(No Model.) 3 Sheets—Sheet 1.

S. M. VAUCLAIN.

FORGED WHEEL AND PROCESS OF MAKING THE SAME.

No. 462,606. Patented Nov. 3, 1891.

FIG. 2.

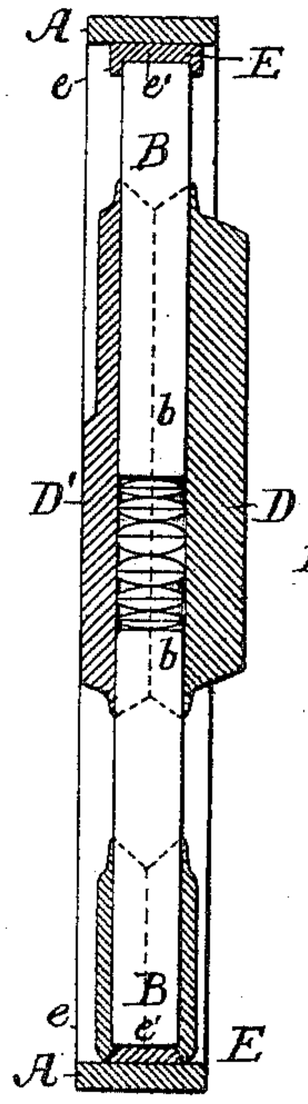


FIG. 1.

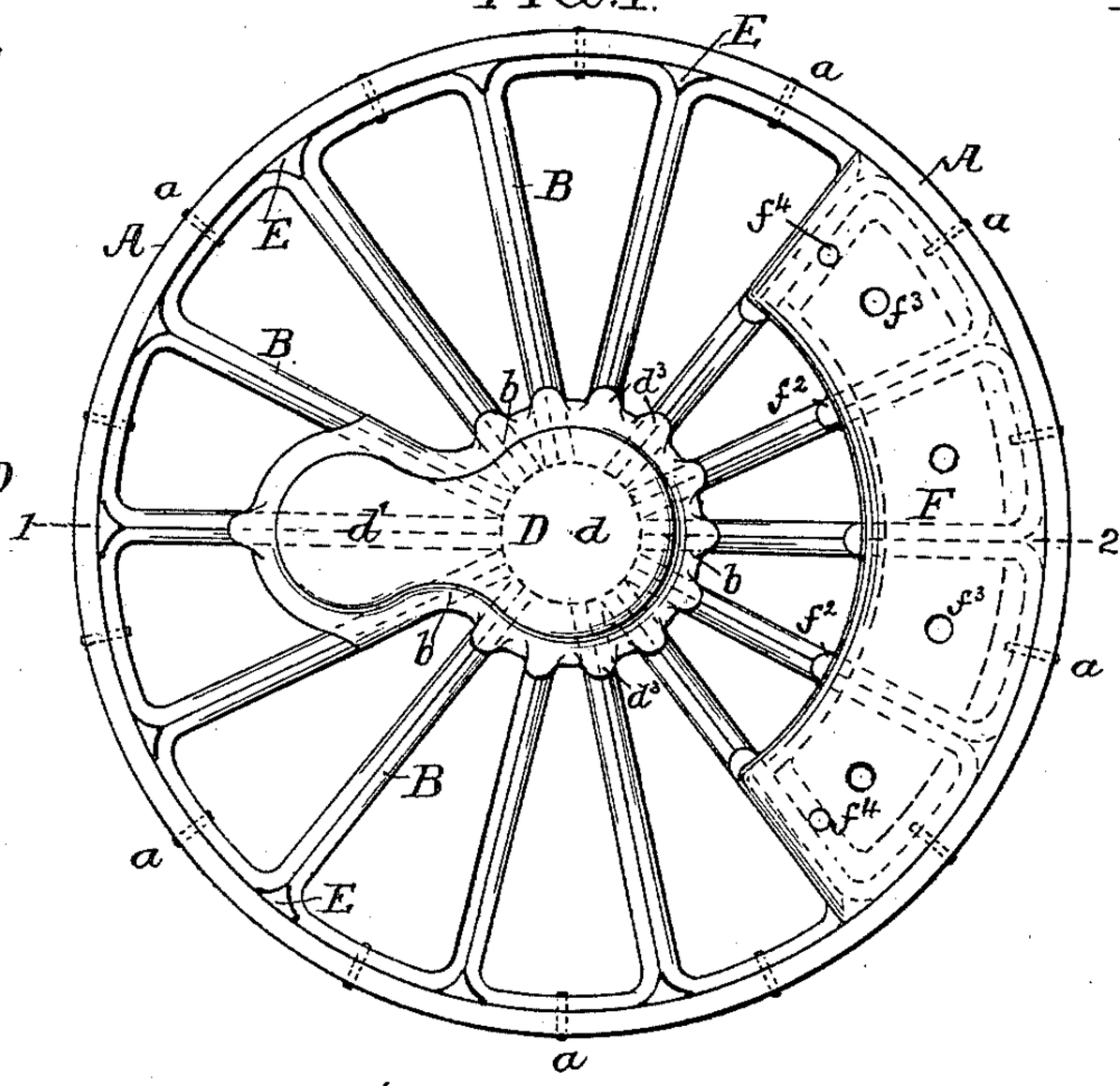


FIG. 5.

