C. B. CARTER.

METAL FOUNDING.

APPLICATION FILED AUG. 24, 1910.

974,024.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

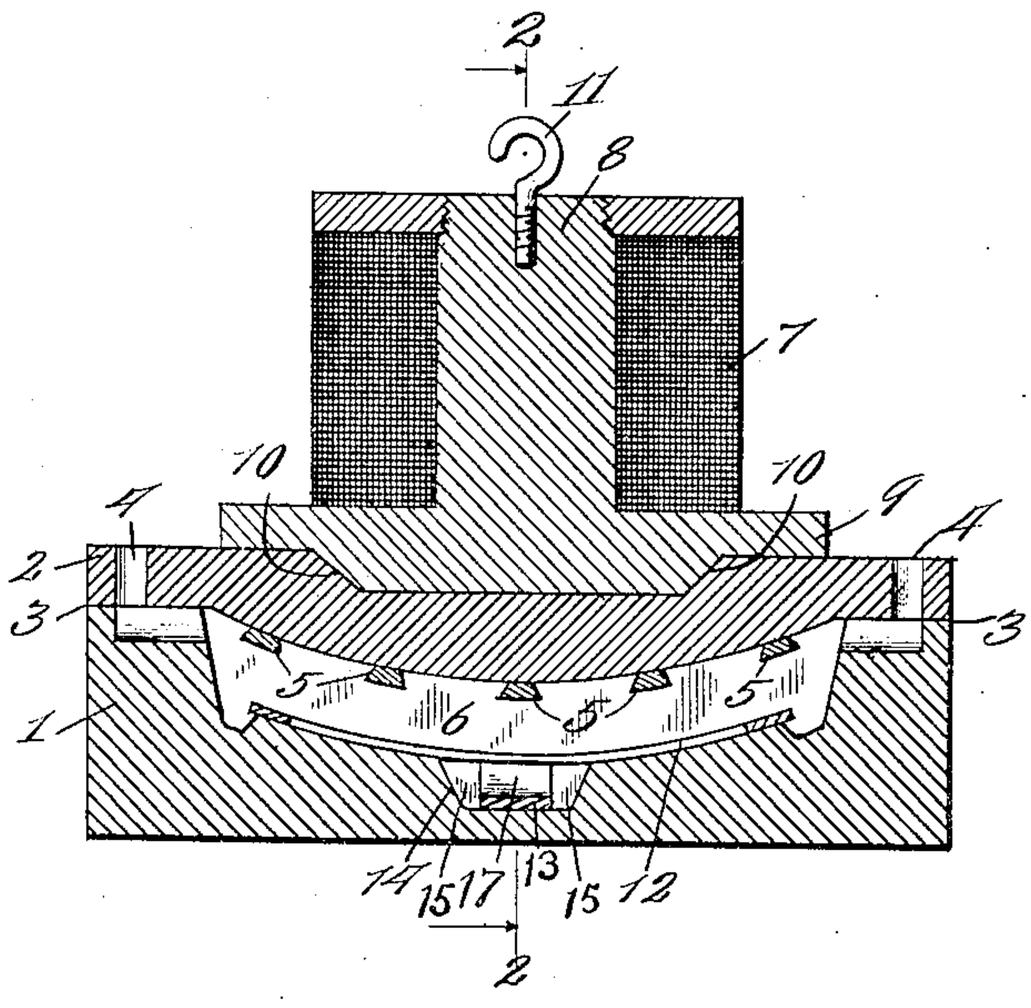


Fig. 2.

