Feb. 13, 1934. H. TORMYN ET AL 1,946,991

MACHINE TO PIERCE A PLURALITY OF HOLES IN A WHEEL HUB SHELL FOR SHORT SPOKES

Filed July 29, 1932 4 Sheets-Sheet 1

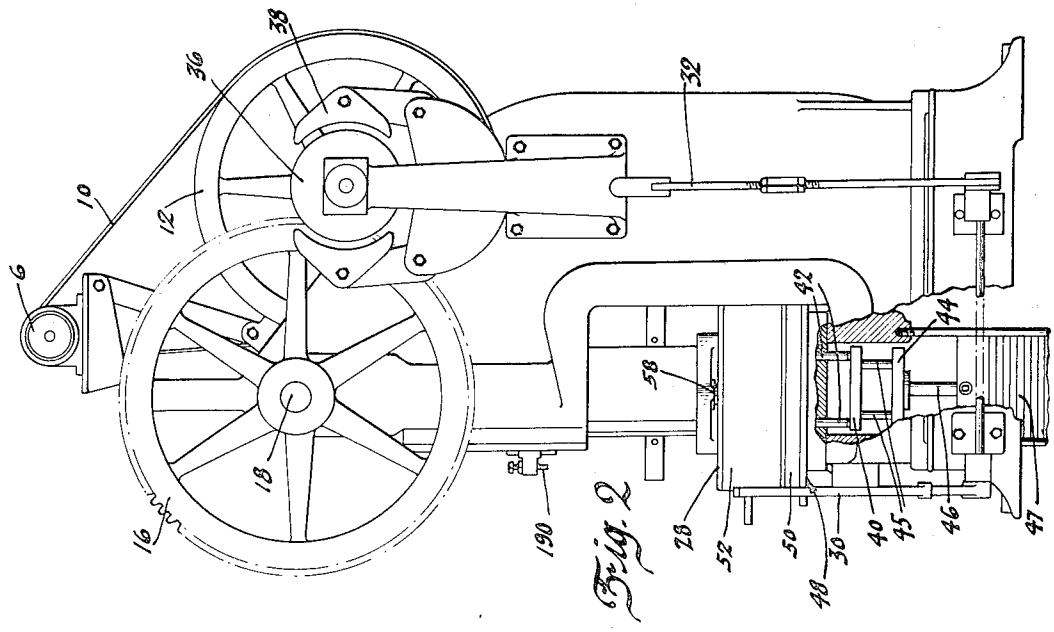


Fig. 2

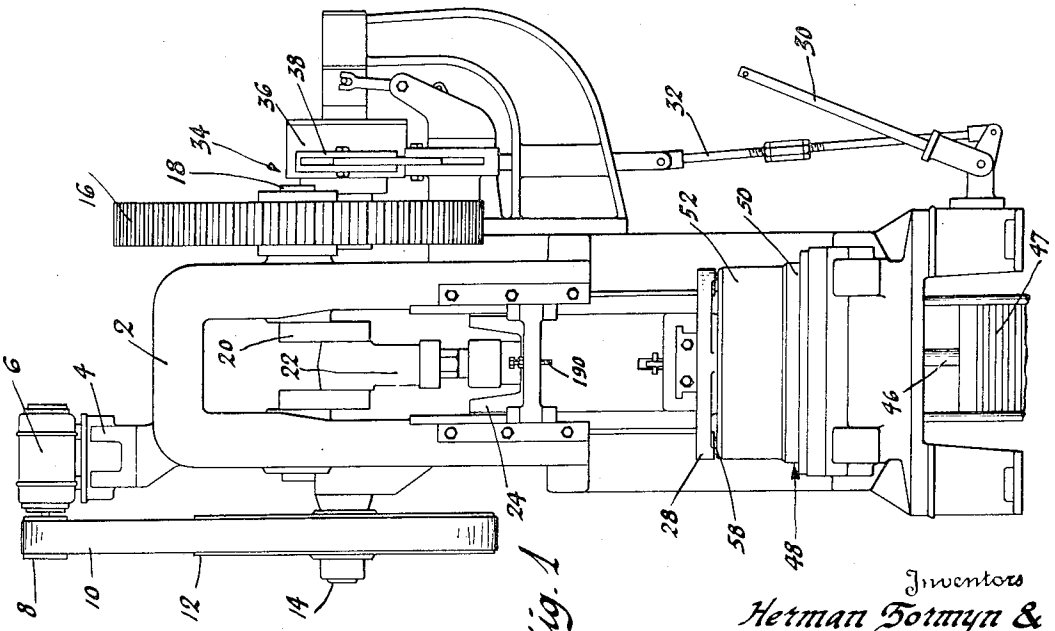


Fig. 1

Inventors
Herman Tormyn &
Frank F. Wiethoff.

