

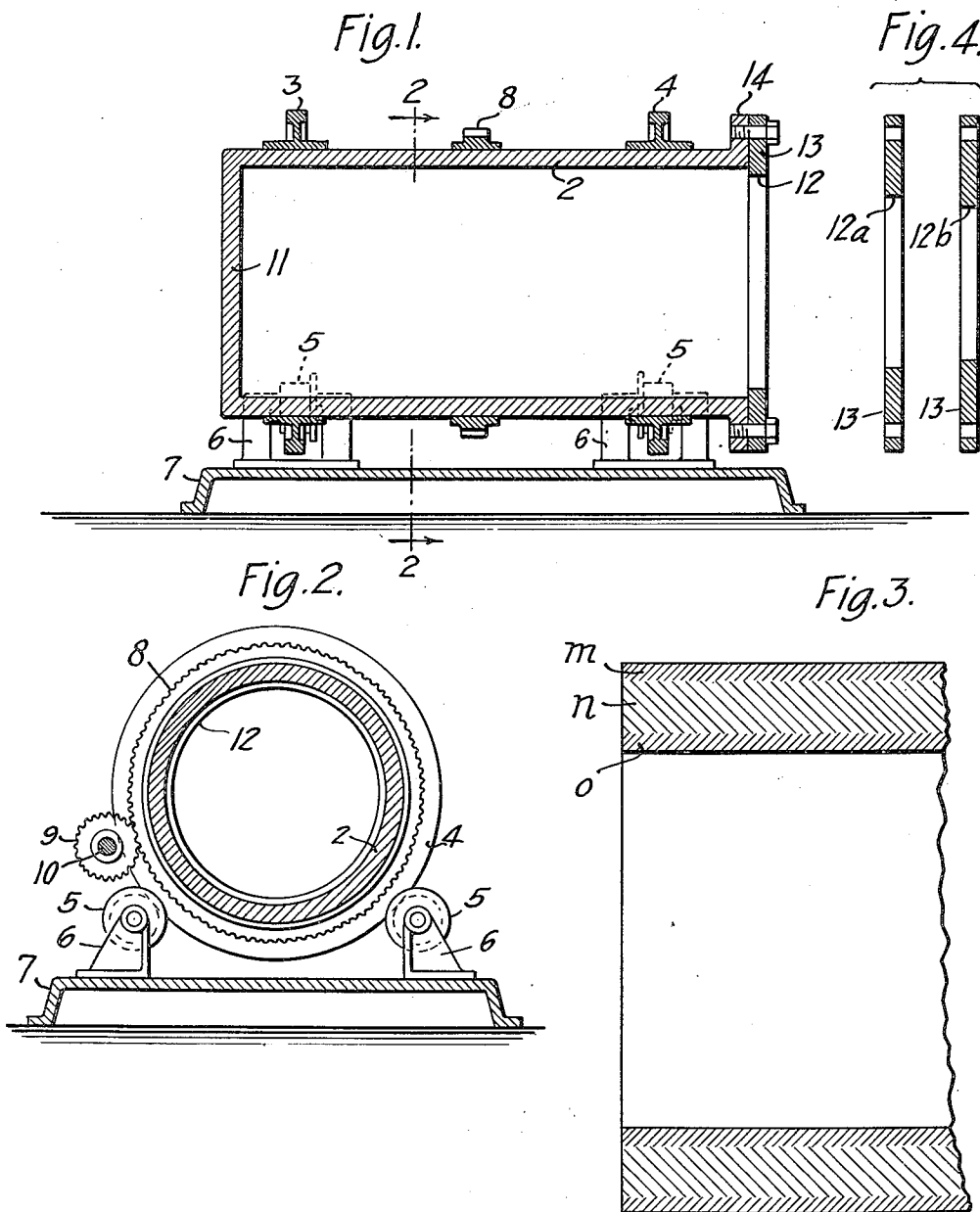
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F. E. CLARK

PRODUCTION OF HOLLOW INGOTS

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PRODUCTION OF HOLLOW INGOTS.

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To all whom it may concern:

Be it known that I, FRANK E. CLARK, a citizen of the United States, and resident of the city, county, and State of New York, have invented certain new and useful Improvements in the Production of Hollow Ingots, of which the following is a specification.

This invention refers to a process whereby hollow ingots, containing steels or other metals of two or more different compositions or chemical analyses are produced.

