

No. 786,009.

PATENTED MAR. 28, 1905.

F. COWDEN.
PROCESS OF CASTING.
APPLICATION FILED MAY 21, 1904.

FIG. 1.

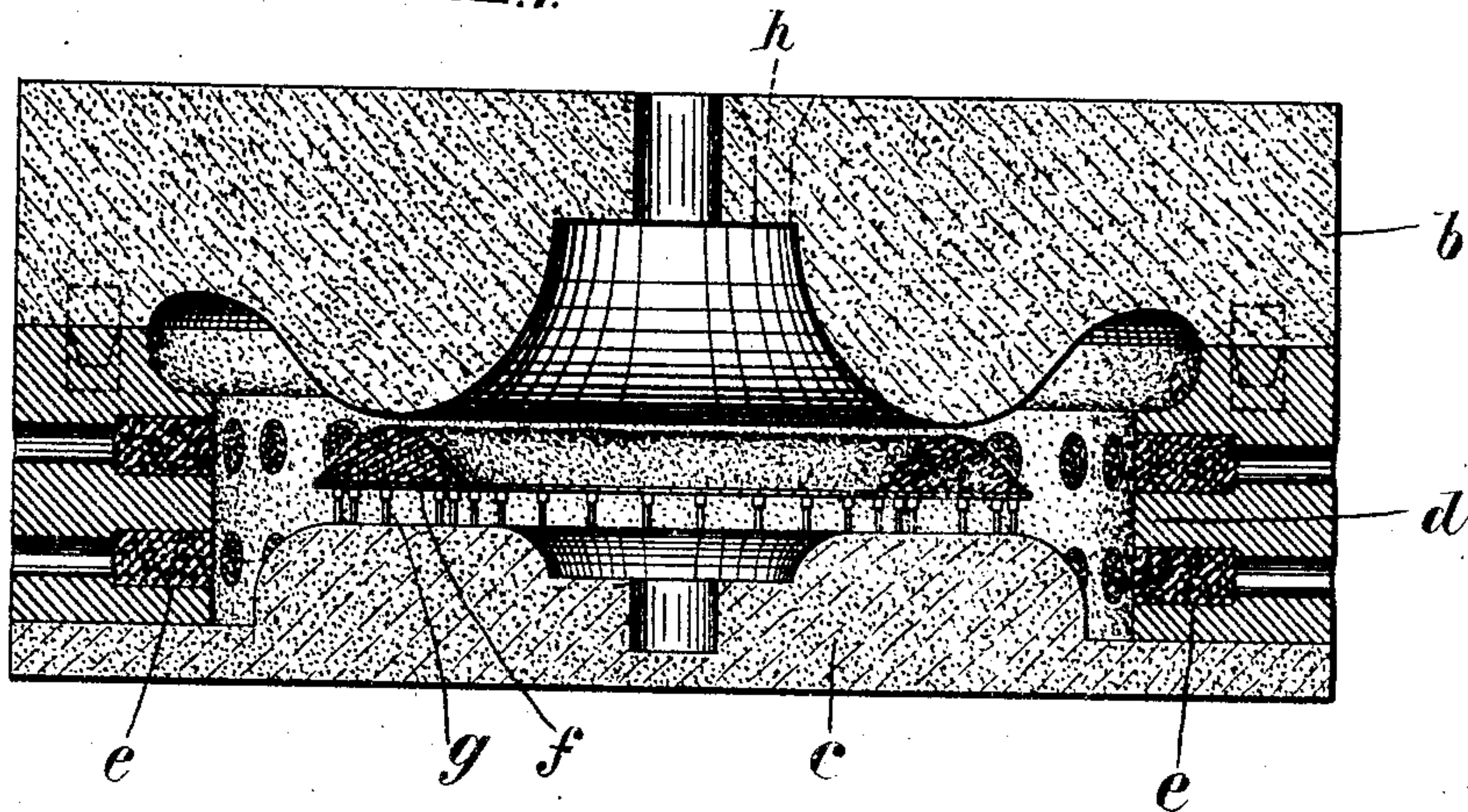
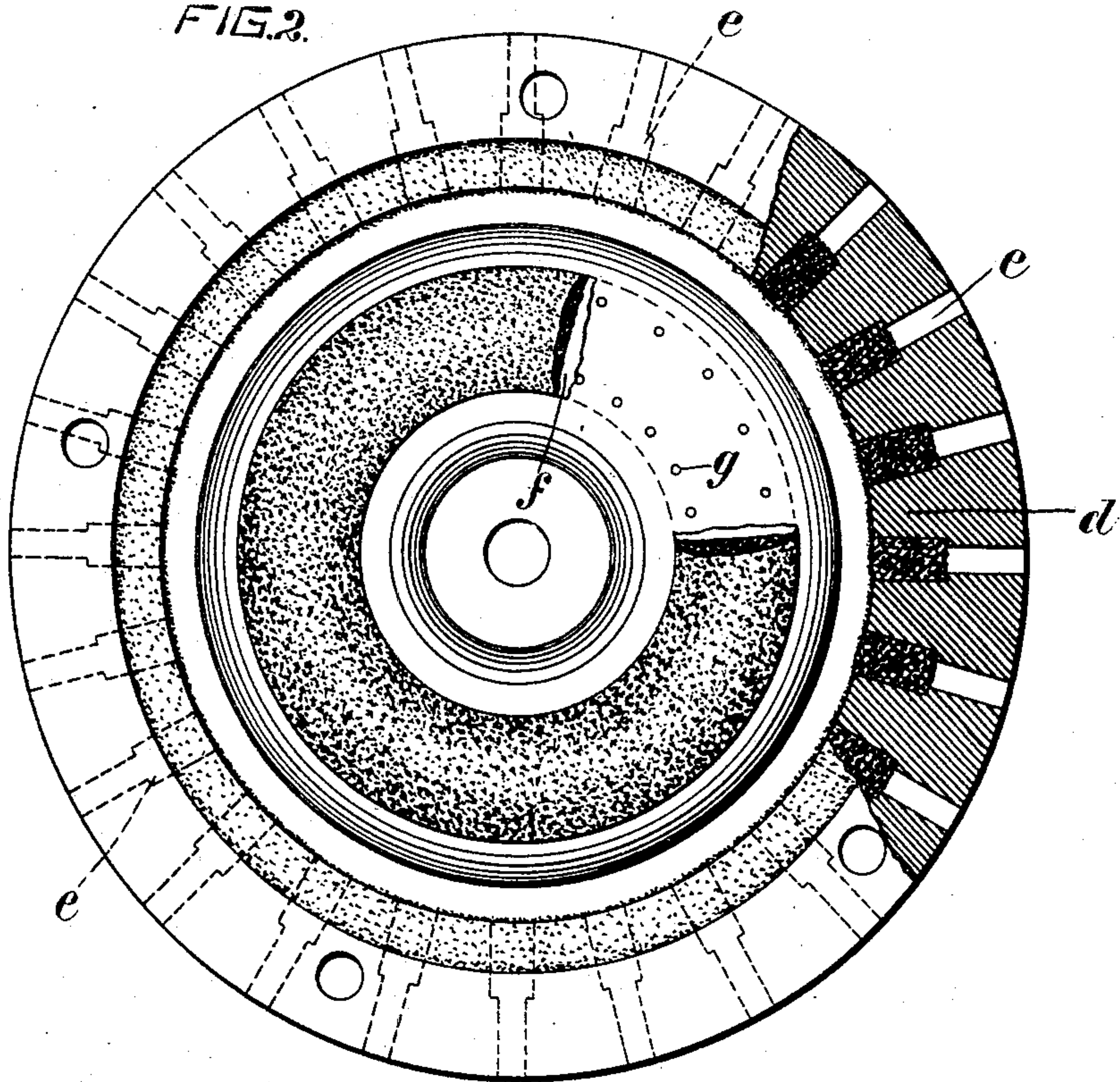