By Blackmore, Spencer & Flint

Attorneys

Feb. 13, 1934. H. TORMYN ET AL 1,946,991

MACHINE TO PIERCE A PLURALITY OF HOLES IN A WHEEL HUB SHELL FOR SHORT SPOKES

Filed July 29, 1932 4 Sheets-Sheet 2

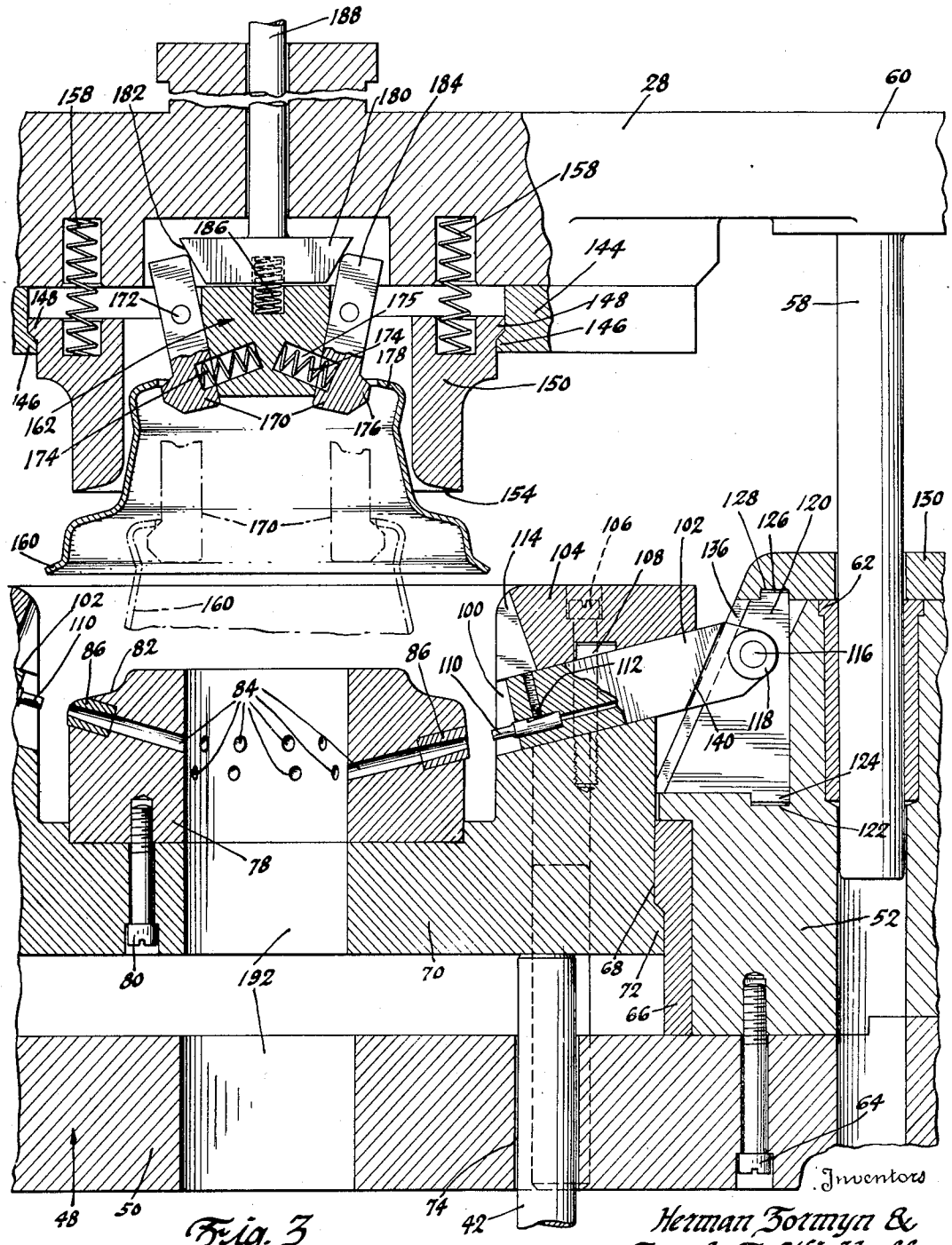


Fig. 3

Inventors

Herman Tormyn &
Frank F. Wiethoff.

