

(No Model.)

J. SMITH.
DIE FOR FORMING AXLES.

No. 299,431.

Patented May 27, 1884.

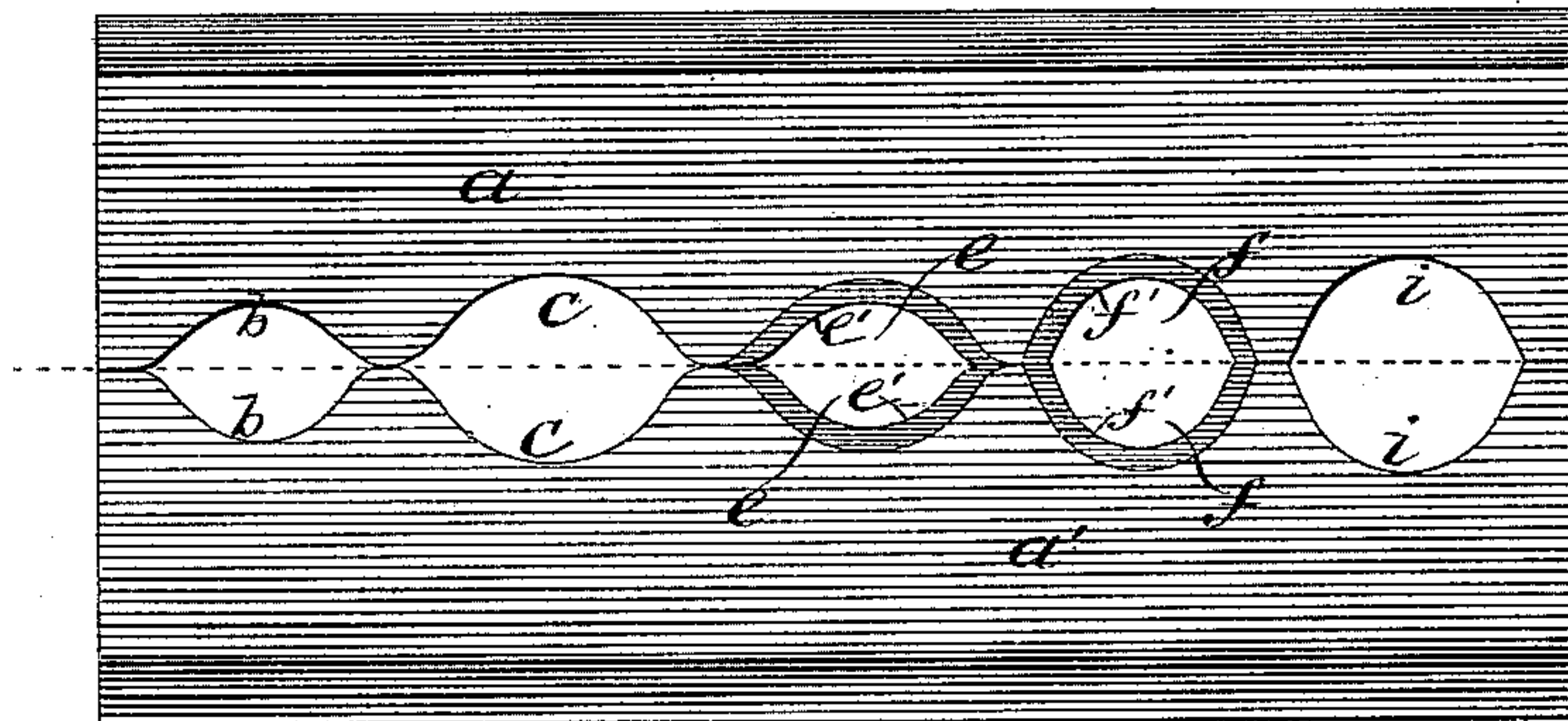


Fig. 1.

