No. 728,956. PATENTED MAY 26, 1903.

T. MITCHELL.

ART OF CASTING STEEL CAR WHEELS.

APPLICATION FILED AUG. 11, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.

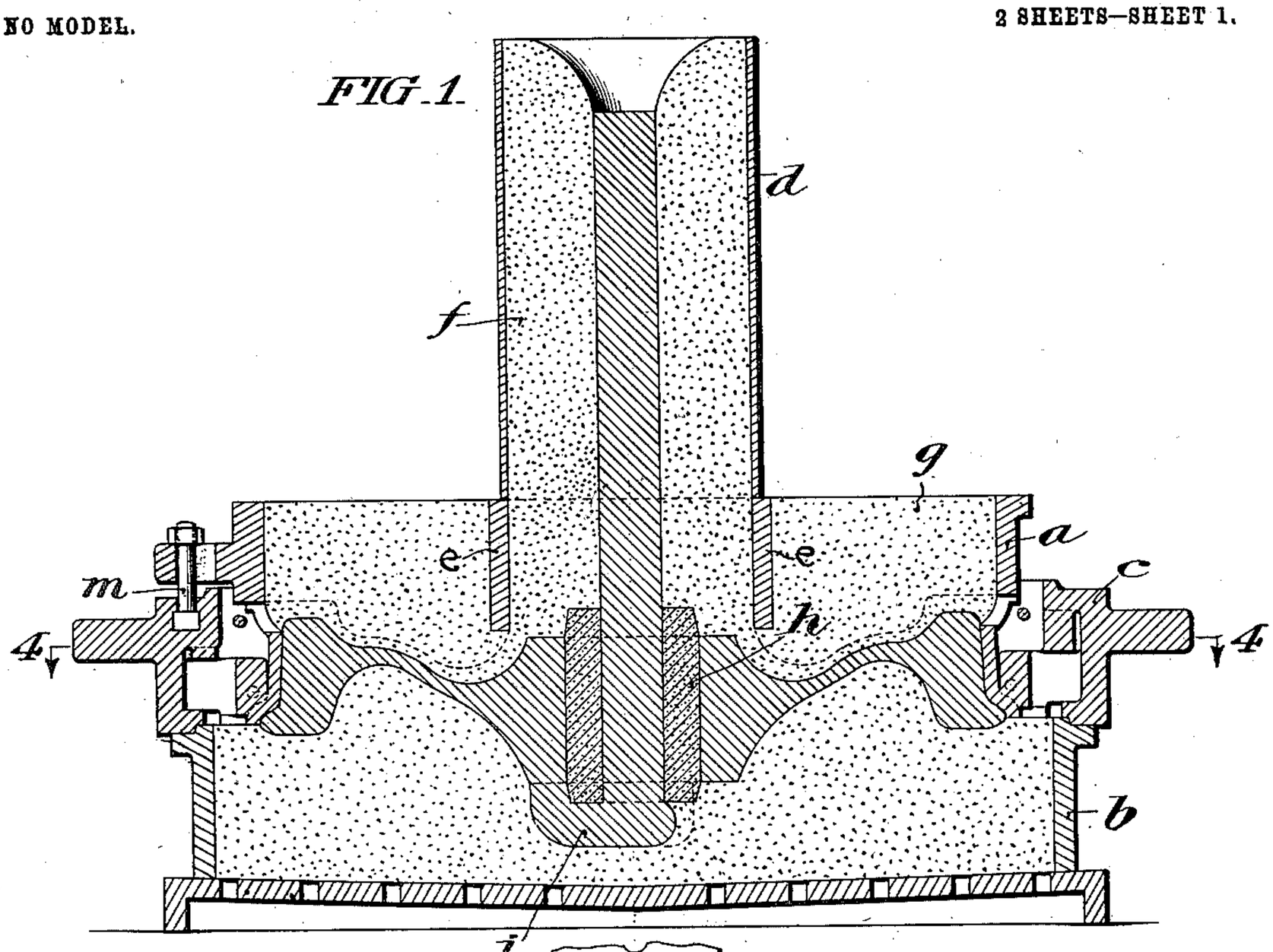
