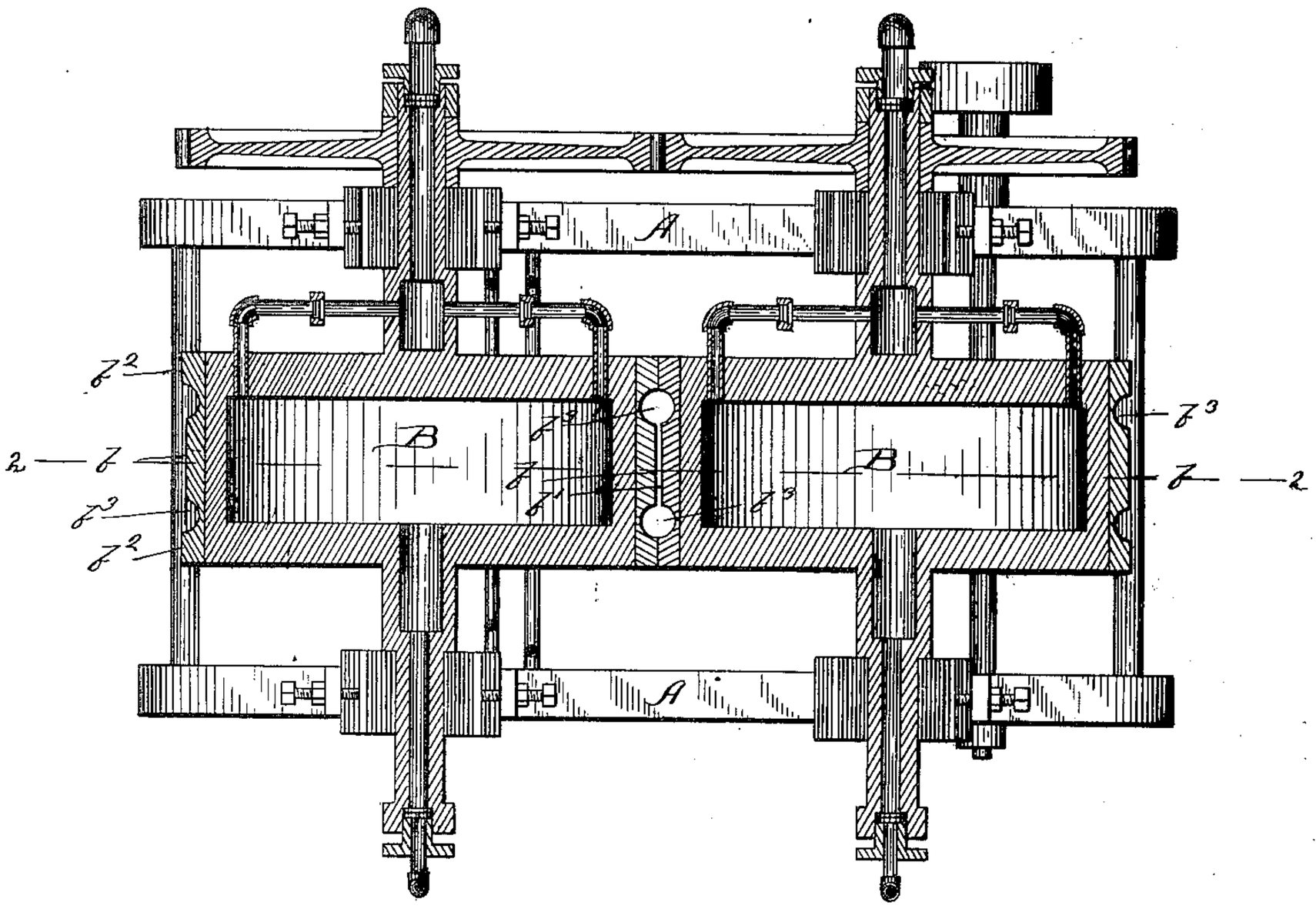
(No Model.) 2 Sheets—Sheet 1.

E. NORTON & J. G. HODGSON.

APPARATUS FOR MAKING SHEET METAL.

No. 406,945. Patented July 16, 1889.

Fig. 1.



Witnesses:
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Edwin Norton
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By Munday Evarts and Adcock
their Attorneys.

(No Model.) 2 Sheets—Sheet 2.