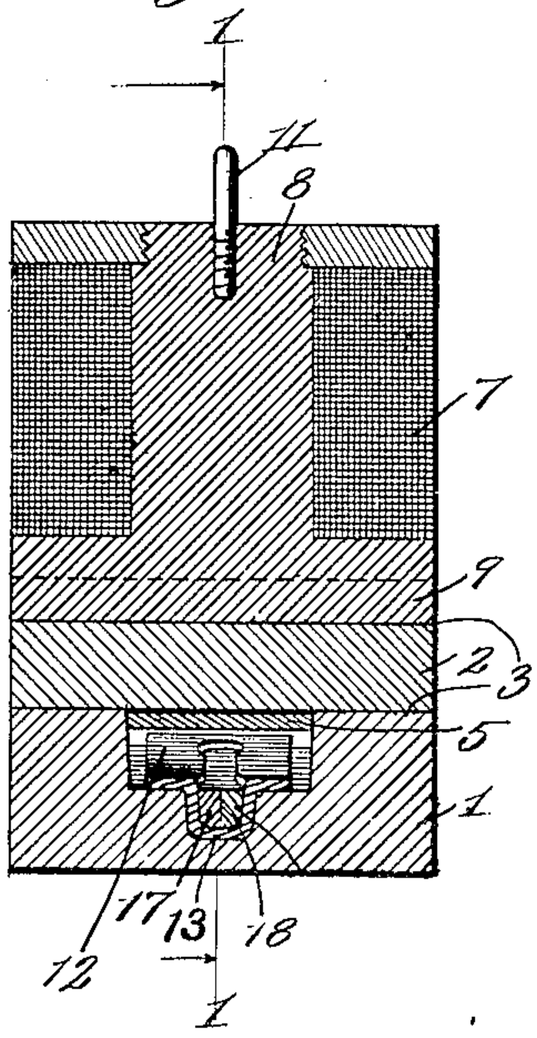


Fig. 3.

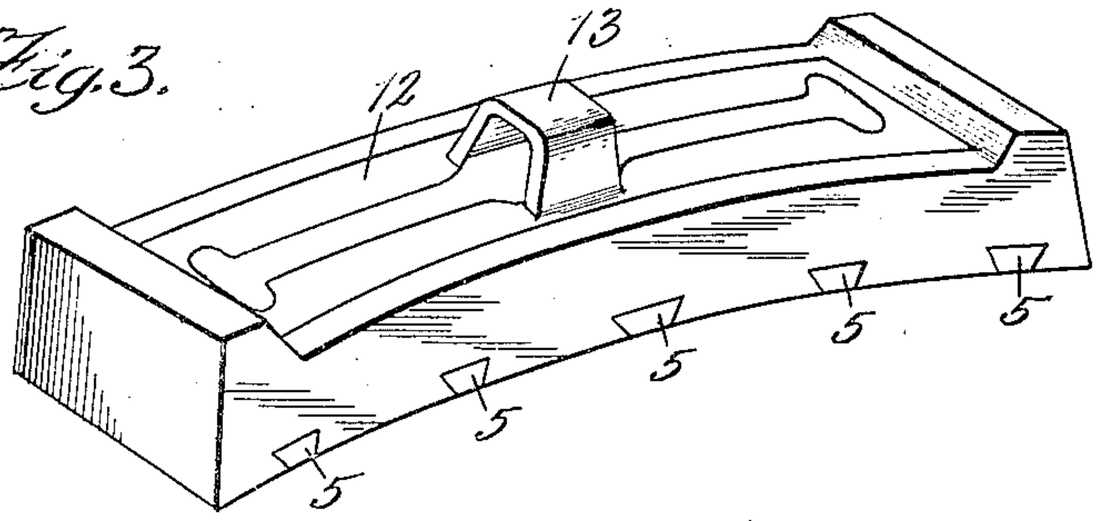
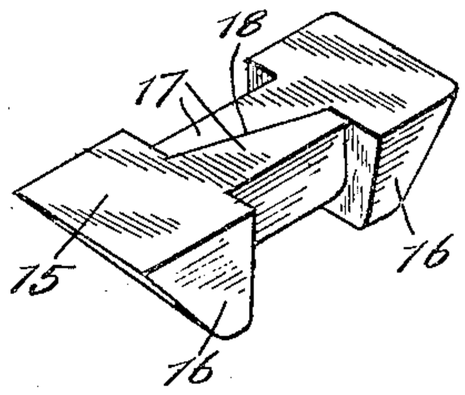


Fig. 4.



