(No Model.)

H. WYMAN.

MACHINE FOR ROLLING SPHERICAL AND CYLINDRICAL ARTICLES.

No. 350,905. Patented Oct. 12, 1886.

Fig. 1.

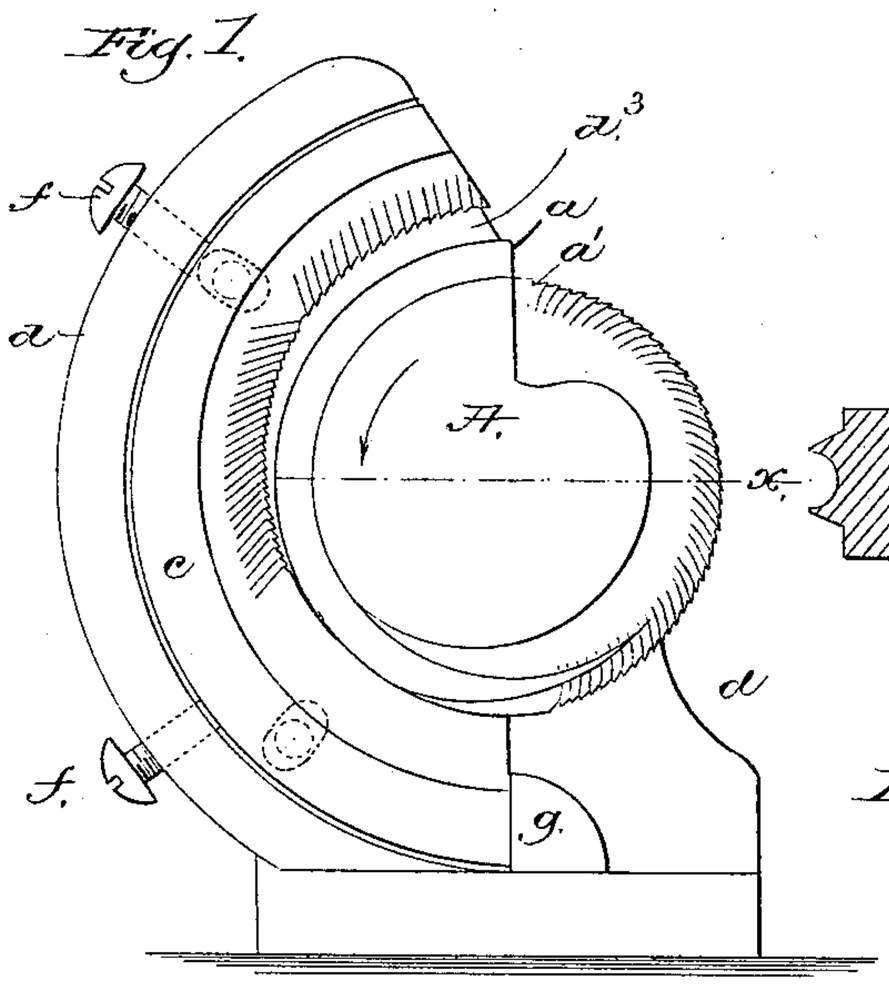

Fig. 2.