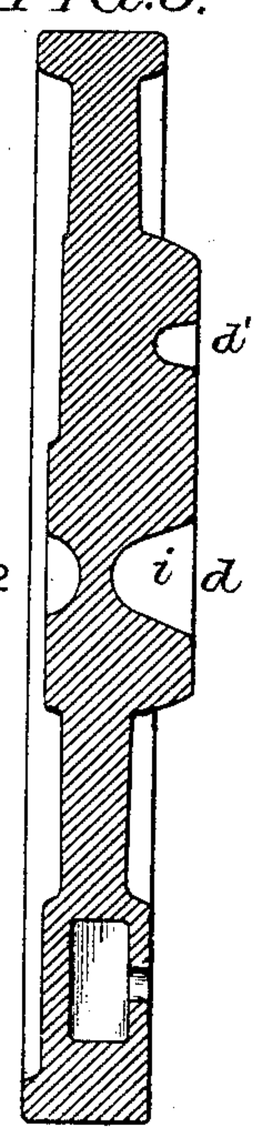


FIG. 3.

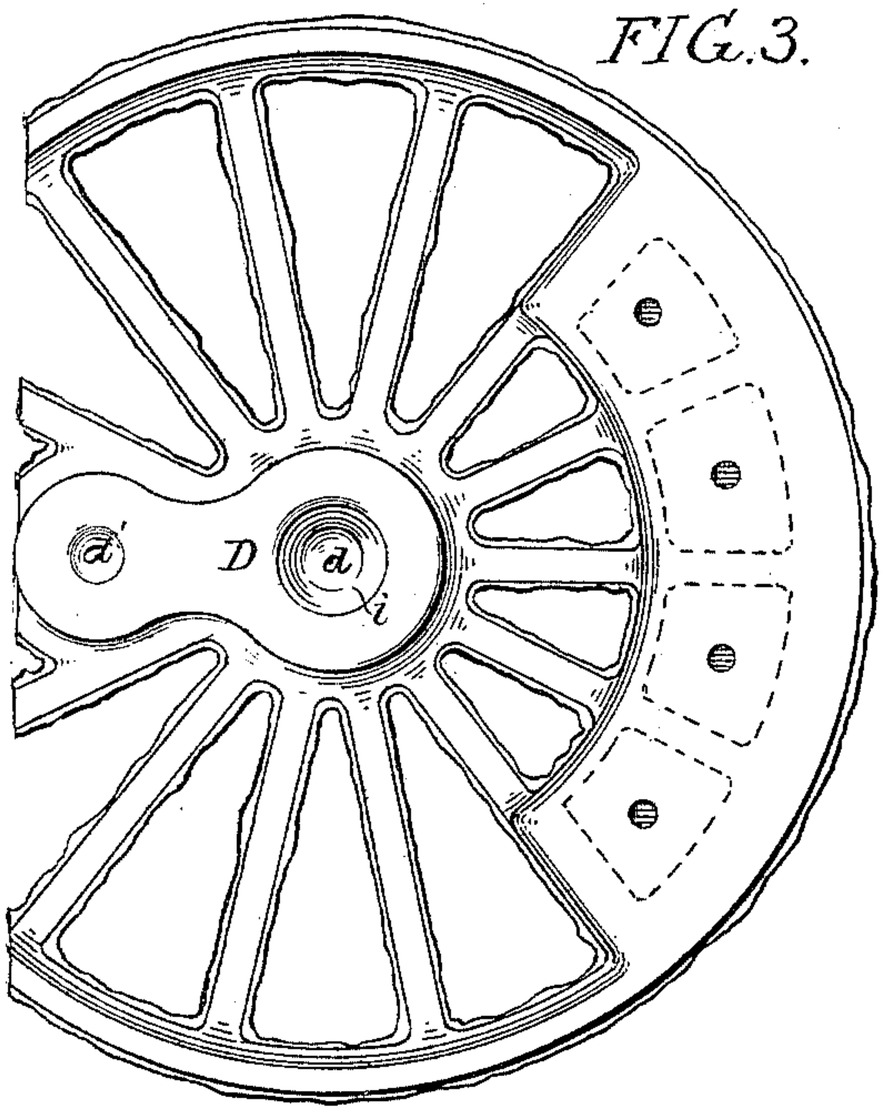
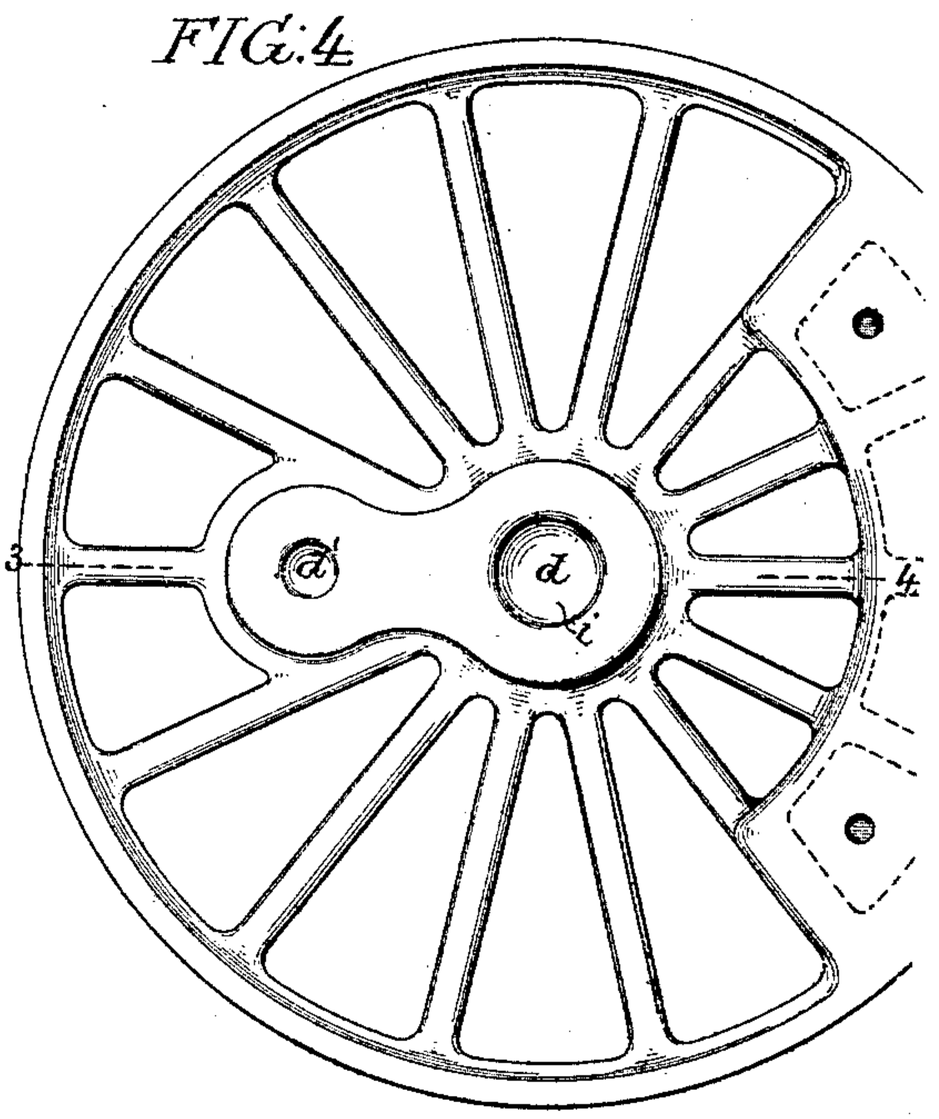


FIG. 4.



Witnesses:
Hamilton D. Turner.
R. Schleicher.

Inventor:
Samuel M. Vauclain
by his Attorneys
Howson & Howson

(No Model.) 3 Sheets—Sheet 2.

S. M. VAUCLAIN.

FORGED WHEEL AND PROCESS OF MAKING THE SAME.

No. 462,606. Patented Nov. 3, 1891.

