F. D. WARD.

WHEEL MAKING MACHINE.

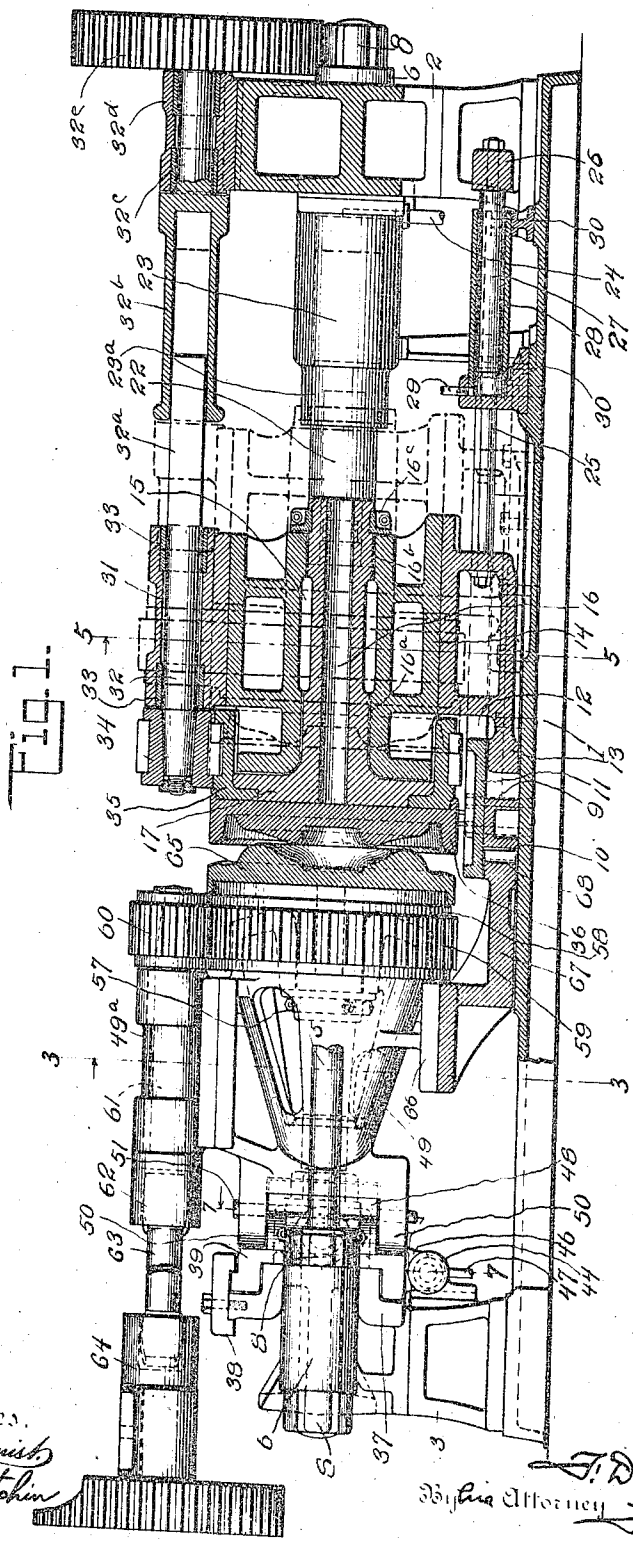
APPLICATION FILED JULY 19, 1910.

1,045,482.

Patented Nov. 26, 1912.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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5 SHEETS—SHEET 2.

