(No Model.) 4 Sheets—Sheet 1.

J. FERGUSON.

CAR WHEEL.

No. 306,070. Patented Oct. 7, 1884.

Fig. 6.

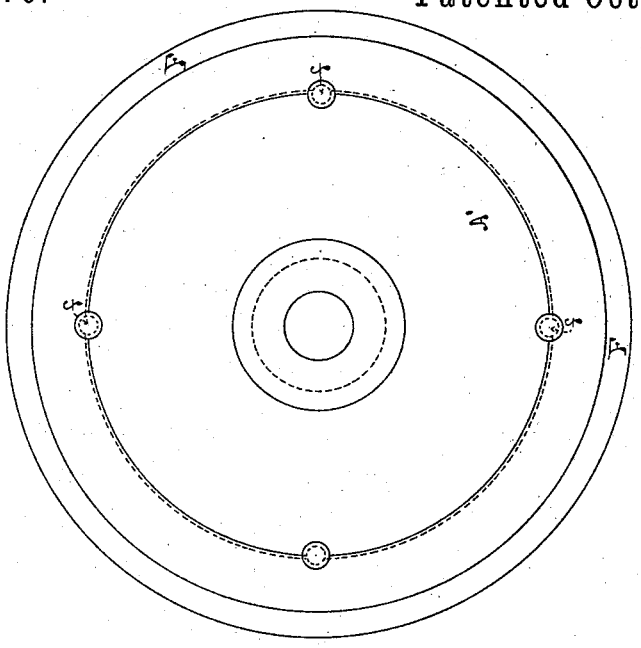

Fig. 5.

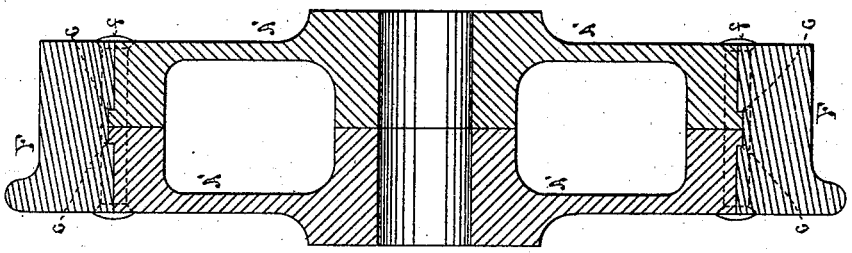

Fig. 7.

