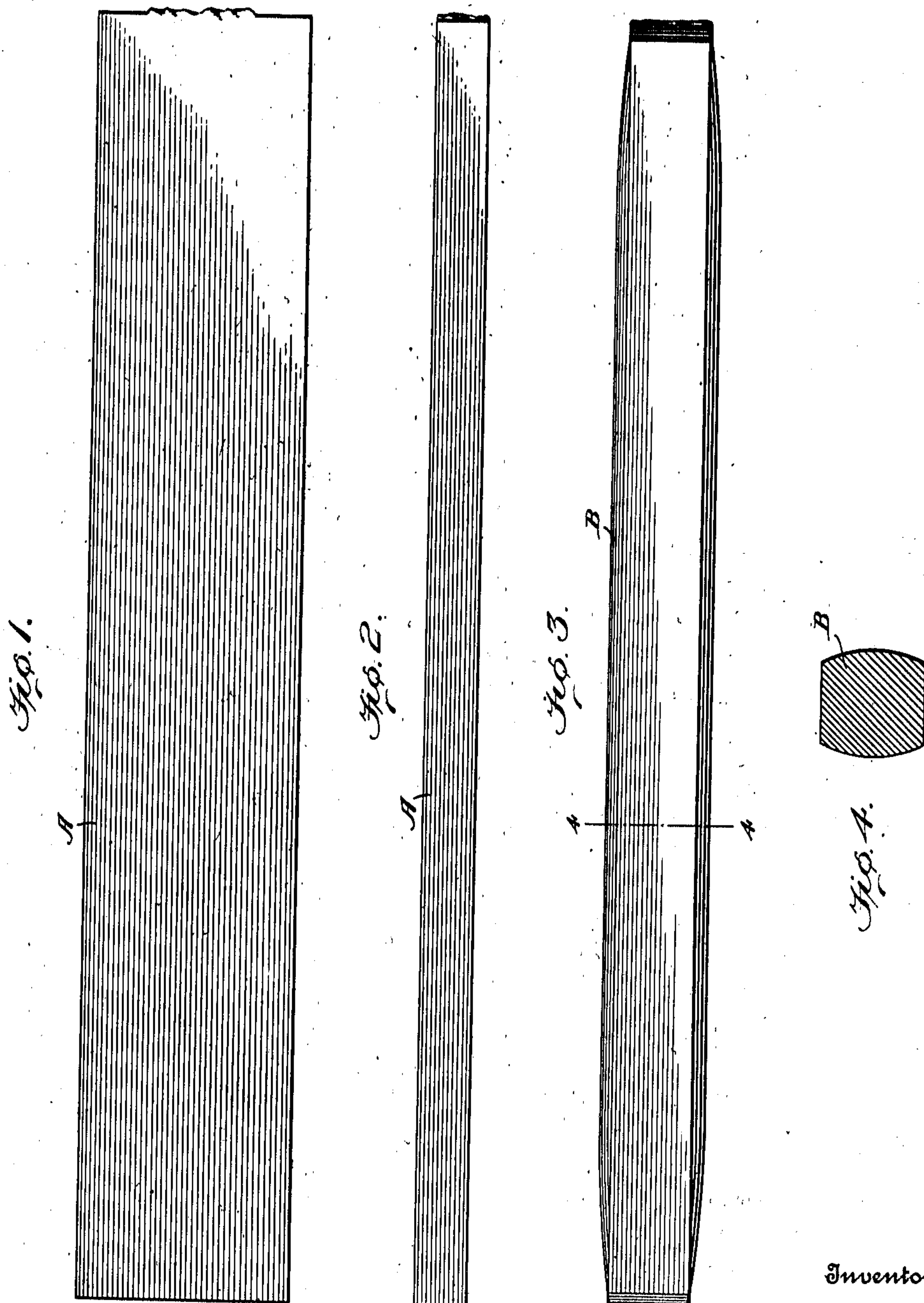


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METHOD OF MANUFACTURING CAST STEEL BILLETS AND COMMERCIAL BLANKS.  
APPLICATION FILED SEPT. 8, 1910.

993,698.

Patented May 30, 1911.



Witnesses

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# UNITED STATES PATENT OFFICE.

WILLIAM McCONWAY, OF PITTSBURG, PENNSYLVANIA.

METHOD OF MANUFACTURING CAST-STEEL BILLETS AND COMMERCIAL BLANKS.

993,698.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed September 8, 1910. Serial No. 580,957.

*To all whom it may concern:*

Be it known that I, WILLIAM McCONWAY, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Methods of Manufacturing Cast-Steel Billets and Commercial Blanks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a method of making cast steel billets or commercial blanks, and has for its several objects, the securing of a cast steel billet or blank sound and of uniform quality throughout the mass, and the avoidance of the loss incident to piping.

Heretofore in the production of cast steel billets and commercial shapes, it has been the practice to cast the ingot in iron molds of such form and cross section as will give the required dimensions in the billet or blank after the defective part, incident to piping, has been removed and the reduction of the cross section and elongation incident to the plastic working of the ingot has taken place.

