July 28, 1931. G. P. KLINE 1,816,117

RIM FORMING MACHINE AND METHOD OF FORMING RIMS

Filed March 18, 1929 4 Sheets-Sheet 1

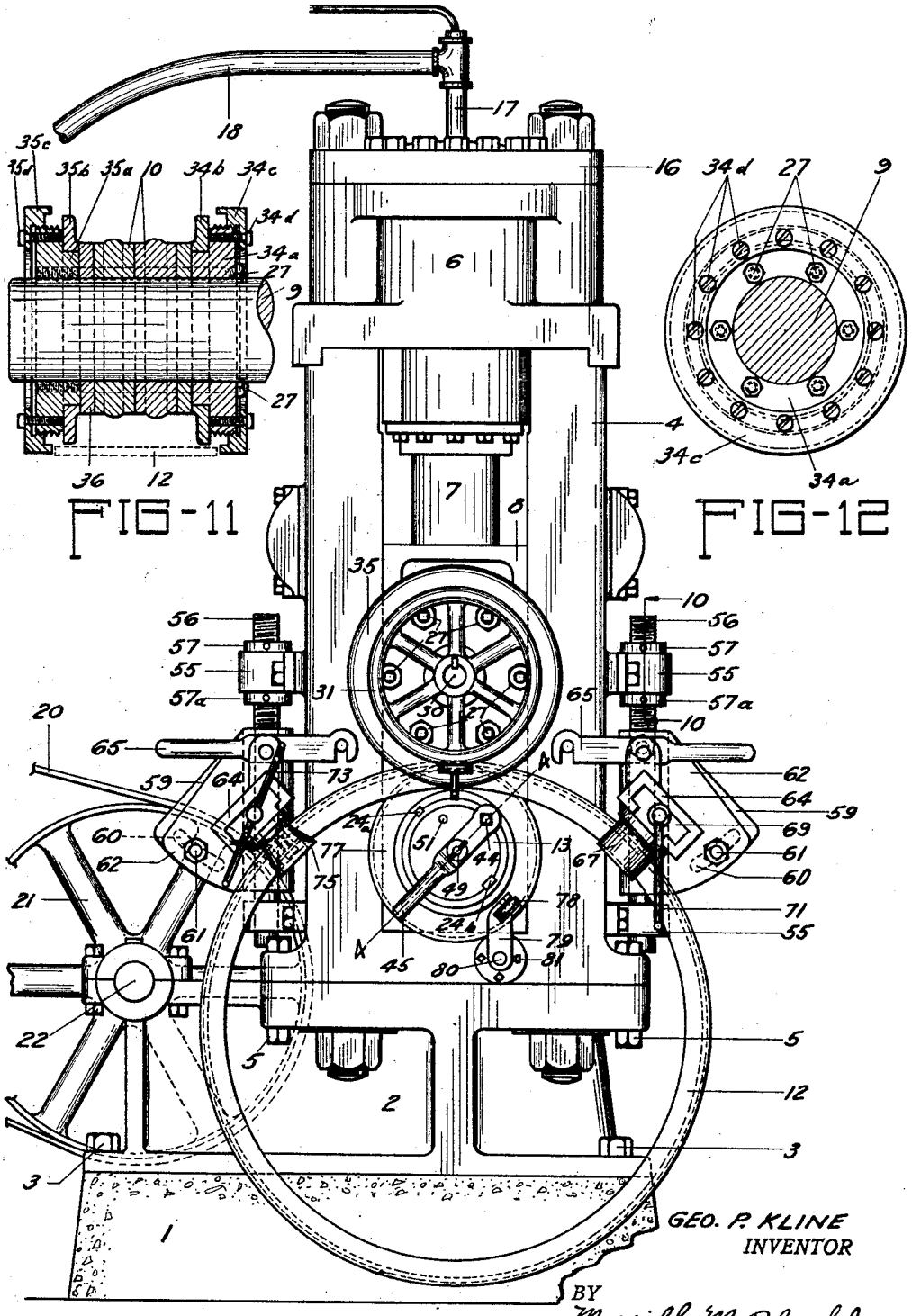


FIG-11

FIG-12

FIG-1

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Filed March 18, 1929 4 Sheets-Sheet 2