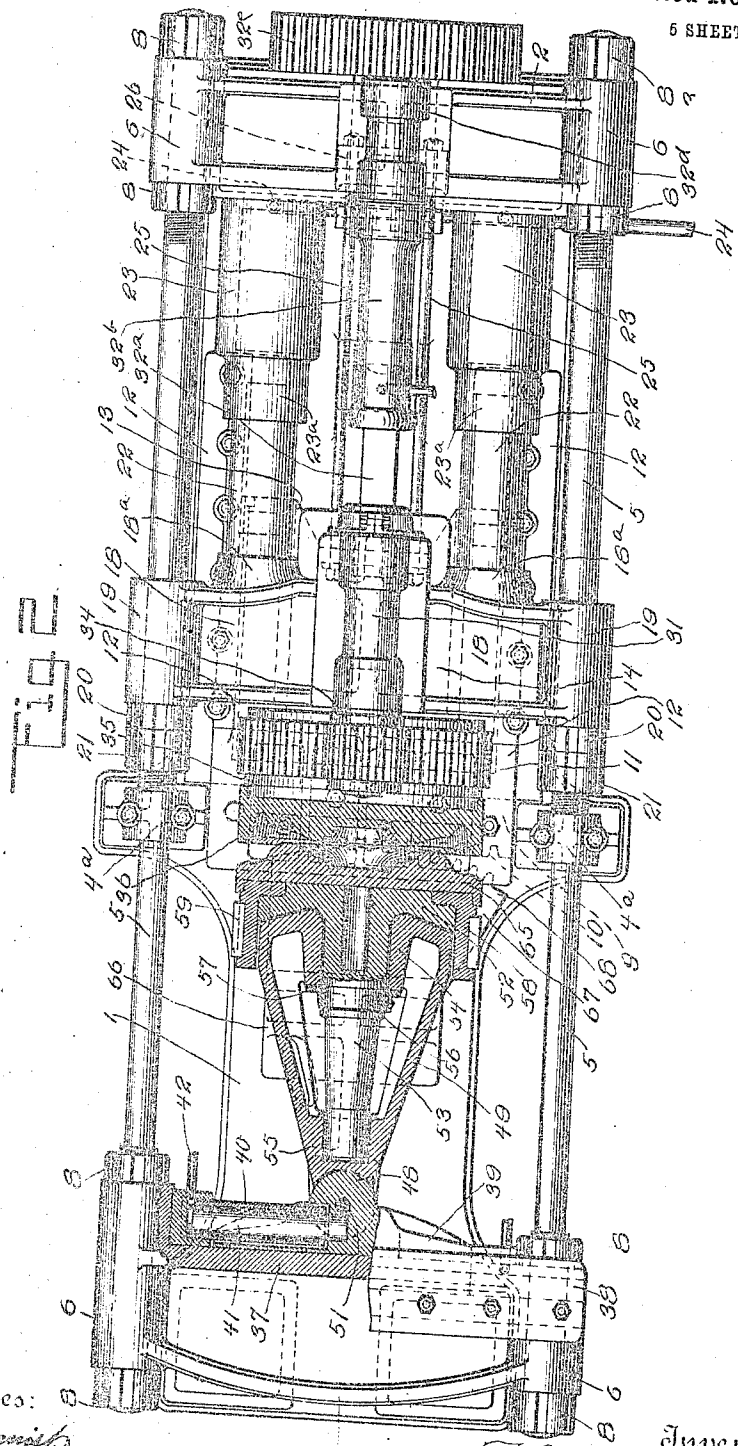

Fig. 2.

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5 SHEETS—SHEET 3.

Fig. 3.

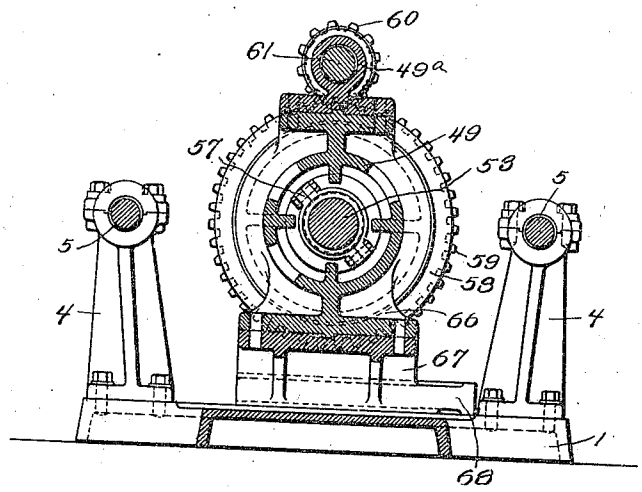
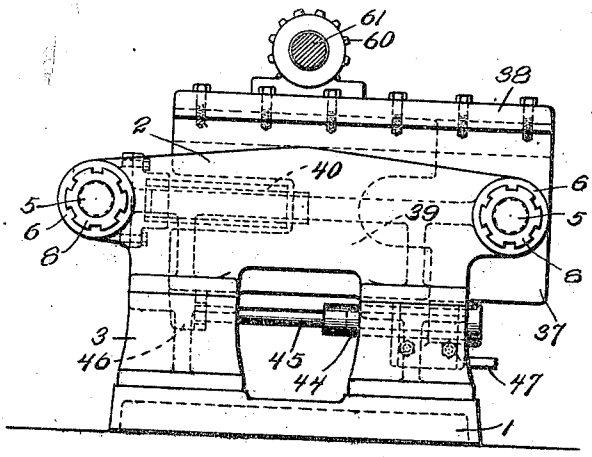


Fig. 4.



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5 SHEETS—SHEET 4.

Fig. 5.