FIG. 2.



Witnesses

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PROCESS OF CASTING.

SPECIFICATION forming part of Letters Patent No. 786,009, dated March 28, 1905.

Application filed May 21, 1904. Serial No. 209,088.

To all whom it may concern:

Be it known that I, FREDERICK COWDEN, of the city of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Processes of Casting; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to casting generally where it is required to make a casting with one or more portions different in chemical and physical properties from the remainder, and particularly to the casting of metal objects having a portion subjected to greater wear than its other portions, such as the tread and flange of a car-wheel, the bearing-surface of an axle, trunnion, or brake-shoe, or friction-faces of an engine, a cog or other wheels, rails or diamond crossings, frogs, switch-points and the like, or any other article or device having a portion subjected to greater wear or liable to be subjected to greater stress than the other portions thereof.

The treads of car-wheels have been hardened hitherto by chilling, and it has been the prevailing custom to in a like manner harden the bearing-faces of bearings, the teeth of cog-wheels or other surfaces or portions of things produced by casting, while when articles have been made heretofore with a portion or portions thereof of a different degree of hardness from the remainder cast-iron has almost invariably been used.

The main object of this invention is to substitute open-hearth, acid, or basic steel for cast-iron, the obvious advantage being that a much lighter and yet stronger article is produced.

The invention also has for its object to change the degree of hardness of one or more portions of a thing being cast by combining with such portion or portions a substance capable of effecting the said result and to provide a simplified process for the purpose.

