

J. M. HANSEN.
 APPARATUS FOR THE MANUFACTURE OF CAR WHEELS.
 APPLICATION FILED NOV. 11, 1909.

1,007,942.

Patented Nov. 7, 1911.

3 SHEETS-SHEET 1.

FIG. 1

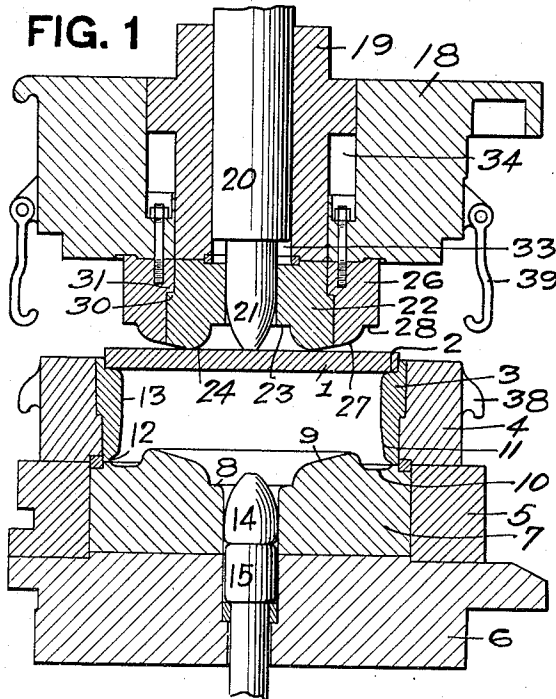
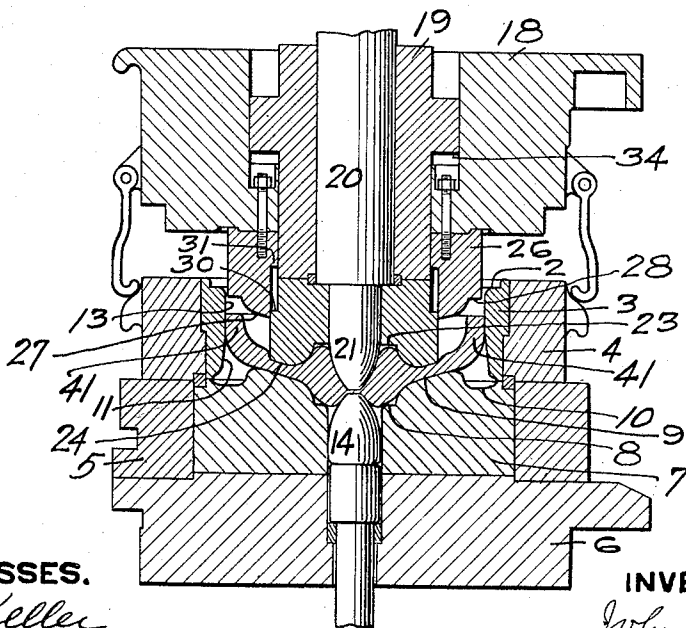


FIG. 2



WITNESSES.

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3 SHEETS—SHEET 2.