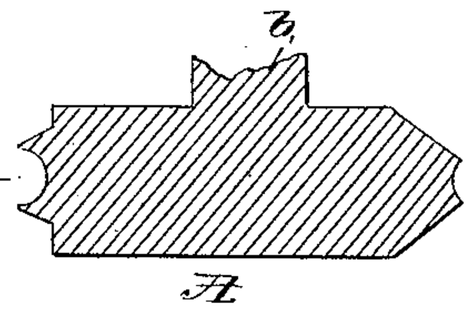

Fig. 5

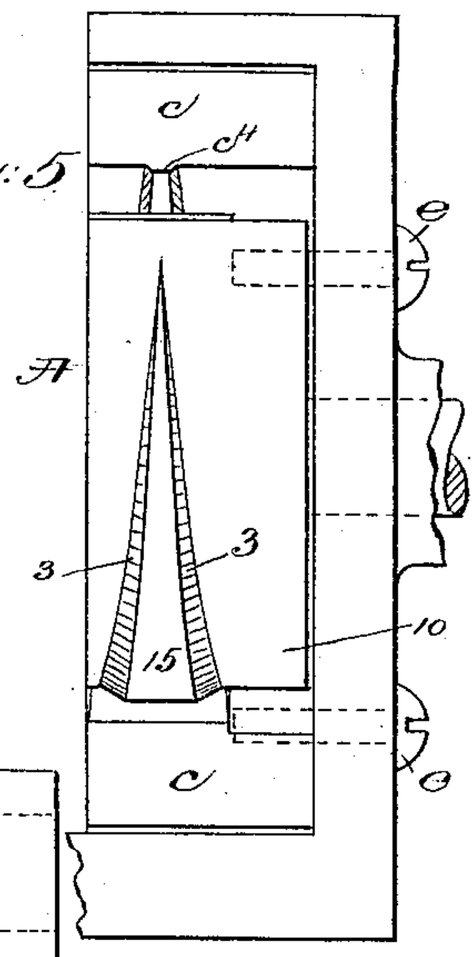

Fig 4.

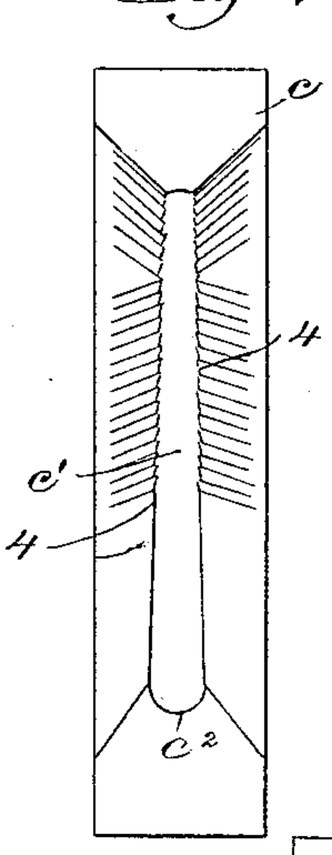

Fig. 3.

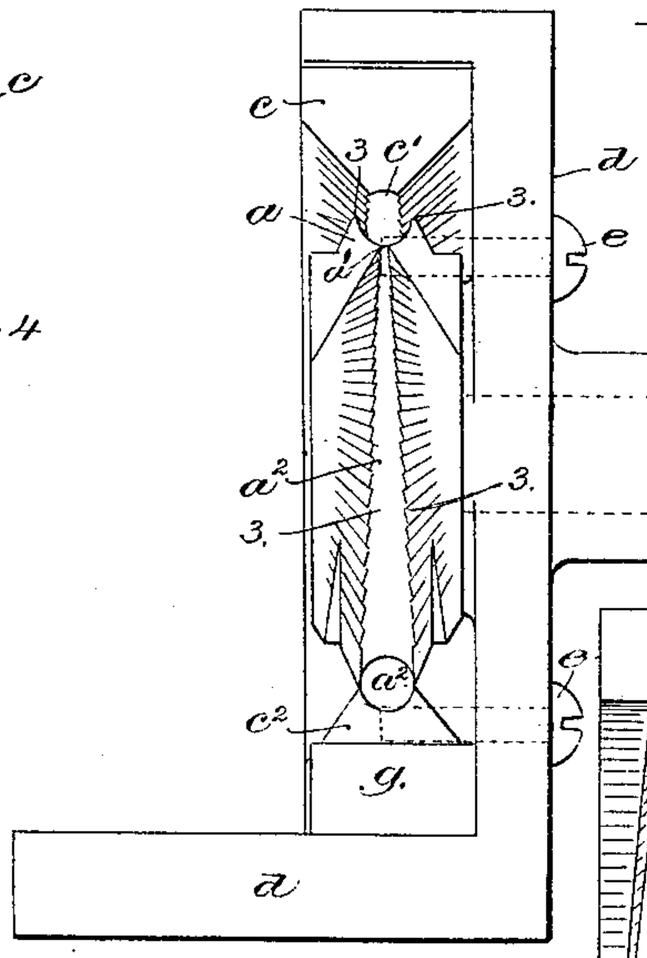

Fig. 6.