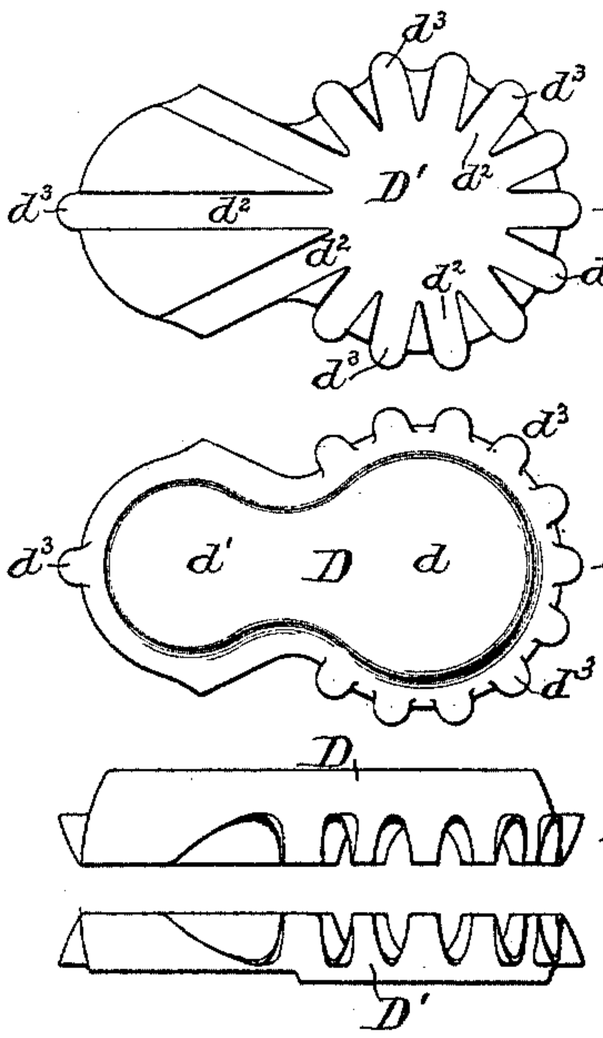


FIG. 10.

FIG. 11.

FIG. 12.

FIG. 13.

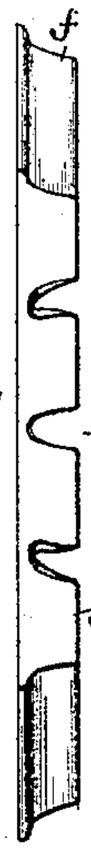


FIG. 15.

FIG. 14.

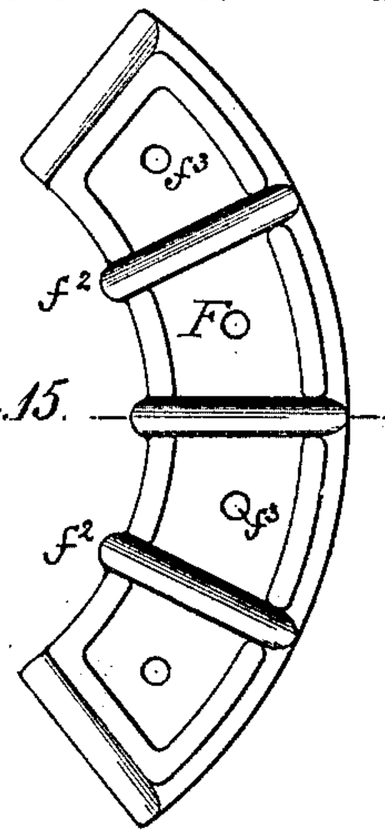


FIG. 16.

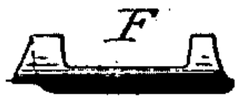


FIG. 17.

FIG. 18.

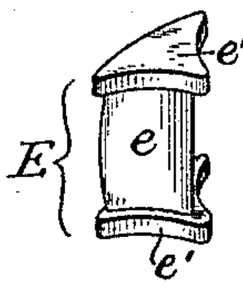


FIG. 19.

FIG. 20.

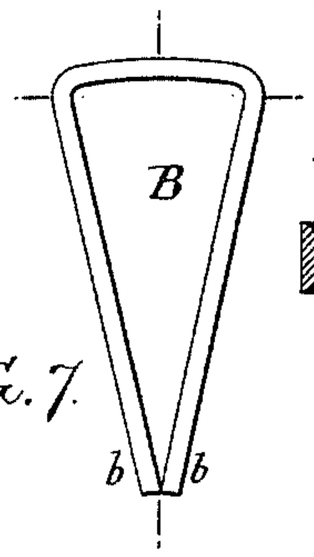


FIG. 8.

FIG. 7.

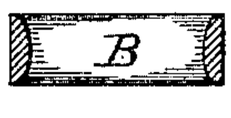


FIG. 9.

FIG. 24.

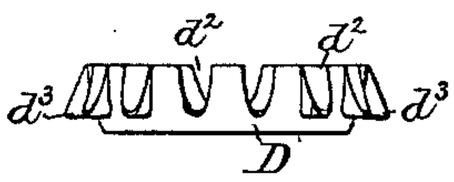


FIG. 25.

