J. KALLE.

CONTINUOUS ROLLING MILL.

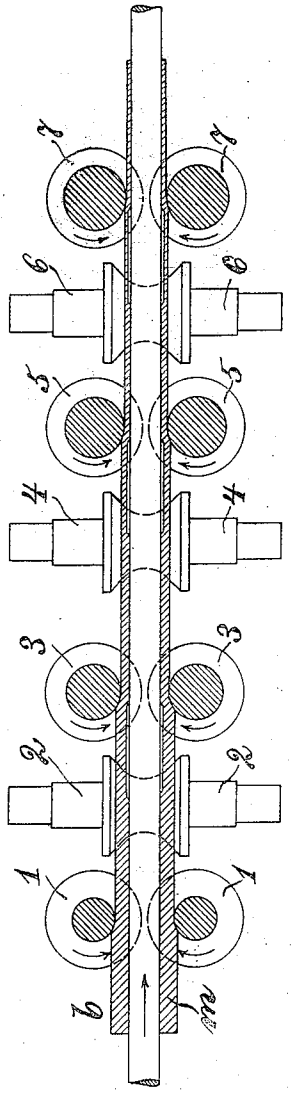
APPLICATION FILED NOV. 10, 1909.

981,281.

Patented Jan. 10, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



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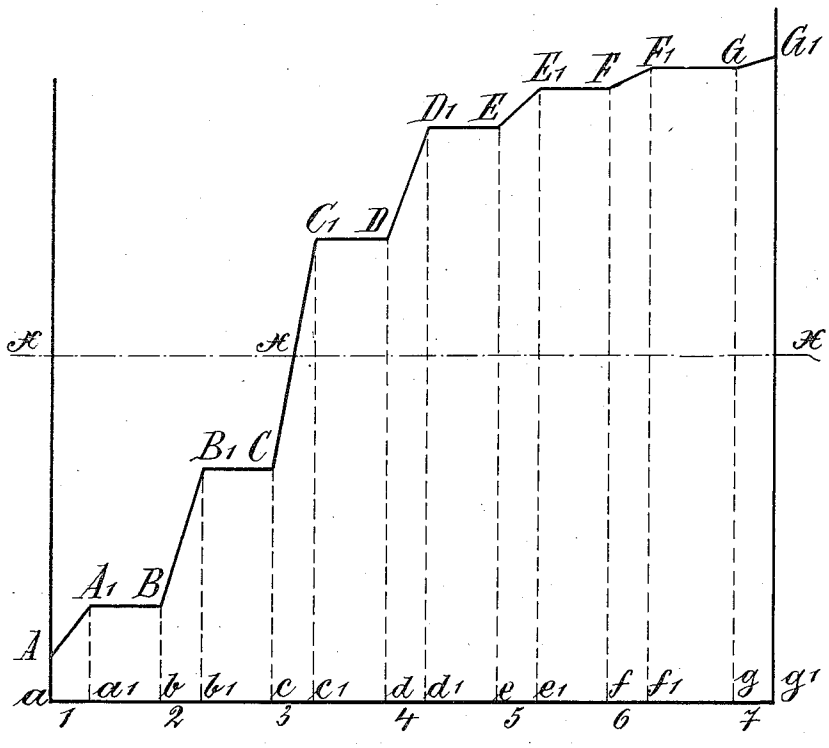
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

JULIUS KALLE, OF DINSLAKEN, GERMANY.

CONTINUOUS ROLLING-MILL.

981,281. Specification of Letters Patent. Patented Jan. 10, 1911.

Application filed November 10, 1909. Serial No. 527,134.

To all whom it may concern:

Be it known that I, JULIUS KALLE, a subject of the King of Prussia, and resident of Dinslaken, in the Province of the Rhine, German Empire, have invented certain new and useful Improvements in Continuous Rolling-Mills, of which the following is a specification.

This invention relates to improvements in the art of rolling tubes in continuous rolling mills of the type in which the succeeding pairs of rollers in the rolling mill are arranged with their axes at right angles and in which the mandrel is moved forward with the material to be rolled.

In rolling out hollow bodies in a continuous rolling mill of this type there always occur differences in velocity between the mandrel and the tube or hollow body. The mandrel can only move with a single velocity, while the blank during the rolling out process increases in velocity corresponding to its diminution in thickness. The disadvantages of these differences in velocity increase with their amount and are most dangerous when the mandrel moves more slowly than the blank. This of course occurs to the greatest extent when the mandrel is stationary but even when the mandrel moves with the velocity of the slowest rollers, the resulting tube has always during its entire operation an ever increasing relative speed in advance of the mandrel so that the thin walls of the finished tube are exposed to the danger of jamming on the mandrel. If the mandrel moves through the rolling mill with the velocity of the last pair of rollers the dangers of damage to the blank are of course diminished but on the other hand a very large length of mandrel is necessary, as opposed to the first two cases where the mandrel may be shorter than the finished tube. It is therefore advisable to communicate to the mandrel a medium velocity so as to obtain the advantages of a short mandrel and to diminish as far as possible the relative velocity between the mandrel and the blank.

