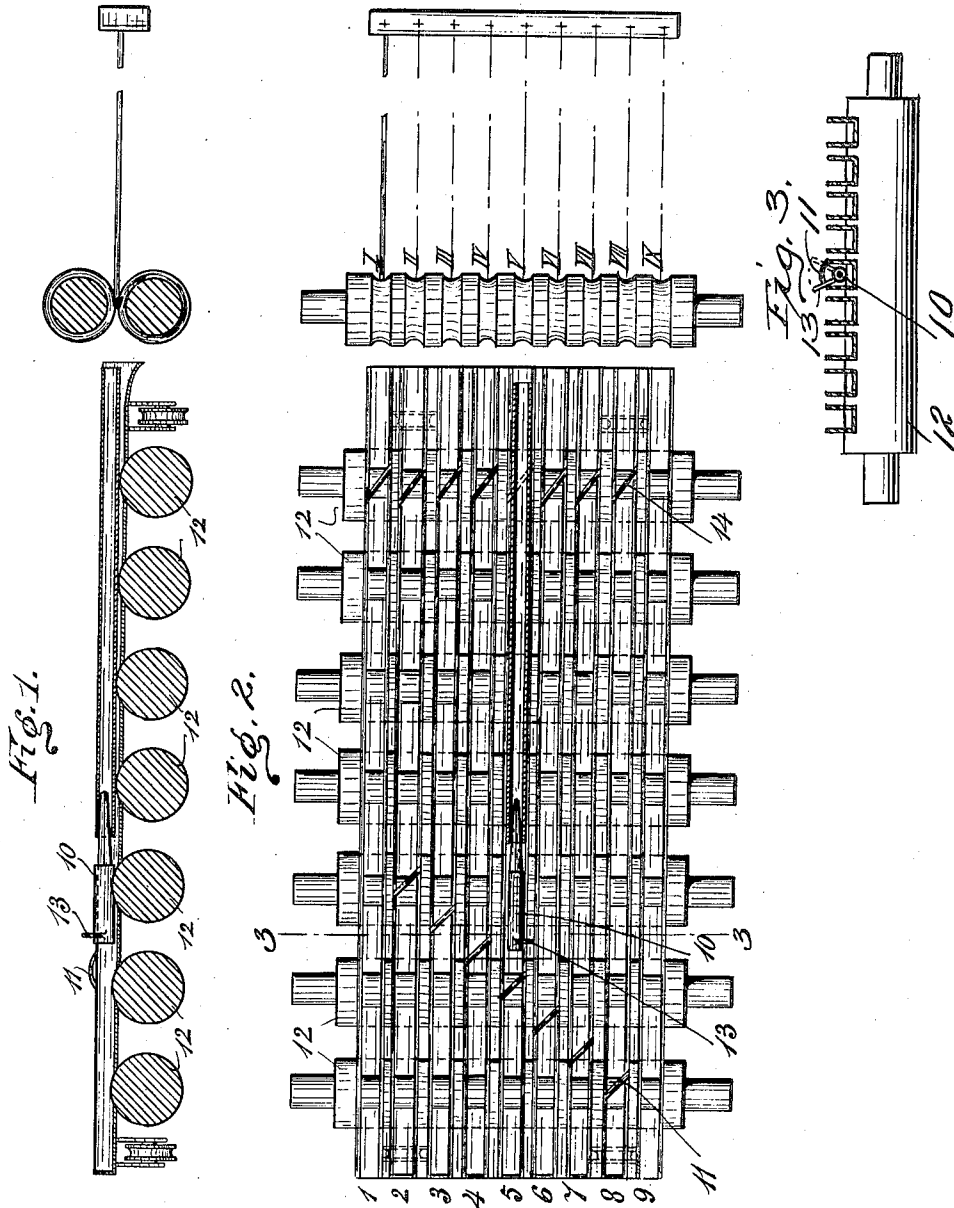


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 APPLICATION FILED APR. 29, 1912.

