(No Model.)

A. PATERSON.

METHOD OF MAKING AXLES.

No. 402,102. Patented Apr. 23, 1889.

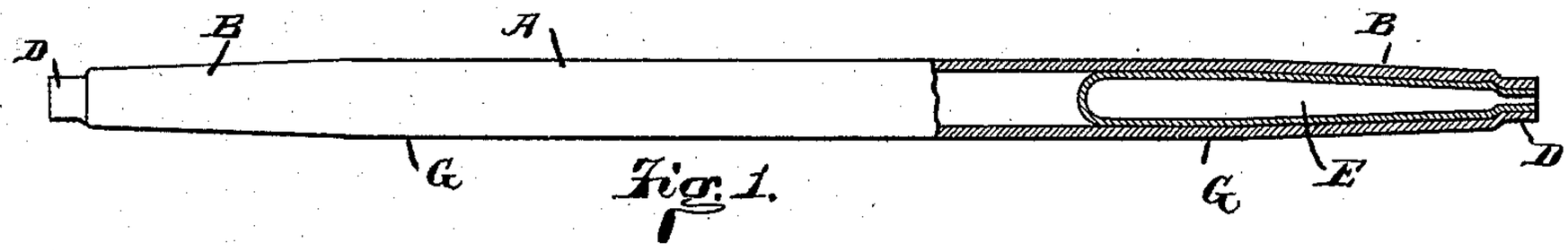

Fig. 1.

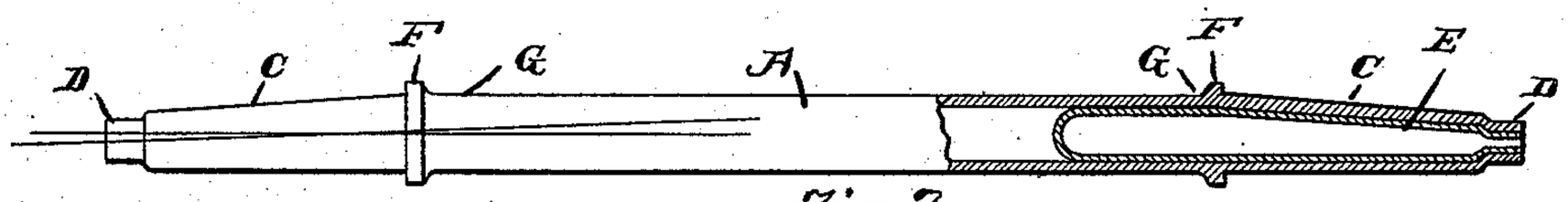

Fig. 2.

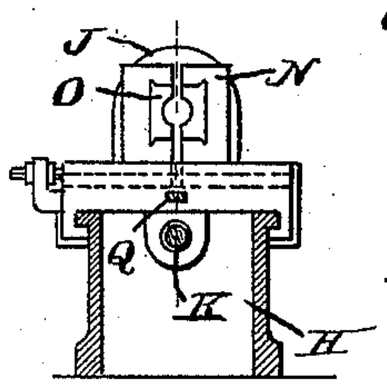

Fig. 4.