By Blackmore, Spencer & Flint

Attorneys

Feb. 13, 1934. H. TORMYN ET AL 1,946,991

MACHINE TO PIERCE A PLURALITY OF HOLES IN A WHEEL HUB SHELL FOR SHORT SPOKES

Filed July 29, 1932 4 Sheets-Sheet 3

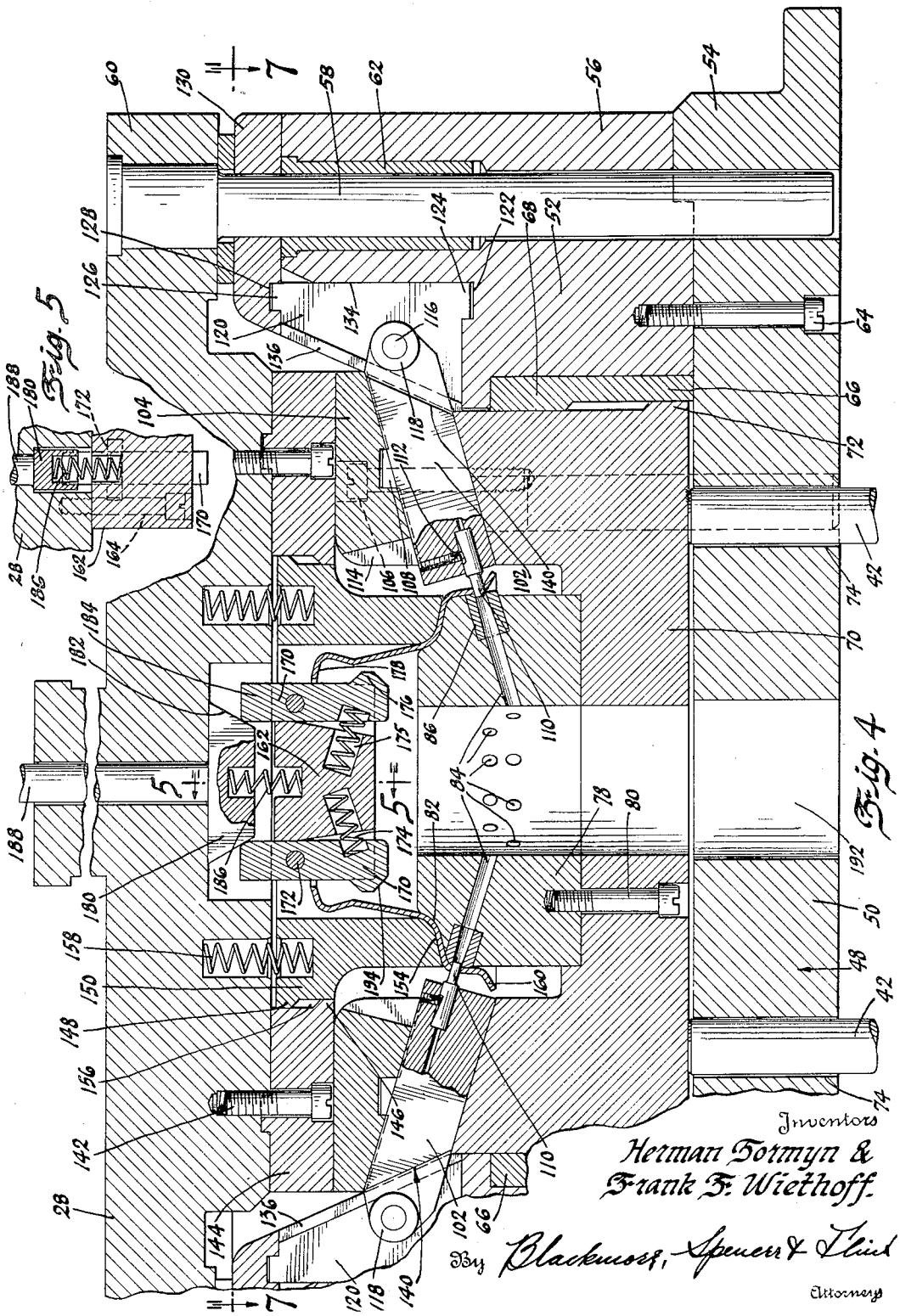


Fig. 4

Inventors

Herman Tormyn &

Frank F. Wiethoff.

