

Sept. 21, 1926.

1,600,668

C. W. HAZELETT

PROCESS AND APPARATUS FOR CASTING SHEET METAL

Filed Nov. 11, 1920

4 Sheets-Sheet 1

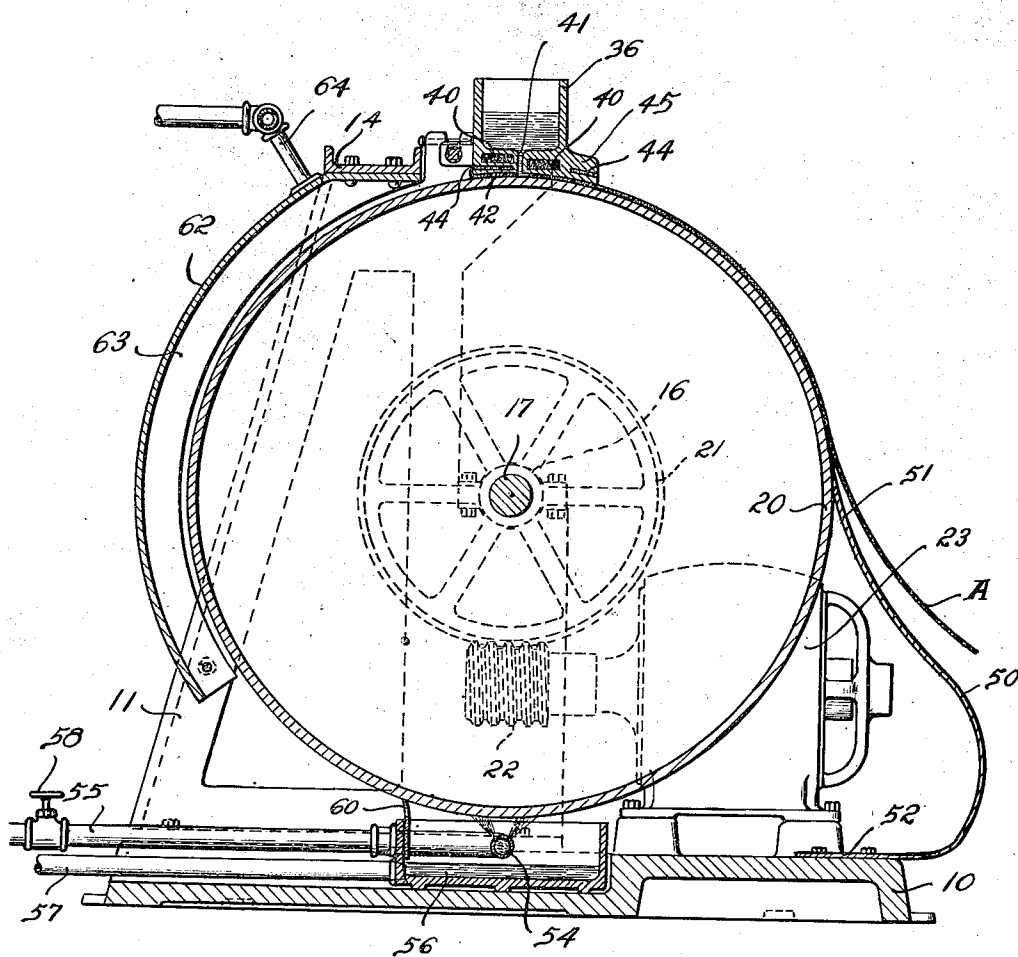


Fig.-1

INVENTOR
Clarence W. Hazlett,
By T. Baker Macklin,
ATTY'S.

Sept. 21, 1926.

