(No Model.)

J. REESE.

Manufacture of Solid Cast Steel Car Wheels.

No. 239,546. **Patented March 29, 1881.**

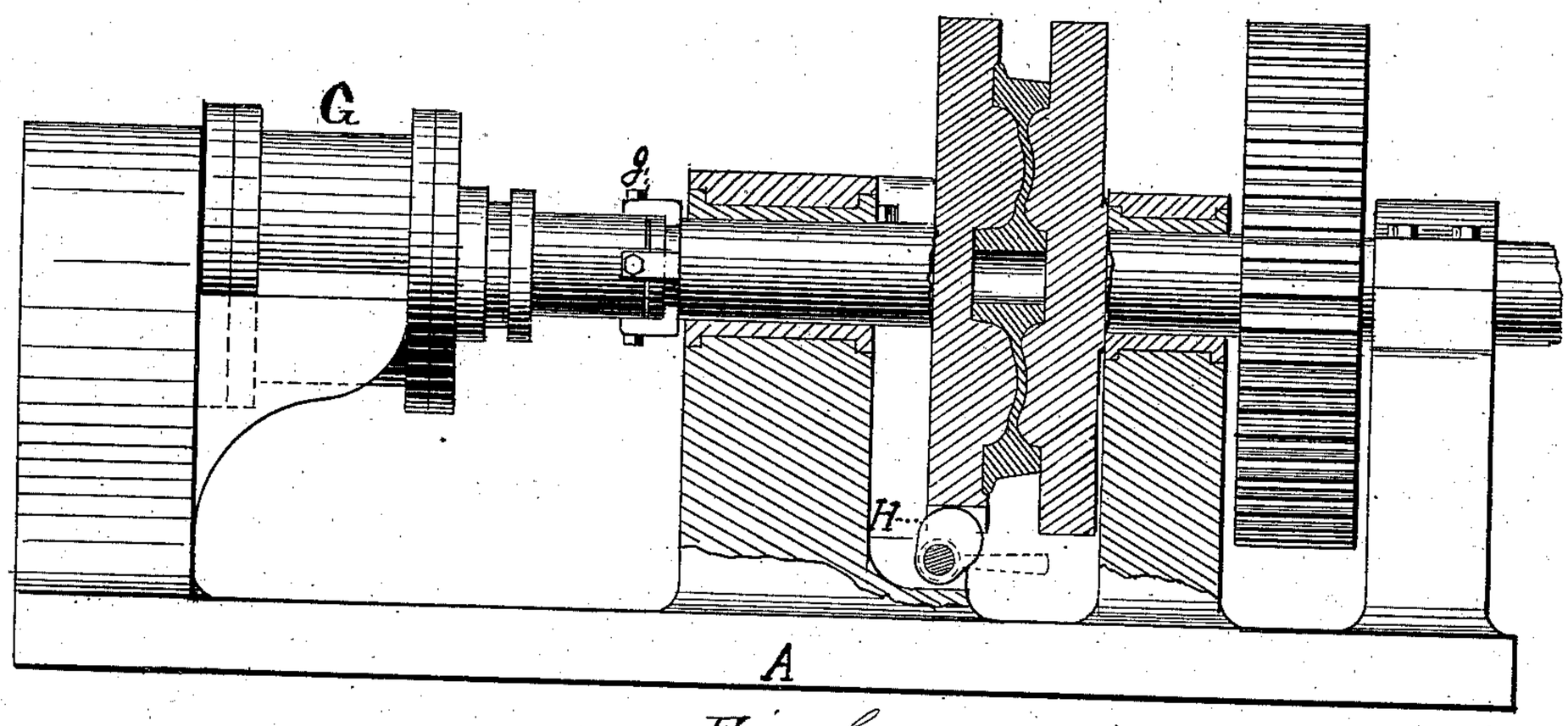

Fig. 1.

