

(No Model.)

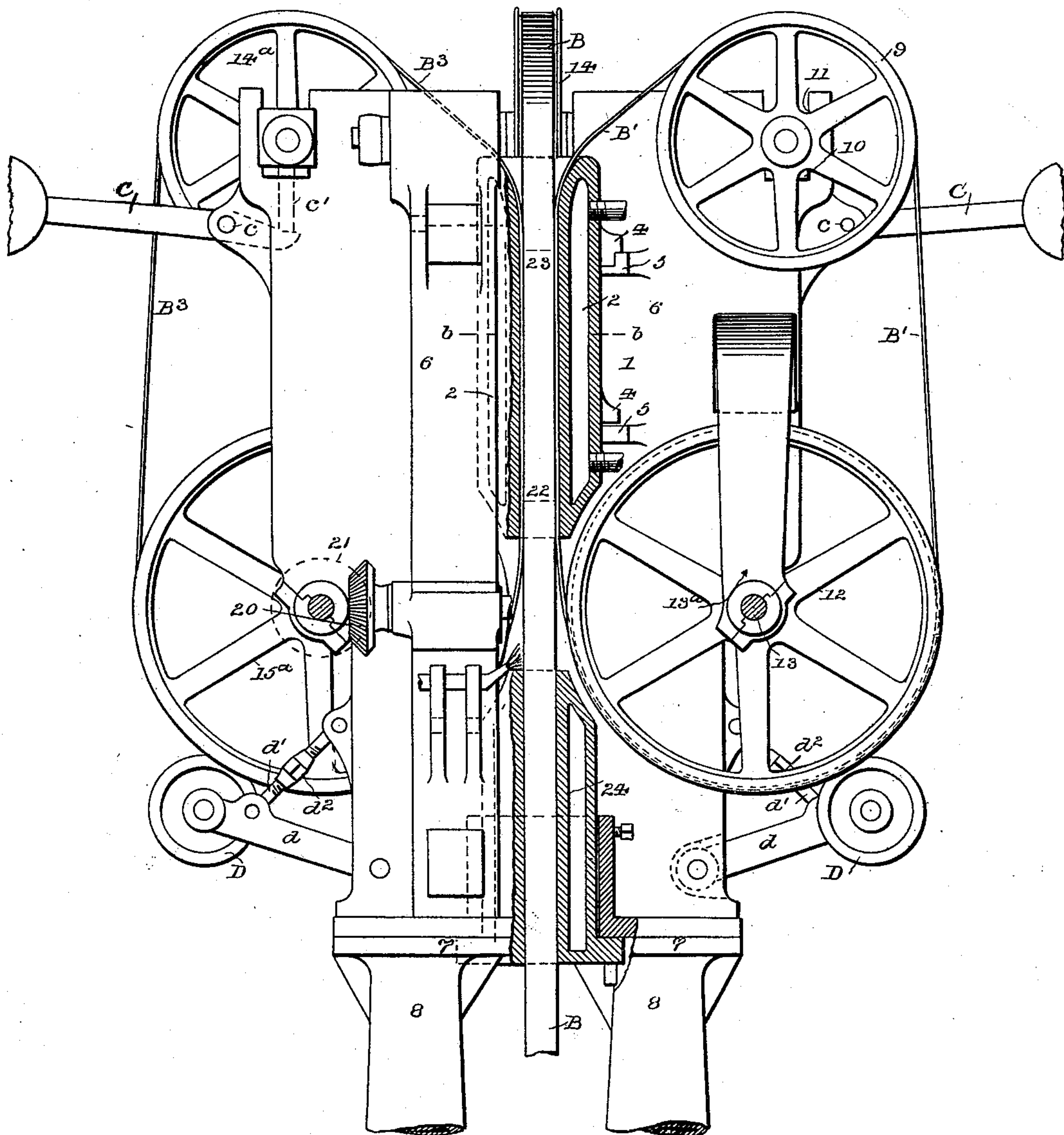
2 Sheets—Sheet 1.

F. W. WOOD.  
CASTING APPARATUS.

No. 594,583.

Patented Nov. 30, 1897.

