No. 812,856. PATENTED FEB. 20, 1906.

H. V. LOSS.

METHOD OF UPSETTING METAL.

APPLICATION FILED DEC. 8, 1903. RENEWED JAN. 10, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

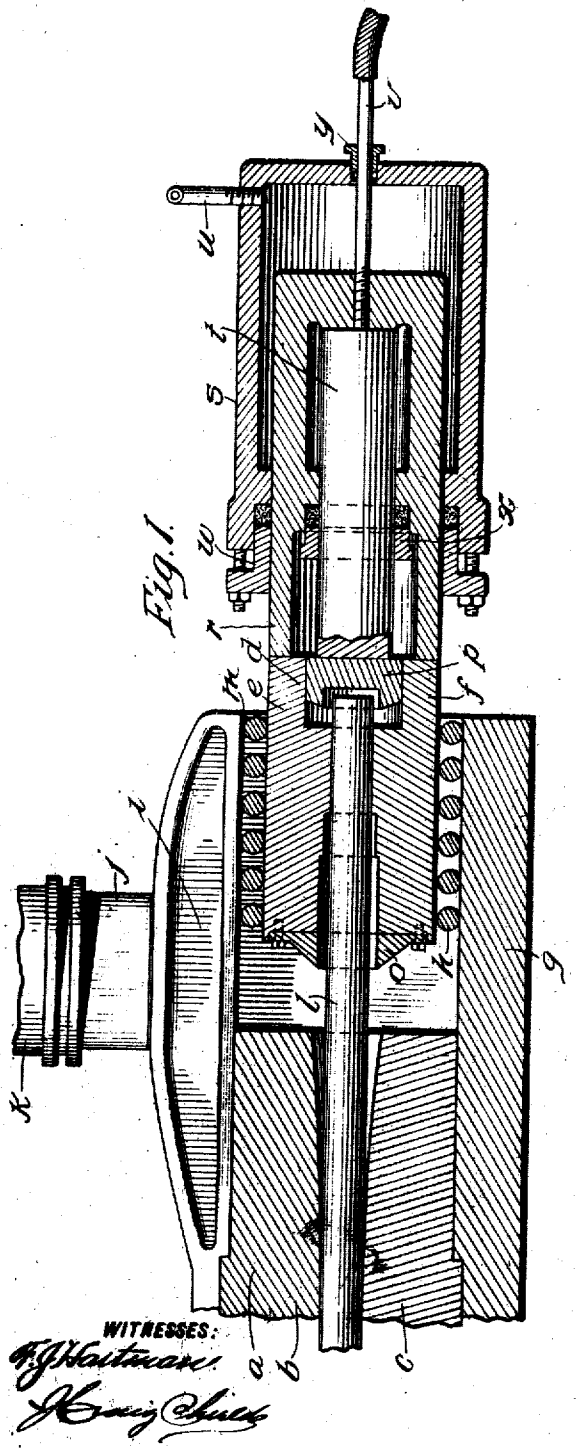
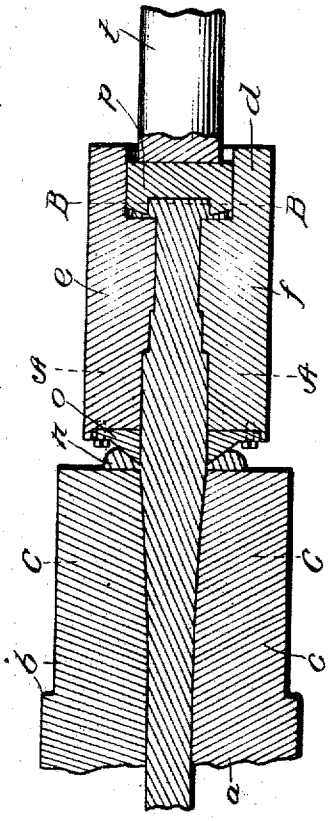


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 2.