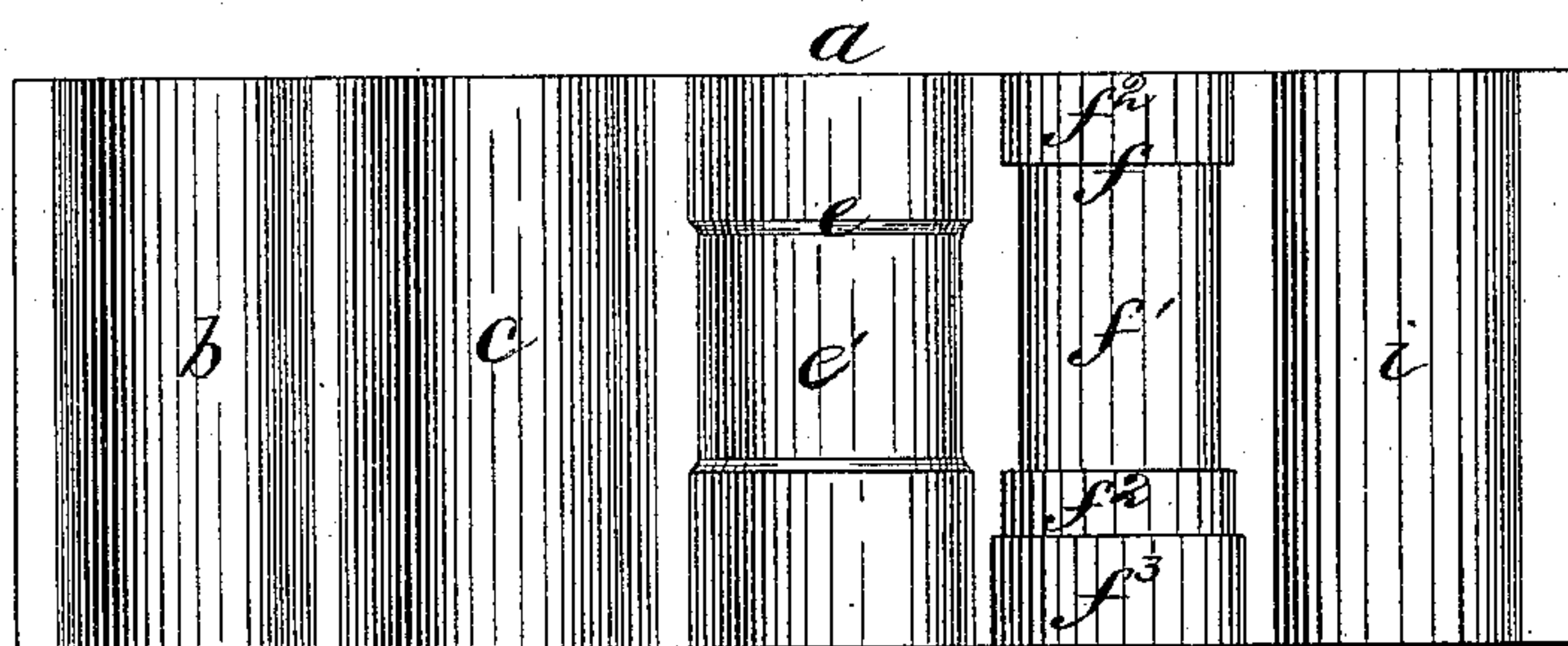


Fig. 2.