It has been usual hitherto when it was desired to give the mandrel the velocity of a certain pair of rollers, to make the groove of the required pair of rollers circular, so that a greater frictional surface between the mandrel and the blank was provided. All the other pairs of rollers in the mill having oval grooves.

According to the present invention the pair of rollers which are to determine the velocity of the mandrel have also an oval groove and the rolling out action of the said rollers is greater than any other pair of rollers in the mill. In this way the greatest pressure on the blank will be exercised by this pair of rollers and the necessary friction between the rollers and the mandrel is obtained, in spite of the fact that the blank does not completely close all the way around on the mandrel as is the case when using a circular groove.

With the present invention the heating action on the mandrel at the point where it is being fed forward is reduced owing to the fact that the contacting surface between the blank and the mandrel is decreased. Then again when the rollers which determine the velocity of the mandrel are given a circular groove, the rolling out action of these rollers is inconsiderable, owing to the fact that it is absolutely necessary to provide a clearance for the flow of the material during pressing. The circular grooved rollers therefore were practically an idle pair in the mill whereas the oval grooved rollers according to the present invention are an exceedingly active pair and thereby not only effect the feeding of the mandrel but also materially advance the rolling action of the mill. The pairs of rollers arranged on each side of the intermediate pair which determine the velocity of the mandrel, are preferably so arranged that their rolling out action gradually decreases so that the pressure of the blank on the mandrel may diminish as the relative velocity of the mandrel and the blank increases. It is also preferable to effect only a comparatively small diminution of cross section in the individual pair of rollers arranged to receive the blank after it has passed to the pair of rollers which determines its velocity. According to the present invention therefore a greater number of roller pairs are arranged to receive the blank after it passes from that roller pair which determines its velocity, than are arranged in front of this roller pair. In this way as the blank becomes thinner, the amount of rolling out action exercised on it by the rollers decreases.

It will be understood that the amount of rolling out action effected by any pair of rollers, may be represented by the increase of velocity of the blank after passing through the said rollers.

In order to make the invention entirely clear, reference is made to the accompanying drawings in which:

Figure 1 represents a rolling mill embodying in desirable form the present improvements, and Fig. 2 illustrates a velocity diagram of a blank passing through said mill.

In the drawings m represents the mandrel and b the blank.

Assuming that seven pairs of rollers 1, 2, 3, 4, 5, 6, 7, are provided as illustrated then the lengths $a\ a'$, $b\ b'$, $c\ c'$, to $g\ g'$ represent the length over which the different roller pairs are acting. Therefore $a\ g'$ represents the entire manipulating length of the rolling mill. The velocity of feeding of the blank is represented by the line a A, the velocity of exit from the first pair of rollers is represented by the line a'—A'. The velocity of the finished tube is represented by the line g'—G'. The lengths b B and b' B' represent the velocity of the blank before and after passing through the second pair of rollers, and so on the various dotted lines representing successively the entrance and exit-velocity of the blank.

In the third pair of rollers the entrance velocity of the blank is c C and the exit velocity c' C'. This is the pair which effects the greatest rolling out action, as can be clearly seen from the drawings, since this pair effects the greatest increase in the velocity of the blank. The average velocity $\frac{1}{2}[cC+c'C']$ will represent approximately the velocity of the mandrel; this approximate velocity is shown by the line $x\ x\ x$.

It will be seen that the amount of reduction effected in the pairs of rollers 4, 5, 6, 7 and therefore the increase in speed of the blank gradually diminishes as also does the amount of reduction effected by the pairs 2 and 1 in the order given. Further four pairs of rollers are arranged to take the blank after it passes through the pair 3 whereas only two pairs are arranged in front of the pair 3.

I claim:

1. The improvement in the art of rolling tubes in a continuous mill, which consists in reducing the tube on a mandrel at each of a succession of passes, the reduction at each pass being on small portions only at diametrically opposite sides of the tube while permitting the metal of the tube to flow laterally, and the greatest reduction being at one of the intermediate passes whereby the velocity of the mandrel will be controlled by said intermediate pass.

2. The improvement in the art of rolling tubes in a continuous mill, which consists in reducing the tube on a mandrel at each of a succession of passes, the reduction at each pass being on small portions only at diametrically opposite sides of the tube while permitting the metal of the tube to flow laterally and the reduction in each pass gradually increasing to a maximum at an intermediate pass and then gradually diminishing, whereby the velocity of the mandrel will be controlled by said intermediate pass in which the greatest reduction is effected.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

JULIUS KALLE. [L. S.]

Witnesses:

OTTO KÖNIG,

CHAS. J. WRIGHT.