

Sept. 15, 1942.

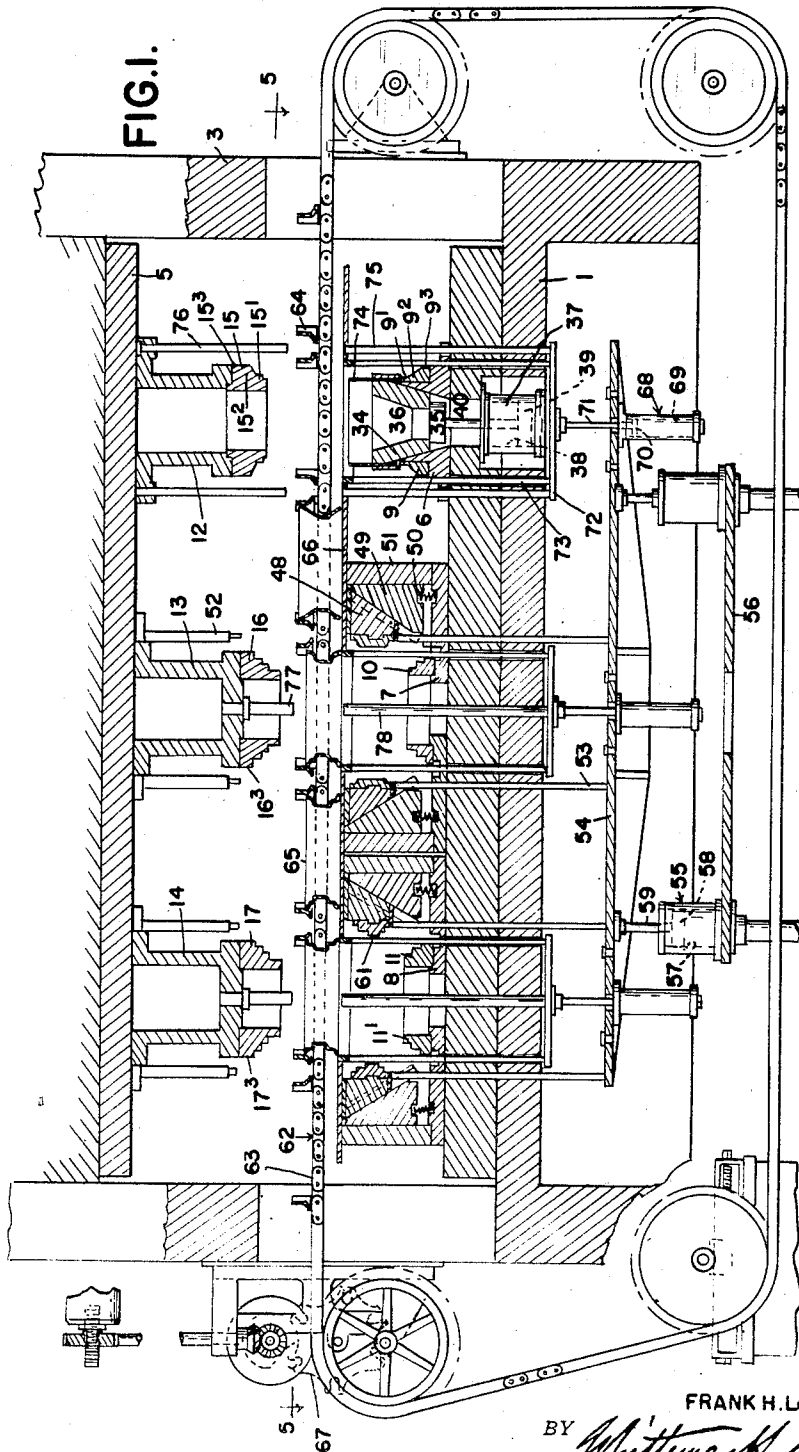
F. H. LE JEUNE

2,295,852

APPARATUS FOR FORMING WHEEL RIMS

Filed Nov. 20, 1939

4 Sheets-Sheet 1



INVENTOR.

FRANK H. LE JEUNE

BY

Whittemore, Kelleys & Bellman

ATTORNEYS

Sept. 15, 1942.

F. H. LE JEUNE

2,295,852

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FIG. 2.

