May 13, 1930. B. F. WALLACE 1,758,095

PARTING FACING PRODUCT FOR CASTING METALS

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Fig. 1.

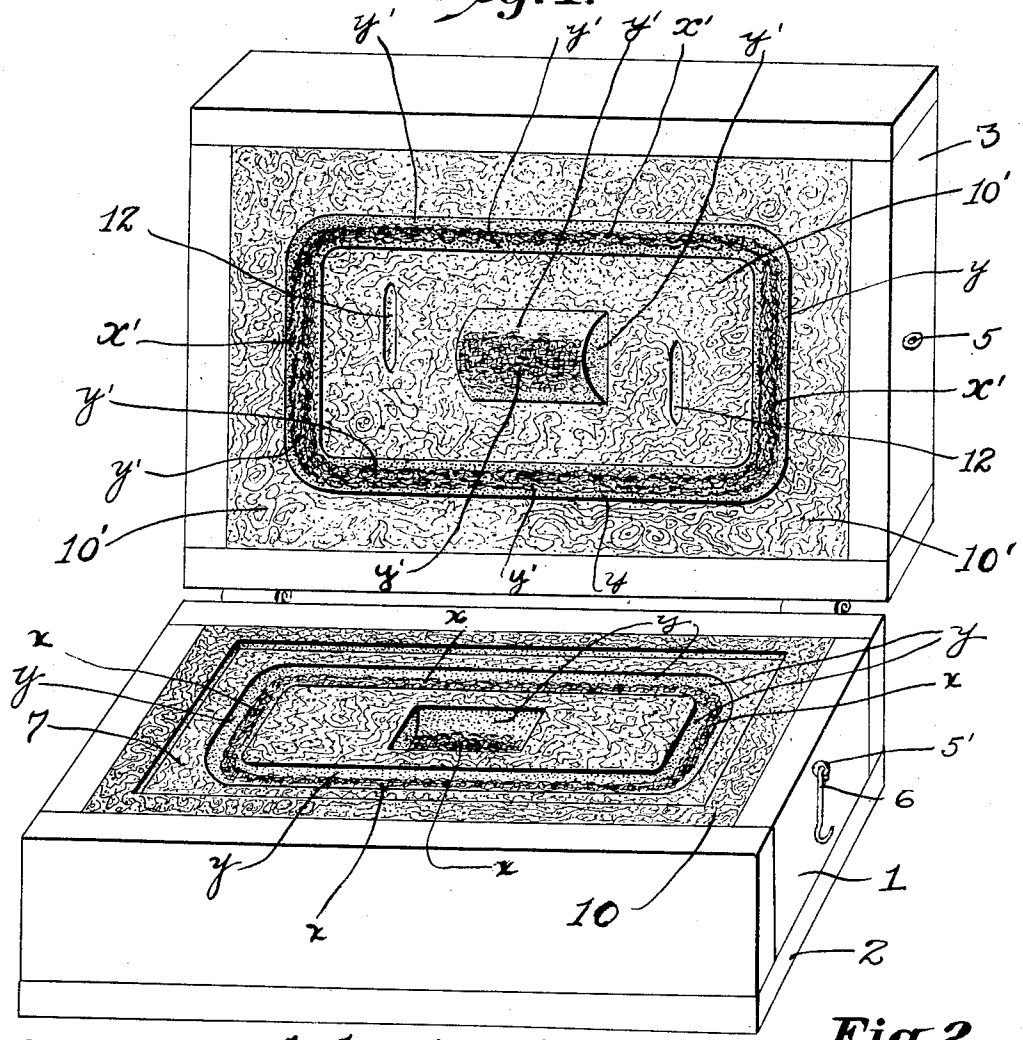

Fig. 2.

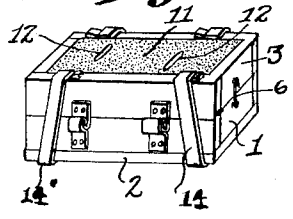

Fig. 3.