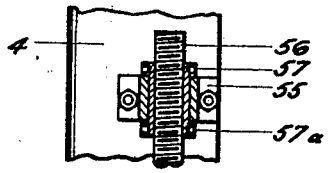


FIG-1

FIG-2A

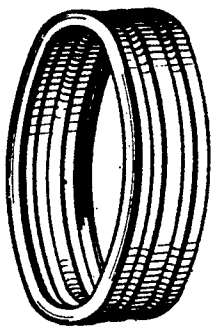


FIG-2

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RIM FORMING MACHINE AND METHOD OF FORMING RIMS

Filed March 18, 1929 4 Sheets-Sheet 3

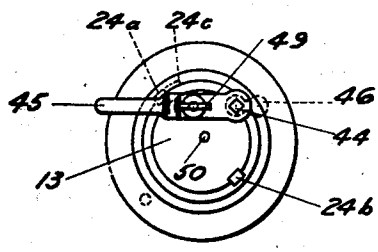


FIG-3

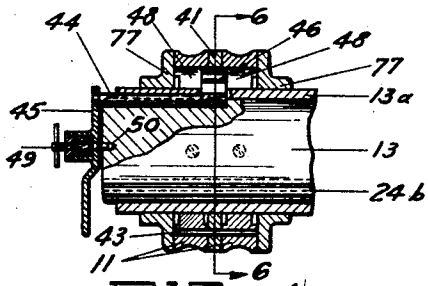


FIG-4

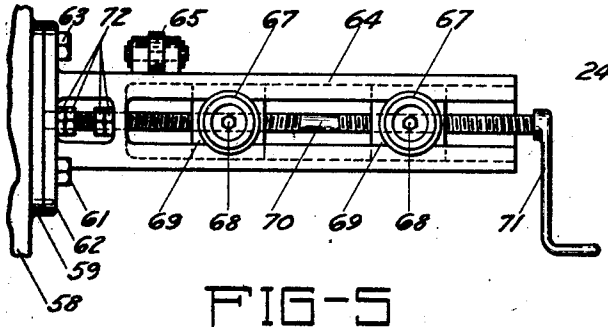


FIG-5

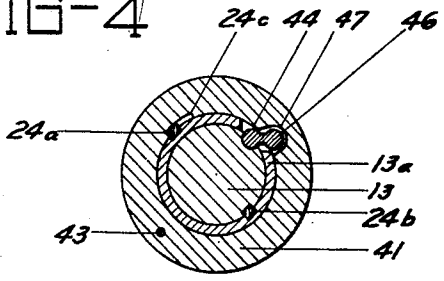


FIG-6

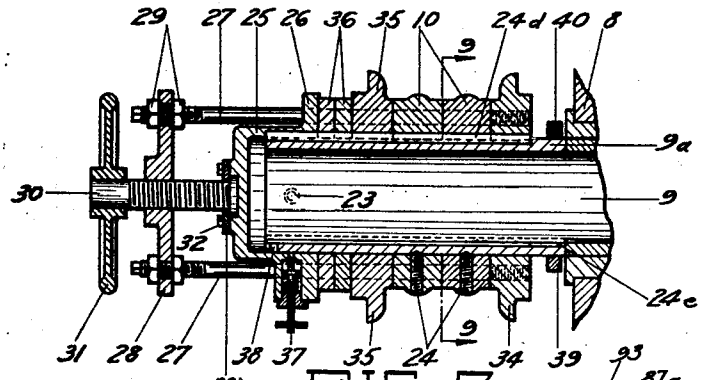


FIG-7

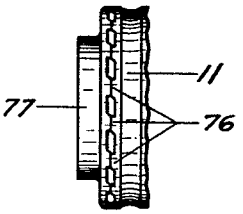


FIG-8

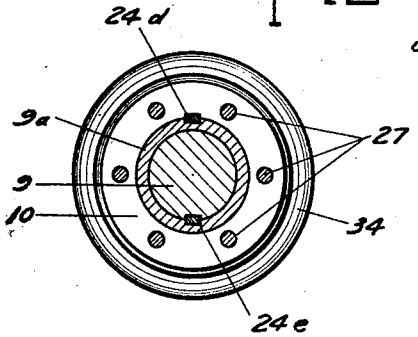


FIG-9

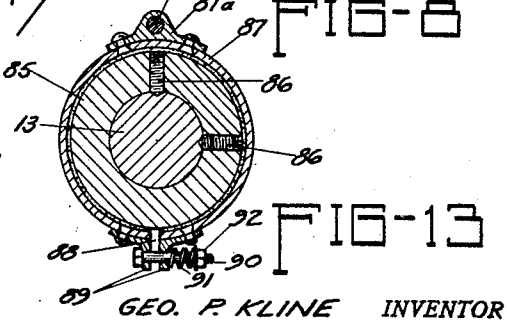


FIG-13

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July 28, 1931. G. P. KLINE 1,816,117

