C. GRUNWALD.

APPARATUS FOR PRODUCING WHEELS IN DIVIDED METALLIC MOLDS.

APPLICATION FILED AUG. 24, 1908.

958,635.

Patented May 17, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

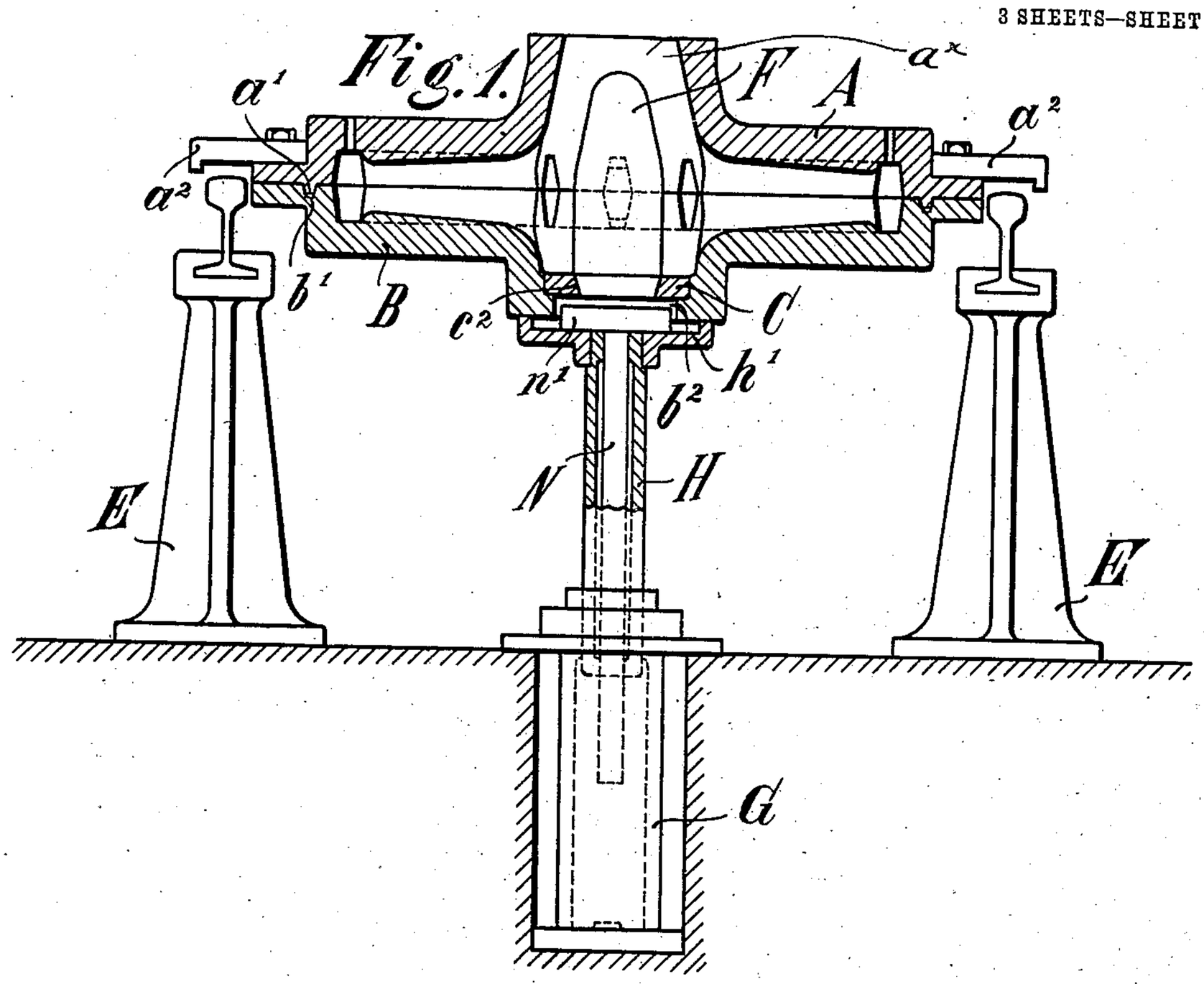
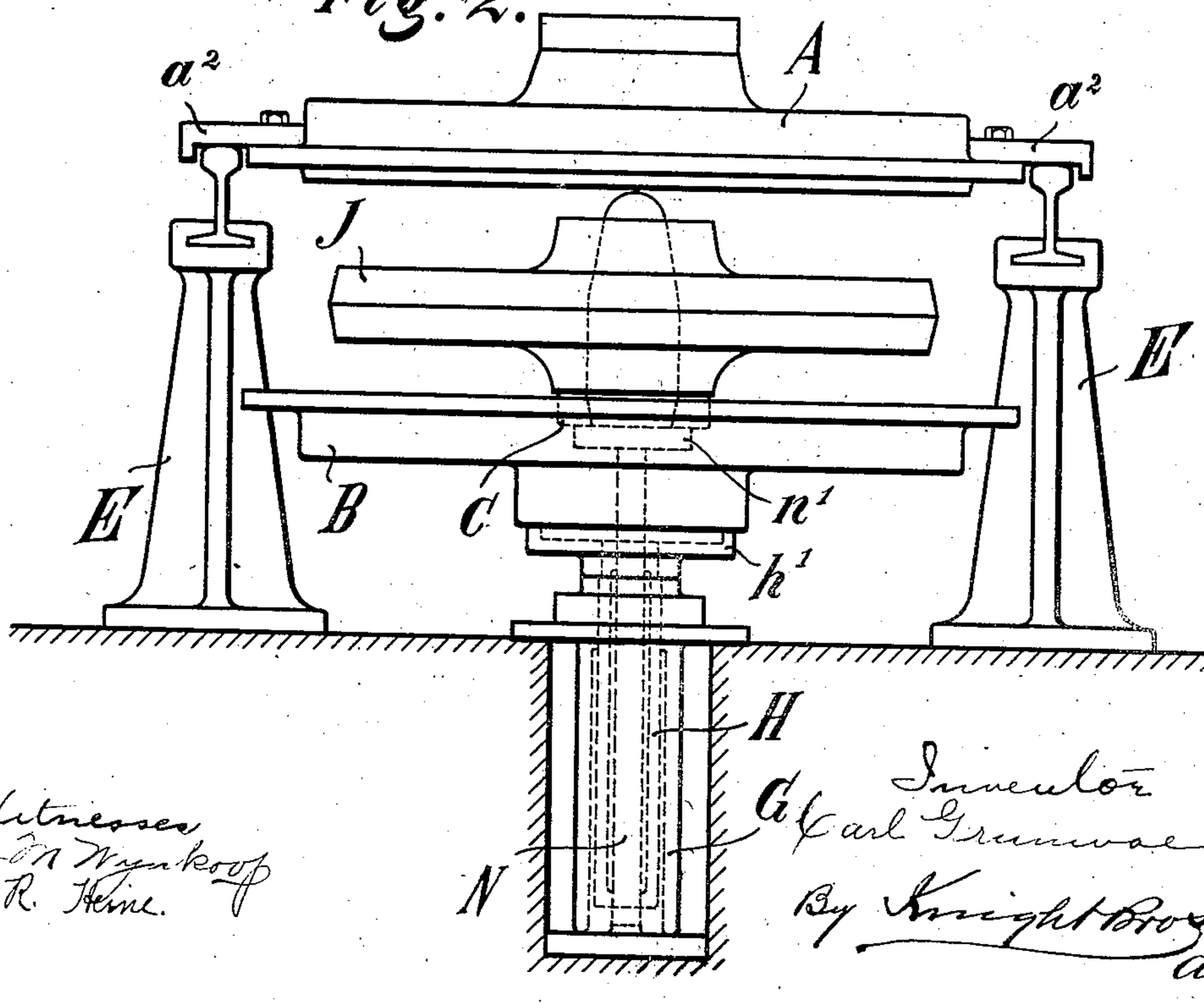