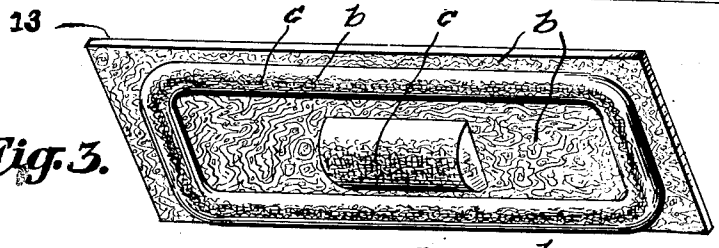

Fig. 4.

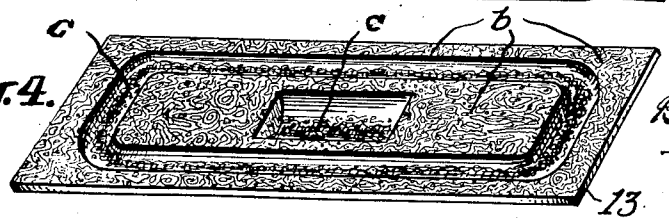

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Fig. 5.

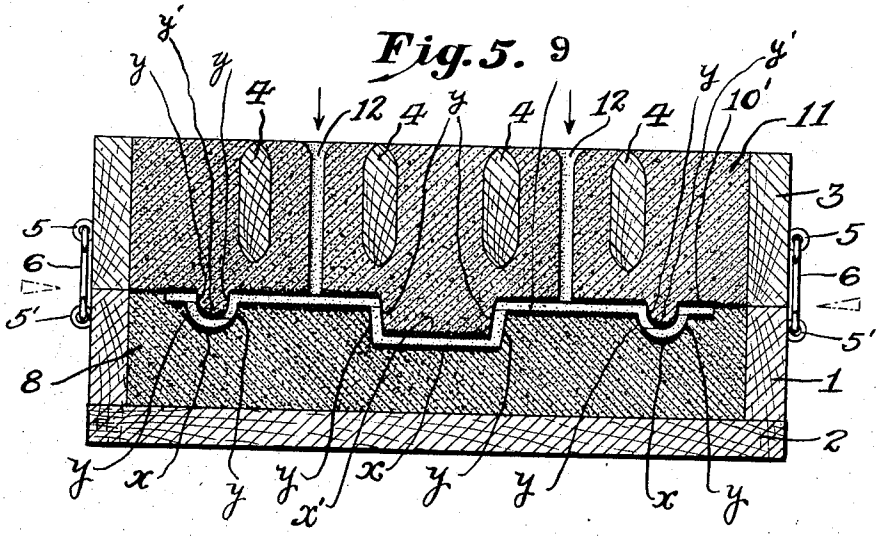


Fig. 6.

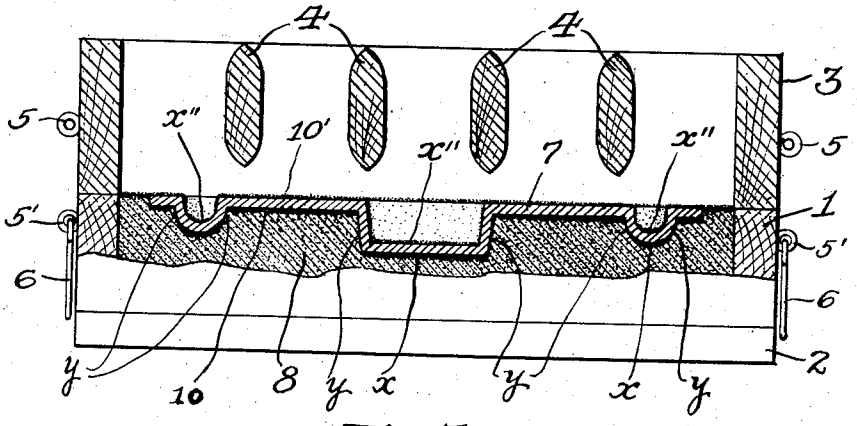
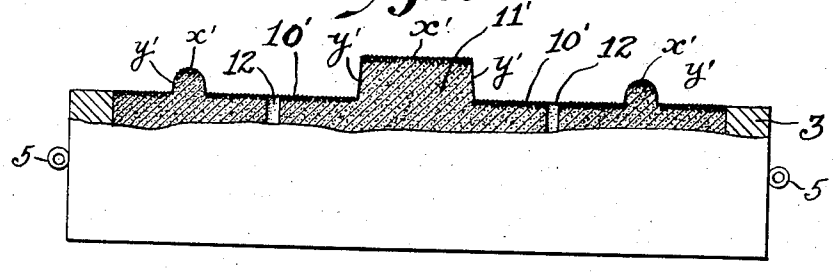


