No. 709,080. Patented Sept. 16, 1902.

W. A. DUNN.

PROCESS OF SHAPING METAL I-BEAMS, CHANNEL BEAMS, &c.

(Application filed Jan. 3, 1902.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1

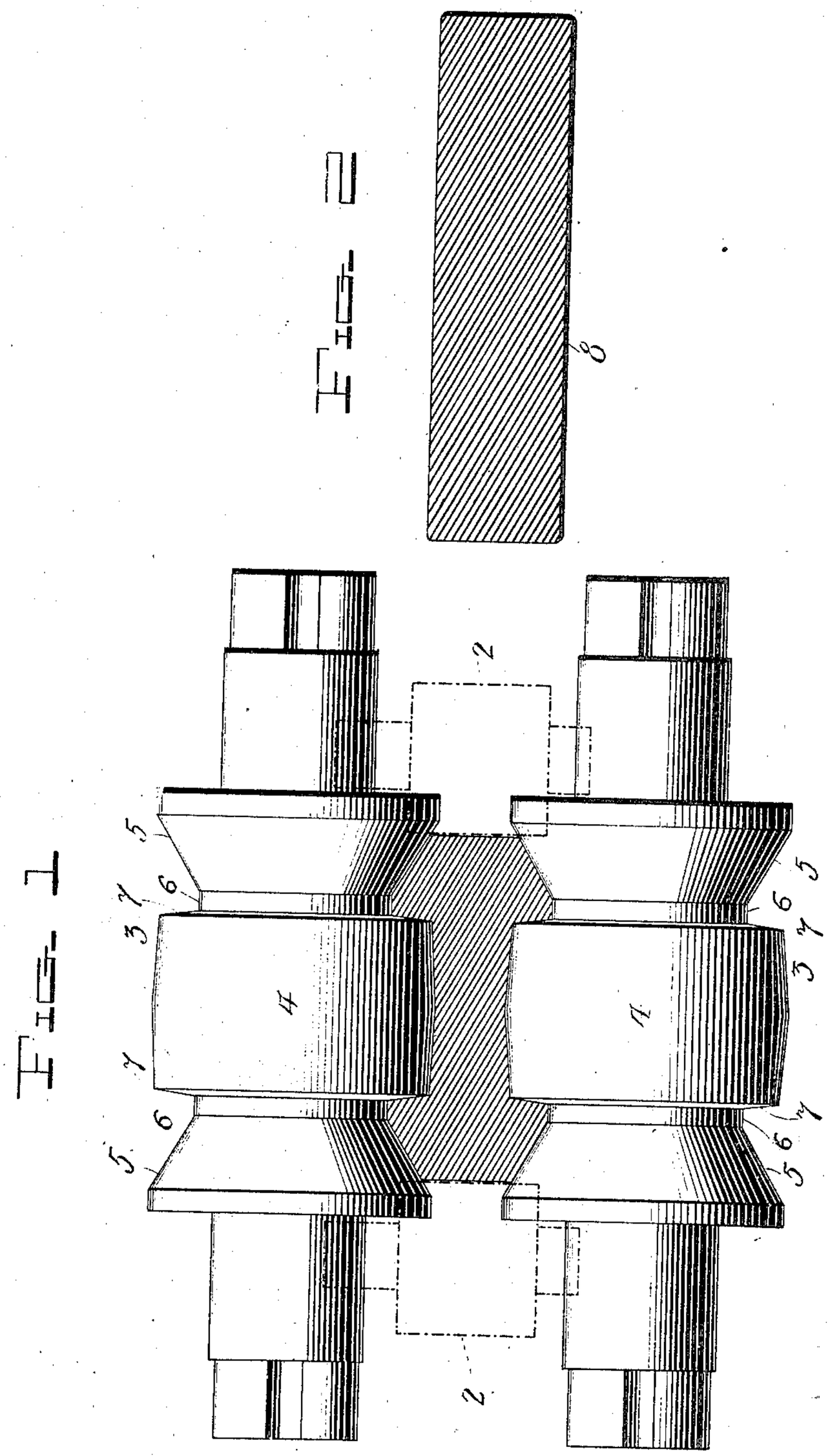

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FIG. 4

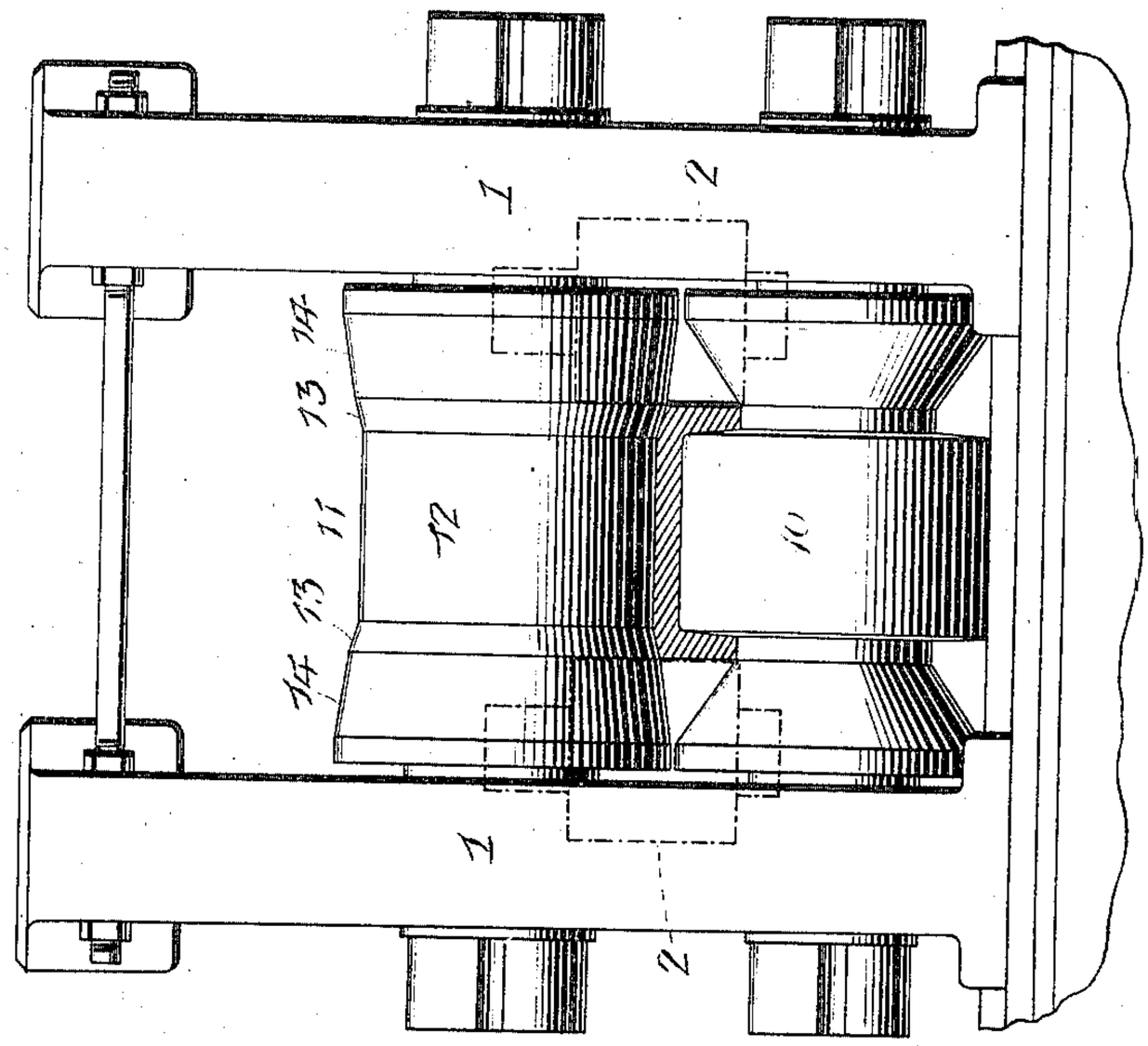
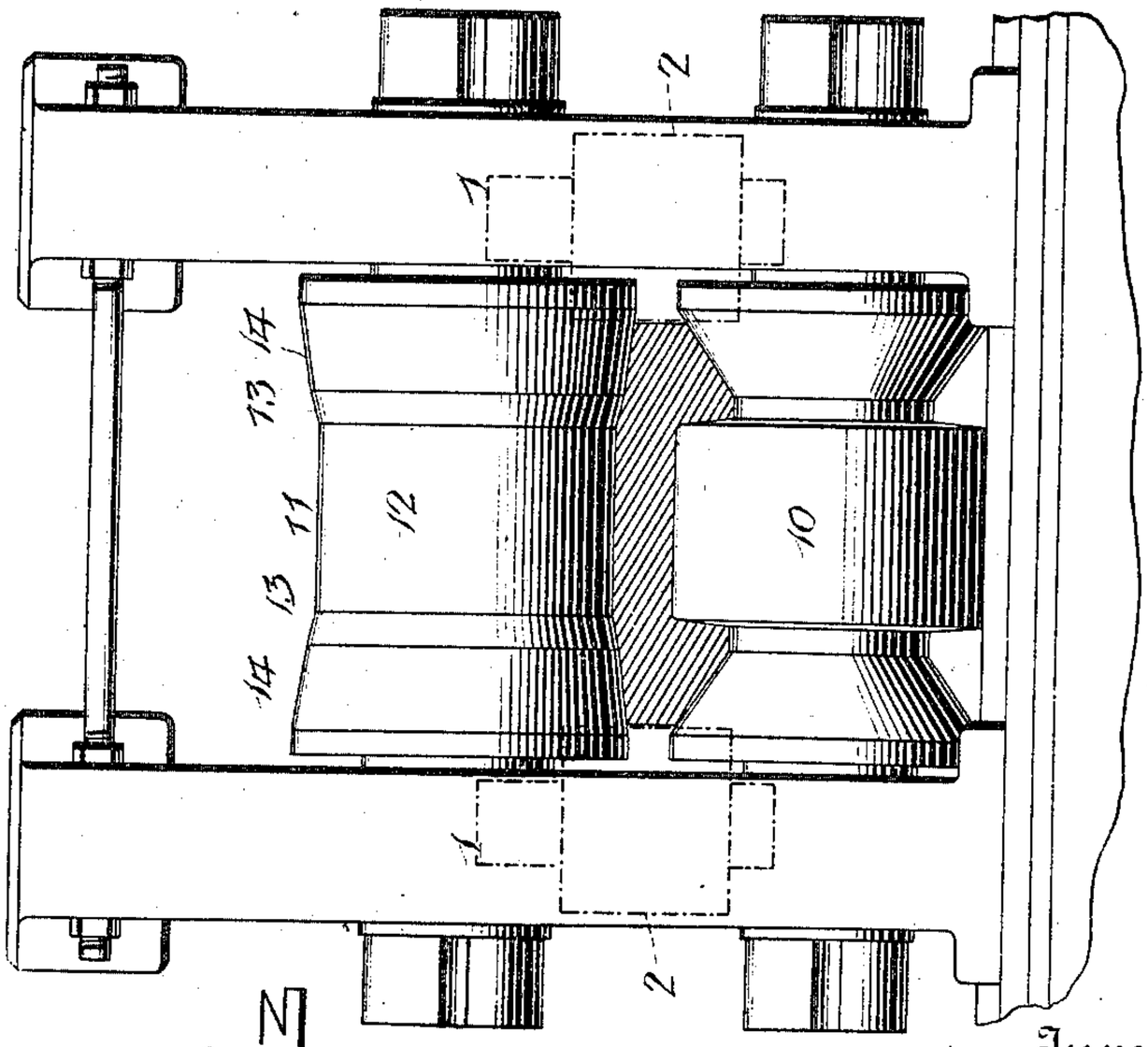


