No. 754,304. PATENTED MAR. 8, 1904.

T. D. HARRIS.

# METHOD OF MANUFACTURING WHEELS.

APPLICATION FILED AUG. 29, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

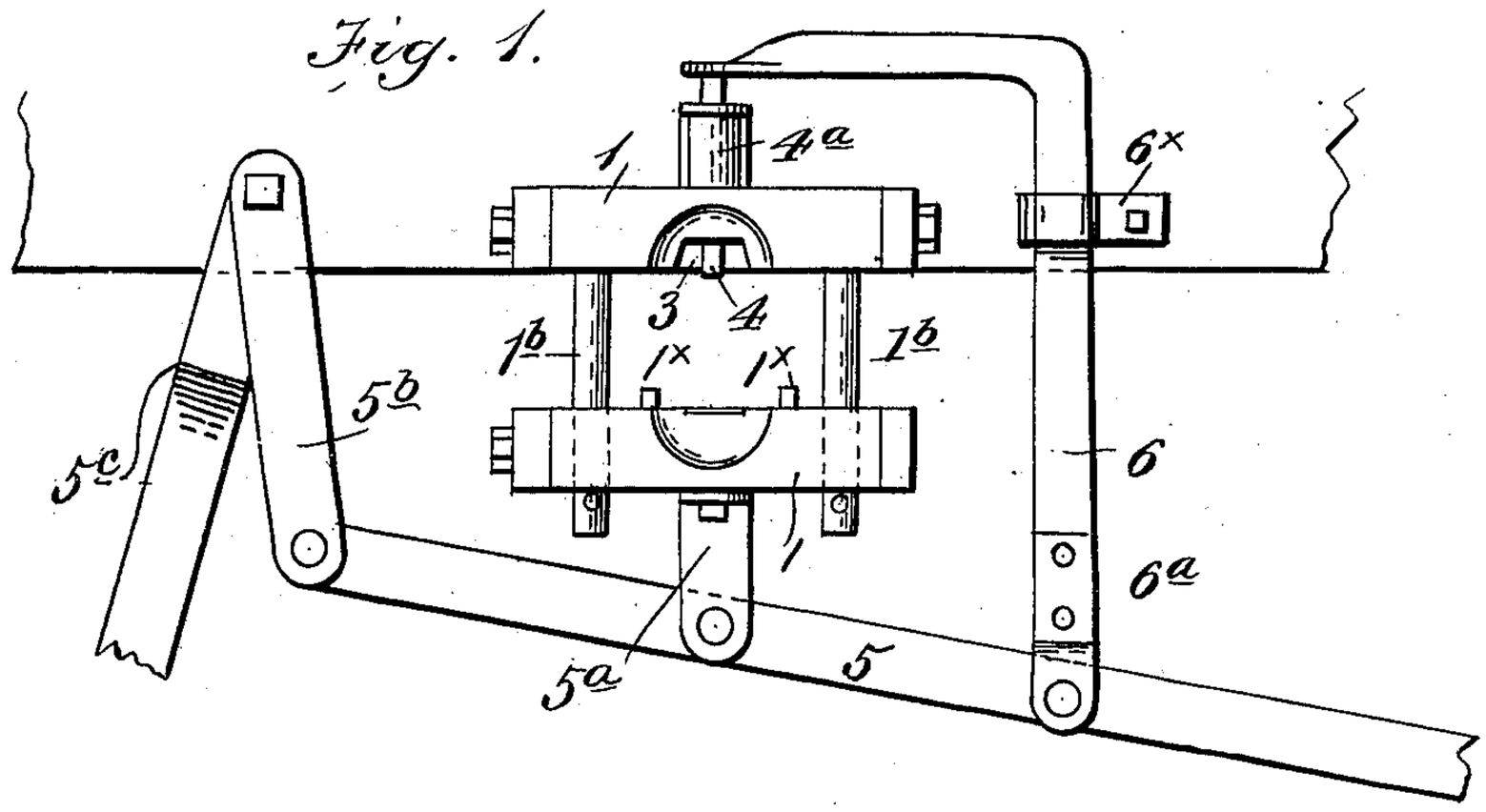



Fig. 2.