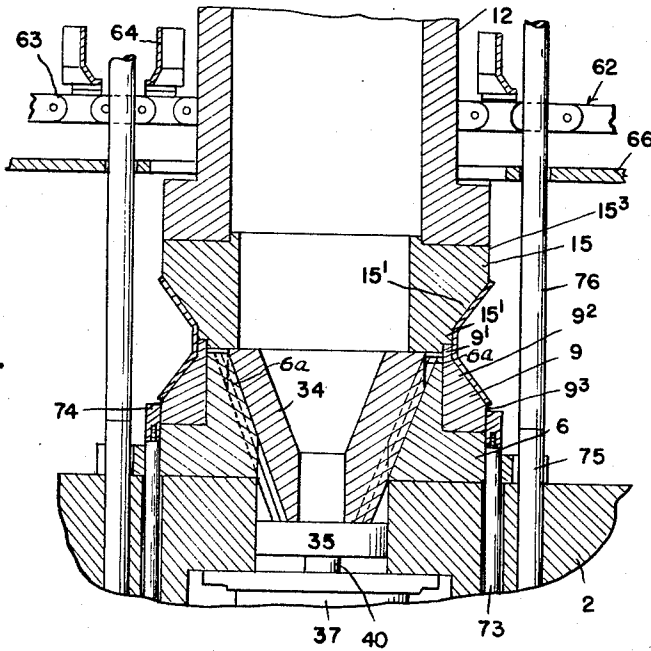
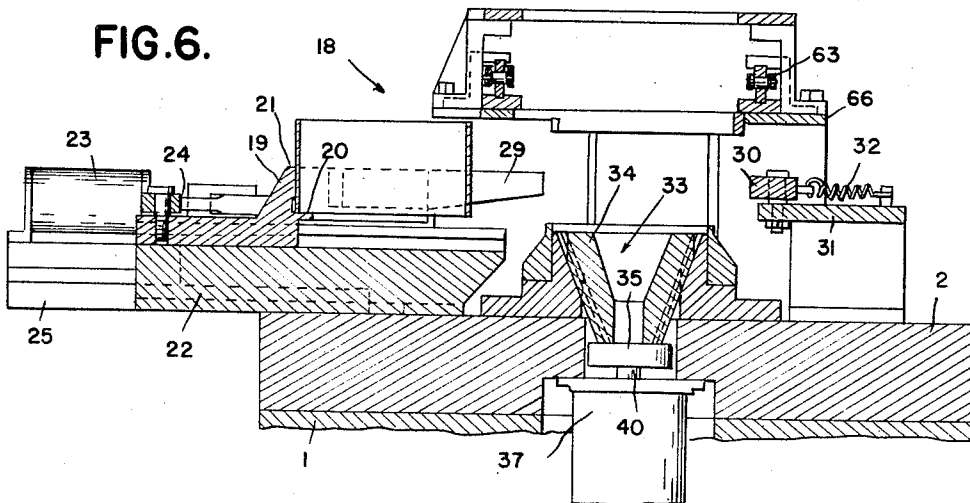


FIG. 6.



INVENTOR.

FRANK H. LE JEUNE

BY

Whittemore, H. H. & R. H. Knapp,
ATTORNEYS

Sept. 15, 1942.

F. H. LE JEUNE

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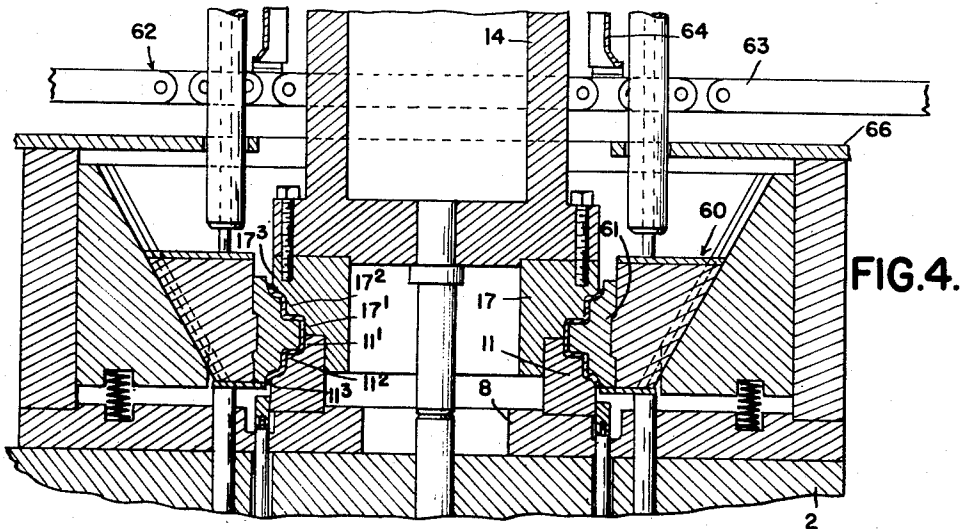


FIG. 4.