By Blackmore, Spencer & Flint

Attorneys

Feb. 13, 1934. H. TORMYN ET AL 1,946,991

MACHINE TO PIERCE A PLURALITY OF HOLES IN A WHEEL HUB SHELL FOR SHORT SPOKES

Filed July 29, 1932 4 Sheets-Sheet 4

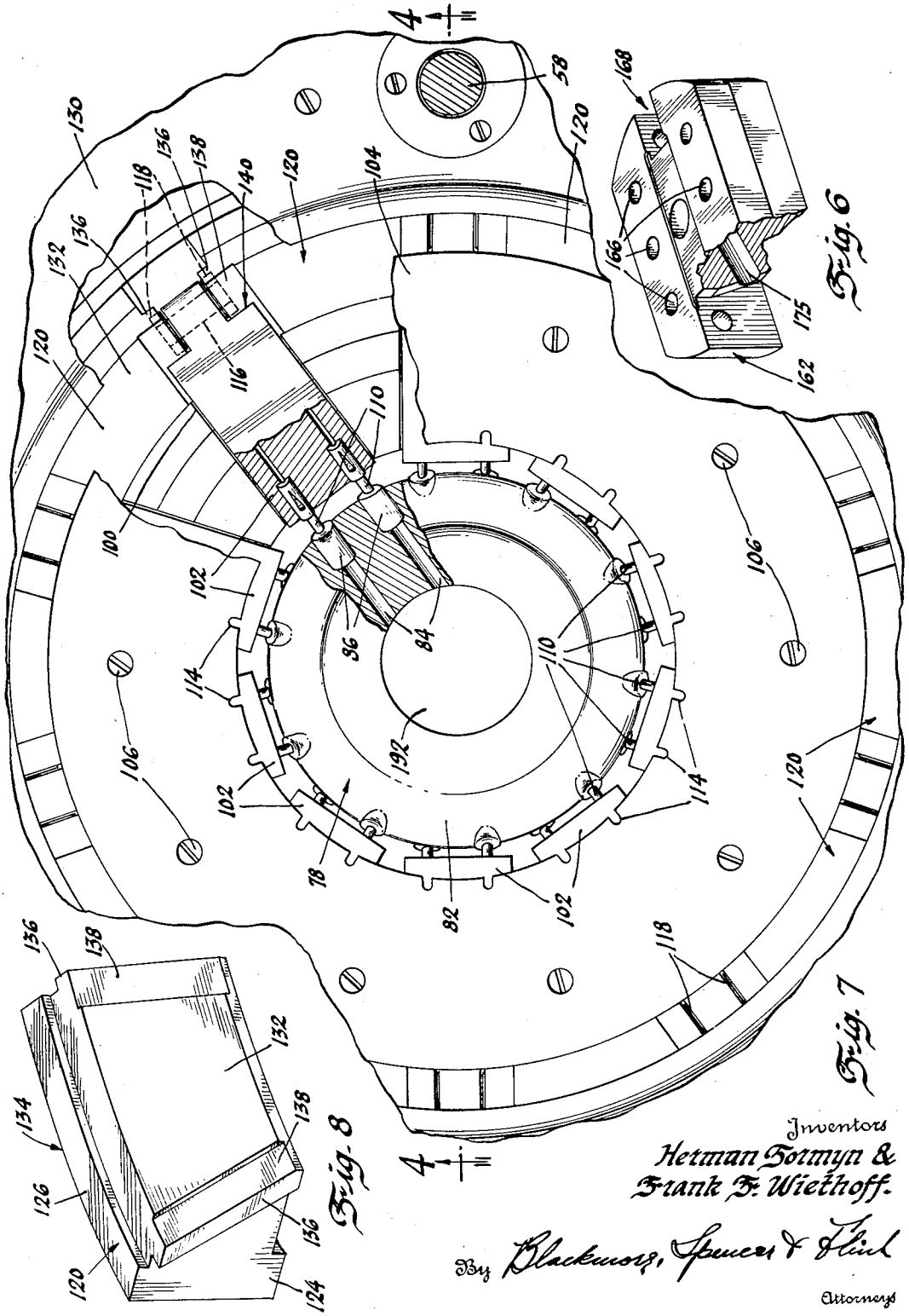


Fig. 6

Fig. 7

Fig. 8

Inventors
Herman Tormyn &
Frank F. Wiethoff.

By Blackmore, Spencer & Flint

Attorneys

Patented Feb. 13, 1934

1,946,991

UNITED STATES PATENT OFFICE

1,946,991

MACHINE TO PIERCE A PLURALITY OF HOLES IN A WHEEL HUB SHELL FOR SHORT SPOKES

Herman Tormyn and Frank F. Wiethoff, Detroit, Mich., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application July 29, 1932. Serial No. 625,990

16 Claims. (Cl. 164—90)

This invention relates to the manufacture of wire wheels and has particular reference to the piercing of a plurality of holes in the hub shell for the short spokes.

The press of the invention comprises the usual upright frame in which a plunger is reciprocably operated. The plunger has a top die fixed thereto which cooperates with a die shoe structure therebelow, the die shoe structure having suitable holders with punches mounted therein to punch holes in the hub shell when the head is moved downward on to the base structure. Each operation of the plunger will punch all of the holes for the shorter spokes in the hub shell.

On the drawings:

Figure 1 is a front view of the press.

Figure 2 is a side view of Figure 1.

Figure 3 is an enlarged sectional detailed view of the mechanism for punching the holes, the parts being shown in separated relation.

Figure 4 is a sectional view similar to Figure 3 but on a reduced scale but showing the punches at the time they are forming the holes in the hub shell and taken on the line 4—4 of Figure 7.