FIG. 3

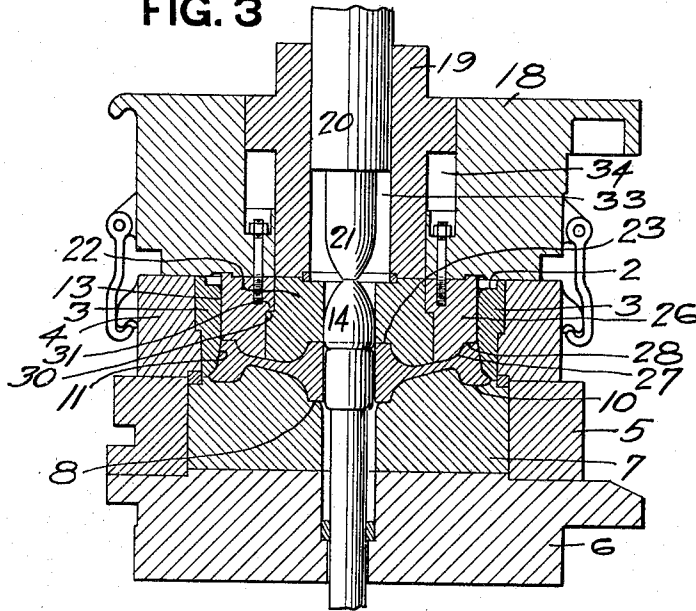
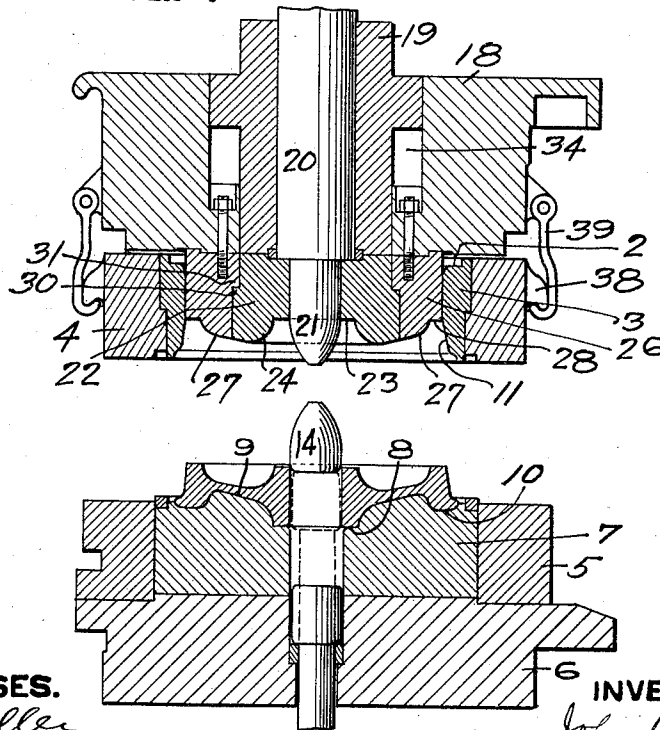


FIG. 4



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3 SHEETS-SHEET 3.

FIG. 5

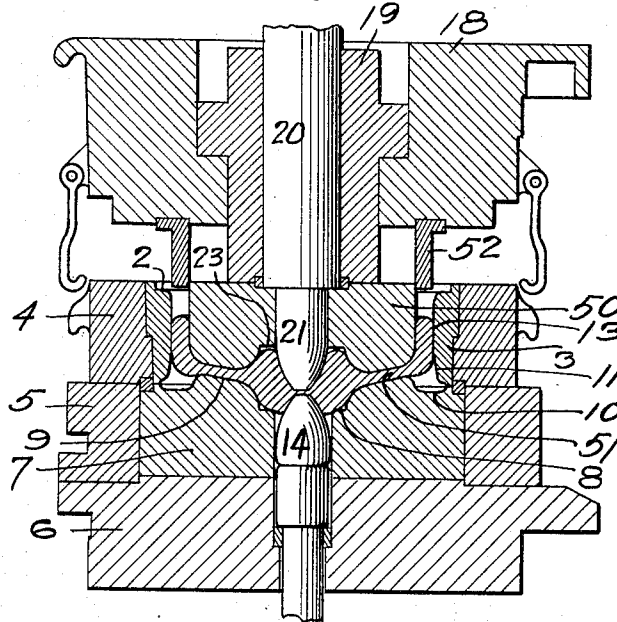
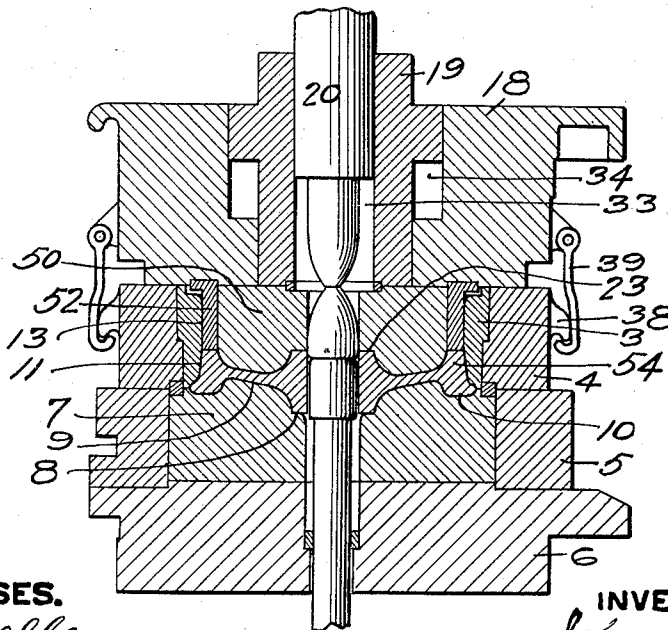


FIG. 6



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APPARATUS FOR THE MANUFACTURE OF CAR-WHEELS.

