No. 702,303. Patented June 10, 1902.

E. W. HOPKINS.

ROLLING MACHINERY.

(Application filed Mar. 30, 1901.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

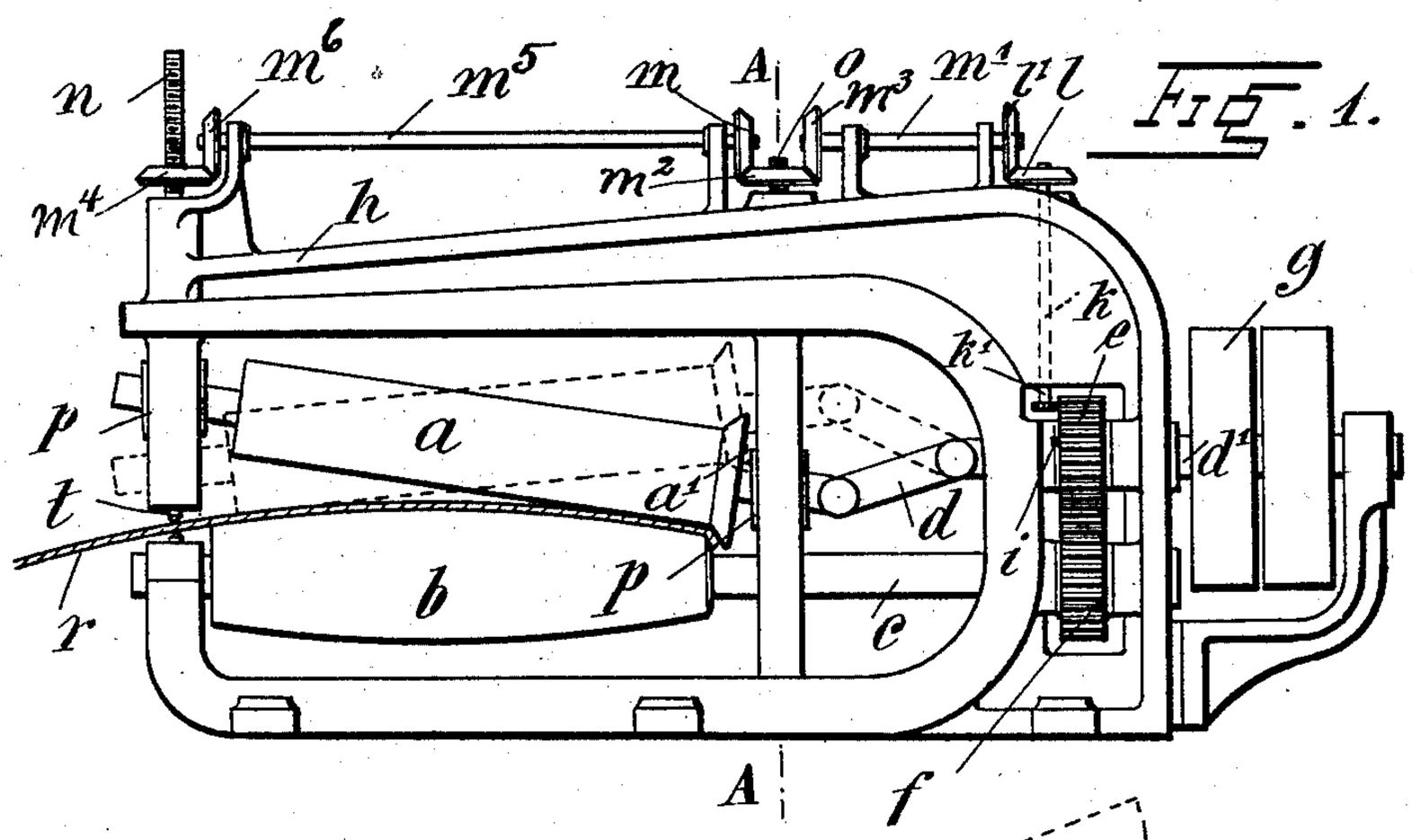

FIG. 2.

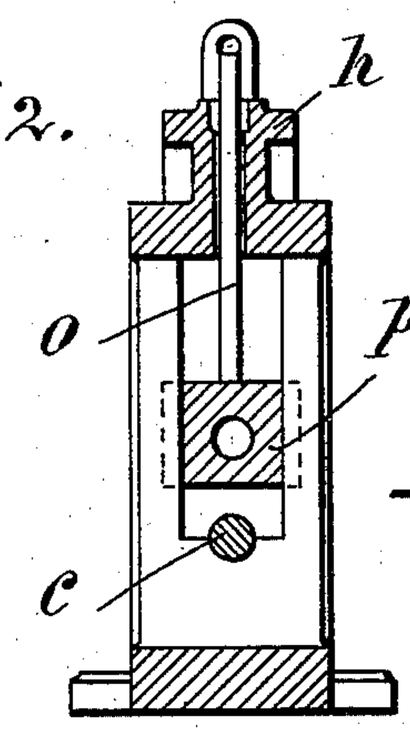

FIG. 4.

