T. D. WEST.

ART OF MAKING METAL CASTINGS.

APPLICATION FILED JAN. 22, 1912.

1,031,305.

Patented July 2, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

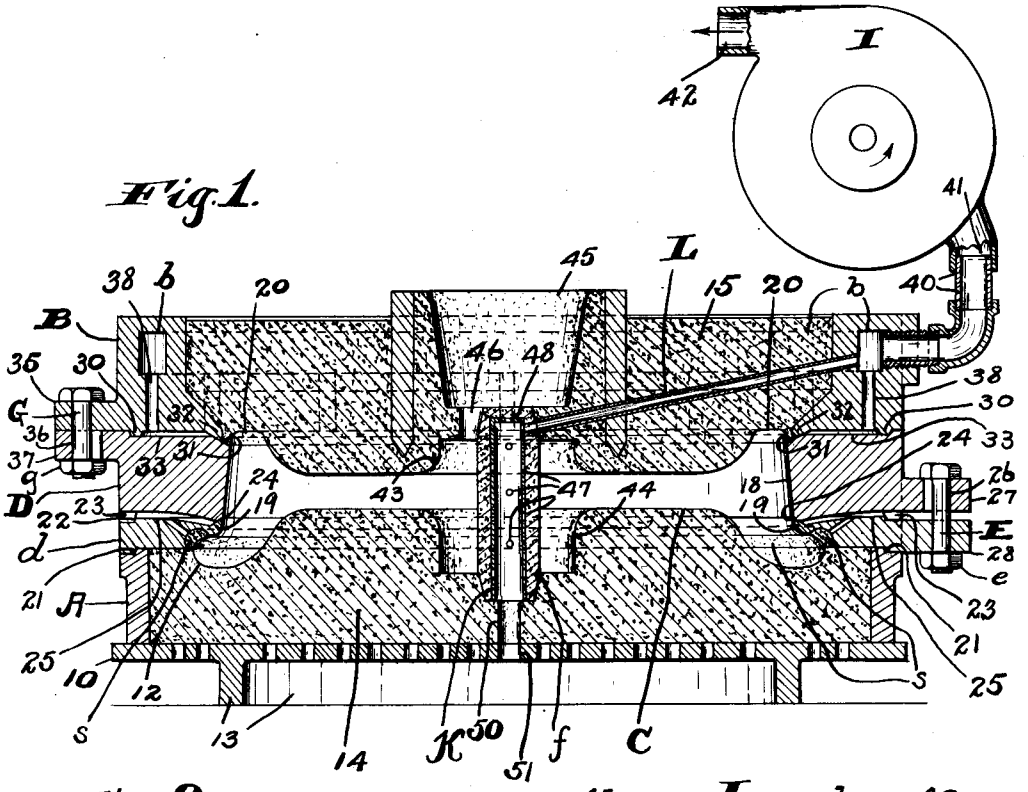

Fig. 2.

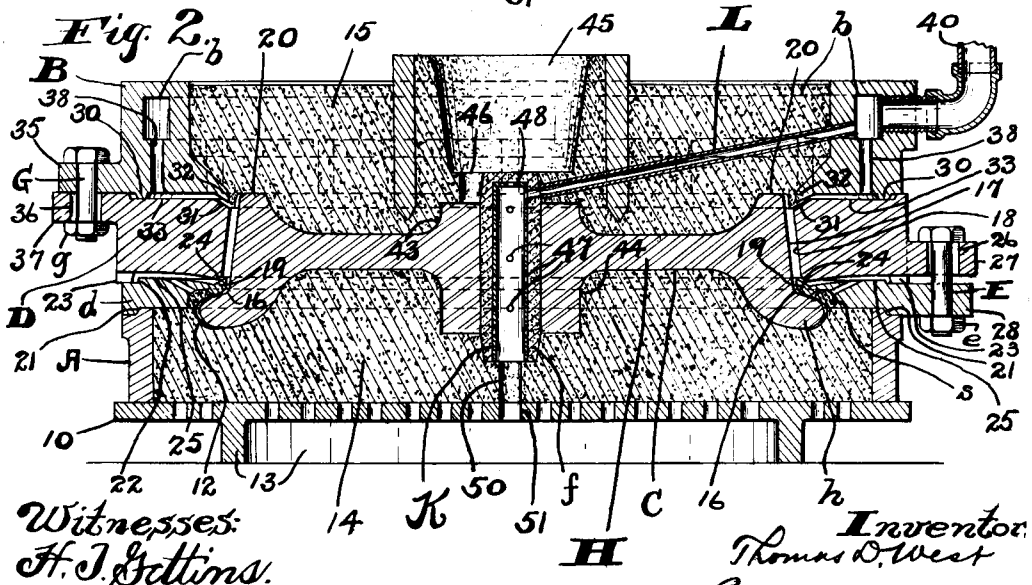

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Fig. 3.