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

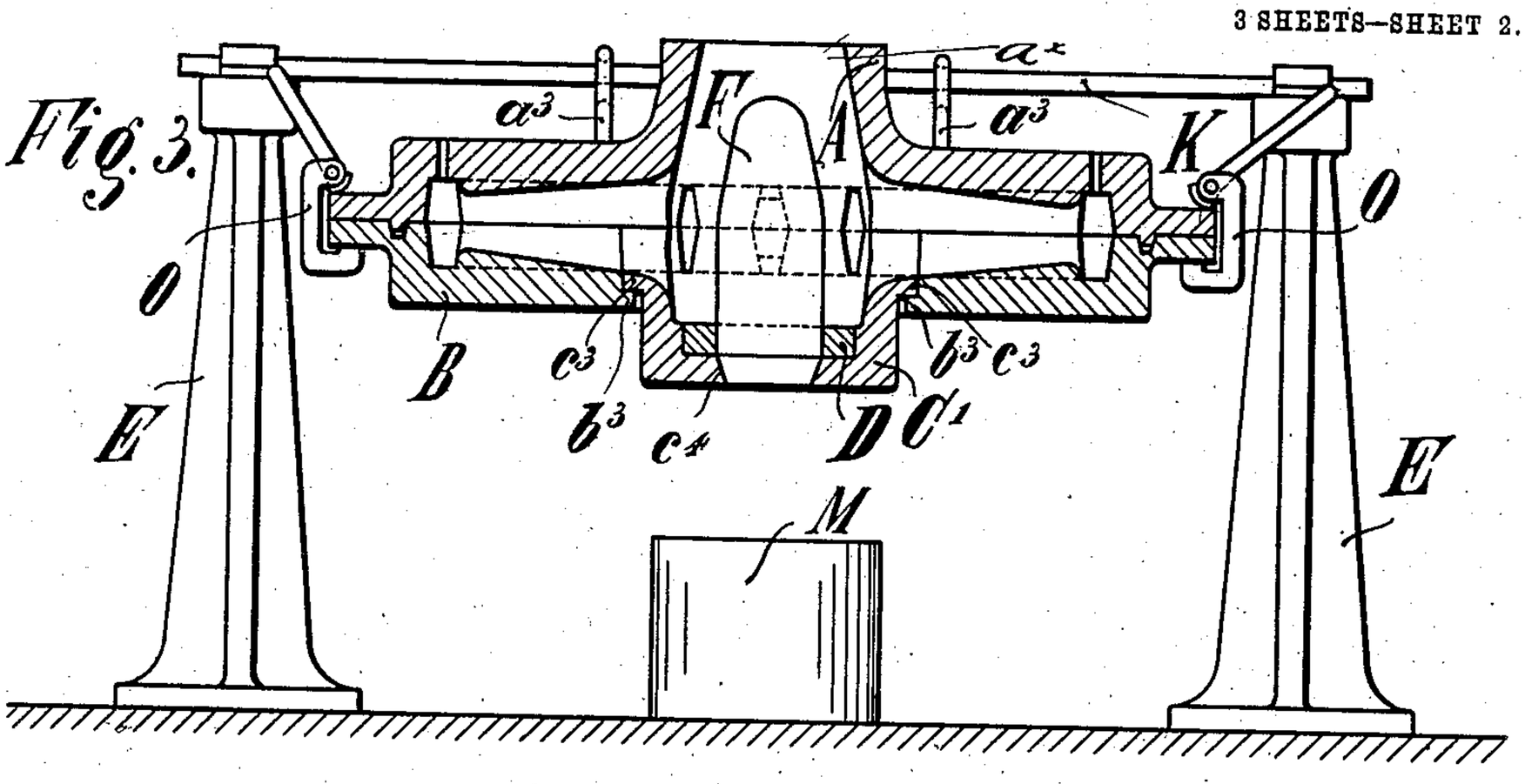


Fig. 4.