1,600,668

C. W. HAZELETT

PROCESS AND APPARATUS FOR CASTING SHEET METAL

Filed Nov. 11, 1920

4 Sheets-Sheet 2

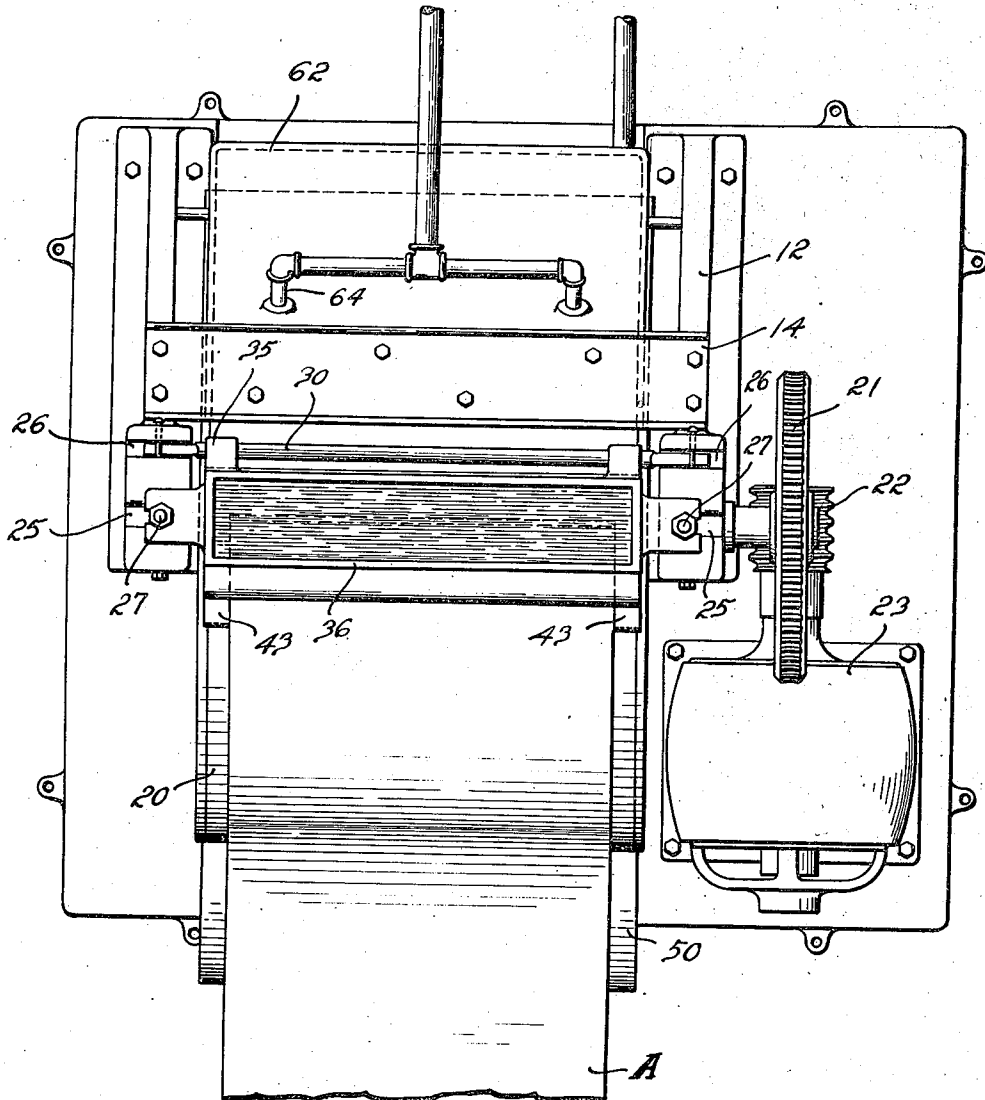


Fig. 2

INVENTOR
Carence W. Hazlett
By Raki Macklin,
ATTY'S.

Sept. 21, 1926.