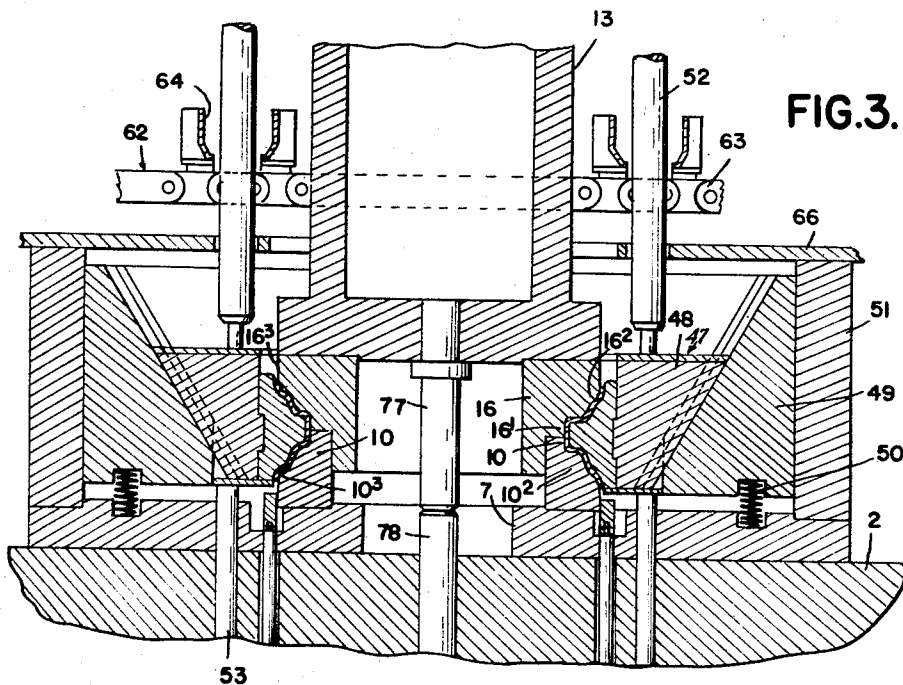


FIG. 3.

INVENTOR.

FRANK H. LE JEUNE

BY

Whittemore, Hubert & Belknap
ATTORNEYS

Sept. 15, 1942.

F. H. LE JEUNE

2,295,852

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4 Sheets-Sheet 4

FIG. 5.

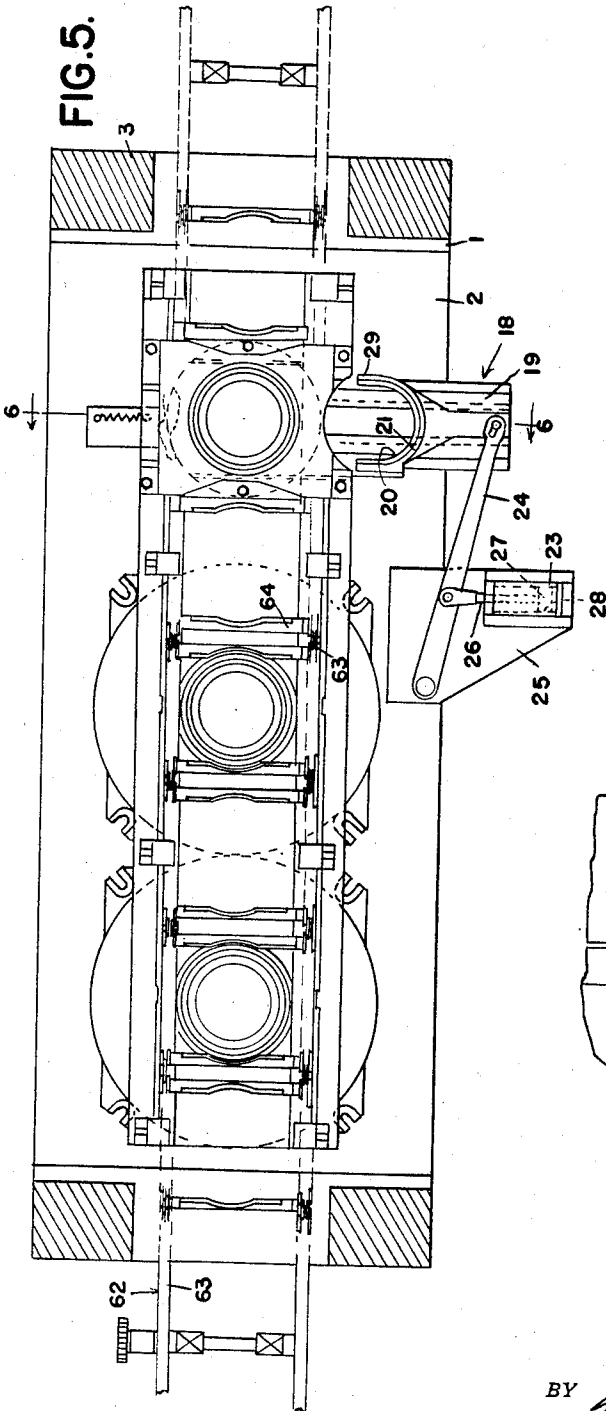
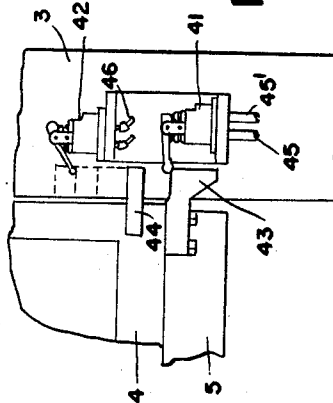