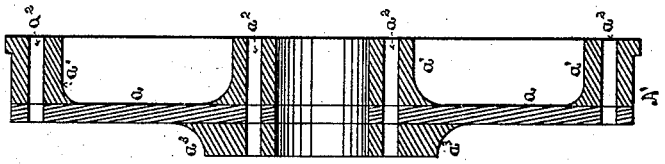

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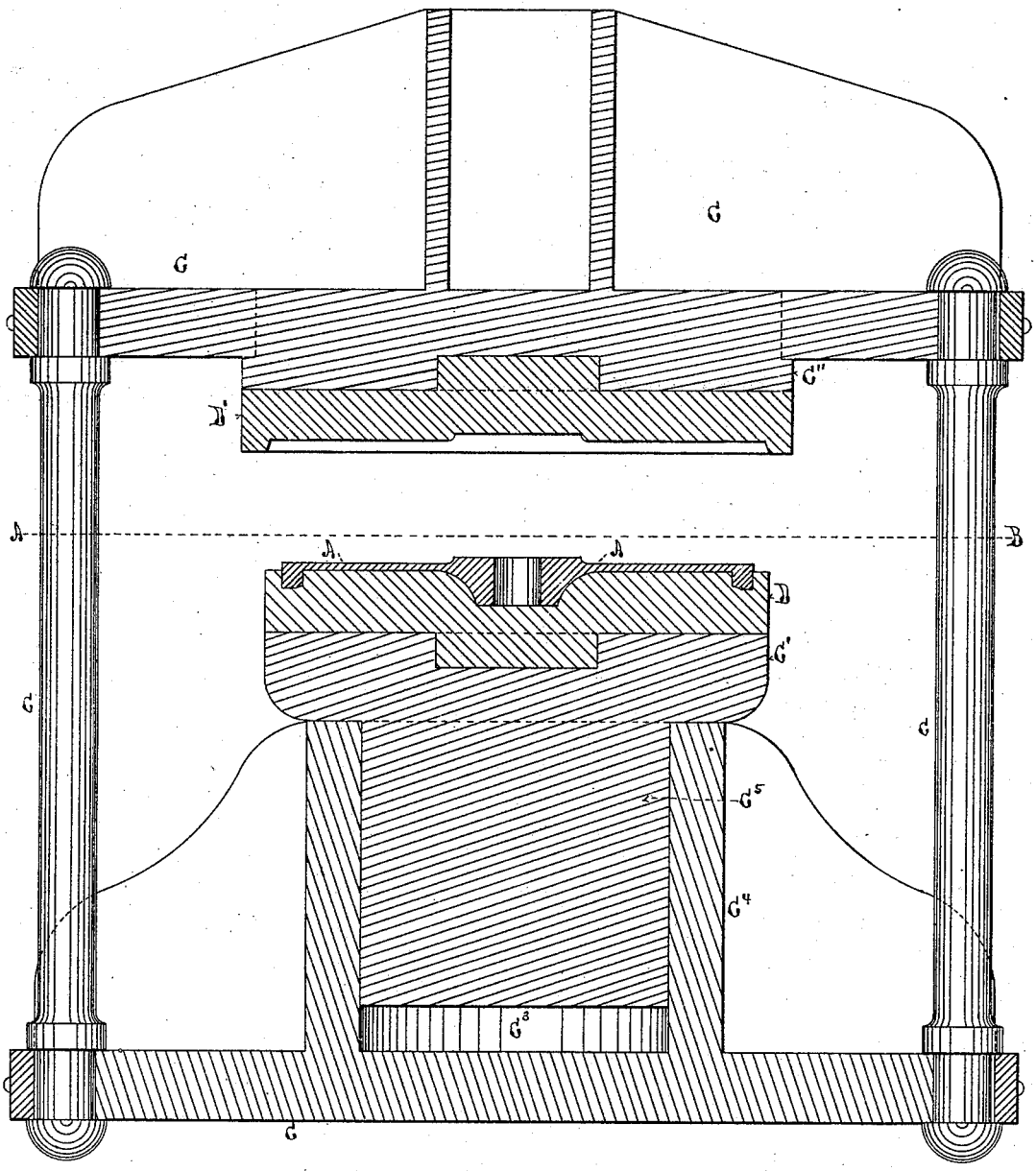
Fig. 2



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J. FERGUSON.

CAR WHEEL.