1,007,942.

Specification of Letters Patent.

Patented Nov. 7, 1911.

Application filed November 11, 1909. Serial No. 527,482.

To all whom it may concern:

Be it known that I, JOHN M. HANSEN, a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for the Manufacture of Car-Wheels, and do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to apparatus for forging steel car and similar wheels. Its object is to provide apparatus to produce by the operation of proper forging dies a finished car wheel at one heat and within a single forging press.

The apparatus is adapted for practice of the method set forth in an application filed by me of even date herewith, Serial No. 527,481.

It comprises a matrix corresponding in shape to the hub and rim of the finished wheel. In combination with a movable die having its mid portion adapted to enter within the matrix, compress the blank upon the bottom die to develop the hub and web, and having an annular follower die entering within the matrix and around the central die and adapted to forge the blank into the bottom die and within the matrix, and so complete the forging of the wheel rim.

It also includes a matrix formed of a bottom die, and a vertically movable ring die providing the forging face for the rim of the wheel, and means for raising such ring die to expose the finished wheel after the forging operation.

It also comprises certain other improvements as hereinafter set forth.

In the accompanying drawings, Figure 1 is a vertical section illustrating the apparatus and showing the blank in position for the first forging stroke; Fig. 2 shows the position of the apparatus after the first forging stroke; Fig. 3 illustrates the apparatus after the final forging stroke; Fig. 4 shows the dies open for the withdrawal of the finished wheel; Figs. 5 and 6 illustrate a modified form of the apparatus also embodying the invention.

The dies, as illustrated in the drawings, are intended to be mounted in a suitable press, a hydraulic press of great power having special strokes, being necessary. Let-

ters Patent No. 922,392 granted to Andrew Christianson, May 18, 1909, illustrating a press suitable for the purpose.

It is not considered necessary to illustrate the entire press or the hydraulic means for operating the dies, and I will therefore, confine myself to the description of the dies and their operation. I have illustrated the apparatus as suitable for the practice of said method embodied in said application Serial No. 527,481 filed of even date herewith, and as showing that method as applied to the practice of the method in Letters Patent previously granted to me, such as in Letters Patent No. 866,820 of September 17, 1907.

One feature of the present invention includes means for forcing part of the metal inwardly to aid in developing the hub, while the remaining portion of the metal is forced outwardly to develop the rim, and the apparatus will be described in connection with such operation.

As illustrated in Fig. 1, the blank 1 which is shown as a heavy rolled slab rests upon the seat or shoulder 2 of the ring die 3, which is carried in the annular die holder 4. Said annular die holder 4 is normally seated upon the ring portion 5 of the anvil 6, though as hereafter described, it is raised to remove the blank from the bottom die. The bottom die 7 rests within the ring portion 5 and upon the anvil block 6. The ring die 3 and the bottom die 7 together form the matrix or female die for the forging of the blank. The bottom die 7 has the central hub cavity 8, and extending out from the same is the web forming face 9, while beyond the same is the annular rim forming seat 10. The lower portion 11 of the ring die 3 together with the annular seat 10 forms the mold for forming the rim of the wheel, and where the wheel is provided with a flange, as in the ordinary car wheel, the lower portion 11 of the ring is flared outwardly so that, with the annular seat 10 it provides the flange forming recess 12, while above such flaring portion of the ring die, the face 11 forms the mold face for the tread of the wheel. This mold face 11 is shown as downwardly flaring and corresponding to the desired tapering of the wheel face; and above such flaring face 11 the wall of the ring die is carried up substantially ver-

tical so as to confine the blank as it is bent into bowl shape as illustrated in Fig. 2, and to provide a face through which the outer annular forging die travels in the final forging operation. Centrally of the hub cavity 8 is the piercing mandrel 14, which is operated by suitable hydraulic plunger 11 to raise the mandrel through the hub portion of the blank and expand the same as part of the forging operation of the wheel.