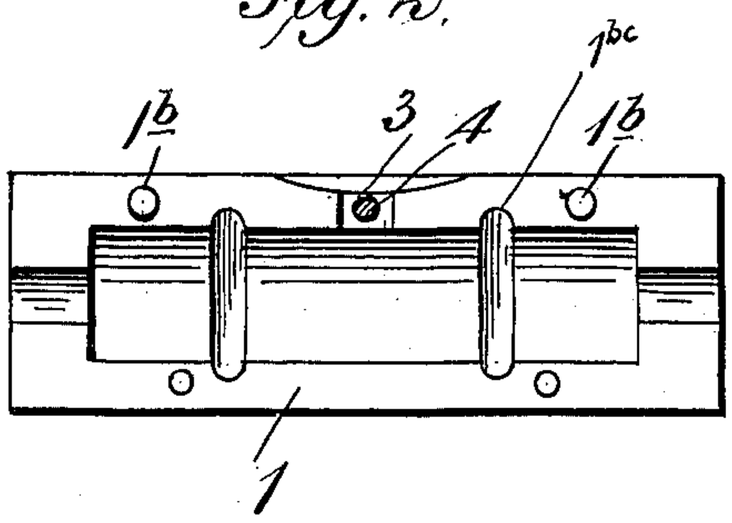



Fig. 3.

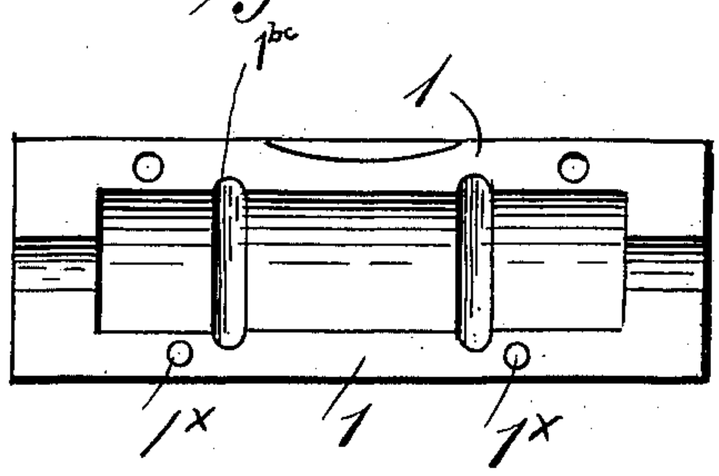
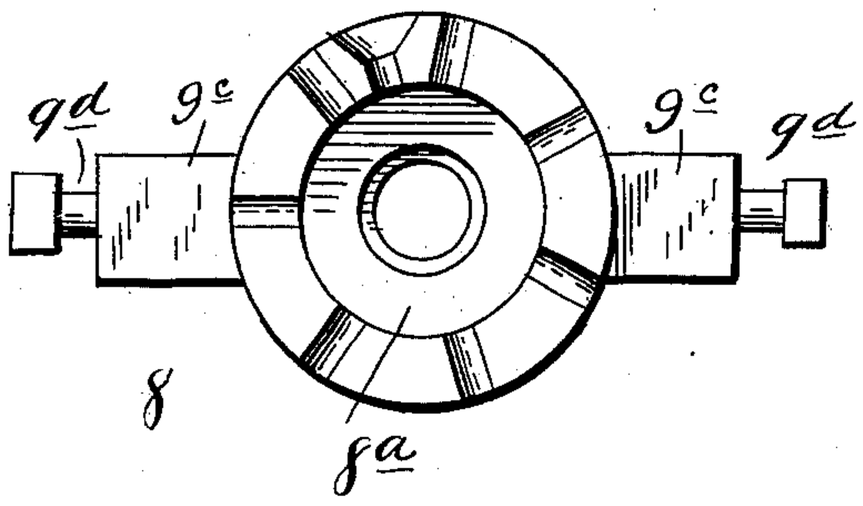



Fig. 5.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 4.