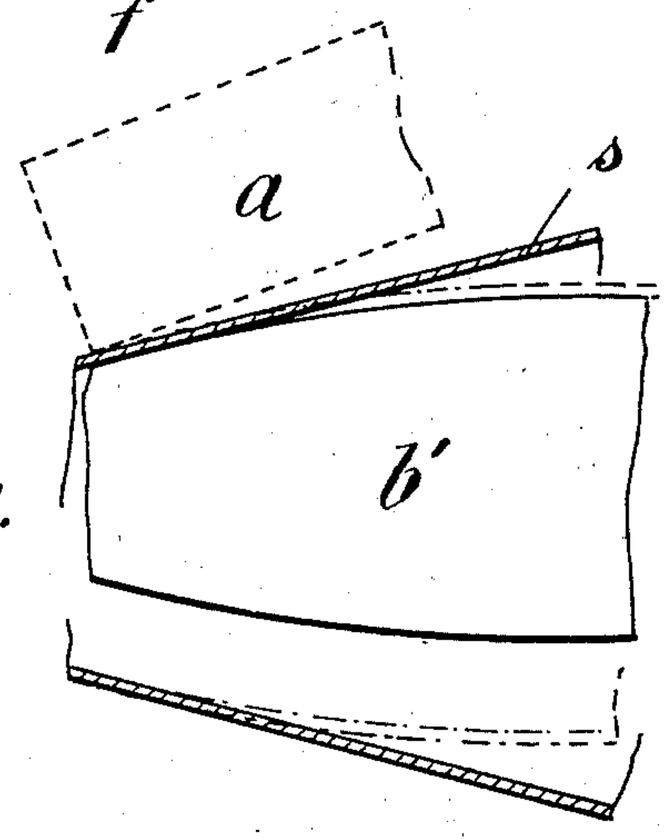

FIG. 3.