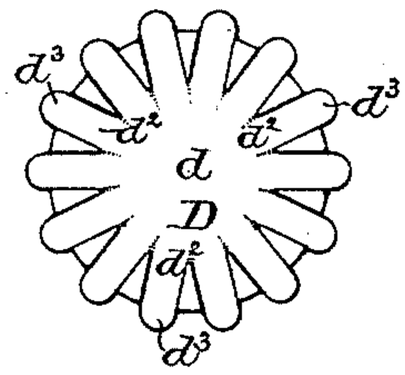
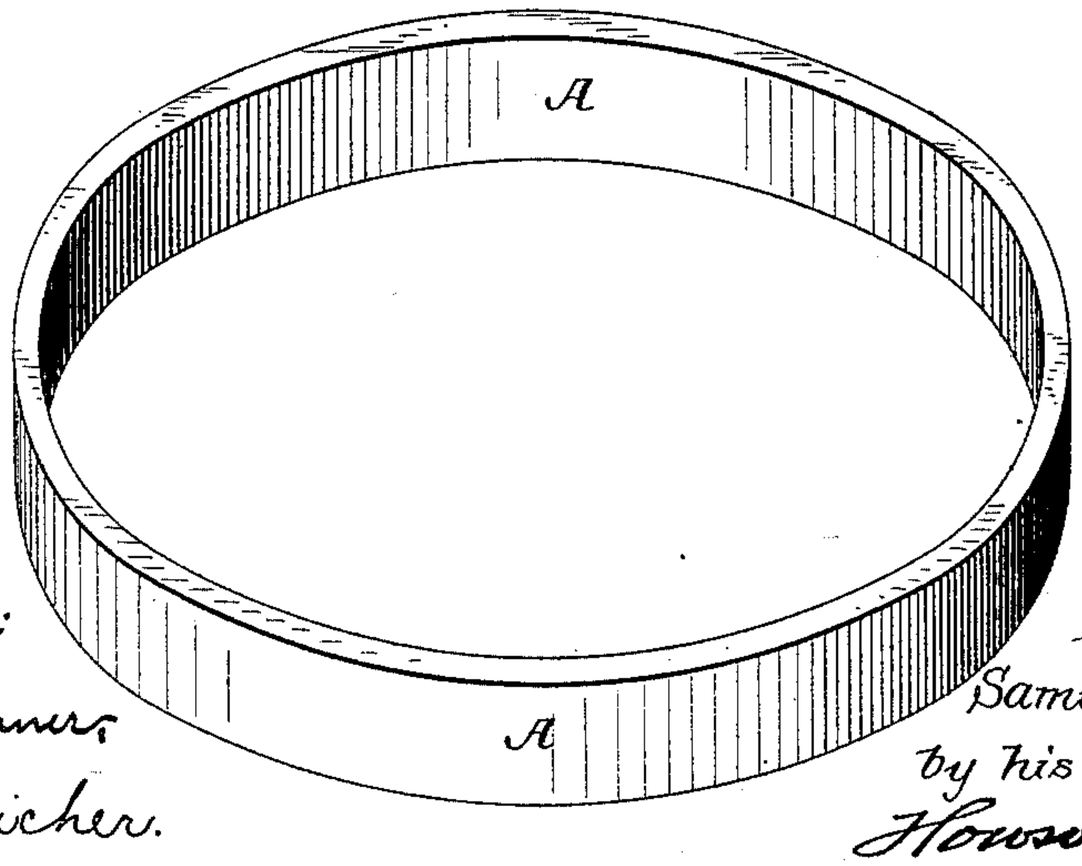


FIG. 6.



Witnesses:
Hamilton T. Turner.
R. Schleicher.

Inventor:
Samuel M. Vauclain
by his Attorneys
Howson & Howson

(No Model.) 3 Sheets—Sheet 3.

S. M. VAUCLAIN.

FORGED WHEEL AND PROCESS OF MAKING THE SAME.

No. 462,606. Patented Nov. 3, 1891.

FIG. 21.

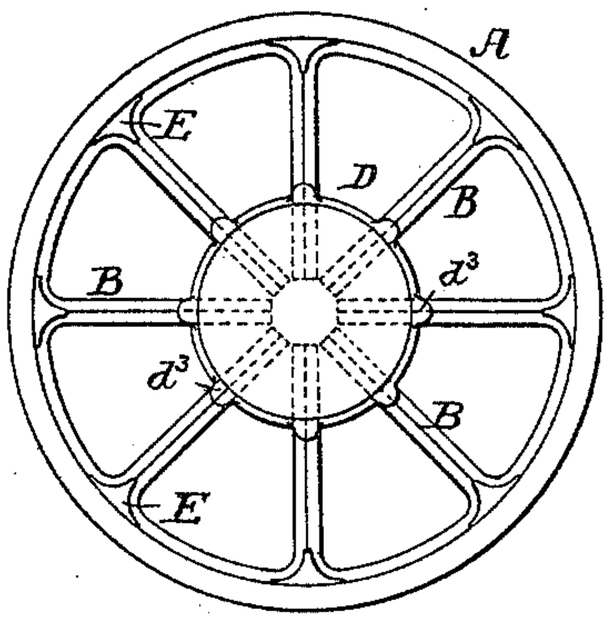


FIG. 22.

