No. 645,889. Patented Mar. 20, 1900.

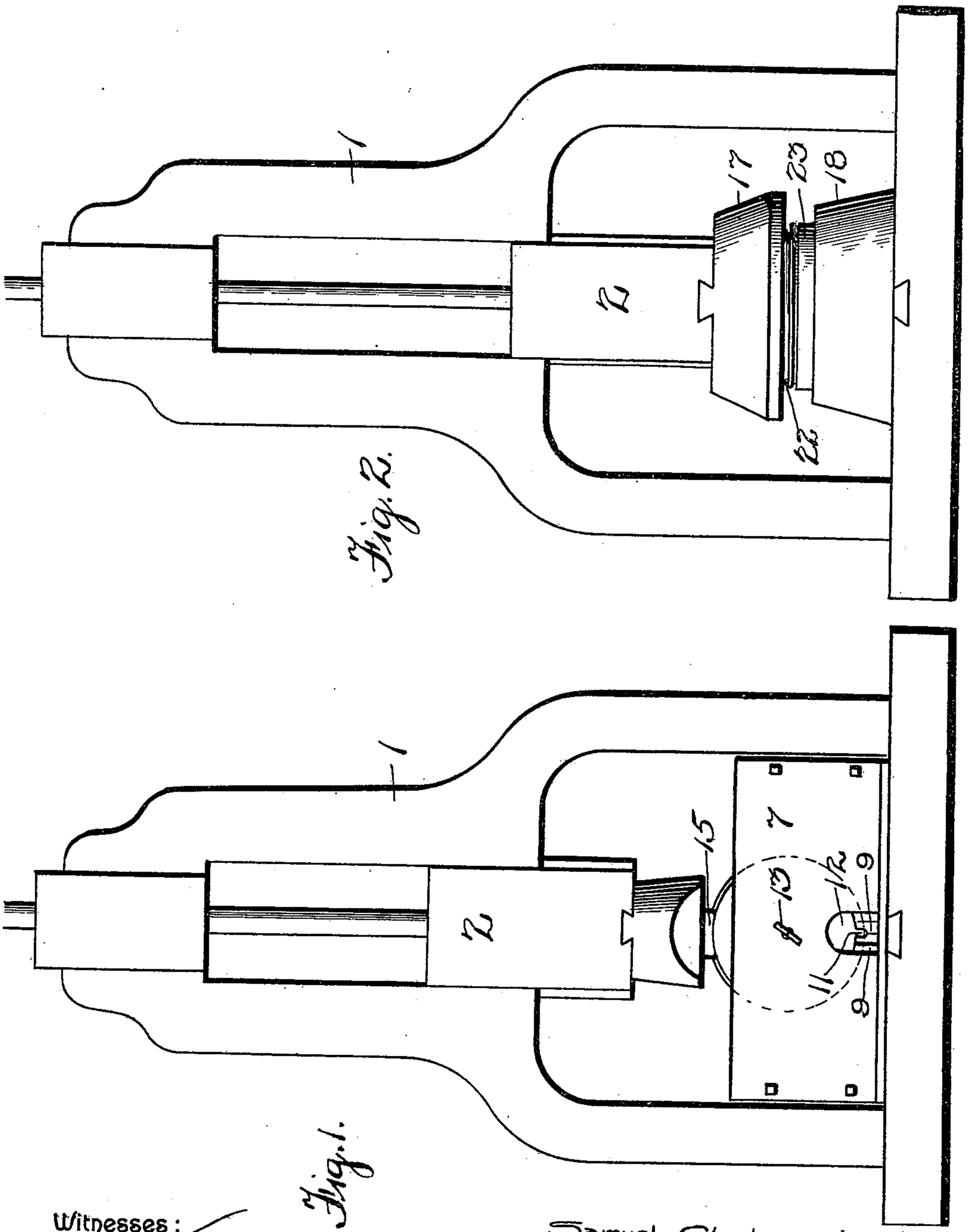
S. CLARKE.

DIE FOR FORGING CAR WHEELS.

(Application filed Apr. 3, 1899.)

(No Model.)