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Patented Mar. 31, 1914.

4 SHEETS—SHEET 1.



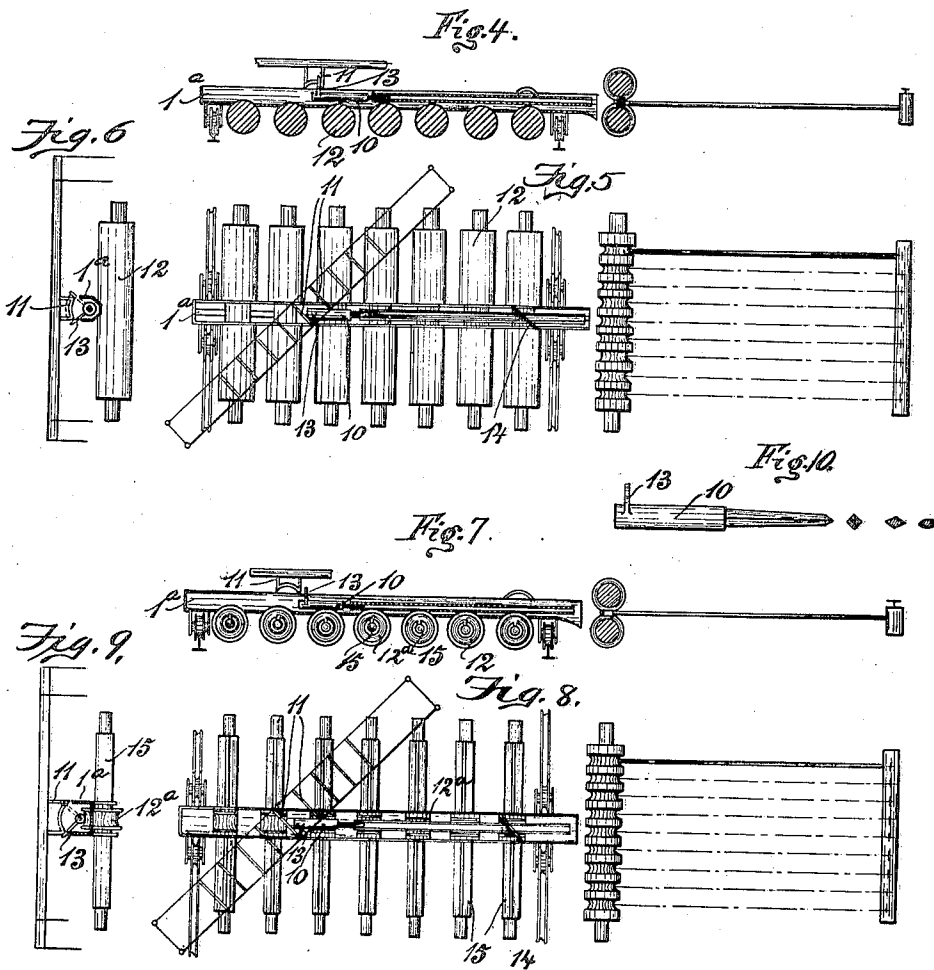
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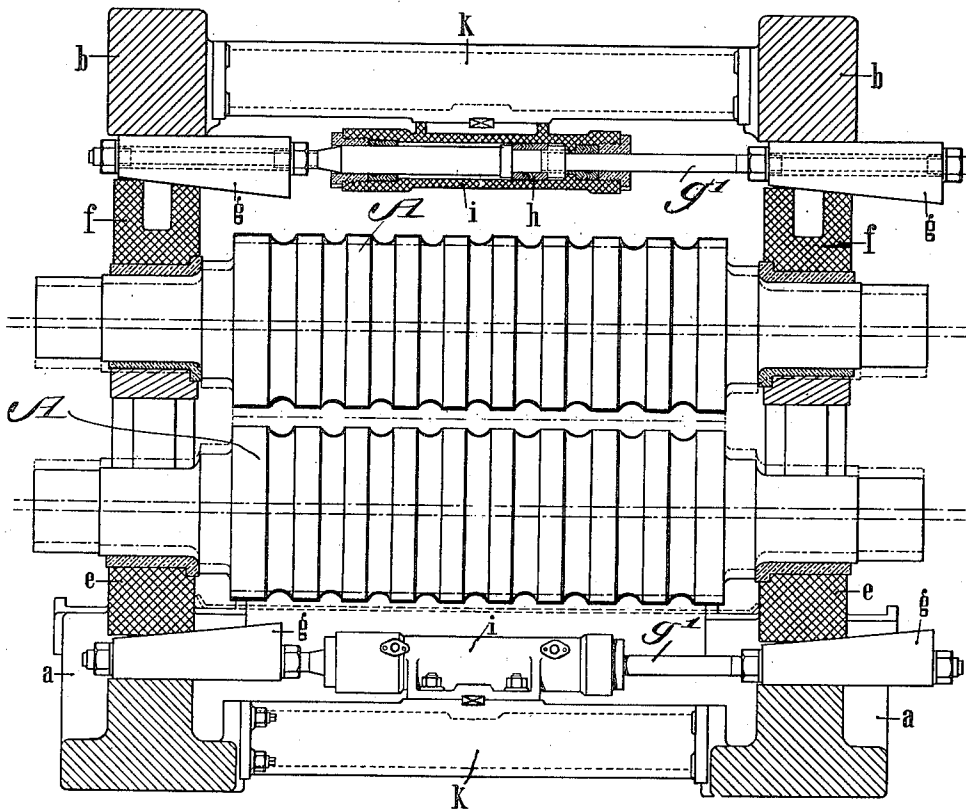
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4 SHEETS—SHEET 3.

