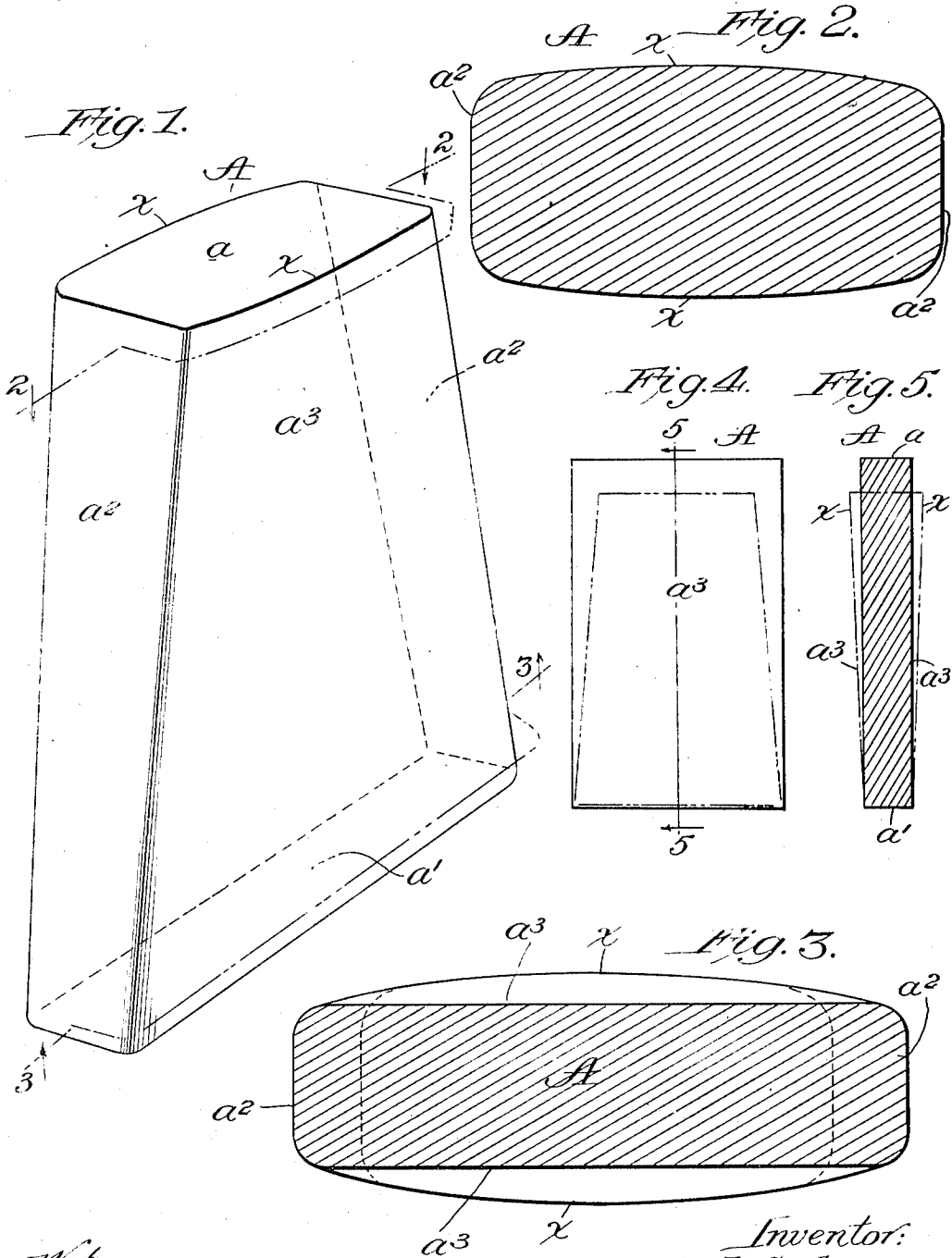


E. GATHMANN.
INGOT.

APPLICATION FILED FEB. 15, 1913.

Patented May 13, 1913.

1,061,467.



Witnesses:
E. J. Gathmann
E. B. Franzoni.

Inventor:
Emil Gathmann
By his Attorneys:
Baldwin Wright

UNITED STATES PATENT OFFICE.

EMIL GATHMANN, OF BALTIMORE, MARYLAND.

INGOT.

1,061,467.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed February 15, 1913. Serial No. 748,562.

To all whom it may concern:

Be it known that I, EMIL GATHMANN, a citizen of the United States, residing in Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Ingots, of which the following is a specification.

This invention relates to the manufacture of ingots and particularly to the manufacture of cast steel ingots of the kind known as "slab" or "plate", i. e., ingots suitable for being rolled into slabs or plates. Such ingots should be of such shape that when rolled to the desired length and thickness the width of the plate shall be uniform throughout its length. To do this, it is necessary that there should be as much metal at the upper end of the ingot as at the lower end, or, in other words, that the cross-sectional area of the ingot throughout its length should be uniform. Heretofore it has not been possible to produce such ingots free from pipe, and the object of my invention is to give to the ingot such a shape that it may have the characteristics above mentioned and may also be of such form that when cooling the pipe may be forced upwardly and practically eliminated at the upper end of the ingot.

