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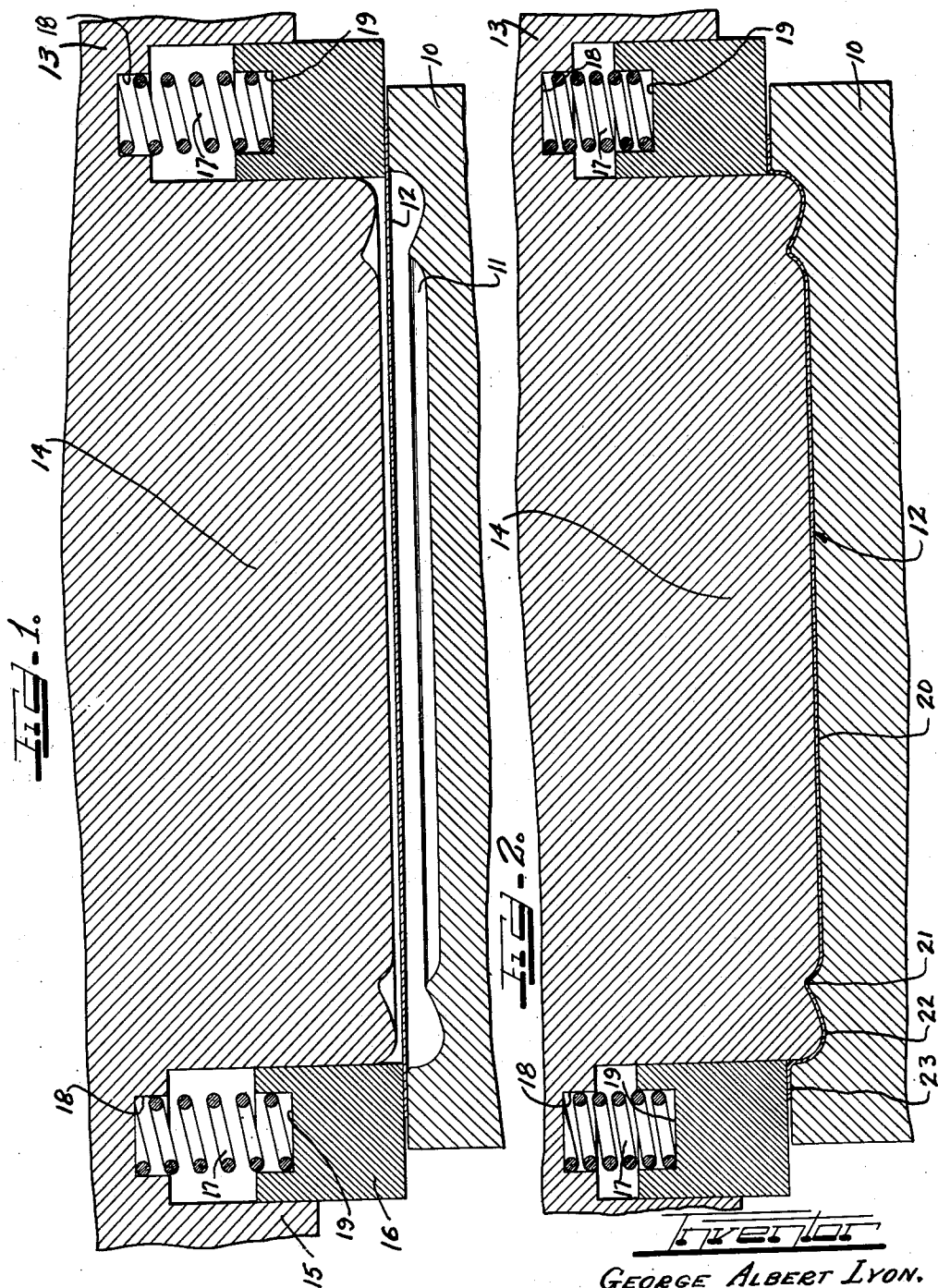
G. A. LYON

2,254,376

METHOD FOR MAKING WHEEL DISKS

Filed June 4, 1938

4 Sheets-Sheet 1



GEORGE ALBERT LYON.

Charles E. Lyon
ATTS.

