No. 79,611. PATENTED JULY 7, 1868.

J. B. TARR.

CAST IRON CAR WHEEL.

Fig. 1.

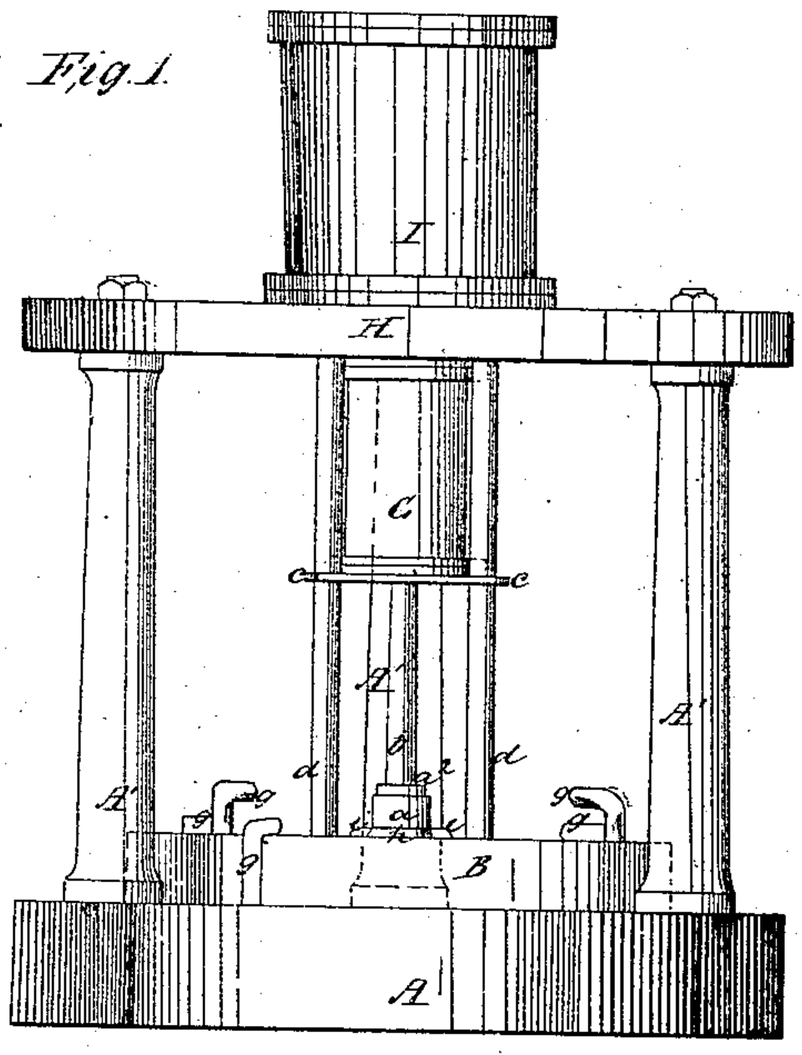


Fig. 3.

