J. B. Tarr,

Car Wheel.

No. 67,227. Patented July 30, 1867.

Fig: 1.

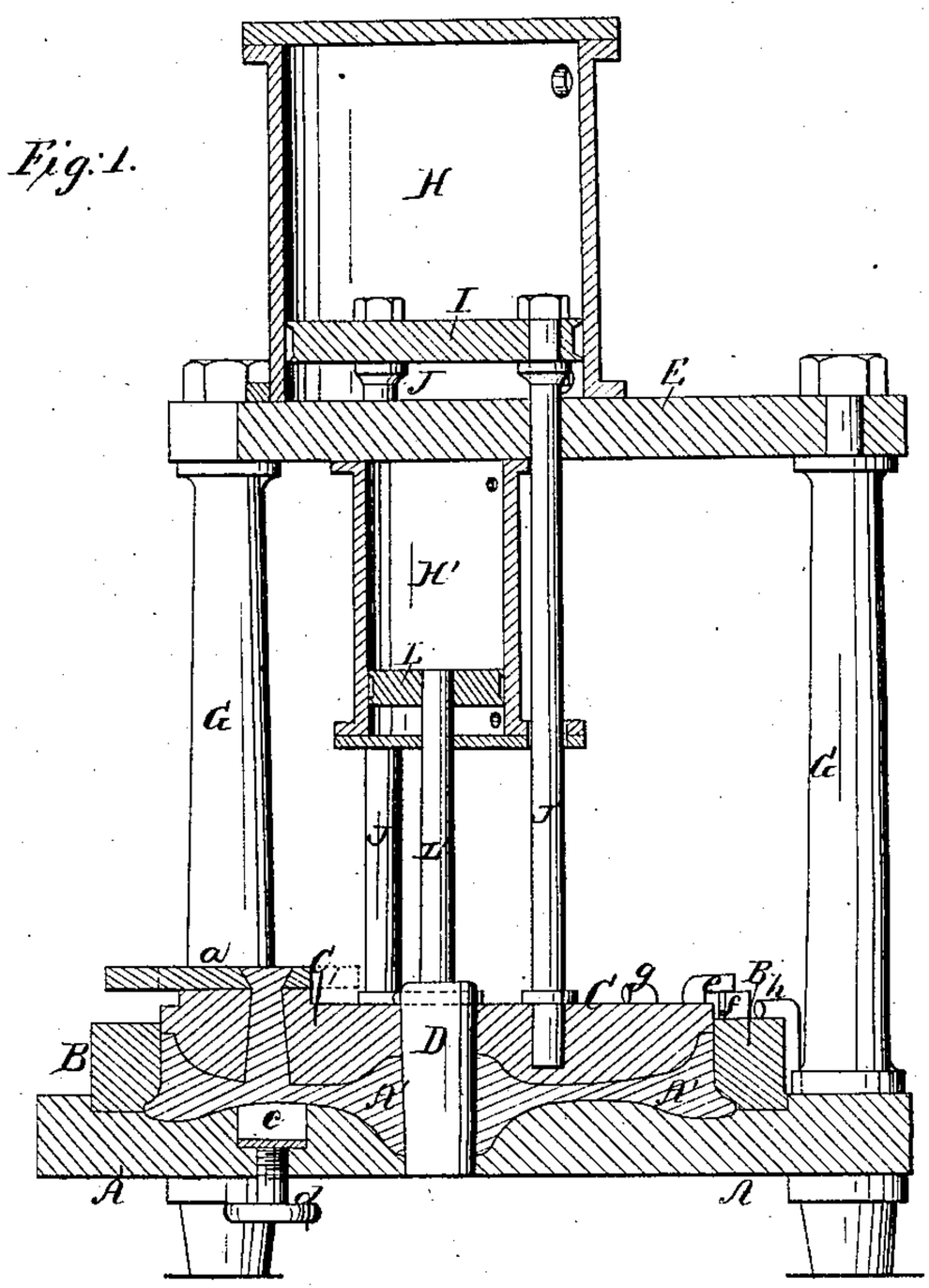


Fig: 2.