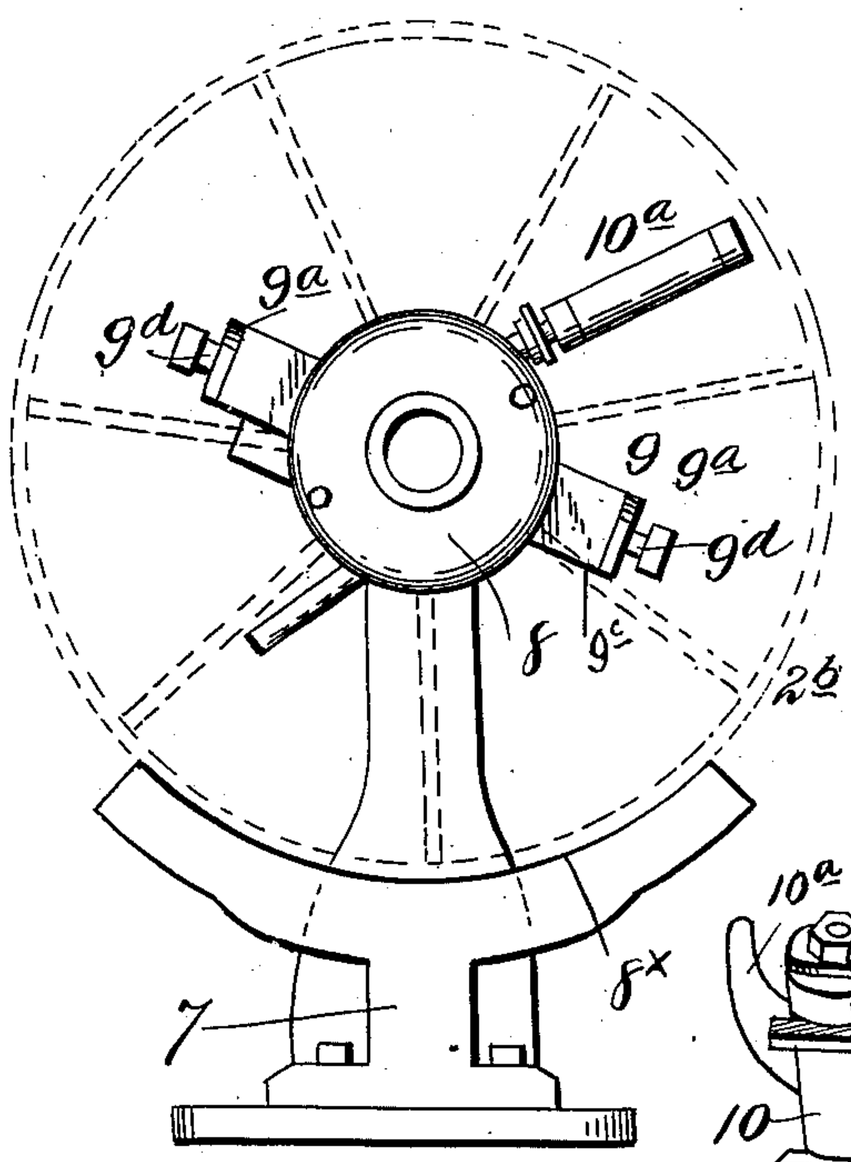



Fig. 10

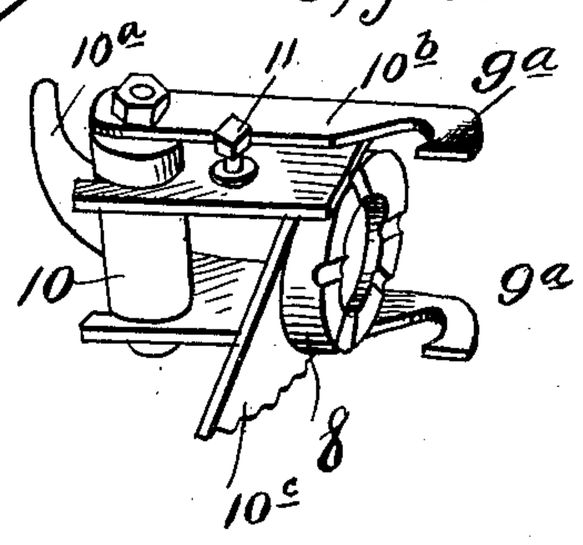