C. W. HAZELETT

1,600,668

PROCESS AND APPARATUS FOR CASTING SHEET METAL

Filed Nov. 11, 1920

4 Sheets-Sheet 3

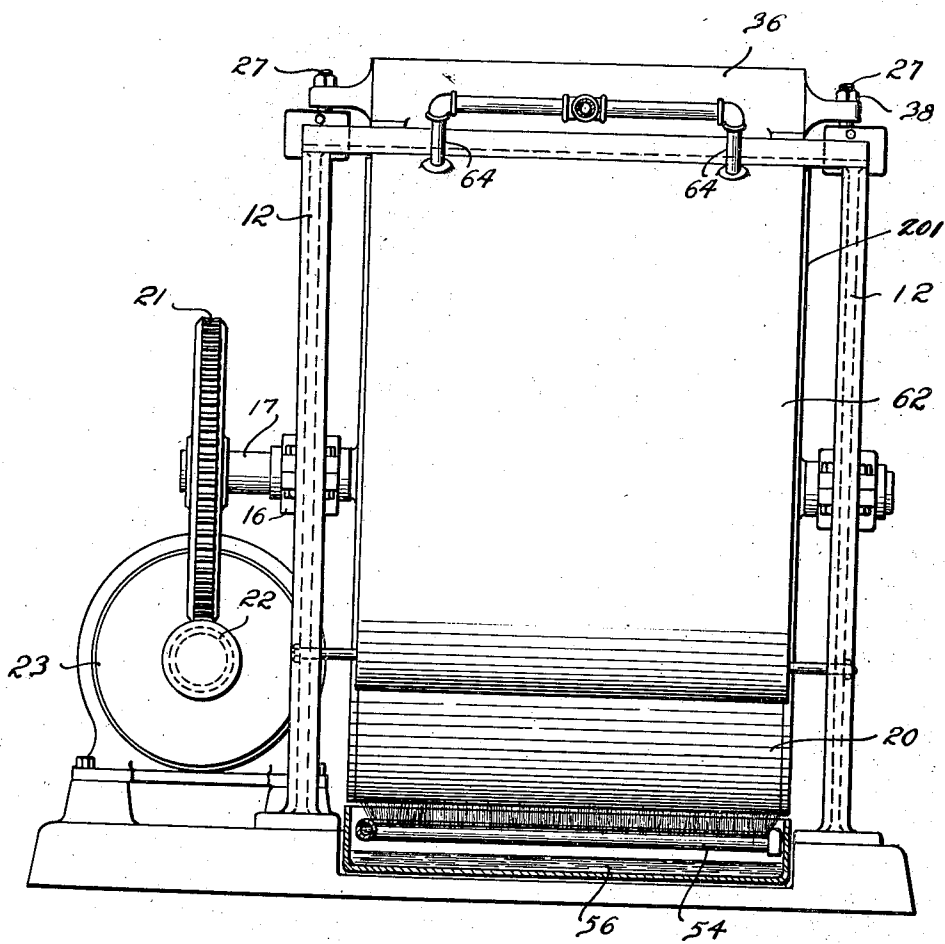


Fig. 3

INVENTOR
Charles W. Hazlett,
By Ralph Maeklin,
Attys.

Sept. 21, 1926.