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Fig. 3

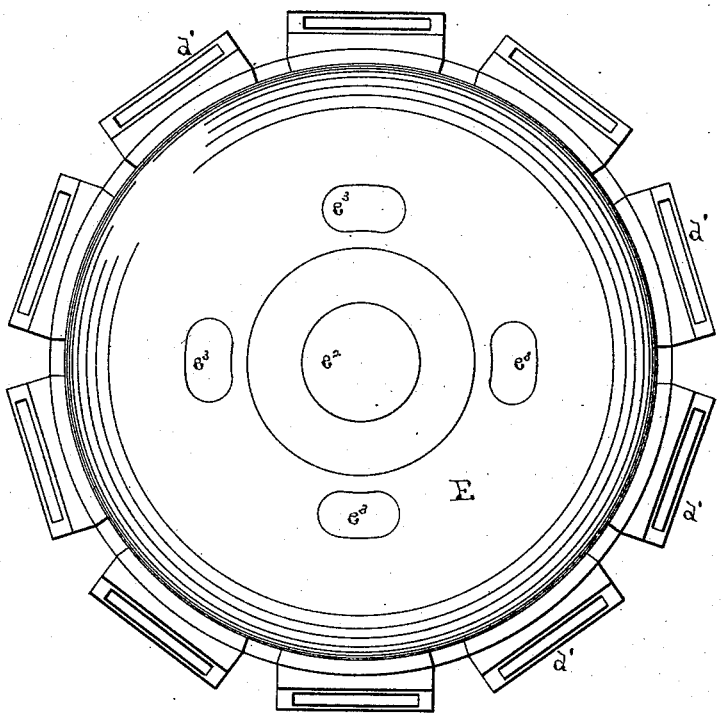

Fig. 4

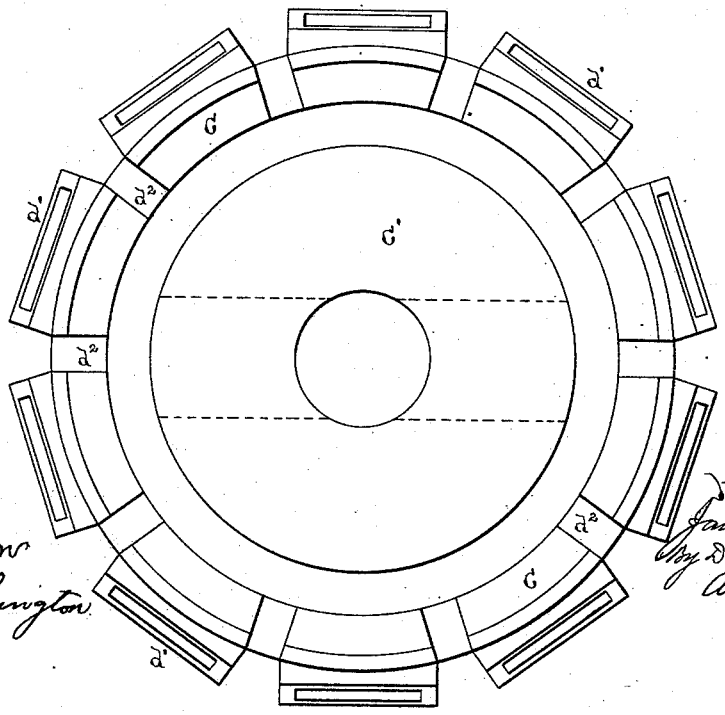

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Fig. 8

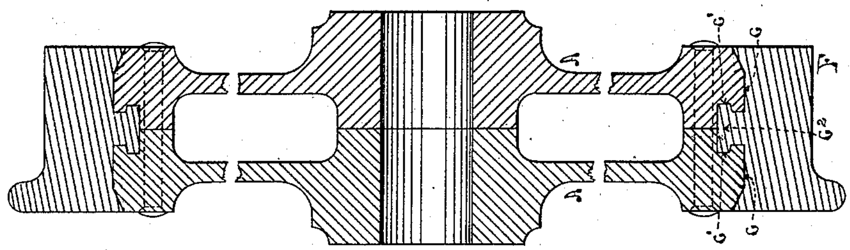
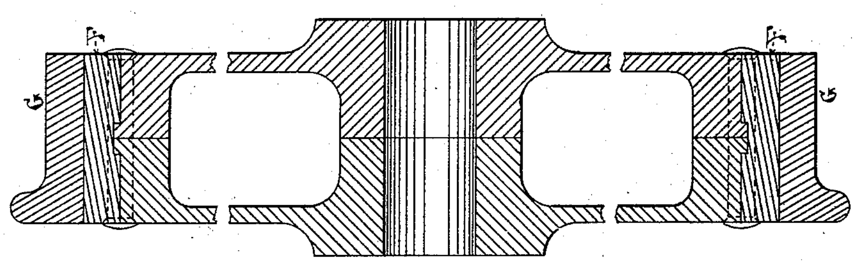


Fig. 7



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UNITED STATES PATENT OFFICE.

JAMES FERGUSON, OF BRIDGEWATER, MASSACHUSETTS.

CAR-WHEEL.

SPECIFICATION forming part of Letters Patent No. 306,070, dated October 7, 1884.

Application filed August 8, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES FERGUSON, of Bridgewater, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in Car-Wheels and Process of Making the Same, of which the following is a specification.

My invention relates to car-wheels and processes of making the same; and it consists of a new method of making such wheels of wrought-iron or steel by forging up the separate parts of the wheel into blanks and joining the same together by dovetails and heating and shrinking the several parts upon one another, all substantially as hereinafter described.

In the drawings, Figure 1 represents in section the different parts of a blank in position for forming the completed blank preparatory to constructing the wheel. Fig. 2 represents a sectional view of the hydraulic press used in forging, with the completed blank in it after being forged up. Fig. 3 is a top view of the forging-press. Fig. 4 is a section of the forging-press through the line A B of Fig. 2. Fig. 5 is a sectional view of a completed car-wheel constructed according to my invention. Fig. 6 is a side or face view of the same. Figs. 7 and 8 are sectional views of modifications of my wheel, showing modified forms of locking the parts together.

