

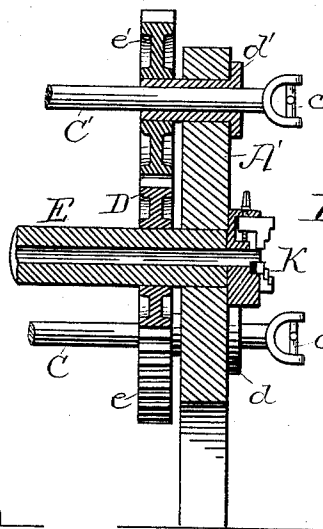
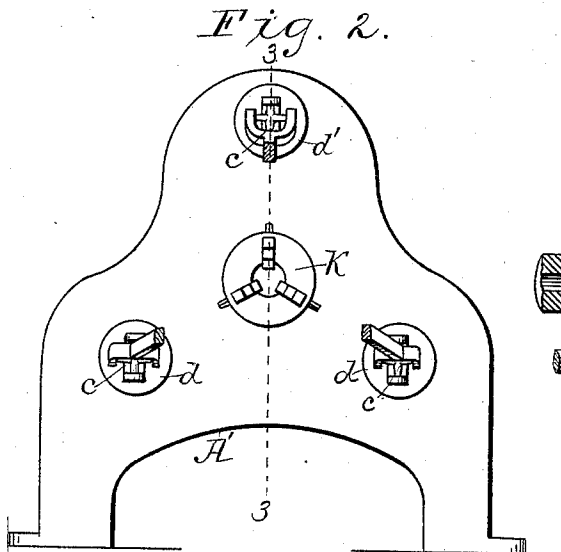
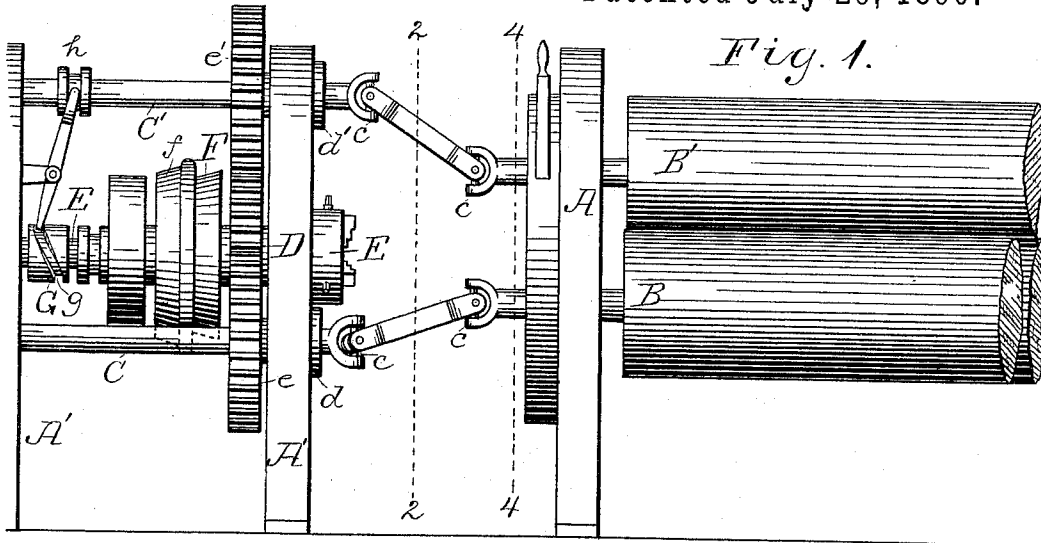
(No Model.)

2 Sheets—Sheet 1.

G. W. MARBLE.
ROLLING MILL GEARING.

No. 433,416.

Patented July 29, 1890.