C. W. HAZELETT

1,600,668

PROCESS AND APPARATUS FOR CASTING SHEET METAL

Filed Nov. 11, 1920

4 Sheets-Sheet 4

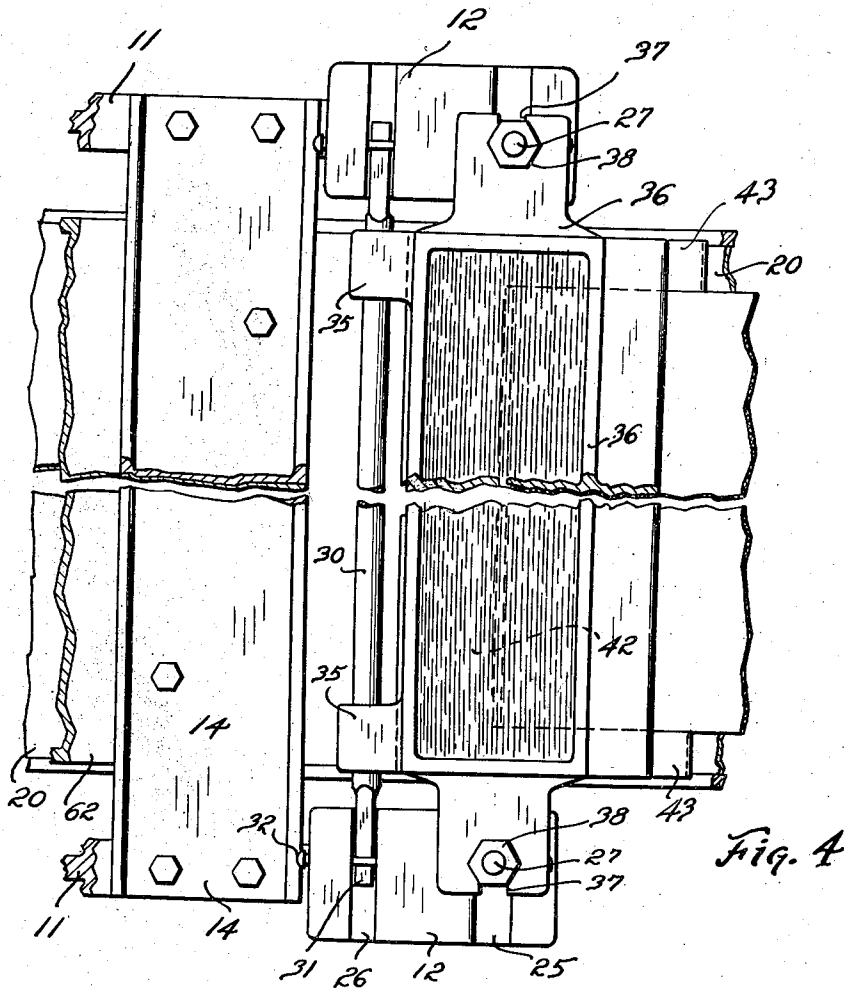


Fig. 4

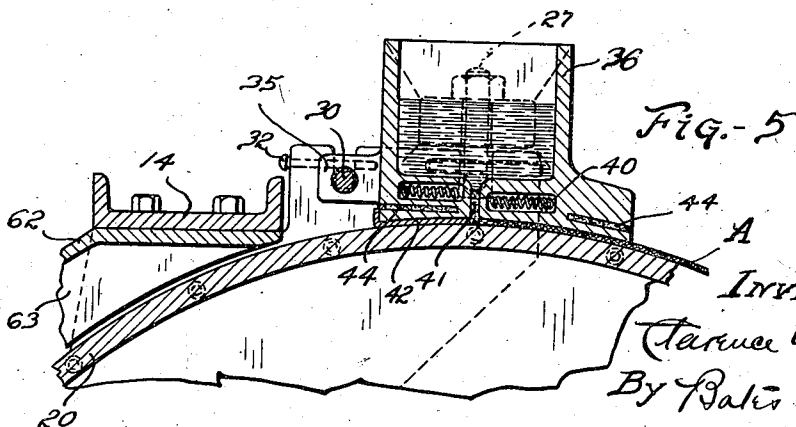


Fig. 5

INVENTOR
Charles W. Hazlett,
By Robert Macklin,
ATTY'S.

Patented Sept. 21, 1926.

1,600,668

UNITED STATES PATENT OFFICE.

CLARENCE W. HAZELETT, OF LAKEWOOD, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO THE CLEVELAND TRUST COMPANY, TRUSTEE, OF CLEVELAND, OHIO.

PROCESS AND APPARATUS FOR CASTING SHEET METAL.

Application filed November 11, 1920. Serial No. 423,309.

This invention relates to a machine for casting sheet metal. The principal object of the invention is to provide a machine, which will produce a uniform, even textured sheet of metal. A specific object of the invention is to provide in a casting machine, means for adjusting the thickness of the cast sheet.