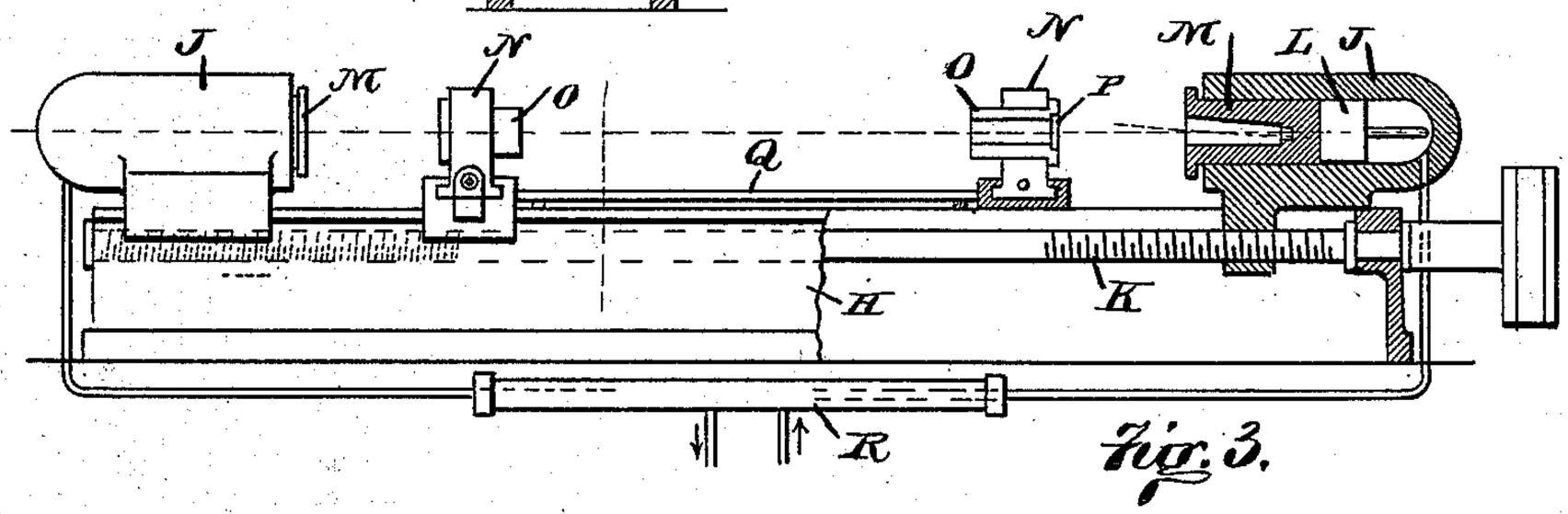

Fig. 3.

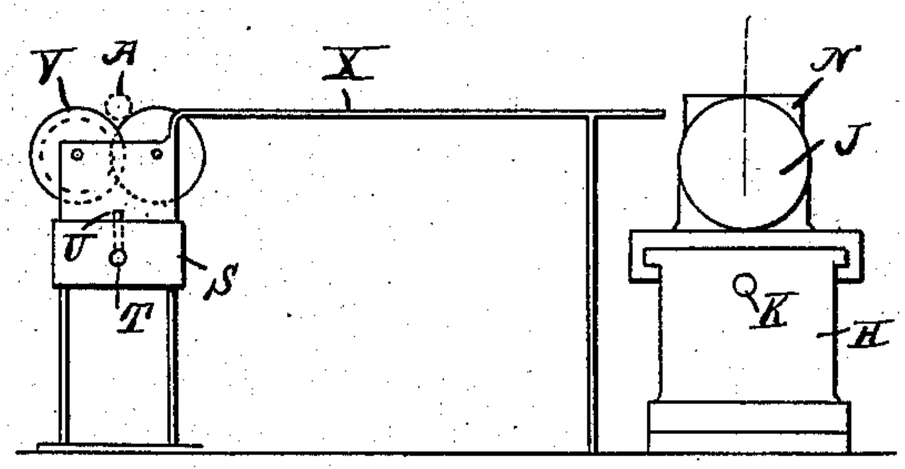

Fig. 6.