FIG. 5



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PROCESS OF SHAPING METAL I-BEAMS, CHANNEL-BEAMS, &c.

SPECIFICATION forming part of Letters Patent No. 709,080, dated September 16, 1902.

Application filed January 3, 1902. Serial No. 88,301. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ABERCROMBIE DUNN, a citizen of the United States, residing at Smithville, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Processes of Shaping Metal I-Beams, Channel-Beams, &c.; 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.

This invention, which relates to the art of metal-rolling, contemplates an improved process for the manufacture of rolled-metal I-beams, channel-beams, and the like, which process is capable of being carried out by an apparatus or machine of comparatively simple construction and in the performance of which there is effected a very great saving of time and labor and of wear and tear of the machine, with the consequent large reduction in the operating expenses and an increased capacity.

The product which is the result of my improved process is unobtainable by existing processes, so far as I am aware. At present in the manufacture by the rolling process of I-beams, for example, the maximum width of flange obtained does not exceed seven inches, although there has existed for many years a large demand for a beam of much greater width of flange, which has necessitated the furnishing of beams built up from plates and angle-bars riveted or otherwise secured together. Rolled beams of the type referred to are universally made from an ingot or slab of approximately rectangular form in cross-section, and in the processes at present employed the flanges are formed by a rolling pressure exerted against the top and bottom and ends of the ingot in vertical and horizontal directions. The rolls are provided with flange-grooves into which the metal is pressed; but by reason of the direction of pressure exerted it is impracticable to force the metal to such an extent as will form a flange exceeding seven inches in width. In the processes at present employed there is experienced the further difficulty of controlling the shape of the flange during the first passes of the blank through the rolls, which frequently results in an unequal distribution of the metal to form the flanges, producing an imperfect product of impaired strength.

My improved process is designed to overcome the various objections to and obstacles present in existing processes, and, moreover, to reduce the expense of operating and increase the capacity of roller-mills and at the same time to produce a very desirable product hitherto unobtainable by a roller process.

My improved process is set forth in detail in the following description, and in connection with such description attention is called to the accompanying drawings, illustrative of a means by which my process may be carried into effect.