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Geo. E. Waldo.

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2 SHEETS—SHEET 2.

Fig. 5.

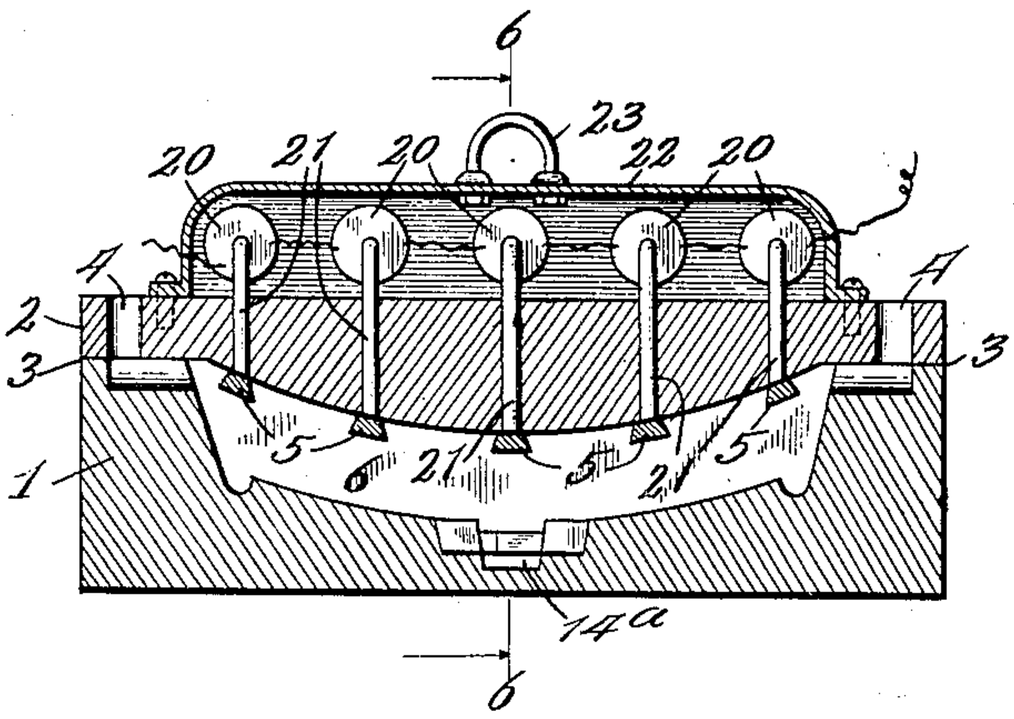


Fig. 6.

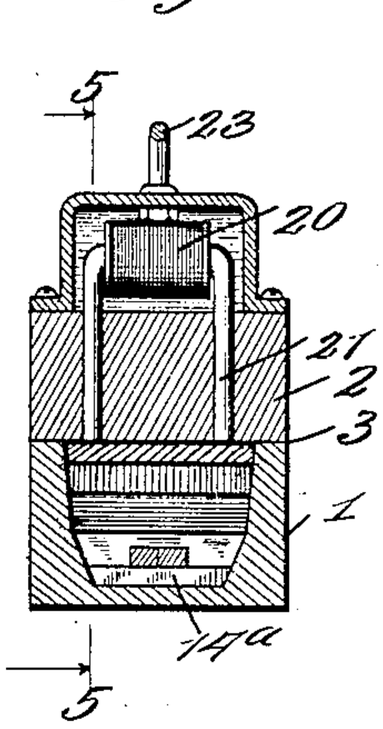


Fig. 7.