Figure 5 is a sectional detailed view on the line 5—5 of Figure 4.

Figure 6 is a perspective view of the head for holding the releasing fingers.

Figure 7 is a view taken on the line 7—7 of Figure 4 with parts broken away and parts in section better to illustrate the structure.

Figure 8 is a perspective view of one of the cam blocks.

Referring to the drawings, the numeral 2 indicates the upright of the press. At the top of the press on a bracket 4 an electric motor 6 is mounted. The motor has the usual pulley 8 and drive belt 10 which operates the flywheel 12 of the press. The flywheel is secured to a shaft 14 which extends through the press and has a small gear wheel (not shown) mounted on the opposite end thereof. The small gear wheel meshes with the large gear wheel 16 secured to a shaft 18 having a crank 20 formed thereon. The connecting rod 22 is mounted on the crank and has secured thereto a crosshead 24 which slides in the frame. The crosshead has secured thereto the top die which forms the upper portion of the die for punching the holes in the hub shell. The shaft 14 has a clutch at the right hand end thereof in Figure 1 which is operated by a lever 30 and a linkage 32 to throw the small gear which meshes with the gear wheel 16 into and out of driving engagement with the shaft 14. When the shaft 14 makes one revolution the mechanism indicated as a whole at 34 will throw the clutch out of engagement with the small gear wheel. The details of this mechanism 34 and the clutch is not shown for the reason that it is conventional and well known and forms no part of the invention. A brake drum is shown at 36, the brake shoes being indicated at 38.

At the base of the press there is slidably mounted the plate 40 having a plurality of pressure pins 42 resting thereon. A second plate 44 is slidably mounted below the plate 40 and is held in spaced relation thereto by means of the pins 45 which may be secured to both plates. The upper ends of the rods 42 pass through the base member 48 of the mechanism for punching the holes in the hub shell. The plate 44 has secured thereto the piston rod 46 connected to a piston which operates in a cylinder 47 to form an air cushion. The air is under pressure and constantly urges the piston upward. The structure of parts 40 to 47, inclusive, will give a resilient mounting to parts of the die shoe of the mechanism.

Referring to Figures 3 and 4, it will be seen that there is shown in detail the top die or shoe 28 and lower die shoe 48 of the die. The die shoe 48 comprises the flat lower member 50 and the annular upper member 52. Each of these members has the lateral ears 54 and 56 provided with suitable registering openings to receive the guide rods 58 rigidly secured in the ears 60 of the head 28. A suitable bearing 62 is placed in the ears 56 to accommodate the guide rods 58. The members 50 and 52 are secured together by means of a plurality of machine bolts 64.

The upper member 52 of the die shoe 48 is open at its center and has mounted therein the bearing ring 66 slightly enlarged at its upper end as indicated at 68. Slidably received in the ring 66 is the punch slide holder 70 which has at its lower end an outwardly projecting flange 72. The flange 72 and the side of the slide holder 70 cooperate with the sides of the bearing ring 66 and its enlarged portion 68, respectively, for slidable engagement. Parts 68 and 72 limit the upward movement of the slide holder 70. The member 50 has openings 74 therein slidably to receive the pressure pins 42 constantly urged upward from their lower ends. The air cylinder 47 constantly urges the plate 40 upward and will, therefore, push the pins 42 upward constantly to force the slide holder 70 upward so that the flange 72 will come into engagement with the flange 68. This position of the parts is shown in Figure 3.

The slide holder 70 is bored and has mounted

at its central portion the circular die holder block or hub shell receiving member 78 secured thereto by means of the machine screws 80. The upper portion of the member 78 is suitably shaped as shown at 82 to receive the enlarged end of the hub shell 160. Suitable inclined passages 84 are provided in the member 78 and dies 86 are seated in enlarged portions of the passages at the outer periphery of the member 78. The dies 86 may be held in place by suitable set screws, not shown. Behind the dies the passages 84 lead to the center of the block to allow the punched out metal to fall to the base of the press.

The slide holder 70 has a plurality of equally spaced tines or upwardly extending projections 100 formed therearound on the upper face thereof, the projections being ten in number. These projections define ten radial recesses therebetween and in each recess there is slidably mounted a punch holder 102. Over the top of the slide holder 70 and the punch holders 102 there is secured the retainer ring 104 which incloses the recesses between the projections 100 and holds the punch holders 102 in place. Suitable machine bolts 106 hold the ring 104 on the punch holder 70 and a tongue and groove connection 108 positions the ring 104 with reference to the top of the slide holder 70. The punch holders 102 are therefore radially slidably mounted in the slide holder 70.