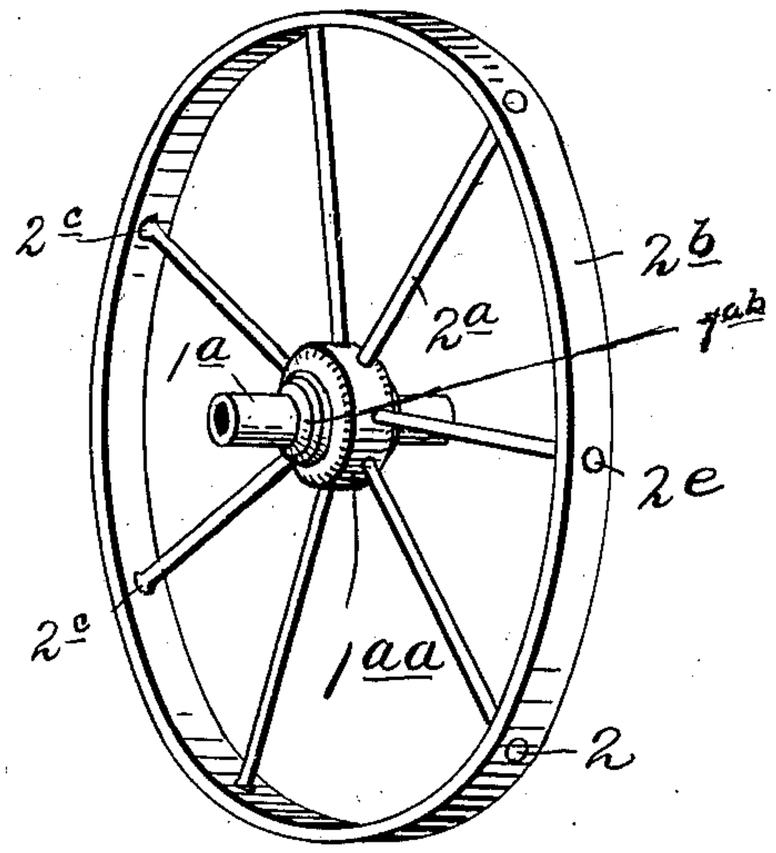



Fig. 6.