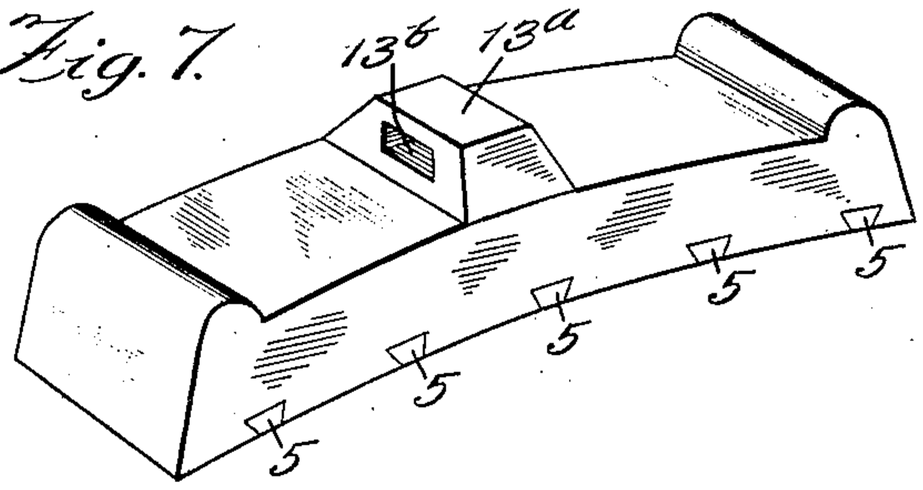
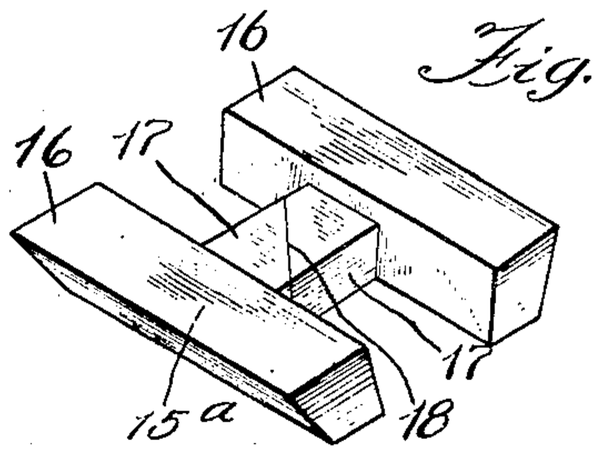


Fig. 8.



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UNITED STATES PATENT OFFICE.

CHARLES B. CARTER, OF CHICAGO, ILLINOIS.

METAL-FOUNDING.

974,024. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed August 24, 1910. Serial No. 578,800.

To all whom it may concern:

Be it known that I, CHARLES B. CARTER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Art of Metal-Founding, of which the following is a specification.

This invention relates to improvements in the art of metal founding, and has particularly in view an improved manner of and apparatus for holding in position in the mold the metal "inserts" placed there, in order that they may be incorporated in the casting subsequently formed therein.

It also has in view an improved manner of clamping the mold together preparatory to pouring, which latter improvement may be found useful even when metallic inserts are not used in the mold.

In casting brake shoes, for example, it is common practice to place a number of pieces or bars of relatively hard or tough metal in the mold in such position that when the brake shoe is subsequently cast, these pieces or bars will become incorporated in the face of the brake shoe, as so-called "inserts," by which the wearing and braking qualities and life of the shoe will be greatly increased. Steel backing pieces are also inserted in brake shoe molds in such position that they will become incorporated with the shoe on its back side, much as the metal inserts above mentioned become incorporated in its face. This is particularly the case with brake shoes designed for use on the drive wheels of locomotives, in which case the backing piece or "back," which is usually made of sheet steel, is relied upon to strengthen the shoe and at the same time provide the lug by which the shoe is keyed in place in the brake head. When any such inserts or backing pieces are employed, however, the problem of securing them at the proper points in the mold preparatory to pouring the casting, is at once presented. It is frequently found desirable to cast the shoe face upwardly, and in such case the inserts must be secured in the top of the mold cavity and suspended, as it were, from the top wall or roof of the mold. Or, if the casting arrangement is reversed and the shoe is cast with its face downward, the steel back, when used, must be similarly secured or suspended, as it were, in the upper part of the mold cavity and held in place against the roof or upper wall of this cavity until such time as the metal which is poured into the mold solidifies around the back. Even where the inserted pieces are not provided in the top of the mold cavity, but rest on its bottom, difficulty is frequently experienced in holding the inserted pieces precisely in place during the pouring operation, since the inrush of the entering metal is liable to sweep them out of position unless securely held.

