

March 4, 1952

M. P. LEFERE
METHOD OF FORGING

2,587,864

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3 Sheets-Sheet 1

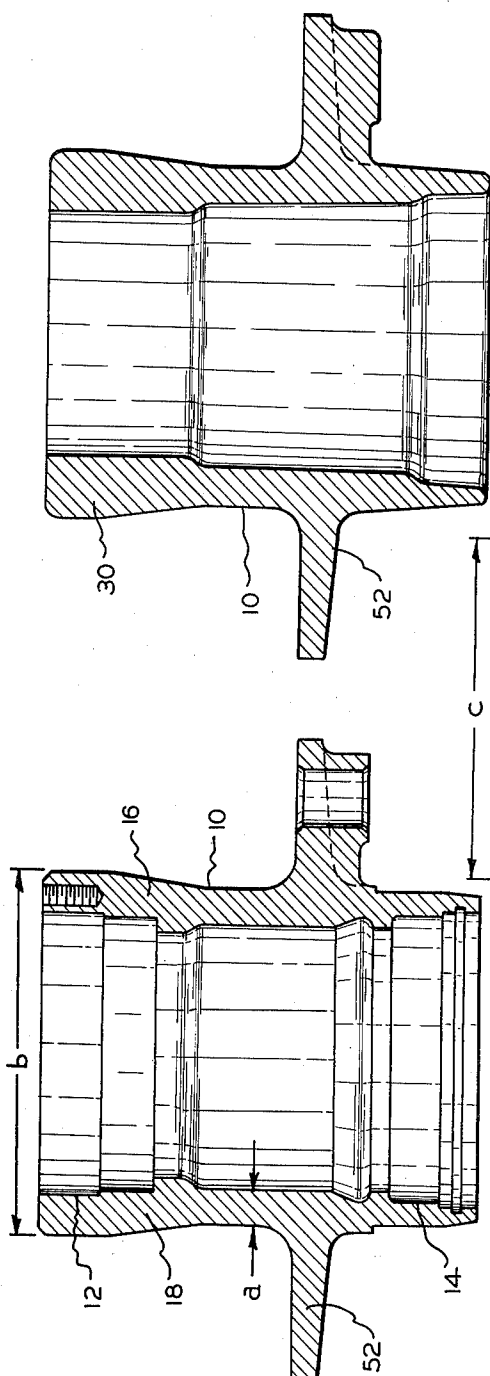


FIG. I-

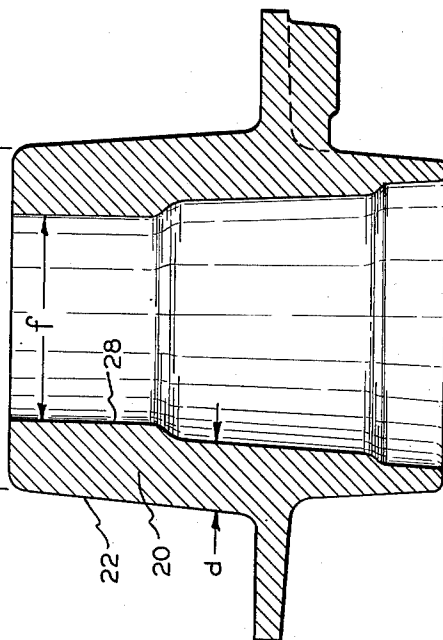


FIG. III-

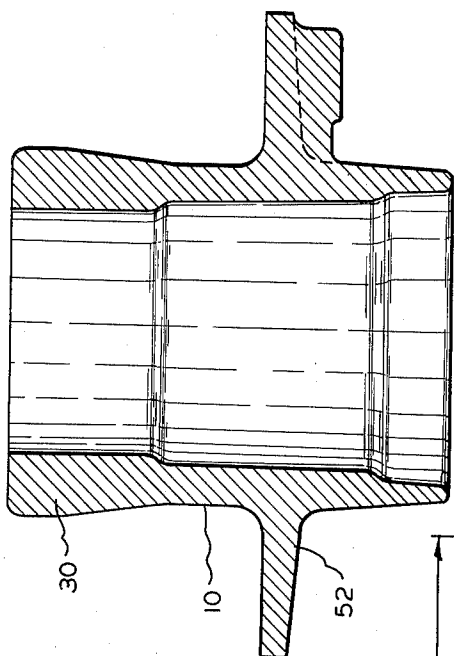