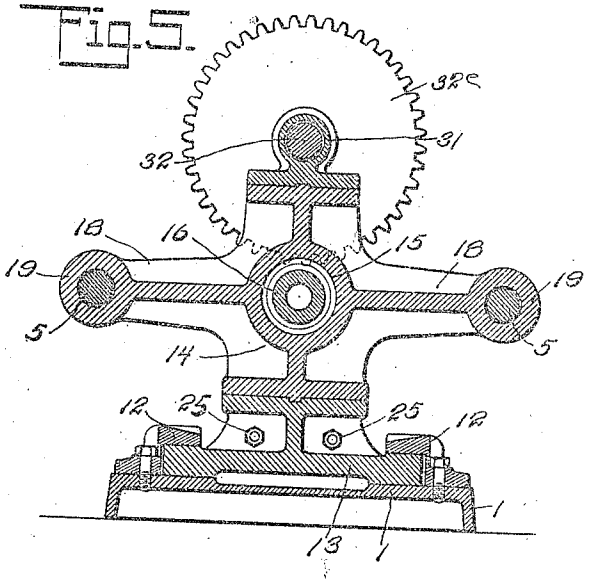
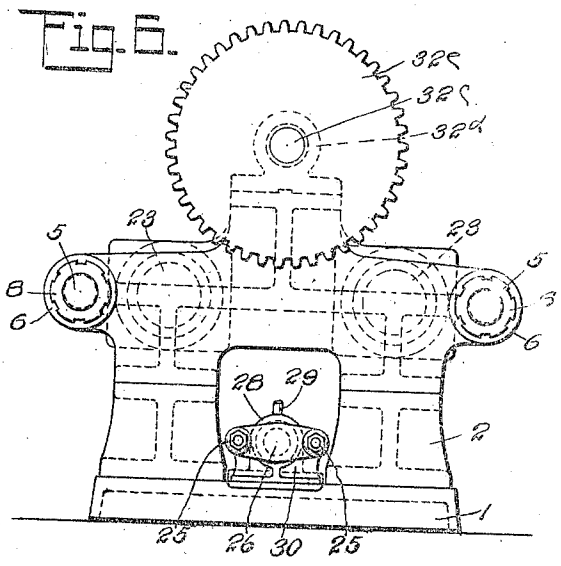


Fig. 6.



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5 SHEETS—SHEET 5.

Fig. 6.

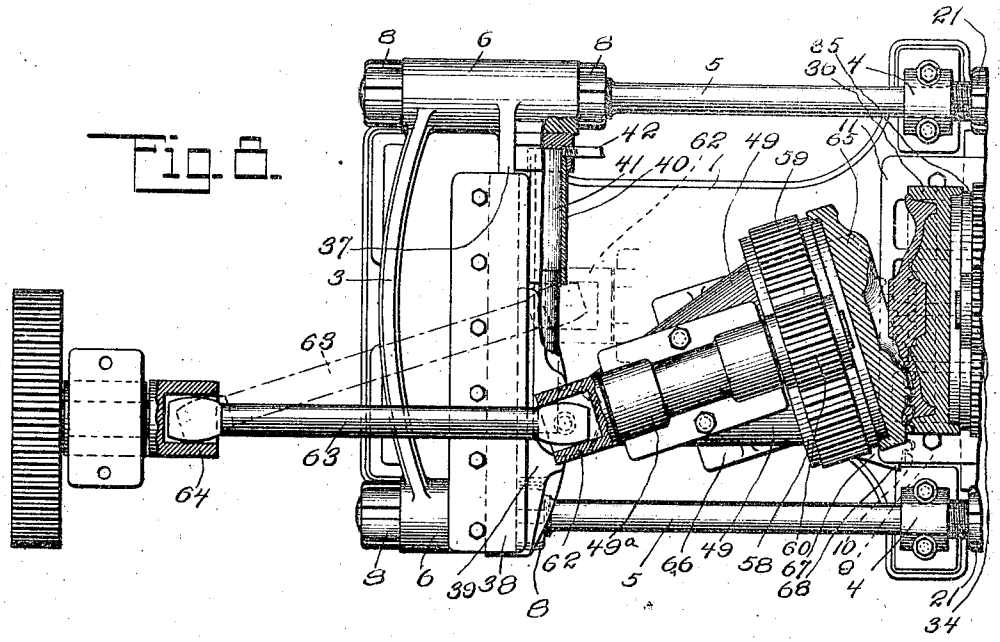
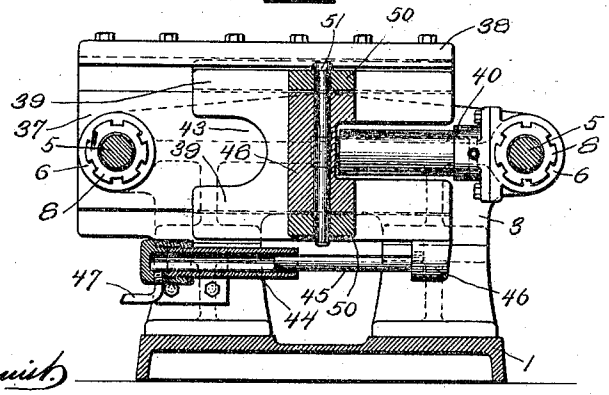


Fig. 7.