3 Sheets—Sheet 1.



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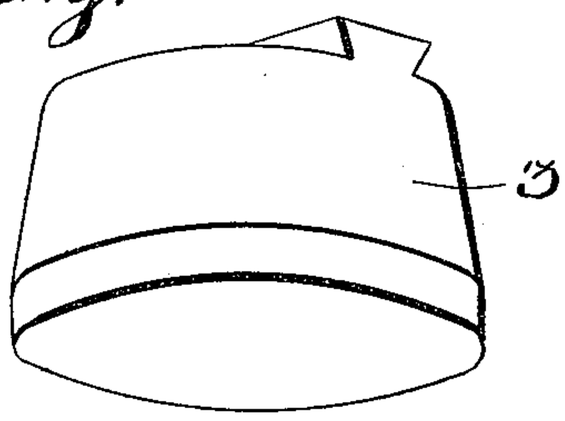
(No Model.) 3 Sheets—Sheet 2.

Fig. 3.



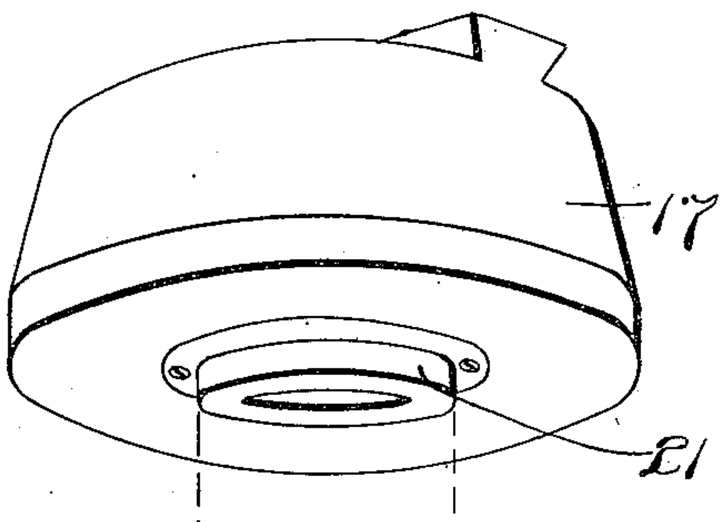


Fig. 10

Fig. 4.