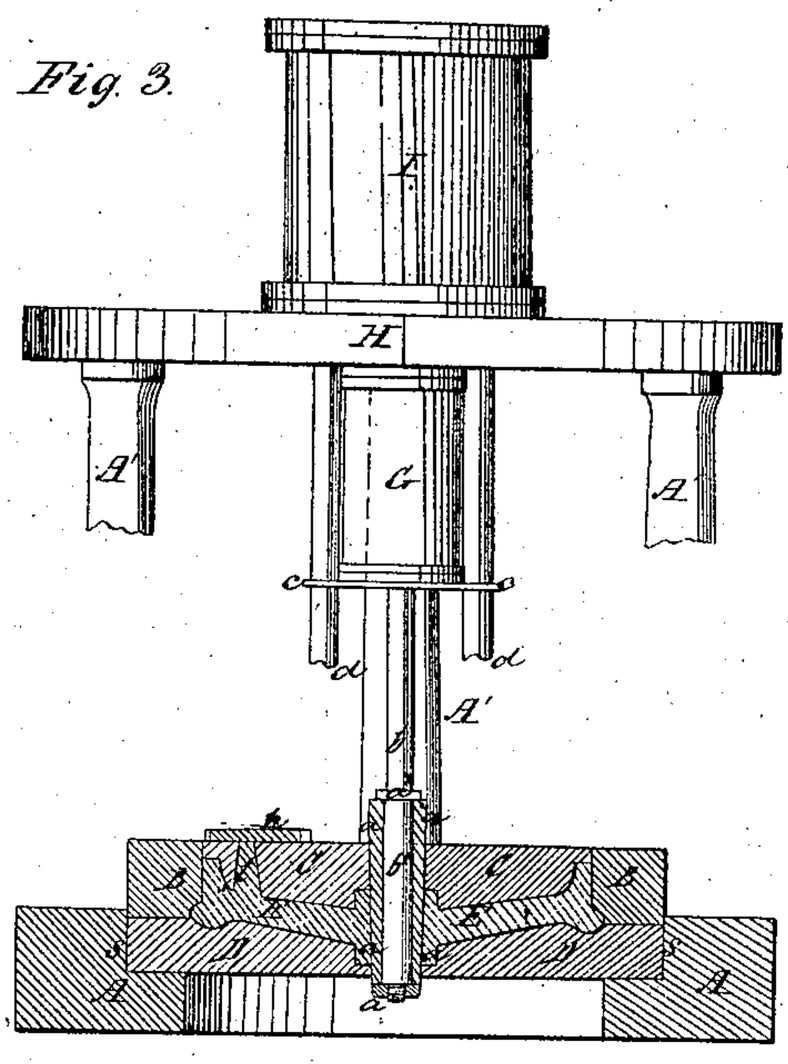


Fig. 2.

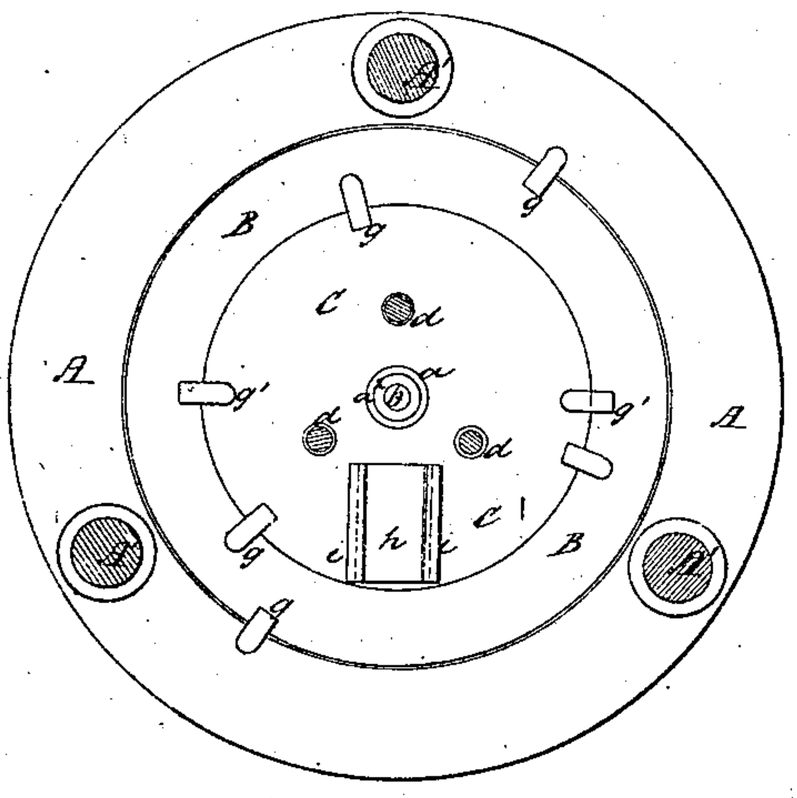


Fig. 4

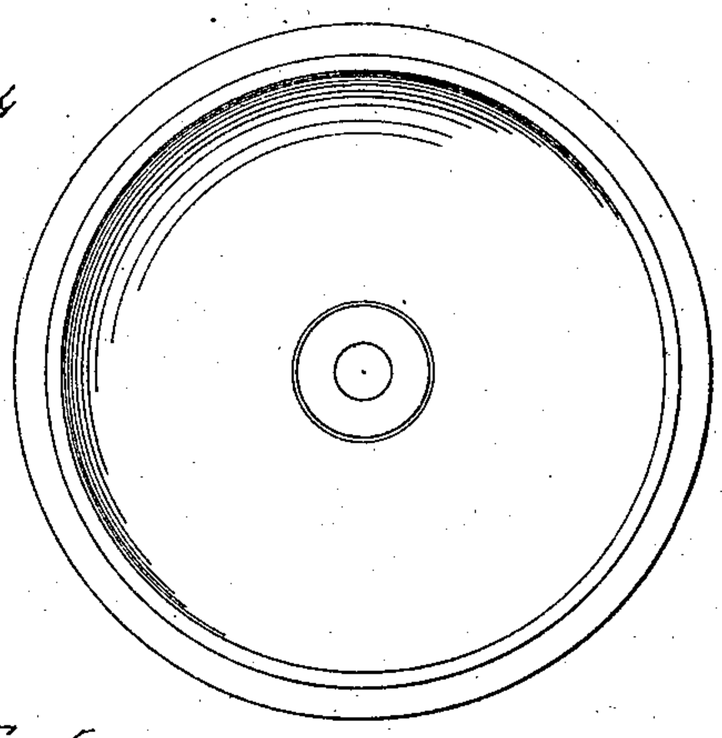
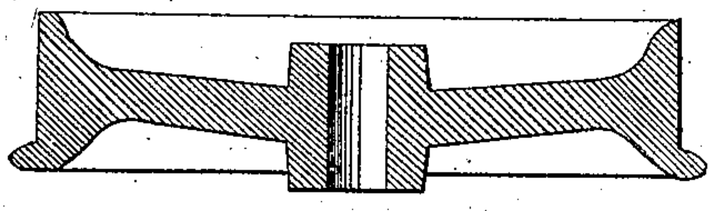