*Fig. 1.*  
*On-line-a-a*



WITNESSES:

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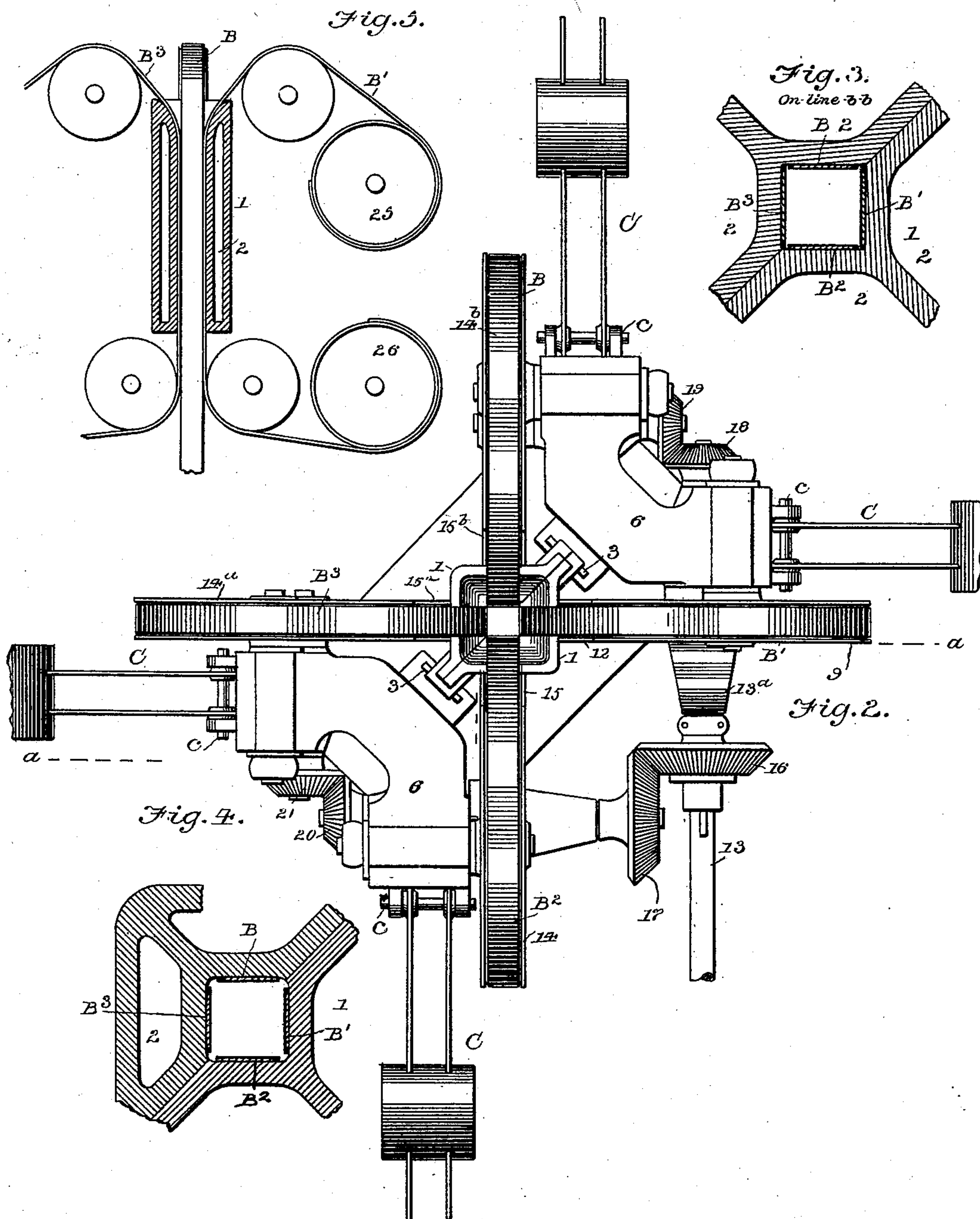
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# UNITED STATES PATENT OFFICE.

FREDERICK W. WOOD, OF BALTIMORE, MARYLAND.

## CASTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 594,583, dated November 30, 1897.

Application filed February 15, 1897. Serial No. 623,502. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK W. WOOD, of Baltimore, State of Maryland, have invented a new and useful Improvement in Casting Apparatus, of which the following is a specification.

This invention has reference to the casting of metals, and relates more particularly to an apparatus for casting ingots in a continuous length or bar, the object being to avoid the imperfect casting usually produced in stationary molds, wherein the shrinkage and sinking of the metal on cooling produce hollows and other defects in the ingot.

With this end in view my invention consists in combining with a stationary mold containing an opening therethrough from end to end a movable lining to receive the molten metal and means for controlling the movement of said lining to discharge the casting from one end of the mold as the molten metal is continuously introduced into its other end.

The invention also consists in the details of construction and combination of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional elevation through my improved apparatus on the line *a a* of Fig. 2. Fig. 2 is a top plan view of the same. Fig. 3 is a horizontal section, on an enlarged scale, through the mold and its lining on the line *b b* of Fig. 1. Fig. 4 is a similar view with the parts in slightly-modified form. Fig. 5 is a sectional elevation of still another modification.

