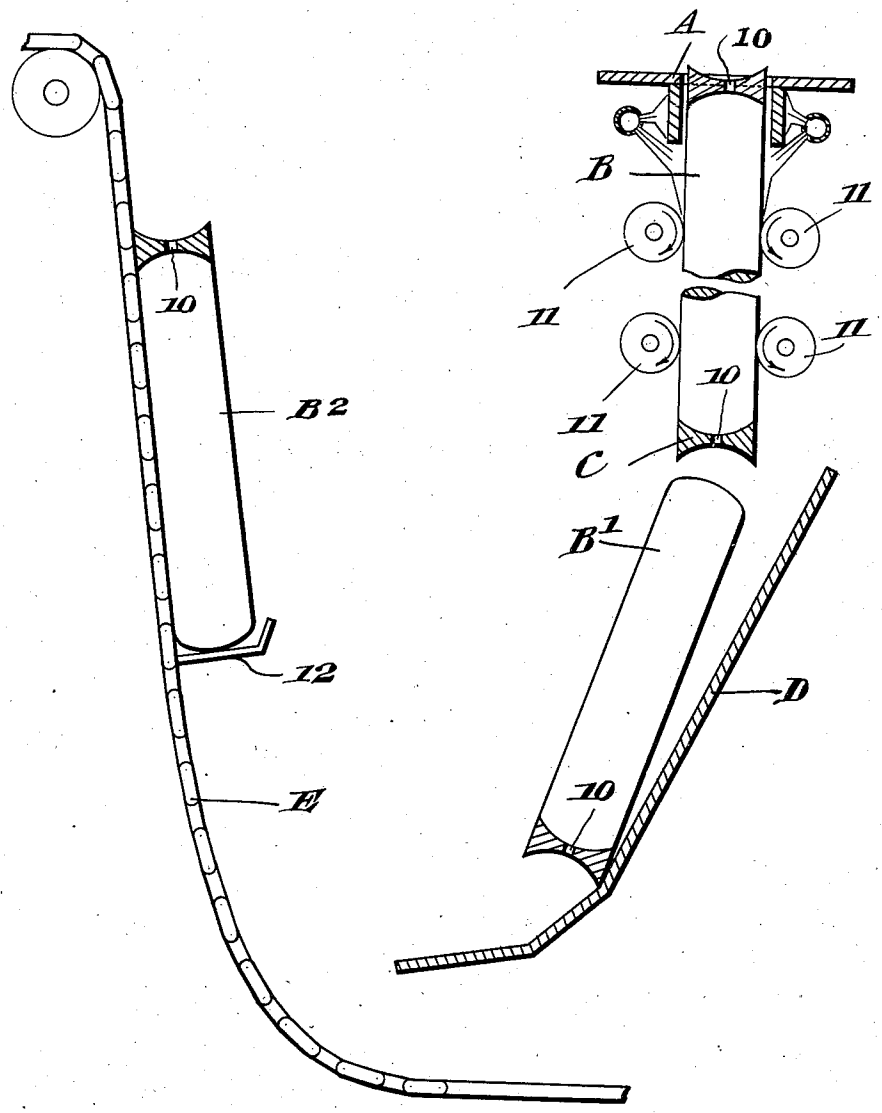
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METHOD OF SEPARATING INGOTS IN A CONTINUOUS CASTING PROCESS

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METHOD OF SEPARATING INGOTS IN A CONTINUOUS CASTING PROCESS

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10 Claims. (Cl. 22—200.1)

This application is a continuation in part of my application, Serial No. 453,436, filed August 3, 1942.

This invention relates to a method of separating ingots in a continuous casting process and the objects of the invention are to provide simple and effective means for readily separating the cast metal into ingots.

Further objects of the invention are to enable the ends of the ingots to be shaped to adapt them for hot work by rolling, extruding or forging.

Further objects still are to enable the form of the continuous casting to be maintained intact until such time as it is desired to separate the ingots therefrom.

Various metals are now cast into ingots by what is known as the continuous casting process by which the molten metal is poured or otherwise introduced into a mold, in which it is solidified and passes out continuously without being cast to definite lengths. The general practice has been to produce a relatively long ingot which corresponds to the amount of metal in a casting ladle and then to saw this ingot to shorter sizes which may be more easily handled.

Several methods have been proposed to cut the ingot during the pouring operations, as for instance by the use of a travelling saw, but this requires quite elaborate mechanism to synchronize the casting speed and travel of the saw.

Another method has been to cut the ingot to the end of the casting operation by means of a blow torch, but for many metals the oxidizing flame of the blow torch leads to overheating or oxidation of the metal. This overheating changes the grain size of the metal and oxidation may lead to the introduction of an oxide film in the metal.

Still another method consists in employing a shear to cut the ingot, but this would involve an interruption of the continuous casting process.