RIM FORMING MACHINE AND METHOD OF FORMING RIMS

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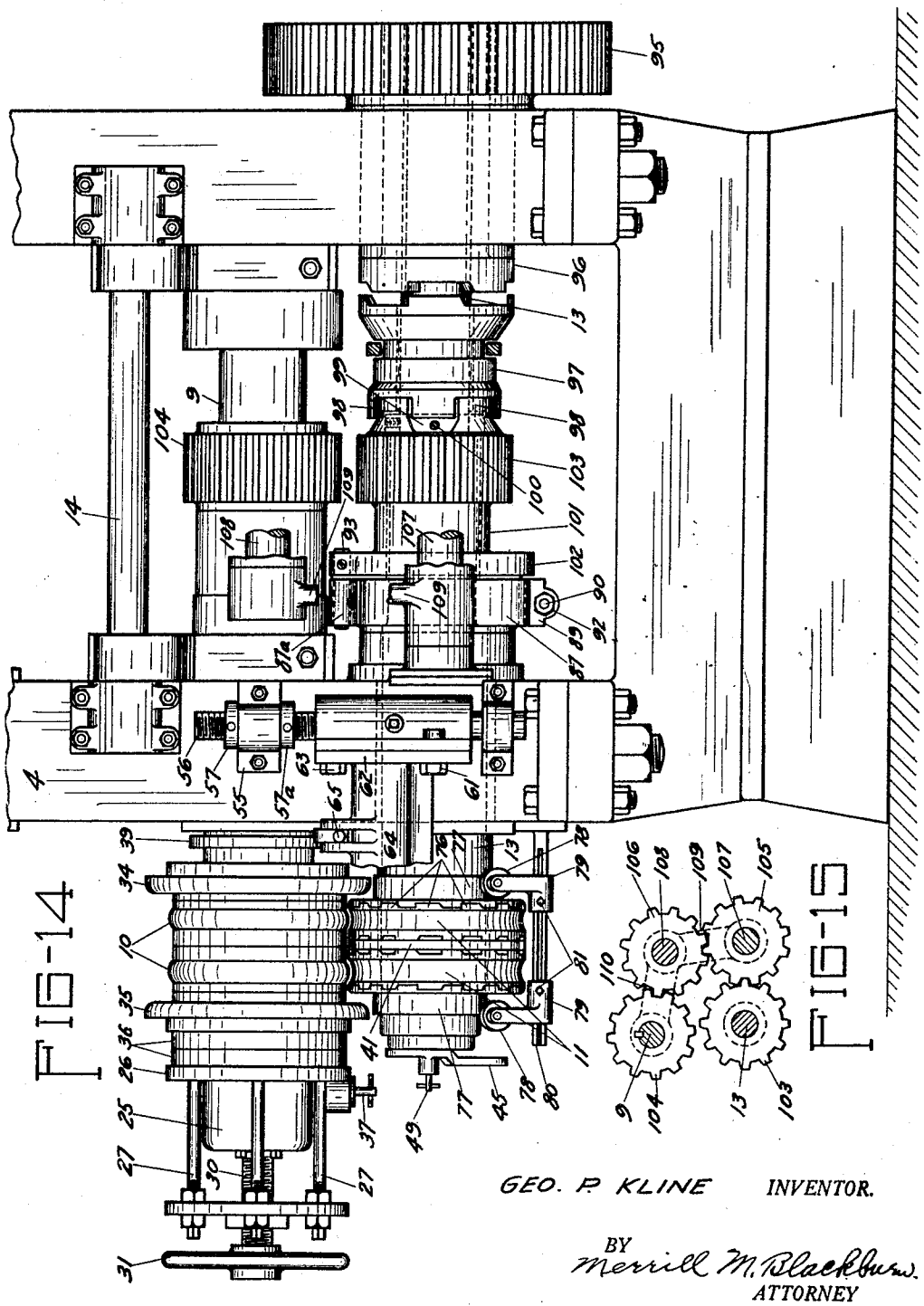


FIG-14

FIG-15

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Patented July 28, 1931 1,816,117

UNITED STATES PATENT OFFICE

GEORGE P. KLINE, OF MOLINE, ILLINOIS, ASSIGNOR TO WILLIAMS, WHITE & CO., OF MOLINE, ILLINOIS, A CORPORATION OF ILLINOIS

RIM-FORMING MACHINE AND METHOD OF FORMING RIMS

Application filed March 18, 1929. Serial No. 347,800.

This invention pertains to a machine for converting plain metallic band rings into wheel rims, and among the objects thereof are to provide a machine for the purpose indicated by means of which such metallic bands can be operated upon to convert them by a series of simple operations into rims of the character stated; to provide a machine of the character indicated in which the band may be corrugated to reinforce the rim and thus reduce distortion of the rim during use; to provide a machine in which a plurality of flanges may be simultaneously formed upon the rim by a series of simple, substantially simultaneous operations; to provide, in a machine of the character indicated, means for easily adjusting the parts for the handling of rims of different sizes; to provide novel means for adjusting the machine to different sizes of work; and such further objects, advantages and capabilities as will hereafter appear and as are inherent in the construction herein disclosed. My invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings and, while I have shown therein what is now considered the preferred embodiment of this invention, I desire the same to be understood as illustrative only and not to be construed in a limiting sense.

In the drawings annexed hereto and forming a part hereof:—Fig. 1 is a front elevation of a machine embodying my invention; Fig. 2 is a fragmentary side view taken from the right side of Fig. 1; Fig. 2*a* is a perspective of the finished product of the machine; Fig. 3 is an elevation of a portion of the construction shown in Fig. 1 with certain parts thereof shown in a different operative position; Fig. 4 is a fragmentary longitudinal section of a portion of the construction shown in Fig. 1, the same being taken substantially along the plane indicated by the line 4—4, Fig. 1; Fig. 5 is a plan view of a portion of the construction shown in Fig. 1; Fig. 6 is a cross-section of the structure shown in Fig. 4, the same being taken substantially along the plane of the line 6—6 in said figure; Fig. 7 is a longitudinal section of a portion of the machine as illustrated in Figs. 1 and 2, the same being designed to illustrate the adjustment of certain of the parts of this machine; Fig. 8 is a fragmentary view of a portion of the structure illustrated in Fig. 2, the same being designed to illustrate the adjustment of certain of the parts of the machine; Fig. 9 is a cross-section substantially along the plane indicated by the line 9—9, Fig. 7; Fig. 10 is a fragmentary longitudinal section substantially along the plane indicated by the line 10—10, Fig. 1; Fig. 11 is a view similar to a portion of Fig. 7 showing a modified form of construction; Fig. 12 is an end view of the construction shown in Fig. 11; Fig. 13 is a section substantially on the plane indicated by the line 13—13, Fig. 2; Fig. 14 is a fragmentary elevation of the structure shown in Fig. 2 but showing the entire width of the machine; and Fig. 15 is a fragmentary detail showing the driving gears connecting the roll shafts.

Referring more in detail to the annexed drawings, numeral 1 denotes any suitable foundation upon which is mounted the base 2 of the machine, the same being secured on the foundation by any suitable means such as bolts 3. A superstructure or framework 4 is secured to the base 2 by suitable means such as bolts 5. It will be understood that these details are merely suggestive of a way in which the construction can be built.

Within the upper portion of the framework is a cylinder 6 which has a piston mounted therein for reciprocating motion. This piston is connected in operative relation to the plunger 7 which is connected to the slidable block 8 in which is mounted the shaft 9. Male rolls 10 are carried by this shaft and cooperate with female rolls 11 in performing an operation upon the rim blank 12 as the same passes through the machine. The female rolls 11 are carried by the shaft 13, as shown most clearly in Fig. 4.