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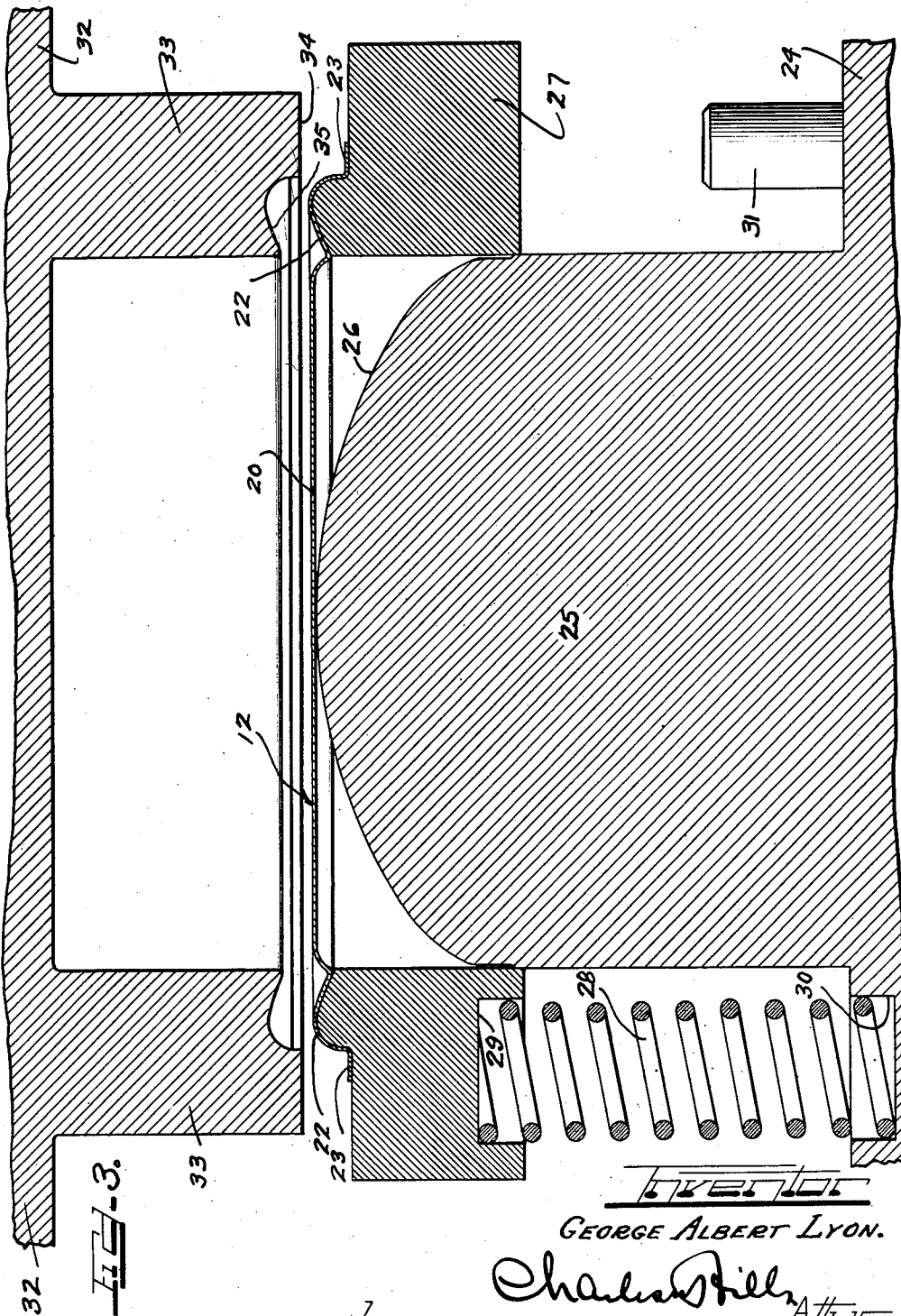
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4 Sheets-Sheet 2



