July 31, 1928. 1,678,655

K. SIPP

PRODUCTION OF IRON CASTINGS

Filed Nov. 3, 1925

FIG. 1.

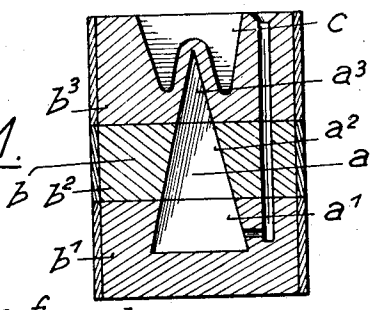


FIG. 2.

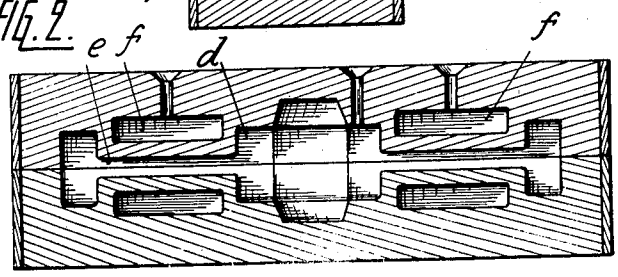


FIG. 3.

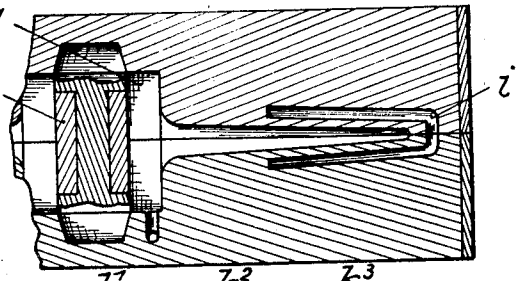
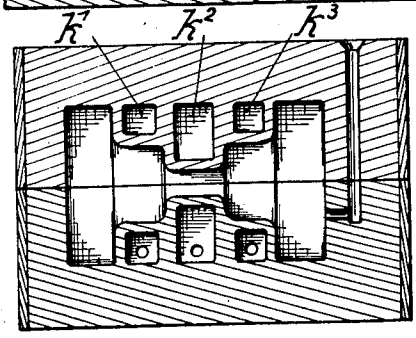


FIG. 4.



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UNITED STATES PATENT OFFICE.

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PRODUCTION OF IRON CASTINGS.

Application filed November 3, 1925, Serial No. 66,462, and in Germany November 30, 1924.

My present invention relates to the production of cast iron articles having parts varying widely in cross-section, and the object thereof is to secure so far as possible in such castings a uniformity of structure and even hardness throughout all parts thereof.

It is a matter of common knowledge that in castings of an article of widely varying cross-section—for example, a conical body—there will be a great difference in the structure formed in the different sections. Generally speaking, it can be said that the structural constituents formed will be ferrite in the thicker and cementite in the thinner portions, while in the intermediate sections there will be formed different structural constituents lying between the limits specified. The reason for this is to be found in the unequal cooling of the metal in the different parts of the casting.

The disadvantages due to the differences of structure in a casting are well known, and hence it is necessary here to refer only, by way of example, to the extreme difficulty which is experienced in working an article of uneven structure and hardness and to the stresses, produced in the formation of the various structural elements, which often endanger the stability of the entire piece.

The invention by which I obviate these defects consists, broadly speaking, in so controlling the cooling of the casting, by retarding the cooling of the thin sections or by hastening the cooling of the thick sections, or by both, that a uniform, or so far as practicable uniform, structural formation will take place in the different sections.

Suitable means for the production of a variety of articles according to my new process are shown, by way of illustration and not of limitation, in the accompanying drawings, in which—

Figure 1 is a view, in central vertical section, of a mold for casting a conical article, illustrating one method of controlling the cooling of such a casting; Fig. 2 is a similar view of a split mold for a fly-wheel, illustrating a modification of the means provided for the control of its cooling; Fig. 3 is a similar sectional view of a portion only of a mold, for a ship's propeller, illustrating a further modification of the cooling process appropriate to such article; and Fig. 4 is a sectional view of a mold, for an article of still different shape, providing a still further modification of the means for obtaining an even cooling of its parts.

Referring first to Fig. 1 of the drawings, a indicates a conical piece, or rather the mold cavity for the casting of a conical piece, and b indicates the mold, which is shown as made in three sections. Taking for example a mixture for the casting which will produce good workable cast iron only in the base or thick lower end a^1 of the cone, in order to obtain approximate uniformity of structure in the upper and thinner portions a^2 and a^3 the lower mold section b^1 is left green, the intermediate section b^2 is dried, and the upper section b^3 is preheated in any suitable manner to the required temperature. All three sections of the mold can, if desired, be made of dry sand and preheated to different temperatures, each of the upper sections being heated progressively higher than the section below. The sections which are to be preheated can either be heated in drying ovens before they are assembled together or, after being assembled, by inserting a suitable heated piece or by pouring molten iron into the cavity c, or in such other suitable manner as may at the time be found most practicable.

For the casting of a fly-wheel in the cavity d of the mold illustrated in Fig. 2, the casting mixture is adjusted to the heavy or thick parts of the casting, in this case the hub and the rim, and the cooling of its thin radial arms in the portions e of the mold cavity is suitably retarded by preheating the adjacent portions of the mold, as by pouring molten iron into the cavities f, or by the application of any appropriate heated pieces.

In the case of the mold illustrated in Fig. 3, for a ship's propeller g, where because of the great differences in its different sections such means for the control of the cooling as are illustrated in Fig. 1 are insufficient, the mixture is adjusted to an average of the different sections of the casting and the cooling of the thin sections or blades is retarded, in the manner described with reference to the

intermediate section of the mold of Fig. 1, by drying the sand while the cooling of the thick or hub portion is hastened by applying a chill *h* of iron or by other equivalent means.

As a further means for retarding the cooling of the thin sections of the castings, the mold shown in Fig. 3 has formed therein an air-chamber *i*, according to the invention of German Patent No. 325,250, which is formed in that portion of the mold embracing these thin sections and serves to render such portion a poor conductor of heat.

In the last modification, illustrated in Fig. 4, the mold is provided with several channels k^1 k^2 k^3 which surround the thinner portions of the mold cavity and through which are conducted fluids (gases or liquids) heated to varying degrees of temperature according to the requirements.

Furthermore, by controlling the diversified cooling of the different sections in accordance with the principles of the pearlite casting process described in the Diefenthäler & Sipp Patent No. 1,544,562, July 7, 1925, it is possible to obtain a pearlitic structure throughout the entitre casting.

What I claim as new, and desire to secure by Letters Patent, is—

1. The method of producing gray iron castings in shapes of widely varying sections having a substantially uniform structure and hardness throughout, which consists in casting with a mixture adjusted to produce under normal cooling conditions a workable gray iron in one of its thick sections and in retarding the cooling of the metal in the thinner sections and hastening its cooling in any thicker sections.

2. The method of securing an approximate uniformity of texture and hardness in cast iron propellers, which consists in equipping the mold therefor with means both for hastening the cooling of the metal in the hub and retarding the cooling of the metal in the blades and in casting therein with a mixture suitably adjusted to an average of the different sections.

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