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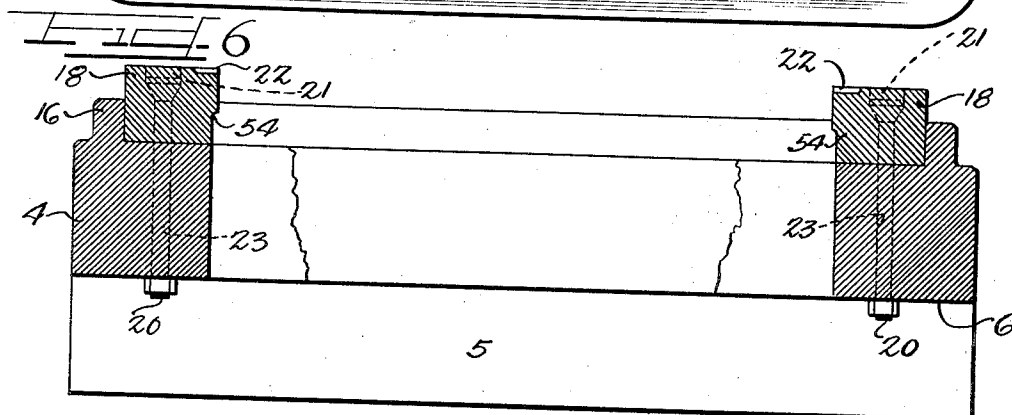
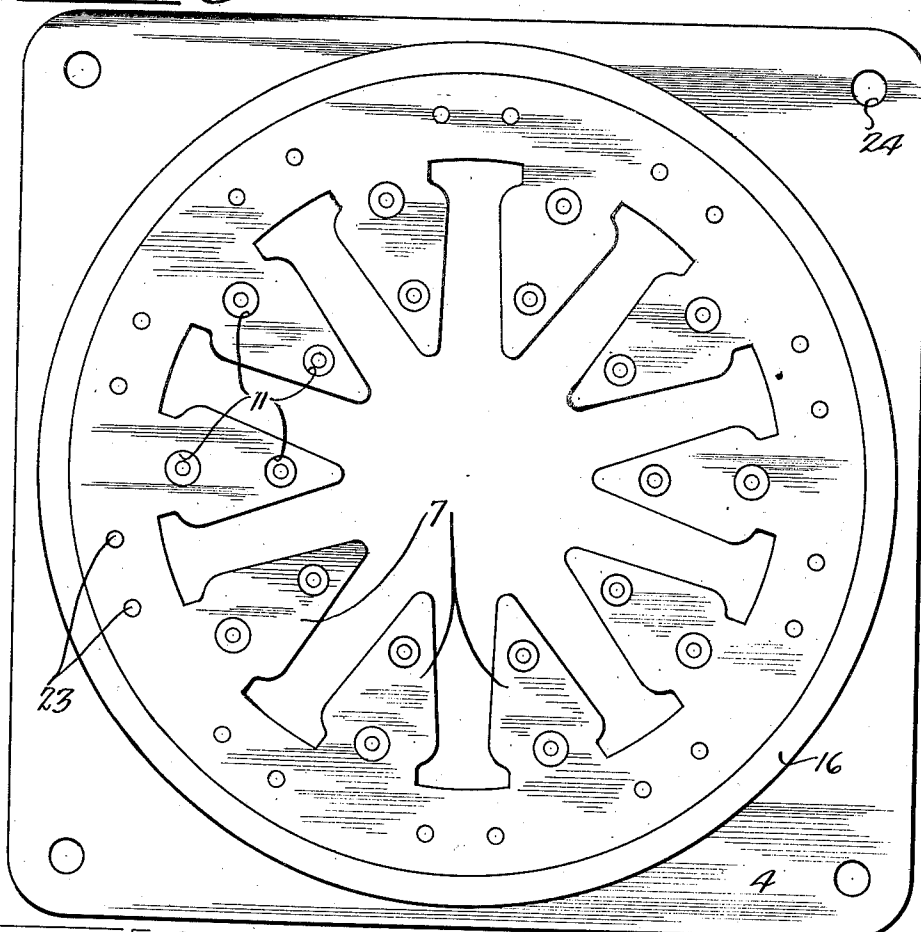
A. R. JAYNE