Above the matrix, as so described, is a suitable outer annular die carrier 18, and within the same is the inner annular die carrier 19, while centrally of the said die carriers is the mandrel carrier 20, which supports and operates the mandrel 21. These several parts are adapted to be operated by suitable hydraulic cylinders which need no especial description. Around the mandrel 21 is the inner annular upper die 22 connected to the die carrier 19, said die 22 having the hub cavity 23, and having the annular convex or cheek portion 24 adapted to forge a portion of the web of the blank. Beyond such die 22 is the outer annular upper die 26, which as shown in the Figs. 1 to 4, has the face 27 to forge the outer portion of the web of the wheel, the forging faces 24 and 27 of the two dies forming together the means for forging the entire web portion thereof. Beyond said face 27 the die 26 has the shoulder 28 to forge the upper face of the rim of the wheel. These dies are suitably connected to their die carriers, and it is to be noted that the annular die 22 has the outwardly projecting shoulder 30, while the annular die 26 has a like inwardly projecting shoulder 31 extending above the shoulder 30 by which the working faces 24 and 27 of the two dies are held in proper alinement at the completion of the forging operation. Such shoulders 30 and 31 also provide for transmitting the full pressure brought upon the outer die carrier and the outer die 26 and the inner annular die 22 so that the entire power of the press can be exerted for confining and condensing the metal of the finished wheel. Suitable clearance for the independent movement of the several mandrel or die carriers is provided, such for example as the space 33 between the mandrel carrier 20 and the die 22, and the space 24 to the inner die carrier 18 and the outer die carrier 19.

It will be noted that the annular die holder 4 has formed on its outer face the hooks 38, and that the outer annular die carrier 18 has the suitable depending swinging hooks 39 which are adapted to engage with hooks 38 when the dies are brought to final position, as in Fig. 3; and in this way the annular die holder 4, after the completion of the forging operation, is raised as shown in Fig. 4 to permit the withdrawal of the finished wheel.

While broadly considered, the parts of the apparatus are adapted for use in connection with other forging operations, as it is especially adapted for the practice of the invention of the said application Serial No. 527,481, I will describe the operation of the apparatus in connection with the same, as giving preferred use thereof. The slab 1 is raised to a suitable forging heat, and placed upon the rest 2 in position to be operated on by the upper dies; and the die 22 together with the mandrel 21 are forced downwardly, the first operation being to bend the blank into substantially bowl shape, forcing it into the matrix with its edges turned upwardly within the annular vertical wall 13 of the ring die 3. As the die 22 continues to descend, the metal is compressed between the die 22 and the web forming face 9 of the bottom die 7. In such operation, the metal is forced inwardly into the hub cavity 8, 23, and around the mandrels 14 and 21, as illustrated in Fig. 2, so as to develop the initial form of the hub as illustrated. In this operation the outer edge 40 of the blank is thrown upwardly, as above stated, and while the blank is thus confined between the dies 22 and the die face 7, the outer annular die 26 descends and forges the outer portion of the web and the rim 41 of the wheel, the working face 27 of said die 22 forcing the metal in the web portion of the wheel outwardly so aiding in providing a full body of metal for developing the rim and flange as illustrated in that figure. The two annular dies thus work together so that one die acts to force the metal inwardly to the hub portion and the other works to force the metal outwardly into the rim portion, thus properly distributing the metal in the finished wheel, the shoulder 28 together with the working face 27 confining the metal and compressing it within the lower portion 11 of the ring die 3, and if a flange car wheel is to be formed as illustrated in the drawing, also forcing the metal into the flange recess 12 between the depressed seat 10 and face 11 of the dies so completing the forging of the rim 41 of the wheel. In this descending stroke of the outer die 26, the shoulders 30, 31 of the dies 22 and 26 engage so as to bring the faces 24 and 27 of the said dies into proper alinement to forge the web, and also to distribute the entire forging pressure upon the blank, while confining the rim and web portions for the final piercing of the hub accomplished by the raising of the mandrel 14 by means of the plunger 15. As the blank is so confined, a uniform heavy forging pressure can be brought so as to condense and compact the blank and so complete the forging of the wheel. As the outer die carrier descends, the swinging hooks 39 engage with the hooks 38 of the ring die holder 4, 130

and as the dies are raised, as in Fig. 4, lifts the ring 4 with its ring die 3 so giving access to the forged wheel so that it may be withdrawn from the press. After the withdrawal of the forged wheel from the press, the ring die holder may be lowered into its normal position, and the hooks 39 disengaged therefrom, the dies raised into position shown in Fig. 1 and the press is ready for another operation.

The apparatus shown in Figs. 5 and 6 has many parts the same as that in Figs. 1 to 4, but in this case the upper annular die 50 is made the full width of the web portion 51 of the blank while the outer annular die 52 corresponds substantially to the rim portion 54 of the finished wheel, the lower die 7, the mandrel 14, the ring die 3 and its holder 4 and the mandrel 21, together with the die carriers 18 and 19, the mandrel 20 being the same as in the apparatus illustrated in Figs. 1 to 4. The operation is substantially the same except that as the annular die 50 descends and bends the blank into substantially bowl shape, as shown in Fig. 5, it practically completes the web portion of the blank forcing a portion of the metal inwardly to develop the hub, and a portion of the metal outwardly into the rim forming cavity, while the die 52 simply forges the rim portion 54 of the blank and acts with the die 50 in compressing the wheel after the final forging thereof.