With these facts in view, my present invention contemplates the employment of magnetic attraction, to hold in proper position within the mold any such inserted pieces—backs, face inserts, or the like. The magnetism utilized may be inherent in the parts themselves, or may be due to a properly applied magnetic field, such for example as will be set up by an electromagnet that can be controlled at will by regulating the current through its coils, which will operate to draw the inserted pieces (of iron or steel) firmly toward or against the adjacent inner surfaces of the mold, with a force sufficient to overcome the attraction of gravitation and to successfully resist any tendency of the inflowing metal to wash the inserted pieces out of place. This improvement—the employment of magnetic attraction to hold the inserted pieces in place in the mold—may be used to particular advantage in connection with the casting of brake shoes in metallic molds or chills, where the mold itself is made wholly or principally of magnetizable metal and is formed to permanently present the shape of cavity desired for the shoe. With such metal molds, the problem of holding the inserted pieces securely in position prior to and during the pouring of metal, is quite a serious one, particularly where it is necessary to suspend, as it were, the insert pieces from the roof of the mold cavity, but the problem is readily solved by resorting to magnetic attraction, in accordance with the contemplation of this improvement. For example, the inserts in this case may be made of steel and first permanently magnetized, so that they will inherently tend to fasten themselves to the surface of the iron mold at whatever point where they are placed in contact with it. Or assuming again, for example, that it is desired to cast a brake shoe with its face uppermost and with iron or steel inserts in the face of the shoe, an electromagnet may

be provided, in connection with the mold, in such manner as to draw the inserted pieces firmly against the roof of the mold cavity and hold them securely in place there until the metal has been poured in and has solidified about the inserts sufficiently to hold them permanently in position, the magnet being kept energized by the passage of a suitable current through its coils until this solidification has taken place. If a steel back is also to be provided in the shoe, the magnetic action will at the same time be relied upon to clamp this back in position in the bottom of the mold cavity. Or, if desired, the position of the mold may be reversed so as to locate the steel back at the top of the mold cavity and the face inserts in its bottom, the magnetic action, however, serving as before to hold the inserted parts securely in place until the casting is completed. Furthermore, with a mold constructed principally or largely of iron, the same magnetic action may be utilized to clamp the parts of the mold itself together thus doing away with the mechanical clamps ordinarily used for the purpose. And this method of clamping together the parts or sections of a mold which is formed wholly or largely of iron or steel, or has sufficient iron or steel parts incorporated in its different sections, may obviously be found of advantage without regard to whether or not the magnetic action is also utilized for the positioning within the mold of inserted metallic pices, such as backs or faces. All of this is illustrated, by the way of example, in the accompanying drawings, in which—

Figure 1 is a longitudinal section, taken on line 1—1 of Fig. 2, of a metallic mold provided with an electromagnet attachment and arranged for the casting of brake shoes with a steel back and face inserts. Fig. 2 is a transverse sectional view thereof, taken on the line 2—2 of Fig. 1. Fig. 3 is a perspective view of a brake shoe, such as is designed to be cast in this mold. Fig. 4 is an enlarged perspective detail of a sectional metallic core piece designed for the coring of the hole through the lug on the back of the shoe, by which the shoe is attached to the brake head. Fig. 5 is a longitudinal section, taken on the line 5—5 of Fig. 6, of a generally similar mold in which, however, the electromagnet arrangement is somewhat different, and from which the steel back has, in this instance, been omitted. Fig. 6 is a transverse section of this mold taken on the line 6—6 of Fig. 5. Fig. 7 is a perspective view of such a brake shoe as is designed to be cast in this mold. Fig. 8 is a perspective detail of a sectional metallic core piece, slightly modified from that shown in Fig. 4.