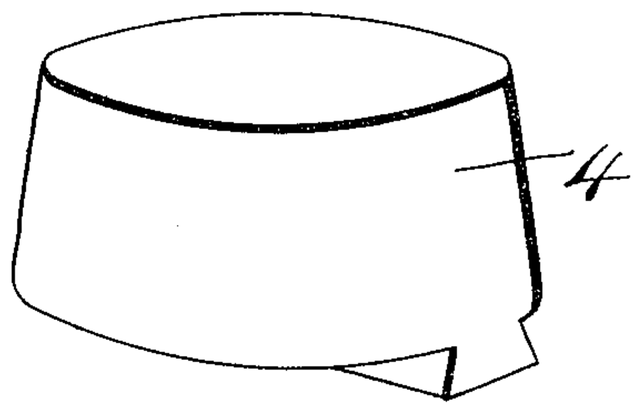


Fig. 11

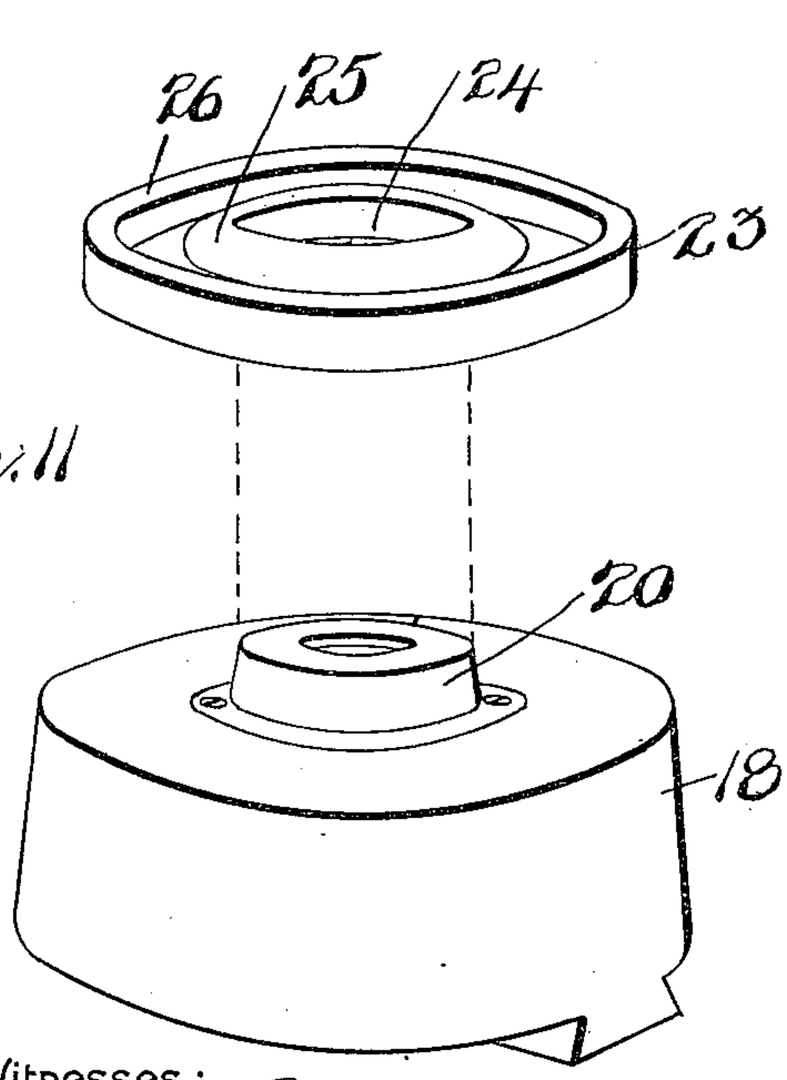


Fig. 12

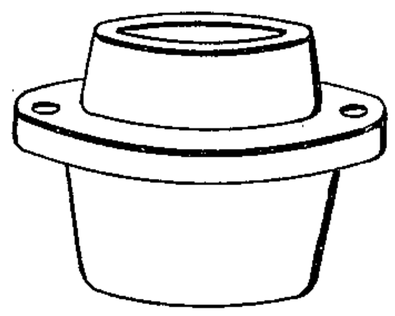


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Fig. 5

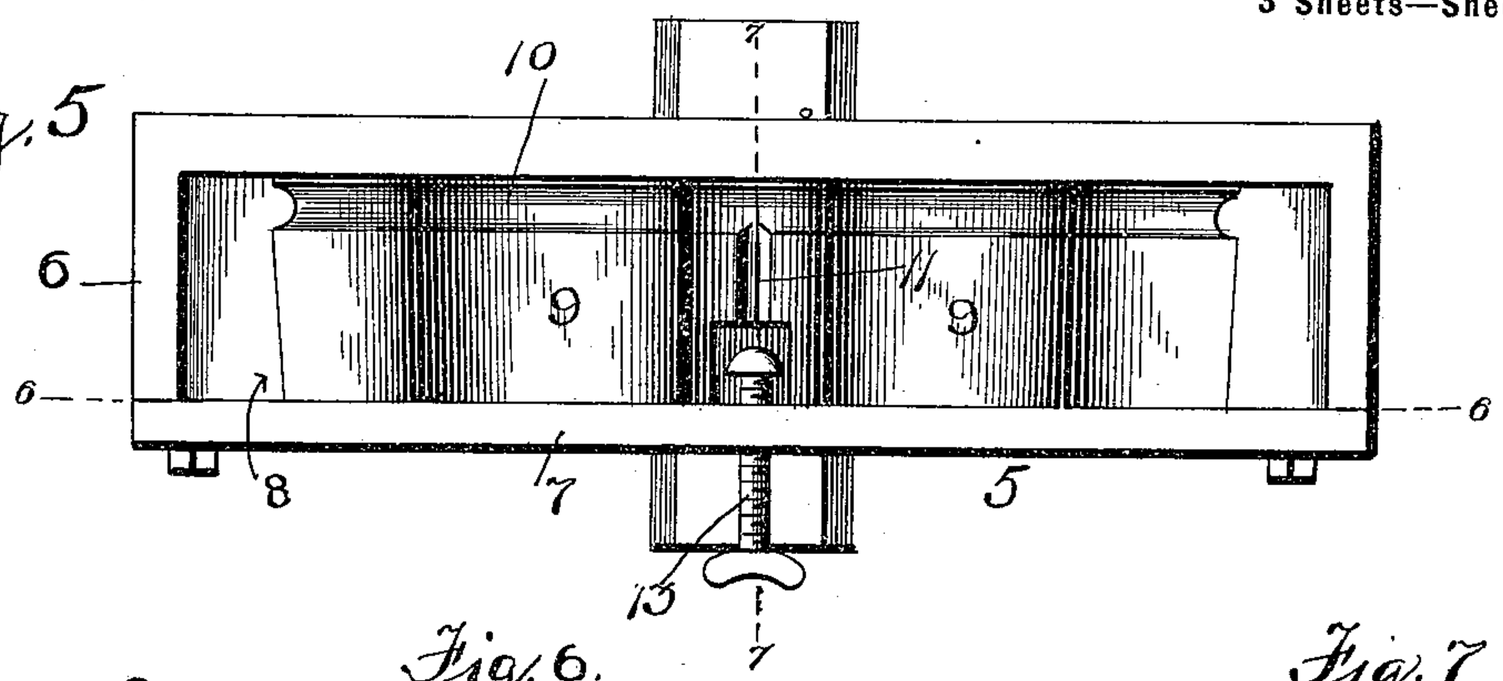


Fig. 6.