A shaft 14 connects the two end members of the framework and has adjacent its bearings gear segments which cooperate with racks upon the sides of bearing members 8. This results in the two ends of the shaft 9 moving upwardly and downwardly at the

same rate and thus always maintaining its position of parallelism with shaft 13. Extending backwardly from the cylinder 6 is a return pipe 15. This pipe opens below the piston in the cylinder 6 and thus permits entrance and exit of the fluid below the piston head as the same moves up and down during operation of the machine. Opening through the head 16 of the cylinder 6 is a pipe 17 which is connected by any suitable means 18 with a source of fluid pressure. When pressure is exerted through the pipes 18 and 17, the piston in cylinder 6 is forced downwardly, thus causing the block 8 to move downwardly. With this travels the corresponding block at the opposite end of the machine. When a proper arrangement of valves is made pressure is applied through the pipe 15 to force the piston upwardly in the cylinder 6, thus raising the block 8 and with it the shaft 9 and the rolls 10. When the rolls 10 and 11 are separated and certain other adjustments are made, the rim which has been operated upon may be removed and a new blank inserted to be operated upon.

Power from a source of power not shown in the present drawings is transmitted through a belt 20 to a pulley 21 mounted upon a shaft 22 carried by the base 2. The power is transmitted from this shaft 22 to one or both of the shafts 9 and 13, thus causing them to rotate. Suitable connecting means 23 such as a screw prevents relative longitudinal motion of the sleeve 9*a* and the shaft 9. The head or cap 25 has an outwardly extending flange 26 which is perforated for the reception of a plurality of longitudinally extending bolts 27. These bolts pass through the male grooving rollers and various other parts associated therewith as will be described hereinafter and hold them against relative rotation with relation to each other and to the shaft 9. Also, these bolts enable longitudinal thrust to be exerted against the parts assembled on the sleeve 9*a* as will be obvious from Fig. 7. Set-screws 24 passing through the grooving rolls 10 and engaging the sleeve 9*a* prevent movement of the rolls with relation to the sleeve. However, these rolls can be adjusted longitudinally of the sleeve without relative rotation thereof by withdrawing the set-screws 24 sufficiently to permit such motion. Relative rotation of these parts is prevented by the key 24*d* shown in Figs. 7 and 9. A key 24*e* prevents relative rotation of the shaft 9 and the sleeve 9*a*.

A plate 28 is mounted upon the bolts 27 and is secured in place thereon, adjustably, by means of the nuts 29. Passing through a centrally arranged threaded opening in the plate 28 is a threaded shaft 30 which has a suitable hand-wheel 31 keyed thereto as shown in Fig. 1. This shaft 30 has a head at its opposite end which rests in a socket in the cap 25. A cover plate 33 holds the head 32 of this shaft in the socket and permits rotation thereof relative to the surrounding parts. It will be apparent from the foregoing that, by turning the hand-wheel 31 in the right direction, pressure can be exerted upon the parts mounted upon the sleeve 9*a* to compress them tightly with relation to each other or to cause separation thereof.

Besides the male rolls 10 there are mounted upon the sleeve 9*a* the flanging rolls 34 and 35 and also the spacing rings 36. Mounted in a socket upon one side of the cap 25 is a spring-pressed plunger 37 which cooperates with a perforation 38 in the sleeve 9*a* to prevent the cap from being inadvertently removed from the end of the sleeve. Normally, this plunger is pressed against the side wall of the sleeve 9*a* but, when the cap is drawn outwardly as if to remove it from the sleeve, the plunger enters the perforation 38 and stops the cap before it is entirely removed from the end of the sleeve. A ring 39 is mounted upon the sleeve 9*a* and secured in place thereon by means of a set-screw 40 as illustrated in Fig. 7. The purpose of this ring is to serve as a stop to limit the movement of the flanging roller 34 away from the grooving roller 10, just as the plunger 37 limits the movement of the roller 35 and cap 25.

The adjustment and construction of the female rolls 11 and associated parts will now be described with particular reference to Figs. 2, 3, 4, 6 and 8. Surrounding the shaft 13 is a sleeve 13*a* which separates the shaft from the rolls or rings 11. Surrounding the sleeve 13*a* and located between the rolls or rings 11 is a spacing ring 41 which is perforated for the passage of pin 43 which ties the rings 11 and 41 together and prevents them from having relative rotation with relation to each other. A shaft 44 is mounted in a groove in the shaft 13 and a slot in the sleeve 13*a*. At its outer end, this shaft 44 carries a handle 45 which is rigidly connected thereto, the shaft being rotated when the handle is swung from one position to another. On the inner end of the shaft 44 is a cam or crank 46 which fits into a socket 47 formed in the ring 41. Corresponding sockets 48 are formed in rings 11. These are engaged by cam 46 in the same manner as socket 47 is engaged thereby, unless a filler ring 41 is used which is wider than the cam. The handle 45 has a spring-pressed plunger 49 mounted therein, said plunger engaging sockets 50 and 51 in the end of shaft 13. When the plunger 49 engages the socket 50, the ring 41 is at one limit of its rotational movement and when the plunger 49 engages the socket 51, it is at the other limit of its rotation.