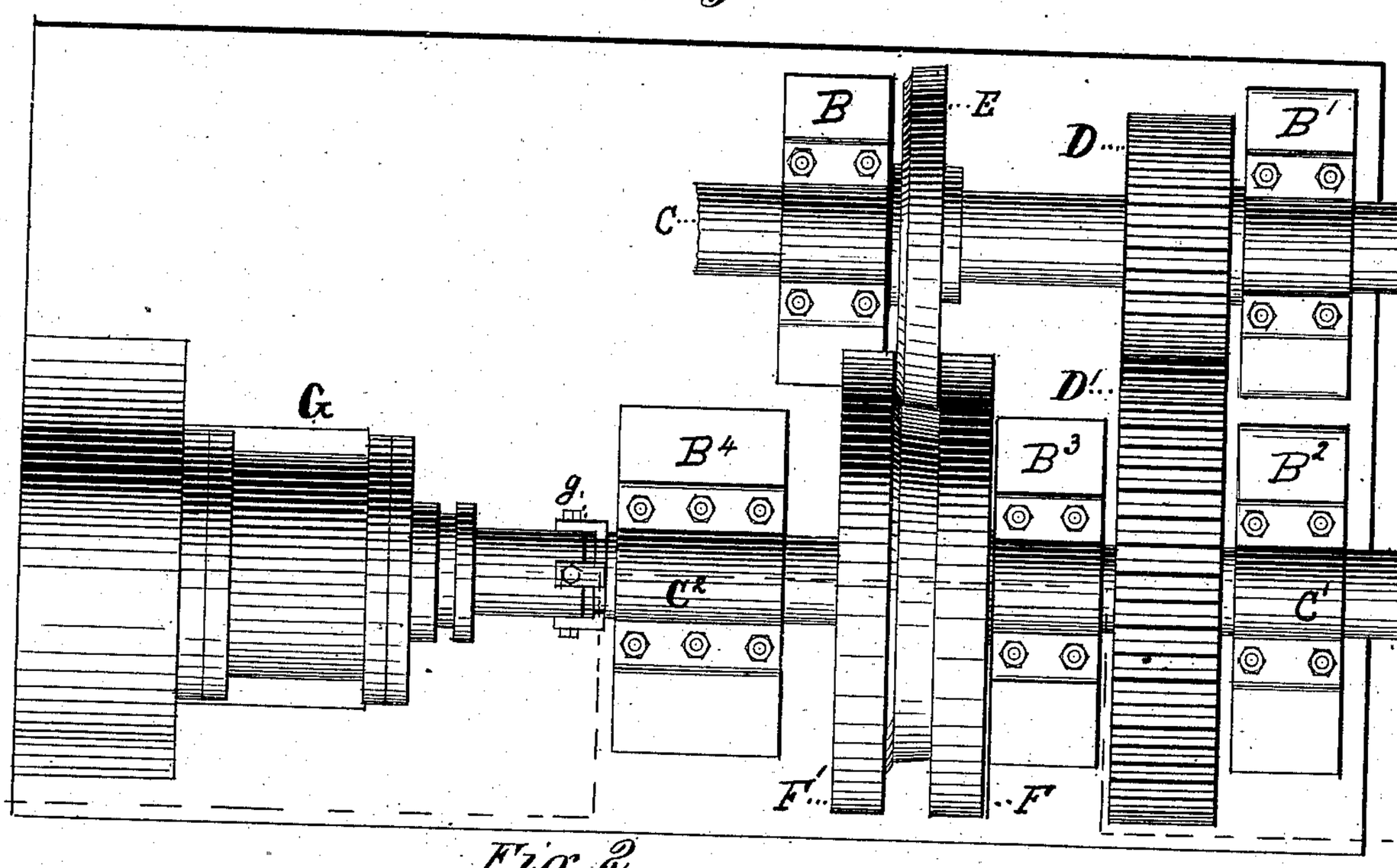

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

JACOB REESE, OF PITTSBURG, PENNSYLVANIA.

MANUFACTURE OF SOLID CAST-STEEL CAR-WHEELS.

SPECIFICATION forming part of Letters Patent No. 239,546, dated March 29, 1881.

Application filed September 14, 1880. (No model.)

To all whom it may concern:

Be it known that I, JACOB REESE, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Solid Cast-Steel Car-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, in which—

Figure 1 indicates a side elevation, partly in section, of an improved machine adapted to the use of my invention, showing a sectional view of the pillow-blocks, the revolving dies, and of a car-wheel engaged between the said dies. Fig. 2 indicates a ground plan of the machine. Fig. 3 indicates a sectional view of a finished car-wheel. The dotted lines represent the unfinished blank in the form in which it is cast before finishing, showing a greater thickness of flange, tread, and outer part of the web than in the finished wheel.