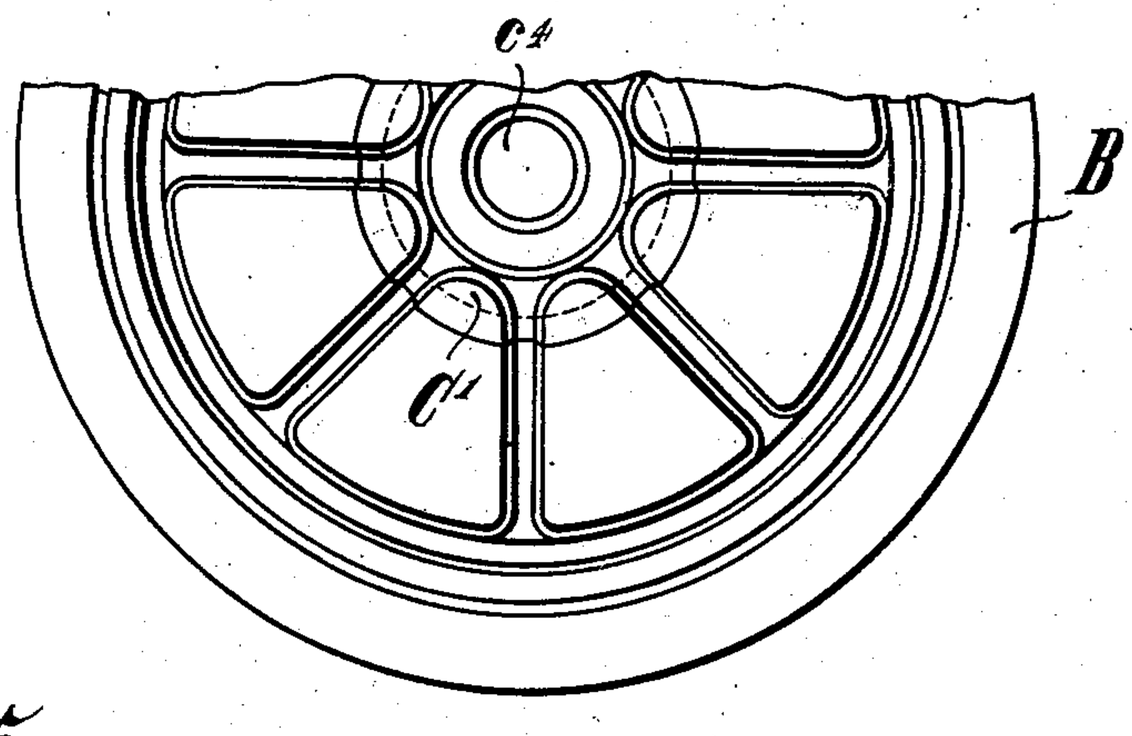
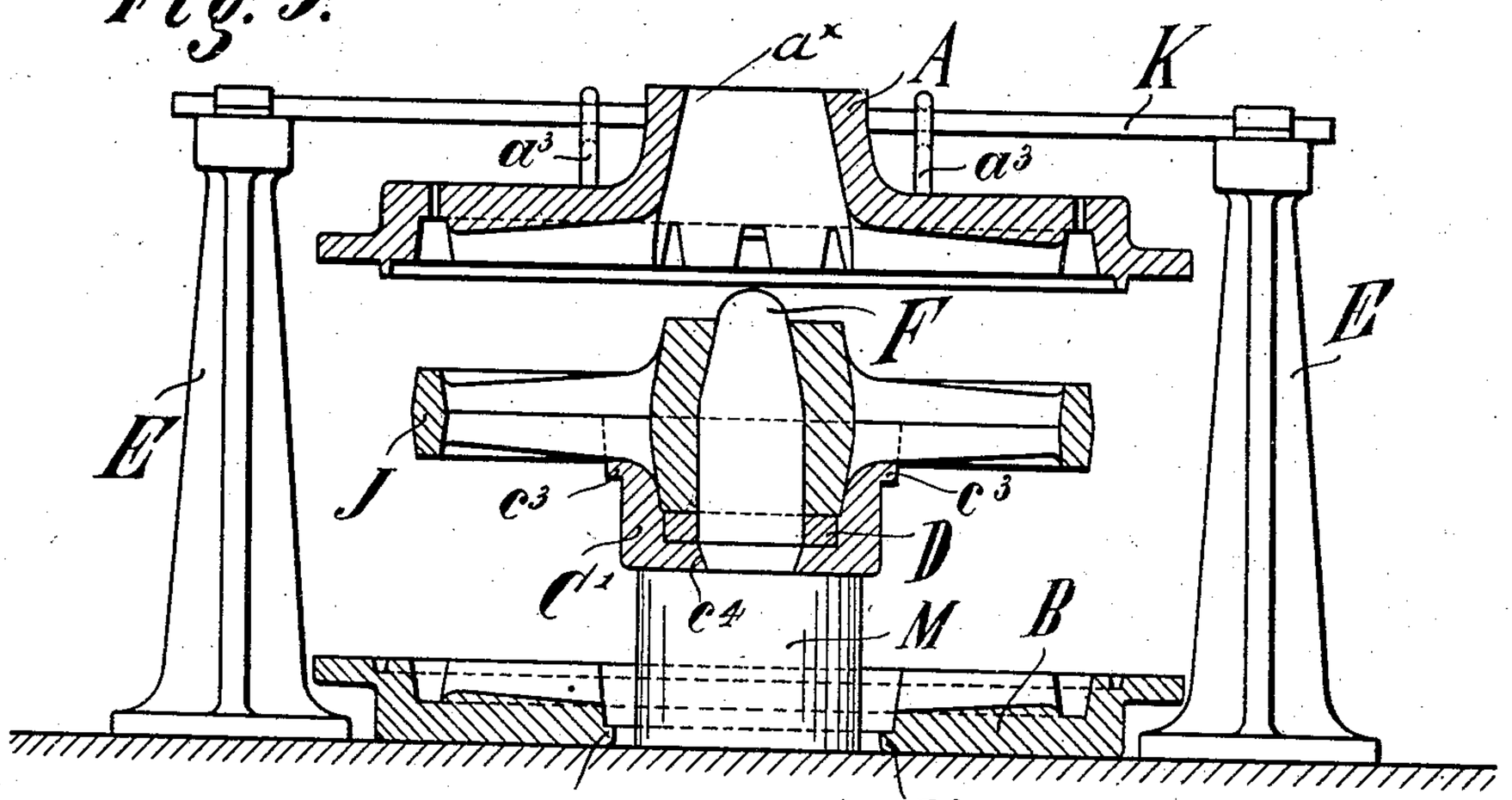


