No. 814,728. PATENTED MAR. 13, 1906.

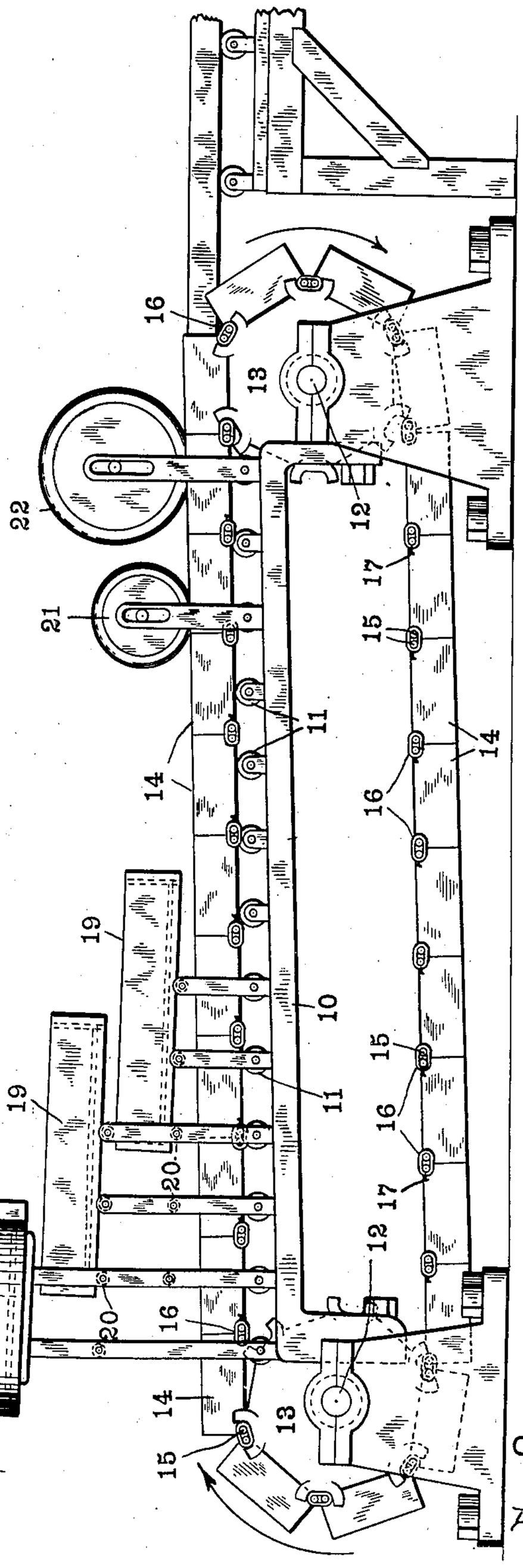
O. POTTER.

CONTINUOUS STEEL BILLET CASTING MACHINE.