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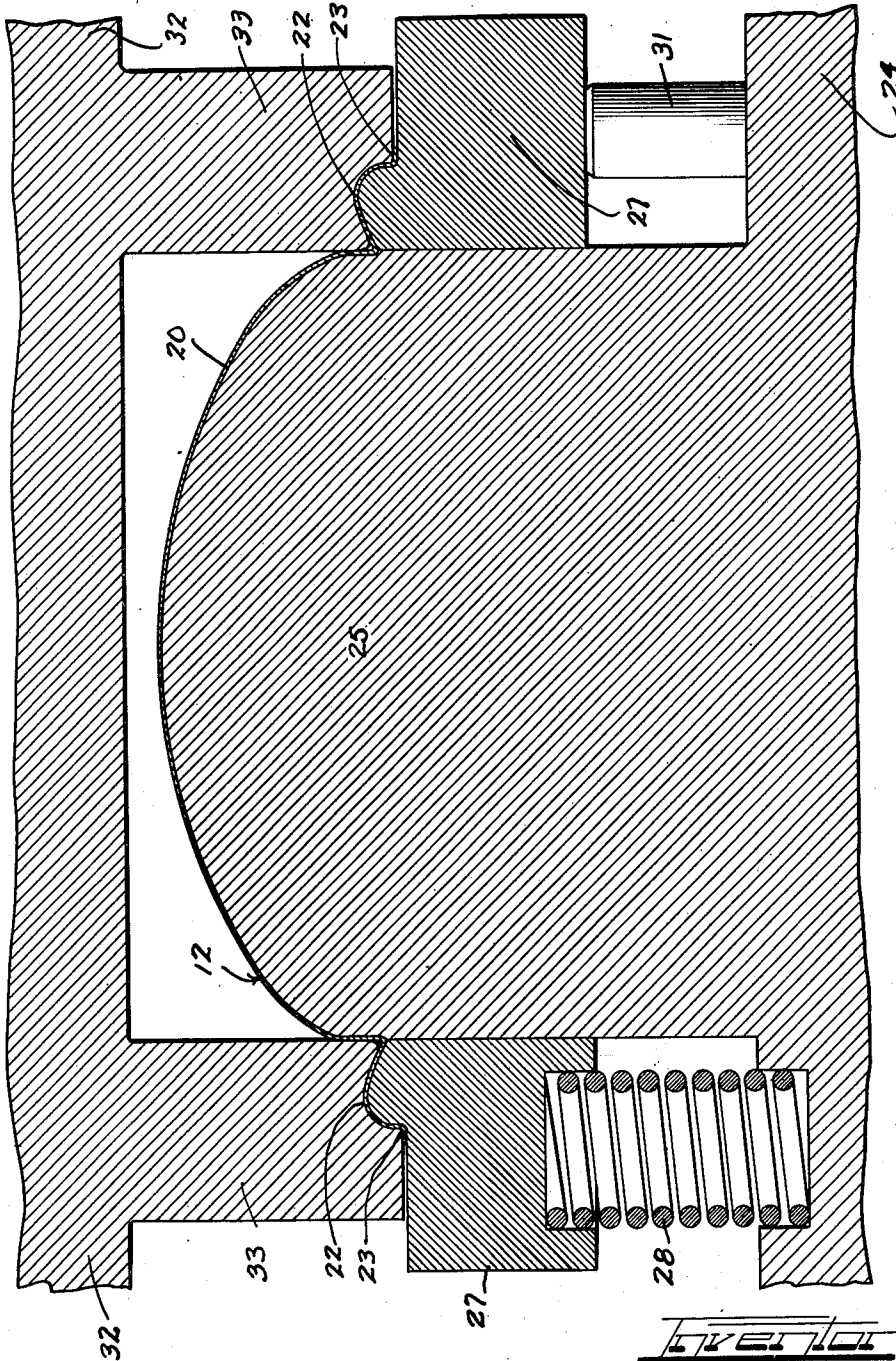
G. A. LYON

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4 Sheets-Sheet 3



GEORGE ALBERT LYON.

Charles E. Lyon
ATTY.