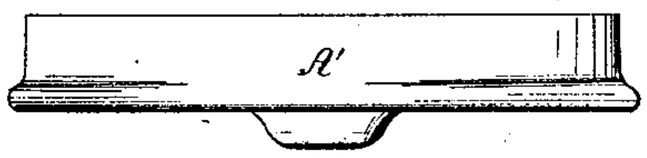
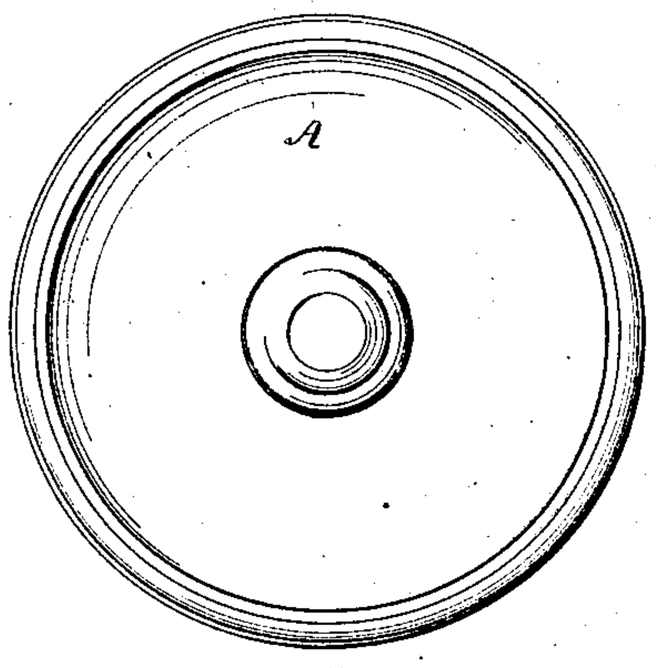


Fig: 3.



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JOHN BLAKE TARR, OF CHICAGO, ILLINOIS.

Letters Patent No. 67,227, *dated July* 30, 1867.

IMPROVED CAST-STEEL CAR-WHEEL.

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 Chicago, in the county of Cook, and State of Illinois, have invented a new and improved Railroad 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 vertical central section through a machine which is adapted for making the improved car-wheels.

Figure 2 is an edge view of a car-wheel.

Figure 3 is a face view of the wheel.

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

The nature of my invention consists in producing railroad car-wheels of steel, by subjecting the steel, while in a liquid or semi-liquid state within a mould, to considerable pressure, for the purpose of expelling the gases from the metal, condensing the fibres thereof, and thus rendering the wheels capable of resisting the shocks and concussions to which they are subjected, and also admitting of the production of wheels without injury to the fibres of the metal, and with greater facility and less expenditure of labor than steel car-wheels hitherto produced, as will be hereinafter described.

Previous to my invention steel car-wheels have been made from ingots by processes of rolling and forging, which not only greatly injure the steel fibres, by elongation and lamination, but to a considerable degree impair the tenacity and cohesion of the metal, so that wheels which are produced from ingots under the hammer, with the greatest care and by the most experienced workmen, are very liable to break under ordinary usage.

The following is a description of one practical mode of producing my improved car-wheels.

In the accompanying drawings, A represents the base-plate of the machine, which forms the lower section of the mould within which the car-wheel A′ is cast. B represents a ring which produces the circumference or tread of the wheel and a portion of the flange thereof. This ring forms the vertical section of the mould, and it is fitted within an annular recess, which is formed in the upper face of the horizontal section or bed-plate A, as shown in fig. 1. C represents the upper horizontal section of the mould, which produces the contour of the outer face of the wheel, and forms, in conjunction with the ring B and base-plate A, a chamber or mould within which the wheels A′ are cast and compressed. The hole, which is through the centre or hub of the wheel, is produced by means of a metal core D, which is made slightly tapering so that it can be readily withdrawn from the mould. This core D passes through the two plates A and C, and fits snugly in holes which are made through them. A tapering hole or ingate is made through the plate C, through which the metal is poured into the mould. The upper end of this ingate is provided with a perforated slide, *a*, which is fitted between guides and used for closing the ingate after pouring the metal into the mould, also for cutting off the surplus metal. More than one ingate may be employed, if desired, so that the mould can be filled by pouring the metal into it at different points. Directly beneath said ingate a recess is made in the upper face of the mould-plate A, and filled with plumbago or some other substance which will not be readily injured by the heated metal; and beneath this plumbago *c* a set-screw, *d*, is employed for adjusting it as it wears, so as to keep its upper surface flush with the surface of the mould-plate A. G G are strong pillars, which are arranged at equal distances apart and securely bolted to the bed-plate A at their lower ends, and to a head-piece, E, at their upper ends, so as to serve as supports for this head-piece, and also as means for holding it firmly against upward strain. These pillars G may be bolted to offsets on plate A, so that there shall be sufficient space between them for the removal of the wheels from the mould. Upon the head-plate E a cylinder, H, of suitable capacity, is secured, within which moves a piston, I. To this piston three or more rods J are secured, at regular distances apart around its centre, which rods pass down through stuffing-boxes applied to the head-plate E, and are secured at their lower ends to the upper section of the mould, as shown in fig. 1. The plate or follower C and piston I are parallel to each other, and their axes or centres coincide. The piston-rods J should be applied to the plate C and piston I, so as to prevent them from tilting or losing their parallelism, otherwise the pressure upon the metal in the mould will be uneven, and the wheels will not be of a uniform thickness. Openings or ports are made at or near the upper and lower ends of the cylinder H, to which pipes are suitably connected, that communicate with a hydrostatic