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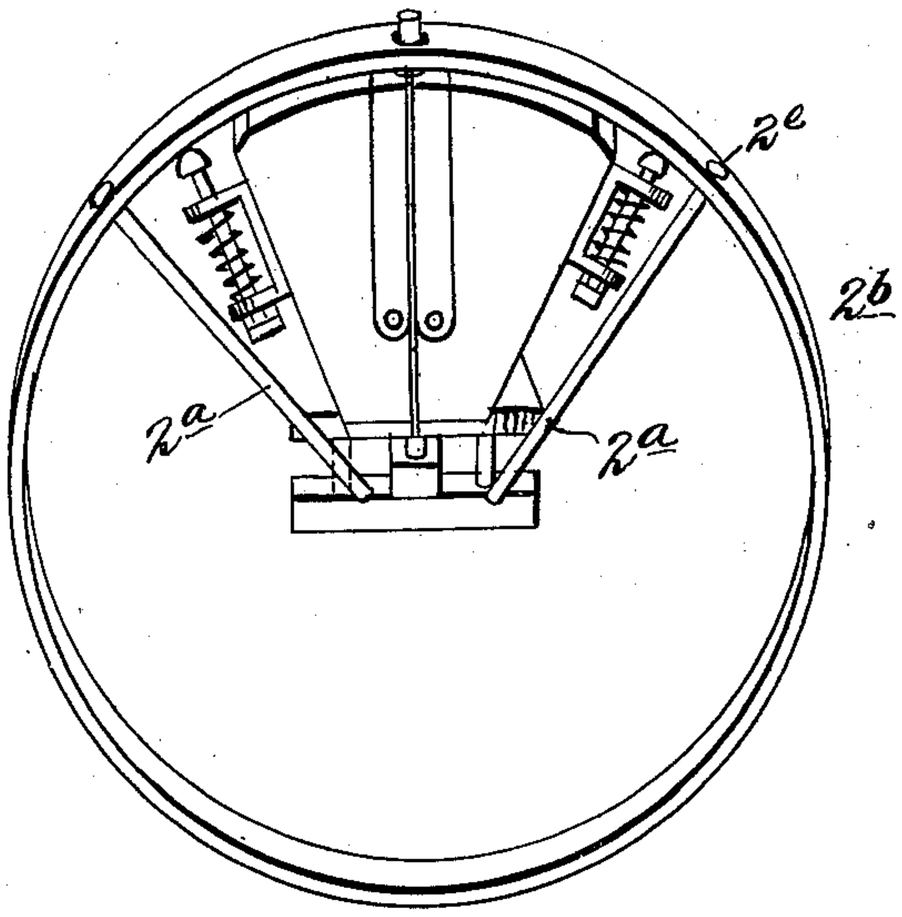
NO MODEL. 3 SHEETS—SHEET 3.

Fig. 7.



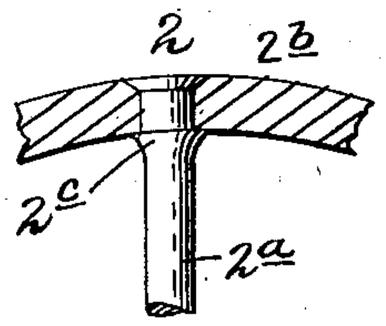
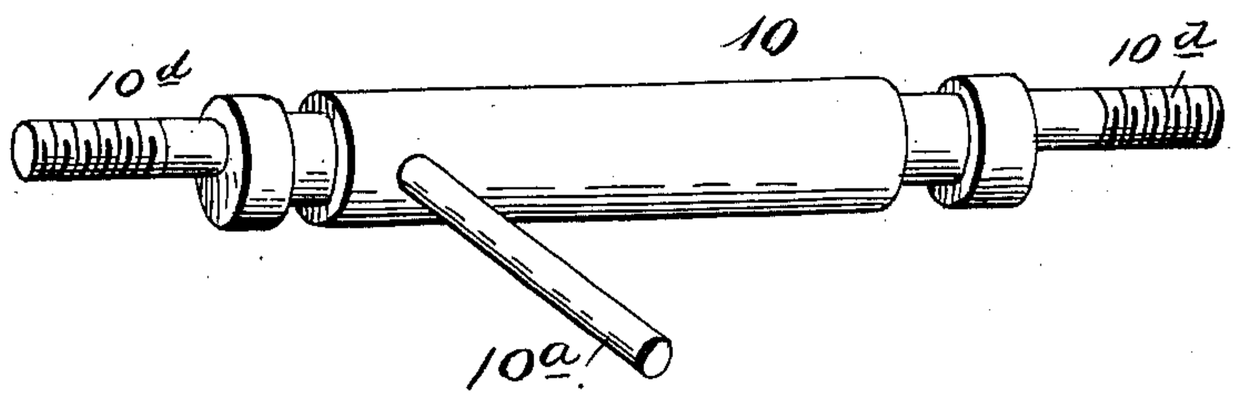




Fig. 9.

Fig. 8.