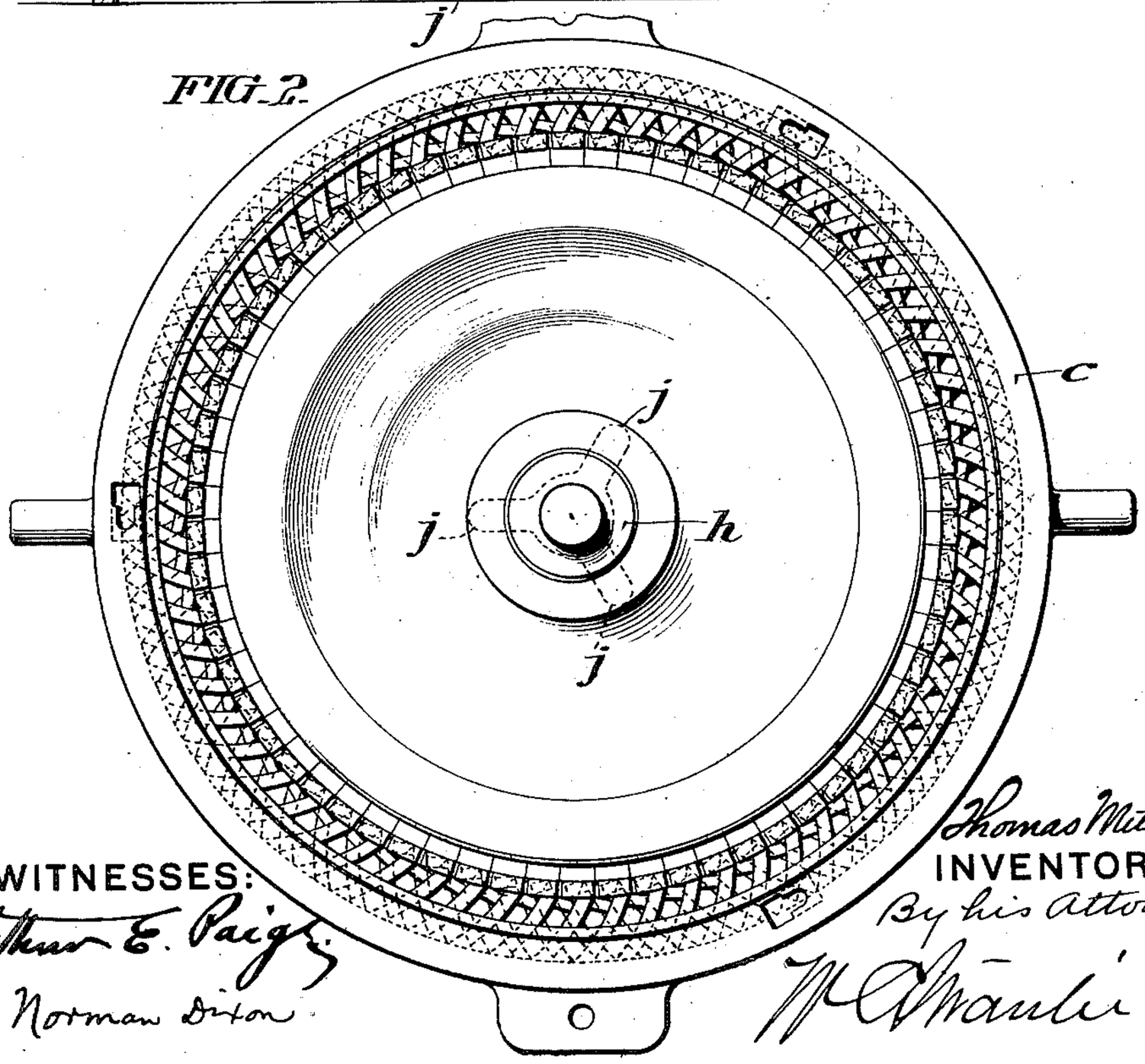


FIG. 2.



WITNESSES:

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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 3.