PUNCH AND DIE CONSTRUCTION

Filed Nov. 12, 1924

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~~Fig. 3~~ 3



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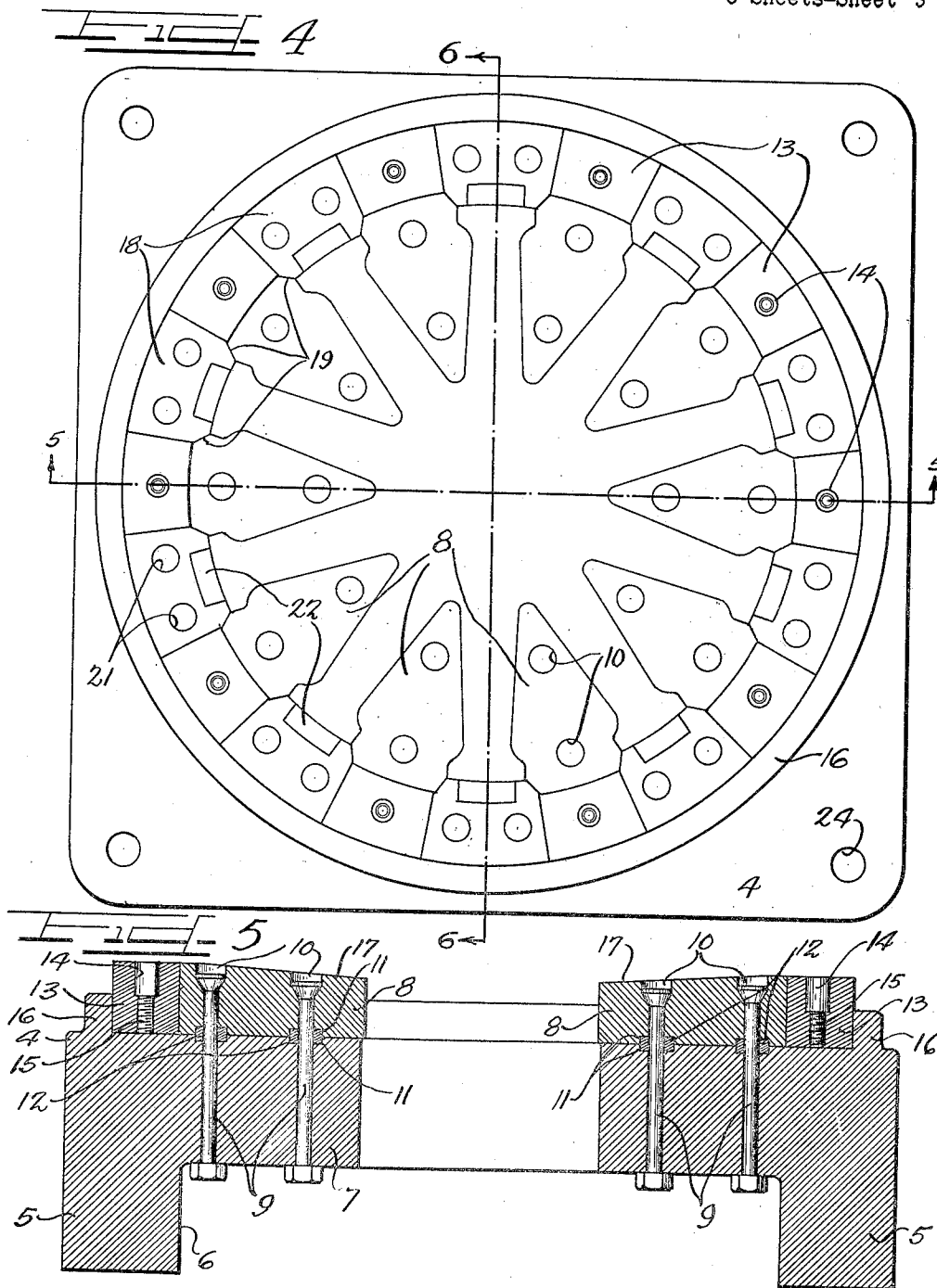
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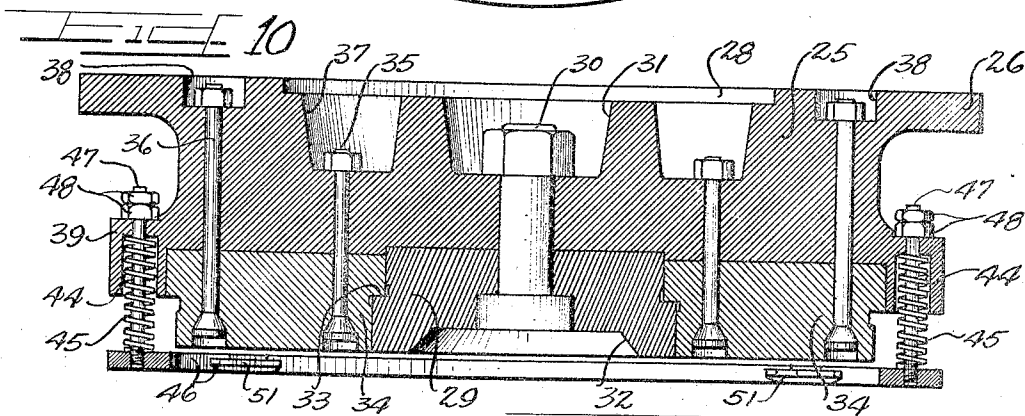
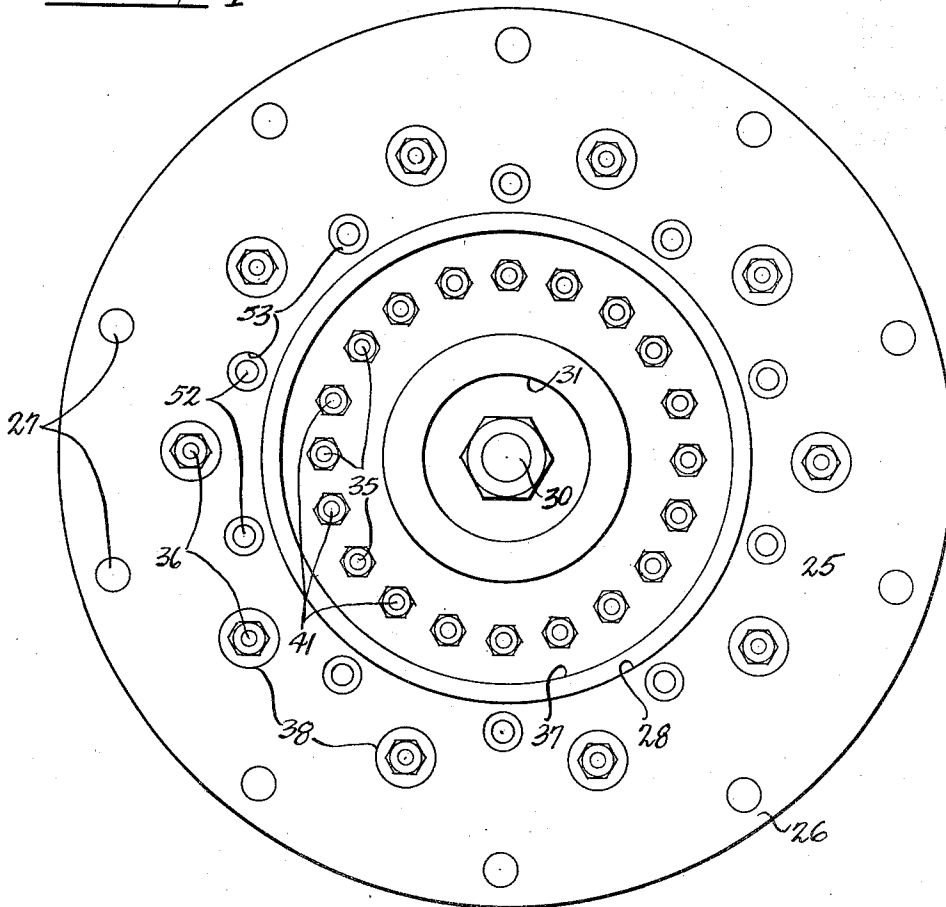
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FIG. 7