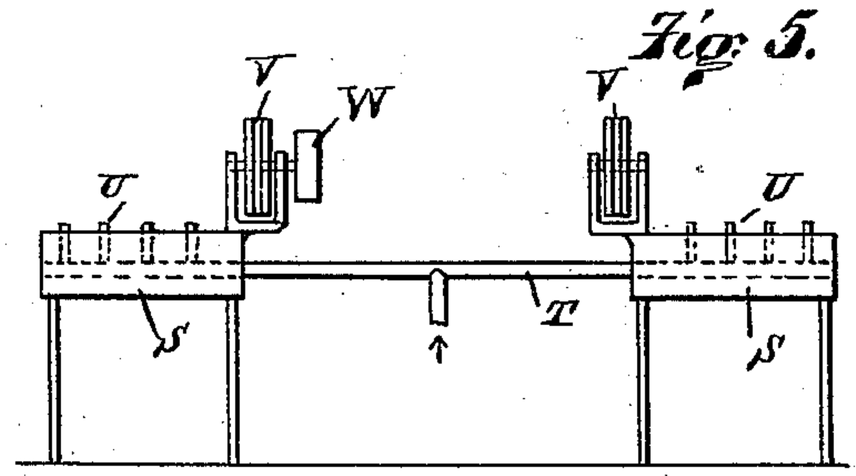

Fig. 5.

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METHOD OF MAKING AXLES.

SPECIFICATION forming part of Letters Patent No. 402,102, dated April 23, 1889.

Application filed January 30, 1889. Serial No. 298,057. (No model.)

To all whom it may concern:

Be it known that I, ANDREW PATERSON, of McKeesport, Allegheny county, Pennsylvania, have invented certain new and useful Improvements in the Method of Making Axles, of which the following is a specification.

This invention pertains to improvements in the art of manufacturing metallic vehicle-axles, and relates particularly to the method of forming and distancing the collars of the axle and giving the set to the spindles and giving the accurate taper to the spindles.

Ordinary tubular axles ordinarily have their spindle-tapers produced by either of two distinct processes. In one case the axle is a parallel tube throughout its length, except at the end nipples, and the taper of the spindles is produced by simply turning the tubes in a lathe or similar machine, whereby the spindles are tapered and the metal of the spindles made thinner at their smaller ends, the internal diameter of the axle being uniform, notwithstanding the external taper of the spindles. By the other plan of operations the ends of the tube are swaged down to form the tapers, thus giving a taper to the interior of the spindles as well as to the exterior.

My improvements in the art relate to work upon the axle after the spindles are tapered by either of the processes indicated. However, in forming the spindle-taper entirely by either of the processes indicated great accuracy is required in turning or swaging the spindle to secure a taper absolutely uniform throughout a given line of product. My improvements render extreme accuracy of this tapering less essential, as I superpose upon the ordinary tapering processes a process which produces a uniformity of taper.

I take a tubular axle, minus the collars, and after its spindles have been tapered the axle is to be somewhat longer than the ultimate finished length, in order to allow sufficient surplus metal to be upset to form the axle-collars. I heat both ends of the axle at and about the collar-points and so much of the spindle portions as may be necessary. I heat the metal uniformly and sufficiently high, but avoid such high heats as will produce damaging scaling of the metal. I then grasp the body of the axle tightly in two chucks, which closely fit the body of the axle, and grasp it at the two points represented by the rear of the collars to be produced. I then place upon each of the taper spindles a die having a die-cavity representing the form of the taper spindle as it is to be finished, and I arrange the axes of these die-cavities oblique to the axis of the body of the axle to that extent called for by the set desired in the finished axle. I then forcibly urge the two dies toward the chucks in a path of motion parallel to the axis of the body of the axle, and continue this motion of the dies toward the chucks until the spindles have been forced into and take the shape and oblique set of the die-cavities, and until the surplus metal between the dies and chucks has been upset to form the axle-collars. The result is an axle having integrally-formed collars accurately spaced, and having spindle-tapers accurately conforming to the die-cavities, and having a set to the spindles accurately corresponding to the degree of obliquity given to the die-cavities.

If the taper preliminarily given to the spindles represents the taper ultimately desired, such taper would of course be unaffected by the action of the dies, and in such cases the heating of the axles may be confined as nearly as practicable to that part of the metal which is to form the collars.