Witnesses
W. C. Lyman
Chas. D. Evans

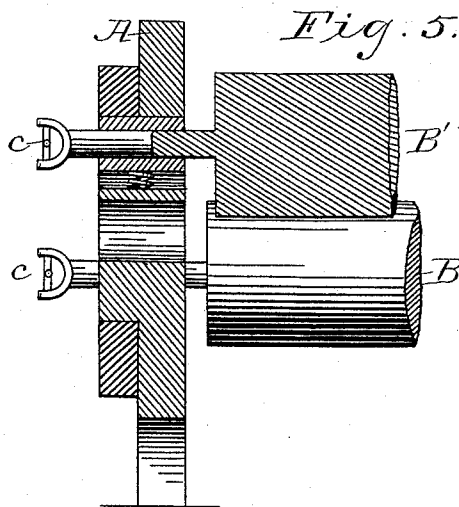
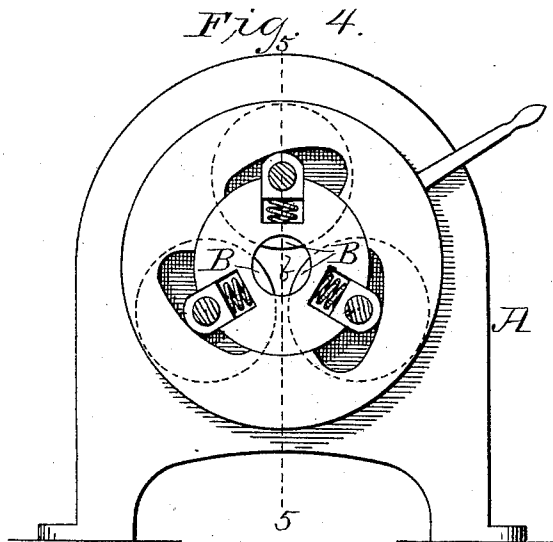
George William Marble
 Inventor

By his Attorney
Frank D. Thomson

G. W. MARBLE.
ROLLING MILL GEARING.

No. 433,416.

Patented July 29, 1890.



George William Marble
Inventor

Witnesses
W. C. Lippman
Chas. A. Evans

By his Attorney
Frank D. Thompson

UNITED STATES PATENT OFFICE.

GEORGE WILLIAM MARBLE, OF PLYMOUTH, INDIANA, ASSIGNOR OF ONE-FOURTH TO MILLARD W. SIMONS, OF SAME PLACE.

ROLLING-MILL GEARING.

SPECIFICATION forming part of Letters Patent No. 433,416, dated July 29, 1890.

Application filed April 7, 1890. Serial No. 346,950. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WILLIAM MARBLE, of Plymouth, Marshall county, Indiana, have invented certain new and useful Improvements in Metal-Forging Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings and to the letters of reference marked thereon.

My invention relates particularly to improvements in the metal-forging machine for which I made application for Letters Patent of the United States November 21, 1889, Serial No. 331,078, and has for its object the improvement of the means for actuating the rollers thereof, the centering of work fed therethrough, and the reciprocating of one or more of said rollers, so as to make perfectly-spherical objects, substantially as hereinafter fully described, and as illustrated in the drawings, in which—

Figure 1 is a side elevation of my invention. Fig. 2 is a transverse vertical section on dotted line 2 2, Fig. 1. Fig. 3 is a vertical longitudinal central section on dotted line 3 3, Fig. 2. Fig. 4 is a vertical transverse section taken on dotted line 4 4, Fig. 1; and Fig. 5 is a longitudinal vertical section taken on line 5 5, Fig. 4.

Referring to the drawings, A A represent the vertical frames, in which the journals of the rolls B B B' have bearings. These rolls are preferably of the same diameter and conformation and are radially adjustable in their bearing in frames A from a common center, from which their respective centers of revolution are preferably an equal distance, substantially as fully described and illustrated in my aforesaid application filed November 21, 1889. In frame A, in alignment with the said common center around which the rolls are arranged, is an opening *b*, through which the work is fed to and withdrawn from the rolls.

A' A' represent two vertical frames which are placed parallel and in alignment with frames A, a suitable distance from the one in which are journaled the ends of the rolls to which the power is applied. The journals of these adjacent ends of the rolls extend

through their bearings and have their ends coupled by means of the double gimbal *c c c* to the shafts C C C'. These shafts are passed through sleeves *d d d'*, which are journaled in the frame A', adjacent to frame A, and are connected thereto by a suitable spline so as to revolve therewith, but so as to be free to have an independent reciprocal motion, substantially as hereinafter fully explained.