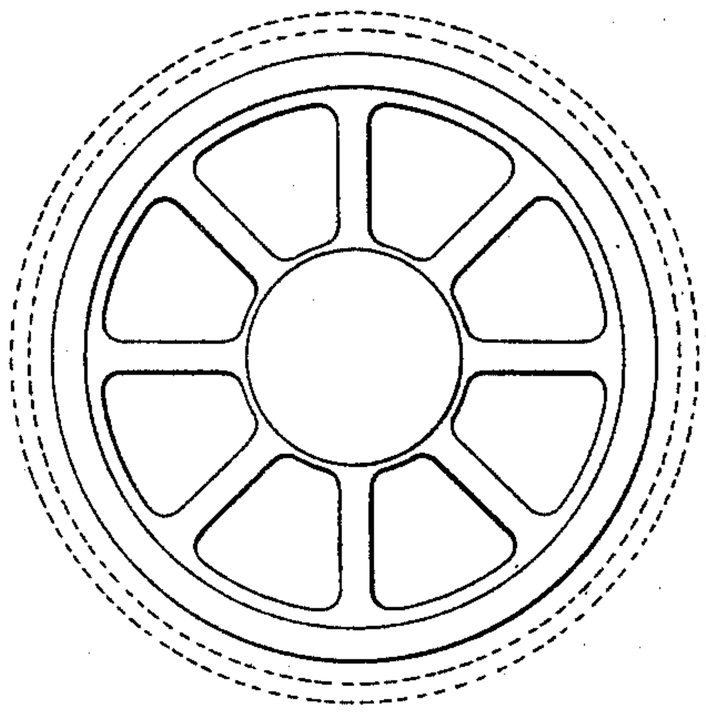
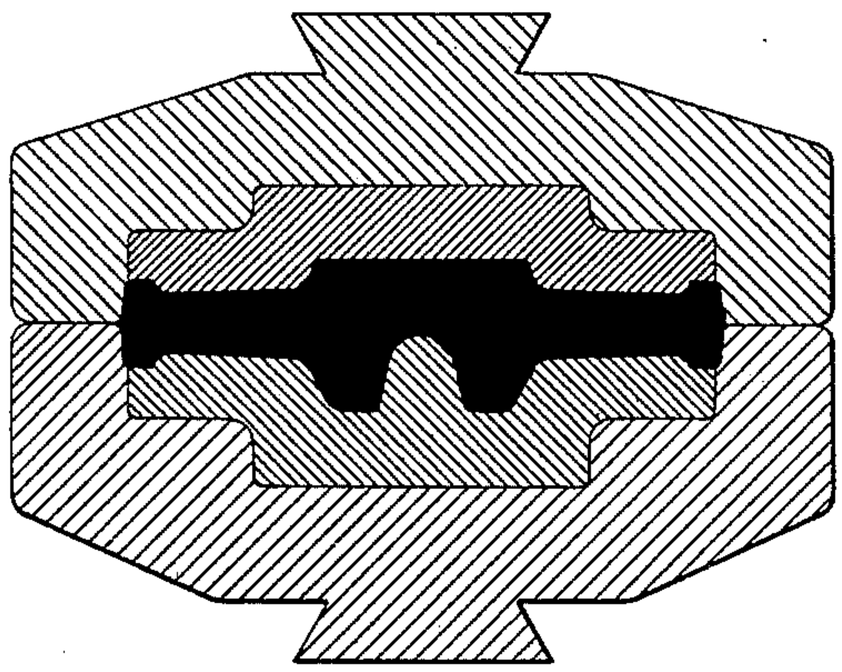


FIG. 23.



Witnesses:
Hamilton D. Turner
R. Schleicher.

Inventor:
Samuel M. Vauclain
by his Attorneys
Howson & Howson.

UNITED STATES PATENT OFFICE.

SAMUEL M. VAUCLAIN, OF PHILADELPHIA, PENNSYLVANIA.

FORGED WHEEL AND PROCESS OF MAKING THE SAME.

SPECIFICATION forming part of Letters Patent No. 462,606, dated November 3, 1891.

Application filed June 11, 1891. Serial No. 395,902. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL M. VAUCLAIN, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Forged Wheels and in the Process of Making the Same, of which the following is a specification.

My invention relates to certain improvements in wrought-iron or steel wheels and in the process of manufacturing the same, my present invention being based on the process of manufacturing wheels for which Letters Patent were granted to me on July 30, 1889, and numbered 408,056.