Fig. 7.



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Patented May 13, 1930 1,758,095

UNITED STATES PATENT OFFICE

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PARTING-FACING PRODUCT FOR CASTING METALS

Application filed January 8, 1926. Serial No. 79,958.

This invention relates to casting metal and more particularly iron, and has for its particular objects the production of a so-called parting facing composition for preparing molds, also the more expeditious and effective preparation of molds for casting metal, furthermore the perfect casting of metal and finally, the production of castings of high quality, of attractive appearance and unusually true to the patterns, and which require a minimum of finishing in the way of tumbling and milling operations.

In the ordinary operation of making either the drag or cope side of the mold in the casting of cast iron, the riddling operation carries down the parting material from the raised portions of the pattern and sloping portions of the surface thereof, with the result that the parting accumulates unduly on the deep portion of the cope and the drag, thus producing a dirty casting. Furthermore, when the mold is faced with graphite, but a "print back" operation is not resorted to, the molten metal tends to strip or wash down the facing material from all of the surfaces and carry the same to the butt end of the flask or to the base risers in those cases where the latter are employed, with the consequence that the molten metal affects the exposed siliceous parting of these surfaces from which the facing has been washed off and this results in the production of a casting that is also dirty and has a difficultly removable coating of a parting and sand mixture adhering thereto which necessitates prolonged tumbling and milling operations in order to obtain a reasonably clean, smooth casting.

While a "print back" operation tends to reduce this washing down of the facing material employed by the molten metal, nevertheless such operation is not only expensive but a very delicate one and even in such operations it is difficult to prevent the sticking of the facing to the pattern due to the fact that the special facing, consisting of untreated graphite and charcoal customarily used in the "print back" operation, is highly absorbent of water and pervious to the passage of water from the wet sand through to the surface of the pattern. Furthermore, the accurate replacement of the pattern is an operation requiring the utmost skill to prevent serious injury to the mold with the consequent impairment of the casting thus produced.

The washing down of the facing material by the molten metal and its collection in the butt end of the mold will produce a casting which is particularly dirty on those portions which conform to that end of the mold. In the preparation of the mold by either of the aforesaid methods, two dusting operations are required, first, dusting with parting material, and second, dusting with facing material, and if the "print back" operation is employed, still a further operation of returning the pattern is necessary.

My invention renders it possible to employ but a single stage operation for the preparation of the mold as well as to produce a mold in which the parting-facing material employed will not wash or run before the molten metal during the pouring of the mold, because of the fact that it is embedded in the surface of the mold during the ramming operation and to produce a casting true to the pattern, substantially free from adhering or difficultly removable coating of sand and parting-facing material and from which any adhering coating can be readily removed by wire brushes, thus eliminating the necessity for prolonged sand blasting, tumbling and milling operations. Further advantages are set forth in the following detailed descriptions and drawings forming a part of this specification.

In the drawings,

Figure 1 is a perspective view in an open position of a finished mold after the removal of the pattern, prepared in accordance with my invention;

Fig. 2 is an elevation of the same mold in a closed position, illustrating the customary locking means;

Fig. 3 is a perspective view of the lower face and Fig. 4 a similar view showing the top face of an iron casting prepared in the mold shown in Fig. 1;

Fig. 5 is a vertical section of the prepared mold shown in Fig. 2;

Fig. 6 is a vertical section, partially in elevation, of the completed drag showing the pattern dusted with my parting-facing material preparatory to riddling the sand thereon to form the cope; and

Fig. 7 an elevation, partially in section, of the finished cope but showing the same in an inverted position.