One of the objects of the invention is to produce ingots having intimately united strata of metals of varying composition. Another object is to produce ingots which are free from pipes. Another object is to produce ingots having one stratum of very thin metal of a desired grade and other strata of metals of different chemical analyses. Other objects will be apparent from the following description and claim when read in connection with the accompanying drawings in which—

Figs. 1 and 2 are respectively longitudinal and cross-sectional views of a rotary casting machine in which the ingots are produced, Fig. 2 being a section on line 2—2 of Fig. 1;

Fig. 3 is a section showing diagrammatically the different strata of the hollow ingot.

Fig. 4 shows in detail two dams having different sized central openings.

The casting machine comprises a metallic shell or mold 2 having secured thereto a pair of supporting rings 3 and 4 which ride on suitable supporting flanged rollers 5 carried in brackets 6 secured to the base 7. A ring gear 8 secured to the shell 2 is driven by a pinion 9 on a shaft 10 which is adapted to be driven by a motor or any other source of power. The mold is closed at one end by a wall 11 and is provided with means whereby an opening 12 of adjustable dimensions may be secured at the opposite end. In the apparatus shown, the diameter of the opening 12 at the end of the mold is varied by bolting or otherwise detachably securing different overflow dams 13 to the end flange 14 of the shell. Each of these dams 13 has a central opening 12 of different diameter as indicated at 12^a and 12^b in Fig. 4. The diameter of the central opening 12 in each dam 13 determines the thickness of metal which will be formed

on the ingot at each step in the process as will be apparent from the following description.

As the mold rotates, molten steel or other metal of predetermined composition is poured into it through the opening in the dam 13 and by means of centrifugal force this metal is evenly distributed on the inner surface of the mold thereby forming one stratum of the hollow ingot. The thickness of this stratum is regulated by the speed of the rotation of the mold, the temperature at which the molten metal is introduced into the mold and by the diameter of the opening 12 in the overflow dam secured at the end of the mold. After forming one stratum of the ingot of metal of desired analysis and thickness, another overflow dam having an opening of smaller diameter is substituted to retain the next charge of metal fed to the mold and to regulate the thickness of the next stratum. This second stratum is formed by introducing another charge of molten metal after the first stratum has become solidified. The first stratum retains a great deal of its initial heat and as the second charge is added while the mold is rotating another stratum is formed which readily welds itself to the first formed stratum. After this last mentioned stratum has solidified the dam is again changed and a third or interior stratum consisting of steel or other metal of the same composition as the exterior layer may be added. The interior layer, however, may be of a third composition or any number of layers or strata may be added to the first stratum to produce ingots having desired characteristics.

In order to minimize oxidation of the exposed surface on the successive stratum, I may use suitable materials to facilitate the welding or uniting the adjacent strata. For example, I may introduce a non-oxidizing gas to the interior of the mold, or I may spray the exposed surface of the ingot with fuel oil, or carbonaceous materials such as powdered coal or coke dust may be applied directly after the pouring of the ingots.

In Fig. 3 I have illustrated diagrammatically an ingot made in accordance with my improved method. This ingot has a thin outer stratum *m* of high grade steel, an intermediate stratum *n* of soft steel and an inner stratum *o* of steel which may be of the same grade as the outer stratum *m*.

By my improved process I am enabled to produce hollow ingots having an outer stratum of so-called "stainless steel" with an intermediate layer of ordinary soft steel and an interior strata also of "stainless steel." Many other combinations may also be made, using metals such as nickel, copper, bronze and various brasses or combinations of these metals with different grades of steels according to the requirements in the class of work for which the metal is to be used. By my process I am enabled to produce ingots having strata of varying thickness by regulating the speed of the casting machine and introducing the metals at proper temperatures and adjusting the overflow dams accordingly. For example, I am able to produce an ingot having an extremely thin outer stratum of high grade steel by introducing the metal at a high temperature for example about 1600 degrees C., such metal being best obtained from an electric furnace. The ingots produced are free from pipes and are suitable for use in the manufacture of various articles. For example, they may be used in the manufacture of seamless tubing or they may be split and flattened out for the purpose of producing sheet bars or small billets or they may be forged while either in the circular or flattened form.

What I claim is:

The method of producing hollow ingots which consists in feeding successive charges of molten metal to a rotating mold having detachable dams and securing different dams to said mold to regulate the thickness of the different strata of the ingot formed in the mold.

In witness whereof, I have hereunto signed my name.

FRANK E. CLARK.