In the accompanying drawings, Figure 1 is a face view of the assembled parts ready to be forged into a locomotive driving-wheel. Fig. 2 is a section on the line 1 2, Fig. 1. Fig. 3 is a face view of the forged wheel after it leaves the dies. Fig. 4 is a face view of the finished wheel prior to being bored and flanged. Fig. 5 is a section on the line 3 4, Fig. 4. Fig. 6 is a perspective view of the ring. Figs. 7, 8, and 9 are views of the spoke-section. Figs. 10, 11, 12, and 13 are views of the hub-sections of a driving-wheel. Figs. 14, 15, 16, and 17 are views of the counterbalance-section. Figs. 18, 19, and 20 are enlarged views of the filling-block. Fig. 21 is a view of the assembled parts of a truck-wheel. Fig. 22 is a view of the finished truck-wheel. Fig. 23 is a sectional view of the truck-wheel, showing it in the dies; and Figs. 24 and 25 are views of the hub-section of a truck-wheel.

It will be understood that I do not limit myself to to the class of wheels shown in the drawings—*i. e.*, driving and car wheels—as my invention is applicable to all classes of wheels, and the wheels may be made with or without the crank-center and counter-balance, as in Figs. 21 and 22, and may in some instances be flanged or provided with gear-teeth. I will, however, for convenience, describe a locomotive driving-wheel, as my invention relates particularly to this class of wheel.

A is the ring in which the assembled parts are placed. B are the series of U-shaped spoke-sections, made of half-oval bars, as clearly shown in Figs. 7, 8, and 9. These spoke-sections are first placed side by side, as shown in Fig. 1, forming a complete circle.

D D′ are the hub-sections. The section D is the thick section and adapted to receive the crank-pin. *d* is the center of the hub, and *d′* the crank center. Each section D D′ has a series of recesses d^2, radiating from the center *d* of the hub, and extending beyond the line of each hub-section are projections d^3 in line with the recesses d^2. These projections extend over each spoke, so that when the wheel is welded they each form a fillet, giving strength and finish to the wheel, as shown in Figs. 4 and 5.

The sections D D′ are placed over the ends *b* of the spoke-sections, as shown in Figs. 1 and 2, and are preferably temporarily secured thereto in any suitable manner, so that the parts will remain in their proper position during the handling and welding. After the hubs are adjusted to the spoke-sections the filling-blocks E are placed at the outer intersection of the spoke-sections and ring, as shown in Fig. 1.

The blocks E are made as shown in detail in Figs. 18, 19, and 20, having a body portion *e* and heads *e′ e′*, and are shaped, preferably, in the manner shown in said figures. The body portion fits snugly at the intersection of the spoke-sections and ring, and the heads overlap the sections, as shown in Fig. 2, so that when the wheel is welded these heads form fillets, as shown in Fig. 5. After the parts are assembled they are held temporarily by a clamping-ring. (Not shown in the drawings.) The ring A is then heated and slipped over the assembled parts and the temporary ring removed. The ring as it cools shrinks, and consequently binds the several parts together.

If an ordinary wheel, such as a car-wheel or truck-wheel, is to be made, as shown in Figs. 21, 22, and 23, the hub-sections, as shown in Figs. 24 and 25, are substituted for the forms shown in Figs. 12 and 13.

In order to prevent the ring A slipping off during the heating of the structure prior to forging, I make a number of holes in the ring and in the spoke-sections and place therein pins *a*, Fig. 1, which will become

welded to the parts during the forging of the wheel.

When it is desired to make a counterbalance-wheel—such, for instance, as a locomotive driving-wheel—I form two plates F, as shown in Figs. 14, 15, 16, and 17. These plates F, I prefer to form from sheet metal; but they may be made from a block, the metal being struck up in dies forming a flange f tapered to fit the wheel, as shown, and formed in each plate are a series of grooves f', radiating from the center of the wheel, and at each groove f' on the inner side of the plate are extensions or fins f^2, which extend over the spokes and form fillets on the finished wheel between the spokes and the counterbalance. The center of each plate being hollow, the plates when placed in position form the hollow counter-balance. I make holes f^3 in plate F to allow the air that would otherwise be compressed in the deep portion of the dies to pass into the die, preventing the plate from collapsing during the forging of the wheel.

The plates F are secured to the spoke-sections preferably by rivets f^4, (shown in Fig. 1,) which become part of the wheel when forged. The rivets are placed near the flanges of the plates and near the spokes and, as shown in Fig. 1, in some instances may pass through the flanges.