Another object is to provide an improved pot for holding the molten metal and for discharging it upon the casting drum. An additional object of the invention is to provide improved means for cooling the casting drum. An additional object of the invention is to provide a novel method of casting sheet metal.

A further object of the invention is to provide a novel form of support for the casting drum. Additional objects of the invention will be apparent as the description proceeds.

In the accompanying drawings, wherein I have shown one embodiment of my invention, Fig. 1 is a central sectional view of a casting machine; Fig. 2 is a top plan view thereof; Fig. 3 is a front elevation of a machine; Fig. 4 is a fragmentary top plan view on an enlarged scale of the metal pot, and Fig. 5 is a cross section of the metal pot.

Referring to the drawing by reference characters, I have indicated at 10 a base member, which is shown as provided with a pair of standards 11, the upper ends of which may have brackets 12, which may be secured together at their upper extremities by a binder plate, shown as a channel 14. Suitably mounted in bearings 16, on a shaft 17, I may provide a casting drum 20. It will be noted from the drawings that the casting drum 20 is supported only at the ends 201 thereof, all spokes or other means being omitted to cause all portions of the drum which contact with the metal to have equal heat conductivity. The drum may have keyed thereon a gear wheel 21, which may be driven by a worm 22, on a motor 23.

A suitable means for controlling the speed of the motor may be provided, since in operation I have found that the speed of rotation is quite important in successfully operating my machine, and I have found that the best results are obtained when the speed of the drum is gradually increased to full speed rather than when the drum is immediately driven at full speed.

The brackets 12 may be slotted at 25, 26 and in the former pair of slots I may mount

eye bolts 27, while in the slot 26 I show a spindle 30 having squared ends 31, which are secured in the slots 26 by means of a pin 32. A metal pot 36 is mounted on the spindle 30 by means of lugs 35. The pot is shown as recessed at 37 adjacent each end to receive the eye bolts 27. Suitable nuts 38 serve to hold the pot in place. The pot may be provided with a lip or extension 45.

In order to maintain the metal at a proper temperature I may provide suitable electric heaters 40, which are disposed between the bottom of the metal bath and the lower face of the pot proper. The heaters may be regulated to suit conditions of casting. A suitable aperture 41 is provided in the bottom of the pot, and is shown as extending substantially the entire length thereof.

In order that the cast sheet A may be of the desired thickness, it is necessary that the lower face of the metal pot be spaced above the outer face of the casting drum a distance corresponding to the thickness of the casting. I have found that by placing a suitable mat or gasket 42, which may be of copper, between the pot and the drum, a very efficient means for gauging the thickness of the cast plate may be secured. This plate 42 may extend beyond the ends of the casting slot 41, leaving substantially the entire slot open and hence allowing metal to flow thru practically the full length of the slot, or if desired, the mat or gasket may close portions of the slot and consequently alter the shape of the cast metal. I may also cast a number of strips by providing tongues on the mat 42, which project across the slot and extend a short distance along the drum. This provides in effect a plurality of separate casting orifices and the resulting operation will produce a number of thin strips of metal. It will be noted that the ends of the spacing mat may extend beyond the face of the pot, as shown at 43.

By using a mat beneath the mold pot which has a tapered cross section, I am enabled to make sheet castings which taper from edge to edge. The drum 20 may have suitable engravings or configurations thereon to provide ornamentation on the cast metal. In order that the drum may be maintained at a proper temperature, I may insert suitable insulation 44, in grooves adjacent the lower face of the metal pot.

To remove the cast sheet from the drum,

I may provide a suitable scraper 50, which may be a plate having a sharpened end 51, normally resting on the drum, the other end 52 may be secured to the base of the machine.