WITNESSES

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UNITED STATES PATENT OFFICE.

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WHEEL-MAKING MACHINE.

1,045,482. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed July 19, 1910. Serial No. 572,783.

To all whom it may concern:

Be it known that I, FRANK DIETRICH WARD, residing at New York city, New York, and being a citizen of the United States, have invented certain new and useful Improvements in Wheel-Making Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and to use the same, reference being had to the accompanying drawings, which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof within the scope of the appended claims will occur to persons skilled in the art.

In said drawings: Figure 1 is a view partly in side elevation and partly in longitudinal, vertical section of an embodiment of the present invention. Fig. 2 is a view partly in top plan and partly in longitudinal, horizontal section thereof. Fig. 3 is a transverse, vertical section taken on the plane indicated by line 3—3 of Fig. 1 and looking in the direction of the arrow. Fig. 4 is a rear end elevation thereof, the drive shaft being seen in section. Fig. 5 is a transverse vertical section taken on the plane indicated by line 5—5 of Fig. 1 and looking in the direction indicated by the arrow. Fig. 6 is a front end elevation. Fig. 7 is a transverse vertical section taken on the planes indicated by line 7—7 of Fig. 1 and looking in the direction of the arrow. Fig. 8 is a fragmentary, detail, top plan view of the rear portion of the structure, parts being broken away.

The object of this invention is the production of a mill or machine intended to be used in the manufacture of car wheels, though it is obvious that other shapes and articles may be manufactured in a machine constructed in accordance with the invention, and it is intended that the metal blank or billet to be worked in the machine shall be first subjected to pressure after which it is preferably rolled in such manner that a portion of the metal near the middle of the blank shall be forced outwardly radially during the condensation and formation of the blank into the finished product.

Referring to the drawings by numerals, 1 indicates a bed plate or base, from the front end of which rises a frame 2 and from the rear end of which rises a frame 3. Fixed to and rising from bed plate 1, at each side and intermediate the length thereof, are pedestals 4—4, each terminating at its upper end in a sleeve 4^a for receiving and supporting the respective guiding and connecting rod or bar 5, one of the rods 5 being arranged at each side and connecting the front frame 2 to the rear frame 3, each of said frames being formed with elongated sleeves 6 for receiving the given ends of the respective rods 5. Each rod 5 is threaded at each end and engaged at the opposite ends of the respective sleeve 6 by jam nuts 8, rigidly retaining the bar in position.

Fixed to bed plate 1 transversely thereof and intermediate its length, is an inverted channel or other suitably shaped stop member 9, having its front edge formed relatively smooth and vertical, and having its rear edge formed into a rack 10. A guide plate 11 is mounted upon and fixed to member 10 and to the bed plate in any suitable manner as by through bolts, the plate 11 having forwardly extending guiding arms 12—12 extending along the bed plate near the opposite edges thereof and fixed thereto. Each arm 12 has its upper flange directed inwardly and spaced above the bed plate for accommodating and guiding a slide block 13, which is slidingly mounted on the bed plate and has its edges overhung by the upper flanges of the respective arms 12. The rear end of slide 13 is adapted at times to pass beneath plate 11 and to be limited in its rearward movement by member 9. Mounted upon and fixed to slide 13 is a die sustaining carriage 14, having a central, horizontal, longitudinal bore 15 accommodating the die carrier shaft 16, the rear end of which shaft terminates in an annular plate or die carrier 17 which is disposed at the rear end of carriage 14. Said rear end of carriage 14 is formed with a flattened annular surface surrounding the rear end of shaft 16 and abutting flat against the front exposed surfaces of die carrier 17. Car-

riage 14 is formed with journal bearings 16^a and 16^b receiving the journal portions of shaft 16, and the forward end of the shaft is formed with an annular groove receiving a split collar 16^c for retaining the shaft against longitudinal shifting. Lateral arms 18—18 project from carriage 14 and terminate at their outer ends in guiding sleeves 19—19 surrounding the bars 5, and limited in their rearward travel by nuts 20—20 threaded on to the respective rods 5 and retained against accidental displacement by jam nuts 21 also threaded on to the bars 5. For effecting travel of carriage 14 and the parts connected thereto, the arms 18 are engaged by pistons 22—22, extending from cylinders 23—23, each provided with a fluid supply pipe 24, and adapted to receive fluid under pressure through said supply pipe for imparting the requisite rearward thrust to the pistons 22. Each piston 22 is guided by extension or sleeve 23^a projecting from the rear end of the respective cylinder 23. The rear end of each piston 22 extends into a socket 18^a opening forwardly from the respective arm 18.