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No. 754,304. Patented March 8, 1904.

# UNITED STATES PATENT OFFICE.

THOMAS DOW HARRIS, OF ASHBORO, NORTH CAROLINA, ASSIGNOR OF ONE-HALF TO EMMETT LEONIDAS MOFFITT, OF ASHBORO, NORTH CAROLINA.

## METHOD OF MANUFACTURING WHEELS.

SPECIFICATION forming part of Letters Patent No. 754,304, dated March 8, 1904.

Application filed August 29, 1903. Serial No. 171,271. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS DOW HARRIS, a citizen of the United States, residing at Ashboro, in the county of Randolph and State of North Carolina, have invented new and useful Improvements in Methods of Manufacturing Wheelbarrow-Wheels, of which the following is a specification.

My invention relates to certain improvements in the manufacture of wheelbarrow-wheels. In this class of wheels the bearing should be, say, six inches in length, while the hub should not exceed one inch in thickness, providing for the projecting or extending of the bearing straight out two and one-half inches from the hub upon each side. It is noted that in the casting of wheels as heretofore practiced the movable or hinged section of the mold in releasing the same has to travel in an arc, which would not permit said section to escape the projecting bearing unless the latter were produced with a very steep taper or inclination toward and terminating the same. This would require about twice the amount of metal necessary to make such bearing. Evidently this type of mold is for making wheels such as are used in hay-rakes, carts, and various vehicles having a short cylindric hub and of an entirely different character from that employed herein—as, for instance, in making wheelbarrow-wheels. This six-inch bearing is very difficult to make without producing the same unnecessarily large from the hub out to the ends. It should not exceed one and three-sixteenth inches in diameter and should have a nine-sixteenths-inch hole or bore through it for the reception of the axle, thus leaving the shell only about five-sixteenths of an inch thick from hub to ends of bearing.

The principal advantage gained by first producing the bearing and subsequently "running" the hub thereon is the opportunity of examining such bearing to ascertain whether or not the casting is a good one, is not defective, before running the metal around the spokes, as is done in forming the hub member, thus aiding to prevent the "spoiling" of a whole wheel. It is a delicate matter to "run" so small an amount of metal around so small a core, made of sand, six inches in length. The least little irregularity in the casting operation will cause a defect; but by the separate casting of the bearing and the hub members any defect in said bearing is readily detected, in which event such defective bearing can be "thrown out" and be subsequently remelted at a very small cost, whereas if the bearing and hub members be cast at one operation with the wheel-spokes in position in the hub member the whole wheel in the presence of such defect would become practically worthless. There is practically no liability of any trouble resulting from the running of the metal around the bearing and spokes, while the wheel is just as good in every particular as in the methods heretofore adopted for that purpose.

A second and very important advantage of running the metal around the spokes at a separate operation from that of forming the bearing is that shrinkage is reduced to such an extent as not to require that the outer spoke ends shall be detached from the rim or tire nor that such spoke ends shall be heated, as heretofore has been done. As the molten metal is poured around the cold bearing the former of course becomes chilled and solid, the heat of said molten metal, however, expanding said bearing and pushing the spokes outward; but while cooling the whole shrinks practically together, so nearly so that it is unnecessary to either heat the outer spoke ends or detach them from the tire or rim for such purpose. In other words, when the molten metal contacts with the cold surface of the bearing-arm of the inner spoke ends a solid connection or union is effected therebetween, whereby as the bearing under this heating action expands the spokes are shoved outward, the latter even being sprung between the hub and tire or rim, and as the cooling action takes place said parts naturally assume their initial or normal relation or position, consequently producing a substantially perfect wheel with very slight changes.

It is further observed that the aim has been to preserve the true circle of the wheel by heating the rim and running the molten metal around the inner spoke ends while said rim was hot, the latter thus being permitted to shrink simultaneously with the shrinking of the molten or poured metal. This objection is overcome by pouring the molten metal around the spokes at their inner ends, as already explained. Again, the molten metal has been poured in a sand mold, otherwise termed a "sand-blast," made especially for the purpose. By the herein-described method it is found that a much better wheel can be made and for one-tenth the labor cost of making the same in the sand.