Referring first to the construction shown in Figs. 1 and 2, it will be understood that the mold here illustrated is a two-part affair, consisting as usual of a drag 1 and cope 2. The mold is parted on the line 3 and is provided with suitable sprue holes 4 through which the pouring may take place. This mold is shown as arranged for the casting of shoes face upward, and with iron or steel inserts 5 in the face of the shoe, and it is contemplated that these inserts will be held in place within the mold cavity 6 preparatory to and during the casting operation, by magnetic action, such as will serve to make the inserts stick, as it were, to the upper surface of the mold cavity—the lower face of the cope—until the metal has had time to cool and solidify around them so as to hold them permanently in position. Assuming that these inserts are made of steel, they may be permanently magnetized before being used, and in such case the magnetic attraction inherent in them will serve to make them stick wherever placed against the under surface of the cope, where this is made of iron or steel, with sufficient tenacity to enable the casting to be poured, without their dropping off or being otherwise disturbed in their positions. Or the magnetic action will be brought about by an electromagnet such as I have illustrated, somewhat diagrammatically, at 7. The core 8 of this magnet I have shown as terminating at its lower end in a pole plate 9 that is arranged to fit against the upper surface of the cope and is herein shown as interfitted therewith, as at 10. When this magnet is energized by the passing of a suitable current through its coils, the magnetic field established will tend to draw the inserts 5, which in this case may be made of either iron or steel, and need not have been previously magnetized, firmly against the under side of the cope, as shown. This magnetic action will also serve to clamp the cope 2 firmly against the pole plate 9 of the magnet, in case the cope is made of magnetizable metal. And in case the entire mold is made of such metal, the magnetic action will further serve to clamp the cope and drag together so that no mechanical clamping device will be necessary. In such case, also, the electromagnet may be used in connection with a crane to lift the cope prior to placing it on the drag, or to lift the entire mold when the cope is in place on the drag, a lifting hook 11 being provided in the top of the electromagnet for the purpose. In the complete development of my invention, this making of the entire mold of magnetizable metal is contemplated, cast iron lending itself most perfectly to the purpose. The utilization of electromagnetic action for holding the inserts in place would, however, be possible if the mold or cope were made of nonmagnetic metal, or even of nonmetallic material.

In Figs. 1 and 2 the mold is shown as arranged to receive the steel back 12, with

which brake shoes are now very frequently provided. This back is shown as formed in the usual manner with a lug 13 which is struck up from the metal of the back, and which, when the shoe is completed, forms the lug by which the shoe is attached to the brake head. A recess 14 is provided in the bottom of the mold cavity to receive this lug, and in order to prevent the molten metal from filling the lug, a core piece 15 is inserted in the cavity 14. This core piece may, of course, be made of sand and baked in the ordinary manner, but to avoid the necessity for venting the mold at this point and to enable the entire mold to be made of permanent parts, I have, as a further improvement, shown this core piece as itself made of metal and in sections, so that it may be readily slipped into place and as readily knocked out of the casting when completed. The piece is made with enlarged head portions 16, which occupy the ends of the mold recess 14 at either end of the lug 13 of the steel back. And these head portions are connected by smaller neck portions 17 which together serve to fill the lug 13 and prevent the molten metal from flowing into the lug so as to close it. To enable this core piece to be inserted through the lug, and afterward readily knocked out of the casting, it is made in sections, as shown in Fig. 4, the plane of cleavage or separation between the sections being preferably a diagonal one extending through the neck portion of the sections, as indicated at 18 in said figure.