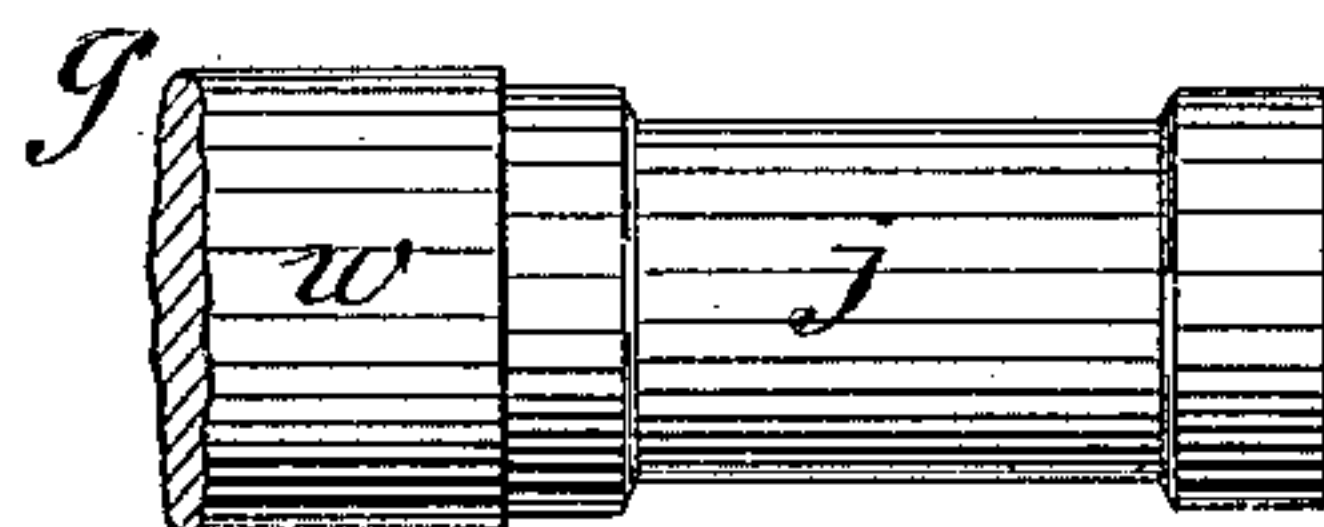


Fig. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES SMITH, OF BOSTON, MASSACHUSETTS.

DIE FOR FORMING AXLES.

SPECIFICATION forming part of Letters Patent No. 299,431, dated May 27, 1884.

Application filed December 1, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES SMITH, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Car-Axle Dies, of which the following is a specification.

This invention is an improvement on that described in Letters Patent of the United States No. 243,642, granted to me June 28, 1881; and it consists, first, in making the hammering portions of the dies which complete the forging of the journal of such form in cross-section that when said dies meet said hammering portions will form arcs of a circle whose center is in the plane of the meeting faces of the die-blocks, and will impart a perfect cylindrical form to the journal, the diameter of the latter being determined by that of the dies, so that there will be no material variation in the diameters of all the journals produced by a given pair of dies.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents an end view of a series of dies embodying my invention. Fig. 2 represents a top view of one part or half of the series. Fig. 3 represents a side view of a portion of an axle.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a a'* represent the heads or blocks, in which are formed the usual dies, *b b c c*, for roughly forging the car-axles, and dies *e e* and *f f*, for forging the journals of the axle.

As stated in my above-named patent, my invention does not relate to the dies *b b c c*, said dies being of the usual form and arrangement; nor does my invention relate to the dies *e e*, as the peculiarity of said dies, as hereinafter described, is set forth in said patent. The block *a* is supported rigidly on a suitable bed, and the block *a'* is operated, in the ordinary manner of operating a trip-hammer. The dies *e e* have projecting faces *e' e'*, with rounded ends, and adapted to form a groove or incipient journal in a car-axle of a lesser length than the completed journal.

In the operation of the dies *e e* on a heated axle-bar placed between them, each blow of the dies indents and at the same time elongates the portion of the axle with which it comes in contact. Thus the first blow forms

a slight groove or indentation in the axle, the next blow deepens the indentation and elongates the indented portion, so that the ends of the first indentation are carried slightly outward in opposite directions, and so on until the faces *e' e'* have entered the axle as far as they are able and formed a groove of the required depth. The extreme length of this groove is greater than that of the faces *e' e'*, so that the ends of the groove do not conform to the rounded ends of the faces, but extend away from the same, the ends of the grooves being rough, and showing traces of each separate blow of the dies. The dies *f f* have faces *f' f'*, which are longer than the faces of the dies *e e*, their length being substantially equal to that of the completed groove or journal. The dies *f f* in operation do not materially increase the depth of the grooves or journals, and therefore do not materially elongate the portions of the axle in which the journals are formed. The dies *f f* finish the ends of said grooves, causing them to conform exactly to the ends of the faces *f' f'*. The difference in length between the faces *f' f'* and *e' e'* is such that very little metal is displaced by the ends of the faces *f' f'*, the effect of the latter being to give the desired form to the ends of the journals, causing them to approximate closely the final form given by the lathe, so that the minimum of time, labor, and waste of material attends the finishing operation.