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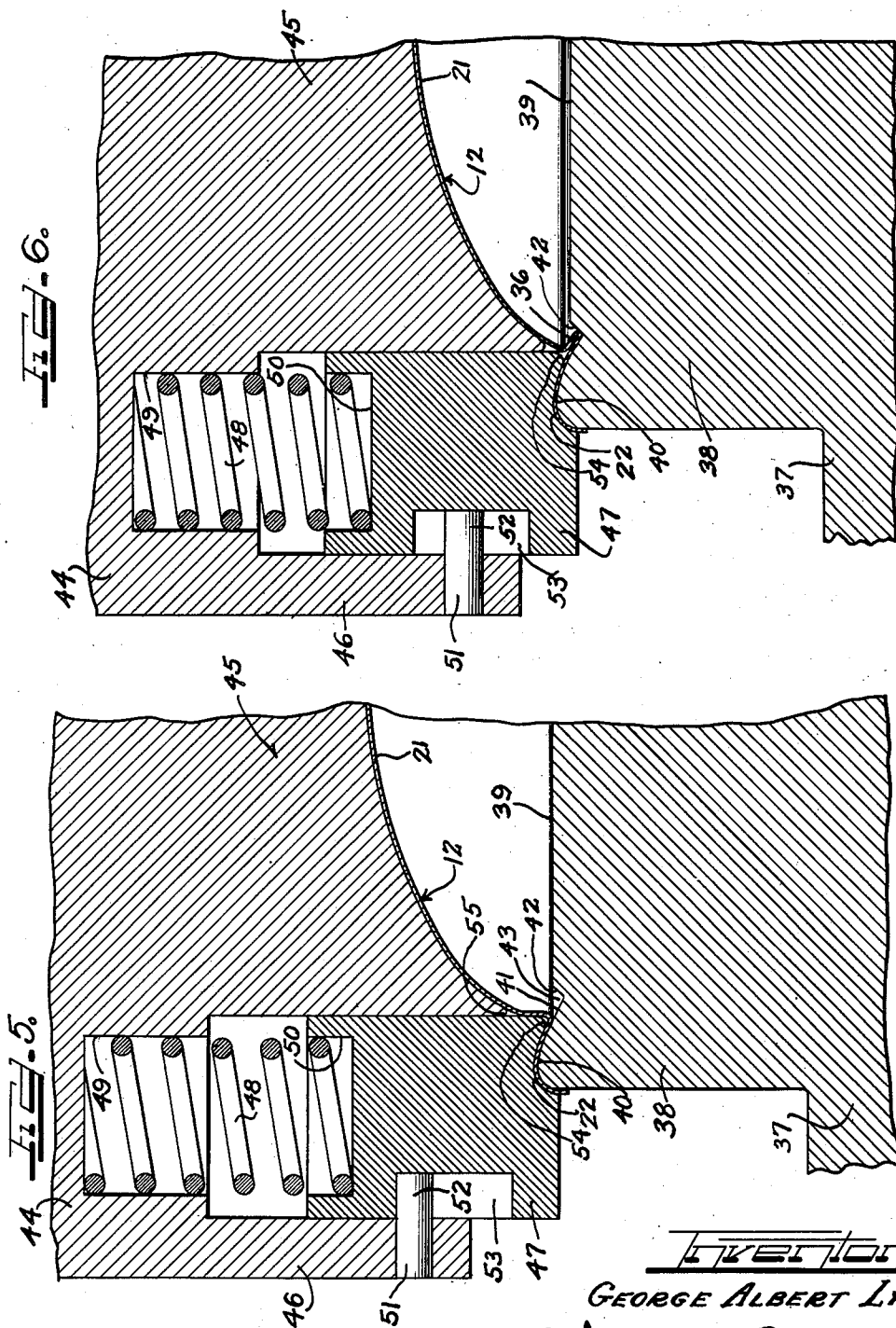
G. A. LYON

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METHOD FOR MAKING WHEEL DISKS

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4 Sheets-Sheet 4



GEORGE ALBERT LYON.

Charles Bell
Att'y.

UNITED STATES PATENT OFFICE

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METHOD FOR MAKING WHEEL DISKS

George Albert Lyon, Allenhurst, N. J.

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3 Claims. (Cl. 113—116)

This invention relates to a method for making wheel disks, and more particularly to a novel method for making wheel disks of the type having an integral folded fastening flanges which provides the wheel disk with a double thickness of metal in that area.

