No. 793,814. PATENTED JULY 4, 1905.

J. H. BAKER.

METHOD OF FORGING WHEEL BLANKS.

APPLICATION FILED MAY 16, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

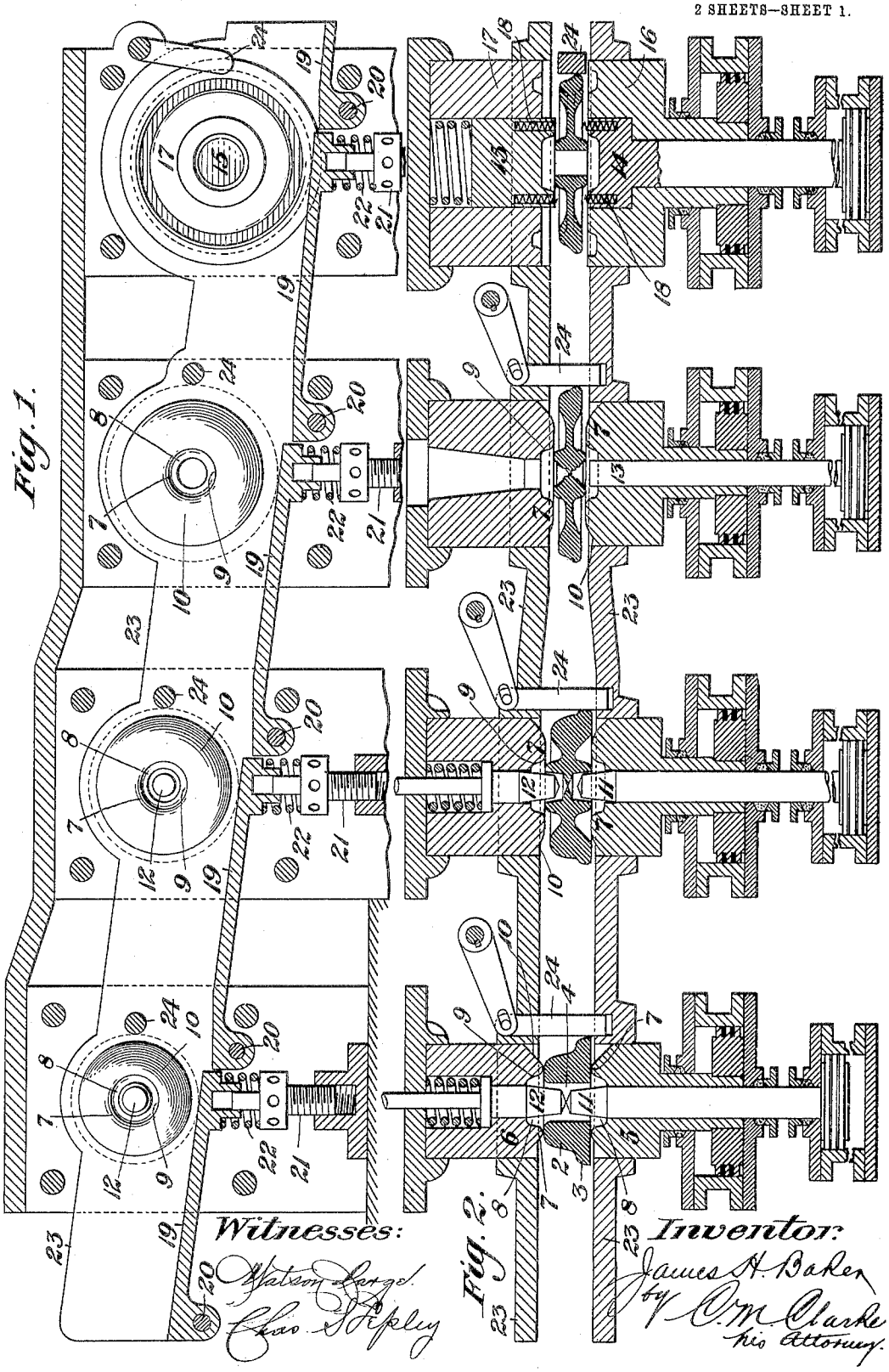


Fig. 2.

Witnesses:

Watson Sargent

Chas. S. Ripley

Inventor:

James H. Baker

by C. M. Clarke

his Attorney.

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2 SHEETS—SHEET 2.

Fig. 3.