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

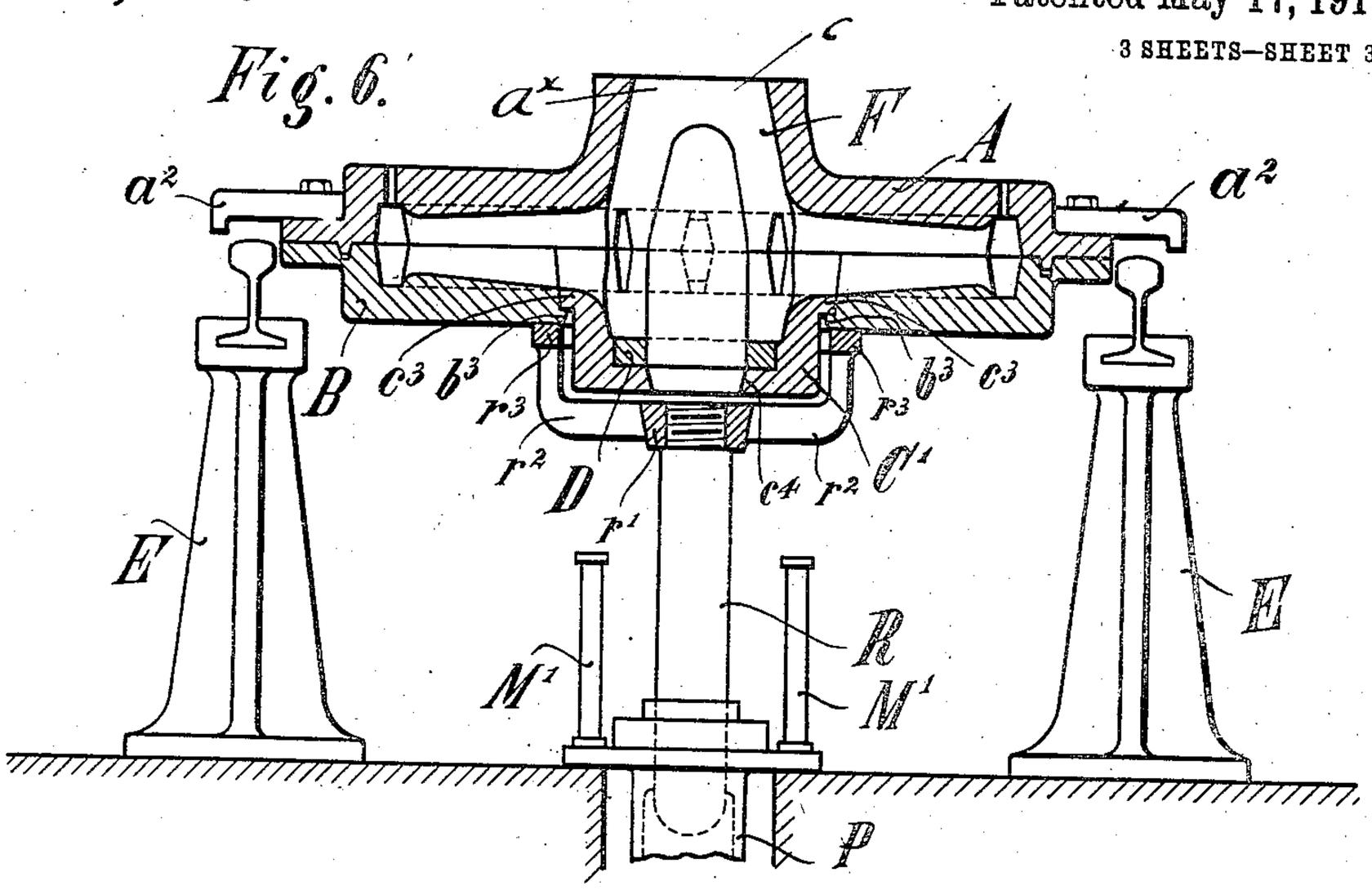
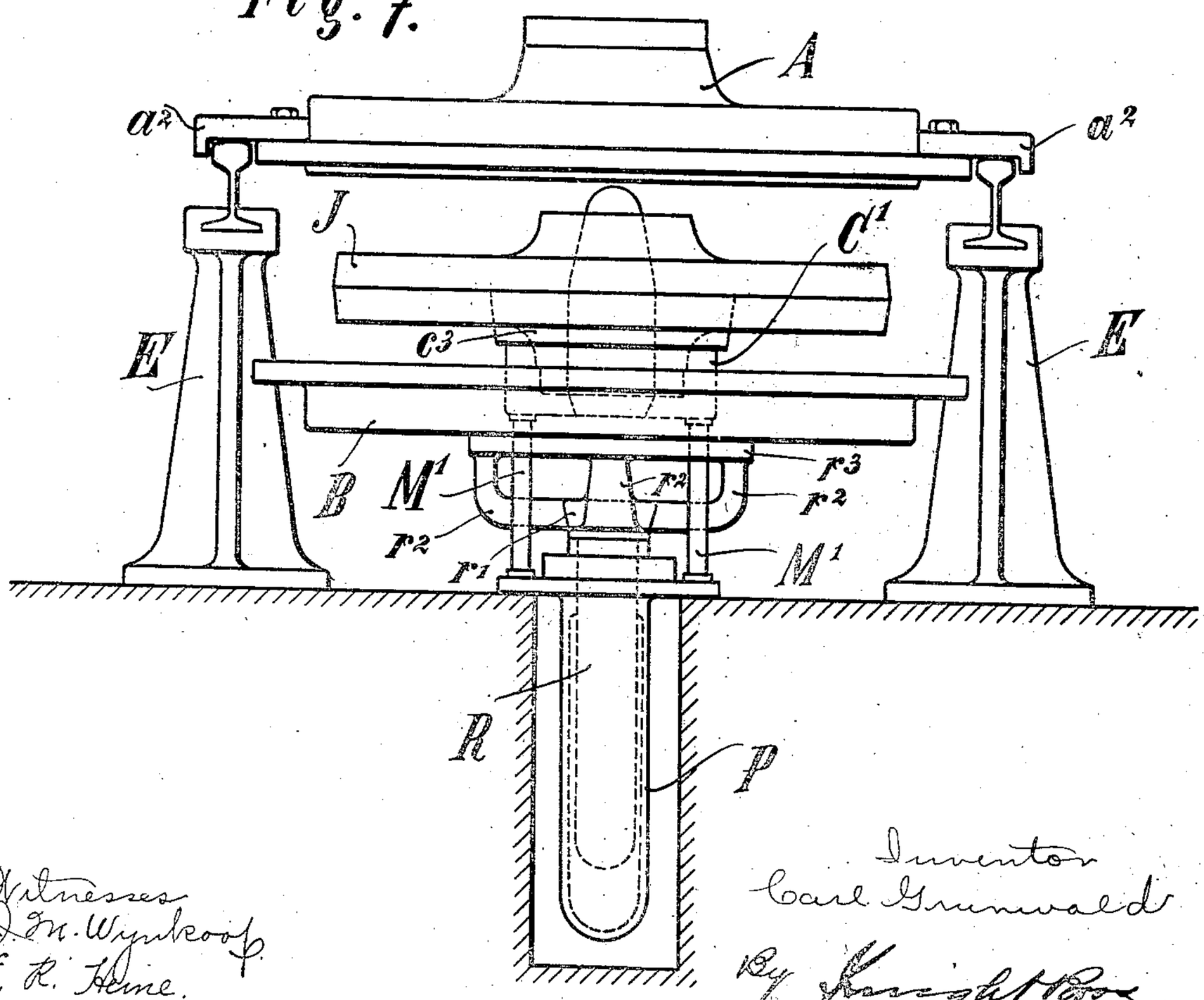