FIG. V-

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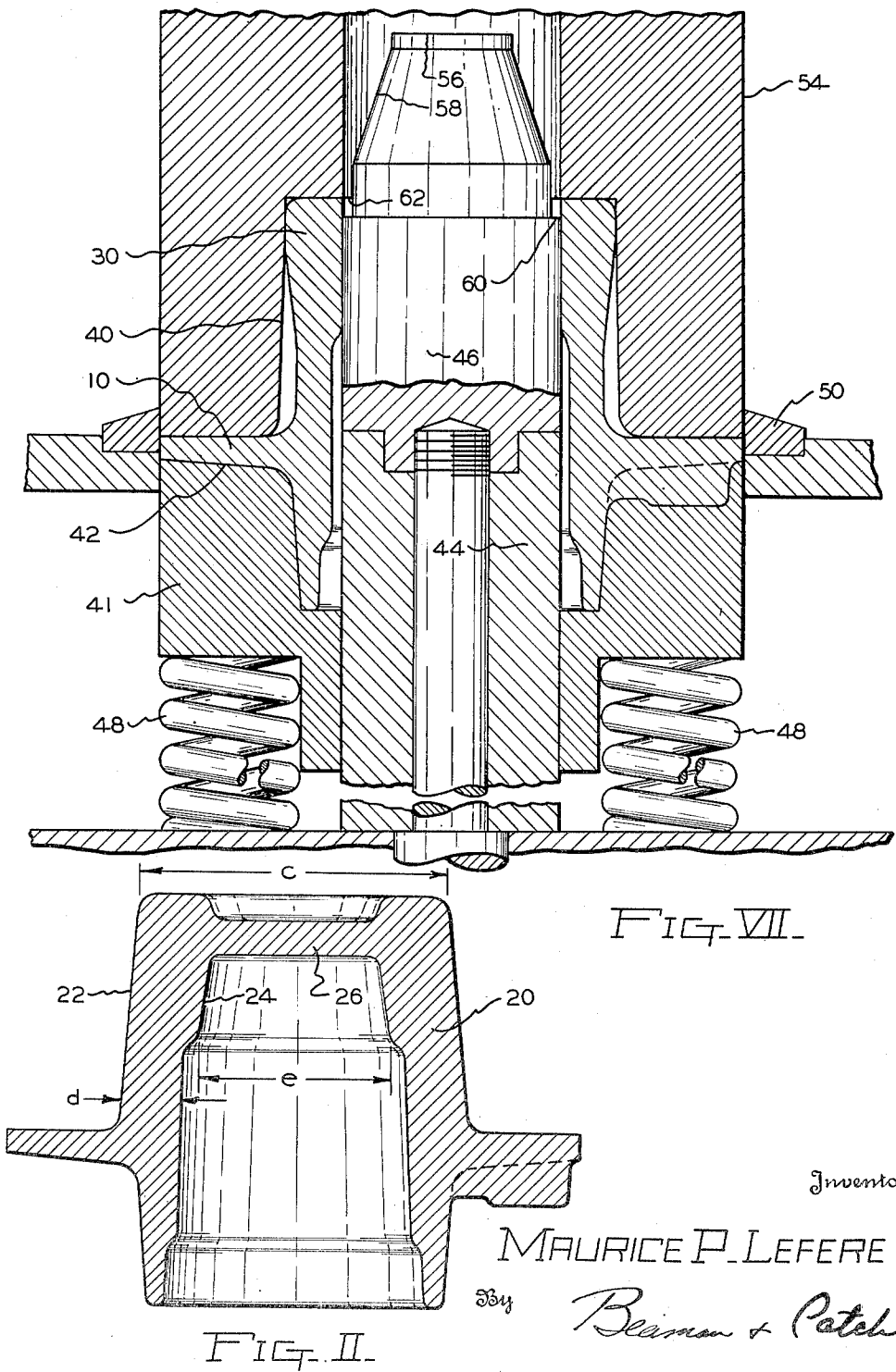
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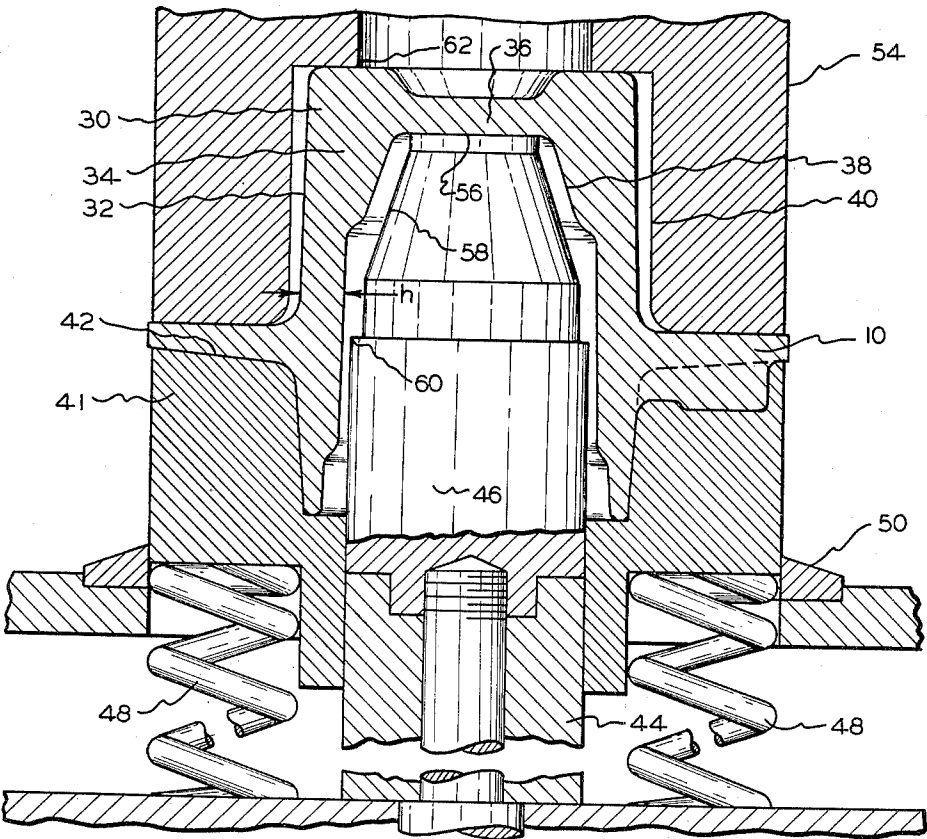
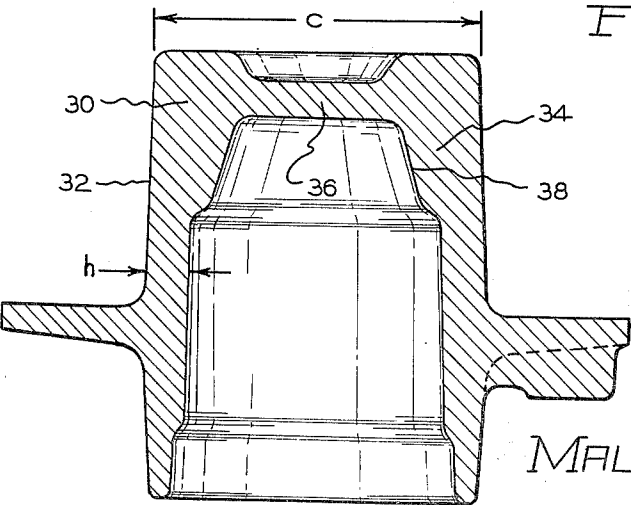