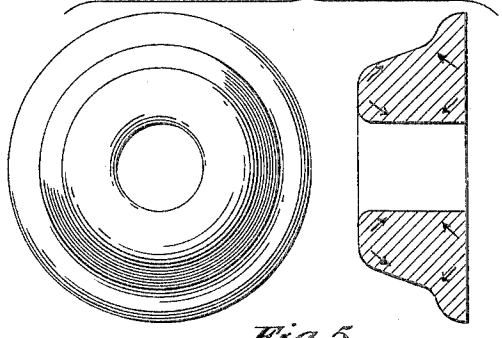


Fig. 4.

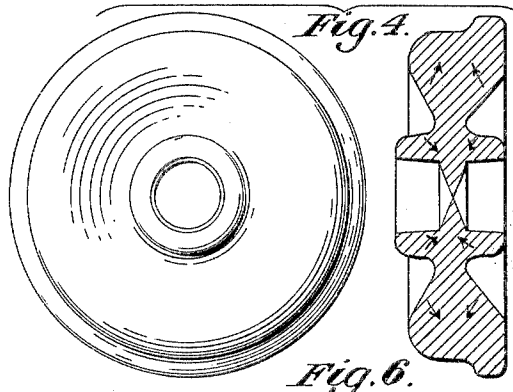


Fig. 5.

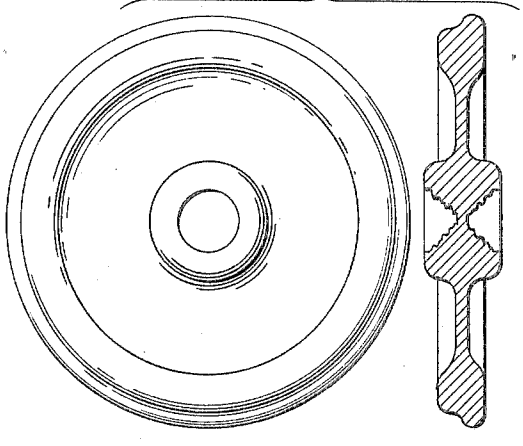


Fig. 6.

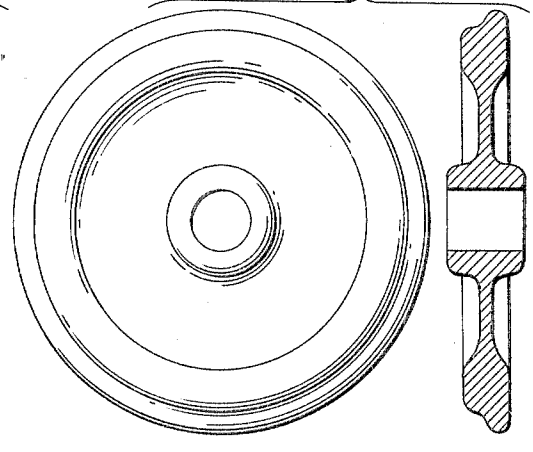


Fig. 7.

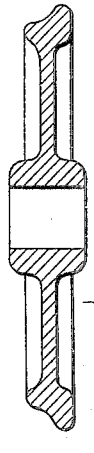


Fig. 8.

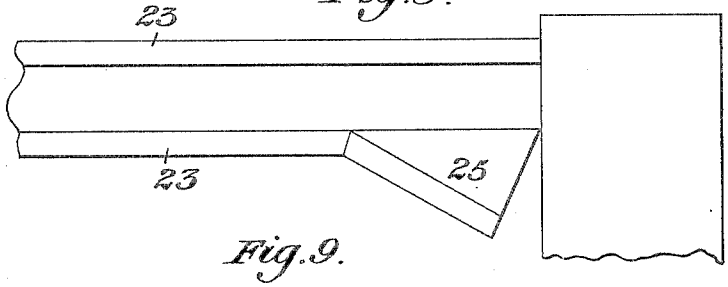
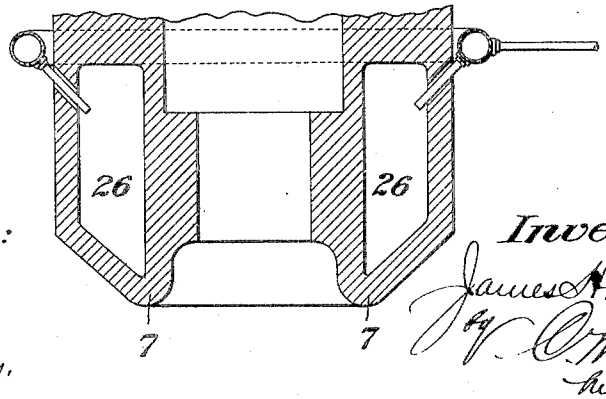


Fig. 9.