The invention may be said briefly to consist in supporting a substance in close proximity to one of the walls of the matrix and locating a second substance in a loose unprotected heap in the path of the molten metal as it flows toward such wall, the second

substance having an affinity for the metal and the two substances having an affinity for one another, while the first-mentioned substance is of different chemical composition from the wall of the matrix.

For full comprehension, however, of my invention reference must be had to the accompanying drawings, forming a part of this specification, in which similar reference characters indicate the same parts, and wherein—

Figure 1 is an axial sectional view of a car-wheel mold, and Fig. 2 is a plan view of the drag with the cope removed.

I shall describe a mold whereby a car-wheel can be cast in order to demonstrate the invention, although it is to be understood that I do not confine myself to such embodiment, but select the same only as an instance.

The mold is in the main of usual construction, and consists of a cope *b* and drag *c*, shaped interiorly to impart the required form, the drag having one of its walls *d* adapted to act as a chill and the cope having a pouring-gate or sprue-hole *h*, and according to my invention the chill is formed with a series of apertures or recesses *e*. After the mold has been formed I locate a destructible tray *f* (in this instance of annular form and consisting, preferably, of paper or other inflammable material) in the drag and support the same above the floor, preferably upon a series of pins *g*, preferably fusible at a comparatively low temperature. This tray is preferably cut to a size adapted to hold heaped thereon the required quantity and no more of manganese to be combined with the substance in the apertures or recesses in the chill, thereby acting as a gage.

In carrying out my improved process I first fill the apertures or recesses *e* with a mixture consisting of sand, one (1) part, and pulverized coke, two (2) parts, dampened with molasses-water, the latter being in the proportion of molasses, one (1) part, and water, five (5) parts. The chill is then washed with a liquid consisting of manganese, one (1) part, coke, two (2) parts, and molasses-water, the latter consisting of molasses, one (1) part, and water, five (5) parts. While the chill is drying, the dry

powdered manganese in quantity sufficient, with that in the liquid mixture with which the chill has been washed, to impart the desired degree of hardness to the article being
 5 cast is introduced into the mold, this being done in the following manner: The destructible tray *f* is placed upon the pins *g*, and as much dry pulverized manganese as it will hold is heaped thereon, the tray being gaged
 10 to hold sufficient manganese to make up, with that in the liquid mixture with which the chill is washed, approximately from one to two per cent., according to the degree of hardness desired. After the chill is dry the flask is
 15 closed, and the molten metal, preferably open-hearth, acid, or basic steel, is poured into the mold through the ingate or sprue-hole *h*, the remainder of the process being the same as usual in casting car-wheels, excepting that if the pins *g* should not happen
 20 to be fused they can be broken or filed off. The action which takes place while the molten metal is being poured and while it is flowing from the ingate to the chill is that when
 25 it comes in contact with the tray the latter will be gradually destroyed, thus allowing the manganese heaped thereon to be fused and absorbed by the flowing molten metal, which will gradually take up all the manga-
 30 nese upon the tray. Owing to the natural rolling forward of such molten metal as it flows, the manganese is supported above the bottom of the mold in order to cause the manganese to be distributed throughout and ab-
 35 sorbed by that portion only of the molten metal which will lie in contact with and be adjacent to the chill when the cast is made. This manner of supplying the dry pulverized manganese to the molten metal secures a uni-
 40 form distribution thereof throughout the portion of the molten metal by which it is required to be taken up. The resultant chemical action is that the molten metal with the additional manganese absorbed thereby ab-
 45 sorbs the carbon in the substance with which the apertures or recesses in the chill are charged, thereby making the portion of the casting thus treated different in chemical and physical properties, owing to its being recar-
 50 bonized from the charges of carboniferous substance carried by the chill and made to constitute an alloy rich in manganese, and consequently hard and durable.

The casting produced according to the foregoing consists of a body portion comprising
 55 any desired percentage of carbon—say, for instance, from 0.25 to 0.35 per cent. approximately—while the tread and rim comprise carbon from 0.75 to one per cent. approximately
 60 and manganese from one to two per cent. approximately.

Articles cast according to the foregoing may be considerably less in weight, comparatively speaking, and will be able to withstand greater
 65 strain than like articles as heretofore cast, and

in the case of car-wheels, while the center or body portion thereof will be of softer steel of any requisite degree of strength or hardness, such as having, for instance, from 0.25 to 0.35 per cent. carbon, such wheel will have
 70 a harder wearing-surface or tread of from 0.75 to one per cent. carbon and from one to two per cent. manganese combined with the said 0.25 to 0.35 per cent., the latter being the carbon strength of the mass from which
 75 the wheel is cast.

I do not herein claim the apparatus and product set forth, as they form the subject-matter of separate applications filed by me
 80 July 14, 1904, Serial No. 216,544, and on July 15, 1904, Serial No. 216,758, respectively.