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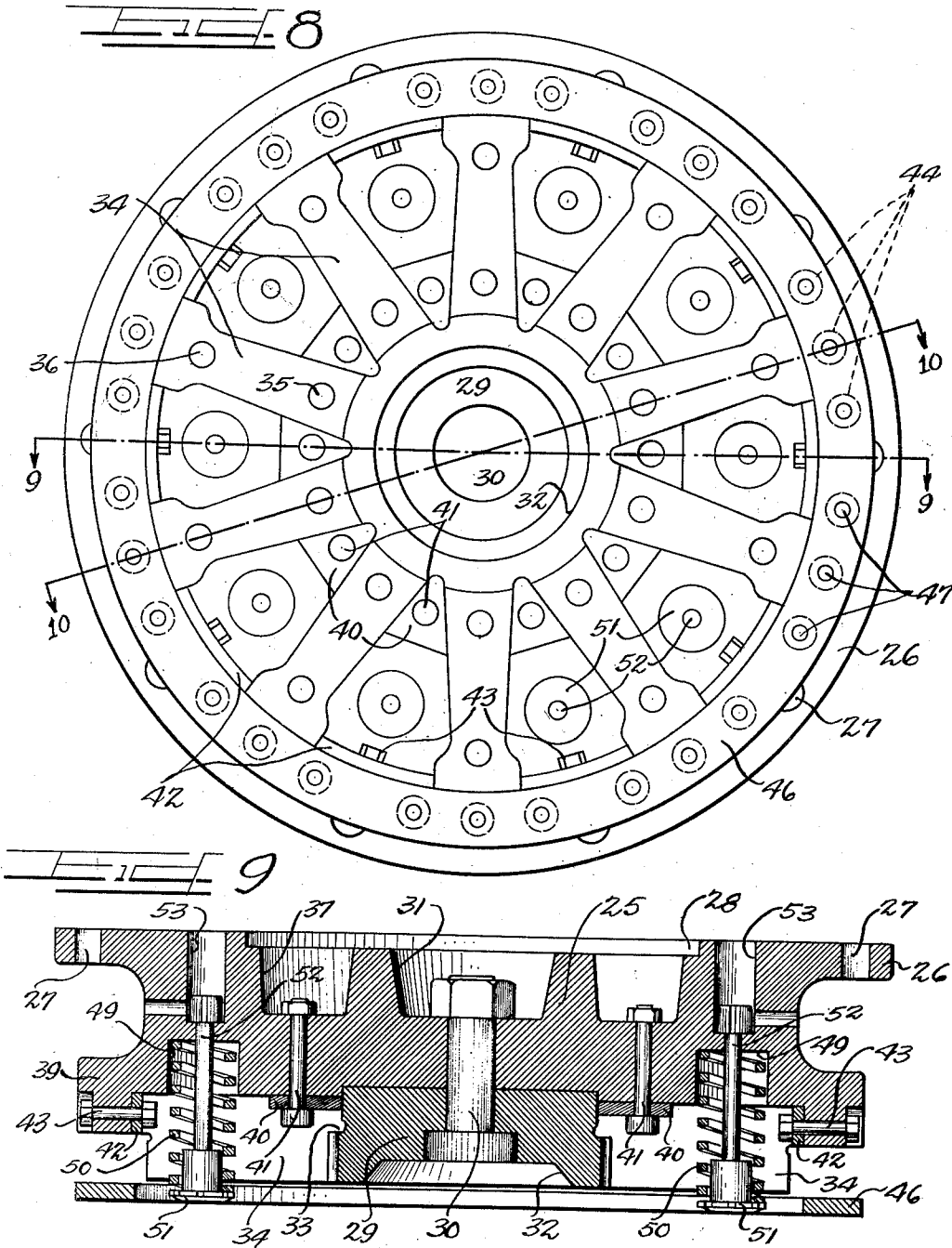
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PUNCH AND DIE CONSTRUCTION