FIG. VI

FIG. IV

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2,587,864

METHOD OF FORGING

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3 Claims. (Cl. 29—159.3)

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The present invention is considered an improvement over the method of forging wheel hubs disclosed in U. S. Patent No. 1,913,492, granted June 13, 1933.

As in the case of the aforesaid patent, the objects of the improved method are to save material in the initial forging billet, reduce finish machining to a minimum, and lighten the finished assembly. These objects have been obtained by a method of expansion and wedging carried out following the hammer forging of the hub.

Wheel hubs of roadable vehicles, such as automobiles, trucks and buses, are generally designed to house a bearing at each end. These bearings are mounted on the axle and a flange is provided at right angles to the axle, to the face of which the wheel is bolted for its bearing and drive. The manufacture of unfinished hub blanks must provide sufficient material at each end of the forging to give support to the bearing that it is to be housed and maintained. Being thus governed by the size required at each end, sufficient taper, from 3° to 7°, must be allowed to remove the forging from the die, with the result that excess weight is present at the open end of the die, or at that point where the barrel of the forging converges with the flange. This excess weight increases cost of manufacture as more material is used, more heating and handling of material is required, and it often necessitates the removal of the excess stock by machining, either to reduce weight or to allow for proper clearance on mounting the brake drum or other requirements.

In contrast to conventional hub forging methods which have heretofore been controlled by taper and end bearing housing requirements, the present invention involves a plurality of operations so carried out that the desired strength and section is given to the general body of the forging in one operation, and in another operation the stock of the forged blank is expanded or wedged into its desired position. The metal necessary for the expansion of the forging in the second operation is provided in excess on the inner diameter and is expanded and wedged outwardly to bring the outer dimensions of the forging into close proximity to actual requirements as to clearance, clean up stock in machining, weight and strength.

In the drawings:

Fig. I is a longitudinal cross sectional view of a finished machined steel forged hub, made according to the present invention,

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Fig. II is a cross sectional view of a conventional first operational forged blank as required for the finished hub of Fig. I.