According to the present method separation of the casting into ingots of suitable size is attained by the insertion of separating members into the metal as it is being cast. These separating members are made of a material resisting elevated temperatures and able to receive the required surface finish and may be made of a convenient form to shape the end of the ingot to adapt it for hot work by rolling, extruding or forging. The separating members may, for instance, in the case of light metals be made of aluminum, copper, steel, asbestos or graphite. Aluminum is satisfactory only in the case of light metals possessing a fairly low pouring temperature. Copper may be used especially for the casting of those light metals which do not attach it at the operating temperature. Heat resisting steel has proved quite satisfactory for separating ingots in the case of aluminum as the operating temperature is low enough to enable the same insert to be used for successive operations. The separating members are conveniently placed on the molten surface of the ingot and the metal is poured on the insert. To maintain a temporary continuity between adjacent ingots it is convenient to form a perforation in the separating member through which a small quantity of metal may flow to unite the ingots but which may be readily broken to separate them as hereinafter described.

The drawing shows a diagrammatic view illustrating how the method may be practised.

The method of separating ingots will naturally vary with the character of the casting apparatus employed. Generally speaking, the separating members are inserted manually in the open top of the casting mold, being placed on the molten surface of the ingot as soon as a desired length of ingot has been reached. Further metal is then poured on the insert until a desired length of ingot has again been reached when a new separating member is introduced for the next ingot.

Referring to the drawing, A indicates the mold in which the metal is being cast, B the ingot being cast, B1 and B2 ingots already solidified and separated; C indicates the separating member which may be formed of the material already stated. In some cases in order to minimize the attack of the molten metal, the surface of the separating member, if made of steel or copper, may be protected by a coating such as whitewash or graphite, though this practice should not be employed where maximum heat derivation is essential.

The separating members may be of any convenient size. Thus a plain plate or disc may be used as in the case of cylindrical ingots and be formed with a central perforation 10. Where it is desired to shape the end of the ingot, which is desirable where it is to be used for hot work, the separating member may be in the form of a biconcave disc, as illustrated, which will suitably round the end of the ingot. The dimensional tolerance of the separating member should be such as to enable it to slip easily through the mold.

Perforation at the centre of the separating member enables the metal connection to be completed between the ends of adjacent pieces of a

cast bar. This hole should be sufficiently large to permit good feeding of the molten metal during casting but should not be sufficiently large to produce a metallic connection between the pieces of the bar which it would be too difficult to break.

In the form of apparatus illustrated the cast bar which is to form the ingot is pulled downwardly from the mold at the required speed by driving rolls 11 and the separating members are inserted as already explained. As the cast bar is moved downwardly it is arranged to engage a deflecting plate D which moves the free end of the bar laterally and breaks it off from the bar. As indicated by the ingot B1, the separated ingot with the separating member at one end thereof will then pass down the deflecting member D which is of such shape as to guide it to a continuous conveyor E having carrier members 12, one of which will engage the ingot and carry it away as indicated at B2. The separating members may be removed from the cast ingot and used again in the process.

Where special shaping of the ends of the ingot sections is not of importance, it may be desirable to employ an extremely thin or filmlike piece as the separating member, for example a piece of metal foil, which if it is of aluminum and used for separation in continuous ingot of aluminum, may be oxide-coated to prevent adhesion. Other examples are sheets or disks of metallic film, such as electrolytically deposited films of iron, copper or other suitable metal. Pieces of film of such character, having extreme thinness and thus having minimal effect on the casting process and its product, may be produced by plating the metal on a suitably treated sheet of paper (in accordance with known procedure for making metal films); the film may be removed for use as a separator, or in some cases the metallically plated sheet of paper may be used "as is," the paper usually burning off immediately when the composite sheet is inserted in the hot ingot-forming column.

What I claim as my invention is:

1. In a process for continuously casting metal ingots, the method of effecting separation between ingots which consists in inserting separating members into the metallic bar as it is being cast by placing said members on the molten surface of the ingot as soon as the desired length of ingot has been reached.

2. The method as claimed in claim 1, in which the separating members are metallic.

3. The method as claimed in claim 1, in which the separating members only partially separate the bar into ingots.

4. The method as claimed in claim 1, in which metallic separating members are employed having a higher melting point than the metal being cast.

5. The method as claimed in claim 1, in which a heat resisting material is used for the separating member.

6. The method as claimed in claim 1, in which the separating members are coated with protecting material.

7. The method as claimed in claim 1, in which the separating members are of such shape that they will give an appropriate form to the end of the ingot to enable the ingot to be readily used in a rolling, forging or extruding process.

8. The method as claimed in claim 1, in which the separating members are perforated.

9. In a process of continuously casting metal bars, the method of effecting separation of the bar into ingots which consists in inserting separating members in the bar as it is being cast designed to effect partial separation between parts of the bar of such character as to enable them to be readily broken into ingots by placing said members on the molten surface of the ingot as soon as the desired length of ingot has been reached.

10. The herein described method which comprises continuously casting a bar of metal, inserting separating members into the bar designed to effect almost complete separation between the sections of the bar by placing said members on the molten surface of the ingot as soon as the desired length of ingot has been reached, then moving the bar against a fixed surface to cause breaking deflection and breaking off of the end of the bar.

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