The advantages of the "big end up" ingot are now generally understood. In such ingots the pipe is materially reduced but so far as I am aware no sound "big end up" ingot or one free from pipe has heretofore been produced which is suitable for being rolled into slabs or plates of uniform width. I have found that the desirable features of the "big end up" ingot may be obtained in an ingot which may be rolled in the ordinary way into slabs or plates of substantially uniform width and of perfectly sound metal.

In carrying out my invention I give to the ingot a greater width but less thickness at the bottom than at the top and so proportion the dimensions that the area of the bottom and the top and the cross-sectional area throughout the ingot are approximately uniform. This is done by tapering the ingot downwardly and outwardly on some of its sides and downwardly and inwardly on other sides in such manner as to preserve the uniform dimensions of area at top and bottom and at each cross-section, as above explained. In this way when the ingot is freezing, the heat in the lower portion there-

of will pass radially outward through the relatively thin portion of the ingot more rapidly than it does in the upper portion thereof, hence the lower portion of the ingot is made to cool more rapidly than the upper portion and thus the pipe is caused to disappear at the top of the ingot or is confined to an exceedingly small crop end at the top. Inasmuch as the ingot tapers in the manner before described and its thickness gradually increases toward the top, the cooling operation is progressive.

In order to insure the uniform width of the finished slab or plate, I provide the ingot with crowned or convex portions on its wider faces and in its upper portion, which are of such nature that in rolling the flow of metal will at first be largely in a sidewise direction instead of altogether longitudinally. In this way by the time the ingot has been rolled to the thinner dimension of the bottom thereof, the upper or thicker portion will have flattened out sidewise approximately to the same width as the lower portion of the ingot. Even with these crowned or convex portions, the ingot is of approximately the same cross-sectional area at top and bottom and throughout its length.

In the accompanying drawings, Figure 1 is a perspective view of an ingot embodying my improvements. Fig. 2 shows a transverse section on the line 2—2 of Fig. 1. Fig. 3 shows a transverse section on the line 3—3 of Fig. 1. Fig. 4 is a diagrammatic plan view showing how the ingot is spread laterally as well as lengthened during the process of rolling. Fig. 5 shows a section on the line 5—5 of Fig. 4.

The ingot A is relatively narrow and thick at its top a and relatively wide and thin at its bottom a' . The opposite sides a^2 are inclined or tapered from the top of the ingot downwardly and outwardly, while the opposite sides a^3 are tapered downwardly and inwardly to the ingot bottom. The four sides are so tapered or inclined that the area at the top of the ingot is approximately the same as the area at the bottom thereof and in such manner that the cross-sectional area throughout the ingot is uniform. Thus if the dimensions at the top of the ingot are eight inches by eight inches the area would be sixty-four inches, and if the dimensions at the bottom were four inches by sixteen inches, the area

would be sixty-four inches the same as at the top and the same proportions are preserved throughout the ingot, the cross-sectional area being sixty-four inches wherever taken. Of course these figures are merely illustrative and may be varied within wide limits. In this way when the ingot is rolled the thicker portion thereof will be flattened out to substantially the same thickness and same width as the thinner and wider portion. I have found, however, that in the rolling operation there is a tendency for the metal to flow mainly in a longitudinal direction and to prevent the ingot from being spread sidewise sufficiently to obtain the desired width. In order to overcome this, I give to the wider faces of the ingot in its upper portion a crown or convex contour α which is such that when the ingot is rolled, the crowned or convex part thereof is pressed into the body of the ingot and spreads the metal sidewise, as indicated diagrammatically in Figs. 4 and 5. This is sufficient to overcome the tendency of the metal to be drawn longitudinally forward too rapidly and enables me to first roll the upper portion of the ingot down to the thickness of the lower portion thereof and produce a uniform width throughout, the ingot then being rolled in the usual way to the desired thickness. These convex or crowned portions are thickest at the top of the ingot and gradually merge into the lower portion thereof as indicated in Fig. 5.

It will thus be seen that according to my invention I am not only able to procure an ingot of suitable shape for being rolled into plates or slabs of uniform width but I am

enabled to so mold or cast such an ingot as to render it perfectly sound at all points.

I claim as my invention:

1. An ingot having some of its sides inclined or tapered downwardly and outwardly from its upper end and others inclined downwardly and inwardly from its upper end.
2. An ingot having approximately uniform cross-section throughout its length and which has some of its sides inclined or tapered from its upper portion downwardly and inwardly toward the bottom of the ingot and other intermediate sides tapered or inclined from its upper portion downwardly and outwardly toward the bottom.
3. An ingot, the upper portion of which is narrower and thicker than its lower portion and in which some of its sides are tapered or inclined downwardly and outwardly from top to bottom and other intermediate sides tapered or inclined downwardly and inwardly in such manner as to insure a uniform cross-sectional area throughout.
4. An ingot having some of its sides inclined or tapered downwardly and outwardly from its upper end and others inclined downwardly and inwardly from its upper end and which has on the upper portion of one of its sides a crowned enlargement, for the purpose specified.

In testimony whereof, I have hereunto subscribed my name.

EMIL GATHMANN.

Witnesses:

JOSHUA S. HULL,
ALEX. C. GROOME.