This invention has for its object principally to effect the casting of the bearing at the wheel center in an improved manner as compared to the heretofore-adopted way of casting bearings of this character, being characterized for uniformity and accuracy of fit at the point of union with the spoke retaining or receiving member or hub proper, said casting or bearing, together with said hub member, also being free from sand-holes or "blows," while the same are harder, consequently superior for the intended purpose than the ordinary sand-made castings or bearings. It has for its further object to form or effect connections between the spokes and the tire.

Said invention consists of the process or method of securing the aforesaid results and the peculiarly-constructed wheel as the product thereof, substantially as hereinafter more fully disclosed, and specifically pointed out by the claims concluding the following description.

In the accompanying drawings, illustrating the preferred embodiment of my invention, Figure 1 is a view in plan of the central wheel-bearing mold with the parts separated. Fig. 2 is an inside or face view of one section or part of the mold. Fig. 3 is a corresponding view of its companion section. Fig. 4 is a view of a mold for casting the hub member in position. Fig. 5 is a view of one of the sections of said mold. Fig. 6 is a view of a wheel having the bearing-casting with the hub member cast thereon. Fig. 7 is an enlarged detail view showing more particularly the manner of securing the spokes at the tire. Figs. 8, 9, and 10 are enlarged detailed views showing parts which will be fully explained hereinafter.

In the carrying out of my invention I provide a two-part or sectional mold 1 1, suitably adapted to receive the core to produce the tubular cylindric bearing $1^a$ in the manner described presently. The mold-sections are provided with transverse semicircular grooves or channels $1^{bc}$, arranged equidistantly from and laterally of the center thereof, those of one mold-section registering with the corresponding grooves or channels of the other mold-section, the purpose of which will appear later. Said mold has its sections or parts, one of which is stationary and the other movable or sliding, adapted to be brought compactly together, one part or section having studs or guides $1^b$ $1^b$ passing transversely through its fellow section and extending some distance beyond the latter when said sections are in contact, as when ready for the casting operation, said studs or projections having pins or stops $1^{bb}$ near their outer or free ends to limit the movement of the sliding section. Said mold-sections are provided with vertical meeting recesses or depressions with upper outwardly-flared enlargements, which recesses and enlargements constitute the "gate" or sprue 3 for the pouring of the molten metal thereinto. One mold-section has suitably incased or housed in connection therewith, as at $4^a$, a spring-retractible plunger 4, movable within a passage intersecting the pouring opening or gate, said plunger therefore, normally, being withdrawn or retracted from said gate or sprue, the means for actuating which and when done will be presently referred to. The other or sliding mold-section has suitably connected thereto, as at $5^a$, a hand-actuated lever 5, itself suitably connected, preferably, by a pivoted link $5^b$ to a base-piece bearing the fixed or stationary mold-section, said link being guided and limited in its movement by an offset or angular arm $5^c$, also secured to said base-piece. To said lever 5 is connected intermediately of its handle and its point of connection with the part $5^a$ an angular bar or arm 6, one end of which is linked, as at $6^a$, to said lever 5 and having its other end opposed to the plunger 4, said arm being guided and held in position by a keeper $6^\times$. Thus it will be seen that as said lever 5 is moved to separate the mold-sections, as when the casting is removed after the casting operation, the arm 6 is caused to simultaneously move the plunger 4 into the plane of the gate or sprue 3, and thus eject the neck or elongation of the bearing-casting from said sprue or gate, accordingly effecting the dislodgment of said bearing-casting from the stationary mold-section. The movable mold-section has, preferably, dowel-pins or projections $1^\times$ entering registering apertures in the stationary mold-section to aid in bringing and retaining the mold-sections in true alinement. The core being in position in the mold-sections and the latter closed and the molten metal poured into the sprue or gate, the same filling the mold, the result will be productive of a bearing-casting $1^a$, as shown, which casting is expelled, as in separating the mold-sections and in the manner as above noted, while yet at a white heat and which when thus expelled is covered for the time being with sand.