Fig. 5



Witnesses.

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Letters Patent No. 79,611, *dated July* 7, 1868.

IMPROVEMENT IN CAST-IRON CAR-WHEELS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN BLAKE TARR, of Fair Haven, in the county of Bristol, and State of Massachusetts, have invented an Improved Cast-Iron Car-Wheel; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a front elevation of a machine which is adapted for the production of my improved wheels.

Figure 2 is a section through the machine, taken in the horizontal plane indicated by red line *x x* in fig. 1.

Figure 3 is a vertical central section, taken through the lower part of the machine, showing a wheel within the mould.

Figures 4 and 5 represent one form of car-wheel, as produced by my improved method and machine.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to a new and improved process of treating cast iron in the manufacture of railroad-carw heels, whereby wheels made of this material will be much stronger, cheaper, less liable to flaws and other imperfections, and better in every other respect than cast-iron wheels made by any other known process.

Owing to the difficulties hitherto attending the production of car-wheels of cast iron, and the uncertainty of producing wheels of this material without flaws, railroad-engineers have, in many instances, substituted steel wheels instead of cast-iron wheels. But steel wheels are very expensive, costing from seventy-five to one hundred and fifty dollars, and their production is attended with many difficulties which are not experienced with cast iron.

The nature of my invention consists in effecting the compression and condensation of cast iron during the act of giving to it the form of a car-wheel, and, while this metal is in a liquid or plastic condition, keeping the metal under considerable pressure until it has set sufficiently to retain the shape and density imparted to it, as will be hereinafter described.

The following description will enable others skilled in the art to understand and carry into effect my improved process of making car-wheels of cast iron.

In conducting the improved process it is necessary to employ metal moulds, or moulds of some material possessing sufficient strength to withstand the pressure which is applied to the metal while in a plastic state; also, to employ certain means whereby air or gases will be allowed to escape from the metal while under pressure in the mould; also to provide for applying powerful pressure to the metal while it is confined within a mould, and to keep it under such pressure, while cooling, until it has set; and finally, it is necessary to provide for releasing the car-wheels from restraint at a proper time, to prevent them from shrinking unevenly.

The mould within which the wheels are produced is composed of three sections, B, C, and D, which may wholly or partially be lined with some suitable refractory substance, to prevent a rapid destruction of the metal of which these sections are composed. These three sections should also be made strong enough to sustain considerable pressure without yielding in the slightest degree.

The section D is a circular plate, with a hole made vertically through its centre, and with a circular concavity formed in its upper surface, of a shape corresponding to the shape of the inside face of a car-wheel, and a portion of the flange thereof. This section D, when in place, fits snugly into an annular recess, *s*, made concentrically in the upper surface of a base-plate or ring, A, as shown in figs. 2 and 3. The section B is a strong ring of metal, which is designed to produce the tread or periphery of a car-wheel, and also a portion of the flange thereof, and which is made so as to fit snugly within the recess *s*, in base-plate A, and on top of the bottom section D of the mould.

The top section C of the mould, I shall denominate a pressing-head, for it is through the medium of this section that the metal in the mould is pressed. This head is shaped on its bottom surface so as to produce the outer face of a car-wheel, and the rim thereof, as shown in fig. 3, and it is adapted to fit within the ring-section B, but not to fit so tightly therein as to prevent the escape of air or gas between it and the ring.