Witnesses.
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HORACE WYMAN, OF WORCESTER, MASSACHUSETTS.

MACHINE FOR ROLLING SPHERICAL AND CYLINDRICAL ARTICLES.

SPECIFICATION forming part of Letters Patent No. 350,905, dated October 12, 1886.

Application filed July 15, 1886. Serial No. 208,050. (No model.)

To all whom it may concern:

Be it known that I, HORACE WYMAN, of Worcester, county of Worcester, and State of Massachusetts, have invented an Improvement in Mechanism for Rolling Spherical and Cylindrical Articles, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention has for its object the production of an improved apparatus by which to roll spherical and cylindrical articles, or articles which in cross-section are circular.

Prior to my invention spherical and various cylindrical articles have been rolled between reciprocating plane-surfaced dies provided with diverging reducing and spreading surfaces moved in opposite directions.

To produce a simple and effective machine for the purposes stated I have devised a die-roll provided with a forming-surface, and with diverging reducing and spreading surfaces extended about it circumferentially, as will be described, the said roll co-operating with an opposed concaved die extended about it for about one hundred and eighty degrees, the said concaved die having forming-surfaces and diverging reducing and spreading surfaces. This die-roll and concaved die referred to receive between them the piece of metal to be rolled into spherical or other circular shape in cross-section, the die-roll in its rotation carrying the said metal along with it between the surface of the roll and the die, the metal during its travel between the die-roll and die being automatically rotated about its own center, and being finally delivered as the wide heel of the forming-surface of the die-roll passes the heel of the die, the movement of the metal in contact with the roll and die being in the direction of the length of the diverging surfaces, or toward their heels.

By the employment of a rotating die and a concaved die of the class described I am enabled to employ circular motions which are more speedy, lasting, and simple than reciprocating plane surfaces.

Figure 1, in front elevation, represents a sufficient portion of a machine embodying my invention to enable the same to be understood; Fig. 2, a section of the die-roll in the line *x* of Fig. 1; Fig. 3, a right-hand elevation of Fig. 1; Fig. 4, an inner side view of the concaved die. Fig. 5 is an elevation of a modified form of my invention, and Fig. 6 a detail showing the inner side of the concaved die to embrace the die-roll.

The die-roll A, at the point *a*, has a rest or surface, upon which is placed the piece of metal to be rolled, the top of the rest being level with the bottom of the groove of the reducing-surface at the junction of the said rest with the heel *a'* of the die-roll. From a point just behind the junction of the rest and shoulder, in the direction of rotation of the die-roll, the periphery of the roll is grooved, as at a^2, the said groove constituting the forming-surface of the roll, being gradually increased in depth and width until the forming-surface is of substantially the same shape as one-half of the spherical, cylindrical, or circular surface in cross-section to be produced. The metal body or hub from which the said die-roll is produced is cut away or beveled from both sides or faces of the hub, as shown, the bevel starting near the sides of the groove therein, and from the rest about the roll to its heel *a'* the said bevel is gradually made more and more abrupt. This beveling is done to leave at the sides of the groove what I denominate "reducing" and "spreading" surfaces, and which I have marked 3 3, the said surfaces diverging the one from the other about the roll from the rest *a* to the heel *a'* of the roll. The outer sides of these reducing and spreading surfaces are scored or milled to form feeding-surfaces or to enable the die-roll to compel the metal being rolled to not only travel with the die-roll as the latter is rotated, but also to rotate about its own center as it is being so moved, the resulting movement of the metal being a planetary movement about the shaft *b*, to which the roll is attached. The concaved die *c*, arranged about the die-roll *a*, is grooved, as at *c'*, as best shown in Fig. 4, the said groove gradually increasing in width and depth in the direction of movement of the die-roll, the shape of the groove at the heel c^2 of the die being complementary to or the same as that of the groove a^2 at the heel *a'* of the roll. (See Fig. 3.) This die *c* is beveled or cut away at the sides of the groove *c'*, to leave reducing and spreading surfaces 4 4, and the