In each punch holder 102 there are mounted two punches 110, each punch being held in position by means of a set screw 112 screwed into a suitable threaded opening in the punch holder 102. The two punches in a holder are not similarly positioned but one is positioned to punch a hole in the shell on a circumference different from the other. This difference in position is represented by the passages 84 as shown in Figure 3. The retaining ring 104 has the cut-out spaces 114 to permit access to the screw 112 when the machine is assembled. Each punch holder 100 is reduced at its outermost end and has two rollers 118 mounted on a pin or shaft 116. These rollers cooperate with the cam blocks 120, one of which is shown in perspective in Figure 8 and which will now be described.

Referring to Figures 4, 7 and 8, the ten cam blocks 120 are mounted at the interior periphery of the annular upper member 52 of the die shoe 48. The member 52 has the groove 122 in which there is received the tongue 124 of the blocks 120. At the upper portion of the blocks 120 a second tongue 126 is provided, which fits in a groove 128 of a retaining ring 130 secured to the top of the member 52. The blocks 120 are segmental and have the curved or conical inner surface 132 and the curved outer surface 134. At the ends of each block 120 the flanges 136 and finished inclined portions 138 are provided. The finished portions 138 cooperate with flat portions 140 on the ends of the punch holders 102 while the flanges 136 cooperate with the rollers 118. The blocks 120 are spaced and between each pair of blocks there fits the reduced end of the punch holder 102 and the rollers 118. This structure is best shown in Figure 7 at the upper right where the ring 130 is broken away.

The top die 28 has secured thereto by means of the machine bolts 142 the retaining and pressure transmitting ring 144. The ring 144 has the flange 146 projecting inwardly at its lower portion which cooperates with a flange 148 at the upper end of a movable holding ring 150 having a bottom surface 154 which cooperates with the surface 82 of the block 78 to hold the hub shell 160 rigidly in position when the machine is in operation. Play is allowed between the ring 144 and the ring 150 as shown at 156 and coil springs 158 mounted in recesses in the members 28 and 150 constantly urge them apart.

A means is provided for pulling the hub shell 160 from the machine after the holes have been punched therein. This means comprises a block 162 (see Figure 6) rigidly attached to the head 28 by means of the machine screws 164 as shown in Figure 5. The machine screws 164 pass through the openings 166 shown in Figure 6. The block 162 is recessed at its two ends as is shown at 168 and a finger 170 is pivoted in each recess by means of the pins 172. Coil springs 174 mounted in recesses 175 in the block 162 and in the fingers 170 constantly urge the lower ends of the fingers outwardly. The lower ends of the fingers are formed into hooks 176 which are adapted to engage under the flange 178 at the narrow portion of the hub shell 160. A cam member 180 having inclined sides 182 is adapted to operate on the upper ends 184 of the fingers to force them outwardly or away from each other and, consequently, to force the inner ends and hooks 176 inwardly. A coil spring 186 is mounted in registering recesses in the block 162 and the cam 180 and constantly urges the cam upward to the position shown in Figure 4. When the block 28 raises the stem 188 on the cam 180, it will strike the knock-out pin 190 (see Figures 1 and 2) to move the stem 188 downward and cause the cam 180 to force the upper ends 184 of the fingers 170 outward and the lower ends or hooks 176 inward. This position of the parts is shown in Figure 3 and will cause the fingers to release the hub shell. The successive movements of the fingers to grip and release the hub shell will be apparent from an examination of Figure 4, the dotted and solid outline, respectively, in Figure 3. The operator will knock or push the punched hub shell from the machine immediately on its release by the hooks 176.

The machine of the invention punches twenty holes in the hub shell and accordingly there are provided ten punch holders 102, each having two punches 110. This is best shown in the plan view in Figure 7. The upper base member 52 has ten projections 100 forming ten recesses, in each recess there being received one of the punch holders 102. Ten cam blocks 120 (Figure 8) are provided which are mounted as shown in Figures 2, 3 and 7. These blocks are spaced from each other and between the adjacent spaced ends the rollers 118 of the reduced end of the punch holder 102 operate.

The operation of the device is as follows and will be understood from an examination of Figures 3 and 4. In Figure 4, the die or machine has performed its work. The top die or shoe 28 has been pushed downward to cause the surfaces 82 and 154 to grip the wheel hub 160. The slide holder 70 has also been forced downward against the upward pressure of the pins 42. The downward movement of the slide holder 70 will cause the surfaces 140 on the ends of the die holders to ride on the inclined surfaces 138 on the cam blocks to force the die holders 102 inwardly to cause the punches 110 to punch the metal from the hub to form the spoke opening. The button or metal punched out will slide down the passages 84 and drop into the central passage 192 formed in the members 78, 70 and 52 and drop to the bottom of the machine. The finished surfaces