Referring to the drawings by the reference numerals employed to designate the various parts, the numeral 1 represents sides and 2 a removable board on the bottom of the drag side of the flask. The numeral 3 designates the sides of the cope side of the flask, which cope is provided with spaced partitions 4 that serve to reinforce and support the sand in the cope. Rings 5, 5′ which are adapted to receive hooks 6, serve to secure the cope and the drag sides of the flask together when the former is superimposed on the latter. A pattern 7 to which it is desired the finished casting shall conform, is shown in Fig. 6 partially embedded in the sand 8 of the drag after the ramming operation has been completed. The matrix 9 which results from the removal of the pattern is shown in Fig. 5. The layer 10 of my improved parting-facing material is embedded and physically incorporated or packed in the adjacent sand surfaces of the aforesaid drag and another layer 10′ of the same parting-facing material is shown as dusted on the pattern prior to the formation of the cope by riddling and ramming sand 11 (see Fig. 5) on the top of the pattern (see Fig. 6). Gates 12 serve to admit the molten metal to the matrix or chamber 9. Suitable clamps 14, 14′ serve to firmly hold the locked cope and drag sides of the flask together during the casting operation.

The molding and casting operations employed, when utilizing my improved parting-facing product, are as follows:—

The empty drag is inverted on a false bottom, such as a board 2 of at least the area of the external cross-sectional area of the flask and the pattern is inverted on such board. My improved parting-facing material of the hereinafter described character is dusted over the top surface of the inverted pattern and the sand to form the drag half of the mold is riddled on the pattern and rammed in the usual manner. The drag is then inverted into its normal position as shown in Fig. 6. The flat portions and the bottom of the curved portions of the surface of the drag will be impregnated with the parting-facing material which is profusely embedded and packed in the interstices of the upper layer of the drag and will present a mottled appearance, as indicated at x, very similar to that now possessed by the ordinary parting which is due to the impinging action of the sand during the riddling operation, except that owing to the more profuse quantity of parting-facing which I employ to secure the maximum facing value, the mottled appearance of the surface of my improved mold will be more pronounced and of a black rather than a light color due to difference in my composition as composed with silicious parting (see Figs. 5 and 6).

The pattern, now in its normal position (see Fig. 6) as well as the surrounding sand surfaces, are then dusted with said parting-facing material and then the sand riddled and rammed into the cope side of the flask to form the cope of the mold (see Figs. 5 and 7).

The sloping or vertical portions y, y of the matrix chamber walls, while they will not have sufficient parting-facing material embedded therein to be readily observable to the eye, will have a sufficient quantity thereof to effect a perfect parting of the sand surfaces of the cope and drag from the pattern. The amount of parting-facing material on the flat contacting sand surfaces of the cope and the drag is ample to effect a perfect parting between these surfaces in lifting the cope to remove the pattern from the flask. The flat surfaces and the low spots of the cope, as designated by the letters x' and y' will also have a mottled appearance (see Fig. 1) for the reasons above explained with the parting-facing similarly to the surface portions x of the drag.

The mold is now opened, the pattern removed and then the mold is closed again and locked in the manner shown in Fig. 2. This new parting-facing material while it will produce in a single stage operation a casting that compares favorably with the aforesaid three stage "print back" operation, can also be employed to very decided advantage in the "print back" operation in which it reduced the same to a two stage operation and produces a casting which is more readily cleaned and far superior to any than it is possible to obtain by any known molding operation.