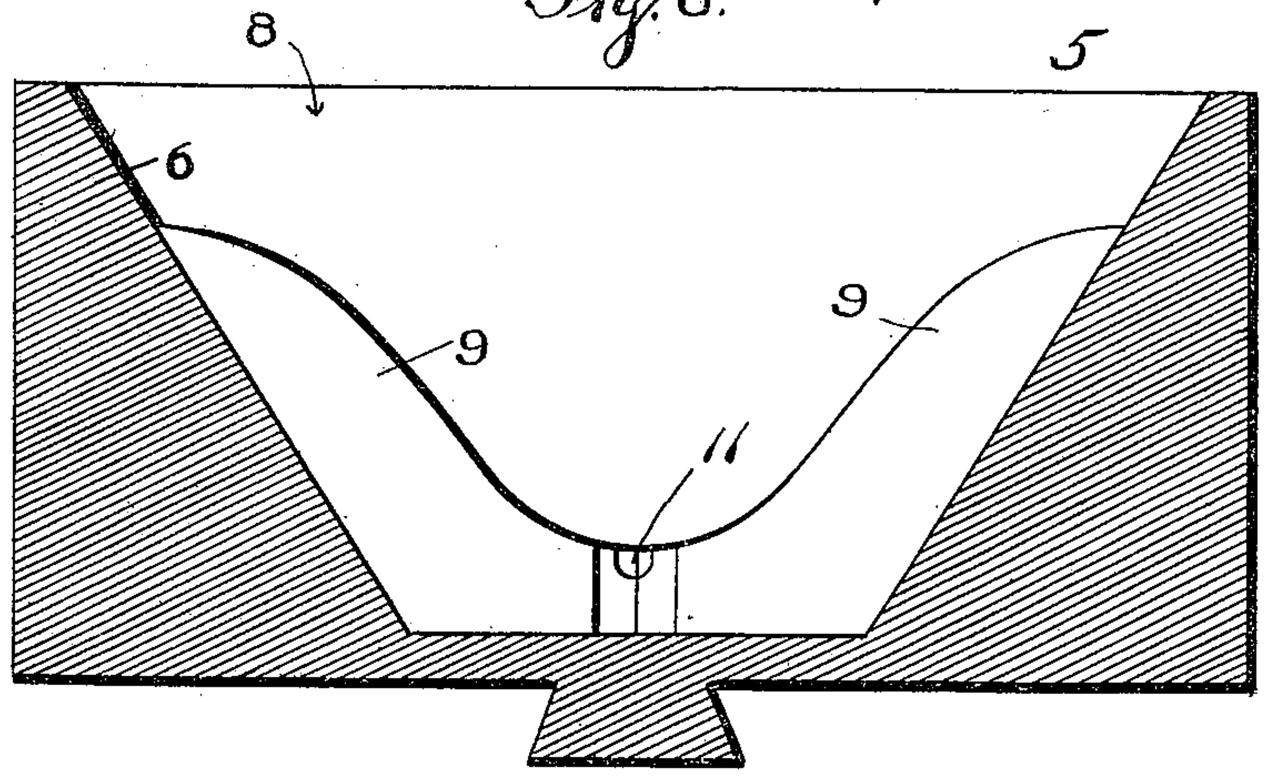


Fig. 7

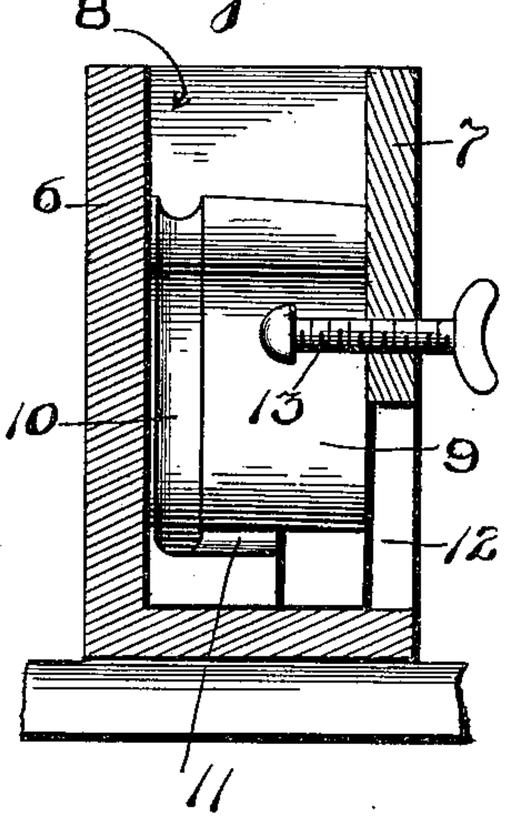


Fig. 8.

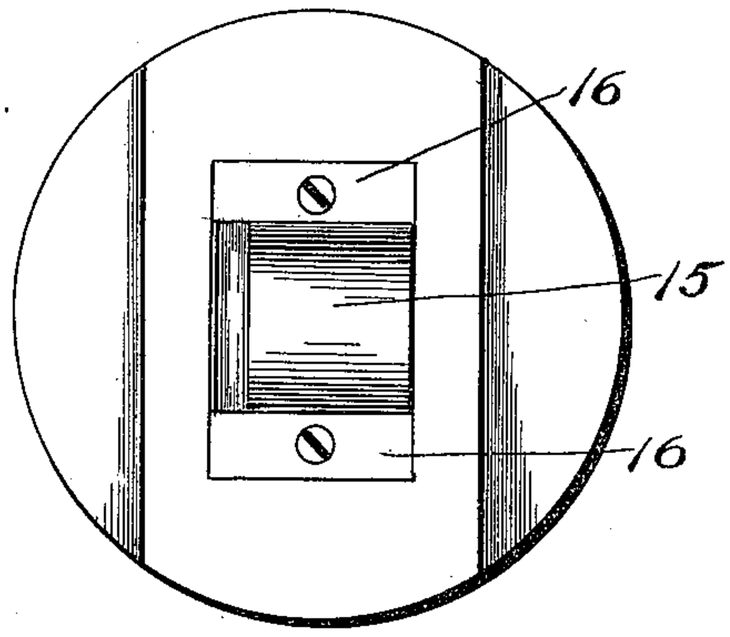
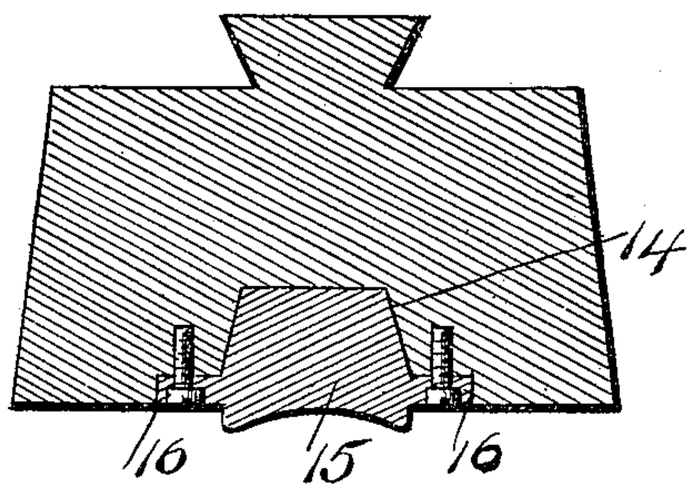


Fig. 9



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UNITED STATES PATENT OFFICE.

SAMUEL CLARKE, OF PERTH, CANADA.

DIE FOR FORGING CAR-WHEELS.

SPECIFICATION forming part of Letters Patent No. 645,889, dated March 20, 1900.

Application filed April 3, 1899. Serial No. 711,542. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL CLARKE, a subject of Her Majesty the Queen of Great Britain, residing at Perth, county of Lanark, Province of Ontario, Canada, have invented certain new and useful Improvements in Dies for Forging Car-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in machines for forging car-wheels, and has particular relation to improvements in the dies of such machines whereby the latter will be rendered more positive, efficient, and durable in operation.

