2 Sheets—Sheet 1.

J. W. & W. NOBLE.

Manufacture of Car-Wheels.

No. 211,105. Patented Jan. 7, 1879.

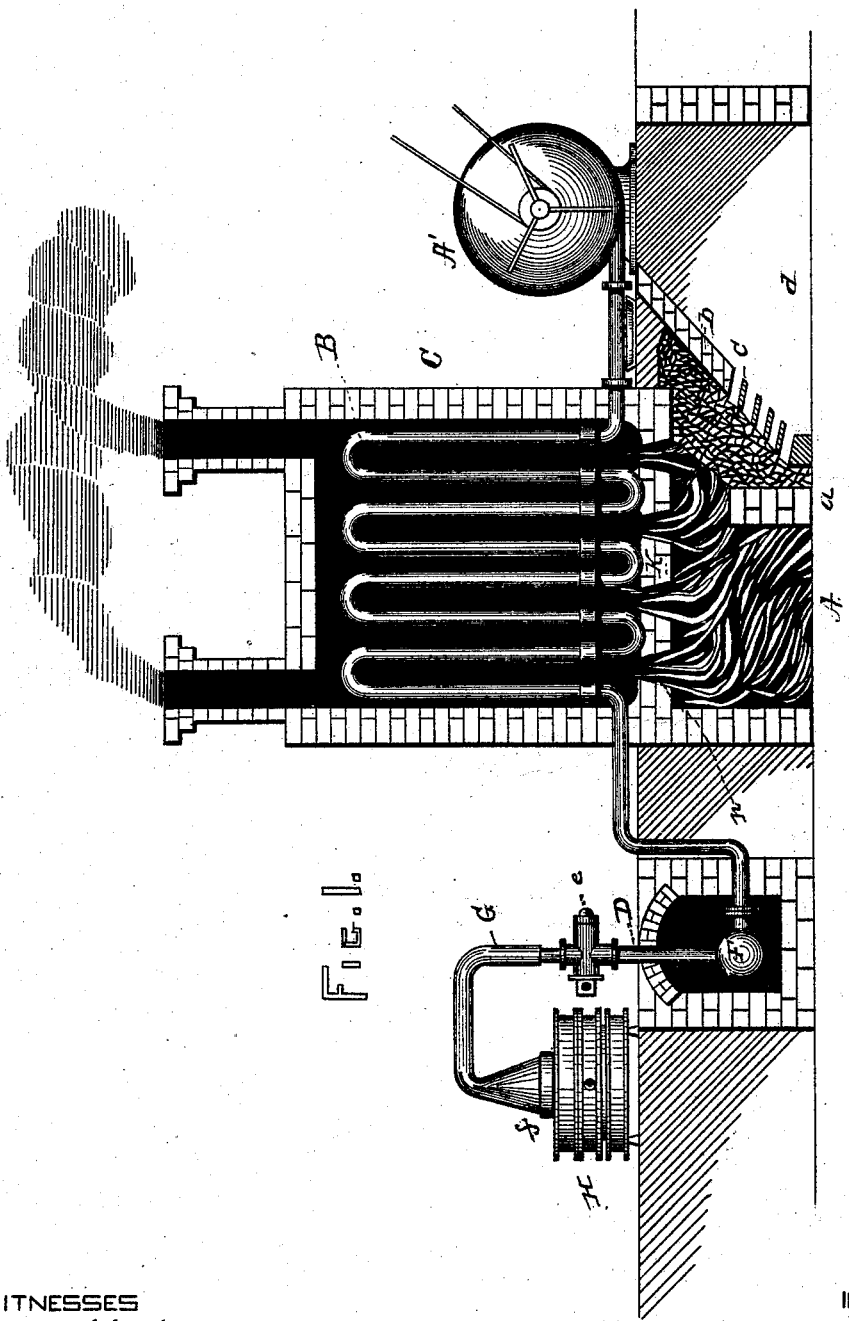


Fig. 1.

WITNESSES

Nat. E. Oliphant

Julia A. Weylmann

INVENTORS

John W. Noble

William Noble

by Lamberton & Darlington

Attorneys.