Fig. 7.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PRODUCING WHEELS IN DIVIDED METALLIC MOLDS.

958,635. Specification of Letters Patent. Patented May 17, 1910.

Application filed August 24, 1908. Serial No. 450,124.

To all whom it may concern:

Be it known that I, CARL GRUNWALD, a subject of the Emperor of Germany, residing at 159/1, Bredeney, Prussia, Germany, have invented certain new and useful Improvements in Apparatus for Producing Wheels in Divided Metallic Molds, of which the following is a specification.

The present invention relates to a process of and apparatus for producing wheels, especially steel wheels, in divided metallic molds.

The object of the invention is to provide an apparatus and a process of this type which makes it possible to remove the casting from the mold extremely rapidly and in a very simple manner so as to permit a great number of castings to be produced in a short time by means of the same mold. This object is attained by moving some parts of the mold axially relatively to each other, directly after the casting operation, to cause complete exposure of the casting, excepting the surfaces which rest on a special part of the mold which serves as a hub support.

In the employment of divided molds for wheels, it is already known to withdraw axially from the casting, directly after the casting operation, the upper and lower annular parts of the mold which are located between the rim and the hub of the wheel; however, in the known molds the withdrawal takes place only to the extent required for permitting free shrinkage of the casting. In the employment of these molds, the casting is not completely exposed, with exception of the surfaces resting on the hub support, as is the case in the present invention, in which the casting is exposed to such an extent that it can be directly removed.

The accompanying drawings show, by way of example, three embodiments of the apparatus for carrying out the process according to the present invention.

Figure 1 is a side view, partly in section, of the first embodiment, the mold being closed; Fig. 2 is a side view corresponding to Fig. 1 and showing the mold opened; Fig. 3 shows the second embodiment in a view corresponding to that shown in Fig. 1; Fig. 4 is a top view of the lower half of the mold of the second embodiment and of the support for the hub of the wheel to be cast; Fig. 5 shows the second embodiment in a view corresponding to that shown in Fig. 2; and Figs. 6 and 7 show the third embodiment in views corresponding to those shown in Figs. 1 and 2.

Reference will first be had to the embodiment shown in Figs. 1 and 2.