It has been for a long time desirable to construct a wrought-iron or steel car-wheel which shall combine lightness and solidity of construction with economy in its manufacture, and it is to this end that my invention is directed. In order to form such a car-wheel, I make it hollow, having two face-pieces connecting a practically solid flange and hub joined together and to the tire by dovetails without the necessity of using bolts or rivets for holding them together, these only being made use of as keys to prevent them from revolving about one another in a rotary manner, as hereinafter described.

A′ represents a car-wheel blank formed of several parts of forged iron or steel, as the same are temporarily joined preparatory to forging the same into a homogeneous whole. It is composed of the plate *a*, made circular, and of a proper size, with a hole through the center of nearly the size of the axle to be used with the wheel. To this plate *a* are secured forged annular pieces or rings a' a^3, of proper shape to form with the plate the completed wheel-blank when forged onto it, as shown. These parts a' a^3 have their surfaces as well as that of plate *a*, where they abut, prepared in the ordinary and well known manner for forging together, and they are temporarily held in position during this welding process by small rivets a^2 a^2. The blank being thus far prepared is placed in a furnace so constructed as to heat the junctions of the parts a' a^3 and plate *a* to a welding heat without injury to other parts of the plate *a*. This must be done by protecting such other parts of plate *a* from being raised to a heat approximating to one suitable for welding the parts a' a^3, because upon the tensile strength of these other parts depends the strength of the wheel, and exposure to the heat necessary to weld parts a' a^3 would greatly injure them, and this process of protecting them is very important. This furnace is the subject of a separate application for a patent thereon by me at the same time as the present one.

Any other form of furnace may be used, if desired, which shall heat all the parts of the blank to be welded together at once, as it is necessary to do this both to avoid scaling of the metal from frequent reheatings as well as to form a perfect weld of all the joints and avoid burning the iron or steel, which would be otherwise practically impossible. The blank A′ having been brought to a welding heat at all the joints between parts a', a^3, and *a*, is next taken from the furnace and placed in a hydraulic or other press between dies so formed as to bring a welding pressure upon the annular pieces a' a^3 and weld them to the plate *a* as one solid piece of metal at one operation.

Figs. 2, 3, and 4 represent one form of hydraulic press which I use for the purpose.

C is the frame-work of the press. C′ is the lower movable platen. C″ is the upper stationary platen. C^3 is the water-chamber; C^4, the cylinder; C^5, the piston.

The parts of the press above described are old and well known, and further description of them is unnecessary, as well as of other parts of the press in common use.

Upon the lower platen, C′, I attach, in the

ordinary manner, a die, D, of proper form to fit one side of the wheel-blank A′, and opposite this die I attach in like manner to the upper platen a die, D′, of proper form to fit the opposite side of the blank. These dies are so made as to bring the greatest pressure upon the parts a' a^3 of the blank, and the press being set in operation with sufficient power welds the blank into a homogeneous piece of metal, substantially as shown in Fig. 2, at one operation.

Instead of a hydraulic press, a steam or drop or other hammer of sufficient size and proper shape may be used to accomplish this result. The blank A′ being thus completed is trued up and bored out accurately to the proper size, and a portion of the periphery turned off, so as to leave an annular shoulder and projecting flange all around it, as shown at *c*, Fig. 5; or this may be made in the forging process, if desired. I then form a second blank just like the first one and place the two face to face with the flanges *c c* together, as shown in Fig. 5. These flanges project from one-eighth to three-sixteenths of an inch beyond the periphery of the blanks in outside diameter. I then form an annular steel or iron tire or rim, F, of exactly the internal diameter of the outer diameter of the blanks A′ A′ exclusive of flanges *c c*, and in the center of the inside of this rim or annular flange F, I form an annular groove all around it of the breadth of the two flanges *c c* measured transversely across their faces and of the same depth as the thickness of these flanges *c c* outward from the periphery of blanks A′ A′. I then heat this rim, so as to expand it properly, and keeping the blanks A′ A′ cold I slip the rim over their outer edges while together in the relative position to each other shown in Fig. 5, until the two flanges *c c* are exactly opposite the groove in the inside face of the rim, when I cool the rim, and it closes over the edges of the blanks A′ A′, the groove receiving the flanges *c c* and forms a completed wheel, as shown in Fig. 5.