For effecting the forward or return travel of the carriage and parts carried thereby, the slide 13 is engaged by a pair of rods 25, which rods extend forwardly and engage the opposite ends of a cross block 26 fixed to a piston 27, which piston is mounted in cylinder 28. A fluid supply pipe 29 is provided for the cylinder 28 and adapted to deliver fluid under sufficient pressure for returning the carriage 14. The cylinder 28 is mounted upon and fixed to stands 30—30 fixed to bed plate 1, and each of the cylinders 23 is fixed to and carried by frame 2.

Mounted upon carriage 14 is a longitudinally disposed sleeve 31 through which extends a drive shaft 32, the sleeve being formed with a journal bearing 33 at each end in which the shaft is journaled. The front end of shaft 32 is formed with a squared portion 32^a extending into and being slidingly engaged by a socket 32^b, projecting rearwardly from a stub shaft 32^c, journaled in bearing sleeve 32^d, and driven from any suitable source of power, preferably through a gear 32^e, fixed to the front end of the stub shaft. To the rear end of shaft 32 is detachably fixed a pinion 34 meshing with an annular gear forming a part of an annulus 35, surrounding and detachably fixed to die carrier 17. Detachably engaging the annulus 35 is a die 36 which is shaped, of course, in accordance with the finished product desired.

Fixed to and formed integral with the rear frame 3 is a transversely disposed guide plate 37, having a vertical face exposed forwardly, and its upper edge engaged by a plate 38 having a depending flange along its front edge to serve as a retainer for a slide plate 39, which slidingly engages plate 37 and has an upstanding flange lapping the depending flange of plate 38. The plate 37 is preferably formed with a forwardly offset portion intermediate its width, and the slide plate 39 is correspondingly offset for providing a guide and support for the slide.

A transversely disposed cylinder 40 is fixed to frame 3 at one end thereof and extends toward the opposite end of the frame, and a piston 41 extends from the cylinder 40 and has its free end extending into a socket in slide plate 39. A fluid supply pipe 42 communicates with the cylinder 40 for supplying fluid under pressure for actuating the piston and shifting the slide and with it the rear end of die carrier 49 hereinafter described. The slide is notched longitudinally for accommodating the cylinder and at its opposite end is provided with a longitudinal notch 43 adapted to accommodate the respective sleeve 6 for allowing requisite shifting of the slide plate. For effecting a return movement of the slide plate, a cylinder 44 is fixed to a portion of frame 3, and a piston 45 extends from said cylinder and engages a pocket in a lug 46 depending from slide 39. A fluid supply pipe 47 communicates with cylinder 44 for supplying fluid under pressure for actuating the piston 45 and returning the slide after a thrust imparted thereto by piston 41. Projecting forwardly from and preferably formed integral with plate 39 is an eye 48 which is disposed vertically intermediate the length of the slide plate. When the slide plate is in its initial position, the eye is disposed for having its axis in the longitudinal median line of the machine.

A hollow frame 49 has its rear end provided with eyes 50—50 lapping the eye 48 above and below the same, and all said eyes are connected together by a pintle 51. The frame 49 flares from the eye 48 to its front end, which is preferably shaped to conform to the shape of the rear face of a die carrier 52, supported in frame 49 so that the frame 49 serves as a thrust bearing therefor, taking compression stresses therefrom, said carrier being formed integral with or suitably connected to a rearwardly extending shaft 53. The frame 49 is provided with bearings 54 and 55 for shaft 53, in which said shaft is journaled. Shaft 53 is provided with an annular groove 56 just in the rear of bearing 54, and a split collar 57 is mounted in the groove and engages the rear end of bearing 54 for limiting play of the shaft and connected parts.

Surrounding and suitably detachably fixed to the die carrier 52 is a gear annulus 58 having gear teeth 59 meshing with the teeth of the pinion 60. Pinion 60 is carried by shaft 61 extending through and journaled

in a sleeve 49ª fixed to an upper extension of frame 49. The rear end of shaft 61 terminates in an open ended socket 62, preferably polysided, and into which extends the front end of a shaft 63. The rear end of shaft 63 extends into a socket 64 similar in construction to socket 62, the ends of the shaft 63 being shaped and connected for transmitting rotary movement from one socket to the other, regardless of relative edgewise travel of the socket 62. Socket 64 is carried by any suitable shaft or other means of power transmission, and is adapted to receive power from any preferred source, not illustrated.

A die 65 is detachably fixed to the annulus 58 and is disposed as a complement to and adapted to coöperate with die 36, the die 65 being disposed in its initial position in longitudinal, axial alinement with die 36.

Frame 49 is provided with a depending portion 66 to which is fixed a segmental plate 67, having its arcuate edge formed into a segmental rack 68 meshing with rack 10 and adapted to "walk" along the same, the arcuate edge of plate 67 being struck on a circle having the axis of pintle 51 as its center.