The process of manufacturing is as follows: The parts are forged or bent in suitable dies and are assembled as follows: The spoke-sections are placed together, then the hub-sections are secured in place over the ends of the spokes, the filling-blocks are placed in their respective positions, the clamping-ring adjusted, the ring A applied in the manner described above, the counterbalance-plates are then secured to the spoke-sections in their proper positions, pins a are then inserted into the openings in the ring and spoke-sections, and the structure thus made up is inserted in a furnace and heated to a welding heat. It is then removed and placed between the proper dies and forged into a unitary structure, as shown in Fig. 3, the two dies being so adjusted as to not quite come together, forming on a perfect wheel thin fins at all the partings, as shown in Fig. 2, which insures a good weld and a perfect wheel full at all points. The metal of the hub-section is preferably expanded by a cold block, which is either loose or carried by the dies, the block forming a cavity i in the hub, as shown in Figs. 3, 4, and 5. The metal of the hub is thus forced into the several corners of the die at the hub, filling these corners and making a properly-welded wheel. The crank-sections may be expanded, as shown in Figs. 4 and 5, in the same manner and for the same purpose. I have described above the manner of forging the counter-balance. After the wheel is forged it is bored, turned, and fitted the same as an ordinary wheel. The counter-balance can be loaded through the openings f^3, after which they can be plugged.

The tire can be placed in the wheel center during the forging process; but I prefer to attach the tire to the center after it is turned and trued.

The dies for forming the wheel and for forging the several parts form the subject of a separate application bearing even date herewith.

I claim as my invention—

1. The process herein described of making wrought wheels, said process consisting in, first, assembling the several spoke-sections and hub-sections; second, heating the ring-sections, and, third, while the ring-section is still hot placing it around the assembled spoke-sections, allowing said ring-section to cool, thereby clamping the several sections together by the contraction of the ring-section, substantially as described.

2. The process herein described of making wrought wheels, said process consisting in assembling the several spoke-sections and hub-sections, placing a clamping-band around the periphery of the spoke-sections, then heating the ring and applying the ring to the periphery of the spoke-sections while still hot, removing the clamp and allowing the ring to cool and contract, thereby binding the several parts of the wheel together, substantially as described.

3. The process herein described of making wrought wheels, said process consisting in assembling the several U-shaped spoke-sections together, placing the hub-section above and below the ends of the spoke-sections, placing fillets having heads on each end between the several spoke-sections at the periphery, applying a ring to the assembled parts, and finally heating the built-up wheel and forging it to form a unitary structure, substantially as described.

4. As a new article of manufacture, a hub-section for wrought wheels, said hub-section being grooved radially to receive the ends of the spoke-sections and having extensions at each groove, said extension forming, when the wheel is struck up, fillets at the joint between the hub-sections and spoke-sections, substantially as described.

5. As a new article of manufacture, a filling-block having a body with enlargements or heads at each end, the body portion of the block adapted to fit at the intersection of the ring with two adjoining spoke-sections, the heads serving to prevent the block from falling out during the process of manufacture, and when the wheel is finally forged into a unitary structure the heads form the fillets at the junction of the spoke-sections and ring-sections, substantially as described.

6. The process herein described of making wrought wheels, said process consisting in assembling the several spoke-sections and hub-sections, applying a ring to the periphery of

the spoke-sections, passing pins through the ring into the several spoke-sections, thereby holding the ring to the sections during the heating and handling of the assembled parts prior to forging, substantially as described.

7. The process herein described of making wrought wheels, said process consisting in assembling the hub-sections and spoke-sections, forging the several sections into a unitary structure, and forcing a cold block into the center of the hub-section, thereby expanding the metal of the hub-section, filling the joints between the hubs and spokes, substantially as and for the purpose described.

8. The process herein described of making wrought wheels, said process consisting in assembling the hub-sections, spoke-sections, and ring-section, heating the mass to a welding heat, placing the assembled parts in a die and compressing or forging the parts by a second die to form a unitary structure, said dies being so regulated in respect to each other that they do not come together, thus forming fins on the wheel at the junction of the two dies, substantially as and for the purpose described.

9. The process herein described of making wrought wheels having hollow counter-balances, said process consisting in assembling the spoke-sections, ring-section, and hub-sections together, securing the assembled parts, two hollow sections, one on each side to form hollow counter-balances, one or both of said sections being perforated to allow for the passage of air into the hollow counter-balances, placing the assembled parts between the suitable dies, the air in the hollow portion of the die forming the counter-balance, being admitted to the hollow portion of the counter-balance through the openings therein, thereby pressing the shell of the counter-balance against the dies, forming flat walls, substantially as and for the purpose described.

10. The process herein described of making wrought wheels, said process consisting in first assembling the ring-sections, hub-sections, and spoke-sections, placing on each side of the assembled wheel counterbalance-sections, riveting the two counterbalance-sections together and to the spoke-sections, passing said rivets through or near the walls of the counterbalance-sections, heating the mass, and forging the whole into a unitary structure, whereby the rivets will be welded to the parts, substantially as and for the purpose described.

11. In the manufacture of wrought wheels, a hollow counterbalance-section struck up from sheet metal, having a flange with grooved projecting portions which fit over the spokes of the wheel to be forged, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL M. VAUCLAIN.

Witnesses:
FRANK H. MASSEY,
HENRY HOWSON.