The dimensions of flanges *c c* above given are not absolute, as they must be proportioned, so that with blanks of the diameter being used the heating of the rim F will expand it sufficiently to allow it to pass over the flanges *c c*, and its cooling will cause it to close down upon the edges of blanks A′ A′ and receive the flanges *c c* into its groove and unite the blanks to the tire and form a complete wheel, as described. The dimensions of the flanges *c c* to effect this result may be easily ascertained by experiment, and will vary somewhat with different diameters of wheel-blanks. By properly proportioning the internal groove in the rim F, it can be made to compress the two flanges *c c* of the abutting blanks A′ A′ as firmly together as may be desired. It will be observed that by this method of forming a wrought-iron or steel wheel, I secure all its parts together without the use of bolts, and much more solidly than can be done by the latter.

To guard against any liability of the rim F turning around upon the blanks A′ A′, I insert key-rivets *f f* in holes made so that one half of each hole shall lie in rim F and the other half in blanks A′ A′. These will serve to prevent any torsion on the rim F by the application of brakes to the wheel—for instance, ever loosening the rim on the blanks. The wheel will be found complete and effective without these rivets, however.

In Fig. 7 I show a modification of my invention, in which the rim F, instead of forming the tire directly, has a separate tire, G, shrunk onto it, or otherwise secured to its periphery. This modification may be found valuable where the tire is exposed to great wear and has to be frequently renewed.

In Fig. 8 I show another form of constructing the groove in the rim F and the flanges *c c*, so that the latter shall serve to lock the rim F to the blanks A′ A′, as well as the latter to the rim.

In the drawings I do not profess to give the exact relative proportions of the parts, as these must vary, as before stated, and are enlarged to show them clearly. In this modification the flanges *c c* are separated by an annular space between them, and their opposite radial faces are grooved with the annular grooves *c′ c′*. There are two grooves made to receive the flanges *c c* in the inner face of rim F, one on each side of an annular inwardly-projecting flange, c^2, on the center of its inner face, which fills the annular space between flanges *c c*. This flange c^2 is formed on its sides to fit the grooves *c′ c′*, as shown in Fig. 8.

By heating the rim F and inserting the blanks A′ A′ into it from the opposite sides and compressing these blanks firmly together, as the rim cools, the flanges *c c* will enter their grooves and the grooves *c′ c′* will embrace the parts of flange c^2 on each side, and the whole be firmly locked together.

Instead of flanges *c c* being made with square shoulders, where they meet the blanks A′ A′, they may be made to rise from the blanks with beveled face or faces, and the groove or grooves in rim F made to correspond without departing from the spirit of my invention, the main feature of which is that the web of the car-wheel shall be composed of two wrought-iron faces clamped and secured together by the shrinking of the rim F thereon, as before described.

It will be observed that the clamping action of the rim F is greatly assisted by having the wheel-blanks A′ A′ extended inward, each toward the other, just within the tire until their surfaces abut at that place; also, that the completed wheel, being hollow from its hub nearly to the rim F, combines the greatest strength with lightness; also, that its rim or tire is made

of a single endless piece of metal. When the wheel is completed, the axle is forced through the hub in the ordinary way.

There is a great advantage in a car-wheel of this construction, as the wheel while in use has all the advantages of a solid forged wheel, while if the rim or tire wears out it can easily be replaced by sawing the old one across transversely and removing it and shrinking on a new one, all the other parts being as good as if made new, thus effecting a great saving in renewing the tires.

I do not claim in this application the process of forming or building up a car-wheel as described, as that is the subject of another application filed by me in the Patent Office April 3, 1884, No. 126,482.

What I claim as new and of my invention is—

1. The combination of two car-wheel blanks, each comprised of the plate *a* and shoulders *a'* *a'*, and having the inner faces of said shoulders resting against those of the other blank, with the endless rim F, provided with a grooved inner surface contracted over and interlocking with said blanks, substantially as described.

2. In a wrought-metal car-wheel, the combination of the wrought web-pieces A' A', provided with flanges *c c*, with the endless rim F, provided with the grooved inner surface interlocking with and contracted over said flanges, substantially as described.

3. In a wrought-metal car-wheel, the combination of the web-pieces A' A', provided with flanges *c c*, and abutting against each other adjacent to said flanges, with the endless rim F, provided with the grooved inner surface interlocking with said flanges, substantially as described.

4. In combination with web-pieces A' A' and rim F, interlocked together, as described, one or more key-rivets, *f*, as and for the purpose set forth.

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Witnesses:

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