In the drawings, Figure 1 is an elevation of a set of shaping-rolls for forming I-beams by my process. Fig. 2 is an enlarged cross-sectional view of the ingot or slab I prefer to employ. Fig. 3 is an elevation of a shaping-mill, showing a set of rolls for forming channel-beams by my process. Fig. 4 is a view similar to Fig. 3, showing the shape of the metal after repeated passes. Fig. 5 is an enlarged sectional view of the ingot or slab I prefer to employ in making channel-beams.

Referring to the drawings by numerals, 1 designates the frame of the machine, in which is mounted a pair of horizontal shaping-rolls and in advance thereof either a single or a double pair of vertical rolls 2 2. In Fig. 1, which illustrates a machine adapted to shape an ingot or slab for I-beams, the horizontal rolls 3 are of similar form, being each provided with a central portion 4 the periphery or rolling-surface of which tapers slightly at each side of the center and with grooves flanking the central portion and each formed of an inclined wall 5, a narrow base 6, and a sharply-inclined opposite wall 7, extending to the surface of the central portion 4.

The ingot or slab which I prefer to employ is illustrated in cross-section in Fig. 2 and is designated by the numeral 8. In practice this ingot or slab is passed between the vertical rolls 2 2 and thence between the horizontal rolls 3 3, by which it is subjected to pressure exerted in a vertical direction by the portions 4 4 of the rolls and also to pressure

exerted in a direction at an angle to the vertical from each end toward the center of the blank by the inclined walls 5 5 of the grooves. The pressure exerted by the walls 5 5, which, as stated, is toward the center, forces the metal of the ingot or slab readily into the grooves of the rolls to fill them and to form the flanges of the beams, after which the metal is passed between the vertical rolls and by them subjected to pressure exerted in a horizontal or endwise direction to further augment the width of the flanges and reduce the height of the beam. It will be understood that the metal is repeatedly passed between the vertical rolls and the horizontal rolls alternately and that each pass is preceded by an adjustment of the rolls to reduce it cross-sectionally to the proper size and shape. It will be noted that the metal in passing between the vertical and horizontal rolls is subjected not only to pressures exerted in vertical and horizontal directions, but also to a pressure exerted at the four edges of the metal in a direction at an angle to the vertical and toward the center of the metal. This last-stated pressure greatly facilitates the formation of the flanges, reducing the number of passes of the metal from approximately twenty-eight under the present practiced processes to approximately nine, or, in other words, reducing such number two-thirds. Aside from the fact that owing to this large reduction in the number of passes a great saving in the operating expenses results and the capacity is largely increased my improved process enables the formation of a beam having a width of flange largely in excess of that heretofore obtainable, this being due to the readiness with which the metal enters the flange-grooves when acted upon by the pressures exerted against it. Again, in practicing my process the shaping of the metal is at all times under complete control throughout the entire body. This feature is important when it is considered that in the finished product the flanges must be uniform in size and strength and that to produce a perfect beam the distribution of the metal to form the flanges must be equal. In the present practiced processes the shaping of the entire body of metal is not at all times under control, and the result is, as above stated, an imperfect and weak product.

My process may, as illustrated in Figs. 3 and 4, be employed with equal advantage in the manufacture of channel-beams. For this purpose I prefer to employ the special form of ingot or slab illustrated in Fig. 5 and designated by the numeral 9. The lower roll 10 of the machine may be substantially similar to the rolls 4 employed in the shaping of I-beams, but the companion roll 11 is of different form, being provided with a central cylindrical portion 12, flanking beveled portions 13 13, and outer portions 14 14 of slightly less bevel than the intermediate portions 13 13. The operation of the rolls 10 12 is similar to that of the I-beam rolls before described. Aided by the vertical rolls 2 2 the metal is pressed by a comparatively few number of passes to the form shown in Fig. 4, from which, as will be understood, it is conveyed to intermediate and finishing rolls for the desired reduction in cross-sectional area and the proper form for the final product.

My process while designed more particularly for the manufacture of beams having comparatively wide flanges is also adapted for the making of standard sizes of beams. When employed for this last-named purpose, a great saving in the cost of production is effected, owing to the rapidity with which the flanges are formed and to the consequent reduction in the number of passes required.

I claim as my invention—

The herein-described process of making flanged beams from metal ingots or slabs, which consists in subjecting the ingot or slab intermediate of its sides to roller-pressures exerted in a vertical direction, subjecting the sides of the ingot or slab to pressures exerted in a horizontal direction, and simultaneously with the vertical pressures applying roller-pressures to the side edges of the ingot or slab in an inward direction and at an abrupt angle to the horizontal.

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

WILLIAM ABERCROMBIE DUNN.

Witnesses:
W. I. NORTON,
F. L. BROWNE.