Fig. 11.



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Fig. 12.

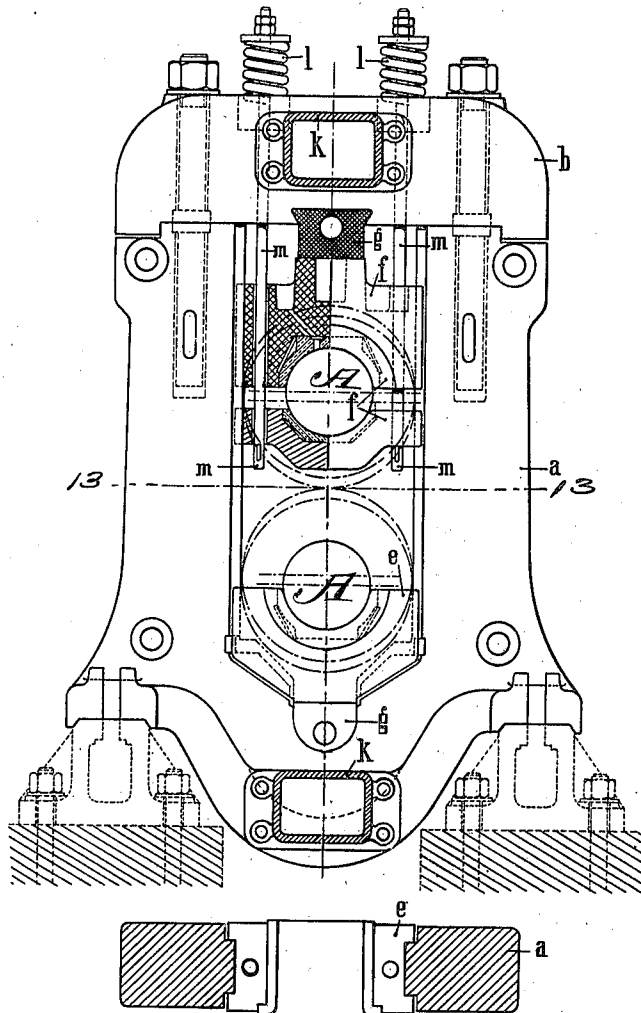


Fig. 13.