In each of the embodiments herein shown, the mold, which is preferably made from cast iron, consists of the two halves A and B, a ring support C or D for the end of the hub of the wheel to be cast, and a core F. The ring C constitutes the surface that receives the metal forming the hub, and in Figs. 1 and 2 also constitutes the support for the hub. It is separate from the core F and interchangeable. The halves A and B are formed in such a manner that, when the mold is closed, they lie against each other in the central plane of the wheel to be cast. The upper half A carries a centering ring a^1 which, when the mold is closed, engages in a groove b^1 provided in the lower half B. The section A has an upwardly disposed annular collar whose central opening a^x bears such relation to the remainder of the mold, (particularly the core F) that when the mold is closed, a pouring opening is left through which the molten metal is poured. In the form shown in Figs. 1 and 2, the lower half B is provided with a central opening b^2 on the edges of which the support C for the hub of the wheel rests when the mold is closed. The support C is provided with a downwardly tapering opening c^2 which serves for holding the core F for the bore of the hub of the wheel.

The following device is provided for opening and closing the mold. The upper half A is provided with arms a^2 which serve the purpose of retaining the upper half on a frame E when the mold is opened. Below the mold and co-axial therewith is provided a cylinder G in which a piston H is guided. Through the medium of a conduit (not shown) and a switching member, such as a three-way cock, pressure medium can be introduced into or conducted out of the cylinder G to cause the piston to ascend or descend. On the upper end of the piston H is secured a dish-shaped disk h^1 on which the lower half of the mold rests. The piston H is provided with an axial bore in which a rod N is arranged so as to be capable of longitudinal displacement. The upper end of the rod N is provided with a plate n^1 which can pass through the opening b^2 in the lower half B and which abuts against the bottom of the disk

h^1 when the mold is closed. The rod N is longer than the piston H so that, when the rod moves downwardly with the piston H, the rod hits the bottom of the cylinder G before the piston has reached its lowermost position. The diameter and the weight of the rod N are selected in such a manner that the rod cannot be displaced relatively to the piston H by the greatest fluid pressure created in the cylinder G when the mold is being closed. If the open mold (Fig. 2) is to be closed a fresh core F is inserted in the hole c^2 of the support C and the piston H with the rod N and the lower half B resting on the disk h^1 are then elevated by introduction of pressure medium into the cylinder G. When the lower half B has almost reached the upper half A, which rests on the frame E, the ring a^1 passes into the groove b^1. The introduction of pressure medium into the cylinder G is continued until the upper half is lifted to a slight extent from the frame E. The mold is then ready for the casting operation (Fig. 1). Directly after the casting operation is completed the pressure medium is let out of the cylinder G which causes the piston H, and consequently also the mold with the casting J, to descend. The upper half A is retained on the frame E by the arms a^2 while the lower half B with the casting J continues to move downwardly until the rod N hits the bottom of the cylinder G. Henceforth, the downward movement is carried out only by the piston H with the disk h^1 and the lower half B resting on the disk, while the casting J is retained by the support C carried by the rod N and in this manner the casting, with exception of the surface resting on the support C, is exposed (Fig. 2) so that the casting is freed from all the parts preventing shrinking. It is apparent from the drawing that the casting can then be directly removed in a lateral direction in a very simple manner, whereupon the mold, after being closed once more in the manner already described, can immediately be filled afresh.

In the second embodiment (Figs. 3 to 5) the upper half A of the mold is suspended from a carrier K of the frame E by means of eyes a^3. Clamps O serve for holding the two halves of the mold together; a socle M which is arranged below the mold serves the purpose of arresting the support C^1 of the hub of the wheel when the mold is opened. In this embodiment the support C^1 is formed in such a manner that it surrounds a part of the hub and spokes of the cast wheel. To that end the support C^1 is substantially dish-shaped. When the mold is closed, the support rests with a projection c^3 loosely on the projecting edge b^3 of a recess which is provided for the support in the lower half B of the mold. The bottom of the support C^1 is provided with a downwardly tapering perforation c^4 in which fits the core F for the bore of the hub of the wheel. On the bottom of the support C^1 is located the centrally perforated interchangeable ring D which receives the core F and serves the purpose of protecting the bottom of the support against the action of the liquid steel.

In the operation of the embodiment shown in Figs. 3 and 5, the open mold (Fig. 5) is closed by lifting the lower half B by hand and when the edge b^3 hits the projection c^3 the support C^1 is carried along. The clamps O are applied to secure the two halves of the mold together. Directly after the casting operation the clamps O are removed and the lower half B with the support C^1 and the casting J are lowered by hand through the medium of beams or the like. As soon as the support C^1 reaches the socle M the lower half B is permitted to drop to the ground over the support C^1 and the socle M. The casting is then exposed, with exception of the surfaces lying against the support C^1 and can be removed laterally after it has been elevated to such an extent that the hub passes out of the support C^1.