5 I have found that in operation it is quite desirable to cool the drum, and consequently I have shown a cooling device comprising an apertured pipe 54, which extends substantially the entire length of the drum. Water 10 may be fed to the pipe 54 by a pipe 55, the water after impinging on the drum drops down into the tank 56 from whence it flows through the pipe 57. The amount of water used may be regulated by a valve 58 to suit 15 conditions, and in practice I have found the regulation of the cooling means to be an important feature. A suitable scraper 60 may wipe the water adhering to the surface of the casting drum. The scraper 60 also 20 serves to remove any small particles of metal which might remain on the drum.

In order that the drum may be perfectly dry after cooling, I may provide a suitable air drying, and cooling means, shown as 25 comprising a curved member 62, spaced from the drum to provide a chamber 63 thru which air may be forced from a pipe 64. It will be noted from the drawings that the movement of the air in the drying chamber is 30 opposite to the direction of the movement of the drum.

A machine constructed according to my invention may be used for casting aluminum, brass and copper, as well as metals having 35 a lower melting point, such as lead, altho if any of the former group of metals are to be cast I prefer to use an oxy-hydrogen or an oxy-acetylene heating torch either in conjunction with the electric heater or independently. 40

In the present construction it will be noted that the lower face of the metal pot is maintained at a higher temperature than the opposite face of the casting drum. This 45 causes the lower portion of the cast metal to congeal somewhat as it strikes the drum, while the upper surface of the metal being in contact with the hot metal pot and the lip thereon will cool slowly. During this 50 cooling of the sheet, the upper surface thereof is smoothed by contact with the smooth lower face of the pot, and the hot metal is continuously pressed downward upon the cool metal beneath. This results in producing a sheet, which is homogeneous and has 55 uniform texture throughout.

Having thus described my invention, what I claim is:

1. In a sheet metal casting machine, the 60 combination of a rotary drum having a cylindrical casting surface, a pouring port associated with the drum and having an arcuate under surface extending substantially parallel with the surface of the drum, said 65 surfaces being spaced apart a distance cor-

responding to the thickness of the sheet metal to be cast, means associated with the pouring pot for maintaining the temperature of the arcuate surface of the pot higher 70 than the solidifying temperature of the metal to be cast, and means acting on the rotating drum for maintaining the temperature of the casting surface thereof lower than said solidifying temperature.

2. In a casing machine, a rotary casting 75 drum, a metal pot, means to heat the pot, and heat insulating means between the heating means and the rotary mold.

3. In a sheet metal casting machine, a rotary drum having a cylindrical casting sur- 80 face, a metal pot having an arcuate surface substantially parallel to the cylindrical surface of the drum, means positioned between said parallel surfaces serving to space the pouring pot and the casting drum apart, a distance corresponding to the thickness of 85 the sheet metal to be cast, means associated with the pot for maintaining the arcuate surface thereof at a temperature which is higher than the solidifying temperature of the 90 metal to be cast, and means acting on the drum to control and regulate the temperature thereof at a substantially constant point which is below said solidifying temperature. 95

4. In a sheet casting machine of the character described, the combination of a rotatable casting drum having a cylindrical surface, a metal pouring pot provided with a gate extending transversely of said cylindrical surface, said pouring gate communicating with a casting space provided between an arcuate under surface formed on the casting pot which extends substantially 100 parallel with the cylindrical surface of the casting drum, heating means associated with the pot for maintaining its under surface at a temperature higher than the solidifying temperature of the metal to be cast, and means acting on the drum for maintaining 105 the cylindrical casting surface thereof at a substantially constant metal chilling temperature, whereby a cast metal sheet may be expressed from said space with the upper portion thereof in a semi-plastic condition. 115

5. In a casting machine, a rotary casting drum; a metal pot maintained in contact with the casting surface of the drum and means to heat said pot, said means comprising heating elements spaced between the bottom of the bath and the bottom face of the metal pot, one of said heating elements being nearer the drum than the other. 120

6. The combination in a casting machine, of a rotary drum, means to cast metal there- 125 on, means to cool said drum, said means comprising a water spray, means to wipe the water and adhering particles of metal from the drum, and a drying means comprising a moving column of air. 130

7. In a casting machine, a metal pot, and a rotary casting drum, spaced from each other, the width of the space determining the thickness of the metal, and means for determining the thickness comprising a mat upon which the metal pot rests.