To produce the desired casting, the metal is then poured into the gate or gates 12 of the mold and allowed to solidify. Owing to the fact that the usual siliceous, parting heretofore employed is eliminated in my process, the surface of the casting obtained will be free from surface protuberances, warts, pimples, or the like, formed ordinarily by the adhesion to the pattern of particles of such parting material and sand with consequent pitting of the mold and my improved casting will moreover have a mottled appearance on its flat portions b, and also its high and low portions a somewhat as indicated in Figs. 3 and 4, whereas if an untreated facing material is not employed in the molding operations as now practiced, while the mold will have a mottled appearance, such mottled effect will not be imparted to the casting, but merely a dirty

casting will result, but if on the other hand an untreated facing is employed, as previously described, in the manner now practiced, the finished mold will not have a mottled appearance due to the absence of any sand riddling operation following the application of the graphite facing employed.

In "print back" operations wherein my improved parting-facing is employed, the mold will have a mottled appearance prior to the "print back" operation, but neither the completed mold nor the casting will have a mottled appearance. In such cases, however, the finished mold will have a continuous, slick, even coating of the parting-facing material and such coating will be readily observable on the vertical and sloping surfaces as well as the flat surfaces and low spots. As a consequence, instead of a prolonged tumbling operation being required in the preliminary cleaning of the casting after it comes from the mold, it is possible to quickly and effectively remove the adhering layer of sand and parting-facing with the wire brushes and thereafter but a short tumbling or milling operation is necessary to clean off the parting-facing and the mottled effect caused thereby. Furthermore, the casting obtained by employing my parting-facing will be true to pattern and have true edges and corners and free from fins due to the absence, at the corners and edges of the parting line, of an easily washed out parting or facing material and the presence of the embedded parting-facing material above described.

I preferably proceed as follows:

A mixture of 100 parts of finely pulverized or air floated plumbago (graphite), coke, coal or other carbonaceous reducing or non-oxidizing material of a fineness preferably of about 200 mesh for example, and 20 to 50 parts of finely pulverized rosin residuum is heated in a mixer until practically all of the volatile matter that will distil about below 250° C. have been volatilized. The heating is preferably continued until the mass in the mixer shows signs of incipient dusting in the case of flake graphite or when employing amorphous graphite, preferably until complete dusting occurs which is an indication that the original sticky mass is in the desired condition and that the undesirable volatiles have been eliminated. The mixture is then chilled to cool the same and then pulverized to its original degree of fineness preferably about 200 mesh or finer.

I can use either crystalline (i. e. flake) or the amorphous plumbago, but the former will, because of its less absorbent character, require considerably less residuum to coat the particles thereof and impregnate the pores as compared with the amount required to properly treat the amorphous variety of plumbago which is relatively more porous and absorbent.

While I prefer as a coating and impregnating ingredient the tarry residuum obtained by the distillation of rosin in the production of rosin oil, many other substances such as coal tar residuums, drip oil residuum, coal tar pitch and the like, from which the volatile ingredients have been driven off are also suitable, though I prefer rosin residuum or a coal tar pitch of high melting point, because of their ready availability and also because of the stability or permanence imparted thereby to the coated and impregnated product.

The characteristics of my improved mold differ radically from those prepared as aforesaid by the present two stage method wherein a parting material, having no so-called facing value, as for example a grease impregnated diatomaceous earth or decomposed silica such as tripoli powder, is first dusted on the pattern and on the surrounding surface of the mold and then, after the ramming of the sand, the pattern is removed, the sand surfaces are again dusted with a facing, such as untreated air-floated plumbago powder, in an effort to coat the active face of the mold with an infusible refractory of poor heat conductivity. In this two stage method, the plumbago dust lays as a light superficial coating on the surface of the sand mold and when employed in proper amounts to be of any real use, the molten metal washes the same off and causes it to collect in the deeper portions of the mold. As a consequence, the molten metal directly contacts with the insufficiently protected and insulated sand surfaces, effecting the enclosure of the particles and producing as a consequence a dirty, rough casting.

My improved mold will have the plumbago parting-facing compound embedded in and effectively retained by the sand surfaces, and consequently the treated plumbago will not wash before the molten metal and collect in the deep portions of the mold. Furthermore, the metal runs over this treated plumbago-faced mold far more freely than over the untreated plumbago-faced mold of the type now customarily employed and consequently produces a smoother, cleaner casting than obtainable by any two stage operation heretofore employed.