Because the rings 11 and 41 are prevented from relative rotation by the pin 43, they will be caused to move together when the

handle 45 is turned to cause the cam 46 to swing to the left from the position shown in Fig. 6 or vice versa. A wide keyway 24*c* formed in rings 11 and 41 and cooperating with key 24*a* mounted in a keyway in sleeve 13*a* permits relative rotation between these rings and the sleeve 13*a*. The walls of the keyway serve as stops to limit the amount of rotation of the rolls with relation to the shaft. A key 24*b* prevents relative rotation between shaft 13 and sleeve 13*a*.

Upon opposite sides of the frame member 4 are supporting brackets 55 through which extend threaded members 56. These extend through and are vertically adjustable by means of the screw-threaded sleeves 57, loosely mounted in the brackets 55. Collars 57*a* hold the sleeves 57 in place in the brackets 55. An internally screw-threaded sleeve 58 fits closely the member 56 and is secured in place thereon by a set-screw 56*a*. This sleeve 58 has a tangentially arranged wing 59 extending laterally away from the machine. This wing is provided with a slot 60 for the reception of a bolt 61 by means of which the position of plate 62 may be adjusted about pivot 63 relatively to the wing 59. A supporting arm 64 is carried by the plate 62 and it, in turn, carries a latch member 65 whereby the arm 64 may be locked to prevent it from swinging around the member 56 in a substantially horizontal plane.

The guiding rollers 67 are carried on suitable pivots 68 which are secured to or form a part of the blocks 69 sliding in the guideways in arms 64. A right and left-hand threaded screw 70 passes through the blocks 69 and is provided with a crank 71 whereby it may be rotated to cause the blocks 69 to approach or recede from each other. Suitable nuts 72 hold the shaft 70 against longitudinal motion and thus compel equal movement of the two blocks 69 and the rollers 67 carried thereby. When a rim blank has been placed between the grooving rolls 10 and 11, the two arms 64 are swung about their vertical pivots 56 until the rollers 67 carried thereby are arranged upon opposite sides of the rim. It is of course understood that these rollers must be separated far enough to permit this to be accomplished, before the arms can be gotten into position. After the arms are in position and the latches 65 have been engaged to hold the arms in such position, the cranks 71 and 73 are turned until the rollers fit closely against the edges of the rim blank. These rollers will then serve as guides to keep the blank properly positioned with relation to the rolls 10 and 11.

The flange beveling rolls 75 operate in the same way as the rolls 67 but have an additional function by reason of their tapered form. The purpose of this taper will shortly be set forth.

Referring now to Fig. 2, it will be seen that the outer faces of the grooving rolls 11 have cam projections 76 thereon and that the rings or collars 77 have similar but oppositely arranged cams. Since the collars are non-rotatably mounted upon the sleeve 13*a* and since rolls 11 are caused to rotate thereon by operation of the handle 45, there will be relative rotation between the rings 11 and the collars 77. This will either force the collars 77 farther apart or permit them to come closer together, depending upon which direction the rolls 11 have rotated. In Figs. 1, 2 and 4 the parts are shown in the same relative position, that is, the cams 76 are in registry with the spaces between the cams on the collars 77, thus permitting the collars to be caused to approach each other. This position I call the "collapsed position". For the initial shaping of the rims, these parts on the shaft 13 are in the expanded position. Rollers 78 are carried by brackets 79 adjustably mounted on an arm 80. These brackets are held in adjusted position on the arm 80 by means of set-screws 81. The brackets 79 are set just far enough apart so that the rollers 78 will limit the separating movement of the collars 77, so that there will be just space enough between their flanges and the flanges of the rollers 34 and 35 to permit the metal of the rim to pass between them.

Operation

Assuming the blocks 8 to have been raised, carrying the bearings for shaft 9 upwardly, thus separating the grooving rolls, also that there is no work between the grooving rolls, and also that the arms 64 have been swung laterally until they are out of the way, a rim blank may be inserted between the grooving rolls and the arms 64 swung in until the pairs of rolls 67 and 75 are located upon opposite sides of the blank. The handles 71 and 73 are then turned until the rolls 67 and 75 engages the opposite edges of the blank. When this has been done, the blank will be properly centered with relation to the grooving rolls. The handle 45 will now be turned to the position shown in Fig. 3, if this has not already been done, and this will expand the rolls on shaft 13, bringing the flanges of collars 77 outwardly into engagement with the limiting rolls 78. With the parts in this position, there is just room between the flanges of collars 77 and the flanges of the flanging rollers 34 and 35 to receive the metal of the rim flange as that is bent downwardly. By now increasing the pressure above the piston in cylinder 6, shaft 9 will be brought downwardly until the flanges of rollers 34 and 35 engage the metal of the rim blank. With power being applied to the shaft 22 to cause rotation of the shafts 9 and 13, and with more power being applied to force the

shaft 9 downwardly, the flanges 34 and 35 will turn the metal of the blank downwardly against the flanges of collars 77, thus forming a substantially right-angled bend between the tread and flanges of the rim. During the last part of this movement, the ribs of the rolls 10 will force the metal of the tread into the grooves of the rolls 11, thus forming the corrugations in the tread of the tire. When this has been done, plunger 49 is drawn back, handle 45 turned into the position shown in Fig. 1 and the plunger 49 is then permitted to engage the socket 50 in the end of shaft 13. This brings the cams 76 into alignment with the depressions between the cams on the flanges of collars 77, thus permitting collapsing of the female rolls. Handle 73 is now turned to bring the flange beveling rolls 75 into pressing engagement with the flanges of the rim. The machine is again started into operation and the pressure of the beveling rolls 75 is increased until the proper angle of bevel is formed between the flanges and tread of the rim. Pressure is now turned on to cause raising of the shaft 9 and separation of the grooving rolls. The rolls 67 and 75 are separated to permit the arms 64 to be swung laterally away from the work, and the latches 65 are unlatched and the arms swung out of the way so that the work can be removed and a new blank inserted in its place. We are now ready to repeat the operation just described.