The majority of vehicle wheels of the present day are equipped with ornamental wheel disks over their outer surface. The use of these wheel disks permits the more economical manufacture of vehicle wheels, since the wheels themselves may be designed solely for strength and utility without regard to ornamental appearance, the wheel disk being employed for the latter purpose. The most popular form of wheel disk at the present time is a disk having a highly polished exterior surface. In order to minimize the total cost of the wheel assembly, it is, of course, necessary to minimize the cost of the wheel disk itself as much as possible. The thinner the sheet metal stock is which is employed to manufacture the wheel disk, the greater the saving is in the manufacturing costs. It has been found that a wheel disk may be constructed of a sheet of metal stock having a thickness dimension of such a character that if a single thickness of the metal stock is engaged by the resilient wheel disk fastening elements on the wheel, the metal of the disk would be deformed at that point, but which, when presented as a double thickness of metal at the point on the disk engaged by the wheel disk fastening elements, the metal is not deformed.

It is an object of the present invention to provide a novel method for manufacturing wheel disks possessing the above highly desirable characteristics.

It is another object of this invention to provide a novel method for manufacturing wheel disks which is extremely economical and which provides a resulting product which is rugged and reliable in use.

It is a further object of the present invention to provide a novel method for manufacturing wheel disks having an integral folded fastening flange which provides the wheel disk with a double thickness of metal where it is engaged by the resilient wheel disk retaining elements of the wheel.

It is another and still further object of this invention to provide a novel method for directly forming a double thickness of metal in a wheel disk to provide a fastening flange which extends obliquely axially rearwardly and radially inwardly.

It is a still further object of this invention to

provide a novel process for manufacturing wheel disks.

The novel features which I believe to be characteristic of my invention are set forth with particularity on the appended claims. My invention itself, however, both as to its organization, manner of construction, and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings, in which:

Figure 1 is a cross-sectional elevational view of a die-press in which a flat sheet of metal stock is placed;

Figure 2 is a cross-sectional elevational view of the die-press of Figure 1 showing the initial shape which the sheet metal stock is given in this press;

Figure 3 is a cross-sectional elevational view of a second die-press, showing the metal article as it has been formed in the press of Figures 1 and 2 mounted therein for the second step of the process;

Figure 4 is a view similar to Figure 3 showing the various elements of the press and the metal stock at the conclusion of the forming operation in this press;

Figure 5 is a fragmentary cross-sectional elevational view of a portion of a die-press in which the third step of the novel process is carried out; and

Figure 6 is a view similar to Figure 5 showing the various elements of the press and the metal stock as it appears after the forming operation in this press.

In the various figures of the drawings, I have illustrated a method of and an apparatus for forming an integral folded fastening flange in a wheel disk structure which provides the wheel disk with a double thickness of metal where it is engaged by the resilient wheel disk retaining elements of the wheel. In this instance, the disk structure is of the type that overlies the outer side surface of the vehicle wheel, being held in position upon the wheel by resilient wheel disk retaining elements mounted on and carried by the body part of the wheel, and the outer periphery of the disk falls within the outer circumferential edge of the tire rim.

The apparatus illustrated in Figures 1 and 2 of the drawings is a die-press which includes a lower die or die-block 10 having its upper surface shaped as at 11 to give the desired initial configuration to a piece of sheet metal stock 12.

The mechanism also includes an upper die 13

carrying a central depending die portion 14 complementary in character to the die 11 of the die block 10. Spaced from the central die part 14 is a depending fixed ring 15. In the space between this ring 10 and the die part 14 is a reciprocable hold down ring 16, which is normally urged downwardly by a plurality of springs 17, or the equivalent, each of which is seated in confronting recesses 18 and 19 in the die 13 and reciprocal hold down ring 16 respectively. The downward and outward movement of the hold down ring 16 is limited in any suitable manner (not shown). As the die member 13 is in Figure 1, it is shown in a position immediately above the piece of sheet metal stock 12 with the hold down ring 16 engaging the sheet metal stock 12 around its outer edge and holding it in desired position.

The sheet metal stock 12 which has been placed in the die press in Figure 1 may be of any suitable material, but is preferably a relatively thin sheet of stainless steel having a slightly resilient characteristic.

