E. A. CUSTER.

PROCESS OF PRODUCING CASTINGS HAVING RELATIVELY LARGE SECTION IN PERMANENT MOLDS.

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Fig. 1.

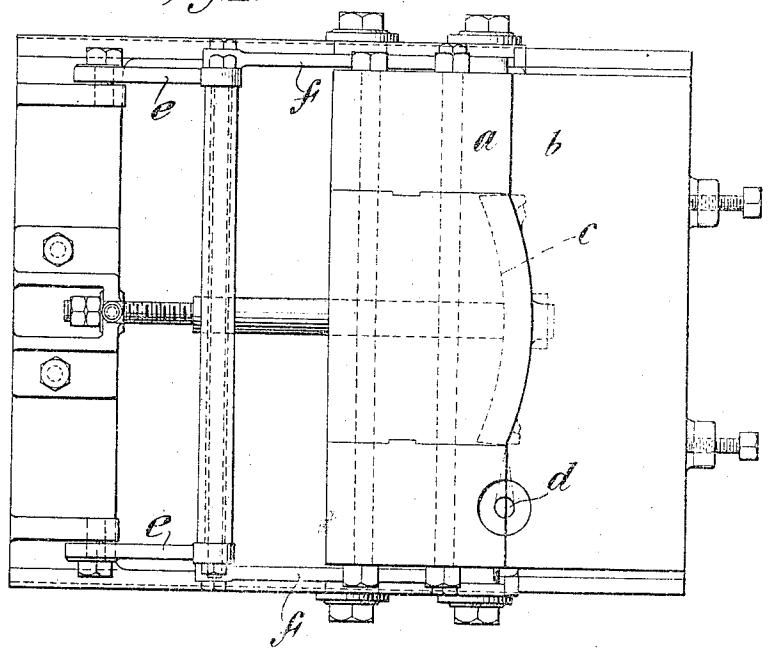
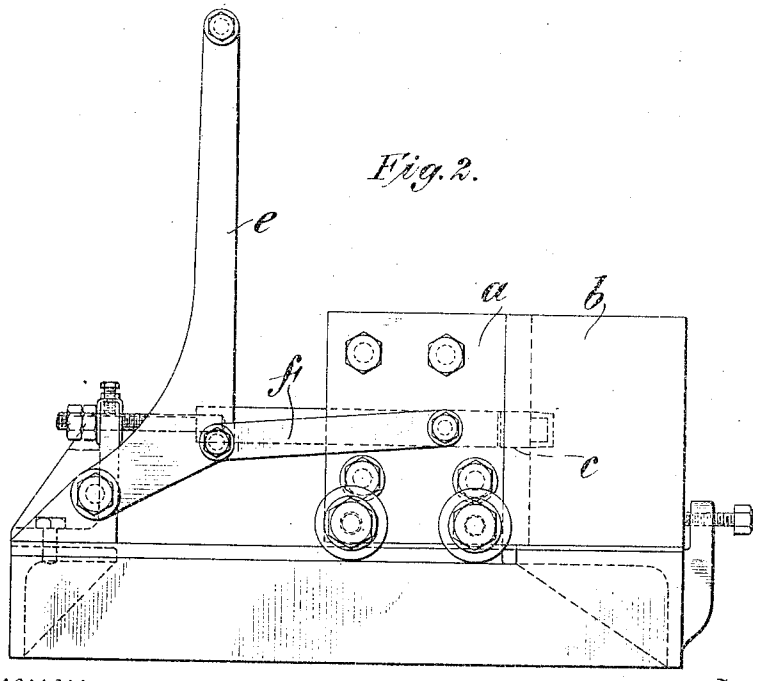


Fig. 2.



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UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING CASTINGS HAVING RELATIVELY LARGE SECTION IN PERMANENT MOLDS.

1,043,404. Specification of Letters Patent. Patented Nov. 5, 1912.

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To all whom it may concern:

Be it known that I, EDGAR A. CUSTER, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Producing Castings Having Relatively Large Section in Permanent Molds, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

It is now well known that machinable iron castings may be produced in permanent molds by bringing the metal of the casting swiftly to the point of setting, and then removing the casting from the mold before the metal chills, and permitting same to cool to normal atmospheric temperature. Heretofore, however, many difficulties have been encountered in attempting to produce large castings, that is, castings having a relatively thick section, and containing a considerable quantity of metal because such large castings would not be homogeneous throughout but would contain large crystals on the interior and also because segregations would occur in the interior of such castings. Furthermore it has been found extremely difficult to produce such large castings of the exact shape of the mold and free from distortions of any kind. These imperfections in large castings have resulted from the necessity of withdrawing the casting from the mold before chilling any portion thereof, and consequently a considerable body of molten metal would remain in the interior of the casting, which would cool slowly giving rise to segregations.

