(No Model.)

S. T. WELLMAN.

APPARATUS FOR FORGING CAR AXLES.

No. 422,557. Patented Mar. 4, 1890.

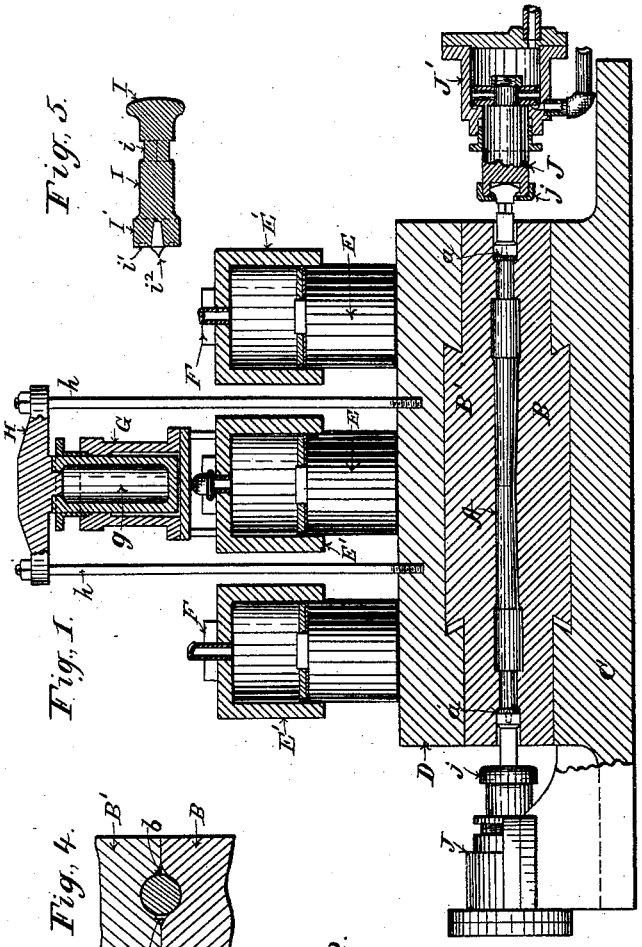

Fig. 1.

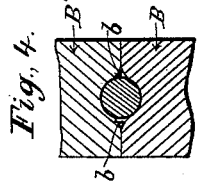

Fig. 4.

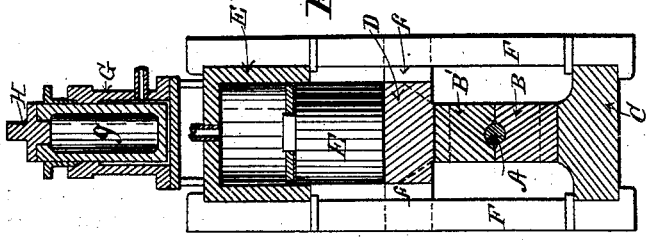

Fig. 2.

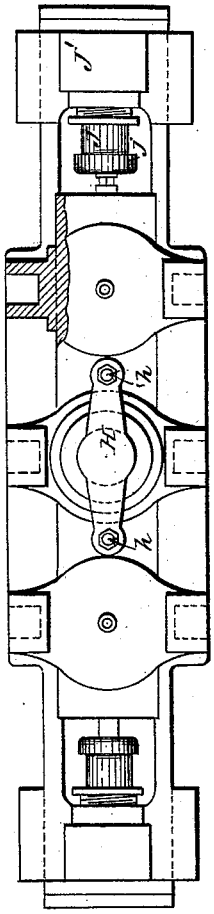

Fig. 3.

Fig. 6.

Fig. 7.

WITNESSES.

W. R. Edelen.

Geo. W. Kunz

INVENTOR.

Samuel T. Wellman

By Leggett & Leggett

ATTORNEY.

UNITED STATES PATENT OFFICE.

SAMUEL T. WELLMAN, OF CLEVELAND, OHIO.

APPARATUS FOR FORGING CAR-AXLES.

SPECIFICATION forming part of Letters Patent No. 422,557, dated March 4, 1890.

Application filed December 26, 1888. Renewed September 9, 1889. Serial No. 323,350. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL T. WELLMAN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Apparatus for Manufacturing Car-Axles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in apparatus for manufacturing car-axles; and it consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation, partly in section. Fig. 2 is an end elevation, in transverse section, through the longitudinal center of the machine. Fig. 3 is a plan. Fig. 4 is an enlarged cross-section of dies B B′. Fig. 5 is an enlarged detail of an upsetting-die. Figs. 6 and 7 are respectively side elevation and plan of blanks for car-axles.