The wheel-spokes $2^a$ are secured at their outer end portions to the tire or rim $2^b$ by

properly heating the same to the requisite degree and producing offsets thereon or flaring said spokes, as at $2^c$, so as to bear upon the inner side of said tire or rim and then flaring or heading the extreme outer ends of said spokes, as at 2, into previously-produced countersinks $2^e$ in the tire or rim into the plane thereof. I have provided special means for carrying out this feature of my invention, having disclosed the same in a pending or concurrent application.

I suitably place in position in a support or standard 7, provided for the purpose, the stationary section or half of a mold 8, and into this mold section or half I insert said bearing or casting, moving it thereinto until said mold-section is at the required point with relation to said bearing or casting. The wheel, with its tire or rim and the spokes secured to the latter, as set forth, is as thus far completed disposed in position with said tire or rim resting in a curved or arcuate gage $8^\times$, suitably supported in place in connection with the standard 7 to properly center the wheel—*i. e.*, arrange the bearing-casting concentrically with the tire or rim. The inner ends of the spokes are let into the radial passages of said stationary mold-section and the movable or other section of said mold slipped over said bearing or casting into place against said stationary mold-section. Said mold-sections are suitably clamped together, preferably by means of a special form of device, as 9, comprising principally two hooks $9^a$, adapted to engage studs $9^d$, which may be angular-headed screw-bolts screwed or inserted into the ends of opposite arms $9^c$, carried by said movable mold-section. Said parts are tightened up by means of a rock-shaft or axial member 10, having an actuating lever or handle $10^a$ and bearing in parallel plates or members $10^b$, suitably secured to a support $10^c$, said shaft also having eccentric end extensions $10^d$, having screw-threaded connection with the shanks of the hooks $9^a$, a stop 11, projecting from one of the plates $10^b$, limiting the movement of said hooks. The molten metal is now poured into the sprue or gate of said mold 8, it finally passing into and filling the annular chamber $8^a$ thereof, thus forming a hub member $1^{aa}$ around the inner ends of the wheel-spoke upon and uniting with the bearing or casting $1^a$ between previously-produced annular raised portions or rings $1^{ab}$, produced upon the last-named by the grooves $1^{bc}$ in the mold-sections, thus solidly connecting all of these parts together. Said rings or raised portions serve to guide the proper disposing of the hub-forming mold upon the bearing or casting $1^a$. The effect of such union of parts is to promote durability and strength and increased wearing capacity, while uniformity and accuracy of fit are obtained therebetween and the same are free from sand-holes and blows, &c.

I do not wish to be limited as to details of construction, as these may be modified in many particulars without departing from the spirit of my invention.

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

1. The method described of casting the central bearing or axle and the spoke-hub of wheels, which consists in producing such a bearing by the ordinary casting operation, in placing or disposing the inner ends of the spokes in relative position to said bearing, and in casting around said spoke ends, and upon said bearing, a hub member.

2. The method described of casting the central bearing and the spoke-hub of wheels, which consists in producing, by casting, a tubular bearing with annular raised portions thereon arranged equidistantly from, and laterally of, the center thereof, in disposing the inner ends of the spokes in relative position to said bearing, and in casting around said spoke ends, and upon said bearing, between said annular portions, a hub member.

3. A wheel comprising a central cast bearing having a hub member cast thereon, around the inner ends of the spokes.

4. A wheel embracing a central cast bearing having raised annular or encompassing portions arranged equidistantly from, and laterally of, the center thereof, and a hub member cast upon said bearing, around the inner ends of the spokes and intermediately of said annular or encompassing portions.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

THOMAS DOW HARRIS.

Witnesses:
SAMUEL FRANKLIN PHILLIPS,
ELIJAH MOFFITT.