Witnesses:

Watson Lapp

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Inventor:

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No. 793,814. Patented July 4, 1905.

UNITED STATES PATENT OFFICE.

JAMES H. BAKER, OF PITTSBURG, PENNSYLVANIA.

METHOD OF FORGING WHEEL-BLANKS.

SPECIFICATION forming part of Letters Patent No. 793,814, dated July 4, 1905.

Application filed May 16, 1904. Serial No. 208,265.

To all whom it may concern:

Be it known that I, JAMES H. BAKER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Methods of Forging Wheel-Blanks, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention consists of an improved method of forging circular metallic bodies, as car wheels or blanks, from a rough ingot or blank-body by a continuous series of rapidly-succeeding operations, with a view of reducing it to an approximately finished size without reheating, forging the metal outwardly and at the same time distributing the inferior central portions of the blank toward the central part of the hub and removing it, and automatic manipulation as far as possible, utilizing gravity to advance the blank and finally deliver it at a given point. I also arrange to allow the excess metal to flow inwardly toward the center of the hub and also outwardly in laterally-opposite directions and afterward remove such excess in forming the journal-opening.

My method also employs the use of an ingot-blank considerably thicker and less in diameter than the finished article, thereby giving opportunity to forge the hub and rim portions flatwise and also making it easier to force the metal outwardly in the first steps of the process, because of the lessened distance to the outside of the circle.

The forging-dies are arranged in a series of opposing horizontally-disposed pairs, to which the blank is transported in any suitable manner. In the arrangement of mechanism shown the blank is caused to roll upon its periphery by gravity, being supported upon an inclined floor, which may be adapted to be vertically adjusted, means being provided to arrest its travel between each pair of dies and for releasing the blank from the dies. By this disposition of the dies and the travel of the blank the loosened scale will fall from them.

Referring now to the drawings illustrating the method, Figure 1 is a longitudinal vertical sectional view of an apparatus adapted to carry out my invention. Fig. 2 is a plan view thereof, partly in section, the blanks being shown in position between each pair of dies immediately before each operation and, with the exception of the first blank, in the form produced by the preceding dies. Figs. 3, 4, 5, 6, and 7 are detail views, in side elevation and cross-section, illustrating the blank in its successive steps from the ingot to the finished car-wheel blank ready for turning. Fig. 8 is a detail view showing the laterally-directed side of the runway. Fig. 9 is a detail sectional view of a heated die.

My method is carried out in a series of forging steps, the forging functions being performed in the earlier of such steps, while the finishing operations are designed to reduce the blank as nearly as possible to the finished form and to remove the central excess portion in the operation of forming the journal-opening, supplemental operations facilitating the progress of the blank through the apparatus, limiting it at proper positions, and finally ejecting it from the dies and delivering it to any desired point.

The original ingot or blank 2 is circular in form, having a peripheral flange extension 3 at one side and a central opening 4 large enough to receive any excess of metal flowing into it from the forging operation. The blank is introduced edgewise between the opposing longitudinally-acting dies 5 6, both of which may be positively actuated by suitable mechanism, although but one die may be actuated, as shown, the other remaining stationary, these dies being provided with relatively longitudinally movable centering mandrels. Generally all of the dies are similar in their action and are designed to compress part of the metal laterally toward the periphery and allow part of it to flow toward the center in the first steps, while reducing it in thickness annularly between these inner and outer portions. To this end they are provided with annular projections 7 7, surrounding a central depression 8, the inner and outer faces 9 10 of the projections 7 tapering away from the apex of the projection in such manner as to do rapid forging in the first steps and to shape the wheel-tread in the finishing operations. In the first