APPLICATION FILED SEPT. 26, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



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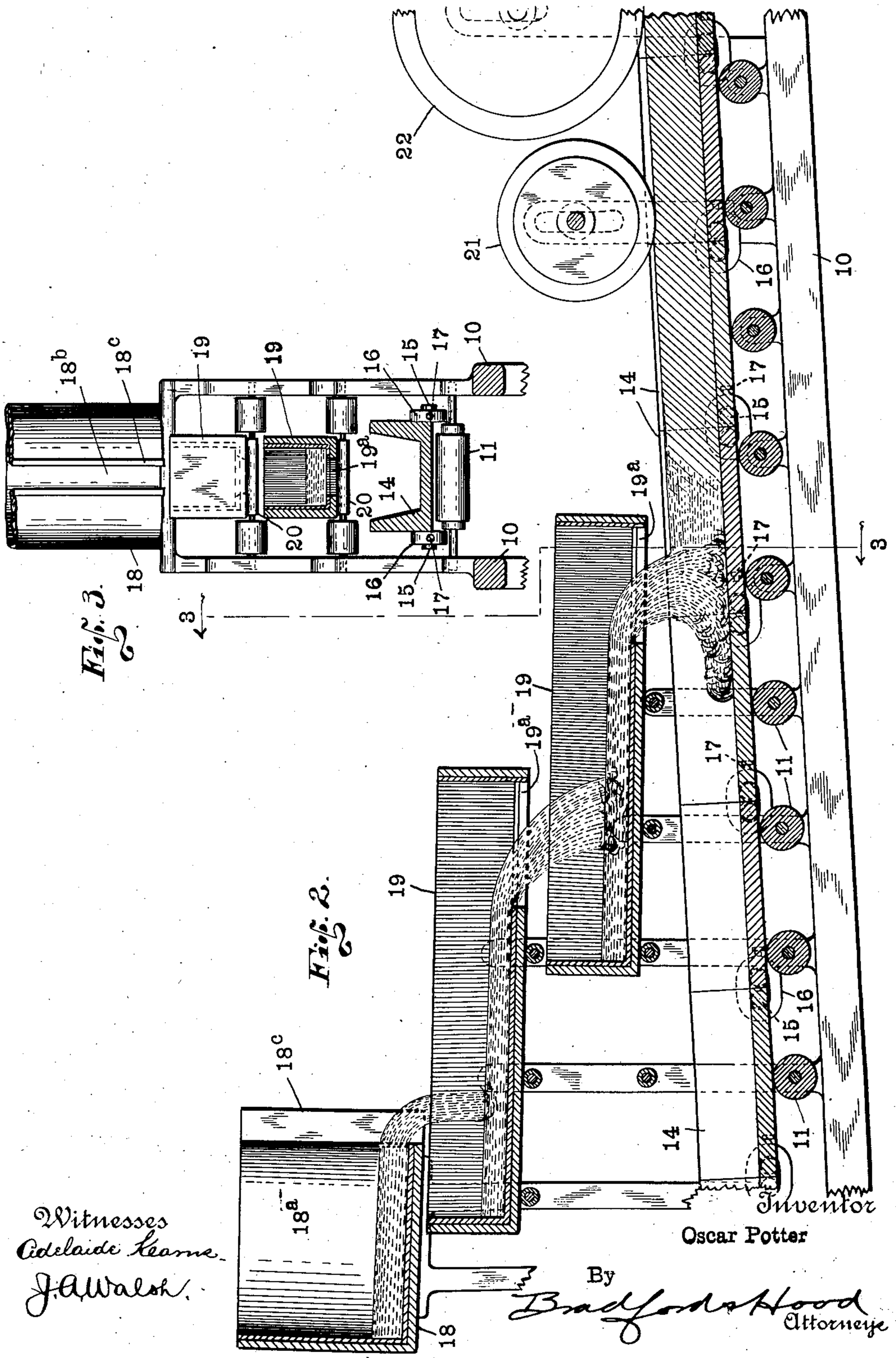

Fig. 3.

Fig. 2.

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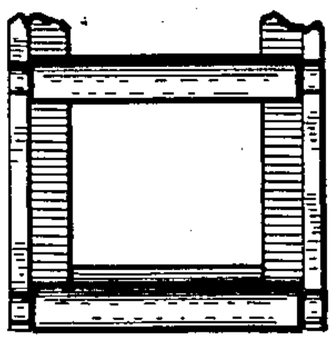

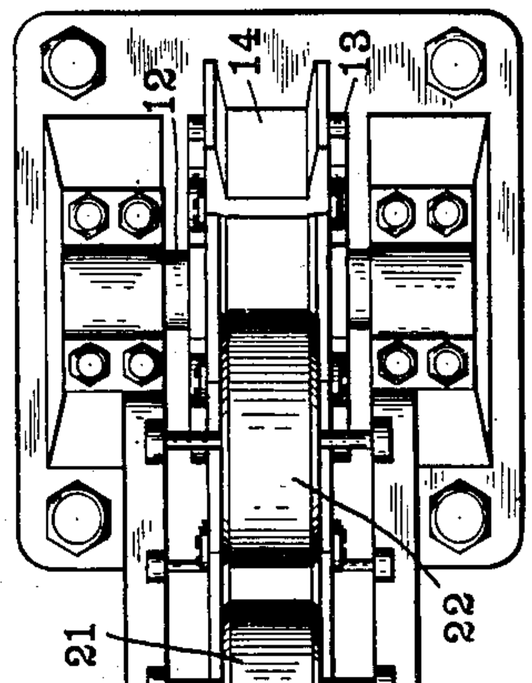

Fig. 4.