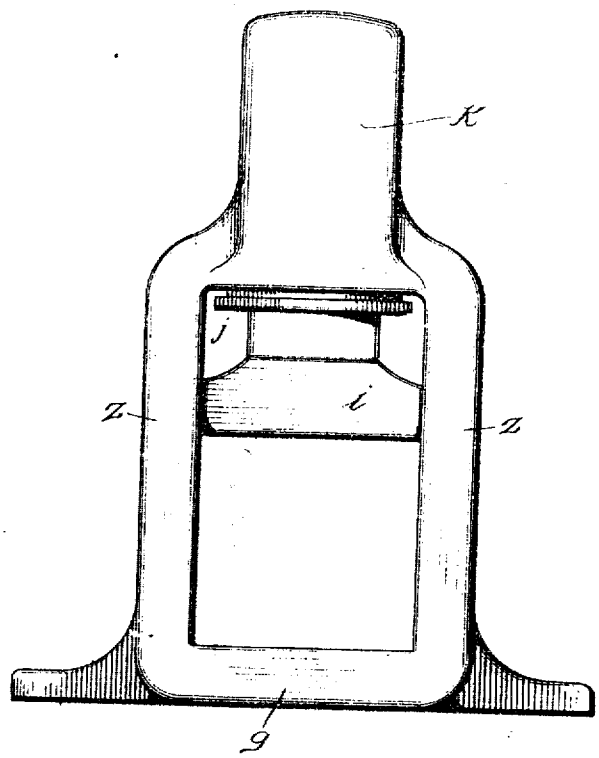


Fig. 4.

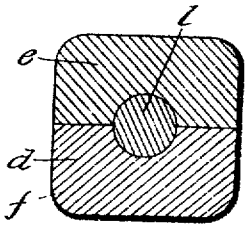


Fig. 5.

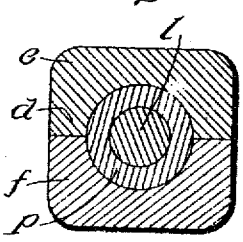


Fig. 6.

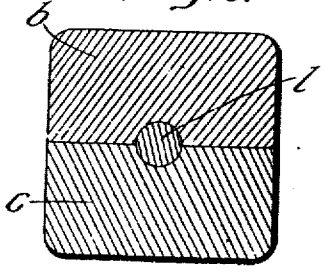
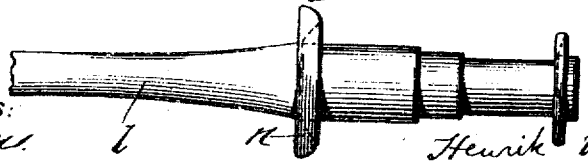


Fig. 7.



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METHOD OF UPSETTING METAL.

No. 812,856. Specification of Letters Patent. Patented Feb. 20, 1906.

Application filed December 8, 1903. Renewed January 10, 1906. Serial No. 295,481.

To all whom it may concern:

Be it known that I, HENRIK V. LOSS, a citizen of the United States, and a resident of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Methods of Upsetting Metal, of which the following is a specification.

My invention relates to improvements in methods for upsetting bars or billets; and the object of my invention is to furnish a method whereby a bar or billet may be upset to form an axle or similar article in one heat.

In carrying out my invention I make use of a set of stationary holding-dies, a set of movable dies, and a plunger or header die. The bar or billet to be upset is placed loosely in the stationary and movable dies, with its end projecting beyond a shoulder-forming portion at the outer end of the movable die. The header-die is then placed a distance from the shoulder-forming portion of the inclosing die to gage the exact amount of metal necessary to form the upset end of the axle. The header-die and the inclosing movable die are then moved forward in unison until the two inclosing dies come together and the metal completely fills them. After the inclosing dies have come to rest the header-die is advanced relatively to the inclosing die and the end of the axle is upset. The movable dies and the plunger move in the line of the longitudinal axis of the article to be formed, and the final upsetting action of the plunger does not take place until the inner part of the bar has been upset, so as to prevent longitudinal sliding between the movable dies and the bar or billet. It is very important that every part of the axle-blank be improved by being worked, and it is on that account that the blank is inclosed by the dies. This condition necessitates the first swelling action throughout the entire blank caused by an early contact with the heading-die, and resulting in the blank quickly being firmly grasped at points in the stationary and movable dies, after which the general upsetting caused by the frictional dragging action at the above places of contact of the movable dies upon the bar or billet will take place

In forging articles that have two forged ends—an axle, for example—I prefer to use in connection with a single stationary holding-die two sets of movable dies, one set for each end of the bar, similar members of both sets of dies operating simultaneously toward the middle of the bar, so as to forge both ends of the bar at one time.