Where the billet is to be a multiple of the commercial blank desired and the billet is to be sliced to produce the blank units, it is evident that the cross section of the ingot is proportionately greater than is required for a single blank. Where, as in the present practice, the dimensions of the casting are such as to retard the setting or congealing of the molten metal, at the center of the mass, what is known as "piping" occurs in the ingot, most markedly at the upper end thereof, which renders portions of the ingot defective and causes a consequent loss. What is known in the art as "piping" is a defect due to the unequal setting or congealing of the molten metal throughout the mass whereby there is a shrinking at the center of the ingot, and this unequal setting of the molten mass also results in a segregation of the steel elements and a lack of uniformity in quality throughout the mass of the ingot, carbon and other elements of the steel appearing in differing proportions in the last part of the ingot to cool than in those portions where the metal has set quickly.

In carrying out my invention the first step

thereof involves the formation of an ingot having the metal required in the billet or blank so disposed in the ingot that at least one of the dimensions (the thickness) of the ingot shall be such as will secure the quick "setting" or congelation of the molten steel throughout the mass; or, as otherwise expressed, the radiating surface of the casting is so proportioned to the thickness and total weight of the molten mass that no portion of the mass remains fluid long enough to be drawn to another portion of the mass as would occur if one part solidified materially earlier than another, whereby segregation of the steel elements of the molten mass is prevented, and "piping" of the ingot is avoided with the loss attendant thereon, and an ingot of uniform quality throughout is obtained. This diminution in one of the dimensions of the ingot, for sake of brevity, I term an "attenuated section."

The second step to be followed in carrying out my invention involves the subjection of the ingot having an attenuated section to a pressure which simultaneously reduces its width and increases its thickness without materially affecting its length.

My method of making cast-steel billets and commercial shapes or blanks, may, therefore, be generally stated as comprising the formation of an ingot having an "attenuated section", and subsequently transforming the same into a billet or blank of the required cross-section by a pressure which decreases one and increases another dimension of the ingot without materially affecting the third.

It will be evident that the form of the ingot for the production of any special commercial blank will be measurably controlled by the proportions of the ultimate billet or commercial form of the blank to be produced, so that no definite proportions for all ingots can be herein stated. It will, however, be sufficient for those skilled in the art to state that in all cases the "attenuated section" calls for such dimensions as will permit the entire molten mass to "set" quickly in the mold and leave no interior portion of the mass in a molten condition which will segregate and shrink as it slowly cools.

For the purpose of illustration but not as matter of limitation, I have selected a steel billet having the dimensions of four by four inches and four feet long, as one specific ap-



plication of the principle involved in my invention.

In the drawings illustrating one form of the cast steel billet to be produced, Figure 1 is a plan view of a cast steel "attenuated section" ingot for the formation of a billet. Fig. 2 is an edge view of the ingot shown in Fig. 1. Fig. 3 is a plan view of the billet formed from the ingot shown in Figs. 1 and 2; and Fig. 4 is a transverse section of the billet shown in Fig. 3 on the line 4—4, Fig. 3.

Like symbols refer to like parts wherever they occur.

In the drawings, A indicates a cast steel ingot the length of which will correspond with the length of the billet to be produced, as the transformation by pressure does not materially lengthen the ingot, the metal therein being displaced transversely of the mass in both directions, thus leaving the blank in a desirable form for subsequent working by either rolls or a hammer. In the present instance, it is assumed that the cross section of the billet is to be four by four inches, consequently the ingot may be of plate form having a width of eight inches and a thickness of two inches, the two inches constituting such an "attenuated section" as will permit the simultaneous and quick setting or congealing of the molten mass throughout the ingot. This ingot (or plate) A is then properly heated and placed on edge in a suitable press, preferably a hydrostatic press, and subjected to such pressure as will diminish the eight inch width of the ingot (or plate) A to four inches and increase the two inch thickness of the plate to four inches, thus producing a billet B 4"x4" in cross section, and 4' long, of sound, uniform quality throughout, and de-

void of "pipe", ready for subsequent working by either roll or hammer. Sinking heads or risers may or may not be used in casting the ingot A, and this will be measurably determined by the dimensions of the ingot, as it is well understood by foundry men that in case of large castings the use of sinking heads to compensate for shrinkage results in better and more solid castings. As an illustration of such well known use of risers or sinking heads reference is made herein to U. S. Patent No. 343,872, to John Walker, dated June 15, 1886. It is to be understood, however, that the use of risers or sinking heads is not an essential, or in fact any part, of this invention, but only a recommended practice where the size of the casting is such as to dictate the same as good foundry practice.

By the method hereinbefore described the production of a cast steel billet or commercial blank is not only perfected and simplified, but the cost of production is reduced.

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

The method of making cast steel billets and commercial blanks, which consists in casting an ingot having an attenuated section that permits the simultaneous setting of the molten metal throughout the mass, and subsequently transforming the ingot by pressure which diminishes one and increases another dimension of the ingot.

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

WILLIAM McCONWAY.

Witnesses:

J. W. HARTLEY,  
F. D. ECKER.