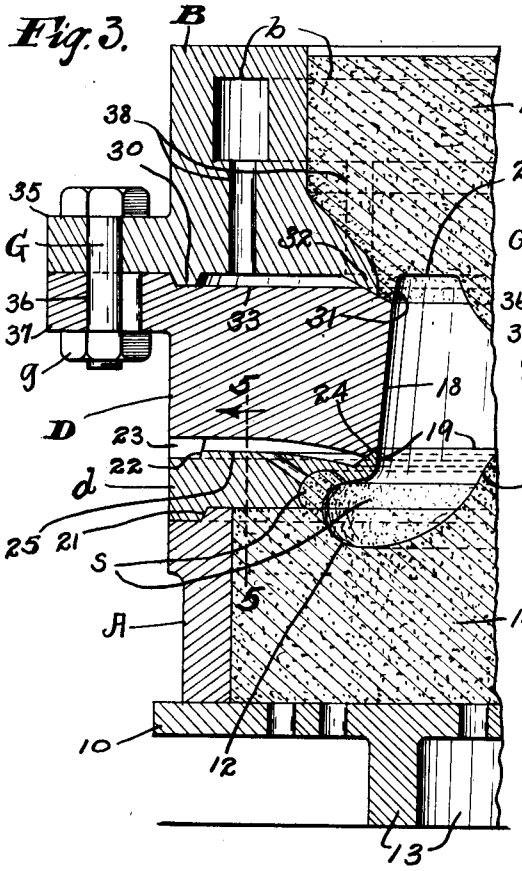


Fig. 4.

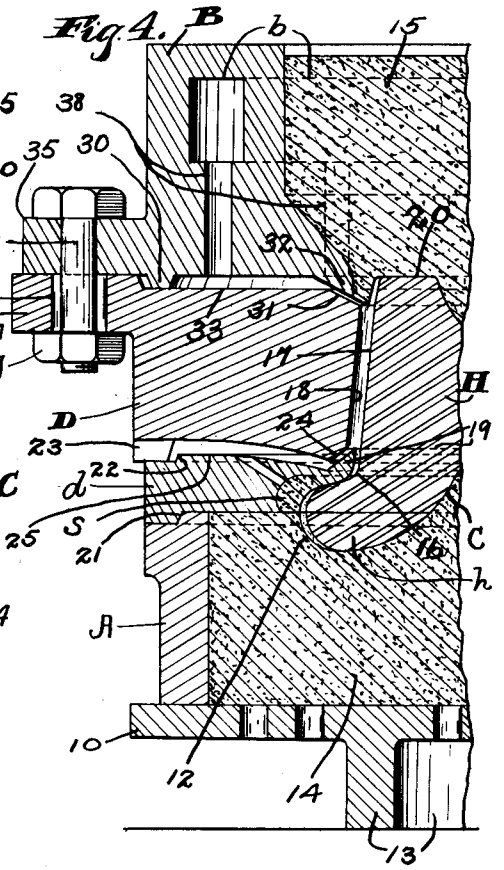
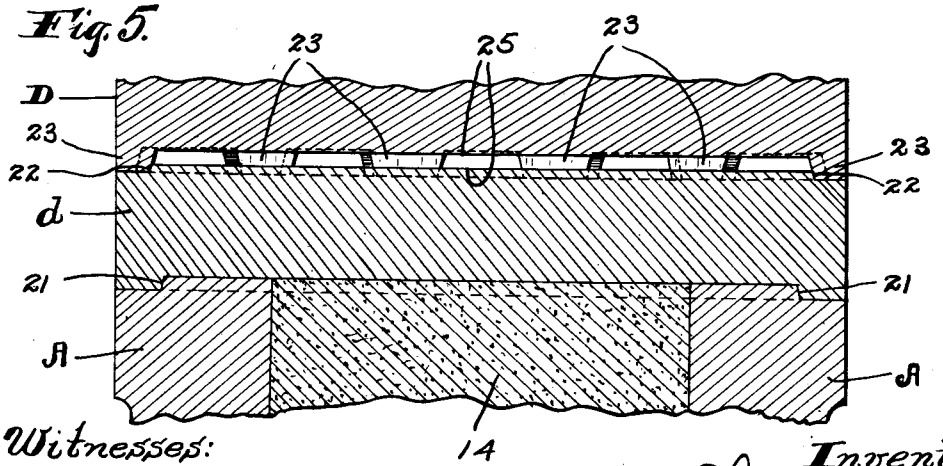


Fig. 5.



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UNITED STATES PATENT OFFICE.

THOMAS D. WEST, OF CLEVELAND, OHIO.