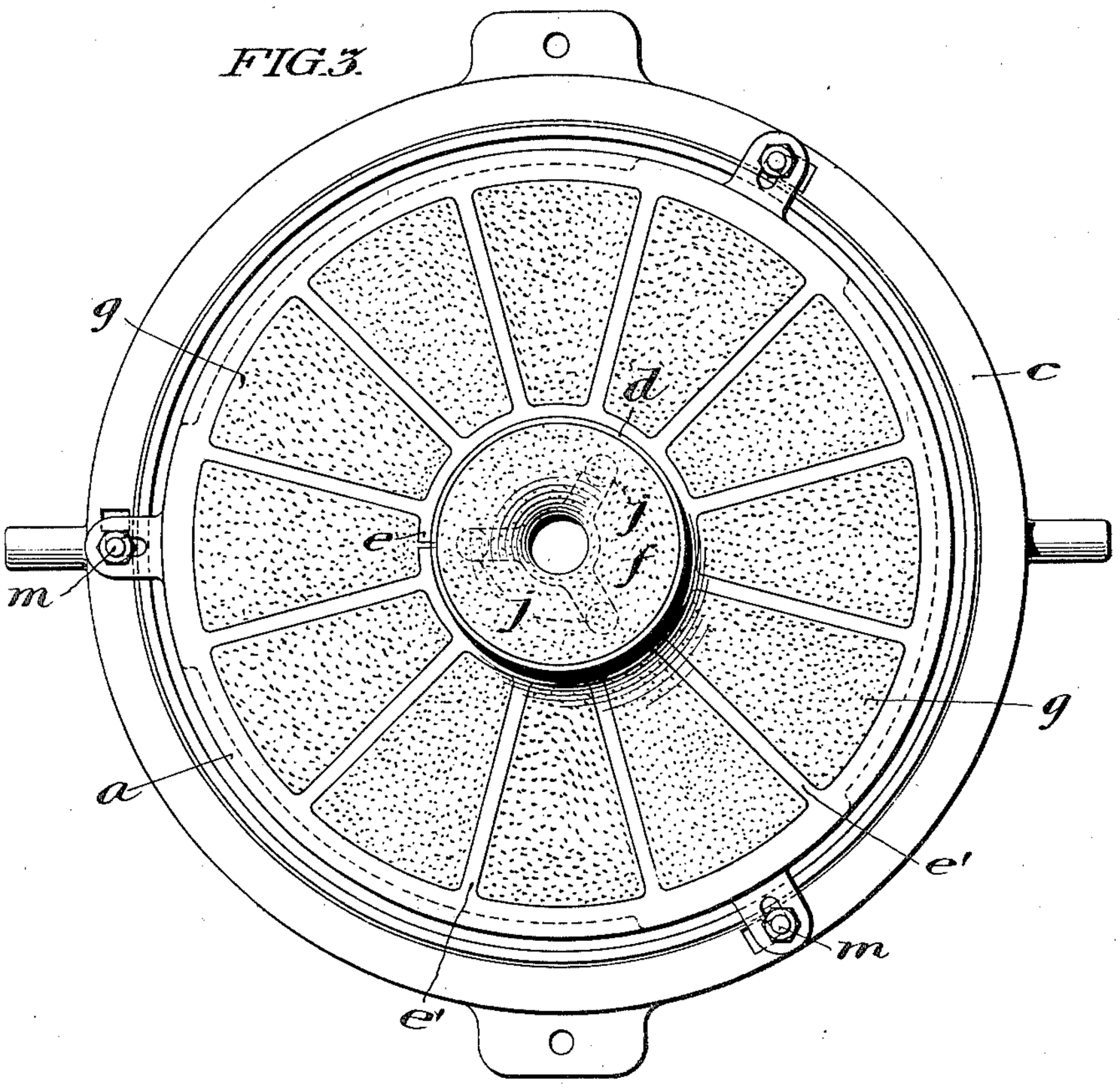
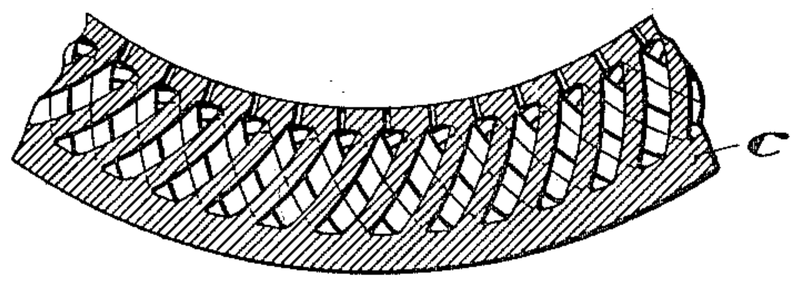