One object of my invention is to provide a new and useful improvement in the construction of the anvil-die for the hammer which will insure the proper positioning of the wheel-blank, so that the entire machine will sustain the least possible degree of jarring or straining, while at the same time the wheel-blank will have the same strain of hammering equally distributed throughout the same to avoid splitting, cracking, or the formation of other defects.

A further object is to provide an apparatus for forging car-wheels which is simple and efficient in operation, durable in construction, and which will serve to allow of the forging of the car-wheel with the least amount of trouble and expense.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction and combination of parts hereinafter fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, forming a part of this specification, and in which similar numerals of reference indicate similar parts in all of the views, Figure 1 is a front elevation of a steam-hammer having one of the forms of dies used in forging the wheel in position thereon. Fig. 2 is a similar view showing a different form of die. Figs. 3 and 4 are perspective detail views of the dies used in the first stage of the operation of forging car-wheels according to my improved process. Fig. 5 is a plan view of the anvil-die used in the second stage. Fig. 6 is a vertical sectional view taken on the line 6 6 of Fig. 5. Fig. 7 is a similar view taken on the line 7 7 of Fig. 5. Fig. 8 is a detail of the hammer-die used in connection with the die shown in Figs. 5, 6, and 7. Fig. 9 is a sectional view of the die shown in Fig. 8. Fig. 10 is a detail of the upper die used in the third or finishing stage, the fuller used in connection therewith being shown as detached. Fig. 11 is a detail of the anvil-die used in the finishing stage, the finishing-ring used in connection therewith being shown as detached for the purpose of clearness. Fig. 12 is a detail of the centering device used in connection with the dies shown in Figs. 10 and 11.

In the forging of car-wheels three processes are used, which may be termed "stages," these stages consisting, first, in taking a bloom or ingot heated to the required degree and flattening it by subjecting it to the action of suitable flattening-dies located in a hammer. The second stage consists in taking the blank so formed by the first stage and subjecting it to the action of a different set of dies, which form the tread and flange on the blank and make the wheel approximately of its required size. The third stage consists in finishing the wheel, and consists in subjecting the blank which had previously been passed through the first stages to the action of a different set of dies, by means of which the wheel is finished ready for attaching to the axle. The passage of the ingot through these stages serves to produce a forged-steel car-wheel, which is compact and homogeneous and formed with a hard surface, which is due to the forging process.

In describing my invention I will do so in connection with the various steps which are necessary in the forming of the car-wheel, and while the invention does not consist in the use of the entire sets of dies shown in the drawings, some of these dies being of well-known form, yet I have shown them for the purpose of explaining clearly the use of the dies which form a part of my invention and also the manner of forging the wheel by the use of these dies.

1 designates the frame of a steam-hammer, and 2 the vertically-reciprocating member of

such hammer. As the hammer forms no particular portion of my invention, excepting in so far as a hammer must necessarily be used to obtain the requisite amount of power, I show no more than a conventional form of hammer, it to be clearly understood that I may use any suitable form of hammer and may make use of any source of power for operating said hammer. The hammer portion 2 is provided with a suitable dovetail slide for the reception of the hammer-dies hereinafter specified, while the frame below said hammer is also provided with a similar slide for the reception of the anvil-dies.

In the first stage of forging the car-wheels the hammer and anvil dies shown in Figs. 3 and 4 are inserted in the slides formed in the hammer and frame and the heated ingot or bloom placed in position on the anvil-die and the hammer reciprocated, which serves to flatten out the ingot or bloom into a plate formed similar somewhat to a disk, the disk being larger than the diameter of the wheel which is to be formed, but having a greater thickness than the finished wheel. The dies used in the first stage, which I will designate as 3 and 4, are then removed and the dies shown in Figs. 5, 6, 7, 8, and 9 are inserted in lieu thereof. As these dies form a particular portion of my invention, I will now describe them in detail.