2 Sheets—Sheet 2.

J. W. & W. NOBLE.

Manufacture of Car-Wheels.

No. 211,105. Patented Jan. 7, 1879.

Fig. II.

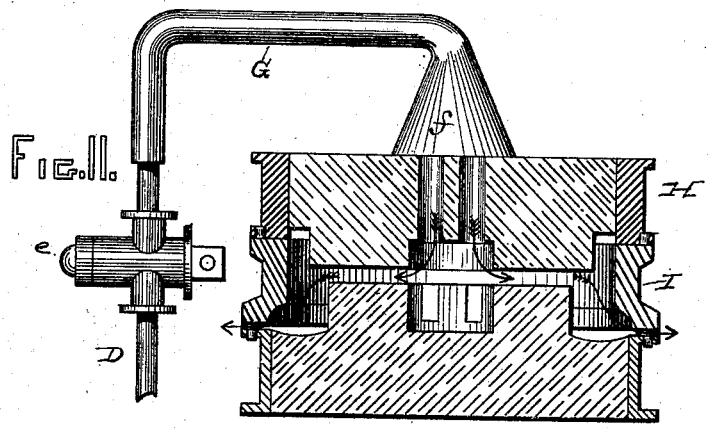


Fig. III.

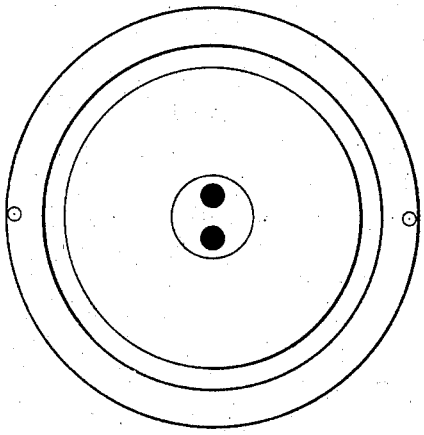
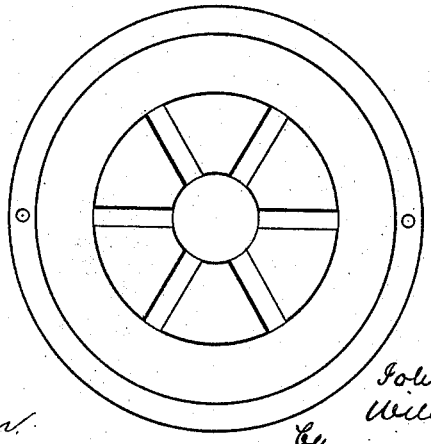


Fig. IV.



WITNESSES

Nat. E. Oliphant

Julia A. Heylmun

INVENTORS

John W. Noble

William Noble

by Lambert & Darlington

Attorneys

UNITED STATES PATENT OFFICE.

JOHN W. NOBLE AND WILLIAM NOBLE, OF ROME, GEORGIA.

IMPROVEMENT IN MANUFACTURE OF CAR-WHEELS.

Specification forming part of Letters Patent No. **211,105**, dated January 7, 1879; application filed July 5, 1878.

To all whom it may concern:

Be it known that we, JOHN W. NOBLE and WILLIAM NOBLE, of Rome, in the county of Floyd and State of Georgia, have invented certain new and useful Improvements in the Manufacture of Car-Wheels; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 is a part sectional view, showing the apparatus in use. Fig. 2 is a central sectional view of the mold, showing the bent pipe in position. Figs. 3 and 4 are two views of the molds.

The main object of this invention is to produce a cast-metal car-wheel with chilled tread or periphery in a more perfect manner, by the improved means or apparatus hereinafter described, than has hitherto been effected; and to this end our invention consists in drying a green-sand car-wheel mold, removing all loose particles of sand from the mold, and heating the solid chill without removing it from the mold, which operations and effects are accomplished by downward currents of hot air, and while the mold is on the foundry-floor; also, in the combination, with a hot-air blast-furnace and connecting air-pipes, of a sand-mold having ordinary gate-holes in the cope to admit the descent of currents of heated air to the interior of the mold, and openings thereof for the escape of the heated air from the inside of the mold; and, finally, in the novel combination of means or devices for accomplishing the result desired—to wit, an improved car-wheel—as will be hereinafter more fully set forth.