8. In a casting machine, a metal pot, an aperture therein, and a rotary casting drum spaced from the pot, the width of the space determining the thickness of the metal, and means for determining the thickness comprising a mat upon which the metal pot rests, said mat having a plurality of separated tongues thereon which extend across and close portions of the aperture in the pot and thereby provide a plurality of channels whereby a plurality of strips of metal may be cast at one end.

9. In a casting machine a mold formed by a plurality of stationary walls positioned beneath a metal bath and a movable wall comprised of a rotating drum associated with the stationary walls of the mold, said rotatable wall serving as an expressing means for continuously moving the cast metal out of the mold.

10. In a casting machine, a frame, a bracket thereon, said bracket having pairs of slots therein, a pivot member seated in one pair of slots, a metal pot pivoted on said member, eye-bolts secured in the other pair of slots, the metal pot having projections thereon which are notched to span the eye-bolt.

11. In a casting machine, the combination of a rotary mold drum and a metal pot, an aperture extending lengthwise of said pot, heating elements located in the lower portion of the pot, heat insulating means provided below one of the heating elements, and spacing means insertable between the pot and the rotary mold, said means determining the thickness of the cast article.

12. In a casting machine, a rotary mold, means to drive the mold, means to separate the cast sheet from the drum, means to spray water upon the drum, means to wipe the water and adhering particles of metal from the drum, and drying means comprising a column of air, moving in a direction opposite to the movement of the drum.

13. The combination of a metal pot and a casting drum, spaced to provide a channel between the two, an aperture leading from the pot to the channel, the upper wall of the channel being stationary and provided with heating means, whereby it may be maintained at a definitely higher temperature with relation to the adjacent face of the drum and thereby determine the rapidity of flow of the metal.

14. The method of making a cast sheet of metal, comprising discharging molten metal upon the face of a cooled drum, rotating the

drum while maintaining a stationary member disposed outside thereof in a heated condition while the drum is rotated to cause the metal to first solidify upon the surface of the drum and progressively cool outward therefrom as the drum rotates.

15. The combination of a metal pot and a casting drum, a channel having three stationary walls between the two, an aperture leading from the pot to the channel, the upper wall of the channel being provided with heating means, means to cool the outer face of the drum whereby the cast metal will begin to congeal on the drum and will cool outwardly therefrom.

16. The combination of a rotating drum and a metal pot spaced therefrom, the pot having a cavity adapted to receive and support molten metal to form a fluid pressure head, said pot being provided with an aperture extending from the cavity to the under side thereof, said underside of the pot being formed to comprise a metal sheet smoothing means having a stationary heated surface adapted to be maintained at a higher temperature than the temperature of the adjacent drum surface whereby, as the metal solidifies on the drum surface and is expressed from beneath the pot by movement of the drum, the upper outer surface of the sheet metal may be maintained in a semiplastic condition by said pot surface and be wiped to a uniformly gaged thickness thereby.

17. In a casting machine, a rotary molding surface, means to rotate the surface, means to eject metal upon said molding surface including a pouring gate having the walls thereof maintained at a definite temperature by electrical heating elements, and means to separate the cast sheet from the rotating molding surface, said means comprising a resilient member having one end bearing upon said rotating surface, and the other end attached to the base of the machine.

18. In a process for casting sheet metal, the step which includes cooling a sheet of metal by first causing one surface to congeal while maintaining the other hot and progressively cooling the casting from the congealed surface toward the other surface, while wiping the higher temperature side of the sheet to gauge it.

19. In a process for casting sheet metal, the step which includes cooling a sheet of metal by first causing one surface to congeal while maintaining the other hot and progressively cooling the casting from the congealed surface toward the other surface, the hot surface of the casting being smoothed by a wiping action while it cools.