From the foregoing it will be observed that the flanging and corrugating occur in overlapping sequences, that is, the flanging is begun first, being followed by the corrugating which occurs simultaneously with the intermediate part of the operation of flanging, and then the flanging is completed after the corrugating is finished.

Whenever a change is made from one width of stock to another or from one size of rim to another, it is necessary to change the adjustment of the parts. For example, if it is desired to change from a 6-inch tread to an 8-inch tread, it will be necessary to change the spacing between the flanges of rolls 34 and 35. If it should be desired at the same time to change the spacing between the corrugations of the rims, then male rolls 10 which are thicker may be substituted for those which have been in use. On the other hand, if it is desired to keep the corrugations the same distance apart, spacing collars may be placed between the rolls 10 and 34 on one side and 35 on the other. These collars should be of the proper thickness to get the desired space between the flanges of 34 and 35. If any change is made in the adjustment of the male rolls 10 and associated parts, a corresponding change must be made in the adjustment of rolls 11 and their associated parts. If, for example, the corrugations are to be made farther apart, a thicker collar 41 will need to be placed between the rolls 11. When this is done, it will be necessary to shift the brackets 79 far enough away to permit free movement of collars 77 when the female roll assembly is expanded.

If rims of larger or smaller diameter are to be shaped, it will be necessary to raise or lower the arms 64 carrying the rolls 67 and 75. This can be done by proper adjustment of the collars 57. Also, the plates 62 can be adjusted on their pivots 63 so that the axes of rolls 67 and 75 will be radial with relation to the cylindrical surface of the rim. When these adjustments have once been made, it is only necessary to change them when the size of the rims being formed is altered.

The construction shown in Figs. 11 and 12 is a modification of that shown in Figs. 2 and 7, the purpose of this construction being to provide adjustable edge guides for the flange forming roll so that the two flanges on the two edges of the rim may always be made the same width and so that the guides may be adjusted to compensate for differences in width of rims. In this construction, the rings 34 and 35 are replaced by 34*a* and 35*a*. Each of these rings has upon its inner face a groove for the reception of a flanging ring 34*b* and 35*b*, respectively. On the outer edges of these rings 34*a* and 35*a* are formed screw threads for the reception and adjustment of edge guide rings 34*c* and 35*c*. These rings can be screwed on or off from the rings 34*a* and 35*a* as desired, the depth of the hollows therein being made as much or as little as desired. When the rings 34*c* and 35*c* have been adjusted to the width of the rim blank 12 and have been so adjusted as to properly space this rim blank with relation to the flange turning rings, the bolts 34*d* and 35*d* are put in place to hold the rings against rotation and also to assist in holding them to the rings 34*a* and 35*a*. As indicated in this figure, the sleeve 9*a* may be omitted, if desired. If this is omitted, either key 24*d* or 24*e* is also omitted.

Since the forming rolls on shafts 9 and 13 are of different diameters and since the internal and external circumferences of the rim are unequal, it is obvious that the two shafts must operate at different speeds when forming a rim. Provision is made for this by having one of the shafts gear-driven and one friction-driven so that they can have relative motion. Means for accomplishing such operation is illustrated in Figs. 2, 13 and 14. Referring now more particularly to Fig. 14, shaft 13, which extends all the way through the machine, is shown as provided with a drive gear 95 which is loosely mounted on the shaft. The clutch comprising the parts 96, 97 and 98 is also loosely mounted on this shaft 13. The part 97 is loose on the shaft and can be shifted back and forth to make driving connections between the gear 95 and

other parts on this shaft. The clutch jaws engaging with the parts 98 of the clutch are always in engagement therewith, whether the parts 96 and 97 are in or out of engagement. Therefore, when this member is shifted to the right, as viewed in Fig. 14, the parts will be connected in driving relation. A collar 99 surrounds the shaft 13 and is held in place by means of set-screws 100. This serves as limiting means preventing longitudinal motion of a sleeve 101 along the shaft, in one direction. Longitudinal motion of this sleeve in the opposite direction is prevented by means of the ring 85 secured in place on the shaft 13 by means of the set-screws 86. This ring is surrounded by a clutch band 87 having an opening 88 therein at one side. Secured opposite this opening is a lug 87*a* which is perforated for the reception of a pin 93. Lugs 89 are arranged at opposite sides of the opening 88 and have a bolt 90 passing through openings therein. A spring 91 surrounds the bolt and the tension of this spring is adjusted by means of the nut 92 which is movable along the bolt 90. By this means, the tension of the friction clutch may be adjusted. As shown, this clutch band is preferably provided with a lining of suitable material, such as brake-band lining.

The sleeve 101 is provided with a flange 102 at its end adjacent the ring 85 and has a projection at one side which is perforated for the reception of the pin 93 whereby the flange and the clutch band are connected together. A gear 103 is integral with or rigidly mounted upon the sleeve 101 and therefore turns with same when clutch 97 engages the element 96. A similar gear 104 is rigidly mounted upon the shaft 9 and forms a part of a train of gears by means of which the said shaft is rotated. The other two gears are illustrated in Fig. 15 and are designated respectively by the numerals 105 and 106. The shafts 107 and 108, upon which the gears 105 and 106 are mounted are shown in Fig. 14. Suitable arms 109 and 110 connect these shafts and keep the gears properly connected in driving relation.