My improved apparatus is for rounding or forging blanks previously prepared, such blanks having two parallel sides, as shown in Fig. 7, the blanks being of such variable width approximately, as shown in Fig. 6, that will distribute the metal lengthwise of the blank, the same as in the finished forging A, the latter being shown between the forging-dies B B′. The lower die B is stationary, being secured to the bed-plate C. The upper die B′ is secured to the vertically-reciprocating die-head D, the latter having attached the plungers E of the respective water-cylinders E′. These three cylinders are each supported by heavy side pieces or columns F, the one member *f* of each serving as a guide for head D. The three cylinders E′ are connected in the same system of water-pipes, so that they operate simultaneously. These three rams or cylinders are employed for depressing head D, to avoid constructing this head of such cumbersome proportions as would be necessary in case a single larger ram were employed for the purpose.

Located above the central cylinder E′, and supported from the same, is a smaller water-cylinder G. The plunger *g* thereof connects with cross-head H. The latter in turn is connected by means of rods *h* with head D aforesaid. By operating the upper ram die B′, head D, and the three plungers E are elevated.

The dies B B′ internally are adapted to fit the finished forgings A, except that the internal corners of the dies at *b* are cut away, as shown more clearly in Fig. 4. The recesses thus formed by cutting away the corners of the dies receive the metal that is forced laterally in breaking down the blank with the first closing of the dies. Without such recesses fins would be formed that would prevent the dies from closing. Outside the end collars *a* of the axle the bore of the dies is cylindrical to the ends thereof and of the same diameter as the end collars *a*.

By operating dies B B′ the axle is not drawn—that is to say, is not elongated—except at or near the ends of the axle; but at the respective ends the tendency to elongate is such that without other appliances than the dies aforesaid said collars *a* would not be forged full and sharp and the ends of the forging would be quite uneven or ragged. To avoid this upsetting-dies I are provided, the heads I′ thereof being adapted to fit internally the end sections of dies B B′ when these are closed. The enlarged rounded ends I^2 of the upsetting-dies enter corresponding sockets in the ends of plungers J of the double-acting rams J′. These latter rams are mounted, as shown, on the respective ends of bed-plates C, the axes of these rams being coincident with the axes of dies B B′. Dies I are held to their seats in the plungers by removable caps *j*. These caps fit so loosely, and by reason of the rounded ends aforesaid, that when the dies B B′ are opened the free end of the upsetting-dies may be raised a short distance without cramping in their seats in the plungers.

The length of dies I is such that with plungers J thrust forward their full throw the axle is upset to just the length required. For axles of different lengths or diameters the larger dies and the upsetting-dies are changed, others of the required dimensions being substituted.

The collars *a* of the axle may be made longer without changing the larger dies by providing a blank with more metal at the ends and substituting shorter upsetting-dies.

For turning the axle on its axis between the

strokes of dies B B′, dies I have sections *i*, squared or otherwise prepared to receive a wrench or other appliance for turning the same, and the faces of these upsetting-dies have depressions or projections—for instance, holes *i*′, (shown in Fig. 5,)—for engaging the ends of the axle to cause the latter to rotate with the rotation of the upsetting-dies.

In operating the apparatus the blank is placed edgewise between dies B B′ and the dies are closed. As this occurs, dies I are brought forward their full stroke and are held in such position during the successive strokes of the larger die. The first stroke of the larger dies breaks down the blank and fairly shapes the upper and lower sections thereof, but of course leaves ridges along the sides of the axle, where the edges of the dies are cut away, as aforesaid. Next, the axle, by means of dies I, is given a quarter-turn to bring these ridges top and bottom, and as the one ridge is turned down into die B the axle must necessarily raise a trifle; hence the provision aforesaid that allows die I to tilt upward. A few more strokes of dies B B′, the axle meantime being rotated between strokes, finishes the work, the entire operation requiring but a few moments of time.

I may also add that the work is more uniform and has a much better finish than when done, as heretofore, under a forging-hammer.

The conical points i^2 are for centering the shaft for subsequent finishing in a lathe.

What I claim is—

1. In apparatus for forging axles, the combination of forging-dies adapted to receive the entire blank with a series of hydraulic rams operating simultaneously for closing the dies and a separate ram for opening the dies, and thereby reversing the plungers of the rams that close the dies, substantially as set forth.

2. The combination, with forging-dies, substantially as indicated, of upsetting-dies operating internally in the end sections of the forging-dies and rams for operating the respective upsetting-dies, the latter being connected with the rams by means of universal joints, whereby the upsetting-dies may be rotated on their axes and at the same time tilted out of the line with the actuating-rams, substantially as set forth.

3. The combination, with forging-dies, substantially as indicated, of interchangeable upsetting-dies operating in the end sections of the forging-dies and rams for operating the upsetting-dies, the length of the latter being such as will gage the length of the axle, meantime the rams for actuating the same are operated full throw, substantially as set forth.

4. The combination, with forging-dies adapted to receive the blank bodily, of upsetting-dies and rams for operating the latter, the arrangement being substantially as indicated, such upsetting-dies having projections or depressions on their faces for interlocking with the forging, whereby the latter is turned on its axis by rotating the upsetting-dies, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 8th day of December, 1888.

SAMUEL T. WELLMAN.

Witnesses:
CHAS. H. DORER,
ALBERT E. LYNCH.