FIG. 7.



INVENTOR.

FRANK H. LEJEUNE

BY

Whitman Bullitt & Co. Inc.
ATTORNEYS

UNITED STATES PATENT OFFICE

2,295,852

APPARATUS FOR FORMING WHEEL RIMS

Frank H. Le Jeune, Detroit, Mich., assignor to
Kelsey-Hayes Wheel Company, Detroit, Mich.,
a corporation of Delaware

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8 Claims. (Cl. 153—2)

The invention relates to apparatus for forming wheel rims of that type having a well intermediate the edges and more particularly drop center wheel rims in which there is a central well intermediate the tire bead seats.

The invention has for an object to provide an apparatus which during each working stroke is adapted to simultaneously perform all of the fashioning steps upon successive rim blanks to complete a rim.

The invention has for another object to so construct the apparatus that the rim blanks will be automatically transferred during the operation of the apparatus.

The invention has for further objects to provide an improved loading device for the rim blanks; to provide an improved truing device for the rim blanks; and to provide means for operating both the loading device and the truing device in timed relation to each other and also the movable fashioning means for the rim blanks.

These and other objects of the invention will become apparent from the following description, taken in connection with the accompanying drawings, in which

Figure 1 is a section through an apparatus embodying my invention with the punch holder in its uppermost position;

Figures 2, 3 and 4 are sections through successive dies of the apparatus with the punch holders in their lowermost positions;

Figure 5 is a cross section on the line 5—5 of Figure 1;

Figure 6 is a cross section on the line 6—6 of Figure 5;

Figure 7 is a side elevation of a portion of the apparatus.

The apparatus illustrated in the present instance is designed to manufacture a drop-center wheel rim having a central well, tire bead seats extending generally axially in opposite directions from the sides of the well, and tire retaining flanges extending generally radially outwardly from the tire bead seats.

The apparatus has the base 1 upon which is mounted the bed plate 2. The apparatus also has the frame 3 extending upwardly from the base and guiding the vertically reciprocable slide 4, which latter carries the punch holder 5. 6, 7 and 8 are annular die base members mounted upon the bed plate with their axes equidistantly spaced from each other longitudinally of the bed plate. The die base members carry the annular dies 9, 10 and 11, respectively, which are adapted to successively engage the inner sur-

face of the lower portion of an annular rim blank. 12, 13 and 14 are punches carried by and depending from the punch holder 5 and having at their lower ends the annular dies 15, 16 and 17 which are in axial alignment with the dies 9, 10 and 11, respectively. The dies 15, 16 and 17 are successively engageable with the inner surface of the upper portion of the rim blank.