138 on the cam block 120 are inclined, as is best shown in Figures 3 and 4, so that the wider portion is at the bottom to force the die holders inwardly when the machine operates. The lowermost position of the parts is shown in Figure 4. As the plunger now rises, the upward pressure of the rods 42 will force the holder receiving member 70 upward. This upward movement will cause the rollers 118 to ride on the backs of the flanges 136 of the cam blocks to pull the punch holders 102 away from the hub and pull the punches out of the punched openings in the shell. The punches will be withdrawn from their openings before the end of the upward movement of the block 70 so that a continued upward movement of the head will not cause the punches to tear the spoke opening made thereby. In the downward movement of the crosshead or plunger 24 and top die 28 the bevelled edges 194 of the fingers 170 will have slipped over the edge of the flange 178 so that the hook portion 176 will now engage with the interior portion of the flange when the plunger rises. This engagement will pull the wheel hub 160 upward with the plunger. Just before the plunger reaches the upward limit of the stroke, the knock-out pin 190 will strike the stem 188 to cause it to move downwardly and cause the cam 180 to move the upper ends 184 of the fingers outwardly and move the hooks 176 inward or away from the flange 178 to release the hub 160. When the shell is released the operator will use a stick or his hand to shove the shell from the machine. A new hub shell is now placed over the block 78 and the handle 30 again operated to cause the machine to make one stroke. The parts now will move from the position shown in Figure 3 to that shown in Figure 4 and again return to the position of Figure 3. During this operation the twenty holes in the hub shell will have been punched.

We claim:

1. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a punch holder slide yieldably mounted in said shoe, a top die reciprocable relative to the die shoe, means on the slide to receive a wheel hub, means on said top die cooperating with the hub receiving means to hold the hub rigidly in position, a plurality of punch holders slidably mounted in said slide for movement transversely to the movement of the slide, a plurality of punches mounted in said holders, means for causing said holders to move toward the wheel hub to cause the punches to punch a plurality of spoke openings entirely around the periphery thereof, said last named means being operative only when the top die is moved to cause the holder slide to move.

2. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a movable annular punch holder slide mounted in said shoe, a plurality of projections on said slide defining recesses therebetween, punch holders slidably received in said recesses, punches mounted in said holders, stationary cam means on said die shoe engageable by said holders, a wheel hub receiving block mounted in said slide, a reciprocable top die adapted to engage the hub on the block rigidly to hold the hub in position, the reciprocation of said top die causing the movement of said punch holder slide and causing said holders to move over said cam means to cause said punches to punch spoke holes around the periphery of said hub.

3. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a punch holder slide yieldably mounted in said shoe, a reciprocable top die, means on the punch holder to receive a wheel hub, means on said top die cooperating with the hub receiving means to hold the hub rigidly in position, a plurality of punch holders slidably mounted in said slide, a plurality of punches mounted in said holders, means for causing said holders to move toward the wheel hub to cause the punches to punch spoke openings therein when the top die is moved toward the die shoe, and means on the top die to raise said wheel hub from the die shoe after the punching operation has been performed.

4. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, an annular punch holder slide movably mounted on said shoe, a wheel hub receiving block on the slide, punch holders movably mounted in said slide, punches in said holders, a plurality of cam blocks mounted in said shoe and engageable by the said holders, a top die over said shoe adapted to descend and rigidly hold the wheel hub in position, said downward movement of the head moving said slide downward and causing the holders to move over the cams to cause the punches to punch spoke openings in the wheel hub.

5. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, an annular punch holder slide movably mounted in said shoe, a wheel hub receiving block on the slide, punch holders movably mounted in said slide, punches in said holders, a plurality of cam blocks mounted in said shoe and engageable by the said holders, a reciprocable top die over said shoe adapted to descend on and rigidly hold the wheel hub in position, said downward movement of the head moving said holder slide downward and causing the holders to move over the cams to cause the punches to punch spoke openings in the wheel hub, and means for withdrawing the wheel hub with the top die when the said top die is raised.

6. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, an annular punch holder slide resiliently mounted in said shoe, a wheel hub receiving block on the slide, punch holders movably mounted in said slide, punches in said holders, a plurality of cam blocks mounted in said shoe and engageable by the said holders, a reciprocable top die over said holder adapted to descend and rigidly hold the wheel hub in position, said downward movement of the top die moving said slide downward and causing the holders to move over the cams to cause the punches to punch spoke openings in the wheel hub, means for withdrawing the wheel hub with the top die when the said head is being raised, and means to release the hub when the top die is fully raised.

7. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a punch holder slide resiliently mounted in said shoe, a wheel hub receiving member secured to the slide, a plurality of punch holders mounted for sliding movement in said slide, punches mounted in said holders, cam means mounted adjacent said slide, flanges on said cam means, rollers on said holders cooperating with said flanges, cooperating surfaces on said cam means and said holders, a reciprocable top die, means on the top die cooperating with said hub receiving member to hold the hub rigidly in position, the downward movement of said top die causing the engagement of said hub holding elements and causing the cooperating surfaces on said holders and said cam means to cause the holders to move inwardly and cause the punches to punch spoke holes in the wheel hub, the up-

ward movement of said top die causing the rollers to engage the flanges on the cam means to withdraw the holders and punches from the hub.