ART OF MAKING METAL CASTINGS.

1,031,305. Specification of Letters Patent. Patented July 2, 1912.

Application filed January 22, 1912. Serial No. 672,585.

To all whom it may concern:

Be it known that I, THOMAS D. WEST, a citizen of the United States of America, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in the Art of Making Metal Castings; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to improvements in the art of making metal castings, and more especially to an improved process of casting circular objects, such, for instance, as car-wheels and rolls.

The primary object of this invention is to treat a body of hot metal in a mold, upon the formation of a crust on said body of metal, with a heat-absorbing medium, such, for instance, as air, drawn through the mold by suction between said crust and the crust-facing portion of the mold and thereby carry off heat from the metal while the crusted body of metal or casting is within the mold and beneficially affect or influence the casting in any one or more of various ways, such, for instance, as increasing the depth or hardness of chilling beyond the chilling or hardening capacity of a metal chiller or chill, or hardening the surface of any casting while the casting is within the mold, or effecting molecular changes in said casting to better qualify it to withstand any ordinary or special service to which it may be subjected, or preventing shrink-holes or contraction-cracks in the casting or preventing warping or distortion of the casting, or rendering the casting stronger or more durable, or producing what I term an "inside chilling",—that is, a chilling of the casting at a point spaced inwardly from the surface or exterior of the casting.

Another object is to inexpensively create or establish a steady passage in ample volume of said air or heat-absorbing medium along or next exteriorly of and in contact with the cooling and contracting casting and through the mold while said casting is within the mold and efficiently and expeditiously effect the hereinbefore indicated beneficial influence upon the strength, durability, depth of chill or other quality of the casting.

Another object is to carry out my invention more especially in the casting of a circular object, such, for instance, as a car-wheel, by, first, pouring a mold having a circular chamber for receiving molten metal, and, upon the formation of a peripheral crust on the body of hot metal supplied to said chamber and the creation of an annular space next exteriorly of and surrounding said crust while said body of metal or casting is within the mold, creating suction within said space uniformly all around the casting being treated and by said suction drawing air or other heat-absorbing medium through and endwise of said space uniformly all around the casting and thereby carrying off heat from or treating the casting uniformly all around the casting.

Another object is to carry out my invention, in casting a metal car-wheel having a flange at one end of the tread-forming portion of the wheel, in such a manner that the tread and the throat which connects said tread with the inner side of the flange of the wheel shall be acted upon by my improved process to increase the depth of chill or hardness at said tread and throat without having said flange, and more especially the rounded periphery of the flange, correspondingly treated to any appreciable extent, so as to produce a cast-metal car-wheel which possesses great durability at its tread and throat without having the peripheral portion of the flange treated in a way that would render the flange unduly brittle and thereby susceptible of being readily broken off or chipped.

Another object is to cool the core of a mold adapted for use in casting an annular object, such, for instance, as a car-wheel, and to materially cool the casting at and around the core before removal of the casting from the mold, and more especially to effect said cooling of said core and the adjacent core-surrounding portion of the cooling and contracting casting by sucking or drawing air or heat-absorbing medium through said core simultaneously with the sucking or drawing of air or heat-absorbing medium through the mold at the peripheral surface of the casting and thereby prevent the creation of undue strains in the outer portion of the casting.

With these objects in view, this invention consists in the steps or features hereinafter described and pointed out in the claims.

A mold suitable for use in carrying out my invention in the manufacture of a car-

wheel chilled at its tread and throat is illustrated in the accompanying drawings, in which—

Figure 1 is a central vertical section of the said mold ready for pouring. Fig. 2 is a central vertical section of the mold, showing a car-wheel H cast within the mold. Fig. 3 is an enlarged view of a portion of Fig. 1. Fig. 4 is an enlarged view of a portion of Fig. 2. Fig. 5 is a vertical section on line 5—5, Fig. 3, looking outwardly.

The mold illustrated consists in the main of an upper mold-part or cope, a lower mold-part or drag and a central mold-part which is shown formed in the main by a sectional chiller or chill.

Referring to the drawings, A indicates a vertically arranged annular casing which forms a portion of the lower mold-part or drag and rests upon a horizontally arranged plate 10 forming the bottom of the drag and provided with a vertically downwardly projecting annular flange 13 serving to elevate said bottom above the floor or support upon which the mold is to be mounted. The drag is rammed with sand or substantially nonchilling material, and the top or upper portion of the body of packed sand 14 of the drag has the contour required to form the bottom of the casting.

B indicates a vertically arranged suitably supported annular metal casing which forms a portion of the upper mold-part or cope. The cope is rammed with sand, and the body of packed sand 15 of the cope has its bottom or lower portion contoured as required to form the top of the casting. The cope and the drag are spaced vertically to form a chamber C between them, which chamber is enlarged diametrically and annularly at its lower end, as at 12.