step these projections enter against the face of the blank, forcing the metal in both directions, the central portion flowing into the inner hub-cavity 4 and thence outwardly, forcing the mandrels backwardly to make room. This hub-cavity 4 is primarily large enough to receive the largest excess of metal liable to occur, for should this cavity be entirely filled before the dies come "home" the flow would stop and the free operation of the dies be interfered with. The advantage from this is apparent, because in practice the ingot or the hole in its center may vary in size, or it may be lightened by scaling, and therefore this excess of metal cannot be predetermined. If this space were otherwise located, a light blank would leave a defect which would destroy the article, but being left in the central part of the hub and punched out the amount of excess metal is not material within reasonable bounds. This operation is clearly indicated in the second step of Fig. 2, which also shows the central mandrels 11 12 in the position they assume before the second step is taken. The third step of Fig. 2 shows a central portion of the hub partially filled by the preceding operations, which have forced the mandrels 11 12 backwardly against their actuating pressure, their backward travel being limited when desired by positive means to prevent the mandrels from being forced too far outwardly or limited only by the adjustment of the spring or piston. As the forging takes place nearer and nearer to the periphery, there is little inclination for the metal to flow inwardly. Fig. 2 shows a punch 13 ready to remove the surplus metal at the center. By these means yieldable resistance is opposed to the inflow of the surplus metal, which, while not being positively restricted in its flow, is against partial resistance. The fourth step of Fig. 2 shows the finished hub embraced by the centering dies 14 15 and the outer independently-acting compressing-dies 16 17, which further compress and expand the blank. If desired, the central mandrels may be used at this stage for centering in place of the center dies. Stripping-springs 18 are mounted in the dies, which automatically eject the blank from them when released, allowing it to roll to the next position.

The supporting inclined floor is composed of a series of vertically-adjustable sections 19, hinged at 20, supported upon temper-screws 21, intervening springs 22 being provided, if desired, to allow for the expansion of the metal during the forging. Other forms of floor may be used in carrying out the invention. The blanks roll upon the inclined floor between vertical longitudinal sides 23 23, which constitute a runway and maintain the blank on edge.

For the purpose of arresting the blank in position for action by the dies a bar or abutment 24 is suitably mounted across the runway, as shown, means being provided to withdraw the bar to allow the blank to roll forward to the next position. For the purpose of delivering the finished blank on its side onto any desired receptacle one side of the runway is deflected laterally, as shown at 25, Fig. 8, and as the blank comes to this point the delivery is automatically accomplished, the blank falling toward the bent-over portion of the runway and out onto the platform or carriage.

In order to save power and facilitate the forging, I may heat the projections 7 of the dies and maintain them at the highest allowable degree of heat by providing an interior cavity 26, in which suitable fuel may be burned.

By my method I am enabled to perform the various operations very rapidly, completing the forging in one heat with a minimum of manual attention, dispense with the poorer metal in the center of the ingot, and can use a regularly-molded ingot at an initial cost per pound of about one-third ($\frac{1}{3}$) of the cost of a molded car-wheel shape, and thus produce an entirely and thoroughly forged car-wheel at low cost.

What I claim is—

1. The method of forging wheel-blanks consisting in pressing a circular blank provided with a central cavity to cause the metal thereof to simultaneously flow outwardly beyond said cavity and against yielding resistance into said cavity.

2. The method of forging wheel-blanks consisting in pressing a circular blank having a central cavity between oppositely-arranged dies adapted to simultaneously force the metal away from and toward the center and around an inner receding mandrel.

3. The method of forging wheel-blanks consisting in pressing a circular blank having a central cavity between oppositely-arranged dies adapted to force the metal away from and toward the center and around a yieldable resisting medium or means adapted to permit the surplus metal to flow into the cavity.

4. The method of forging wheel-blanks consisting in placing the end of a mandrel centrally within the cavity of an annular metal blank and pressing the blank laterally between dies formed to force the metal simultaneously away from and toward the center, and causing the mandrel to recede as the metal presses against it.

5. The method of forging wheel-blanks consisting in placing the ends of tapered mandrels centrally within the cavity of an annular metal blank and pressing the blank laterally between dies formed to force the metal simultaneously away from and toward the center, and causing the mandrels to recede by pressure of the metal against them.

6. The method of forging wheel-blanks con-

sisting in pressing a circular blank having a central cavity successively between a series of pairs of oppositely-arranged horizontally-acting dies constructed to simultaneously force the metal away from and toward the center of the blank, and allow the surplus metal to flow into the central cavity, transferring the blank edgewise by gravity from one pair of dies to the next adjacent pair, and holding it against further travel during each operation.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES H. BAKER.

Witnesses:
JAS. J. MCAFEE,
C. M. CLARKE.