In the upsetting of the metal by the stationary and movable dies a fin will be formed by the surplus metal, and if the surplus metal be considerable this fin might interfere with the complete movement of the sliding die. Hence I have devised a shear to be carried by one of the dies which will shear off this fin as the sliding die advances, and in addition to my method for upsetting the bar or billet my invention includes a method for shearing off the fin simultaneously with the upsetting of the inner part of the bar.

In the accompanying drawings, forming part of this specification, and in which similar letters of reference indicate similar parts throughout the several views, Figure 1 is a central longitudinal sectional view through the dies employed in my method of upsetting through the driving-cylinders for actuating the movable and header dies and a side elevation in part of the die closing and holding means, the upsetting-dies being shown in position to commence the upsetting; Fig. 2, an end elevation of the die-closers, the cylinder for carrying their actuating-pistons, and the housing for the stationary and movable dies; Fig. 3, a central sectional elevation of the dies at the completion of the upsetting operation; Fig. 4, a section of the movable die on line A A, Fig. 2; Fig. 5, a section of the movable die on line B B, Fig. 2; Fig. 6, a section of Fig. 2 on line C C; Fig. 7, a side elevation of an axle upon being removed from the dies.

a is a central or stationary die, which for convenience in removing the completed axle or other article is formed in two or more sections *b c*. *d* is the movable die, likewise and for similar reasons formed in sections *e f*.

g is a base which carries die *b* and through rollers *h* die *d*.

i is a die-closer operated hydraulically in a well-known manner through a piston *j* and cylinder *k*. This die-closer operates to force the upper parts *b e* of the dies *a d* against the heated bar or billet *l*, Fig. 1, to be upset. The base *g* is connected to the cylinder *k* by ties or connections *z* on each side of the die system, so as to bring the reaction of the cylinder down into the base, thus forming a self-contained unit or housing.

m, Fig. 1, represents friction-rollers interspersed between the top of the sliding die *d* and the die-closer *i*.

The bar or billet to be upset is laid in the

lower parts of the stationary and movable dies, the upper parts of these dies engaging or nearly engaging its top, and the header-die, carrying the movable die with it, is driven in, causing the bar or billet to swell throughout its entire length and to engage the stationary and movable dies. The movable die is now moved toward the stationary die, with the header or plunger following, and the metal of the bar or billet between the points of engagement of the stationary and movable dies therewith is upset and fills the parts of the dies not first in engagement therewith. The metal between the stationary and movable dies will upset to form a fin *n*, Fig. 3, and as this fin may sometimes be so large as to prevent the complete approachment between the movable and stationary dies I place at the forward end of the movable dies a shear *o*, which as this latter die advances cuts off the fin. Upon the last stroke of the upsetting action when the dies are to be completely filled and shoulders made the friction between the metal and the inside walls of the upsetting-dies becomes so great that the metal, seeking the lines of least resistance, will bulge out between the stationary and movable dies and presently bring the movable die to a complete stop. In order to prevent this, the shear *o* is employed to undercut the fin, which will permit the movable die to complete its stroke, shearing and upsetting taking place simultaneously.

p is a header-die which after the inner part of the bar has been upset is driven in to form the head upon the bar.

The dies *d p* may be actuated in any suitable manner. In the drawings I have shown a hydraulic arrangement for actuating them consisting of a hollow piston *r*, which is carried in a cylinder *s*, and a piston *t*, carried by and working in the hollow piston *r*. The piston *r* is first actuated, carrying the piston *t* along with it, thus driving in the dies *d* and *p* simultaneously, and after this die has wholly or partly completed its stroke the piston *t* is actuated separately to drive in the header-die *p* to form the head upon the end of the bar.

u is the pipe for admitting the actuating liquid or gas to cylinder *s*, and *v* is the pipe for admitting the actuating liquid to the hollow piston *r*.

In an application for Patent of the United States bearing even date herewith I have described in detail the construction of the dies and the means for operating them.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The described method of upsetting a bar or billet which consists in first inclosing the bar or billet in dies longitudinally separable, causing said dies to approach one another and simultaneously applying end pressure to the bar to cause the metal to move with the dies thus swelling the metal within and between them, continuing the approachment of and completing the upsetting of the metal within and between the dies, and finally upsetting the end of the bar while held within the said dies.

2. The described method for upsetting a bar or billet, which consists in first inclosing the bar or billet in dies longitudinally separable; secondly, moving said dies toward one another and causing the metal to move with said dies in order to upset the metal within and between them, and finally upsetting the end of the bar while held within said dies.

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CHARLES A. RUTTER.