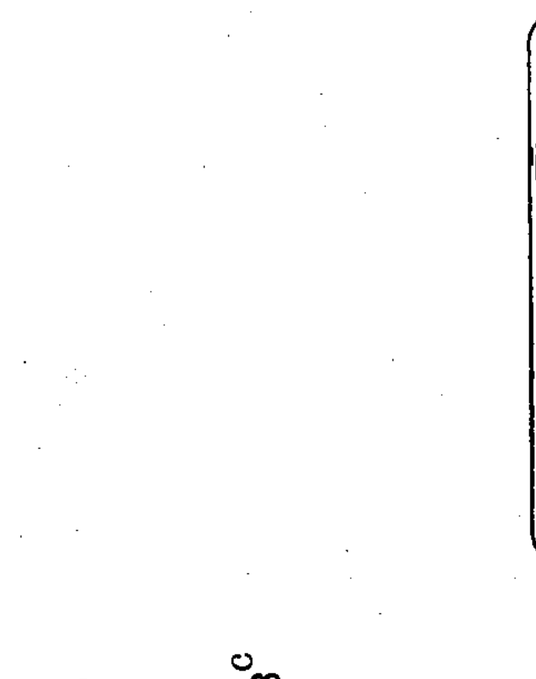

Fig. 5.

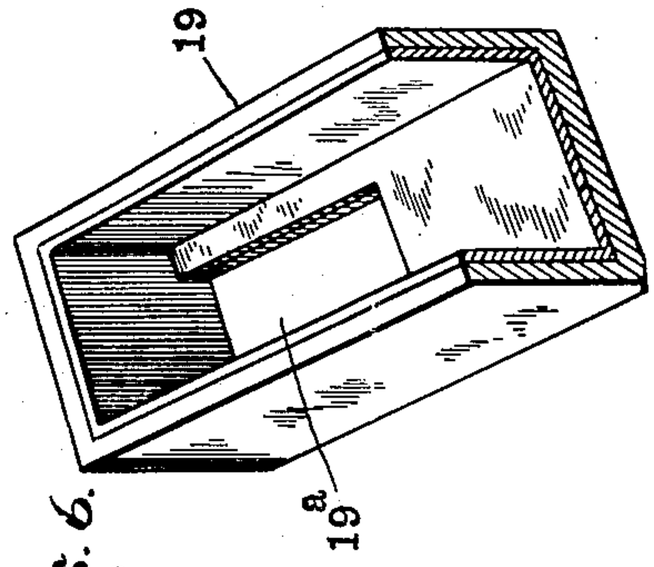

Fig. 6.

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UNITED STATES PATENT OFFICE.

OSCAR POTTER, OF WILMINGTON, DELAWARE.

CONTINUOUS STEEL-BILLET-CASTING MACHINE.

No. 814,728. Specification of Letters Patent. Patented March 13, 1906.

Application filed September 26, 1904. Serial No. 225,991.

To all whom it may concern:

Be it known that I, OSCAR POTTER, a citizen of the United States, residing at Wilmington, in the county of Newcastle and State of Delaware, have invented certain new and useful Improvements in Continuous Steel-Billet-Casting Machines, of which the following is a specification.

In the present manufacture of commercial steel—such as shafts, bars, channel-irons, beams, angles, &c.—an ingot is first produced which relative to the final product is very much shorter and of very much greater cross-section, and a large and expensive plant is required to reduce these ingots to billets from which desired cross-sections may be rolled. The ingots are, as a general rule, "piped" more or less, and care must be exercised in the reduction of the ingot that the piping is not continued into the billet and finished product.

The object of my invention is to produce a machine into which molten steel may be poured so as to form a billet of indefinite length, the mechanism being of such character that the cross-section of the billet may be comparatively small and may, if desired, approximate the cross-section of the desired final product. The construction and arrangement are also such that the billet which is produced is more free from piping.

A further object of my invention is to produce a construction and arrangement of pouring vessels especially adapted for use with my machine which will not "freeze up," which will prevent spattering of the metal, and which will also serve to reduce the fluidity of the metal to such condition that it may be introduced into the continuous mold without danger of running into the joints. This treatment results, further, in permitting as much contraction of the metal as possible, and because of the exposure of large surfaces the confined gases are liberated.

The accompanying drawings illustrate my invention.