Heretofore, in the manufacture of car-wheels, they have been generally made of cast-iron, or of cast and wrought iron combined. In some instances, however, it has been purposed to cast the wheels, of the form and size required, from cast-steel; and it has also been proposed to harden the tread and flange to enable them to resist abrasion. In none of these cases, however, so far as I am aware, has it been purposed to cast the wheel from cast-steel of different form or thickness, and then subject it to a rolling or compressing operation to bring it to the desired shape, and close up the pores and blow-holes in the metal. Consequently in all of these cases (as all castings of this nature vary considerably in shrinkage, on account of their variable thickness, and become blown and filled with water-cracks in tempering) such steel car-wheels have not gone into practical use.

Now, in the use of my improvement, which is designed to overcome the objectionable features of such castings, and to produce a car-wheel having a tough elastic center and a perfectly true tread of a close, firm, and even texture, I cast the wheel-blanks of the same general conformation, but of smaller diameter and thicker in the flange and outer part of the web than an ordinary wheel. The steel used for this purpose must be cast-steel of a suitable quality to produce as solid a casting as possible, steel made by the process described by me in an application filed in the United States Patent Office on or about August 10, 1880, for a patent for producing solid steel castings, being preferable for this purpose. These wheel-blanks are cast either in sand or metallic molds, as may be desired, and when the blanks are produced they are taken, one at a time, while still hot, (or they may be allowed to cool and be subsequently reheated,) and inserted between the dies of my machine, and treated in the manner which I shall hereinafter describe.

I shall now describe the construction and mode of operation of the machine which I use for compressing, truing, and straightening the blanks.

In the drawings, A indicates the bed-plate.

B, B′, B^2, B^3, and B^4 are the pillow-blocks, in which the shafts are journaled.

C indicates the main driving-shaft, mounted in the pillow-blocks B and B′. On this shaft is mounted a roll, E, which has a working-face of a shape to correspond to the shape of the tread of the car-wheel to be produced. This shaft C is also provided with a gear-wheel, D, which meshes into and communicates motion to the gear-wheel D′, mounted on the shaft C′. A rolling-die, F, having a shape to correspond to the shape to be given to the inner side of the wheel to be produced, is attached to one end of this shaft.

C^2 indicates a shaft mounted in the pillow-block B^4, and is provided with a die having a working-surface of a shape to correspond to the shape to be imparted to the opposite side of the wheel. This shaft C^2 has no connection with the shafts C or C′, and rotates only through the frictional contact of the wheel-blank between the dies F′ and F.

H indicates an eccentric pawl, which engages in a slot in the die F′, and is withdrawn from or thrown into the slot by means of a hand-lever, (not shown,) to prevent or admit of rotation of the die F′, as may be desired, during the rolling and compressing of the blank.

G indicates a direct-acting hydraulic ram

for forcing the die F′ against the blank confined between it and the die F.

g indicates clutches, which are attached to the end of the plunger of the ram, and engage in an annular groove or slot in the shaft C^2, in order to communicate a positive backward movement to the shaft C^2 and die F, to admit the insertion of a fresh blank into the machine, and also to allow the rotation of the shaft C^2 and die F′, when the eccentric pawl is relieved from the slotted part of the die F′.