In operation, the die carrier 14 is retracted to the position seen in dotted lines in Fig. 1 the bloom or billet is introduced between the dies, and the carriage is advanced toward frame 49, the dies 36 and 65 being rotated throughout the operation by means of the respective driving gears. Carriage 14 continues to advance under the action of pistons 22 until the carriage arrives at the limit of its movement where it remains until the operation is completed. The face of die 36 is a perfect matrix for the finished product, but the face of die 65 varies constantly so as to permit the rocking movement of die 65 under the action of piston 41 which piston begins to advance as soon as carriage 14 arrives at its final position. The advance of piston 41 shifts slide plate 39 transversely of the machine and thus through the pivotal connection swings the rear end of frame 49 laterally and away from the median line of the machine. The die 65 is thus rocked laterally to the final position seen in Fig. 8, and during such rocking movement successive parts of the die are presented into shaping engagement with the blank between the dies. The constant rotation of the dies with the resultant rotation of the blank causes the die 65 to act on the blank in a continuous spiral line from the initial position to the periphery of the blank. The metal of the blank is thus caused to flow smoothly and evenly into the hollows of the die 36, and a highly efficient and perfect die product is obtained. Die 36 is shown as and will preferably be the female die but of course an inverse relation of the parts may be provided when desired, care always being exercised to see that the die carried by frame 49 varies from the contour of the face of the blank to be produced by it, so that when the die is tilted in varying degrees until it reaches the position seen in Fig. 8 each part of the die will bear the exact relation to the blank which a corresponding part of a perfect die directly engaging the blank would bear. Piston 41 continues to move until it arrives at the limit of its movement whereupon the entire operation is complete, and the parts are ready to be retracted for another operation. Fluid is exhausted from cylinders 23 and 40, pistons 27 and 45 are actuated, and the parts are returned to their initial positions, and, the die product being removed, the parts are ready for another operation. The segmental rack 68, in its engagement with rack 10 and being guided and confined by plate 11 which overhangs the rack, serves as a positive guide for the lateral rocking of die 65, and insures the maintenance of a substantially perfect concentric relation of the dies 65 and 36 at all times.

It is noted, of course, that while the present invention is particularly well adapted for the formation of railway car wheels or other similar circular bodies, it is not limited in this application solely thereto but comprehends any mechanism within the scope of the appended claims for the output of die products in which the features of this invention prove useful.

What I claim is:

1. In a device of the class described, the combination of die supports, one movably mounted relatively to the other and adapted to be moved longitudinally and rocked transversely to rock the die carried thereby laterally with respect to the die carried by the other support, and means for rotating the die support.

2. In a device of the class described, the combination of a longitudinally shiftable die support, and a die support for coöperation therewith adapted to be rocked in a relatively lateral direction, and means for rotating the last mentioned die support.

3. In a device of the class described, the combination of a longitudinal shiftable die support, and a rotary die support adapted to be rocked in a lateral direction relative thereto and adapted to be maintained against longitudinal shifting.

4. In a device of the class described, the combination of a rotary die support adapted to carry a die and fixed against lateral movement, and an opposite rotary die support adapted to carry a die in axially alined coöperative relation to the first mentioned die, said last mentioned die being adapted to be rocked laterally relatively to said first mentioned die.

5. In a device of the class described, the combination of axially alined dies, and means for sustaining and rotating one of the dies and shiftably mounted means for rocking the other die relative to the first mentioned die.

6. In a device of the class described, the combination of a die, a support therefor, a coöperating die in axial alinement with the first mentioned die, means rotatably and shiftably carrying the second mentioned die and adapted to rock the second mentioned die laterally with respect to the first mentioned die, the second mentioned die being distorted.

7. In a device of the class described, the combination of axially alined dies, means for supporting the same, one of said supporting means with its supported die being rotatable and shiftable laterally for rocking its die relative to the other die, said other die being adapted to sustain a blank being formed between the dies, and the first mentioned die being distorted proportionately to the degree of its lateral rocking.

8. In a device of the class described, the combination of relatively alined dies, means for supporting the same, one of said supporting means being movable relative to the other for rocking its die relative to the other die, one of said dies being adapted to sustain a blank and the other die being distorted proportionately to the degree of rocking of the rockable die, and means for rotating the dies.

9. In a device of the class described, the combination of means for holding a blank, a die adapted to act on the blank, and means for moving the die for acting on the blank in a continuous spiral line from the initial point of contact of the die with the blank throughout the remaining area of the blank.

10. In a device of the class described, the combination of means for holding a blank, a die for acting on the blank, and means for causing the die to act on the blank along a spiral line.

11. In a device of the class described, the combination of rotary die carriers, one of the carriers being shiftable longitudinally relative to the other, and the second die carrier being shiftable laterally relative to the longitudinally movable die carrier.