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UNITED STATES PATENT OFFICE.

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FEED MECHANISM FOR TUBE-ROLLING MILLS.

1,092,084.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HEINRICH STÜTING, a subject of the Emperor of Germany, residing at Witten-on-the-Ruhr, Germany, have invented new and useful Improvements in Feed Mechanism for Tube-Rolling Mills, of which the following is a specification.

This invention relates to tube-rolling mills wherein the tube is moved automatically from one working pass to the next, and wherein the rolls of each pass are caused to act on the parts of the tube corresponding to the places where the rolls of the next preceding pass come into contact with each other, in order to avoid the formation of fins in the rolling. So far as I am aware, this result has heretofore only been obtained in tube-rolling mills of the kind wherein two or more pairs of rolls are arranged with their passes in line with each other and movable abutments are provided whereby a tube can pass off the end of the mandrel-rod of one pair of rolls into engagement with the next pair of rolls, and so on to the end of the series, the median planes of successive pairs of rolls being in some cases arranged substantially at right angles to each other, so that any incipient fins formed by one pair of rolls are rolled down by the next pair of rolls. Tube rolling mills with fixed abutments for the mandrel-rods are, however, in very general use, wherein the tube is returned to the front of the working rolls after each pass, and is then fed into the next working pass of said rolls by means of mechanism comprising a channel, which is adapted to receive the tube when it has been returned to the front of the working rolls and which is provided with a feed-roller or cylinder whereby the tube is fed into the next working pass. In this arrangement, it has heretofore been necessary to employ hand-operated tools during the feeding of the tube to the working pass of the rolls, since after each pass the metal to be rolled must be turned through 90 degrees, in order to avoid the formation of fins in the rolling. In the feed-mechanism forming the subject of the present invention, this hand labor is dispensed with and a completely mechanical method of operation is rendered possible with tube-rolling mills having fixed abutments for the mandrel-rods. By the interaction of a train of feed-rolls, the feed-channel and a turning device consisting, for ex-

ample, of a mandrel of conical or other suitably tapered form, arranged in said feed-channel and acted upon by suitably inclined relatively fixed abutments, the feeding of the metal to be rolled to the next pass takes place automatically, *i. e.* without the aid of hand-operated rolls, after the channel has been moved into the required position. The actuation of the turning device can be arranged in some cases, so that the metal to be rolled, in running into the feeding apparatus, always moves through the whole length of the channel, or the abutments can be arranged so that the travel is limited in accordance with the stretching in the several passes. According to this latter arrangement, in the first pass, the travel is the shortest and in the last pass, *i. e.* for the finished tube, the travel is the longest. For the utilization of the heat in the metal to be rolled and for rapid work, this arrangement has an importance which is not to be minimized. By this means, hand-labor can be dispensed with in the known feed-mechanism of this kind, if a turning device be provided in the feed-channel. In all cases, the turning device is moved in the channel by the returning metal to be rolled and the turning of the tube is thereby effected. In order to grasp the tube securely, the mandrel of the turning device terminating in the tube, in addition to a conical form, *i. e.* of round cross-section, can be made of any suitable shape in cross-section.

The feed mechanism comprises a number of feed rolls, one or more removable feed channels, and one or more turning devices.

Embodiments of the invention are illustrated in the accompanying drawings, wherein:

Figure 1 is a longitudinal sectional view of a tube rolling mill in which the features of the invention are incorporated; Fig. 2 is a plan view of the mill; Fig. 3 is a transverse sectional view thereof on the line 3—3 of Fig. 2; Figs. 4, 5, and 6 are views similar to Figs. 1, 2, and 3 respectively, showing another construction in which the features of the invention are incorporated; Figs. 7, 8, and 9 are views similar to Figs. 1, 2, and 3 respectively, showing a further alternative construction; Fig. 10 is a detail view showing one of the tube turning mandrels. This figure includes a showing of different cross sectional forms in which these mandrels may be made. Fig. 11 is a front elevation, partly

in section, showing the pass rolls and their mounting; Fig. 12 is a side elevation, partly in section, also showing the pass rolls and their mounting; Fig. 13 is a detail sectional view on the line 13—13 of Fig. 12.