Filed Nov. 12, 1924

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

AMES R. JAYNE, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN STEEL WHEEL CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PUNCH AND DIE CONSTRUCTION.

Application filed November 12, 1924. Serial No. 749,480.

To all whom it may concern:

Be it known that I, AMES R. JAYNE, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in a Punch and Die Construction; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

Heretofore, in the production of stampings or blanks for use in making vehicle wheels, pulleys, tire racks and the like, at least twelve distinct mechanical operations have been required, thereby making the cost of producing pressed steel stampings prohibitive. The production of an automobile wheel stamping under the present method requires first an operation to punch out a round disc after which a second operation is required for the purpose of punching out a center hole for spacing and then subjecting the round disc to ten separate or distinct operations each of which is adapted to punch out by the aid of a spacing arrangement ten parts from between the spokes to produce the required wheel stamping as the result of twelve mechanical operations.

This invention relates more particularly to an improved rapid production automatic punch and die mechanism adapted to rapidly produce steel stampings or blanks for making pressed all-steel automobile or vehicle wheels, pulleys, tire racks and the like in but a single mechanical operation of the improved punch and die mechanism of this invention.

It is an object of this invention to produce a rapid production automatic punch and die adapted to produce a clear cut stamping for a pressed steel vehicle wheel by a single operation of the punch and die mechanism.

It is also an object of this invention to provide a punch and die mechanism adapted with a single operation to punch out an automobile wheel blank permitting the blank to be crowded through the die mechanism by following blanks until the lowermost blank reaches an enlarged portion of

the die permitting the blank to fall upon a conveyor to be carried to a machine adapted for forming wheels from the blanks.

It is a further object of this invention to produce a rapid production automatic punch and die adapted to punch out with a single operation a vehicle wheel blank and provided with a plurality of stripper mechanisms adapted to strip the resultant scrap from the punch mechanism after a stamping operation, so that the steel strip from which the blanks are punched may be advanced at predetermined times between the punch and die devices.

It is furthermore an object of this invention to provide a punch and die mechanism adapted with a single operation of said mechanism to punch from a sheet of metal a one-piece vehicle wheel blank and cause the blank to be crowded through the die which is constructed without any relieving clearance so that the die may be filled with stampings which may be consecutively crowded out of the die to drop upon a conveyor mechanism.

It is still another object of this invention to provide a rapid production punch and die adapted with a single operation to punch from a sheet of steel a vehicle wheel blank with the die so constructed that the punched out wheel blanks are permitted to be stacked up within the die thereby greatly reinforcing and strengthening the die structure during the time that wheel blanks are being produced.

It is an important object of this invention to provide a punch and die of improved and simplified construction adapted to rapidly produce with each operation of the punch and die a complete one-piece vehicle wheel blank or stamping which is crowded through the die and is eventually permitted to drop upon a conveyor to be conducted to a wheel forming machine.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a vertical section through a rapid production punch and die mechanism of this invention illustrating the punch in its up-stroke position above a steel strip on the die in a position ready to have a wheel blank punched therefrom.

Figure 2 is a similar vertical section of the punch and die mechanism with the punch in its down-stroke position coacting with the die.

Figure 3 is a top plan view of the die plate or frame with the die blocks and die backing blocks removed.

Figure 4 is a top plan view of the die frame with the die blocks in position.

Figure 5 is a transverse section of the die taken on line 5—5 of Figure 4.

Figure 6 is a transverse section of the die taken on the line 6—6 of Figure 4 with parts broken away.