The object of this invention is to provide a process whereby a relatively large iron casting or a casting of considerable section which is cast in a permanent mold, will be homogeneous throughout and which will conform absolutely with the shape of the mold and be entirely free from distortions of any kind.

In practising my improved process the casting is set deeply so as to form a relatively thick wall around the molten iron in the interior of the casting, which resists the well known tendency of the molten metal to expand when cooling and this force is, so to speak, turned upon itself, thus producing a fine crystallization and preventing segregation. The deep setting is brought about by conducting the heat away from the molten metal of the casting very rapidly. This may be accomplished by making the mold of cast iron or similar metal of a very large bulk compared with the area of the casting exposed to the action of the mold. The heat is removed from the casting and the setting progresses from the exterior toward the center of the casting, and the casting is subjected to the action of the mold until the metal is about to chill, that is, the point where the white hard crystals are about to form, and thereupon the casting is removed from the mold and allowed to cool to normal atmospheric conditions.

In the accompanying drawings: Figure 1 is a plan view and Fig. 2 is a side elevation of a mold which may be employed in practising my invention.

The mold comprises the parts *a* and *b* hinged together and having registering recesses provided therein to form the matrix *c* of the mold. Since this invention is not directed to any specific structural device it is obvious that the parts *a* and *b* need not necessarily be hinged together, nor need the other operating parts of the apparatus be constructed in accordance with the embodiment herein illustrated. The molten metal is introduced to the matrix through a suitable gate *d*. The mold is opened and closed by suitable means as the lever *e* and links *f*. The bulk of the mold is preferably about 20 times the bulk of the casting, and may be greater if desired, depending upon the thickness of the casting. Preferably the mold has at least sufficient bulk and radiating surface to prevent the temperature from rising above 600° F.

By my improved process castings of considerable thickness may be cast in permanent molds without injury to or distortion of the mold. The casting will be of fine even grain throughout and may be easily machined. Although the casting is removed from the mold while the interior is in a molten condition the swift deep setting of

the exterior portion prevents segregations of any kind and also prevents the casting itself from becoming distorted.

I claim as my invention:

1. The process of producing relatively large castings of iron in permanent molds, which consists in causing the casting to set deeply without chilling to form an expansion resisting outer layer, removing the casting from the mold while the interior thereof is in a molten condition and then permitting the casting to cool to normal atmospheric temperature.

2. The process of producing castings of iron having relatively large section in permanent molds, which consists in producing an expansion resisting wall around the molten metal in the interior of the casting by swiftly removing a relatively large quantity of heat from the outer portion of the casting, removing the casting from the mold before the outer portion is chilled, and allowing the casting to cool to atmospheric temperature.

3. A process of producing castings of iron having a relatively large section in permanent molds, which consists in swiftly removing a very large quantity of heat from the casting, thereby setting it deeply and producing a thick wall that resists the tendency of the molten metal in the interior to expand and produces a fine even grain throughout the casting, removing the casting from the mold before chilling has set in, and then allowing the casting to cool to normal atmospheric temperature.

4. The process of producing castings of iron having a relatively large section in permanent molds, which consists in rapidly removing a relatively large quantity of heat from the outer portion of the casting to cause same to form an expansion resisting outer layer and compress the molten metal in the interior of the casting, and removing the casting from the mold before the outer portion has chilled and then allowing same to cool to normal atmospheric temperature.

5. A process of producing castings of iron having a relatively large section in permanent molds, which consists in casting in a mold having a bulk of not less than twenty times that of the outer portion of the casting contiguous thereto and cooled thereby, so as to cause the outer portion of the casting to set deeply and form a resisting wall, removing the casting from the mold while the interior is molten but before the exterior has chilled, and allowing the same to cool to normal atmospheric temperature.

This specification signed and witnessed this 1st day of December, A. D., 1910.

EDGAR A. CUSTER.

Signed in the presence of—
AMBROSE L. O'SHEA,
HELEN M. DAWES.