The central mold-part comprises an annular vertically arranged sectional chiller or chill consisting of two superimposed annular sections D and *d* instrumental in forming the surrounding wall of the chamber C. The chill-sections D and *d* are arranged vertically and in line endwise. The upper or main chill-section D is preferably of cast iron, whereas the lower chill-section *d* may be of steel.

Figs. 2 and 4 show a wheel-forming casting H in the mold, and, referring to said figures of the drawings, *h* indicates the annular flange formed on and externally of said casting at one end of the casting, which flange is shown formed at the lower end of the casting and has a rounded peripheral surface, and the throat 16 of the wheel formed by said casting is formed at the junction of the inner side of said flange with the tread 17 of the wheel. The flange of a car-wheel to be cast in the mold illustrated is obviously therefore formed next above the outer portion of the drag. The lower section or portion of the central mold-part is arranged to form the top wall and upper portion of the surrounding wall of the diametrical enlargement 12 of the chamber C. The outer portion of the body of packed sand 14 of the drag is contoured and arranged as required to form the bottom wall and lower portion of the surrounding wall of said enlargement of the said chamber. The surrounding wall of the chamber C is formed in the main by the internal annular surface 18 of the upper chill-section and the tread of the car-wheel to be cast in the mold is formed at said surface. The upper inner portion 19 of the lower chill-section is arranged below the lower end of said surface 18 of the upper chill-section and has its internal surface arranged flush with said surface 18 at the lower end of said surface 18 and contoured as required to render said portion of the lower chill-section instrumental in effecting the formation of the throat 16 of the wheel, and said portion 19 of the lower chill-section is arranged to form the inner portion of the top wall of the diametrical enlargement 12 of the chamber C. An annular body *s* of packed sand or substantially nonchilling material is applied to the lower chill-section in any approved manner and arranged to form the outer portion of the enlargement 12 of the chamber C and forms the upper portion of the surrounding wall of said enlargement of said chamber and extends from the sand-body 14 of the drag to the portion 19 of said chill-section. By having the diametrical enlargement 12 of the molten-metal-receiving chamber C formed as hereinbefore described undue brittleness in the flange of the car-wheel being cast in carrying out my invention is successfully avoided and the wheel is not only chilled at its tread but also chilled at its throat.

The lower chill-section is mounted on the drag-casing A, and said drag-casing is provided at its top with a laterally and outwardly facing annular shoulder 21 which is overlapped by said chill-section so as to prevent displacement of the said chill-section horizontally independently of the drag. The lower chill-section is provided at the top and substantially vertically above the shoulder 21 with a laterally and outwardly facing annular shoulder 22 which is overlapped by lugs 23 formed on and projecting downwardly from the upper chill-section and spaced circumferentially of said shoulder 22. The shoulder 22 and the lugs 23 are instrumental in centering the upper chill-section relative to the lower chill-section during the assemblage of the component parts of the mold. The upper chill-section rests at its lugs 23 on the lower chill-section. The upper chill-section is shown provided at the lower end of its in-

ternal surface 18 with a laterally inwardly and downwardly facing beveled annular shoulder 24 which is closely overlapped by the portion 19 of the lower chill-section, and an annular space 25 is formed between the bottom of the upper chill-section and the top of the lower chill-section and arranged substantially concentrically relative to the chill and in communication between the lugs 23 with the external atmosphere, and the upper chill-section is free to expand laterally and outwardly by heat independently of the lower chill-section.

Any suitable number of bolts are employed in removably attaching the upper chill-section to the lower chill-section, and in Figs. 1 and 2 E indicates one of said bolts. The bolt E is shown extending through a slot 26 which extends vertically through a lug 27 formed on the upper chill-section and through a lug 28 formed on the lower chill-section. Said bolt has its head resting on the top surface of the lug 27, and a nut *e* is screwed onto the bolt at the bottom of the lug 28. The relative arrangement of the parts is such that in the normal condition of the upper chill-section, before any lateral and outward expansion of said chill-section by heat, the bolt E, as shown in Fig. 1, is arranged next the outer end wall of the engaging slot 26 which is arranged radially of the chill and extends inwardly beyond said bolt toward the chamber C far enough to accommodate a lateral and outward expansion of the said chill-section by heat independently of the lower chill-section.