FIG. 4.



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UNITED STATES PATENT OFFICE.

THOMAS MITCHELL, OF CHESTER, PENNSYLVANIA, ASSIGNOR TO DANIEL EAGAN, OF PHILADELPHIA, PENNSYLVANIA.

ART OF CASTING STEEL CAR-WHEELS.

SPECIFICATION forming part of Letters Patent No. 728,956, dated May 26, 1903.

Application filed August 11, 1902. Serial No. 119,162. (No model.)

To all whom it may concern:

Be it known that I, THOMAS MITCHELL, a citizen of the United States, residing at Chester, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in the Art of Casting Steel Car-Wheels, of which the following is a specification.

My improvement relates to the art of molding or casting steel car wheels. Hitherto, when attempts have been made to cast car wheels of steel, it has been found necessary to provide the molds, at points in the vicinity of the rims, with openings leading to the exterior of the molds, so that when the molten metal was charged to the mold, a certain portion of it could flow out through said openings, to the end that, as the metal within the mold began to set,—the setting being, of course, accompanied by considerable shrinkage,—the metal which had so passed out could flow back into any vacant spaces in the marginal portions of the mold space occasioned by such shrinkage, thus compensating for the shrinkage, the metal returning through said openings becoming integral with the metal of the partly set casting.

In this practice, however, such of the metal passing out through the openings as did not return to the interior of the mold, of course, set, forming sink heads or protuberances on the side face of the wheel, with the result that when the wheel was removed from the mold, it was necessary to manually remove such heads, a matter requiring considerable time of workmen.

Hitherto, furthermore, it has not, so far as I am aware, been possible to produce, by operations of casting, steel car wheels possessing such wearing qualities as to lead to their general adoption.

It is the object of my invention to provide an improvement in the methods or art of casting steel car wheels, my improvement contemplating not only the conducting of the operations in such manner as to avoid the existence or presence of sink heads on the castings, but, furthermore, the production of wheels of more compact texture, and therefore of greater capacity to resist wear than has heretofore been possible.

In the accompanying drawings I show an apparatus for molding or casting steel car wheels by the aid of which my improvement in the art may be readily and conveniently practiced. Variations in the form of the apparatus employed may, of course, be resorted to without departure from the spirit of my invention.

In the accompanying drawings,

Figure 1 is a vertical sectional view of a flask showing a wheel cast therein.

Figure 2 is a plan view of the device shown in Figure 1, the cope of said flask being removed to show the upper face of the cast wheel, and the contractible chill inclosing the same.

Figure 3 is a plan view of the device shown in Figure 1.

Figure 4 is a fragmentary sectional view taken on the line 4—4 of Figure 1.

Similar letters of reference indicate corresponding parts.

In the accompanying drawings,

a is the cope, and *b* the drag of a mold which I may employ. *c* is a chill shown as of the contracting variety. I illustrate a special arrangement of gate through which the molten metal is supplied to the interior of the mold. The gate is preferably straight and extends vertically a considerable distance, preferably two feet or thereabout above the top of the cope, and may be provided at its upper end with any usual funnel-like mouth to the more conveniently receive molten metal.

The gate is composed of an external tube-like metal body *d*, the lower end of which rests upon the central split ring *e*, of the cope, which is integrally connected by the series of radially disposed webs *e'*, with the external rim or shell of the cope. The sand or other lining *f* of the gate is continuous of the mass of sand *g* of the cope.

h is a core arranged centrally within the mold space, having a central opening registering with the channel of the gate, the central opening or bore of the core and the channel or bore of the gate constituting a continuous channel.