Figure 7 is a top plan view of the punch mechanism of this invention.

Figure 8 is a bottom plan view of the punch mechanism.

Figure 9 is a transverse detail section of the punch mechanism taken on line 9—9 of Figure 8.

Figure 10 is another transverse detail section of the punch mechanism taken on line 10—10 of Figure 8.

As shown on the drawings:

The reference numeral 1 indicates a strip of steel adapted to be advanced between a punch and die mechanism to have one piece vehicle wheel blanks 2 struck therefrom, one at a time with each operation of the punch and die mechanism and adapted to be dropped upon a roller conveyor 3 provided below the die for the purpose of carrying away the discharged vehicle wheel blanks.

The die mechanism of this invention comprises a heavy solid cast steel frame 4 having two oppositely disposed parallel ribs or downwardly directed flanges 5 which together with the bridging frame 4 form a tunnel or recess 6 through which the blanks or stampings are permitted to fall before dropping upon the conveyor 3. The die frame 4 is formed with a plurality of integral radially directed cantilever prongs or supporting arms 7. Supported upon the cantilever prongs or supporting arms 7 of the die frame are a plurality of tool steel die blocks 8 that are adapted to punch and shear the spaces between the spokes of the wheel blanks or stampings produced by the punch and die mechanism. The die blocks 8 are rigidly held in position on the cantilever arms 7 of the die frame by body bound cone head retaining bolts 9 the heads of which are countersunk in recesses 10 provided in the upper face of each of said die blocks. The heads of the retaining bolts 9

are thus sufficiently sunk or seated in the die blocks to allow for repeated resharpenings of the die blocks without interfering with the heads of said bolts.

Both the die blocks 8 and the frame arms 7 are provided with recesses 11 (Figure 5) at their meeting or contacting surfaces through which the retaining bolts 9 project. The recesses in the die blocks are positioned to register with the recesses in the frame arms 7 to afford pockets for the reception of hard tool steel keeper rings 12. The keeper rings 12 are provided for the purpose of relieving the bolts 9 from side shearing stresses and forces thereby permitting the bolts 9 to serve only as a vertical tightener medium between the die blocks 8 and the die block supporting arms 7 of the die frame.

Positioned immediately behind or to the outside of the die blocks 8 are a plurality of tight fitting mild steel backing blocks or spacing shoes 13 each of which is provided with a recess 14 the lower end of which is of a reduced diameter and threaded as at 15 (Figure 5) for the reception of lifting bolts. The spacer blocks or shoes 13 are positioned between the outer ends of the die blocks 8 and a circumferential ring or flange 16 which is integrally formed upon the upper face of the die frame 4. The spacer blocks 13 are provided to prevent movement of the die blocks 8 outwardly from the center of the die under heavy strains. Each of the die blocks 8 has the upper face thereof ground or finished to afford a bevelled surface as indicated by the reference numeral 17 so that the die blocks considered in a group are dished toward the center of the die or provide a concave surface. The dishing or bevelling surface of the die blocks 8 starts a short distance from the ends of the die blocks which are contacted by the spacer blocks 13. Separating the backing blocks 13 are a plurality of spoke tip die blocks 18 which act to punch and shear the spoke tip parts of the stamping or blank 2. The dishing effect of the die blocks 8 starting a short distance from the point of contact of the die blocks 8 with the corners of the spoke tip die blocks 18, tends to give the assembled die approximately a twenty per cent punching effect and eighty per cent shearing effect thus requiring a minimum amount of power to actuate the assembled die when the punch and die mechanism is in operation.

The spoke tip die blocks 18 have the corners at the inner ends thereof bevelled at 19 (Figure 4) to obviate sharp corners. The spoke tip die blocks 18 are drilled with a plurality of holes or passages for the reception of bodybound cone head retaining bolts 20 the ends of which are countersunk in the upper ends of the passages 21 as indi-

cated in Figure 6. The cutting edge of each of the spoke tip die blocks 18 is provided with an arc shaped recess or pocket 22 the ends of which stop short of the bevelled corners 19 of said spoke tip die blocks. This construction of the cutting edge of the spoke tip die blocks 18 gives said blocks a punching effect which is considerably less than the shearing effect of said blocks. As illustrated in Figure 6 the die frame 4 below each of the spoke tip die blocks 18 is provided with a pair of drillings or passages 23 to permit the bolts 20 to project there-through to rigidly hold the spoke tip die blocks 18 secured in place.

The various groups of die blocks 8, 13 and 18, when rigidly secured in position upon the die frame 4 as illustrated and described, produce an assembled die of rigid construction which may be very easily reground as a whole by simply putting the assembled die on a boring mill and grinding the surface of the assembled die with a cup shaped emery wheel driven by a motor or other suitable means attached to the tool post of the boring mill. As illustrated in Figures 3 and 4 each of the four corners of the die frame 4 is provided with a drilling or hole 24 for the reception of a bolt which serves to fasten the die frame to the platen of a hydraulic or mechanical punch press.