What I claim is as follows:

1. The process of casting metallic articles consisting in causing the molten metal being cast to come into contact with an unprotected
 85 loose heap of granular substance adapted to change the chemical and physical properties of the portion of the molten metal coming into contact therewith.

2. The process of casting an article with a
 90 portion thereof different in chemical and physical properties from the remainder, such process consisting in supporting a substance in contact with one of the walls of the mold such substance being of different chemical
 95 composition from the walls of the mold, and locating a second substance in the path of the molten material, the second-mentioned substance having an affinity for the material being cast and such substances having an affinity
 100 for one another.

3. The process of casting a metal article with a portion thereof of a different degree of hardness from the remainder, such process consisting in heaping an unprotected loose
 105 granular substance in the path of the molten metal as it flows toward the matrix, and such unprotected heap of substance being adapted to be gradually taken up and absorbed by and change the degree of hardness of the molten
 110 material which comes in contact therewith as it flows from the ingate to the wall of the matrix.

4. The process of casting an article with a
 115 portion different in chemical and physical properties from the remainder, such process consisting in supporting an unprotected loose granular substance in close proximity to one of the walls of the mold, such substance being of different chemical composition to the walls
 120 of the mold and locating a second substance above the bottom of the mold and in the path of the material being cast, the second-mentioned substance having an affinity for the material being cast and said substances having an
 125 affinity for one another.

5. The process of casting a metallic article with a portion of a different degree of hardness from the remainder, such process consisting in supporting a substance consisting
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of a mixture of sand pulverized carboniferous substance and molasses-water in close proximity to one of the walls of the matrix, and locating a substance in the path of the molten material, the second-mentioned substance having an affinity for the material being cast and said substances having an affinity for one another.

6. The process of casting a metallic article with a portion of a different degree of hardness from the remainder, such process consisting in supporting a substance consisting of a mixture of sand pulverized coke and molasses-water in close proximity to one of the walls of the matrix, and locating a substance in the path of the molten material, the second-mentioned substance having an affinity for the material being cast and said substances having an affinity for one another.

7. The process of casting a metallic article with a portion of a different degree of hardness from the remainder, such process consisting in supporting a substance consisting of a dampened mixture of sand and pulverized carboniferous substance in close proximity to one of the walls of the matrix, and locating a substance in the path of the molten material, the second-mentioned substance consisting of manganese.

8. The process of casting a metallic article with a portion of a different degree of hardness from the remainder, such process consisting in supporting a substance consisting of a dampened mixture of sand and pulverized coke in close proximity to one of the walls of the matrix, and locating a substance in the path of the molten material, the second-mentioned substance consisting of manganese, and said substances having an affinity for one another.

9. The process of casting which consists in filling apertures in one of the walls of the mold with a mixture of sand one (1) part and pulverized carboniferous substance two (2) parts made damp with molasses-water, then washing the surface of such wall with a mixture of manganese one (1) part and pulverized carboniferous substance two (2) parts with molasses-water added to make a consistency of a liquid, then placing dry pulverized manganese in the mold between the ingate and the wall thus prepared, then pouring the molten metal, as set forth.

10. The process of casting which consists in

filling apertures in one of the walls of the mold with a mixture of sand one (1) part and pulverized coke two (2) parts made damp with molasses-water, then washing the surface of such wall with a mixture of manganese one (1) part and pulverized coke two (2) parts with molasses-water added to make a consistency of a liquid; then placing dry pulverized manganese in the mold between the ingate and the wall thus prepared, then pouring the molten metal, as set forth.

11. The process of casting which consists in filling apertures in one of the walls of the mold with a mixture of sand one (1) part and pulverized carboniferous material two (2) parts made damp with molasses-water; then washing the surface of such wall with a mixture of manganese one (1) part and pulverized coke two (2) parts with molasses-water added to make a consistency of a liquid, then placing dry pulverized manganese in the mold between the ingate and the wall thus prepared, then pouring the molten metal, as set forth.

12. The process of casting which consists in filling apertures in one of the walls of the mold with a mixture of sand one (1) part and pulverized coke two (2) parts made damp with molasses-water, then washing the surface of such wall with a mixture of manganese one (1) part and pulverized coke two (2) parts with molasses-water added to make a consistency of a liquid, then placing dry pulverized manganese in the mold between the ingate and the wall thus prepared, then pouring the molten steel, as set forth.

13. The process of casting which consists in filling apertures in one of the walls of the mold with a mixture of sand one (1) part and pulverized coke two (2) parts made damp with molasses-water, then washing the surface of such wall with a mixture of manganese one (1) part and pulverized coke two (2) parts with molasses-water added to make a consistency of a liquid, then placing dry pulverized manganese in the mold between the ingate and the wall thus prepared, then pouring molten open-hearth steel, as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

FREDERICK COWDEN.

Witnesses:

WILLIAM P. McFEAT,
FRED. J. SEARS.