By the term facing material, as employed in the claims, I refer to such products as amorphous graphite, commonly known as Mexican graphite, and crystalline graphite, as Ceylon lump graphite and crystalline graphite, Canadian, Alabama, Pennsylvania flake graphites as well as such grades of lamp black, carbon black or coke used for facing purposes and other like substances which are highly refractory, heat insulating and inert or non-oxidizing in their action upon iron at the temperature at which the casting operation is performed and withal capable of serving as effective facings.

While I have described my invention as applied to the casting of iron, the same can also be utilized for the casting of copper, brass and like metals wherein parting and facing compositions are now employed in the molding of same.

While I preferably employ from but 20 to 50 parts of the impregnating agent to every 100 parts of base, other proportions of such impregnating agent within the scope of the appended claims may obviously be made without departing from the spirit of my invention. Furthermore, as above described, owing to the volatilization of the low boiling point portions of the impregnating agent, the parting-facing product will obviously have a smaller percentage of such agent than the amount originally added. Notwithstanding the fact that I have employed the expression that the parting-facing composition is inert to molten iron, it is evident that substantially all of the impregnating agent will be volatilized therefrom during the casting operation and consequently by inert in this connection I refer to the action of the parting-facing composition upon iron and not to the fact that no portion of the parting-facing composition will be volatilized by the heat of the molten metal.

The binder or so-called pitch-like residuum with which my carbonaceous base is impregnated should be free from volatiles having a boiling point below 150° C. I preferably employ a residuum which is free from volatiles having a boiling point of below 200° C. or in many instances 250° C.

Having thus described my invention, what I claim and desire to obtain by United States Letters Patent is:

1. A pulverulent parting-facing product for casting metals, comprising graphite as the major ingredient, the same being homogeneously impregnated with a pitch-like residuum obtained from the distillation of rosin and substantially free from volatile ingredients that have a boiling point below 150° C., said product being highly water-repellent and capable of serving both as a parting in the preparation of the mold and as an effective facing for such mold during the casting operation.

2. A sand mold for casting metals, the same having its surface portion pre-impregnated prior to the removal of the pattern during the formation of the mold with a parting-facing product consisting of a carbonaceous facing base essentially free from oxidants and which base is homogeneously impregnated with a water-repellant pitch-like residuum obtained from the distillation of rosin which is substantially free from volatile ingredients boiling below 150° C., said mold when freshly prepared having a highly mottled appearance and a metallic lustre.

3. A parting-facing product for casting metals, comprising carbon in a pulverulent condition as the major ingredient, the same being homogeneously impregnated with a pitch-like residuum obtained from the distillation of a heavy hydrocarbon and being substantially free from volatile ingredients that have a boiling point below 150° C., said product being highly water-repellant and capable of serving both as a parting in the preparation of the mold and as an effective facing for such mold during the casting operation therein.

4. A sand mold for casting metals, the same having its surface impregnated, during the formation of the mold and prior to removal of the pattern therefrom, with a parting-facing product comprising a base of carbonaceous facing material essentially free from oxidants and which base is homogeneously impregnated with a minor percentage of a binder comprising essentially a water-repellant residuum which is substantially free from volatile ingredients boiling below 150° C.

5. A sand mold for casting metals, the same having its surface impregnated, during the formation of the mold and prior to removal of the pattern therefrom, with a parting-facing product comprising a base of carbonaceous facing material essentially free from oxidants and which base is homogeneously impregnated with a minor percentage of a binder comprising essentially a water-repellant residuum which is substantially free from volatile ingredients boiling below 200° C.

6. A sand mold for casting metals, the same having its surface impregnated, during the formation of the mold and prior to removal of the pattern therefrom, with a parting-facing product comprising a base of carbonaceous facing material essentially free from oxidants and which base is homogeneously impregnated with a minor percentage of a binder comprising essentially a water-repellant residuum which is substantially free from volatile ingredients boiling below 250° C.

Signed at New York, in the county and State of New York this 7th day of January, 1926.

BENJAMIN F. WALLACE.