The anvil-die 5 is formed substantially as shown in the drawings, comprising a casing 6, having a recess formed therein, the sides of said recess being preferably inclined, as best shown in Fig. 6, the front of said casing being formed either integrally with the remaining portion of said casing or removable therefrom, the figures in the drawings showing said portions, which I will designate as 7, as removable, suitable bolts being provided for the purpose of retaining it in its proper position. The inclined recess, which is formed in the die 5 and which I designate as 8, is adapted to receive the flanging-die 9, preferably formed as shown in Fig. 6, said die being formed in two parts held in proper position by reason of the inclined face of the casing. The inner contour of the die 9 is formed substantially as shown in the drawings, which contour is adapted to set the tread of the car-wheel, the contour being rounded and forming a segment of a circle. As shown in Figs. 5 and 7, the die 9 is provided at its rear upper face with a recess 10, which is adapted to form the flange located on the periphery of the tread of the car-wheel. The die is further provided with a suitable forwardly-extending recess 11, formed at the meeting edges of said portions of the die, which serves to allow of the insertion of a suitable bar by means of which the car-wheel may be raised from the die after the hammer has been operated and which also allows of the turning of the wheel a sufficient distance to bring the periphery of the tread portion into proper position. In turning the wheel by means of the bar the bar is first inserted through the opening 12 and passed into the recess 11 below the tread portion of the wheel. The outer end of the bar is then pressed downward, raising the wheel from the die, in which position the outer end of the bar is moved to either side, causing the wheel to be turned, the die forming the fulcrum. Obviously other methods of turning the wheel may be employed—such, for instance, as providing a supplemental fulcrum for the bar, the opening 12 being of a size large enough to allow of the lateral movement of the bar. To enable a ready insertion of the bar for turning the car-wheels, I provide the face-plate 7 with an opening 12. To hold the ingot or bloom in position on the die 9, I provide a suitable screw-threaded pin or thumb-screw 13, having its inner end rounded, said inner end being adapted to contact with the face of the ingot or bloom or the wheel. As car-wheels of different sizes must be made, I make use of dies 9 of different sizes, it being readily seen that the die can be easily removed from the casing 6 and the proper die be placed in position.

The hammer-die used in connection with the second stage of the process is best shown in Figs. 8 and 9. The base of the die is of any suitable contour and is provided at its center with a recess 14, having its sides inclined, said recess being adapted to receive the removable block or die-plate 15, the outer face of which is rounded in the segment of a circle similar to the rounded portion of the die 9, the block or plate being provided with laterally-extending portions 16, by means of which the block is secured within the die by means of suitable screws or other fastening means, as shown in the drawings. As shown in Fig. 9, the block 15 has its edges rounded, this provision being made for the purpose of preventing any overlapping of the part when the wheel is being forged, such overlapping having a tendency to destroy the contour of the car-wheel.

From the above description it will be readily seen that during the second stage of the process of forging the ingot or bloom is placed within the recess 8 and the thumb-screw 13 passed into contact with the face of the ingot, thereby holding it in position against movement. The hammer-die is now brought down in contact with the periphery of the ingot or bloom, which serves to drive the particles of steel closer together, the face of the block 15 and the face of the die 9 serving to give the proper curvature to the car-wheel. As the car-wheel is gradually hammered into its proper shape the wheel is turned to bring a new surface to bear for the action of the hammer-die, the implement used being passed through the opening 12 and into the recess 11, as heretofore set forth. As will be readily understood, when forging the tread and flange portions of the wheel the segmental surface of the die 9 will receive the periphery of the ingot or bloom or the tread and flange portions

of the wheel, supporting it against the blows of the hammer-die without any liability of the wheel binding or having its shape altered, thus enabling a ready rotation of the wheel after the blows have been struck. As the recess within which the die 9 is located is inclined, as shown, it will be apparent that there will be no liability of the two portions of the die becoming separated by the operation of the hammer-die, such operation tending to hold said portion in a close position. After the ingot or bloom has passed through the second stage the dies used in the second stage are replaced by the dies shown in Figs. 10 and 11, which I designate as 17 and 18. Each of these dies is provided with a recess 19, the sides of the recess being inclined, as shown, said recesses being adapted to receive the removable centering-piece 20, formed in the die 18 and the hub-pocket 21, formed in the die 17. The centering-piece 20 and hub-pocket 21 are secured to the dies in any suitable manner, such as by bolts, being removable from the dies for the purpose of a ready replacing should either become worn or broken.

In practice the wheel is first centered on the lower die, after which the hammer or thumb die is forced downward, thus causing the fullers to be forced into the steel until the desired thickness of the plate or wheel is formed, the surplus steel passing into the hub-pocket. The top die is then raised, as well as the wheel, and the finishing-ring (best shown in Fig. 11) placed in position on the die 18. The wheel is then placed in position, and the top die, on which the ring 22 (shown in Fig. 10) is placed, is then passed downward, and the wheel is finished by this downward movement of the upper die.