Fig. III is a view similar to Fig. II showing the blank of Fig. II after the final operation,

Fig. IV is a view similar to Fig. III of a first operational forging blank according to the present invention,

Fig. V shows the blank of Fig. IV after the expanding or wedging operation to provide a blank form which the hub of Fig. I may be machined,

Fig. VI shows the blank of Fig. IV in the trimming and size expanding die in the up position,

Fig. VII shows the die of Fig. VI in the down position and the blank of Fig. V completed.

Referring to the drawings, the finished machined hub 10 has portions 12 and 14 which are machined after forging to receive the bearings. The final dimensions of the hub 10 which particularly pertain to the present invention include the wall thickness a and the outside diameter b , both dimensions being of the finished forging. It will be noted that the wall 16 of the barrel portion 18 is of relatively uniform cross section area; the barrel portion 18 being slightly flared at its outer end.

In Fig. II is a view similar to Fig. I of a first operational hub forging made in the conventional manner. The diameter c at the outer end of the barrel portion 20 is equal to the diameter at this point of the finished hub. With the conventional forging taper in the order of 3° on the outer wall 22 of the barrel, an excessively heavy wall results at the dimension d . With dimensions b of Fig. I and c of Fig. II equal, the dimension a will be materially less than d . During the first operation, the hub blank of Fig. II is provided with an inner wall 24 tapered in the order of 5°. The forging dies are separated during the first operation by a pad portion 26. In the second operation a punch shears out the inner wall 24 and the pad portion 26 to provide the finished forging shown in Fig. III in which the dimension e of Fig. II substantially equals the dimension f of the cylindrical portion 28.

To produce the hub shown in Fig. I, the forged hub from the first operation is shaped as shown in Fig. IV. The barrel portion 30 has a slightly tapered outer wall 32. The dimension h corresponds to the dimension a of Fig. I; being substantially less than the same relative dimension d of the Fig. II. From the relatively thin section at dimension h , the section of the barrel 30 is

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substantially thickened at 34 to the point where it merges into the pad 36. For reasons herein-after discussed the inner wall 38 is tapered and set in from the cylindrical wall 40 an amount dependent upon the degree of expansion required.

The means of carrying out the second operation upon the forging blank of Fig. IV, to produce the finished blank of Fig. V, is shown in Figs. VI and VII.

In Fig. VI the first operation blank of Fig. IV is shown located in a set of press dies comprising a locator 41 having a face 42 upon which the blank 10 is placed with the ram of the press elevated. A center post 44 carries the combination expander pin and punch 46 concentric therewith. The locator 41 is supported by springs 48 for vertical movement guided by the post 44 and punch 46. A trimming knife 50 guides the locator 41 on the outside and trims the flange 52 of the blank 10 when the locator is lowered compressing the springs 48.

When the press is tripped, the top die 54 comes down to contact the flange 52 to lower the locator 41 to the point shown in Fig. VI at which the expanding punch 46 engages the pad 36. Continued downward travel of the die 54 brings the expanding pin and punch 46 into operation. As relative movement between the die 54 and punch 46 takes place, the pad 36 is punched out by the pointed end 56 of the punch 46. Thereafter the tapered portion 58 expands the thickened portion 34 of the hub outwardly against the wall 40 and the cutting edge 60 of the punch 46 takes out the taper on the inside of the hub, acting as a broach; the stock picked up in this broaching operation being sheared off when the cutting edge 60 arrives at the shearing edge 62 of the die 54. The hub is stripped from the punch 46 by the expansion of the spring 48 at the time the die 54 is raised.

As will be readily understood the desired expansion of the hub in the operation of Fig. VI will determine the taper 58, the thickness 34 and the internal diameter of the wall 40.

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Having thus claimed by invention what I claim and desire to protect by Letters Patent is:

1. A method of making a forged wheel hub characterized by the minimum weight of the forging billet and minimum finish machining comprising the steps of forging a billet into a hub blank having a barrel portion which has an undersize outer end and a thickened wall portion adjacent said outer end, expanding said outer end to size while reducing the thickness of said wall, and shearing the excess stock from said wall portion to size the same immediately following said expanding and constituting a continuation of the expanding operation.

2. A method of making a forged wheel hub characterized by the minimum weight of the forging billet, and minimum finish machining of the forged blank comprising the steps of forging a billet into a hub blank having a barrel portion with an undersize outer end which is closed by a pad portion merging with a wall portion of substantial thickness as compared with the final wall thickness and thereafter progressively shearing out said pad, expanding said outer end to size, by reducing the thickness of said wall portion, and shearing the excess stock from said wall portion all as a continuous uninterrupted operation.

3. A method as defined in claim 2 in which said barrel has inner and outer walls tapering toward the outer end thereof prior to said expansion and shearing to size.

MAURICE P. LEFERE.

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The following references are of record in the file of this patent:

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