Referring to the drawings, my improved apparatus comprehends, mainly, a stationary mold 1, having an opening therethrough from end to end, and a movable lining in the form of thin steel polished bands B, B', B<sup>2</sup>, and B<sup>3</sup>, extending through the opening in the mold and jointly covering its interior surface. The mold is in the present instance formed with an opening square in cross-section, and is provided with chambers 2 for the circulation of a cooling medium, such as water, cold air, &c. It is in two sections, as shown in Fig. 3, to permit of the removal of the bands when necessary, and these sections are connected together firmly by bolts 3, as plainly shown in Fig. 2. The mold is sustained in a fixed vertical position by means of lugs 4 on its

opposite sides adapted to be seated on lugs 5, projecting inwardly from two standards 6, constituting a frame which gives support also to the operative parts of the apparatus hereinafter described. These two standards are of right-angular form in cross-section and are sustained on a bed-plate 7, with the apexes of the angles facing each other, the bed-plate being supported in turn by columns 8.

The four bands before alluded to constituting the lining of the mold, enter the top of the mold, at which point the interior faces of the mold are rounded or curved outward to facilitate the introduction of the molten metal between the bands, and the latter extend flatly over these rounded portions of the mold downward through the mold and outward at its lower end. The band B' passes over an upper guide-wheel 9, mounted in a bearing-block 10, which is in turn mounted to move to a limited extent vertically in guides 11, formed in the upper end of the standard 6 at one side. It also passes over a lower drive-wheel 12, fixed to a shaft 13, mounted in a hanger 13<sup>a</sup> and a bearing sustained by the standard below the guide-wheel. The other bands B<sup>2</sup>, B<sup>3</sup>, and B are similarly guided and driven by guide-wheels 14, 14<sup>a</sup>, and 14<sup>b</sup> and lower drive-wheels 15, 15<sup>a</sup>, and 15<sup>b</sup>, which wheels are mounted in bearings similar in form and arrangement to those just described.

From the foregoing description it will be seen that the four bands are arranged opposite each other in pairs and completely cover the four interior faces of the mold, passing into the upper end of the mold from the four guide-wheels, vertically downward through the same, and from its lower end over the drive-wheels. Motion is imparted to the drive-wheel 12 from any suitable source through its shaft 13, which is extended at one side, as shown in Fig. 2, to receive the power. From this shaft motion is imparted to drive-wheel 15 by means of a bevel-gear 16, fixed to said shaft and engaging a bevel-gear 17, fixed to the shaft of wheel 15. Drive-wheel 15<sup>b</sup> is driven by a bevel-gear 18, fixed to shaft 13, meshing with a bevel-gear 19, fixed to the shaft of drive-wheel 15<sup>b</sup>. Drive-wheel 15<sup>a</sup> is driven by means of a bevel-gear 20, fixed to the shaft of drive-wheel 15, which gear meshes with a bevel-gear 21, fixed to the shaft of drive-



wheel 15<sup>a</sup>. From this arrangement of gearing the rotation of the shaft 13 in the proper direction will cause all the drive-wheels to turn in the same direction, drawing the four bands  
5 downward through the mold from over the guide-wheels.

In the operation of casting by my improved apparatus I proceed as follows: The bands having been previously coated with graphite,  
10 soot, or other suitable material to facilitate the separation of the ingot, the space between these bands at a point within the mold near its lower end is closed by means of a plug of iron, asbestos, or other suitable material, as  
15 indicated by dotted lines at 22, Fig. 1. Molten metal is then poured in at the top of the mold between the bands in a continuous stream, and when the metal rises in the mold to about the point indicated by dotted lines  
20 at 23 the drive-wheels carrying the bands are set in motion and the bands slowly move downward through the mold, their speed being so regulated that the tendency of the metal to rise will be counteracted by the downward  
25 movement of the body of metal, thereby maintaining the level of the metal at practically the same point within the mold. Water or other cooling medium being circulated through the chambers in the mold, the outer  
30 portion of the molten metal will instantly cool and harden. By the time a given portion of the ingot has reached the lower end of the stationary mold its walls will have become thick enough to withstand the pressure of the  
35 molten metal above and the casting will issue from the bands at the lower end of the mold as a continuous bar free from hollows, holes, or other imperfections. The casting or ingot may be further sprayed to cool it as it leaves  
40 the bands, or it may be passed through a second hollow mold or casing 24 and there subjected to the action of a cooling medium circulated through this casing. At any suitable point beyond the mold the casting as it issues  
45 therefrom may be severed into lengths for the market.