In the annexed drawings, the letter A represents the furnace divided by a vertical partition, *a*, forming a fuel and a hot-air chamber, and the inclined wall *b*, with bars *c*, separates the ash-pit *d* from the fuel-chamber. Above the furnace A is erected a brick oven, C, within which is arranged a serpentine pipe, or coil-pipes, B, forming a connection with a blower or fan, A′, as shown in Fig. 1 of the drawings.

The other end of the pipe B passing through the opposite end of the oven makes a connection with a reservoir or supply-pipe, F, arranged in a passage or pit below the surface of the floor. From this supply-pipe extends a vertical pipe, D, provided with a stop-cock or valve, *e*, for regulating the admission of air to the mold through the curved or bent pipe G, attached to the upper end thereof, as shown in Fig. 1. This detachable pipe G is provided at its outer end with a hood, *f*, which is designed to cover the gate-holes of the mold when the blast-machine is in operation.

The wheel-mold H, consisting of the ordidary car-wheel drag, cope, and chill, is made in the usual way. The pattern is placed in the solid chill, and the drag and cope of the flask filled with "green sand" and rammed firm around the pattern and runner-stick in the cope for forming the gate-opening through which the molten metal passes. The runner-stick is withdrawn and the cope lifted upward at the parting, leaving the pattern in the chill and sand of the drag. The cope is then turned over on supports for dressing. The pattern is now removed from the chill and drag in the usual manner. The mold having been dressed and the facing-sand dusted with finely-powdered charcoal or other substance, the flask is again closed, except between the lower portion of the mold-drag and the chill. A thin washer or separator is arranged on the flask-pins to keep the chill and drag slightly apart to allow the escape of the hot air from the interior of the mold, in the manner as will be hereinafter described.

As soon as the mold is made currents of hot air are turned into the interior of it to dry the sand, and at the same time heat the chill.

It will be observed that our chill is solid and heated without any pipes connected directly with it, and can be raised and moved at pleasure; also, that the green-sand mold, after being made, is dried on the foundry-floor without moving it to the oven or dry-kiln. Likewise the solid chill is heated while in position on the mold.

Operation: The fan blows air into the pipe B, inclosed in the brick oven C, which becomes heated by the flames and products of combustion passing through the openings *h* in the arch K over the fire. The heated air is forced

by the blast from the pipe B into the supply-pipe F, and thence is distributed to the wheel-mold through the bent pipe G, properly adjusted, the currents of hot air passing down through the gate-holes in the cope into the interior of the mold, and escaping between the lower part of the mold-drag and chill, which is kept slightly apart for the purpose, thus drying the sand and heating the chill. When the mold is properly dried and the chill heated, the pipe G, with hood *f*, is turned aside or disconnected from the mold, the separators removed, and the flask closed tight, and the molten metal poured in the usual manner through the same gate-holes the air was blown through.

The advantages of this method of casting wheels are: We have a dry mold, every particle of moisture in sand and chill being driven out by the hot air, and all particles of dust or loose sand that may be in the mold are also driven out, thus insuring a clean mold. The mold being clean and dry, the metal is not agitated by moisture when passing over damp sand, as is the case in the old way. In the old mode, the chill being colder than the sand, it condenses the moisture from the sand on its face, (that forms the tread of the wheels,) and becomes so wet that the water drips from the face of the chill. This water had to be evaporated by the molten metal as fast as it rose against the chill, causing a boiling or agitation of the metal as it came in contact with the cold damp chill, making it to flow in circles or rings, and setting or solidifying while in that state, causing the wheel to spot out in rings and circles on the tread after being used but a short while; but with a hot chill every particle of moisture is evaporated, even out of the pores of the iron composing the chill, and the melted metal lies still and quiet against it, and, not cooling so quick as against the cold chill, the metal has time to arrange itself in a solid and homogeneous manner.