Figure 1 is a side elevation of an apparatus embodying my invention; Fig. 2, a vertical section of a part thereof on a larger scale; Fig. 3, a section on line 3 3 of Fig. 2; Fig. 4, a plan of the part shown in Fig. 1, the billet being omitted; Fig. 5, a perspective view of the initial pouring vessel, and Fig. 6 a perspective detail of the pouring end of one of the cooling-troughs.

In the drawings, 10 indicates a supporting-table preferably carrying upon its upper face a plurality of transverse supporting-rollers 11, the table being horizontal or inclined slightly. Located at opposite ends of the table are shafts 12, each of which carries suitable sprocket-wheels 13, over which runs a suitable carrier carrying a plurality of open-ended mating mold-sections. The mold-sections 14 may, if desired, be attached to an endless carrier; but in the drawings I have shown each of said sections provided at each of its ends with a pair of transverse pins 15, the pins at each end being connected to the adjacent pins of the next mold-section by means of a yoke 16, provided with a suitable adjusting-screw 17, by means of which the several sections may be held properly together to form an endless chain. Many possible modifications of this construction will readily suggest themselves. The shafts 12 are driven in any suitable manner, preferably in the direction indicated by the arrows, so that the molds will pass along table 10 up the incline thereof when the table is inclined.

It is not unlikely that the steel may be introduced into the trough-like mold formed by the sections 14 in many ways; but any device chosen for this purpose must be of such character as to prevent freezing and also to prevent spattering of the metal as it passes from the ladle or converter into the mold. For this purpose I have designed a peculiar pouring vessel 18. This vessel consists of a receiving-body provided with a bottom and suitably lined with any desired lining 18^a. Formed through the vertical side of the body (preferably the entire height) is a vertical slot 18^b, which extends to the bottom of the body, and extending from each side of this slot is a vertical lip 18^c, the arrangement being such that any material flowing from the body 18 will issue therefrom in a comparatively narrow vertical stream. By making the slot the full height of the vessel all possibility of freezing of the issuing stream is prevented.

It will often occur that the metal will be in most too fluid a state to successfully pass directly from the vessel 18 into the endless mold, and in order to permit it to cool and become less fluid before entering the molds I arrange between the vessel 18 and the endless mold a series of troughs 19, arranged in any desired number and arrangement. I prefer to arrange these troughs one directly below the other and upon suitable supports

20, by means of which the effective length thereof may be varied, as readily appears from the drawings. The first trough can be set at any angle to the molds should conditions require. In order to prevent spattering from one trough to another, the bottom of the trough is provided with a pouring-slot 19^a, which thus performs the function performed by the lips 18^c of the initial vessel 18. The pouring end of the trough may be closed, as shown, or may be left open. The last trough 19 may be directed either up or down the incline; but I prefer to direct it in the direction of movement of the endless mold, so that the metal flowing from the last trough into the mold will drop into the mold and flow downward in the direction opposite to the direction of motion of the mold. The movement of the mold will then carry this thin lip continuously up under the oncoming metal, thus preventing the hotter metal from directly striking the mold and also preventing any unequal and improper shrinkage.

In order to properly compact the metal into the mold, any desired means may be provided for engaging the top of the metal in the mold; but I prefer a series of rollers 21 22, &c., which are gradually increased in weight and arranged to rest upon the upper surface of the billet. The rollers engage the metal while it is still soft and compress it, so as to compensate for any inequalities in contraction, and thus prevent any cracking of the billet.

The operation of the machine is substantially continuous after the first mold has been plugged at its forward end by a brick or fire-clay. As the molds pass beneath the feeding vessel or trough the stream of molten metal is discharged into the mold in a narrow vertical stream which spreads out and is continuously covered, as already described.

The mold-sections may be given any desired cross-section and may be formed as a part of the endless carrier, as shown, or be merely supported by an endless carrier of any desired form without departing from my invention.

I claim as my invention—

1. A billet-casting machine consisting of an inclined support, a series of open-ended molds, means for driving said molds in succession end to end up the incline, and means for introducing molten metal into said molds as they are presented to casting position.

2. In a billet-casting machine, the combination of, an inclined support, a series of open-ended molds adapted to lie end to end on said support, means for introducing molten metal into said molds, and means for causing a relative movement between the molds and the filling means, said movement being such that, relative to the mold, the filling-point will pass down the mold.