The rim blank upon which the apparatus operates is formed by hooping a flat rectangular metal blank and welding its ends, the average diameter of the rim blank hoop being the diameter of the base of the well of the completed drop center rim. The hoop is moved into operative position in registration with the dies 9 and 15 by the loading device 18 which is mounted upon the bed plate 2. The loading device comprises the slide 19 which is reciprocable transversely of the direction of reciprocation of the punch holder. The slide has the semi-circular support 20 engageable with the lower edge of the hoop and the semi-circular ledge 21 which is externally engageable with the hoop, the two being adapted to support and advance the hoop into registration with the dies 9 and 15 above the former die and below the latter die when the punch holder is in raised position. The slide is mounted upon and guided by the base member 22 which is secured upon the bed plate 2 and the slide is adapted to be reciprocated by the fluid operated device 23 through the lever 24. The lever is pivotally connected at one end to the outer end of the slide and is pivoted at its other end to the support 25 for the fluid operated device. The lever at an intermediate point is pivotally connected to the rod 26 of the piston 27 reciprocable within the cylinder 28, the rod, piston and cylinder forming the fluid operated device.

For limiting the advancement of the hoop to register the same with the dies 9 and 15, the slide is provided at one side with the forwardly extending rod 29, the forward end of which is engageable with one end of the dog 30 which is pivotally mounted intermediate its ends upon the support 31 carried by the bed plate 2. The other end of the dog is adapted to be swung inwardly to engage the hoop and limit its further advancement at the time the hoop is in registration. For holding the dog out of the path of movement of the die 15 and also the rim blank after it has been fashioned by the dies 9 and 15 so that the dog will not interfere with the movement of the die 15 and the rim blank,

the hoop engaging end of the dog is adapted to be resiliently retracted by means of the coil spring 32.

It is essential that the hoop be in cylindrical form prior to movement of the die 15 toward the die 9 and before the hoop is internally engaged by the dies. Therefore, the truing device 33 is provided for internally engaging the hoop and shaping the same into cylindrical form if the hoop does not already have this form. The truing device is reciprocable in the direction of reciprocation of the punch holder and comprises the annular series of segments 34 and the head 35 supporting the segments. The segments slidably engage and are guided by a member 6a on the inner side of the base member 6 which flares upwardly so that as the segments are moved upwardly they will be moved radially away from each other or expanded into engagement with the inner surface of the hoop. The upper portions 36 of the outer faces of the segments together cooperate to form an interrupted cylinder so that when they are expanded against the hoop the latter will be shaped to cylindrical form. The truing device is reciprocated by the fluid operated device 37 which is supported by and depends from the bed plate 2. This fluid operated device comprises the cylinder 38 and the piston 39 reciprocable within the cylinder and having secured to the upper end of its rod 40 the head 35.

The operation of the fluid operated devices 23 and 37 is controlled in timed relation with the reciprocation of the punch holder. This is accomplished by providing the control valves 41 and 42 mounted upon the frame of the apparatus and adapted to be actuated by the abutments 43 and 44, respectively, both of which are secured to and reciprocate with the slide 4. Both valves are of standard construction. The valve 41 is a non-locking four-way valve which is connected to opposite ends of the cylinder 28 of the fluid operated device 23 by the pipes 45 and 45'. The valve 42 is a locking type three-way valve and is adapted to be connected with the lower end of the cylinder 38 of the fluid operated device 37 by the pipe 46. The arrangement is such that fluid under pressure, preferably compressed air, is admitted to the cylinder 28 to force the piston outwardly and to advance the slide 19 and the hoop carried thereby into operative relation with the dies 9 and 15 during the upward movement of the punch holder after the die 15 has been raised sufficiently to clear the hoop. Then when the hoop is in registration and before the return of the slide the valve 42 is operated to allow the fluid under pressure, preferably compressed air, to enter the lower end of the cylinder 38 of the fluid operated device 37 so that the segments 34 internally engage the hoop to true the same. Then during the down stroke of the punch holder the valve 41 is actuated to allow the compressed air to discharge from the pressure side of the piston 27 of the fluid operated device 23 and to permit compressed air to enter the cylinder 28 of the fluid operated device 23 at the other side of the piston 27 to withdraw the loading slide. Continued downward movement of the punch holder brings the punch into engagement with the inner surface of the upper edge portion of the hoop which moves the hoop downwardly to bring the inner surface of its lower edge portion into engagement with the die 9. The lower end of the punch 15 will engage the upper ends of the segments 34 to lower the

same, the valve 42 being actuated at approximately this time to allow the compressed air to exhaust from the cylinder of the fluid operated device 37.