The cope is mounted on the upper chill-section. The cope-casing B is provided at its bottom and in proximity to the circumferential surface of said casing with a downwardly projecting annular flange 30 which is arranged concentrically relative to the mold, and said cope-casing rests at said flange on the top of the upper chill-section. The outer side of the flange 30 is overlapped by the upper chill-section so as to facilitate centering of the cope relative to said chill-section during the assemblage of the component parts of the mold. The upper chill-section is provided at the upper end of its internal surface 18 with a laterally inwardly and upwardly facing beveled annular shoulder 31, and the inner lower portion of the cope-casing terminates at the bottom in a downwardly and laterally inwardly projecting flange 32 which closely overlaps the upper portion of the beveled surface 31 of the said chill-section. The flanges 30 and 32 of the cope-casing form opposite side walls respectively of an annular recess 33 formed in the under side of said cope-casing and extending circumferentially but arranged externally of the chamber C and out of communication with said chamber in the normal condition of the upper chill-section.

Any suitable number of vertically arranged bolts are employed in removably attaching the cope-casing to the upper chill-section, and G indicates one of said bolts. The bolt G extends vertically through a lug 35 formed on the cope-casing and through a slot 36 which is formed in and extends vertically through a lug 37 formed on the upper chill-section, which slot is arranged radially of the chill. The bolt G has its head resting on the top surface of the lug 35, and the shank of the bolt extends a suitable distance below the lug 37, and a nut *g* is screwed onto said bolt at the bottom of the last-mentioned lug. The relative arrangement of the parts is such that in the normal condition of the upper chill-section, before any lateral and outward expansion of said chill-section by heat, the bolt G, as shown in Figs. 1 and 3, is arranged next the outer end wall of the engaging slot 36 which extends far enough inwardly beyond the said bolt toward the chamber C to accommodate the lateral and outward expansion of the said chill-section by heat independently of the lower chill-section.

The cope-casing is provided interiorly with an annular chamber *b* which is substantially concentric relative to the mold and arranged above and spaced from the recess 33 in the bottom of said casing, and vertically arranged holes 38 formed in said casing between said recess and said chamber and placing said recess in communication with said chamber are spaced circumferentially of the chamber C, and said recess 33 is of course wide enough to be in communication with said holes not only in the normal and unheated condition of the upper chill-section, as shown in Figs. 1 and 3, but also during and upon the lateral and outward expansion of said chill-section by heat during the operation of the mold, as shown in Figs. 2 and 4. The recess 33 is therefore continuously in communication with the chamber *b*, but is out of communication with the chamber C in the normal condition of the upper chill-section. A suction-pipe 40 for conducting air or other fluid from the chamber *b* is placed at its fluid-receiving end in communication with said chamber and communicates at its delivering end with the inlet 41 (see Fig. 1) of a suitably operated rotary air-pump or suction-creating device I which has its outlet 42 communicating with the external atmosphere.

The lower portion of the beveled shoulder 31 of the upper chill-section is covered by the sand-body 15 of the cope around the bore in said chill-section, and said sand-body is provided in and centrally of its under side with a cavity 43 forming the upper central

portion of the chamber C, and the sand-body 14 of the drag is provided with a cavity 44 which forms the lower central portion of said chamber. The sand-body 15 of the cope is provided in its under side and next the internal surface 18 of the upper chill-section with an annular recess 20 which is arranged concentrically relative to said chill-section and forms an upward annular enlargement of the chamber C. The cope and the drag of the mold illustrated are shown rammed to fit them for casting a car-wheel which has a hub provided with a central bore extending therethrough, and consequently a baked hollow sand-core *f* is arranged vertically and centrally of the chamber C and shown extending through said chamber from the bottom of the cavity 44 to the top wall of the cavity 43. The top wall of the cavity 43 forms the bottom of a pouring basin 45 formed in any approved manner and having its bottom shown provided with a gate 46 which establishes communication between said basin and the chamber C.

The casting formed in the mold obviously contracts horizontally or diametrically when it cools and thereby frees the chill, and obviously during the first cooling and contraction of a casting formed in the mold the upper chill-section expands laterally and outwardly by heat. The lower chill-section, having the greater portion of its inner portion covered by the sand-body *s* carried by said chill-section and having its upper inner portion 19 comparatively thin, does not transmit enough heat to the much thicker body formed by the central and outer portions of said chill-section to effect any material expansion of said chill-section during the lateral and outward expansion of the upper chill-section.