or force-pump. The opening beneath the piston I is for the purpose of admitting liquid for raising this piston, and the opening above the piston admits liquid for depressing it. By this means the piston I and plate C can be raised and depressed by hydrostatic pressure. Beneath the head-plate E, and secured to it concentrically to the axis of the cylinder H, is a smaller cylinder, H′, within which works a piston, L, to which a rod, L′, is secured, the lower end of which is secured to the core D, as shown in fig. 1. This piston-cylinder H′ also receives liquid from a force-pump at its upper and lower ends, by which pressure can be obtained for raising and depressing the core D. The length of stroke of the piston I should be such as to admit of raising the plate C to the proper height for removing the wheel from the mould. The length of stroke of the piston L should be such as to raise the core D to the proper height to free it from the casting. Two or more adjustable hooks *e* are secured into the upper surface of the plate C, near its circumference, which, when this plate C is brought down to the position shown in fig. 1 for pouring the metal into the mould, will rest upon ledges or elevations *f* upon ring B, and prevent said plate from further descent. By adjusting these hooked screws *e*, plate C can be caused to enter the ring B any required distance, according to the thickness required of the wheels. Before pressure is applied to the metal in the mould, the hooked screws *e* are turned to one side, so as to be released from their elevations *f*. The hooked screws *g*, which are screwed into the ring B, are used for allowing this ring to be lifted with the section C, when it is desired to remove the casting from the mould. The hooked screws *h*, which are screwed into the bed-plate A, serve for holding down the ring B during the operation of pouring the metal into the mould and compressing the metal. These hooks *h* also serve to hold the ring B down in place when the plate C is raised, so as to allow this plate to be detached from the upper surface of the wheel. The hooks *g* are adjusted to allow this movement of plate C before the ring B is raised, after which hooks *h h* are turned to one side and the ring and plate are elevated together, leaving the wheel free upon the bed-plate.

Before commencing the operation of casting, it is desirable to smoke the mould, or to cover its entire interior surface with soot, to prevent liability of the metal burning and adhering to the mould. The sections A, B, and C are adjusted in their proper positions for receiving the melted steel, after which the central core D is moved down to its place, as shown in fig. 1, so as to leave an eye through the centre or hub of the wheel. The liquid steel is then poured into the mould through the ingate above described, and the slide *a* is immediately moved over the ingate, so as to cut off the upper end of the sprue and close the opening. The hooks *e* are then turned to one side, so as to allow the plate C to be depressed by the application of hydrostatic pressure to the piston I, which will condense the metal while in the mould. After pressure, and when the wheel is sufficiently cool or "set," the core D is raised free from the casting; the plate C is then raised a short distance to free it from the wheel, the hooks *h* are then turned to one side, and the ring B and plate C raised as rapidly as possible.

It will be seen from the above description that the wheels are produced by moulding or casting, and that the metal is subjected to steady pressure while in the mould, and in a condition to receive compression and condensation. This process of treating the steel while in a liquid or a semi-liquid state, and in the mould which is to give it the required form, will uniformly condense the fibres of the metal of the entire wheel, and give to it an equal tenacity throughout, which cannot be done by the process hitherto adopted in making steel car-wheels or parts of wheels, of forging or rolling steel ingots. The great strength and toughness given to the wheels by my process will admit of their being made of about one-third or one-half the weight of wheels which are made by any other process, and give them, even at this reduced weight, as great, if not greater strength. The pressure which is applied to the wheels while in the mould will not only compact or condense the fibres of the steel, but it will expel the air and gas from every part of the mould, and cause the metal to flow to every part of the mould, so as to make a perfect casting. The compressed steel car-wheels are not liable to injury from the effects of extremes of heat and cold, owing to the homogeneousness or uniformity of density of the fibres of the metal. For a like reason, the wheels are not liable to crack in cooling.

While I prefer to construct the wheels of the form shown in the drawings, I do not confine my invention to such form; nor do I confine my invention to the machine herein described for compressing and condensing the metal in the mould, as other means which will afford the required degree of pressure may be adopted; for instance, the means shown in my patent of August 28, 1866, will answer the purpose, but not so well as the means herein shown.

I am aware that in 1862 John Martin Rowan filed a provisional protection in Great Britain for the application of pressure to steel when in a molten state. But although he contemplated the construction of the tires of car-wheels, he shows no adequate means even for the manufacture of such tires, and still less for the manufacture of entire wheels. I am also aware that in 1856 Henry Bessemer obtained an English patent, in which, among other things, he contemplated the casting of ingots of cast steel which were compressed when in a molten state. I therefore make no broad claim to the exclusive use of the application of pressure to cast steel when in a molten state. But the subject-matter of my invention is a completed car-wheel which has been subjected to high pressure when in a molten state, and after being cast into its mould, and thus receiving its final general shape, so as to require no further method or forging, by means whereof its form is rendered more perfect, its texture more compact and uniform, and its strength much greater, in proportion to its weight, than when fashioned in any other way.

Having shown one practicable means of giving effect to my idea, what I claim as new, and desire to secure by Letter Patent, as a new manufacture, is—

A cast-steel car-wheel which has been condensed by high pressure when in a molten state, after it has received its general final shape, substantially as and for the purpose described.

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