The dies 9 and 15 have at their adjacent ends the cylindrical portions 9' and 15', respectively, with an external diameter equal to the internal diameter of the rim blank and the base of the well of the completed rim. The dies also have the straight-line flared portions 9² and 15² extending from the cylindrical portions and the enlarged cylindrical portions 9³ and 15³ extending from the flared portions. In operation, the dies maintain the diameter of the central portion of the hoop which is to form the base of the well and expand and progressively reduce in thickness the portions of the hoop at the opposite sides of the central portion to produce straight-line flared portions extending from the central portion.

The dies 10 and 16 are adapted to next operate upon the rim blank. These dies also cooperate with the external confining device 47. The confining device comprises the slide segments 48 and the restraining segments 49 mounted upon the slide segments and engageable with the outer surfaces of the outer portions of the rim blank. The slide segments slidably engage and are guided by the annular guide 49 which is resiliently supported upon the base member 7 by the coil springs 50. The annular guide also vertically slidably engages the ring 51 fixedly secured upon the base member 7. The arrangement is such that upon downward movement of the external confining device the slide segments and the restraining segments are moved radially inward relative to the rim blank. The downward movement of the annular guide occurs during the final portion of the downward movement of the punch holder.

The dies 10 and 16 have at their adjacent ends the cylindrical portions 10' and 16' with an external diameter equal to the internal diameter of the central portion of the rim blank. The dies also have the stepped portions 10² and 16² and enlarged cylindrical portions 10³ and 16³. In operation, the dies and the restraining segments maintain the diameter of the central portion of the rim blank and fashion the expanded portions of the rim blank to produce approximately or roughly the sides of the well, the tire bead seats, and the tire retaining flanges of the completed rim.

The external confining device is adapted to be moved downwardly in timed relation to the reciprocation of the punch holder by means of the push rods 52 carried upon the punch holder. The external confining device is adapted to be moved upwardly by means of the push rods 53 which extend through the base member 7, the bed plate 2 and the base 1 and have their lower ends abutting the cushion head plate 54. The push rods 53 are constantly urged in an upward direction by the fluid operated devices 55 which are mounted upon the cushion base plate 56. These devices each comprise the cylinder 57 and the piston 58 slidable within the cylinder and having its rod 59 supporting at its upper end the cushion head plate 54. Fluid under pressure, preferably compressed air, is admitted under constant pressure to the lower ends of the fluid operated devices. It will thus be seen that as the punch holder is raised, its pressure is released and the external confining device is raised as permitted by the rising of the punch holder.

The dies 11 and 17 operate upon the rim blank after its fashioning by the dies 10 and 16. The dies 11 and 17 also cooperate with the external confining device 60 which is constructed in the same general manner as the external confining device 47, but has an inner contour corresponding to the outer contour of the completed rim. The external confining device 60 is operated in the same manner as the external confining device 47.

The dies 11 and 17 have at their adjacent ends the cylindrical portions 11' and 17' with an external diameter equal to the internal diameter of the central portion of the rim blank and the base of the well of the completed rim. The dies also have the stepped portions 11² and 17² and the enlarged cylindrical portions 11³ and 17³ extending from the stepped portions. In operation, the dies maintain the diameter of the central portion of the rim blank and fashions the previously fashioned expanded portions of the rim blank to produce in final form the sides of the well, the tire bead seats, and the tire retaining flanges. The restraining segments also cooperate in the final fashioning of the sides of the well, the tire bead seats, and the tire retaining flanges and assure the producing of the desired cross sectional contour of the drop center rim.

The rim blanks are automatically transferred from one set of dies to the succeeding set in timed relation to the reciprocation of the punch holder. 62 is an endless conveyor formed of the side chains 63 and the cross bars 64 therebetween, the cross bars being arranged in pairs and shaped to receive a rim blank therebetween. The pairs are equally spaced along the length of the chain, the distance being slightly greater than the greatest diameter of the rim blank after the first die-pressing operation. The chain has the upper portion 65 which is located above the top plates 66, the dies 9, 10 and 11 and the associated parts being below the top plates. The upper conveyor portion is, furthermore, located below the lower ends of the punches, and, more particularly, the dies 15, 16 and 17 of these punches and also the push rods for actuating the external confining device 47 and 60 when in the raised or uppermost position of the punch holder. The conveyor has a lower portion which extends below the cushion base plate 56 and end portions beyond the ends of the apparatus, the conveyor extending around suitable sprocket wheels, one pair of which are driven by a suitable Geneva movement 67 which is driven by the gearing for reciprocating the punch holder. The arrangement is such that the conveyor and particularly the upper portion of the conveyor is advanced step by step when the punch holder is in its raised or uppermost position a distance equal to one-half the distance between the axes of the sets of succeeding punches so that the rim blanks are successively advanced from registration with one set of punches into registration with the succeeding set of punches.