The operation of the machine is as follows: The die F′ is drawn back by the plunger to admit the insertion of a blank between it and the die F, and is locked to prevent its rotation by throwing the eccentric pawl H into its slotted portion. Power is then applied to the shaft C, causing it to rotate, together with the roll E and the pinion D, which communicates the motion to the pinion D′, and from it to the shaft C′ and rolling-die F. One of the heated blanks is then inserted into the machine between the rolling-dies F and F′, and the die F′ is gradually forced, by the action of the hydraulic ram, against the wheel-blank until it is reduced in thickness and increased in diameter sufficiently, so that the metal is forced against the edge of the roll E, and the blank is almost brought to the required form. During this part of the operation the blank, being held by the die F′, will not rotate, or will remain nearly motionless, until the metal is forced out against or in frictional contact with the face of the roll E, at which time the blank will rotate. Thus at first the die F moves over the face of the wheel, truing it and forcing the metal out against the face of the roll E, and then the blank will rotate upon the die F′. Thus the blank is smoothed, trued, and rolled, first on one side by the movement of the die F, and then trued and straightened on its opposite side by its movement over the stationary face of the die F′, and both these movements assist the action of the direct pressure in forcing the metal out against the action of the roll E, and aid in forming a true and perfect face to the flange and tread of the wheel. At this point, when the blank is compressed almost to the thickness required in the finished wheel, the pressure is relieved, and the eccentric pawl H is thrown out of gear to allow the die F′ to rotate, when the pressure is again applied, and the blank is reduced and brought to the exact form desired.

After the wheel has been brought to the required shape it may be bored, and if it contains sufficient carbon to impart to it the required degree of hardness it will be ready for use without further treatment; but if it is desired to make a wheel of soft steel, low in carbon, it should be tempered in an oil-bath, or the tread and flange should be tempered in oil or water.

The wheel produced by this method may be readily distinguished, by its appearance, from all steel car-wheels heretofore produced, as its surface is marked by series of circular lines extending around the sides of the wheel from its center to its periphery; and when the wheel is broken the physical structure of the metal may be readily distinguished by its gradually-increasing density or closeness of texture from its center to the face of the tread, and the wheel may also be distinguished by its perfect smoothness, roundness, and its freedom from air-cells, blow-holes, and other imperfections which characterize ordinary cast-steel car-wheels.

One of the advantages of a wheel made by my method is, that it possesses a circular texture around the face of the flange and tread, the texture of the metal being in the line of travel of the wheel, while in all other solid cast-steel car-wheels the texture runs in radial lines from their axes to peripheries, and the metal has a tendency to crack in such lines.

I am aware that it has been proposed to manufacture car-wheels from wrought-iron by placing a blank of uniform thickness between converging dies of configuration suitable to produce a wheel, and by forcing the dies together to press the metal into the desired form. I therefore do not claim the same, as wrought-iron contains a large amount of oxide of iron, and such a wheel would soon laminate and wear unevenly, as is the case with iron rails.

I am also aware that it has been proposed to cast steel into the form of car-wheels or car-wheel blanks and subject them, while in a fluid or heated condition, to pressure; but in all such cases the press, rolls, or stamp produced uniform density of the metal throughout the whole structure, while my process of casting a wheel-blank of substantially the same configuration and size as the finished hub and web, but with a tread and flange of little less diameter and sufficiently wider to cause the rolling and pressing action of the dies to be exerted on the flange and tread, will produce a finished wheel with a dense, hard, close-grained tread, and a softer, tougher and more ductile web and hub, which will give great durability to the tread and increased capacity to the web and hub to resist shocks and strains.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The method herein described of manufacturing cast-steel car-wheels, which consists, essentially, in the following steps: first, casting the car-wheel blank with hub and web of substantially the shape and proportions of the finished wheel, and with the flange or tread wider and less in diameter than what is required in the finished wheel; and, secondly, subjecting said blank to the action of rolling-dies, which true the web and hub without compacting the metal, and which compress and compact the flange or tread, whereby a cast-steel car-wheel having a tough ductile web and hub and a hard dense tread is obtained, substantially as specified.

2. As a new article of manufacture, a solid

rolled or pressed cast-steel car-wheel, having smoothly-finished surfaces covered with circular lines, and having a circular texture running in the line of travel of the wheel, and of gradually-increasing closeness or density from its center to periphery, substantially as herein set forth.

3. In a machine for rolling and pressing car-wheels, the combination of a roll for rolling the flange and tread with a pair of rotating dies, and of an eccentric pawl to engage in a slot in and prevent the rotation of one of the said dies, substantially as herein set forth.

4. In a machine for rolling and pressing car-wheels, the combination of a roll for rolling the flange and tread, a pair of revolving dies to hold, true, and straighten the sides of the blank, an eccentric pawl to prevent the rotation of one of said dies, and of a hydraulic ram for actuating one of said dies to exert pressure upon the wheel or blank.

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Witnesses:
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