Similar characters of reference designate corresponding parts throughout the several views.

The drawings assume a tube rolling mill having nine passes and including rolls A which are fashioned to provide the passes, the latter being designated by the Roman numerals I to IX respectively. The rolls A are driven in the usual manner and are mounted for movement toward and away from one another, as will be hereinafter fully explained. The movements of the tubes are effected by feed rolls 12. In the construction shown in Fig. 1 there are nine channels corresponding to the respective passes and arranged over the said feed rolls, the bottom walls of the channels having openings into which the feed rolls project to engage the tube. These channels are designated by the numerals 1 to 9 respectively, and are combined or connected to be movable in unison transversely of the mill or parallel to the longitudinal axes of the rolls A. The channels 2 to 8 are each provided with a device, to be hereafter described, for turning the tube.

The method of operation is as follows: The tube is introduced into the channel 1, pushed by the train of feed-rolls into the first pass and rolled through. As soon as the channel 1 has become free, channel 2 is brought in front of pass I, so that when the rolls A are moved apart or opened, the returning tube enters this channel. In this operation, the tube first pushes itself on to the turning mandrel 10 lying in the channel 2 and is moved farther back by the train of feed-rolls 12, if the energy stored therein is not sufficient to bring it up to the abutment 11. The turning mandrel lever 13 now slides along on the abutment 11 and thereby the turning mandrel 10, together with the tube thereon, is caused to turn through 90°. Channel 2 is now again brought in front of the pass II and by reversing the feed-rolls, rolling takes place in the now closed pass II. In this operation, as soon as the turning mandrel lever 13 strikes against an abutment 14, the tube releases itself from the mandrel and the turning mandrel is brought back into its original position. As soon as channel 2 is free, channel 3 comes in front of pass II and receives the returning tube. This series of operations is repeated up to the last pass IX, when the tube comes into the channel 9 and is removed entirely from the mill by the train of feed-rolls.

As above intimated, a turning mandrel 10 is provided for each of the channels 2 to 8, but as a matter of convenience, such a man-

drel is shown only in connection with the channel 5, and in this case, the mandrel is shown in relation to a tube.

The construction shown in Figs. 4 to 6 embodies the rolls 12, already described, but differs from the construction shown in Fig. 1 principally in that there is but a single feed channel, as 1^a, which travels from pass to pass. The abutments 11 for the turning of the mandrel are here stationary, (*i. e.* supported independently of the transversely movable channel 1^a) as shown, the abutment 14 for detaching the tube from the mandrel being fixed to the channel 1^a itself. The procedure is otherwise as above described.

The construction shown in Figs. 7 to 9, like the construction shown in Figs. 4 to 6, embodies but a single feed channel 1^a. In this case, the feed rolls, as 12^a, correspond generally in width to the width of the channel 1^a, and are peripherally grooved. The rollers 12^a are mounted for slidable movement on longitudinally grooved shafts 15, and are movable with the feed channel 1^a when the latter is moved transversely of the mill, their outer sides engaging against the vertical side walls of the channel 1^a, as the latter travels from pass to pass. The turning of the tube takes place as in the embodiment shown in Figs. 4 to 6, *i. e.* by means of stationary abutments 11.

Fig. 10 shows the turning mandrel 10 with its lever 13, and various cross sectional forms which said mandrel may have.

Figs. 11, 12, and 13 illustrate, in detail, the arrangement of the rolls A whereby these rollers are moved away from one another, as when the tube is to be returned to one of the channels, or are brought together, as when the tube is to be rolled.