In carrying out my invention in the casting of a chilled car-wheel chillable molten iron or metal is used and the mold illustrated is poured. A peripheral chilled crust quickly forms on the body of hot chillable metal supplied to the chamber C and the normal cooling or contraction of the crusted and circumferentially chilled body of metal or casting takes place, and the upper chill-section expands laterally and outwardly by heat independently of the lower chill-section during said cooling or contraction of the casting. Said cooling or contraction of the casting and the lateral and outward expansion of the upper chill-section by heat during said cooling and contraction of the casting not only create an annular space next exteriorly of and surrounding the casting, as shown in Figs. 2 and 4, but result in placing the space 25, which is formed between the two chill-sections and communicates with the external atmosphere, into communication with the first-mentioned space all around the casting and in placing said first-mentioned space into communication at the top of the upper chill-section and all around the casting with the recess 33 in the bottom of the cope-casing B and consequently with the inlet of the pump or suction-creating device I. That is, the lateral and outward expansion of the upper chill-section independently of the lower chill-section results in the spacing of the shoulder 24 on the upper chill-section from the portion 19 of the lower chill-section, as shown in Figs. 2 and 4, so as to place the space 25 between the two chill-sections in communication with the chamber C all around the peripheral surface of the casting being treated in said chamber, and obviously air or heat-absorbing medium is supplied to the annular space formed next exteriorly of and around the peripheral surface of the casting during the cooling or contraction of the casting while the casting is within the mold. The lateral and outward expansion of the upper chill-section also results in the spacing of the shoulder 31 of said chill-section from the flange 32 of the cope-casing, as shown in Figs. 2 and 4, so as to place the annular space created around the casting during the cooling and contraction of the casting into communication all around the chamber C with the recess 33, and consequently with the inlet of the pump or suction-creating device I, and when said space has been placed in communication adjacent the throat of the car-wheel being cast with the external atmosphere and placed at its upper end in communication with the inlet of the pump or suction-creating device the latter is operated to draw air or heat-absorbing medium into and upwardly through said space created next exteriorly of and around the circumferential or peripheral surface of the casting while the casting is within the mold. The heat-absorbing medium sucked or drawn through said space while the casting is within the mold and cooling or contracting within the mold absorbs heat from the metal and is drawn to the external atmosphere from the upper portion of said space through the recess 33, holes 38, chamber *b* and pump or suction creating device I. The air or heat-absorbing medium sucked or drawn through the annular space created around the peripheral surface of the casting during the cooling and contraction of the casting enters said space above but in proximity to the diametrical enlargement 12 of the chamber C of the mold and consequently at the lower end of the tread-forming surface of the cooling and contracting casting and in proximity to the throat of the wheel being cast, and upon operating the pump or the suction-creating device I when said space has been placed in communication with the external atmosphere between the chill-sections as hereinbefore described air

or heat-absorbing medium is continually supplied to said space from between said chill-section,—that is, through the chill,—so as to supply air or heat-absorbing medium in ample volume to said space and cause said air or heat-absorbing medium upon entering the said space to pass upwardly through the said space and carry off heat from the cooling and contracting casting being treated in the mold and thereby beneficially affect the casting in any one or more of several ways already hereinbefore described. I would here remark that when a chill is used in forming the surrounding wall of the molten-metal-receiving chamber of the mold, as in the mold illustrated, the crust formed on the body of hot metal or casting is of course chilled, but that the depth of chilling of the casting is materially increased by the treatment of the crusted body of hot metal or casting with air or other heat-absorbing medium hereinbefore described, and that in carrying out my invention in the casting of a car-wheel having a flange at one end of the tread-forming portion of the wheel, as illustrated, the introduction of the air or other heat-absorbing medium in proximity to the throat of the wheel being cast materially improves the durability of said throat where durability is more especially needed.

The core *f* is provided centrally with a pipe K arranged substantially vertically and centrally of the core, which pipe is provided with lateral vent-holes 47 for permitting detrimental gases to escape from within the core into said pipe during the operation of the mold. The pipe K is provided at its upper end with a suitably applied head 48 and at its lower end communicates through an aperture 50 formed in the sand-body 14 of the drag and through a hole 51 formed in the plate 10 with the external atmosphere. The pipe K is placed in communication at its upper end by a pipe L, which extends through the sand-body 15 of the cope, with the chamber *b* in the cope-casing and consequently with the inlet of the pump or suction-creating device I. Obviously therefore during the operation of said pump or suction-creating device to draw air or heat-absorbing medium through the mold at the peripheral surface of the cooling or contracting casting air or heat-absorbing medium is simultaneously drawn through the core *f* without coming in direct contact with the casting. The sucking or drawing of air or heat-absorbing medium endwise through the core during the drawing of air or heat-absorbing medium at and transversely of the tread-forming surface of the cooling and contracting casting not only rapidly cools the core and the adjacent core-surrounding portion of the casting but successfully prevents the creation of undue strains in the outer portion of the casting.