The casting produced in the manner described will be free from the usual shrinkage-cavities so common in ingots cast in a stationary mold, the weight of the overlying  
50 body of soft metal in my apparatus as it is introduced into the mold being exerted vertically on account of the vertical position of the mold, insuring a solid and homogeneous casting.

It will be observed that in my apparatus the metal is wholly surrounded by the bands, and they being thin the heat is rapidly withdrawn by the cold surrounding fixed mold,  
60 the result being a rapid cooling and hardening of the casting.

While I have described and illustrated a mechanism embodying my invention in a practical form and one which I prefer to  
65 adopt, it will be understood that the invention is not limited to this particular form. For instance, the fixed mold may be of other

forms in a cross-section, as triangular, or, as shown in Fig. 4, the corners of the mold may be rounded. In this case, while the bands  
70 will not meet at their edges, the limited uncovered space of the mold at its corners will not interfere to any material extent with the advance of the body of metal within the bands as the bands are moved through the mold.  
75 Further, it is not necessary that the bands be endless, for, as shown in Fig. 5, they could be connected at their ends to rollers 25 and 26 and adapted to be wound on the roll 26 from the roll 25.  
80

It is important that the bands be maintained under such tension that they will pass closely and flatly against the faces of the mold. I insure this result by means of weighted levers C, pivoted to the standards  
85 adjacent to the guide-wheels, as at c, and having their inner ends extending beneath depending extensions C' on the bearing-blocks of the guide-rollers. These levers will force the blocks upward in their guides with a  
90 yielding pressure and will hold the bands tightly against the sides of the mold.

In order that the bands may be held flatly against the drive-wheels to insure their movement by the wheels, I provide each wheel  
95 with a pressure-roller D, mounted on the end of an arm d, pivoted at its inner end to the standard. The contact of the roller with the band is maintained and controlled by a connecting-rod d', jointed to the arm and to the  
100 standard and having a turnbuckle or adjusting-nut d<sup>2</sup> to regulate the pressure of the roll.

By arranging the mold in a vertical position with the bands passing downward vertically through the opening therein, as in the apparatus described, peculiar advantages will result when employed for casting steel ingots in that there will be no liability of the ingot cracking, inasmuch as it passes in a  
105 straight line while between the bands, the latter moving with it and not relatively to it. This is of great importance when is considered the great care required in handling ingots at the "tender" stage of their formation.  
115 Unless handled with the greatest care the skin or wall of the ingot will crack. In my apparatus the casting is not subjected to any lateral strain or bending action, nor is there any relative movement of the mold and ingot, inasmuch as the lining of the mold follows the ingot in a straight line, the lateral separation of the bands from the ingot not being of such nature as to cause any injury to the same.  
120 125

Having thus described my invention, what I claim is—

1. The combination with a fixed mold or casing provided with a vertical opening there-  
130 through from end to end and with a chamber or chambers surrounding said opening, of thin metallic bands extending through the opening in the mold and flatly against its interior sides and jointly wholly covering the



same, means for moving the bands downward through the mold and means for circulating a cooling medium through the surrounding chamber.

5 2. The combination with a fixed mold or casing provided with a vertical opening there-  
through from end to end of rectangular form  
in cross-section and with a surrounding cham-  
ber or chambers, of four thin metallic bands  
10 extending downward through said opening  
and flatly over the four interior sides of the  
mold, means for moving said bands down-  
ward through the mold, and means for cir-  
culating a cooling medium through the sur-  
15 rounding chamber.

3. The combination with the fixed mold or  
casing provided with an opening therethrough  
from end to end, of the bands extending  
through said opening, and the rolls over  
20 which said bands pass, said rolls having their  
peripheral surfaces situated laterally beyond

the respective interior sides of the mold;  
whereby the rolls will have a tendency to  
maintain the close contact of the bands  
against the interior sides of the mold. 25

4. The combination with the fixed mold or  
casing provided with a vertical opening there-  
through from end to end forming flat interior  
faces rounded or curved outward at the up-  
per end of the mold, of the bands passing 30  
downward through the mold and closely over  
the flat interior surfaces thereof; whereby  
the introduction of the molten metal into the  
upper end of the mold between the bands is  
facilitated. 35

In testimony whereof I hereunto set my  
hand, this 8th day of February, 1897, in the  
presence of two attesting witnesses.

FREDERICK W. WOOD.

Witnesses:

THOS. KELL BRADFORD,  
SAML. D. BRADFORD.