8. In a machine of the class described having a reciprocable head, as a sub-combination, a means to raise a wheel hub from the machine comprising a block secured to the head, a plurality of fingers pivoted to the block, a hook end on the finger, resilient means urging the hook ends away from the block and into engagement under the flange of the wheel hub, a bevelled edge on the finger ends to cause them to ride over the flange when the head descends, and a cam engaging the other end of the fingers to press them apart against the tension of the springs to cause the fingers to release the wheel hub, said releasing action taking place after the head has been raised.

9. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a punch holder slide mounted for reciprocable movement in said shoe, a plurality of punch holders slidably mounted in said slide holder, punches in said punch holders, a wheel hub receiving block mounted in the holder slide concentrically therewith, said block having a plurality of openings complementary to the punches to receive the punch ends and punched out pieces of metal when the punches are operative, a top die descendable on the holder slide to cause the slide to move, and means on the die shoe cooperating with the punch holders to cause the punch holders to move toward the wheel hub to punch spoke openings therein.

10. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a punch holder slide mounted for reciprocable movement in said shoe, a plurality of punch holders slidably mounted in said slide holder, punches in said punch holders, a wheel hub receiving block mounted in the holder slide concentrically therewith, said block having a plurality of openings complementary to the punches to receive the punch ends and punched out pieces of metal when the punches are operative, a top die descendable on the holder slide to cause the slide to move, means on the die shoe cooperating with the punch holders to cause the punch holders to move toward the wheel hub to punch spoke openings therein, and means to cause the holder slide to move in the reverse direction when the top die is withdrawn.

11. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a reciprocable punch holder slide mounted in the shoe, punches mounted for slidable movement in the punch holder, means to actuate the punches when the holder is moved, means for supporting the hub, a top die reciprocable relative to the holder slide to move the same, the reciprocation of said top die causing the movement of said holder slide to cause said punches to move toward the hub to punch spoke openings therein.

12. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a reciprocable punch holder slide mounted in the shoe, punches mounted for slidable movement in the punch holder, means to actuate the punches when the holder is moved, means for supporting the hub, a top die reciprocable relative to the holder slide to move the same, the reciprocation of said top die causing the movement of said holder slide to cause said punches to move toward the hub to punch spoke openings therein, and means on the top die to raise the hub from the die shoe after the holes have been punched.

13. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, a circular reciprocable punch holder slide mounted in the shoe, a plurality of punch holders mounted entirely around the holder slide for slidable movement therein, punches in the punch holders, cam means mounted in the die shoe concentrically with the punch holder slide, said cam means adapted to cause the operation of the punches when the holder slide is moved, and means to reciprocate the punch holder slide to cause the punches to punch holes in the hub.

14. In a machine for punching spokes in the hub of a wire wheel, a die shoe, a circular reciprocable punch holder slide mounted in the shoe, a plurality of punch holders mounted entirely around the holder slide for slidable movement therein, punches in the punch holders, cam means mounted in the die shoe concentrically with the punch holder slide, said cam means adapted to cause the operation of the punches when the holder slide is moved, means to cause the reciprocation of the punch holder slide to cause the punches to punch holes in the hub, and means on said last named means to withdraw the hub from the die shoe after the punching of the holes.

15. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, an annular punch holder slide reciprocably mounted in said shoe, a hub receiving member mounted concentrically with the holder, a plurality of punch holders mounted in the slide for movement transversely to the movement of the slide, punches in said holders, a plurality of cams annularly arranged adjacent the punch holders and adapted to operate the holders to cause the punches to punch spoke openings in the hub when the holder slide is moved, and means movable simultaneously to grip and hold the wheel hub on the receiving member and to move the holder slide to cause the punching of spoke holes.

16. In a machine for punching spoke holes in the hub of a wire wheel, a die shoe, an annular punch holder slide reciprocably mounted in said shoe, a hub receiving member mounted concentrically with the holder, a plurality of punch holders mounted in the slide for movement transversely to the movement of the slide, punches in said holders, a plurality of cams annularly arranged adjacent the punch holders and adapted to operate the holders to cause the punches to punch spoke openings in the hub when the holder slide is moved, means movable simultaneously to grip and hold the wheel hub on the receiving member and to move the holder slide to cause the punching of the spoke holes, and means on said last named means to withdraw the wheel hub from the die shoe when said first named means is moved to release the slide holder.

HERMAN TORMYN.
FRANK F. WIETHOFF.