In carrying out my invention in the art of casting a metal car-wheel having a flange at one end of the tread of the wheel as hereinbefore described, it will be observed that upon pouring the mold and forming a chilled peripheral crust on and circumferentially of the body of hot metal supplied to the mold and creating a space next exteriorly of and around said chilled crust while the crusted body of hot metal or casting is within the mold it is not unimportant during the creation of said space to effect, as hereinbefore described, the creation for said space of an entrance and an exit which extend all around said space adjacent opposite ends respectively of the tread-forming portion of the casting, so that during the operation of the pump or suction-creating device I air or heat-absorbing medium is sucked or drawn at said entrance into said space all around the casting and sucked or drawn at said exit out of said space from all around the casting, thereby insuring the passage of a uniform and equal volume of air or heat-absorbing medium through every portion of said space between said entrance and said exit and consequently insuring uniformity in the action or influence by said air or heat-absorbing medium on the casting all around the casing. As shown in Figs. 3 and 4 the incline formed by the bevel of the shoulder 24 on the upper chill-section is preferably steeper than the incline formed by the bevel of the shoulder 31 on said chill-section. I would also remark that although I have shown the entrance to said space adjacent the throat-forming portion of the casting,—that is, at or in proximity to the inner side of the flange of the casting,—the action or influence of said heat-absorbing medium on the casting will effectively reach said throat-forming portion of the casting, but the creation of said entrance to said space at the inner side of or above the flange of the casting is not unimportant to prevent any material action or influence by the heat-absorbing medium on the peripheral portion of the flange of the casting.

What I claim is:—

1. An improvement in the art of making metal castings, said improvement consisting in pouring a mold in which a casting is to be formed, and then sucking or drawing a heat-absorbing medium to the casting and through the mold to carry off heat from the casting while the casting is within the mold.

2. An improvement in the art of making metal castings, said improvement consisting in pouring a mold in which a casting is to be formed, and sucking or drawing a heat-absorbing medium through the mold outside of the casting to carry off heat from said casting.

3. An improvement in the art of making

metal castings, said improvement consisting in pouring a mold in which a casting is to be formed and, upon the formation of a crust on the body of hot metal in the mold and the creation of a space next exteriorly of said crust while the crusted body of metal or casting is within the mold, sucking or drawing a heat-absorbing medium through said space.

4. An improvement in the art of making metal castings, said improvement consisting in chilling a body of molten metal supplied to a mold and thereby forming a chilled crust on said body, and then sucking or drawing a heat-absorbing medium to said chilled crust and through the mold.

5. An improvement in the art of making metal castings, said improvement consisting in forming a chilled crust on the body of hot metal supplied to the molten-receiving chamber of a mold and creating a space next exteriorly of said chilled crust while said body of metal is within the mold, and then treating the crusted and already chilled body of hot metal or casting by sucking or drawing a heat-absorbing medium through said space.

6. An improvement in the art of making metal castings, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal, and, upon the formation of a peripheral crust on the body of hot metal supplied to said chamber and the creation of a space next exteriorly of and around said crust while said body of metal or casting is within the mold, sucking or drawing a heat-absorbing medium into and through said space all round the crusted body of metal or casting.

7. An improvement in the art of making circular metal castings, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a chilled crust on and circumferentially of the body of hot metal supplied to said chamber by chilling said body exteriorly and circumferentially, and creating a space next exteriorly of said chilled crust while the crusted and already chilled body of metal or casting is within the mold, and then sucking or drawing a heat-absorbing medium into and through said space.

8. An improvement in the art of making circular metal castings, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a crust on and circumferentially of the body of hot metal supplied to said chamber, and creating a space next exteriorly of said chilled crust while the crusted body of metal or casting is within the mold, and then sucking or drawing a heat-absorbing medium into and endwise through said space all around the casting.

9. An improvement in the art of making metal castings, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a peripheral crust on the body of hot metal supplied to said chamber and creating a space next exteriorly of and around said crust while said body of metal or casting is within the mold, and effecting the creation for said space of an entrance and an exit which extend all around and are spaced endwise of said space, and then causing a heat-absorbing medium to pass through said entrance, space and exit.

10. An improvement in the art of making metal castings, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a peripheral crust on the body of hot metal supplied to said chamber and creating a space next exteriorly of and around said crust while said body of metal or casting is within the mold, and during the creation of said space effecting the creation for said space of an entrance and an exit which extend circumferentially and are spaced endwise of said space, and then sucking or drawing a heat-absorbing medium through said entrance, space and exit.

11. An improvement in the art of making metal castings, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a chilled peripheral curst on and circumferentially of the body of hot metal supplied to said chamber and creating a space next exteriorly of and around said chilled crust while said body of metal or casting is within the mold, and effecting the creation for said space of an entrance and an exit which are spaced endwise of said chilled crust, and then causing a heat-absorbing medium to pass through said entrance, space and exit.

12. An improvement in the art of casting a metal wheel having a flange at one end of the tread of the wheel, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and, upon the formation of a peripheral crust on and circumferentially of the body of hot metal supplied to said chamber and while the crusted body of hot metal or casting is within the mold sucking or drawing a heat-absorbing medium transversely of the tread-forming surface of said peripheral crust without drawing a heat-absorbing medium transversely of the peripheral surface of the flange of the casting.