In Figs. 5 and 6, I have illustrated the mold as made up with a somewhat modified electromagnetic arrangement, in which a separate magnet 20 is provided for each of the inserts 5. Each magnet is here shown in horse shoe form with its pole pieces 21 extending through holes provided in the cope to receive them, the idea being to apply the inserts directly to the ends of the pole pieces. The cope itself in this case may be made of nonmetallic material, or even of sand, or it may be made of metal having very poor magnetic qualities such as an alloy of iron or manganese. A cover plate 22 is in this instance shown as secured to the cope over the coils of the magnets 20, and is provided with a loop or hook 23 by which the cope is lifted. A steel back shoe may, of course, be cast in the mold shown in Figs. 5 and 6, as well as in that shown in Figs. 1 and 2, but as herein illustrated, the mold is arranged for the casting of a shoe in which the steel back is omitted, and such as is illustrated in Fig. 7. In such shoe, the lug 13^a at its back will be cast with the rest of the shoe, and is here shown as arranged to have its opening 13^b formed by a core piece 15^a. This is illustrated in perspective in Fig. 8, and is substantially similar to the core piece shown in Fig. 4, which I have already described, the devices only differing in details which are obvious from an inspection of the drawings, and which are not of material character. This core piece 15^a fits into a recess 14^a in the bottom of the mold cavity, substantially as in the case of the core piece, 15 of the mold previously illustrated, and will be knocked out of the completed casting in the same manner, by the separation of its sections along the line of cleavage 18.

I claim:—

1. The method of making castings containing inserts of magnetizable metal, which consists in holding the inserts in place in the mold by magnetic action, pouring the molten metal into the mold, and allowing it to cool and harden about the inserts thus held, substantially as described.

2. The method of making castings containing inserts of magnetizable metal, which consists in supporting the inserts in the mold against the attraction of gravitation by magnetic action, pouring the molten metal into the mold, and maintaining the magnetic action until the molten metal has solidified sufficiently to maintain the inserts in place, substantially as described.

3. The method of making castings containing inserts of magnetizable metal in a mold of magnetic material which consists in magnetizing the inserts, placing the magnetizing inserts in proper position against the interior surface of the metal mold to be retained there by their magnetic action, and pouring the molten metal into the mold to inclose the inserts, substantially as described.

4. The method of making castings containing inserts of magnetizable metal in a mold of magnetic material, which consists in magnetizing either element, placing them in contact with each other so as to be held in place by magnetic attraction, and pouring the molten metal into the mold around the inserts thus held, substantially as described.

5. The method of making castings which consists in clamping the parts of the mold together by magnetic action, pouring the molten metal into the mold, and maintaining the magnetic action until the molten metal has solidified, substantially as described.

6. The method of making castings containing inserts of magnetizable metal in a mold of magnetizable metal, which consists in magnetizing the mold so as to hold the inserts in position therein by magnetic attraction, filling the mold with molten metal and allowing it to cool and harden about the inserts thus held, substantially as described.

7. The method of making castings in a mold of magnetizable metal, which consists in magnetizing the mold so as to clamp its parts together by magnetic attraction, pouring the molten metal in the mold and continuing the magnetic action until the poured

metal has cooled and hardened sufficiently to maintain its shape, substantially as described.

8. The method of making castings containing inserts in a mold of magnetizable metal, which consists in magnetizing the mold so as to hold the inserts therein by magnetic attraction and so as to cause the sections of the mold to be clamped together by a magnetic attraction, filling the mold with molten metal and maintaining the magnetic action until the entering metal has cooled and hardened sufficiently to maintain its shape and hold the inserts in place, substantially as described.

9. The combination with a mold, of an electromagnet for holding inserts of magnetizable metal in position within the mold, preparatory to and during the casting operation, substantially as described.

10. The combination with a mold, and means for inducing a magnet field through the mold and thereby magnetically holding in position within the mold inserts of magnetizable metal preparatory to and during the casting operation, substantially as described.

11. The combination with a sectional mold, of means for clamping the sections of the mold together by magnetic attraction preparatory to and during the casting operation, substantially as described.

12. The method of making castings containing inserts of magnetizable metal, which consists in placing the inserts within the mold, holding them in position therein by subjecting them to the attraction of a magnetic pole, pouring the molten metal in the mold, and continuing the magnetic attraction until the entering metal has solidified sufficiently to maintain the inserts in position, substantially as described.

In testimony that I claim the foregoing as my invention, I affix my signature in presence of two subscribing witnesses, this 22nd day of August, A. D. 1910.

CHARLES B. CARTER.

Witnesses:

HENRY WAITE,

JENNIE L. FISKE.