The roll stand consists of two standards *a* with their caps *b*. The lower roll A is mounted in the two bearing blocks *e*, and the upper roll A in the bearing blocks *f*. These bearing blocks are raised and lowered by movements of the wedges *g*. The wedges *g* are connected by rods *g'* and their movements are effected by means of pistons *h* mounted on the rods *g'* and working in cylinders *i*. Each piston *h* and its cylinder *i* forms a hydraulic motor and the pistons, on their larger right hand ends, are acted upon by water under pressure controlled by a valve, while their left hand ends are continuously acted upon by water under pressure. The two cylinders *i* are secured to the distance pieces *k*. The upper bearing blocks *f*, and with them the upper roll A, are carried by the springs *l* through the intermediary of the tension rods or hangers *m*.

In Figs. 11 to 13 the rolls A are shown in their drawn-apart position. In this position of the rolls, the material to be rolled can be returned. The positioning of the rolls A is effected by means of the wedges *g*. By let-

ting off the water under pressure on the right hand ends of the pistons by means of a suitable hydraulic control, the water under pressure continuously acting on the left hand ends of the pistons moves said pistons and with them the wedges *g* to the right. During the movement of the wedges, the carrying springs *l* lift the upper roll *A* with the bearing blocks *f*; the lower roll *A* with the bearing blocks *e* descends by reason of its own weight. By this means, the material to be rolled is rendered free to return and after this operation has been completed water under pressure is again allowed to act on the right hand ends of the pistons. The pistons *h* move to the left by reason of the larger pressure-surface on the right hand ends and the water under pressure continuously acting on the left hand ends of the pistons is forced back into the supply pipe. These movements of the pistons are followed by both the upper and lower wedges *g* and by this means the upper roll *A* is caused to descend and the lower roll *A* to rise, that is to say, the rolls are closed for the next pass. After this, the drawing-apart of the rolls takes place again and the operations above described are repeated.

By arranging two separate hydraulic controls, the upper and lower rolls can be raised and lowered as desired.

What I claim is:—

1. Feed-mechanism for tube-rolling mills comprising a channel for receiving the metal to be rolled, a tube turning mandrel rotatably arranged in said channel and independent of the tube-drawing mandrel of the mill, and means for turning said tube-turning mandrel.

2. Feed-mechanism for tube-rolling mills comprising a channel for receiving the metal to be rolled, a mandrel arranged in said channel, and means for turning said mandrel, such means being operated by the moving metal and mandrel in said channel.

3. Feed-mechanism for tube-rolling mills comprising a channel for receiving the metal to be rolled, a mandrel arranged in said channel, a lever arm on said mandrel and an abutment for engaging said lever-

arm in the movement of said mandrel along said channel.

4. Feed-mechanism for tube-rolling mills comprising a channel for receiving the metal to be rolled, a mandrel arranged in said channel, a lever arm on said mandrel, and abutments for engaging said lever arm and turning the same at each end of the travel of the mandrel along the channel.

5. Feed-mechanism for tube-rolling mills comprising a channel for receiving the metal to be rolled, a mandrel arranged in said channel, a lever-arm on said mandrel and an abutment for engaging said lever-arm in the movement of said mandrel along said channel the position of the abutment relatively to said channel being arranged to correspond with the distance the metal is to be moved in said channel.

6. Feed-mechanism for tube-rolling mills comprising a channel for receiving said metal, and mounted for transverse movement, a turning mandrel in said channel, a lever-arm on said mandrel, an abutment mounted independently of said channel, and an abutment mounted on said channel, for the purpose specified.

7. Feed-mechanism for tube rolling mills comprising a channel for receiving said metal, feed-rolls for acting on the metal in said channel, a mandrel in said channel, and means for turning said mandrel, such means being operated by the moving metal and mandrel in said channel.

8. Feed-mechanism for tube-rolling mills comprising a channel for receiving said metal, feed-rolls for acting on the metal in said channel, shafts bearing said rolls, means for enabling said rolls to move axially along said shafts and for preventing said rolls from turning relatively to said shafts, a mandrel in said channel, and means for turning said mandrel, said means being operated by the moving metal and mandrel in such channel.

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