Said core *h* is conveniently held between the sand of the lower end of the gate and that of the drag,—the ends of said core finding in

said sand suitable seats for themselves. The core *h* happens to be illustrated as of a different texture of sand from that of the cope and gate, and in fact I so prefer to make it. Said core *h* may, however, manifestly be made of the same character of sand as that employed in the cope and body of the gate, and be made as a part or continuous of the mass of sand in said cope and gate.

j are ports or channels, formed in the sand of the drag, beneath the core *h*, through which the molten metal passing downward through the gate and core, emerges into the lower part of the mold space.

The contracting chill *c* is of a well known character and I make no claim upon it in itself, nor do I deem it necessary to describe it. Said chill is, as illustrated in Figure 1, preferably temporarily attached, by suitable bolts *m*, to the cope.

In carrying out or practicing my invention by the aid of the apparatus described, I charge the molten metal within the upper end of the gate, whereupon said metal will descend through the gate and the bore of the core, and the necessary quantity emerge through the channels *j* to the lower portion of the mold space, the metal being charged to the gate in such quantity that after the mold space has been filled a column of the metal will remain in the channel of the gate.

The metal accumulating in the bottom of the mold space rises and flows laterally without splashing or destruction of the mold, and in due time completely fills the mold space, which latter may be provided with sink heads for the hub of the wheel.

By reason of the elevation of the gate the metal enters and remains in the mold space under such pressure that said mold space is very uniformly and thoroughly filled with the molten metal, the pressure of the column acting while all the metal in the mold is still fluid to very thoroughly compact the metal throughout all the mold space.

As the entire body of metal forming the body of the wheel passes in a molten condition down through the gate and core in its passage to the mold space, it communicates a considerable part of its heat to the sand adjacent to the channel of the gate and core, and the heat thus stored in said sand, after the charging operation is completed, acts to retain the metal in the core and gate in a fluid condition for a considerably longer time than would be the case were such metal not acted upon by the heat from the sand.

The column of metal thus remaining fluid, operates, under well-known physical laws, to exert pressure against the metal in the mold space.

So soon, moreover, as the metal adjacent to the central portion of the mold space, that is to say, the portion in the vicinity of the hub of the wheel, in setting, begins to contract, the molten metal from the column enters the mold space and unites with the metal of the wheel casting in the portion referred to to compensate for the shrinkage.

The metal of the central portion of the wheel casting will, therefore, not only remain under the considerable pressure of the column while molten and in the early stages of the setting operation, whereby its metal will be compacted and consolidated, but such shrinkage as occurs will be compensated for by the entry, under pressure, of the molten metal from the column, which last-mentioned column, as stated, is retained in a molten condition for a considerable time.

The central portion of the wheel, therefore, will be of full contour and of compacted and consolidated texture.

The metal of the rim portion of the wheel, making contact with the metal chill very quickly communicates a portion of its heat to the said chill.

The heat thus communicated to the contracting chill, consisting in the form shown of an outer ring, an inner sectional ring-shaped portion, and diagonally disposed stems, occasions the movement of the inner sectional ring-shaped portion of said chill toward the wheel casting, thus following up the contracting metal of the casting and bearing or pressing upon the rim face of said casting, making said rim perfectly circular and smooth so as to entirely obviate the use of machine work, heretofore required for finishing such rims.

As a result of the compressive action of the chill upon the metal of the rim portion of the wheel casting, said metal is in its setting maintained in a compressed and consolidated condition, with the result that the rim portion of the wheel is of more solid and compact texture, than if made with sink heads as heretofore.

The position of the elevated gate at the central point of the flask, in which position the metal passes down a straight vertical channel through the cope and directly into the mold space,—is a feature of great importance, inasmuch as the pressure due to the elevation of the gate thereby acts directly upon the metal within the mold and it is not lost or wasted in traveling a considerable lateral distance before reaching the interior of the mold as would be the case were said gate situated at a point outside of the rim of the mold.