The other ends of shafts C C C' are journaled in the frame A' farthest from frame A. They are located with reference to the roller which each respectively is to drive, and are preferably located an equal distance from a common center which is concentric and in alignment with the common center around which the rolls are arranged. These shafts are actuated through the medium of gears *eee'*, secured to the end of sleeves *d d d'*, which extend through their respective bearings in frame A' to the side thereof farthest from frame A, and gears *eee'*, being of equal diameter, are driven by the king-gear D, mounted upon the drive-shaft E.

Drive-shaft E is journaled in frames A' A', and its part nearest frame A is preferably much greater in diameter than its remainder and is made hollow. It is driven by means of a friction-clutch, the counterpart F being mounted fast on said shaft, and the clutch proper *f*, which is loose on the same, is shifted by suitable means so as to engage with said counterpart F, and has a pulley attached to it, which is driven by a belt from a main shaft. Instead of a friction-clutch, however, as shown, a fast and loose pulley with a shifting belt may be used, and, it is thought, would serve just as well.

In order to make spherical objects it is necessary that one of said rolls may be given a reciprocal motion of an extent or throw equal to about one-half the circumference of the spherical object it is desired to make. I accomplish this by securing a boss G on the drive-shaft between its bearings and making therein an oblique groove *g*, and by placing and securing on said shaft C' in register therewith a boss *h* with a circumferential groove. Connecting these two bosses is a lever H, which is fulcrumed at its center of length,

and the end of which nearest boss G enters the groove *g* therein. The other end of said lever is bifurcated, and the extremities of these bifurcations are turned inward and enter the groove in boss *h* at points diametrically opposite each other. Thus, as boss G revolves the lever H is oscillated and moves shaft C' back and forth. When not making spherical objects, of course boss G, lever H, and boss *h* are dispensed with.

On the end of the drive-shaft, projecting through its bearings nearest frame A, I prefer to place a chuck K, for centering and holding work when it is not desired that the whole should not be operated upon by the rolls B, and it is to permit the longitudinal adjustment of this work that I prefer to make the contiguous part of said drive-shaft hollow.

I do not wish to be confined to the use of a drive-shaft E to drive shafts C C C', because it is obvious other mechanical expedients which would suggest themselves to a skilled workman and which would act independently upon each shaft could be substituted.

What I claim as new is—

1. The combination, with several forming-rolls between which work is placed longitudinally and formed, of shafts C C C' and double gimbals *c c c'*, connecting and forming a swivel-coupling between said shafts and rolls, as set forth.

2. The combination, with several forming-rolls which are adjustable toward a common center, of shafts C C C' and double gimbals *c c c'*, connecting and forming a swivel-coupling between said shafts and rolls, as set forth.

3. The combination, with several forming-rolls, of the double gimbals *c c c'*, shafts C C C', sleeves *d d d'*, through which said shafts pass and revolve with, but have an independent longitudinal motion from, substantially as set forth.

4. The combination, with several rolls, one

of which has an independent reciprocal motion and arranged so that their engaging-surfaces are an equal distance from a common center, of the double gimbals *c c c'* and shafts C C C', said gimbals forming a swivel-connection between said shafts and rolls, as set forth.

5. The combination of several rolls, their engaging-surfaces being an equal distance from a common center, and one of said rolls having an independent longitudinal reciprocal motion, as set forth.

6. The combination, with three rolls arranged around a common center, of the double gimbals *c c c'*, shafts C C C', sleeves *d d d'*, gear *e e e'*, drive-shaft E, and king-gear D, said gimbals forming a swivel-connection between said shaft and rolls, as set forth.

7. The combination, with frames A A and several rolls suitably journaled therein, so that their engaging-surfaces are an equal distance from a common center, and said frames having openings in them concentric and in alignment with said common center, of shaft E and chuck K on the end thereof adjacent to and in alignment with the center of said openings, as set forth.

8. The combination, with rolls B B B', shafts C C C', gimbals *c c c'*, establishing a swivel-connection between said rolls and shaft, sleeves *d d d'*, through which said shafts pass and revolve with, but have an independent longitudinal motion from, drive-shaft E, which drives said sleeves, boss G on said shaft E, having an oblique endless groove in its circumference, lever H, and boss *h*, having a transverse circumferential groove therein, as set forth.

GEORGE WILLIAM MARBLE.

Witnesses:

FRANK D. THOMASON,
FRANK H. GOIN.