The finishing-ring, which I designate as 23, is formed substantially as shown in the drawings, having a central opening 24, which is adapted to pass over the outer periphery of the centering-piece 20, said ring being extended radially from a flange 25, which forms the boundary of the opening 24. The outer periphery of said radially-extending portion is provided with a lateral annular flange 26, extending upwardly a suitable distance. The flange 26 extends upwardly a suitable distance, but is not intended to form a wall-ring, the periphery of the tread portion abutting against the inner periphery of said flange for a portion of the width of said tread portion.

The operation of my improved device is believed to be clearly set forth, and it is therefore not set forth in greater detail.

The advantages of my construction reside in the fact that each of the operating parts used in all of the dies, with the exception of the first-stage dies, which serve only to flatten the ingot or bloom, are removably connected to the dies themselves. This enables the parts to be readily replaced and also allows of the use of different-sized parts, which is essentially necessary where wheels of different sizes are made.

A further advantage lies in the construction of the anvil-dies used in the second stage. As shown, this die has a curvature at its top similar to the curvature of the purposed wheel, so that it is impossible to give the tread portion of the wheel any shape other than that of the proper form. This is not the case where a V-shaped slot is formed, as it will be readily seen that if the wheel is subjected to a greater amount of pressure the shape of the wheel will be varied.

A further advantage lies in the construction of the finishing-ring, by means of which the proper configurations of the face of the wheel are given without the necessity of using a cumbersome wall-ring and retaining-ring to hold said wall-ring in position, while the fact that the flange 26 does not extend upwardly the entire distance equal to the width of the tread portion of the wheel does not allow of the wheel spreading, yet will serve to allow of a ready release of the wheel from the finishing-ring.

While I have herein shown a preferred form of carrying my invention into effect, yet I do not desire to limit myself to such preferred details of construction, but claim the right to use any and all modifications thereof which will serve to carry into effect the objects to be attained by this invention in so far as such modifications and changes may fall within the spirit and scope of my said invention.

I claim—

1. In a machine for forging the tread and flange of car-wheels, the combination with the hammer-die, having a die projection, the face of which is formed in the segment of a circle corresponding to the finished wheel; of an anvil-die comprising a casing, said casing having a recess inclined toward its bottom; a removable sectional die located within said recess, said die extending entirely across the lower portion of said recess, the upper face of said die having an operating-surface formed in the segment of a circle corresponding to the finished wheel, said die being adapted to support and contact with the tread portion of said wheel in vertical position; and a recess formed within said removable die, said recess extending the entire length of said sectional die, said recess being adapted to receive the flange formed on said wheel, whereby the tread and flange portions will be supported on said anvil-die without binding and without tendency of lateral spreading of the wheel, substantially as described.

2. In a machine for forging the tread and flange of car-wheels, the combination with the hammer-die, having its face formed segmental to correspond with the circle of the finished wheel-tread; of an anvil-die, comprising a casing; a recess formed therein, said recess being inclined toward its bottom; a removable sectional die located within said

recess, said die extending entirely across the lower portion of said recess, the upper face of said sectional die having an operating-face formed in the segment of a circle corresponding to the finished tread portion, said die being adapted to support and contact with the tread portion of the wheel in vertical position during the forging; a longitudinal recess formed in said removable die, said recess extending the entire length of said sectional die, said recess being adapted to receive the flange formed on said wheel, whereby the tread and flange portions will be supported on said anvil-die without binding and without tendency of lateral spreading of the wheel; and a laterally-extending recess formed centrally on the upper face of said sectional die, said recess being adapted to afford access to means for turning said wheel within said die, substantially as described.

3. In a machine for forging the tread and flange of car-wheels, the combination with a hammer-die, having its face formed segmental to correspond with the circle of the finished wheel-tread; of an anvil-die, comprising a casing, having a recess inclined toward its bottom; a sectional die located within said recess, said die extending entirely across the lower portion of said recess, the upper face of said die having an operating-surface formed in the segment of a circle corresponding to the finished tread portion, said die being adapted to support and contact with the said portion of the wheel in vertical position during the forging; a longitudinal recess formed in said sectional die; said recess extending the entire length of said die, said recess being adapted to receive the flange formed on said wheel, whereby the tread and flange portions will be supported on said anvil-die without binding and without tendency of lateral spreading of the wheel; and a thumb-screw secured within said casing, said screw extending into the space formed above said removable die, said screw being adapted to hold the wheel against lateral movement within said casing, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

SAMUEL CLARKE.

Witnesses:
A. R. WALSH,
W. J. FLETT.