beveled surfaces and edges so formed are scored or milled, as shown, to not only aid the surfaces 4 4 to enter and spread the metal, but also to aid in compelling the metal to make a planetary movement into and out of the apparatus. The die *c* is placed in a holder or shell, *d*, herein shown as erected from the base *d'*, having the hub or bearing d^2, the die being held in place by the set-screw *e e'*, the distance of the concaved die from the periphery of the die-roll being determined by the die-adjusting devices *f f*, shown as screws extended through a horizontal flange of the holder or shell *d*, the latter having a foot or abutment, *g*, to sustain the heel of the die *c*. As herein shown, the die-roll is rotated or moved by a handle, *h*, connected to the shaft *b;* but instead I may employ any usual belt wheel or gearing to move the roll by power.

In operation, the metal to be rolled, it being in proper condition as to heat, and in the shape of a rod, is placed upon the rest *a* of the die-roll, or at the junction of the forming surface and reducing and spreading surfaces with the heel *a'* of the die-roll, the end of the rod passing beyond the groove in the heel of the said die-roll, and thereafter the rotation of the die-roll in the direction of the arrow causes the latter to carry into the space between the said die-roll and the concaved die the metal to be rolled and shaped, the said metal having a planetary motion in the said space until the heel *a'* of the die-roll passes the heel c^2 of the concaved die, at which point it is discharged, the metal immediately acted upon by the said die-roll and die and retained in the grooves of forming-surfaces a^2 *c'*, having been shaped to conform to the larger area in cross-section of the said grooves. It is obvious that the width and depth of the grooves constituting the forming-surfaces and the rapidity of the divergence of the reducing and spreading surfaces may be varied according to the particular shape in cross-section of the article to be produced by rolling, so I do not desire to limit my invention to the exact shape of forming and reducing and spreading surfaces herein shown. I also desire it to be understood that the die-roll herein shown may be made to co-operate with a second like die-roll on a shaft parallel to it, and such a machine now in operation by me will form the subject-matter of another application for United States Patent. By the time that the metal being operated upon reaches the heel c^2 of the die *c*, the article to be produced, if a perfect sphere, will have been completely severed from the metal, the chief waste of metal being that end of the rod which was pushed beyond the groove a^2.

By changing the shape of the forming-surface and the co-operating diverging reducing and spreading surfaces I may produce any article more or less elongated, and which in cross-section presents circular or cylindrical sections.

Figs. 5 and 6 show a modification of my invention, wherein the forming-surfaces and the co-operating diverging reducing and spreading surfaces are so modified as to roll the metal article having a cylindrical shank with a conical head or a metal article or device suitable for a loom-shuttle tip of usual shape.

In the drawings the diverging reducing and spreading surfaces of the die-roll are marked by the figures 3 3, the surface between being a smooth full surface rather than a curve, as in Fig. 3.

In Fig. 5 the conical portion of the article being rolled will be shaped between the part 10 of the die-roll A and the part 12 of the concaved die *c*. The concaved die *c* has a full part, c^4, which is of substantially the same shape as the enlarged or full part 15 of the die-roll A.

I claim—

1. In a machine for rolling metal for the production of spherical or other surfaces cylindrical or circular in cross-section, a die-roll having forming-surfaces and diverging reducing and spreading surfaces, combined with a co-operating concaved die having forming-surfaces and diverging reducing and spreading surfaces, substantially as described.

2. In a machine for rolling metal for the production of spherical or other surfaces cylindrical or circular in cross-section, a die-roll having forming-surfaces and diverging reducing and spreading surfaces, and milled or scored to constitute a feeding-surface, combined with a co-operating concave die having forming-surfaces and diverging reducing and spreading surfaces, substantially as described.

3. In a machine for rolling metal for the production of spherical or other surfaces cylindrical or circular in cross-section, a die-roll having forming-surfaces and diverging reducing and spreading surfaces, and milled or scored to constitute a feeding-surface, combined with a co-operating concaved die having forming-surfaces and diverging reducing and spreading surfaces, and with means, substantially as described, for adjusting the said concaved die, the combination being and operating substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HORACE WYMAN.

Witnesses:
J. B. SYME,
JUSTIN A. WARE.