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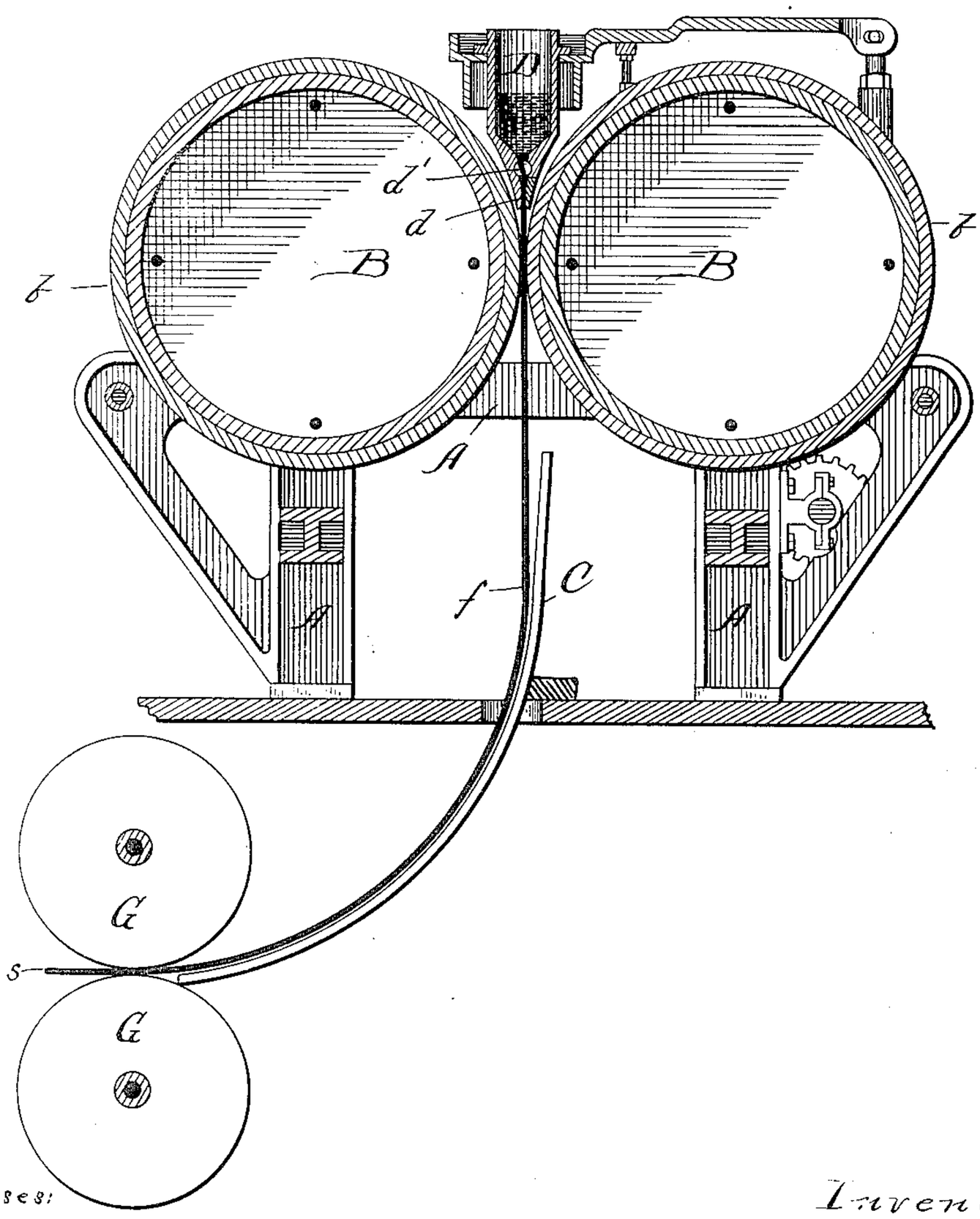
Fig. 2



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UNITED STATES PATENT OFFICE.

EDWIN NORTON AND JOHN G. HODGSON, OF MAYWOOD, ASSIGNORS TO SAID NORTON, AND OLIVER W. NORTON, OF CHICAGO, ILLINOIS.

APPARATUS FOR MAKING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 406,945, dated July 16, 1889.

Application filed April 6, 1889. Serial No. 306,206. (No model.)

To all whom it may concern:

Be it known that we, EDWIN NORTON and JOHN G. HODGSON, citizens of the United States, residing in Maywood, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Apparatus for Making Sheet Metal, of which the following is a specification.

Our invention relates to improvements in apparatus for making sheet metal, and more particularly to improvements upon the apparatus heretofore patented by us in Letters Patent No. 382,319, dated May 8, 1888.