Furthermore, by reason of said location of the elevated gate, the molten metal has the minimum distance to travel to reach the mold space, and consequently reaches said space with the maximum fluidity, and, furthermore, in my arrangement, the pressure against the metal in the mold space by the column of metal in the gate, will continue longer after the metal in the gate begins to lose its fluidity than it would were it necessary for the metal in the gate to traverse a considerable horizontal region before entering said mold space.

It will be observed that I employ a hydrostatic head of metal of considerable height, the

height in practice being not less than fifteen inches above the mold space, and preferably about twenty-four inches, and that I combine therewith a contracting chill of such a construction that it contracts over a wide range and therefore has a multiplied action. The combined compressive effect on the metal of a head of the above dimensions and of a chill of this construction is much greater than would be the case were a head of the usual height and an ordinary chill used, consequently the resulting product is more dense, is firmer, and is sharper in outline.

The apparatus herein shown and described is not claimed herein, but forms the subject of claims in an application executed by me contemporaneously herewith and filed as Serial No. 119,161.

The dispensing with the heads constitutes a very great practical improvement and economy in the art.

Having thus described my invention, I claim—

1. The improvement in the art of molding or casting steel car wheels, which consists in conveying to a mold space of suitable form, between a cope and a drag, a sufficient quantity of molten steel, and compacting the metal as it sets by subjecting it to a hydrostatic head of metal of considerable height, and to a circumscribing chill having a multiplied action, which tends to move toward the center of the apparatus, and thus exercise compressive action upon the metal, whereby a solid wheel is produced without the use of a heading or headings upon the rim.

2. The improvement in the art of molding or casting steel car wheels, which consists in conveying to a mold space of suitable form, between a cope and a drag, a sufficient quantity of molten steel to fill the mold, and compressing and compacting the metal as it sets by subjecting it to a hydrostatic head of metal of considerable height, and to a circumscribing contracting chill having a multiplied action which tends to move toward the center of the apparatus and exercise compressive action upon the metal, maintaining it in proper shape as it contracts in setting, and thereby producing a wheel which is dense, firm and of sharp outline, without the use of heads.

3. The improvement in the art of casting steel car wheels, which consists in conveying through a gate or channel to a mold space of suitable form, a charge of molten steel sufficient to fill said mold space, and in maintaining in communication with the central portion of the metal within the mold space, a vertically extending hydrostatic head of metal of considerable height arranged within said gate or channel, said head being arranged above the central portion of the molding or casting apparatus, and exerting pressure directly against the metal in the mold, and subjecting the metal to a circumscribing chill having a multiplied action, which tends to move toward the center of the apparatus and exercise compressive action upon the metal, whereby the metal of the casting is, as it sets, compressed, added to, and consolidated, as specified.

4. The herein described improvement in the art of molding cast steel car wheels, which consists in charging from a point vertically above the central part of a mold through an elongated channel having direct connection with the lower side of said mold, a quantity of molten steel to said mold, and causing said molten metal to gradually rise and fill the mold and the channel, and forming in the channel a hydrostatic head of metal of a height not less than fifteen inches, and compressing the metal in the mold by the action of said head, and adding to the metal in the mold space from the metal of the head as the metal in the mold space sets, and compressing and compacting the metal by a circumscribing contracting chill having a multiplied action, whereby a cast wheel is produced which is dense, firm, and of sharp outline.

5. The herein described improvement in the art of molding cast steel car wheels, which consists in charging molten steel to a mold from a point vertically above the central part of the same, through an elongated channel having direct connection with the lower side of said mold, and causing the molten metal to gradually rise and fill the mold and the channel, to form a hydrostatic head of metal of considerable height in the said channel, and compressing the metal in the mold by the action of the said head, and adding to the metal in the mold space from the metal of the head as the metal in the mold space sets, and also compressing and compacting the metal in the mold by a circumscribing contracting chill having a multiplied action.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 8th day of August, A. D. 1902.

THOMAS MITCHELL.

In presence of—

THOS. K. LANCASTER,
ARTHUR E. PAIGE.