12. In a device of the class described, the combination of axially alined die carriers disposed for sustaining concentric dies, one of the die carriers being shiftable for rocking the die carried laterally while substantially maintaining the coöperative relation of the dies, and means for rotating the rockable die carrier.

13. In a device of the class described, the combination of axially alined die carriers and dies, means for rotatably carrying the same, means for rocking one of the dies laterally with respect to the other and means for preventing edgewise shifting of the rockable die.

14. In a device of the class described, the combination of axially alined die carriers, coöperating dies carried thereby, one of said die carriers being fixed against lateral movement and a laterally shiftable connection for the other of the die carriers engaging the same in substantially the axial line thereof.

15. In a device of the class described, the combination of die carriers, dies carried thereby, and means engaging one of the carriers in substantially the axial line of the die carried by the engaged carrier for shifting the engaged part of the carrier laterally away from the axial line of the other die, said other die being fixed against lateral movement.

16. In a device of the class described, the combination of die carriers, dies carried thereby, and means engaging one of the carriers in substantially the axial line of the die carried by the engaged carrier for shifting the engaged part of the carrier laterally away from the axial line of the other die, and means fixing the die sustained by the laterally shiftable carrier against edgewise shifting.

17. In a device of the class described, the combination of axially alined die carriers, dies carried thereby, a frame sustaining one of said carriers, and a transversely shiftable slide pivotally connected to said frame.

18. In a device of the class described, the combination of die carriers, dies carried thereby, a frame sustaining one of said carriers, and a transversely shiftable slide pivotally connected to said frame in substantially the axial line of the frame.

19. In a device of the class described, the combination of die carriers, dies carried thereby, a frame sustaining one of said die carriers, means for shifting laterally the end of the frame farthest from the die, and means for guiding the frame in its lateral shifting movement.

20. In a device of the class described, the combination of die carriers, dies sustained thereby, a frame supporting one of the die carriers, means for shifting laterally the end of the frame farthest from the die, and means for preventing bodily edgewise shifting of the die sustained by the frame.

21. In a device of the class described, the combination of die carriers, coöperating dies carried thereby, a frame sustaining one of the carriers, segmental and straight racks, one fixed to the frame and the other independent thereof, and means for shifting the frame for walking one of the racks upon the other.

22. In a device of the class described, the combination of die carriers, dies carried thereby, a frame sustaining one of the car-

riers, means for shifting the frame for rocking the die sustained thereby, a segmental rack fixed to the frame, and a guiding rack meshing with the segmental rack.

23. In a device of the class described, the combination of die carriers, dies carried thereby, one of said carriers being longitudinally shiftable, and the other carrier being rotatably mounted and retained against longitudinal movement, and being mounted to rock laterally.

24. In a device of the class described, the combination of rotary die carriers, dies sustained thereby, one of said carriers being longitudinally movable, and the other being laterally rockable and retained against longitudinal movement, means for rocking the rockable carrier, and means for reciprocating the other carrier.

25. In a device of the class described, the combination of die carriers, rotary dies carried thereby, a frame sustaining one of said carriers, and a transversely reciprocating slide pivotally connected to the frame and spaced from the die and mounted to resist longitudinal stresses on the frame.

26. In a device of the class described, the combination of normally alined die carriers, rotary dies carried thereby, means for shifting one die carrier toward the other for compressing a blank between the dies, and means for rocking the other die carrier while resisting longitudinal stresses thereof.

27. In a device of the class described, the combination of normally alined die carriers, dies carried thereby, means for shifting one die carrier toward the other for compressing the blank between the dies, and means for rotating and rocking one of the dies while under compression.

28. In a device of the class described, the combination of die carriers, dies carried thereby, a frame sustaining one of said carriers, a transversely shiftable slide pivotally connected to the end of the frame opposite the die, and enginery for shifting said slide.

29. In a device of the class described, the combination of die carriers, dies sustained thereby, means for rotating one of the dies, a frame sustaining one of the die carriers, a transversely reciprocating slide, means for reciprocating the slide, means pivotally connecting the slide to the frame for rocking the frame when the slide is reciprocated, and means for guiding the frame in its rocking movement.

30. In a device of the class described, the combination of die carriers, dies carried thereby, means for rotating one of the dies, a frame sustaining one of the die carriers, means engaging the frame at the end opposite the die for rocking the frame, and means engaging the frame for guiding the rocking movement thereof at the die engaging end.

31. In a device of the class described, the combination of die carriers, a rotating gear sustained by one of said carriers, a pinion meshing with said gear, means for rocking the gear engaged guide carrier laterally with respect to the other die carrier, and means for rotating said pinion.