For raising or elevating the rim blank after it has been subjected to the first die-pressing operation by the dies 9 and 15, a fluid operated elevator is provided. The elevator comprises the fluid operated device 68 mounted upon the underside of the cushion head plate 54 and preferably operated by compressed air under constant pressure. The device comprises the cylinder 69 and the piston 70 slidable in the cylinder and having its rod 71 supporting the elevator plate 72 located

below the base 1 of the apparatus. The elevator plate abuts the lower ends of the rods 73 which slidably engage the bed plate 2 and the base 1. The upper ends of these rods are secured to the elevator ring 74 which is engageable with the lower edge of the rim blank. The downward movement of the elevator ring is controlled by the push rods 75 and 76. The push rods 75 slidably engage and are guided by the bed plate 2 and the base 1 and have their lower ends abutting the elevator plate 72. The push rods 76 are secured to and depend from the punch holder 5 and have their lower ends adapted to abut the upper ends of the push rods 75. The arrangement is such that as the punch holder is lowered the push rod 76 comes into contact with the push rods 75 and compel the elevator plates 72 to lower against the constant pressure of air exerted upon the piston 70. The lowering of the elevator plate allows the rods 73 and the elevator ring 74 to lower to a position to engage the rim blank after it has been operated upon. As the punch holder moves upwardly, the elevator rods 73 and ring 74 are moved upwardly until the upper face of the elevator ring is flush with the upper face of the plates 66, at which time the upper ends of the push rods 75 are also flush with or below the upper face of the plate. The punch holder continues to move upwardly to its uppermost position when the lower ends of the push rods 76 are located above the upper portion 65 of the conveyor. Then the upper portion 65 of the conveyor may be advanced to slide the rim blank to a position in registration with the succeeding die 10.

For lowering the rim blank to a position to be operated upon by the dies 10 and 16 and then raising the rim blank from the die 10 to a position to be engaged by the upper portion of the conveyor, the same general arrangement of elevator is provided. However, instead of controlling the operation of the elevator by means of push rods radially beyond the lower die, the elevator is controlled by means of central push rods 77 and 78, the first of which is secured to and depends from the punch 13 and the second of which extends axially through and slidably engages the bed plate 2 and the base 1 and has its lower end abutting the elevator plate.

The same arrangement of elevator and control push rods is also provided for lowering and raising the rim blank before and after operation of the dies 11 and 17.

What I claim as my invention is:

1. In an apparatus for forming a wheel rim with a well intermediate its edges, a series of dies for successively operating upon a portion of a rim blank, a holder reciprocable toward and away from said dies, a series of punches carried by said holder for successively operating upon another portion of the rim blank, a conveyor having a portion above said dies for intermittently advancing the rim blank into registration with successive dies in timed relation to the reciprocation of said holder, and means other than said punches and external to said dies operating in timed relation to the reciprocation of said holder for lowering the rim blank from said conveyor portion to a position for engagement by certain of said dies and for raising the rim blank from said dies to a position for engagement by said conveyor portion.

2. In an apparatus for forming a wheel rim with a well intermediate its edges, a series of dies for successively operating upon a portion of a rim blank, a holder reciprocable toward

and away from said dies, a series of punches carried by said holder for successively operating upon another portion of the rim blank, a conveyor having a portion above said dies for intermittently advancing the rim blank into registration with successive dies in timed relation to the reciprocation of said holder, means external to said dies operating in timed relation to the reciprocation of said holder for lowering the rim blank from said conveyor portion to a position for engagement by certain of said dies and for raising the rim blank from said dies to a position for engagement by said conveyor portion, and means carried by said holder and other than said punches and dies for controlling the operation of said lowering and raising means.

3. The combination with a series of stationary dies, of a cooperating series of movable dies normally arranged above and in registration with said stationary dies, an intermittently advancing conveyor for transferring work into successive registration with said dies, said conveyor being arranged in a plane above the stationary dies and below the movable dies in their raised position also when stationary providing clearance for the passage of said movable dies therethrough into cooperative relation with said stationary dies, means for supporting the work in the plane of said conveyor while moved by the latter into registration with cooperating dies, and means external to said stationary dies actuated during the descent of said movable dies and separate therefrom for depressing said supporting means to carry the work thereon into engagement with its registering stationary die.