In Figure 2 of the drawings, the upper die member 13 of the press illustrated in Figure 1 has been moved under high pressure to its lowermost position. In this position, the sheet of metal stock 12 has been drawn to the shape illustrated in Figure 2, or in other words, to the shape provided by the die surface 11 of the lower die block 10. Specifically, the sheet metal stock 12 now includes a flat central portion 20, an annular groove or depressed portion 21, an annular ring portion 22 and a hold down portion 23. It is to be noted that the hold down portion 23 is slightly smaller than the hold down portion as shown in Figure 1 for the reason that the metal stock as it is drawn to form the central portion 20, the groove portion 21 and the ring portion 22 is permitted to slip slightly in the hold down area.

The upper die member 13 of the die press of Figures 1 and 2 is now raised and the metal form 12 is removed therefrom. Thereafter, it is reversed and set in a die press preferably of the character shown in Figure 3. As shown, the die press in Figure 3 includes a lower die block 24 having an upstanding central die portion 25 which terminates in a dome shaped die surface 26. Extending around the upstanding die portion 25 is a reciprocable hold down ring 27 which is normally urged upwardly by a plurality of springs 28 circumferentially spaced about the central die portion 25. The springs 28 are preferably seated in confronting recesses 29 and 30 in the hold down ring 27 and die block 24 respectively. The lowermost position of the hold down ring 27 is limited by a plurality of stop blocks 31 mounted on the lower die block 24 and spaced between the springs 28. The upward movement of the hold down ring 27 caused by the biasing force of the springs 28 is limited in any suitable manner (not shown).

The press illustrated in Figure 3 also includes an upper die member 32 having a depending die ring 33. The lower surface of the die ring 33 includes a flat hold down portion 34 and a die portion 35, which is provided with the same configuration as the upper surface of the ring portion 22 of the metal stock.

As the upper die member 32 is lowered, the hold down portion 34 of the depending die ring 33 engages the hold down portion 23 of the sheet metal article 12 and the die portion 35 at the same time engages the ring 22 to firmly hold the outer por-

tion of the metal article 12 in place. As the downward movement of the upper die member 32 continues, the metal in the central portion 20 of the metal article 12 is drawn over the dome-shaped lower die surface 26 of the die block 25. This downward movement of the upper die member 32 continues until the hold down ring 27 abuts the stop members 31 on the die block base 24. The metal article 12 now has the configuration as shown in Figure 4 of the drawings, and the various members of the press at the conclusion of this second step of the process are clearly shown in Figure 4.

It will be observed that during the drawing operation in the press shown in Figures 3 and 4, the metal which forms the hold down portion 23 in the article 12 has slipped slightly, thus making the width of the annular band which forms the hold down portion 23 slightly less in width than it was prior to this second forming or drawing operation.

The upper die member 32 is now raised, and the metal article 12 is removed from this press and put into a third press for the purpose of forming a double thickness integral folded flange 36 (see Figure 6). One form of die press which has been found highly satisfactory for this purpose has been illustrated in Figures 5 and 6 of the drawings, only that portion of the press which is essential to a clear understanding of the carrying out of this step of the process, however, being illustrated, in order to simplify the drawings as much as possible commensurate with a clear understanding of the invention.

Referring first to Figure 5, the die press which is fragmentarily illustrated therein includes a lower die block 37 having an upstanding central die portion 38. The upstanding central die portion 38 includes a flat central portion 39 which does not engage the metal article 12 and an annular die surface 40 which is shaped to have the ring portion 22 intimately seated thereon. The die surface 40, however, continues downwardly as at 41, at an oblique angle, and then upward as at 42, at a second oblique angle, as is clearly shown in the drawings. The obliquely inclined surfaces 41 and 42 form an annular groove or forming space in which the integral depending flange 36 will be formed in a manner presently to be described.

The die press illustrated in Figure 5 also includes an upper die member 44 which is provided with a central depending die portion 45 complementary in character to the dome-shaped configuration of the metal article 12. Spaced from the central die part 45 is a depending fixed ring 46, and in the space between the fixed ring 46 and die part 45 is a reciprocable hold down ring 47, which is normally urged downwardly by a plurality of springs 48 or the equivalent, each of which is seated in confronting recesses 49 and 50 in the die member 44 and the hold down ring 47, respectively. The downward movement of the hold down ring 47 is limited by a plurality of pins 51 each firmly fixed in the stationary ring 46 and having an end portion 52 which extends into a suitable recess 53 in the hold down ring 47. As the hold down ring 47 is seen in Figure 5, it is in its lowermost or outer position, with the inner horizontal edge of each respective slot 53 abutting a pin 51.