13. An improvement in the art of casting a metal wheel having a flange at one end of the tread of the wheel, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and, upon the formation of a peripheral crust on and circumerentially of the body of hot metal supplied to said chamber and

the creation of a space next exteriorly of and around said crust while said body of metal or casting is within the mold, sucking or drawing a heat-absorbing medium through said space all around the casting from the inner side of the flange transversely of said peripheral crust.

14. An improvement in the art of casting a metal wheel having a flange at one end of the tread of the wheel, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and effecting the formation of a chilled peripheral crust on the body of hot metal supplied to the mold by chilling said body exteriorly and circumferentially of the body, and then sucking or drawing a heat-absorbing medium to and transversely of the tread-forming surface of the casting.

15. An improvement in the art of casting a metal wheel having a flange at one end of the tread of the wheel, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal, and upon the formation of a peripheral crust on and circumferentially of the body of hot metal supplied to said chamber and the creation of a space next exteriorly of and around said crust while said body of metal or casting is within the mold, treating the throat-forming and the tread-forming portion of the casting, without correspondingly treating the peripheral portion of the flange of the casting, by sucking or drawing a heat-absorbing medium into the aforesaid space in proximity to said throat-forming portion of the casting and thence endwise of and through said space at the tread-forming portion of the casting.

16. An improvement in the art of casting a metal wheel having a flange at one end of the tread of the wheel, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a chilled peripheral crust on and circumferentially of the body of hot metal supplied to said chamber and creating a space next exteriorly of and around said chilled crust while said body of metal or casting is within the mold, and then treating the throat-forming and the tread-forming portion of the casting, without correspondingly treating the peripherial portion of the flange of the casting, by sucking or drawing a heat-absorbing medium into the aforesaid space in proximity to said throat-forming portion of the casting and thence endwise of and through said space at the tread-forming portion of the casting.

17. An improvement in the art of casting a metal car-wheel having a flange at one end of the tread of the wheel, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a peripheral crust on and circumferentially of the body of hot metal supplied to said chamber and creating a space next exteriorly of and around said crust while the crusted body of hot metal or casting is within the mold, and during the creation of said space effecting the creation for said space of an entrance and an exit which extend all around the casting at opposite ends respectively of the tread-forming portion of the casting, and then causing a heat-absorbing medium to pass through said entrance, space and exit.

18. An improvement in the art of casting a metal car-wheel having a flange at one end of the tread of the wheel, said improvement consisting in pouring a mold having a circular chamber for receiving molten metal and forming a chilled peripheral crust on and circumferentially of the body of hot metal supplied to said chamber and creating a space next exteriorly of and around said chilled crust while the crusted body of hot metal or casting is within the mold, and effecting the creation for said space of an entrance and an exit which extend circumferentially of the casting adjacent opposite ends respectively of the tread-forming surface of the casting, and then sucking or drawing a heat-absorbing medium through said entrance, space and exit.

19. An improvement in the art of manufacturing a metal car-wheel having a flanged end, said improvement consisting in casting the wheel flanged end lowermost and forming a chilled peripheral crust on and circumferentially of the casting, and creating a space next exteriorly of and around the casting while the casting is within the mold, and effecting the creation for said space of an entrance and an exit which extend circumferentially of the casting adjacent the lower end and upper end respectively of the tread-forming surface of the casting, and then causing a heat-absorbing medium to pass through said entrance, space and exit.

20. An improvement in the art of making an annular casting, said improvement consisting in pouring a mold having an annular circular chamber for receiving molten metal, and sucking or drawing a heat-absorbing medium through the mold centrally of the mold without contact of said heat-absorbing medium with the casting.

21. An improvement in the art of making an annular metal casting, said improvement consisting in pouring a mold having an annular circular chamber for receiving molten metal, and, upon the formation of a peripheral crust on and circumferentially of the body of hot metal supplied to said chamber and the creation of a space next exteriorly of and around said crust while said body of metal or casting is within the mold, sucking or drawing a heat-absorbing medium through said space, and also sucking

or drawing a heat-absorbing medium through the mold centrally of the mold.

22. An improvement in the art of making an annular metal casting, said improvement consisting in pouring a mold having an annular circular chamber for receiving molten metal, and, upon the formation of a peripheral crust on and circumferentially of the body of hot metal supplied to said chamber causing a heat-absorbing medium to pass into contact with and transversely of said crust, and simultaneously causing a heat-absorbing medium to pass through the mold centrally of the mold.

In testimony whereof, I sign the foregoing specification, in the presence of two witnesses.

THOMAS D. WEST.

Witnesses:
B. C. BROWN,
N. L. MCDONNELL.