4. The combination with a series of stationary dies, of a cooperating series of movable dies normally arranged above and in registration with said stationary dies, an intermittently advancing conveyor for transferring work into successive registration with said dies, said conveyor being arranged in a plane above the stationary dies and below the movable dies in their raised position also when stationary providing clearance for the passage of said movable dies therethrough into cooperative relation with said stationary dies, means for supporting the work in the plane of said conveyor while moved by the latter into registration with cooperating dies, said means including a resiliently yieldable elevator, and means external to said stationary dies actuated during the descent of said movable dies and separate therefrom for depressing said elevator to carry the work into engagement with the registering stationary die, said means permitting the automatic raising of the work by said elevator into the plane of the conveyor during the ascent of said movable dies.

5. The combination with a series of stationary dies, of a cooperating series of movable dies normally arranged above and in registration with said stationary dies, an intermittently advancing conveyor for transferring work into successive registration with said dies, said conveyor being arranged in a plane above the stationary dies and below the movable dies in their raised position also when stationary providing clearance for the passage of said movable dies therethrough into cooperative relation with said stationary dies, means for supporting the work in the plane of said conveyor while moved by the latter into registration with cooperating dies, said means comprising an annular member for directly engaging and supporting the work, a

plurality of rods supporting said annular member, a resiliently yieldable elevator normally holding said rods in raised position, and means external to said stationary dies actuated during the descent of said movable dies and separate therefrom for depressing said elevator to lower the work into engagement with its registering stationary die, said means permitting the automatic raising of the work into the plane of the conveyor during the ascent of said movable dies.

6. The combination with a series of stationary dies, of a cooperating series of movable dies normally arranged above and in registration with said stationary dies, an intermittently advancing conveyor for transferring work into successive registration with said dies, said conveyor being arranged in a plane above the stationary dies and below the movable dies in their raised position also when stationary providing clearance for the passage of said movable dies therethrough into cooperative relation with said stationary dies, means for supporting the work while advanced by said conveyor including a table extending between said dies, an annular member concentric with and surrounding each die of the series, rods for supporting said annular member, an elevator supporting said rods, resiliently yieldable means supporting said elevator, and means actuated by the descent of said movable dies for depressing each of said elevators and the annular member supported thereby, said means including registering rods extending upward from said elevator and downward from the corresponding movable die whereby on the ascent of said movable die said annular member will raise the work into the plane of said conveyor.

7. The combination with a series of stationary dies, of a cooperating series of movable dies normally arranged above and in registration with said stationary dies, the cooperating stationary and movable dies at one end of the series being adapted for the radial expansion of an annular blank, an intermittently advancing conveyor for transferring work into successive registration with said dies, said conveyor being arranged in a plane above the stationary dies and below the movable dies in their raised position when stationary providing clearance for the passage of said movable dies therethrough into cooperative relation with said stationary dies, annular members for supporting the work in the plane of said conveyor while moved by the latter into registration with cooperating dies, said annular members being of an internal diameter greater than the external diameter of said stationary dies, means actuated during the descent of said movable dies and separate therefrom for depressing said annular members to carry the work supported thereon into engagement with their registering stationary dies, means at one end of the series for feeding an annular blank transversely into registration with said expanding dies and in a plane between the plane of said conveyor and said stationary die, means actuated during the descent of said movable dies and separate therefrom for depressing said annular members to below the plane of said stationary dies prior to the expansion of the annular blank by said end dies, and resilient means for returning said annular members upon the upward movement of said movable dies, whereby said return movement will carry the work upward from each stationary die into the plane of said conveyor including the annular blank expanded by said end dies.

8. The combination with a series of stationary dies, of a cooperating series of movable dies normally arranged above and in registration with said stationary dies, an intermittently advancing conveyor for transferring work into successive registration with said dies, said conveyor being arranged in a plane above the stationary dies and below the movable dies in their raised position, also when stationary providing clearance for the passage of said movable dies there-
10 through into cooperative relation with said stationary dies, means for supporting the work while advanced by said conveyor including a

table extending between said dies, an annular member concentric with and surrounding each die of the series, rods for supporting each of said annular members, an elevator supporting the lower ends of said rods, resiliently yieldable means centrally supporting said elevator, a rod extending upward from said central supporting means through said stationary die, and a rod depending from said movable die for engaging the last-mentioned rod to depress said elevator and annular supporting member during the downward movement of said movable die.

FRANK H. LE JEUNE.