For the purpose of exemplification, I supply herewith a drawing, in which Figure 1 is a side elevation and part vertical longitudinal section of an axle ready to be operated upon in accordance with my improvements; Fig. 2, a similar view of the axle after being so operated upon; Fig. 3, a side elevation and part longitudinal vertical section of a press for grasping the axles and forcing the spindle-dies upon them; Fig. 4, a vertical transverse section of the same; Fig. 5, a rear elevation of that portion of the machinery employed in heating the axles, and Fig. 6 an end view of the complete machine.

In the drawings, Fig. 1, A indicates the tubular cylindrical body of the axle; B, Fig. 1, the preliminarily tapered spindles of the axle, the two spindles being farther apart

than in the ultimate finished axle by a degree represented by the amount of metal required to be upset to form the collars of the axle, these spindles having their axes in a common line; C, Fig. 2, the spindles after the execution of my improved method, these spindles being the proper distance apart, as called for in the finished product, and having their axes sufficiently oblique to each other and to the axis of the body of the axle to bring the bottoms of the two spindles into a common horizontal plane; D, the usual nipples for the axle-nuts or other wheel-keepers; E, the usual bushings to form oil-chambers; F, Fig. 2, the collars formed upon the axle at junctures of spindles and body by upsetting the metal at their points of location; G, those portions of the axle at and about the points of location of the collars; H, a horizontal press-bed; J, a pair of hydraulic press-cylinders, one fitted to slide upon each end of the bed; K, a screw mounted in the bed and furnishing a means by which the two press-cylinders may be given a movement of approach and recession; L, the pistons of the cylinders, one only appearing; M, dies fitting the cylinders in advance of the pistons and having die-cavities conforming precisely to the spindle shape desired upon the axle, these die-cavities being set obliquely to the general axis of the press to the degree called for by the desired set of the axle; N, a pair of chucks adjustable upon the body between the cylinders; O, die-blocks separably secured in the chuck-jaws and adapted to grasp and accurately fit the body of the axle; P, counterbores in the taper faces of these die-blocks conforming in dimension and shape to the collars desired upon the axles; Q, a distance-piece supported by the bed between the two chucks, and engaging the chucks and serving to limit the approach of the chucks to each other to such a distance that the out-to-out measurement of the die-blocks will correspond with the out-to-out measurement of the collars on the desired axle; R, the pipe system for supplying the press-cylinders; S, a pair of gas-heaters; T, a gas-pipe extending from heater to heater and adapted to be connected with a source of gas-supply; U, a longitudinal row of vertical jet-pipes at each heater on the pipe T; V, a set of intermembering rolls at each heater, arranged to support an axle in such position that the ends of the axle protruding beyond the rolls will be vertically over the rows of gas-jets; W, a pulley for giving motion to one of the rolls; and X, a track or table at the common level of the rolls and the tops of the chucks, extending from one to the other.

The operation is as follows: Select die-blocks, dies, and a distance-piece suited to the axle in hand and apply them to the press in the obvious manner, open the chuck-jaws, operate the screw to separate the press-cylinders so that the axle will drop freely between the dies into the chucks. Place an axle on the rolls and apply belt-power to the pulley, thus rotating one of the rolls and causing the axle to rotate with its protruding ends over the gas-jets, heat sufficiently without scaling, roll the axle out of the rolls onto the track or table X, and over to the press and into the press, operate the screw and approach the cylinders until the dies have properly engaged the ends of the axle and the spindles fill the die-cavities and take their shape and obliquity, stop the screw and firmly tighten the chucks, apply the pressure to the cylinders and force the dies toward the chucks until the surplus metal between the dies and chucks is upset in the counterbores of the die-blocks, turn the screw to retract the cylinders to initial position, open the chucks and remove the axle, and proceed as before.

I claim as my invention—

That improvement in the art of axle-making which consists of the following steps, viz: forming the axle preliminarily with a surplus of length between the spindles, heating the preliminarily-formed axle at the necessary points, grasping the body of the axle at two points corresponding with the rear of the collars, grasping the entire spindle portions, and forcing the spindle portions toward the body portion, substantially as and for the purpose set forth.

ANDREW PATERSON.

Witnesses:
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