3. In a billet-casting machine, the combination with an inclined trough-like mold, of means for introducing molten metal into said molds, means for causing a movement between the molds and the filling means, said movement being such that, relative to the mold, the filling-point will pass down the mold, the angle of the inclination of the mold being such that the molten metal passing into the mold will not strike the bottom of the mold directly but will strike molten metal already in the mold, as and for the purpose set forth.

4. In a billet-casting machine, the combination, with an inclined trough-like mold, of means for introducing molten metal into said mold, means for causing a movement between the mold and introducing means, said movement being such that, relative to the mold, the filling-point will pass down the mold, the angle of an inclination of a mold being such that the molten metal passing into the mold will not strike the bottom of the mold directly but will strike molten metal already in the mold, and means for engaging the poured molten metal in the mold to compact the same at a point higher in the incline than the point of introduction of the molten metal.

5. In a billet-casting machine, the combination with an open-topped trough-like mold, of a pouring vessel therefor consisting of a receiving-body having a vertical slot formed through its wall with lips projecting from each edge of said slot beyond the vessel-bottom in alinement with the mold, and means for causing a relative movement longitudinally between the mold and vessel, as and for the purpose set forth.

6. A pouring vessel for controlling the flow of molten metal, said vessel consisting of a receiving-body having a vertical slot formed through its wall, and a vertical lip extending outward along each edge of the slot and beyond the bottom, whereby the metal will issue from the vessel in a comparatively narrow vertical stream.

7. In a billet-casting machine, the combination with a trough-like mold, of a plurality of receiving vessels arranged in a cascade above said mold with the lower vessel arranged to discharge into the mold whereby the molten metal will flow from an upper vessel into the one next below and lengthwise through said vessel to the opposite end and from thence to the next lower vessel, and means for driving the mold beneath said last-mentioned vessel.

8. A billet-casting machine consisting of an inclined support, a series of open-ended molds, means for driving said molds in succession end to end up the incline, means for introducing molten metal into said molds as they are presented to casting position, and means for compacting the poured metal into the mold.

9. In a billet-casting machine, the combination of, an inclined support, a series of open-ended molds adapted to lie end to end on said support, means for introducing molten metal into said molds, means for causing a movement between the introducing means and the molds, said movement being such that, relative to the mold, the filling-point will pass down the mold, and means for compacting the poured metal into the mold at a point higher than the point of introduction of the molten metal.

10. In a billet-casting machine, the combination with an inclined trough-like mold, of means for introducing molten metal into said molds at continuously-successive points longitudinal'y thereof the pouring metal moving downward toward the empty lower portion of the mold, the angle of inclination of the mold being such that the molten metal passing into the mold will not strike the bottom of the mold directly, but will strike molten metal already in the mold, and means arranged up the incline from the pouring-point for compacting the poured metal into the mold, as and for the purpose set forth.

11. In a billet-casting machine, the combination with an inclined trough-like mold, of means for introducing molten metal into said mold at continuously-successive points longitudinally thereof the pouring metal moving downward toward the empty lower portion of the mold, the angle of inclination of the mold being such that the molten metal passing into the mold will not strike the bottom of the mold directly but will strike molten metal already in the mo d, means arranged up the incline from the pouring-point for engaging the poured metal in the mold to compact the same, as and for the purpose set forth.

12. In a billet-casting machine, the combination with an open-topped trough-like mold- of a pouring vessel therefor consisting of a receiving-body having a vertical slot formed through its wall with lips projecting beyond each edge and the bottom of said slot in alinement with the mold, means for causing a relative movement longitudinally between the mold and vessel, and means for compacting the poured metal into the mold, as and for the purpose set forth.

13. In a billet-casting machine, the combination with a trough-like mold, of a plurality of receiving vessels arranged in a cascade above said mold with the lower vessel arranged to discharge into the mold the molten metal flowing from an upper vessel into the adjacent end of the next lower vessel and from thence through said lower vessel and discharging therefrom at the opposite end, means for driving the mold beneath said last-mentioned vessel, and means for compacting the poured metal into the mold.

In witness whereof I have hereunto set my hand and seal, at Wilmington, Delaware, this 23d day of September, A. D. 1904.

OSCAR POTTER. [L. S.]

Witnesses:
AKE W. TISSEL,
FRANK G. RUTTY.