20. The combination of a metal pot and a rotating casting drum, the pot being spaced from the drum by a mat whereby a channel

is provided between the opposite face of the pot and the drum, the thickness of the casting depending upon the thickness of the mat, means to cause the upper surface of the metal just after casting to be hotter than the lower surface whereby the upper surface of the casting will be smoothed by contact with the pot.

21. A metal pot for a casting machine, having a cavity adapted to form a bath and a longitudinal aperture extending from the cavity to a lower face of the pot, heating elements in the pot disposed beneath the bath and above the lower portion of the pot, said elements being on opposite sides of the aperture, a lip on one side of the pot, the heating elements being constructed and arranged so that more heat is supplied to the lower surface of the bath on the side provided with a lip than to the other side, heat insulating means between certain of the heating elements and the lower surface of the pot, other heat insulating elements being disposed in the lip and a mat between the pot and the drum.

22. The combination of a metal pot and a casting drum, one side of the pot having a mat thereunder, whereby a channel is provided between the opposite face of the pot and the drum, the thickness of the casting depending upon the thickness of the mat, means to heat the lower face of the pot above the channel, whereby the temperature of the metal on the drum will be lower than it is adjacent the pot, to cause the metal adjacent the casting drum to be somewhat solidified, while the upper portion is still semi-plastic.

23. In a sheet casting machine, a rotary casting drum, a metal pot associated with the drum having an integral element extending over the drum and means to heat said pot and element, including electrical heating units, whereby the extending element may maintain the upper surface of the cast sheet in a semi-plastic condition and serve as a gauging means for determining the thickness of the metal as it is expressed from the mold.

24. In a sheet casting machine including a metal pot having a pouring gate the walls of which are maintained at a definite temperature by electrical heating elements, a rotary casting drum, and a mat disposed between the bottom of the casting pot and the surface of the drum, the thickness of said mat corresponding to the thickness of the metal cast upon the drum.

25. In a sheet casting machine, a mold comprised substantially of a plurality of stationary molding surfaces, a rotating

surface associated with the stationary surfaces adapted to express the cast material out of the mold, said stationary surfaces being maintained at a higher temperature than the rotating surface by electrical heating means disposed within the walls of said mold.

26. In a sheet casting machine, a mold comprised substantially of a plurality of stationary molding surfaces, and a rotatable molding and expressing surface, a metal bath disposed above the molding surfaces, and electrical heating means disposed within the mold walls for maintaining a definite temperature of the bath and stationary mold members.

27. In a sheet casting machine of the character described, the combination of a rotatable casting drum having a cylindrical casting surface, a casting pot associated therewith with an under arcuate surface thereof uniformly spaced from the cylindrical surface of the drum, said casting pot having a gate aperture extending transversely of the drum, the length of the gate being substantially equal to the width of the sheet to be cast, means associated with the pot for maintaining the walls of the gate and the under sheet forming surface of the pot at a temperature which is higher than the solidifying temperature of the metal to be cast, and means for maintaining the cylindrical surface of the drum at a temperature which is substantially lower than said solidifying temperature to thereby chill the under portion of the metal cast between the drum and the pot, whereby sufficient solidarity of the metal may be obtained to permit the expressing thereof from beneath the casting pot, with the upper portion of the sheet formed to size while being moved in a semi-plastic condition.

28. The combination of a metal pouring pot and a casting drum, said pouring pot having a casting gate extending transversely of the casting surface of the drum and communicating with a channel having three stationary walls between the two, means for maintaining the stationary walls at a temperature higher than the solidifying temperature of the metal to be cast, and means for maintaining the casting surfaces of the drum at a metal chilling temperature whereby the cast metal may be sufficiently solidified to be expressed from between the casting pot and the drum while said stationary walls are acting to gage three sides of the cast sheet to the proper size.

In testimony whereof, I hereunto affix my signature.

CLARENCE W. HAZELETT.