It will be understood from the foregoing that, when the forming rolls are separated and a rim is not being formed, the shafts 9 and 13 will be driven in unison by reason of the gear connection heretofore referred to. On the other hand, the forming rolls must be driven at a different rate of speed, when a rim is being formed and the clutch 87 provides the means whereby this may be accomplished. The two shafts 9 and 13 will continue to operate at the same speed and the ring 85 on shaft 13 will be driven by the clutch 87 at the same speed until pressure begins to be applied upon the rim. When a difference in speed requires it and pressure upon the rim is sufficient to cause it, there is a slippage of the band 87 with relation to the ring 85, thus permitting the forming rolls to have the requisite relative speed. The amount of force required to cause this slippage can be adjusted by adjusting the nut 92 and thereby adjusting the tension of spring 91 and clutch band 87.

The supporting members 56 which are shown as threaded and longitudinally adjustable may have the screw threading omitted if desired and be longitudinally non-adjustable. As a matter of fact it has been found in practice of the invention that this longitudinal adjustment is a superfluous refinement and not at all necessary.

It is believed that the construction and operation of my device will be clear from the foregoing description taken in connection with the drawings annexed hereto.

It is of course understood that the specific description of structure set forth above may be departed from without departing from the spirit of my invention as set forth in this specification and the appended claims.

It is intended to claim both broadly and specifically the various novel subjects-matter disclosed herein, and I therefore desire that failure to insert any claim commensurate with the scope of my invention be not construed as an abandonment thereof.

Having now described my invention, I claim:

1. A rim forming machine including a pair of adjacent shafts in substantially parallel arrangement, said shafts carrying cooperating rolls for forming corrugations in the rim blank and turning flanges along the edges thereof, in combination with means for turning the flanges inwardly beyond a plane perpendicular to the tread surface of the rim at its lateral edges.

2. A rim forming machine including a pair of adjacent shafts in substantially parallel arrangement, said shafts carrying cooperating rolls for forming flanges upon a rim blank, in combination with means for turning the flanges inwardly beyond a plane perpendicular to the tread surface of the rim at its lateral edges.

3. A rim forming machine including a pair of adjacent shafts in substantially parallel arrangement, said shafts carrying cooperating rolls for forming corrugations in the rim blank and turning flanges along the edges thereof, said shafts being capable of being separated or brought closer together in order to form said flanges and corrugations, the parts being constructed and arranged to form the flanges and corrugations in overlapping sequences.

4. A rim forming machine including a pair of adjacent shafts in substantially parallel arrangement, said shafts carrying cooperating rolls for forming corrugations in the rim blank and turning flanges along the edges thereof, said rolls being capable of adjust-

ment to adapt them for the shaping of rims of different widths.

5. A rim forming machine including a pair of adjacent shafts in substantially parallel arrangement, said shafts carrying cooperating rolls for forming corrugations in the rim blank and turning flanges along the edges thereof, one of said rolls being expansible and collapsible longitudinally of its shaft to make it possible to give the flanges an inclination by bending them inwardly beyond planes at right angles to the tread of the rim, said planes contacting the rim at its extreme edges.

6. A rim shaping element for a machine of the character described comprising a rotatable shaft, roller elements upon said shaft and secured against rotation relatively thereto, other roller elements between the first-named roller elements, and means for causing simultaneous rotation thereof relatively to the first-named roller elements.

7. A rim shaping element for a machine of the character described comprising a rotatable shaft, roller elements upon said shaft and secured against rotation relatively thereto, other roller elements between the first-named roller elements, and means for causing a partial rotation of the second named roller elements relatively to the first named roller elements.

8. In a machine of the character described, a framework, a pair of shafts rotatably mounted therein and capable of being caused to relatively approach toward or recede from each other, shaping rolls on said shafts adapted to cooperate with each other in the shaping of rims, and two pairs of guiding rolls carried by the framework, one on the front and one on the back of the machine, in a position to engage opposite edges of the rim blanks to position the same relatively to the forming rolls.

9. Mechanism for use in a rim-forming machine, comprising a rotatable shaft, a pair of roll elements non-rotatably connected to said shaft, a plurality of roll elements located between said first-named roll elements, and means to oscillate the second-named roll elements about the shaft whereby longitudinal movement of the first-named roll elements along the shaft may be caused or permitted.

10. Mechanism for use in a rim forming machine, comprising a rotatable shaft, a pair of roll elements non-rotatably connected to said shaft, a plurality of roll elements located between said first named roll elements, cam means to oscillate the second named roll elements about the shaft whereby longitudinal movement of the first named roll elements along the shaft may be caused or permitted, and means to selectively adjust the cams to one of a plurality of possible positions.

11. Mechanism for use in a rim forming machine, comprising a rotatable shaft, a pair of roll elements non-rotatably connected to said shaft, a plurality of roll elements located between said first named roll elements, cam means to oscillate the second named roll elements about the shaft whereby longitudinal movement of the first named roll elements along the shaft may be caused or permitted, and means to selectively adjust the cam to a plurality of possible positions, in combination with turning-in means to force inwardly flanges formed on the edges of the rim blank by the first named roll elements.

12. In a machine of the character described, a substantially vertically arranged frame element, a substantially horizontal supporting arm carried by the frame element, said arm being mounted to swing in a substantially horizontal sector, guiding rolls adjustably carried by said arm, and means for adjusting the rolls longitudinally of the arm.