Figures 7 to 10 inclusive, illustrate the improved punch mechanism which consists of a heavy solid circular cast steel frame 25 the top of which is provided with an integral circumferential flange 26 having a plurality of equidistantly spaced apertures or holes 27 therein for the reception of bolts whereby the punch frame 25 may be securely fastened to the face of the ram of a hydraulic or mechanical punch press. The upper face of the punch frame 25 is recessed to afford a female spigot opening 28 to receive a male spigot boss provided on the face of the ram of the punch press thereby holding the punch frame when secured to the ram in a firm position. The firm mounting of the punch frame upon the punch press ram is essential to the successful operation of the punch and die mechanism owing to the close limits of clearance between the punch unit and the die unit of this invention.

The middle portion of the bottom face of the punch frame 25 is recessed to receive the inner end of a hardened tool steel hub 29. The hub 29 is rigidly held in place by a heavy master bolt 30 which is positioned in the exact center of the punch frame 25. The hub 29 is recessed to receive the head of the bolt 30 while the upper face of the punch frame 25 is provided with a central recess 31 in which the nut of the bolt 30 is seated. The bottom face of the hub 29 is counter bored at its center to form the bevelled recess 32 to reduce the punching surface as

much as possible thereby reducing the regrinding operation. The punch hub 29 is offset at 33 for the purpose of affording a shoulder 33 which acts to hold down and clamp a plurality of spoke punches 34 in place. The shoulder of the punch hub relieves retaining bolts 35 and 36 of said spoke punches of their greatest strain at the moment the punches are receding on their upstroke and the scrap portion of the metal sheet 1 is stripped from the punches. The bevelled heads of both the retaining bolts 35 and 36 are countersunk in the punch faces of the spoke punches 34 as illustrated in Figure 10 thereby permitting many regrindings of the punch surfaces of said spoke punches. The upper portion of the punch frame 25 is provided with a circular recess or groove 37 in which the nuts of the bolts 35 are seated. The upper face of the punch frame 25 is also provided with a plurality of recesses 38 for receiving the nuts of the bolts 36.

The spoke punches 34 radiate from the punch hub 29 and as described are held in place by means of the bolts 35 and 36 and by means of the shoulder portion of the punch hub 29. The outer ends of the spoke punches fit tightly into a circumferential stripper spring cage or ring flange 39.

For the purpose of protecting the spoke punch mechanisms against distortion under heavy strains, triangular flat steel brace plates 40 are tightly fitted between the converging ends of the spoke punches 34 and are seated in the crotches formed by said spoke punches as illustrated in Figure 8. The punch crotch plates 40 are securely held in position by means of bolts 41.

Inserted between the outer tip ends of the spoke punches 34 are curved flat steel keepers or separating plates 42 which serve to prevent transverse movements of the outer tip ends of said spoke punches and furthermore act to relieve the spoke punch holding bolts 36 from excessive side strains. The keeper plates 42 are fastened against the inner peripheral surface of the spring cage 39 by means of bodybound bolts 43. A series of pockets 44 are bored into the bottom face of the stripper spring cage 39 for the purpose of housing the upper ends of tempered square wire springs 45 the lower or outer ends of which seat against and actuate a stripper ring 46. The stripper ring 46 is provided for the purpose of stripping the scrap parts of the metal strip 1 from which the vehicle wheel stampings or blanks are punched. Threaded into the threaded apertures provided in the stripper ring 46 are the lower threaded ends of bolts 47 which project upwardly through the springs 45 and through suitable apertures in the top wall of the stripper spring cage 39. Nuts 48 are engaged on the upper projecting ends

of the stripper ring supporting bolts 47 and may be adjusted to limit the movement of the stripper ring 46 by the springs 45.

The bottom face of the punch frame 25 is bored to provide a plurality of equidistantly spaced recesses or pockets 49 with the said pockets positioned between the spoke punches 34. Seated in the pockets 49 are the upper ends of heavy tempered square steel wire springs 50 (Figure 9) the lower ends of which seat against individual stripper heads 51 which are supported on the lower ends of slidable bolts 52, the upper headed ends of which are slidably positioned in recesses 53 provided in the upper portion of the punch frame 25. The individual strippers 51 are provided for the purpose of stripping the scrap parts of the metal strip 1 from between the spokes of the stamping or wheel blank punched from said steel strip of material.

The side walls of all of the die parts in both the punch and the die mechanisms are constructed at perfect angles of 90° without any relieving clearance. This construction produces a crowding effect of the punched out vehicle wheel stampings or blanks in the die mechanism, thereby causing the die mechanism to be filled with stampings 2 as illustrated in Figure 2 so that each time a new stamping is delivered into the die mechanism the lowermost stamping in the stack of stampings within the die mechanism is discharged downwardly through the punch frame 4 and through the tunnel 6 for delivery upon the conveyor 3 as illustrated in Figure 2. The arrangement whereby a large number of stampings 2 are permitted to stack one upon the other within the die mechanism acts to greatly reinforce and strengthen the die structure thereby making it safe to use the punch and die mechanism for the rapid production of vehicle wheel stampings which when produced and discharged from the die mechanism are rapidly carried away by the conveyor 3.