The third embodiment illustrated in Figs. 6 and 7 mainly differs from the second embodiment in the fact that a hydraulic lifting device is used for elevating and lowering the lower half of the mold. The lifting device consists of a cylinder P and a piston R which is guided in the cylinder. On the upper end of the piston R is screwed a ring r^1 which is connected to a supporting ring r^3 by means of arms r^2 which are bent at a right angle. The lower half B rests on the ring r^3. Furthermore, a socle consisting of a plurality of pillars M^1 is provided and serves for arresting the support C^1 when the mold is opened. To close the mold pressure is introduced into the cylinder P so that the lower half B with the support C^1 and finally also the upper half A are elevated to the position shown in Fig. 6. Directly after the casting operation the pressure medium is let out of the cylinder P so that the piston R with the mold and the casting descend. The upper half A is retained on the frame E by the arms a^2 while the lower half with the support C^1 and the casting J continue to move downwardly until the support C^1 hits the pillars M^1. Henceforth, only the lower half descends with the piston, so that the casting, with exception of the surfaces lying against the support C^1, becomes exposed.

To obtain a uniform cooling of the casting it is advisable, in all the embodiments, to coat the inner wall of the lower half B and the wall of the support C or C^1, against which the casting lies, with a coating of a material which is a poor conductor of heat, such as chamotte. This coating pre-

vents the casting from cooling off more rapidly at these walls, with which it comes first into contact during the casting operation, than at the wall of the upper half of the mold.

Without departing from the scope of the invention, the support C in the mold of the first embodiment might be connected with the rod N and the plate n^1 might be done away with.

Having thus described the invention, the following is what is claimed as new therein and desired to be secured by Letters Patent:—

1. An apparatus for casting wheels comprising two mold-halves having a plane of separation coinciding with the transverse plane of the rim of the wheel and separable a distance equal at least to the axial dimension of the wheel, one of said mold-halves being provided with a central opening which permits introduction of the molten metal into the mold when closed, a hub support having a surface which serves as a rest for the under face of the wheel hub, a core detachably mounted on said hub support, and means for supporting the wheel through the medium of the hub support, in a position axially removable from each half of the mold when in separated position.

2. An apparatus for casting wheels comprising two mold-halves having a plane of separation coinciding with the transverse plane of the wheel rim, one of said mold-halves being provided with a central opening which permits introduction of the molten metal, a hub support, having a surface which serves as a rest for the under face of the wheel hub, a core detachably mounted on said hub support, and projecting upwardly therefrom without closing the said pouring opening, and means for separating the mold-halves in the direction of the axis of the wheel, a distance sufficient to permit removal of the wheel in a direction transverse to its axis.

3. An apparatus for casting metal wheels comprising two horizontal mold-halves, separable in a transverse plane of the rim of the wheel, a hub support, fitted to the under half of the mold, means supporting the mold at a height sufficient to permit separation of its members to release the casting, and means arresting the casting through the medium of the hub support, at a height intermediate of the mold-halves when the latter are separated.

4. An apparatus for casting wheels comprising two mold-halves having a plane of separation coinciding with the transverse plane of the wheel rim, a hub support, and means for separating the mold-halves in the direction of the axis of the wheel, a distance sufficient to permit removal of the wheel in a direction transverse to its axis; said separating means comprising independent supports for the hub support and the mold half adjacent thereto, movable simultaneously to remove the casting from the opposite half of the mold, and then independently for the purpose of arresting the casting while releasing it from the moving half of the mold.

5. An apparatus for casting wheels comprising two mold-halves having a plane of separation coinciding with the transverse plane of the wheel rim, a hub support, and means for separating the mold-halves in the direction of the axis of the wheel, a distance sufficient to permit removal of the wheel in a direction transverse to its axis; said separating means comprising pistons for the hub support and the mold-half adjacent thereto, movable simultaneously to remove the casting from the opposite half of the mold, and then independently for the purpose of arresting the casting while releasing it from the moving half of the mold.

6. An apparatus for casting wheels comprising two separable mold-halves, a support for the hub of the wheel to be cast, a reciprocatory member supporting the lower half of the mold, means for arresting the upper half of the mold when the lower half is lowered by the movement of said member, a rod slidingly mounted in said member below the hub support, and adapted to reciprocate with said member, and a stop adapted to arrest the movement of said rod to cause the rod to arrest the movement of the hub support while permitting the reciprocatory member and the lower half of the mold to continue their downward movement.

7. An apparatus for casting wheels comprising two separable mold-halves, a support for the hub of the wheel to be cast, a reciprocatory member having arms supporting the lower half of the mold, a frame adapted to arrest the downward movement of the upper half of the mold when the lower half is lowered by the movement of said member, and a plurality of pillars arranged below the hub support and out of the path of movement of said arms and adapted to arrest the movement of the hub support while permitting the reciprocatory member and the lower half of the mold to continue their downward movement.

The foregoing specification signed at Barmen, Germany, this 10th day of August, 1908.

CARL GRUNWALD. [L. S.]

In presence of—

WM. WASHINGTON BRUNSWICK,

OTTO KÖNIG.