The object of our present improvement is to provide means for governing the space between the revolving rolls by which the stream of molten metal is converted into sheet metal, so that the sheet metal produced may be made of uniform thickness throughout and not be subject to the variations due to the expansion or contraction of the metal rolls, the springing of the frame-work, or other causes. The means which we employ to accomplish this result consists in providing each of the metal rolls with a pair of collars or peripheral faces which bear against like collars on the opposite roll, so that the working-faces of the two rolls cannot crowd closer together when the rolls expand by the heat. Between the rolling faces or collars and the working-faces of the rolls we also provide peripheral grooves or recesses to make room for excess of metal due to any variation in the rate at which the molten metal is poured between the rolls. The working-faces of the rolls in our present improvement, as in our previous patent, No. 382,319, are made wider than the strip of sheet metal desired to be produced, so that any variation in the rate of pouring the molten metal may be compensated for by variations in the width of the strip of sheet metal produced. The annular grooves between the working-faces and the rolling-faces of the rolls also give additional room or space to receive any excess of metal in case there should be any great variation in the rate of pouring.

Another feature of our improvement consists in combining with the chilling-rolls and pouring-nozzle a pair of finishing-rolls and a guide chute or passage extending from the chilling-rolls to the finishing-rolls, so that the sheet or strip of metal produced may be turned into a horizontal direction as it issues from the chilling-rolls. This second pair of rolls also serves to finish or further roll the sheet as it is produced while it is still at a comparatively high temperature.

In the accompanying drawings, which form a part of the specification, Figure 1 is a plan view of a device or apparatus embodying our invention, and Fig. 2 is a central vertical section of the same on the line 2 2 of Fig. 1.

In the drawings, A represents the frame of the machine. B B are the hollow chilling-rolls, having the smooth working peripheral faces *b*, which revolve together, with a space between the rolls equal to the thickness of the sheet metal to be produced. D is the pouring bowl or vessel, having an opening *d*, through which the stream of molten metal issues directly downward between the two hollow rolls B B and in a direction tangential to both. This pouring-bowl is furnished with a valve *d'* for opening and closing the discharge-orifice *d*. The general construction of the hollow rolls, the pouring nozzle or bowl, the mechanism for revolving or driving the rolls, the means for causing the water to circulate through the hollow rolls, and other parts of the machine are or may be the same as that shown and described in our previous patent, before referred to; and as our present improvement does not particularly relate to these features we do not deem it necessary to show or describe the same in detail, but would refer to our previous patent for a more complete description of such parts.

The hollow rolls B B are provided on each side of the working-faces *b* of the rolls with rolling faces or collars or stops b^2, which roll together and thus limit the extent to which the working-faces *b* may approach each other and the size of the space or passage *b'* between such working-faces of the rolls. Between the stop collars or faces b^2 of the rolls and the working-faces *b* we also provide each of the rolls with grooves b^3, which grooves may receive any excess of metal that may issue from the pouring-nozzle.

C is a curved guide for deflecting or de-

livering the sheet-metal strips *f* to the horizontally-arranged rolls G G. The rolls G G may be revolved in any suitable manner; but they are preferably geared with the rolls B B, for convenience in driving them at the same surface speed. The rolls G G, which receive the sheet-metal strip in a horizontal position, also serve, or may serve, to further roll or finish the sheet. The curved guide C is especially serviceable for guiding or directing the end of the sheet-metal strip between the rolls G G when the operation begins. After the end of the strip, as indicated at *s* in the drawings, is started between the rolls G G it will naturally bend or curve by its own weight, and the curved guide C is not at this part of the operation so necessary. The rolls B B, as well as the rolls G G, are also to be revolved at a surface speed equal to or greater than the velocity of the stream of molten metal issuing from the pouring-vessel D. The curved guide C also serves to give a little slack between the chilling-rolls B and the polishing-rolls G, to compensate for any momentary difference of speed or slipping of the rolls.

We claim—

1. The combination of two revolving chilling-rolls B B with a pouring-vessel above and between them, said rolls B B having working-faces *b b* and rolling faces or collars b^2 b^2, serving as stops to regulate the space between the working-faces of the rolls, substantially as specified.

2. The combination, with a pair of revolving chilling-rolls, of a pouring-nozzle arranged above and between them, said rolls having working-faces and rolling-faces outside of the working-faces, and grooves or recesses between the rolling-faces and the working-faces, substantially as specified.

3. The combination, with a pair of revolving chilling-rolls, of a pouring-vessel arranged above and between them, and a second pair of rolls G G, substantially as specified.

4. The combination, with a pair of chilling-rolls and pouring-vessel arranged above and between them, of a curved guide for deflecting the sheet-metal strip from the vertical to a horizontal direction, and a second pair of rolls G G, to which the strip is delivered by said guide, substantially as specified.

5. The apparatus for producing sheet metal in a continuous strip as it is poured from a vessel, consisting in a pair of chilling-rolls, between which the molten metal is poured and by which it is set, in combination with a pair of finishing-rolls to further roll the metal while it is still hot, substantially as specified.

6. The combination, with a pouring-vessel and chilling-rolls, of finishing-rolls, substantially as specified.

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