I am thus enabled by a single heating of the blank to produce a finished car wheel, and to utilize the full power of the press to condense and compact the wheel body, and further in the dies of Figs. 1 to 4 to reduce the power necessary for the forging of the wheel blank by reducing the surface area engaged by the inner annular die, overcoming the necessity of that die forging the entire web portion of the blank, and at the same time making it practicable for the outer annular die, not only to forge part of the web, but in the final operation to act with the inner annular die in completing the compacting of the wheel. While the blank is so confined in the die, I am enabled by the operation of the central mandrel to provide for the finishing of the hub portion, this being made practicable by the employment of the vertically movable central mandrel 21 acting with the dies 22 and 26. I also provide means for the quick withdrawal of the finished wheel from the press.

What I claim is:

1. In apparatus for forging wheels, the combination of a bottom die, a normally stationary ring die resting thereon and co-operating therewith to form a matrix, said ring die having an under cut tread forming face, a reciprocating forging die, and means for lifting the ring die.

2. In apparatus for forging wheels, the

combination of a bottom die, a normally stationary ring die coöperating therewith to form the matrix, a reciprocating pressing die, and connections between the reciprocating die and the ring die to raise the ring die.

3. In apparatus for forging wheels, the combination of a bottom die, a normally stationary ring die coöperating therewith to form the matrix, a reciprocating pressing die, said ring die being provided with lugs and said reciprocating die having movable connections adapted to engage therewith.

4. An apparatus for forging wheels, the combination of a bottom die having a rim seat formed therein, a ring die having a tread forming face and below the same a flange forming recess, and a reciprocating die coöperating with said bottom die and ring die.

5. In apparatus for forging wheels, the combination of a matrix having a hub forming recess, a web forming face, and an annular rim forming recess, reciprocating dies formed of an inner annular die and an outer annular die, separated on a line above the web forming face of the bottom die.

6. In apparatus for forging wheels, the combination of a matrix having a central hub-recess, a web-forming face and a rim forming seat, an inner annular reciprocating die having a hub forming recess and a web forming projection and an outer annular die having a web-forming projection, said web-forming projections being adapted to coincide with each other on the completion of the stroke.

7. In apparatus for forging wheels, the combination of a matrix having a central hub-recess, a web-forming face, and a rim-forming seat, an inner annular reciprocating die having a hub-forming recess and a web-forming projection, and an outer annular die having a web-forming projection and a rim forming face entering within the matrix.

8. In apparatus for forging wheels, the combination of the matrix and two annular reciprocating dies adapted to enter the matrix, said two dies having shoulders engaging with each other to bring the die faces to proper relative position one to another.

9. In apparatus for forging car wheels, the combination of a matrix having a hub forming recess, a web forming face around the same, a rim forming recess beyond the web forming face, and an under-cut flange forming face above said recess, and a reciprocating die entering the matrix.

10. In apparatus for forging car wheels, the combination of a bottom die, a ring forming die normally stationary and co-operating therewith to form the matrix, said ring forming die having a downwardly flaring tread forming face and below the same an under-cut flange forming face, and a

reciprocating die adapted to enter within the ring die and forge the wheel blank to finished shape within said matrix.

11. In apparatus for forging car wheels, the combination of a bottom die, a ring forming die normally stationary and co-operating therewith to form the matrix, said ring forming die having a downwardly flaring tread forming face and below the same an under-cut flange forming face, and a reciprocating die adapted to enter within the ring die and bend the blank into bowl form therein, and a reciprocating annular die fitting around said bending die and adapted to forge the wheel rim within the tread and flange forming faces of the matrix.

12. In apparatus for forging car wheels, the combination of a matrix having a bottom

face corresponding to one face of the finished wheel, a ring die normally stationary and coöperating therewith to form the matrix, said ring die having a vertical confining face in the upper part thereof, a downwardly flaring tread forming face and an under-cut flange forming face and a reciprocating die adapted to enter within the ring die and forge the rim portion of the blank to finished shape against said tread and flange forming faces.

In testimony whereof, I the said JOHN M. HANSEN have hereunto set my hand.

JOHN M. HANSEN.

Witnesses:

ROBERT C. TOTTEN,
J. F. WILL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."