13. In a structure of the character described, a frame member, a supporting element attached to said frame member, a bracket carried by said supporting element, a supporting arm carried by the bracket and pivoted on said bracket so as to be capable of swinging in a substantially vertical plane, and guiding elements adjustably carried by said arm.

14. In a machine of the character described, a frame member, a shaft extending therethrough and rotatable therein, a rim forming roll on said shaft, supporting arms supported by said frame member and adjustable toward and away from the axis of the rim, supporting and guiding members carried by and movable along said arms, said members having axes extending substantially perpendicular to the length of the arms, and guiding rollers rotatable on said axes and serving to guide the work to be operated upon, adjustment of the arms toward and from the axis of the rim serving to compensate for the difference in curvature of rims having different diameters.

15. In a machine of the character described, a rotary shaft having a longitudinal groove in the exterior surface thereof, roller elements surrounding said shaft and rotatable with relation thereto, a shaft mounted in said groove and provided adjacent one end with a handle and at a point longitudinally spaced from the handle with means to cause relative rotary motion of the roller elements, means to secure the handle in adjusted position, collars surrounding said rotary shaft and secured thereto in a way to permit longitudinal motion of the collars with relation to the shaft but to prevent rotary motion with relation thereto, said first named means being adapted to cause rotary motion of the roller elements with relation to the collars.

16. In a machine of the character described, cooperating rim forming rolls including means to engage the edges of the rim blank and guide the same while the rim is being formed, said edge engaging means being adjustable with relation to the rolls so that adjustment may be made to compensate for varying widths of rims, means to form flanges along the edges of the rim blank, and means to form corrugations in the tread of the rim substantially simultaneously with the formation of the flanges.

17. A rim forming machine including means for forming flanges along the edges of a rim blank and rolls serving to guide the rim with relation to the flange forming means, said rolls having their rim contacting surfaces arranged at an acute angle to the axis of the rim and hence serving to turn the flanges inwardly beyond planes extending through the edges of the rim.

18. A rim forming machine including a pair of adjacent shafts in substantially parallel arrangement, said shafts carrying cooperating rolls for forming flanges along the edges of a rim blank, in combination with adjustable edge engaging guides to engage the edges of the rim blank and guide the same with relation to the flange forming mechanism, said edge guides being carried by one of the forming rolls.

19. A rim forming machine including a pair of adjacent shafts in substantially parallel arrangement, said shafts carrying cooperating rolls for forming flanges along the edges of a rim blank, in combination with adjustable edge engaging guides to engage the edges of the rim blank and guide the same with relation to the flange forming mechanism, the guides being carried by a flange forming roll and being separately adjustable to make it possible to shift the blank laterally with relation to the flange forming mechanism.

20. In a machine of the character described, a rotary shaft, corrugating rolls secured to said shaft, flanging elements adjacent the corrugating rolls and movable toward and from the same, a cap on the shaft adapted to cooperate with other parts to exert pressure upon the flanging elements to cause them to press against the corrugating rolls, stop means to limit the movement of the flanging elements away from the corrugating rolls, and means cooperating with the cap, the elements and the rolls to force them towards each other.

21. In a rim forming machine, cooperating shafts carrying rim forming rolls, and adjustable edge guides for rims on one of said shafts adjacent the ends of a roll.

22. In a rim forming machine, cooperating shafts carrying rim forming rolls, and adjustable edge guides for rims on one of said rolls and moving therewith during operation of the machine.

23. In a rim forming machine, cooperating shafts carrying rim forming rolls, and adjustable edge guides for rims on each end of one of said rolls and moving therewith during operation of the machine.

24. In a rim forming machine, cooperating shafts carrying rim forming rolls, and edge guides for rims on each end of one of said rolls and moving therewith during operation of the machine, said edge guides being independently adjustable with relation to said rolls.

25. In a rim forming machine, cooperating shafts carrying rim forming rolls, flanging rolls for the rims, and edge guides for the rims on one of said rolls, said edge guides being adjustable with relation to the roll by which carried.

26. In a rim forming machine, cooperating shafts carrying rim corrugating rolls, edge guides for the rims on one of said rolls, said edge guides being adjustable with relation to the roll by which carried.

27. In a rim forming machine, cooperating shafts carrying rim forming and rim corrugating rolls, flanging rolls for the rims, and edge guides for the rims on one of said rolls, said edge guides being adjustable with relation to the roll by which carried.

28. The method of forming a one-piece wheel rim or the like which consists in providing a continuous annular metallic blank, locking said blank against axial movement while subjecting the marginal edges thereof to a bending force to displace said marginal edges radially inward to produce inturned flanges and then displacing the region centrally of and spaced from the flanges radially to produce a corrugated surface.

29. The method of forming one-piece wheel rims or the like which consists in providing a continuous substantially circular metallic blank, rotating said blank while supporting the same against axial and bodily displacement, pressing inward the metal at the opposite edges of the rim while bodily rotating the same and supporting it against axial and bodily displacement to produce inturned flanges, and then displacing the metal of the blank by pressure exerted progressively and radially around the blank to produce corrugated surfaces.

30. The method of forming from sheet metal corrugated and flanged rims for wheels and the like, comprising the steps of rotating a continuous cylindrical band of sheet metal between corrugated forming rolls while supporting the band against axial and bodily displacement, gradually and progressively forcing the edges of the band inwardly to form flanges, and gradually and progressively forming corrugations in the intermediate surface of the band by pressure exerted in-

side and outside thereof by the forming rolls at successive points circumferentially, then rotating the corrugated band between forming rolls while supporting it against axial and bodily displacement.

In witness whereof, I hereunto subscribe my name to this specification.

GEORGE P. KLINE.