The sprue or pouring-hole or holes *t* are made vertically through the pressing-head C, and provided on top of this head with cut-off slides *h*, which are dove-tailed and fitted to work between guides *i i*, shown in figs. 1, 2, and 3. The slide *h* is designed for cutting off the superfluity of metal left over the sprue-hole *t*, after filling the mould, and also for closing the sprue-hole so that the metal will not be forced out through this hole when pressure is applied to the pressing-head. The pressing-head C has a vertical hole made through its centre, the axis of which coincides with the axis of the hole which is made through the centre of the bottom section D, of the mould. The hubs of the wheels are produced by making corresponding recesses in the top and bottom sections C D, as shown in fig. 3.

Three vertical rods, *d d d*, are secured to the pressing-head C, and arranged concentrically around the centre of this head at equal distances apart. These rods are carried up through a guide-plate, *c*, and through a head-plate, H, and are connected to a piston working in a cylinder, I. By the ascent and descent of the piston in cylinder I, the head C is caused to rise and descend.

Beneath the head-plate H is a small cylinder, G, the vertical axis of which coincides with the axis of the cylinder H, and the mould-sections. Within cylinder G works a piston, to which a rod, *b*, is secured, which rod extends downward, and has a core, *a*, which may be made slightly tapering, applied upon its lower portion *b'*, as shown in fig. 3. This core is designed to leave holes through the centres of the car-wheels, and it may be made of a suitable refractory substance, and held in place on the lower portion *b'* of piston-rod *b*, between a collar a^2, and a nut, a^1.

The core *a* is made tapering, so that it may be readily withdrawn from the casting when the latter has properly set.

The head-plate H is supported upon and held down by means of pillars A', as shown in the drawings, which should be of sufficient strength to resist the upward strain against the head-plate H during the act of pressing and condensing the metal in the mould.

Each one of the cylinders I G should be suitably connected by pipes with force-pumps, which are made upon the principle of the well-known force-pumps used for hydrostatic presses, so that the pistons in these cylinders can be forced upward and downward, at pleasure.

The operation is as follows: Three mould-sections are brought together, as shown in fig. 3, with the core *a* in position to produce a hole through the wheel when cast. The mould is then filled with melted cast iron, and the slide *h* moved over the sprue-hole *t*. Pressure is then applied to the head C, and the metal in the mould thereby condensed. When the wheel becomes cool enough to allow of its release from the mould-sections, the core *a* is first retracted, then the head C is raised, and finally the ring B is lifted free from the wheel, leaving the wheel to cool upon the bottom section of the mould.

The hooks *g g*, which are represented in figs. 1 and 2, are designed for holding the ring-section B down in place until the pressing-head C is lifted free from the casting, when these hooks are turned to one side, and this ring allowed to be lifted by the hooks which extend over the pressing-head. The hooks *g' g'* are designed to serve as gauges for determining the descent of the pressing-head, and regulating the density of the wheels cast in the mould.

Instead of employing hydrostatic pressure, screw or lever-pressure may be adopted, but I prefer to use hydrostatic power, because the machinery required in the application of this power is more readily manipulated than any other with which I am acquainted.

By subjecting cast iron to considerable pressure while it is in a molten or plastic condition, and while it is confined within the mould which is to give to it the final or desired shape, an extraordinary strength and closeness is imparted to this metal. The fibres or grain of the metal are reduced and compacted to such a degree that a piece of the fractured metal presents more the appearance of fine steel, than cast iron, as hitherto moulded. And not only is this metal rendered stronger, and its fibres made to cohere with greater tenacity, by applying pressure, but another important result is obtained, which is, that in the act of applying pressure to condense the metal, the latter is compelled to flow rapidly into every space in the mould, thereby producing a perfect casting at every operation. By subjecting cast iron to pressure while in a molten state, the castings will be homogeneous, because the metal in the mould will be subject to a uniform pressure throughout, which is not the case under the old modes of casting cast iron.

I am aware that steel car-wheels have been produced by subjecting this metal to pressure while in the moulds in a liquid or plastic state. An instance of this kind will be found in the Letters Patent granted to me on the 30th day of July, 1867, and numbered 67,227, and therefore I do not now lay claim broadly to a compresed metal car-wheel.

By my invention the difficulty and expense attending the construction of moulds adapted for moulding and condensing steel are greatly reduced, for the reason that the moulds do not require to be capable of withstanding so intense a heat when iron instead of steel is run into them. Again, they do not require to be so strong as when steel is pressed within them.

Having described my invention—

I claim, as a new article of manufacture, a car-wheel made of cast iron, condensed by pressure while in a molten state within the mould, substantially as and for the purpose described.

JOHN BLAKE TARR.

Witnesses:

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