The cutting faces of the spoke tip die blocks 18 are relieved at 54 (Figure 6) so that after a stamping 2 is crowded into the relieved or enlarged space provided between the spoke tip die blocks 18 the side cutting face of the die blocks 8 are only crowded by the edges of the spoke portions of the stamping thereby insuring a prompt and direct drop of the stamping onto the conveyor 3.

The operation appears to be self-evident and when a strip of metal 1 is fed into position between the punch and die mechanisms of the invention as illustrated in Figure 1 the punch may be operated by the ram of a suitable punch press so that with but a single operation of the punch a one piece or unitary vehicle wheel stamping or blank is struck from the sheet of metal 1. With the

upward or return stroke of the punch mechanism the stamping 2 is stripped from said punch mechanism by means of the stripper ring 46 assisted by the individual strippers 51. The strippers 51 as hereinbefore described, act to strip the scrap projections of the metal strip from between the spokes of the stamping thereby permitting the stamping to be left within the die mechanism crowded against the side cutting faces of the die blocks 8 and against the cutting faces of the spoke tip die blocks 18 until said stamping has been crowded downwardly a sufficient distance to pass into the relieved portions 54 of the spoke tip die blocks 18. From this point the stamping is permitted to drop downwardly between the die block supporting arms or prongs 7 of the punch frame. It will be noted that with each operation of the punch and die mechanism of this invention that a complete unitary automobile or vehicle wheel stamping or blank is produced ready to be discharged upon the conveyor 3 which acts to carry the stampings to a vehicle wheel forming machine to be formed into vehicle wheels. Since the vehicle wheel forming machine forms no part of the present invention no further description or reference to the same is made in this patent. It will, of course, be understood that each time a vehicle wheel stamping is struck from the metal sheet 1 that said sheet is advanced over the die mechanisms a predetermined distance during the upstroke of the punch mechanism ready for the next operation of the punch mechanism.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention and I therefore do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. A rapid production punch and die device comprising a punch mechanism, a plurality of punch blocks secured thereto, a die mechanism and a plurality of die blocks rigidly secured thereto, said punch blocks and die blocks having the side walls thereof at perfect right angles with respect to their end walls without any relieving clearance between the punch blocks and the die blocks to cause a crowding effect of stampings to take place in the die mechanism between the die blocks.

2. A rapid production punch and die device comprising a punch frame, punch blocks secured thereto, a stripper ring supported on the punch frame, a plurality of independently operable individual strippers supported on the punch frame between said punch blocks, a die frame and a plurality of die blocks secured thereto for co-action

with said punch blocks, said punch blocks and die blocks having the side faces thereof constructed without any relieving clearance between said punch blocks and said die blocks to cause a crowding effect to be produced by stampings between said die blocks each time the punch frame is lowered to cause the punch blocks to coact with the die blocks to punch a stamping from a sheet of material disposed in the field of operation of the punch and die device.

3. A punch and die device comprising a punch frame, a die frame, a plurality of punch blocks secured to said punch frame, a punch hub also secured to said punch frame and constructed to assist in holding all of said punch blocks in place, and a plurality of die blocks secured to said die frame, said punch blocks and die blocks having the coacting walls thereof constructed without any relieving clearance therebetween to cause a crowding effect between said die blocks and a stack of stampings between said die blocks so that succeeding stampings will force one another through the die frame.

4. A rapid punch and die device comprising a punch frame, a plurality of punch blocks thereon, countersunk bolts for holding said punch blocks secured to the punch frame, a shouldered hub rigidly secured to said punch frame and acting to assist in holding all of the punch blocks in place, a spring impelled stripper ring movably supported on said punch frame, a plurality of spring impelled individual strippers supported on the punch frame between said punch blocks, a die frame, a plurality of bevelled die blocks supported thereon, countersunk bolts for rigidly holding said die blocks secured to the die frame, backing blocks secured to said die frame to the outside of said die blocks, and a plurality of spoke tip die blocks rigidly secured to said die frame between said backing blocks.

5. A punch and die device of the class described comprising a punch frame, a plurality of punch blocks rigidly secured thereto, means for securely holding said punch blocks secured to said punch frame, a shouldered hub rigidly secured to said punch frame and acting to assist in holding all of said punch blocks secured in place, a spring cage formed on said punch frame, a stripper ring slidably supported on said spring cage, springs seated in said spring cage and engaging said stripper ring, a plurality of individual strippers slidably supported on said punch frame between said punch blocks, springs for holding said individual strippers in projected position, a die frame, a plurality of dished die blocks rigidly secured to said die frame, backing blocks on said die frame for said die blocks, and tip die blocks rigidly secured to said die frame

between said backing blocks and co-acting with said die blocks.