Another advantage of a hot chill is that the flange and tread do not cool so rapidly, thus giving the body and hub more time to solidify and keeping the temperature of the whole wheel more even, the outer ring being much hotter and the hub and body cooler when taken out of chill to put in the annealing-ovens, thus getting rid of the difficulty of the unequal contraction of rim and the other portions of wheel. If the outer circle of wheel becomes too cool before annealing, the contraction of center will tear the wheel apart through the hub and plate, because the rim being so strong and rigid it cannot be compressed into a smaller diameter to accommodate the contraction of the center portion of wheel.

The hot chill so far overcomes this difficulty that wheels left to cool suddenly in the open air do not crack.

Another advantage is, we make a more uniform wheel than was possible in the old method. The sand part of the mold, being dry and hard, does not yield to the weight and pressure of the metal, as green and damp will, thus insuring even thickness of metal and better-balanced wheels; and for engine and tender wheels that are painted they have a truer and smoother surface for receiving paint.

Another advantage of the improvement is, that it obviates the difficulty of the sudden and rapid contraction of the flange while the metal of the tread is yet in a soft state, (the flange being comparatively cool,) contracts and forces the tread of the wheel away from contact with the chill before it is properly set, thus preventing the proper chilling of the throat of the tread, and at the same time forcing particles of liquid iron through the face of the tread into the vacant space left between the wheel and chill, making the "bead-drops or sweating. It also destroys the proper taper and true circle of the wheel, for as the pressure exerted on one edge of the wheel by the contracting flange forces the tread away from the chill at its softest places, and making dents or flattened places on tread of wheel, generally opposite the ribs or arms, (that being the hottest place and last to cool,) and in some cases the shrinkage of flange is so great that the lowest place on the tread of the wheel is next to the flange.

We are aware that heretofore a hot-blast, or a current of heated air, forced through vertical pipe-molds for drying the sand and heating a chill-plate located at the bottom of the mold has been used in the manufacture of pipes, and to such invention no claim is made; also, we are aware that a hollow heated chill with connecting-pipes for conducting steam, &c., through the hollow space around the chill has been used in casting car-wheels. This construction of a chill is objectionable for the reason that steam-tight joint-connections are necessary, and have to be broken every time the mold is made.

What we claim as our invention is—

1. The improvement in the art of making a mold wherein to cast a chilled car-wheel, which consists in making the green-sand mold and arranging the solid chill, substantially in the usual way, then subjecting the interior of the mold while on the foundry-floor to downward currents of hot air, whereby the sand is dried, loose particles of sand, &c., removed, and the chill heated, all at the same operation.

2. The improvement in the art of molding for casting chilled car-wheels hereinbefore described, which consists in making the green-sand mold in the usual way and arranging a solid chill between the drag and cope of mold, then drying the mold and heating the chill by downward currents of heated air from a blast-furnace, and, finally, casting by successive steps without moving the flask with chill.

3. In combination with a blast-furnace and connecting air-pipes, the arrangement of a sand mold, a solid chill, and thin separators, as described, and for the purpose set forth.

4. The combination, with a hot-air blast-furnace and connecting air-pipes, through which

currents of heated air pass, of a sand mold having ordinary gate-holes in the cope to admit the descent of currents of heated air to the interior of the mold, and having openings formed in its sides for the escape of the heated air from the inside of the mold, as set forth.

5. The combination, with a flask having gate-holes in the cope, of the movable bent pipe G, having a hood, *f*, at its upper end, and of suitable connections with a hot-air blast-furnace, substantially as described.

6. The means, substantially as described, for drying car-wheel sand molds while on the floor, consisting of a blower, a coil of pipes arranged within an oven over a furnace, a supply-pipe, and a connecting-pipe with a hood arranged over the gate-holes of the mold, whereby the currents of hot air are caused to pass downward through the interior of the mold.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

JOHN W. NOBLE.
WILLIAM NOBLE.

Witnesses:
C. A. THORNWELL,
I. W. HUME.