The inner lower corner of the hold down ring 47 is preferably rounded off, as at 54, and the outer lower corner of the depending central die portion 45 is also preferably rounded off as at 55.

As the upper die member 44 is moved downwardly under pressure, the metal in the metal part 12 at the junction point of the ring portion 22 and the central dome-shaped portion 20 is rolled or forced downwardly along the inclined surface 41 of the forming space 43. This progressive unrolling of the metal continues until it abuts the inclined surface 42 of the forming space 43; whereafter, upon continued downward movement of the upper die member 44, the integral folded fastening flange 36 is completed, as is shown in Figure 6 of the drawings, with a double thickness of metal pressed tightly together.

Either prior to the insertion of the metal article 12 into the die press, as shown in Figure 5, or after the metal article has been removed from the die press after the forming operation, as shown in Figure 6, the hold down marginal portion 23 is trimmed off.

The metal article 12, which is now in the form of a wheel disk, is now removed from the die press after its flange forming operation, as shown in Figure 6, and any final finishing or polishing steps may thereafter be performed upon it to place it in its final condition for use on a vehicle wheel. Due to the fact that there is a folded double thickness of metal in the fastening flange 36 of the wheel disk, the wheel disk at this point is capable of withstanding greater forces without permanent disforming than it is throughout the remainder of its area where there is only a single thickness of metal. The wheel disk formed by the above described process is arranged to be snapped over the wheel disk retaining elements carried on a vehicle wheel and to be retained on the wheel thereby. Since the wheel disk retaining elements of a vehicle wheel are relatively stiff, it is clear that an increase in strength of the wheel disk in its fastening flange portion is not only desirable but necessary to prevent any disforming of the wheel disk at this point when relatively thin sheet metal stock has been employed in making the disk.

While I have shown particular embodiments of my invention, it will, of course, be understood that I do not wish to be limited thereto, since many modifications may be made, and I, therefore, contemplate by the appended claims to cover all such modifications as fall within the true spirit and scope of my invention.

I claim as my invention:

1. The method of forming a folded flange in a circular member having a crown-like top portion, an outer portion, and an upstanding cylindrical side wall connecting said portions, which includes: holding said outer portion against

movement and subjecting said crown-like top portion to endwise pressure to force said side wall against a conical forming surface adjacent said outer portion, which surface extends obliquely inwardly at an obtuse angle with respect to the side wall, and positioning a cylindrical guiding surface around said side wall for restraining outward collapse of said side wall, thereby to collapse said side wall obliquely inwardly along said forming surface from the held outer portion to form an obliquely extending folded flange from the wall between the top and outer portions.

2. The method of forming a folded flange in a circular member having a crown-like top portion, an outer portion, and an upstanding cylindrical side wall connecting said portions, said outer portion extending away from said cylindrical wall at an acute angle with respect thereto, which includes: holding said outer portion against movement and subjecting said crown-like top portion to endwise pressure to force said side wall against a conical forming surface adjacent said outer portion, which surface extends obliquely inwardly and at an obtuse angle with respect to the side wall and substantially in line with the outer portion, and positioning a cylindrical guiding surface around said side wall for restraining outward collapse of said side wall, thereby to collapse said side wall obliquely inwardly along said forming surface from the held outer portion to form an obliquely extending folded flange from the wall between the top and outer portions.

3. The method of forming a folded flange in a circular member having a crown-like top portion, an outer portion, and an upstanding cylindrical side wall connecting said portions, which includes holding said outer portion against movement and subjecting said crown-like top portion to endwise pressure to force said side wall against a conical forming surface adjacent said outer portion, which surface extends obliquely inwardly and at an obtuse angle with respect to the side wall, positioning a cylindrical guiding surface around said side wall for restraining outward collapse of said side wall, and providing an abutment surface on the forming surface to limit the inward collapse of the wall along the forming surface, thereby to collapse said side wall obliquely inwardly along said forming surface up to said abutment surface from the held outer portion to form an obliquely extending folded flange from the wall between the top and outer portions.

GEORGE ALBERT LYON.