6. A punch and die device of the class described comprising a punch frame, a plurality of punch blocks secured thereto, a punch hub rigidly secured to said punch frame to assist in holding said punch blocks in place, a plurality of spring impelled individual strippers supported on said punch frame between said punch blocks, a spring impelled stripper ring also movably supported on said punch frame to the outside of said punch blocks, a plurality of crotch plates rigidly secured to said punch frame in the crotches formed by said punch blocks, a plurality of keeper plates rigidly secured to said punch frame separating and bracing the outer ends of said punch blocks, a die frame, a plurality of dished die blocks rigidly secured thereto, backing blocks on said die frame for said die blocks, and tip die blocks rigidly secured to said die frame between said backing blocks and separating the outer ends of said die blocks.

7. A rapid production punch and die device of the class described comprising a punch frame, a plurality of punch blocks rigidly secured thereto, a punch hub also rigidly secured to said punch frame and acting to assist in holding all of said punch blocks in place, a plurality of crotch plates rigidly secured to said punch frame and seated in the crotches formed between the inner ends of said punch blocks, a spring cage integrally formed on said punch frame, a plurality of keeper plates rigidly secured to said spring cage and acting to separate and brace the outer ends of said punch blocks, a spring impelled stripper plate movably supported on said spring cage, a plurality of spring controlled individual strippers movably supported on said punch frame between said punch blocks, a die frame adapted to be positioned below said punch frame, a ring flange integrally formed on said die frame, a plurality of die blocks rigidly secured on said die frame, a plurality of backing blocks on said die frame between the outer ends of said die blocks and said ring flange, and a plurality of tip die blocks rigidly secured to said die frame between said backing blocks and in contact with adjacently disposed die blocks.

8. A rapid production punch and die device comprising a punch mechanism and a die mechanism for coaction therewith, said die mechanism comprising a die frame, a plurality of dished die blocks rigidly secured thereto, a ring flange integrally formed on said die frame, a plurality of backing blocks rigidly secured on said die frame between said ring flange and the outer end of said die blocks, and a plurality of tip die blocks rigidly secured to

said die frame and in contact with said ring flange, said die blocks and said backing blocks.

9. A rapid production punch and die device comprising a punch mechanism and a die mechanism for coaction therewith, said die mechanism comprising a die frame, a plurality of dished spoke die blocks, countersunk bolts for rigidly holding said dished die blocks secured to said die frame, a plurality of keeper rings engaged around said bolts at the meeting surfaces of said spoke die blocks with said die frame, a flange integrally formed on said die frame, a plurality of backing blocks on said die frame between said flange and the outer ends of said spoke die blocks, a plurality of spoke tip die blocks on said die frame between said backing blocks and in contact with the outer ends of said spoke die blocks, and countersunk bolts for rigidly holding said spoke tip die blocks secured to said die frame in contact with said die frame flange.

10. A rapid production punch and die device comprising a die mechanism and a punch mechanism, said punch mechanism comprising a punch frame, a plurality of spoke punch blocks thereon, countersunk bolts for rigidly holding said spoke punch blocks secured to said punch frame, a punch hub constructed with a shoulder, means for rigidly holding said punch hub secured to said punch frame with the shoulder of said hub engaging each of said spoke punch blocks to assist in holding the same in place, a plurality of crotch plates rigidly secured to said punch frame seated in the crotches provided between the inner ends of said spoke punch blocks, and a plurality of keeper plates rigidly secured to said punch frame separating and bracing the outer ends of said spoke punch blocks.

11. A rapid production vehicle wheel stamping device comprising a die mechanism and a punch mechanism, said punch

mechanism comprising a punch frame, a plurality of spoke punch blocks rigidly secured thereto in radial relation, a punch hub formed with a shoulder and rigidly secured to said punch frame engaging each of said spoke punch blocks to assist in holding the same in position, a plurality of crotch plates rigidly secured to said punch frame and seated in the crotches formed between the inner ends of said spoke punch blocks, a spring cage integrally formed on said punch blocks, a plurality of keeper plates rigidly secured to said spring cage separating and bracing the outer ends of said spoke punch blocks, a spring impelled stripper ring supported on said spring cage, and a plurality of spring controlled individual strippers supported on said punch frame between said crotch plates and said keeper plates.

12. A rapid production vehicle wheel stamping device comprising a die mechanism and a punch mechanism for coaction therewith, said punch mechanism comprising a punch frame, a plurality of shouldered spoke punch blocks rigidly secured thereto, a shouldered punch hub rigidly secured to said punch frame with the shoulder thereof engaging the shoulders of said spoke punch blocks to assist in holding the same in position, a plurality of sets of plates rigidly secured to said punch frame and separating the inner and outer ends of said spoke punch blocks, a stripper ring supported on said punch frame adapted to strip the main portion of a sheet of material from said spoke punch blocks, and a plurality of individual strippers supported on said punch frame and acting between said spoke punch blocks to individually strip the waste material from between said spoke punch blocks.

In testimony whereof I have hereunto subscribed my name.

AMES R. JAYNE.