The foregoing description is substantially identical with that given in my above-named patent, and is given to avoid the necessity of reference to said patent. My present improvement, so far as the same relates to the dies, consists in making the hammering portions of the dies *f f* in cross-section arcs of a circle whose center is in the plane of the meeting faces of the blocks *a a'*, said dies forming, when the blocks meet, a complete circle, excepting at and near the said meeting faces, where they are preferably enlarged or widened, as shown, to afford room for the lateral displacement of the metal of the journal caused by the action of the hammering portions of the dies above and below said enlarged portions, so that the displaced metal will not be indented by the faces of the dies, but will form gentle protuberances, which can be readily reduced by rotat-

ing the axle, and thus bringing said protuberances under the hammering portions of the dies. The dies *f* are allowed to act on a journal until they meet, as shown in Fig. 1. The journal is thus hammered to a perfectly cylindrical form, and has the same diameter as the space inclosed by said dies. The preceding dies are substantially oval in cross-section, each half-die being wider than it is deep, and they are not allowed to act on the axle until they meet; but the axle is rotated while being acted on by said dies, so that it is reduced to nearly the proper shape before reaching the dies *f*. The axle is also rotated while being acted on by the dies *f*, so that the protuberances above mentioned are reduced by the compacting or condensing action of said dies, and all parts of the surface are equally hardened. When the journal leaves the dies *f*, it is hammered to a cylindrical form, and is substantially completed, and requires only sufficient reduction by the lathe to impart the desired finish or smoothness. The finished journal therefore presents a uniformly hard hammered surface at all points, the metal hardened and condensed by the dies not being removed by the lathe to any material extent. The dies *f* have enlargements *f*¹ *f*² at their ends, which form the enlargements or shoulders on the axle at the ends of the journals. Said enlargements *f*² are also semicircular, and are concentric with the journal-forming portions *f*¹; hence the enlargements or shoulders on the axle are hammered to a cylindrical form, and are made exactly concentric with the journal. *i* *i* represent a pair of semicircular dies or grooves which are of uniform size from end to end. Said dies are adapted to form the wheel-seat *w* on the axle and give said seat the same perfection of form as that imparted to the journal by the dies *f*. In case the wheel-seat is made larger than the shoulder or oil-seat at the inner end of the journal, as shown in Fig.

3, the dies or grooves *f* should have enlargements *f*³ at one end, adapted to form the outer end of the wheel-seat. The dies *i* *i* finish the wheel-seat in continuation of the part finished by the enlargements *f*², so that the wheel-seat is necessarily concentric with the journal, and is compacted and hardened on its surface like the journal. When the wheel-seat is made of the same diameter as the shoulders at the inner ends of the journal, the enlargement *f*³ will not be required. The improved axle thus formed forms the subject of an application for Letters Patent of the United States filed by me July 20, 1883.

I claim—

1. As a means for forging the journals of car-axes, the dies *e* *e*, having faces *e'* *e'* of less than the length of the completed journal, jointly with the dies *f* *f*, having faces *f'* *f'* of substantially the same length as the completed journal, the hammering portions of said dies *f* forming arcs of a circle whose center is in the plane of the meeting faces of the die-blocks, whereby the journal is forged to a substantially perfect cylindrical form with a predetermined diameter, as set forth.

2. The dies *f* *f* in the blocks *a* *a'*, for forming the arms of axes, each die presenting a hammer-face that is a short arc only (less than the half) of a circle drawn from a point in the parting-line of the dies, and the two dies jointly having such configuration (indicated by *f*, *f'*, *f*², and *f*³) as would mold the axle-arm, its journal, shoulders, and wheel-seat to the finished form represented by Fig. 3 of the drawings.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 26th day of November, 1883.

JAMES SMITH.

Witnesses:

C. F. BROWN,
A. L. WHITE.