32. In a device of the class described, the combination of die carriers, a rotating gear sustained by and movable with one of the carriers, means for rocking the gear sustaining carrier laterally with respect to the other carrier, a pinion meshing with said gear, a drive shaft, and universal joint connections between the drive shaft and pinion.

33. In a device of the class described, the combination of normally alined die carriers, a frame sustaining one of said carriers and having a thrust bearing therefor, and means for rocking the frame for laterally rocking the carrier relative to the other carrier.

34. In a device of the class described, the combination of normally alined die carriers, a frame rotatably supporting one of said die carriers and having a thrust bearing engaging the die carrier, and means engaging the frame for shifting one end thereof for rocking the thrust bearing and die carrier engaging the same laterally relative to the other die carrier.

35. In a device of the class described, the combination of normally alined die carriers, a frame, a shaft extending from one of said die carriers journaled in said frame, the frame being formed with a thrust bearing for the die carrier surrounding said shaft, and means for shifting the frame for rocking the die carrier sustained thereby relative to the other die carrier.

36. In a device of the class described, the combination of normally alined rotary die carriers and supports therefor, each of the supports having a journal bearing and a thrust bearing, each of said die carriers being formed with a shaft journaled in the respective journal bearing and disposed for having the respective die carrier engage the thrust bearing, and means for rocking one of the supports relative to the other.

37. In a device of the class described, the combination of normally alined die carriers and supports therefor, each of the supports having a journal bearing and a thrust bearing, each of said die carriers being formed with a shaft journaled in the respective journal bearing and disposed for having the respective die carrier engage the thrust bearing, and means for rocking one of the supports relative to the other.

38. In a device of the class described, the combination of normally alined die carriers and supports therefor, each having a journal bearing and a thrust bearing, each of said die carriers being formed with a shaft journaled in the respective journal bearing

and disposed for having the respective die carrier engage the thrust bearing, means for rocking one of the supports relative to the other, and means for reciprocating said other support.

39. In a device of the class described, the combination of die carriers, a reciprocating carriage sustaining one of said carriers, lateral arms extending from said carriage, guiding rods engaged by said arms, pistons engaging said arms for shifting the carriage, cylinders for the pistons, and pressure supplying means for the cylinders.

40. In a device of the class described, the combination of die carriers, a reciprocating carriage sustaining one of said carriers, pistons engaging the carriage for advancing the same, cylinders for said pistons, pressure supplying means for the cylinders, rods connected with the carriage for retracting the same, a piston connected with said rods, and a cylinder and pressure supplying means for the last mentioned piston.

41. In a device of the class described, the combination of die carriers, dies sustained thereby, a rotating gear engaging one of the dies and sustained by the die carrier, means for reciprocating the gear sustaining die carrier, a pinion meshing with said gear, a journal bearing carried by said die carrier sustaining means, a shaft fixed to the pinion and journaled in said journal bearing and having a polysided free end, and an actuating shaft having an elongated polysided socket receiving the polysided end of the first mentioned shaft.

42. In a device of the class described, the combination of normally alined die carriers, a support for one of said carriers having spaced bearings, a shaft projecting from said last mentioned die carrier which is journaled in said bearings, a collar engaging said shaft for maintaining the relative position of the parts, and means for shifting one of the die carriers relatively to the other.

43. In a device of the class described, a bed plate, frames upstanding therefrom at the ends thereof, guiding rods extending longitudinally of the bed plate and connecting the frames to resist bursting stresses, die carriers disposed between the frames, one of said die carriers being reciprocally mounted and having guiding means engaging the rods, and means for moving said die carrier toward and away from the other die carrier.

44. In a device for forming circular bodies, the combination of a rotary and a rockable die, and instrumentalities for rotating and rocking the rockable die for causing the same to act on a blank in a spiral line.

45. In combination, dies adapted to have a blank to be formed and disposed therebetween, means for rocking one of the dies relative to the other to positions with successive outwardly radial portions only of said die engaging the blank, and means for rotating the rockable die while being rocked.

46. In combination, normally alined cooperating dies, supports therefor, and means engaging one of the supports in the axial line of the die carried thereby for shifting said support laterally for rocking the die relative to the other die.

47. In combination, normally alined cooperating dies, supports therefor, means engaging one of the supports in the axial line of the die carried thereby for shifting said support laterally for rocking the die relative to the other die, and means for rotating the rockable die.

48. In combination, coöperating dies, supports therefor, means for reciprocating one of the dies, and means engaging the support for the other die in the axial line of the die for shifting said support laterally for rocking the die carried by the respective support relative to the other die.

49. In combination, coöperating rotary dies, means for reciprocating one of the dies, supports for the dies, and means engaging one of the supports in the axial line of its die for rocking said die laterally relative to the other die.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

FRANK D. WARD.

Witnesses:
EDGAR M. KITCHIN,
F. H. GIBBS.