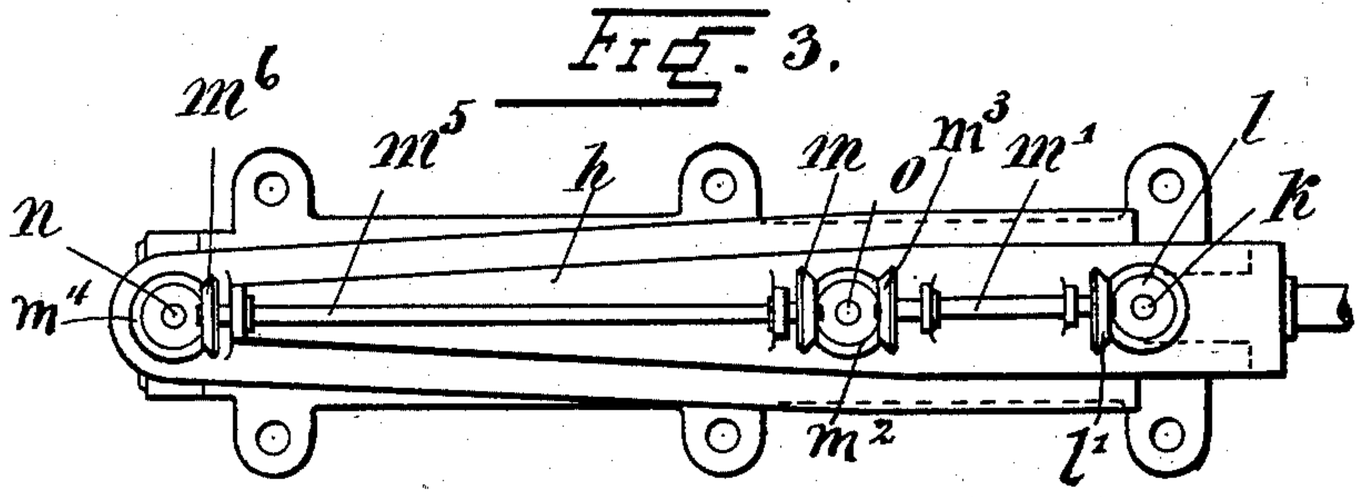

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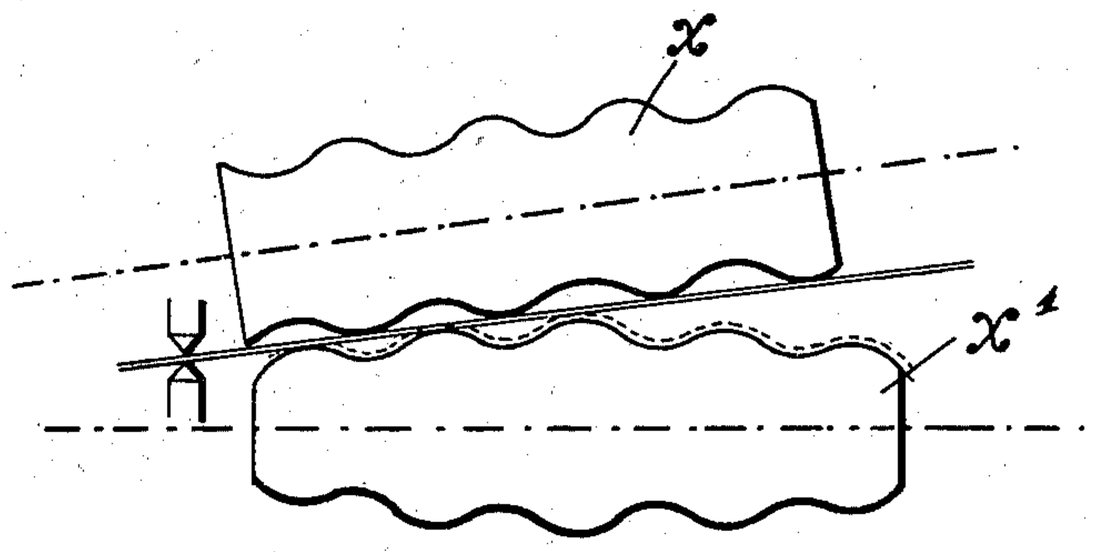
Fig. 5.



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UNITED STATES PATENT OFFICE.

EUSTACE WOOLNOUGH HOPKINS, OF BERLIN, GERMANY.

ROLLING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 702,303, dated June 10, 1902.

Application filed March 30, 1901. Serial No. 53,748. (No model.)

To all whom it may concern:

Be it known that I, EUSTACE WOOLNOUGH HOPKINS, a subject of the King of Great Britain, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Rolling Machinery, of which the following is a full, clear, and exact description.

The present invention relates to rolling-mills; and it consists of the details of construction hereinafter set forth, and particularly pointed out in the claims.

In order to render the present specification easily intelligible, reference is had to the accompanying drawings, in which similar letters of reference denote similar parts throughout the several views.

Figure 1 is a side elevation of a rolling-mill embodying the present invention. Fig. 2 is a cross-section on line A A of Fig. 1, and Fig. 3 a plan of Fig. 1. Fig. 4 is a diagram showing a modified form of roll, and Fig. 5 is a diagram showing a further modification of the form of the rolls.

One of the main objects of the present invention is to roll instead of hammering concave circular plates, and this operation naturally embraces a great variety of hollow bodies which may be bent from plates thus rolled. For the purposes of the present specification the invention is described for producing concave circular plates, such as are employed for the roofs of gasometers and like bells of every description.

A roll *b* is suitably mounted on a shaft *c* in the frame *h*, the said roll being tapered toward one or both ends, the radius of the said taper being about equal to the radius of the bend of the plate to be worked. Above the roll *b* a cylindrical or tapered roll *a* (it is immaterial which) is mounted and is movable in the direction of its longitudinal axis, so that in rotating with the roll *b* it may be moved from a contacting point with the said roll—for instance, at the left-hand end of Fig. 1—gradually lengthwise along the said roll *b* until it has passed from the initial position (shown in dotted lines in Fig. 1) to the final position. (Shown in full lines in the said figure.) It is quite immaterial what means are employed to effect this movement of the roll *a* during the rotation of both rolls. In the present case and for the purpose of this specification the shaft carrying roll *a* is mounted in sliding blocks *p*, adapted to slide vertically in suitable guideways of the frame *h*, and these block may be raised automatically or by hand by means of screw-spindles *n* and *o*. These spindles may be gradually turned to effect the movement of the cylindrical or other shaped top roll along the lower formed or shaped roll by means of a pair of bevel-gears *l* and *l'*, the former of which is fast on vertical spindle *k*, having a small star-wheel *k'* at the lower end, and a tooth or projection *i* on the face of one of the driving-wheels *e* may gradually turn the same one tooth at each revolution of the said driving-gears, so as to work the top roll along the bottom one. The screw-spindle *o* may be driven by bevel-gears m^2 m^3, the latter being keyed to the shaft *m'*, which also carries the bevel-gear *l'*. The screw-spindle *n* may be driven by the shaft m^5 from bevel m^2 by means of bevel-gearing *m*, m^4, and m^6. The shaft of the movable roll *a* must be connected to its driving-gear shaft by means of an intermediate shaft *d* and two universal joints or by an equivalent flexible shaft connection, as will be readily understood. The shaft *c* of the lower roll is provided with a gear *f*, which meshes with *e*, and the shaft of the gear *e* may be driven from driving-pulleys *g* or in other suitable manner.

According to the present embodiment of the invention the circular plate to be worked is advantageously supported at the center between the two adjustable points *t*, and the roll *a* is adjusted on the roll *b* in the position shown in dotted lines in Fig. 1, with the plate *r* between the two rolls. When now the rolls are turned, the work will rotate on the center *t*, and at the same time the effect of the movement of the roll *a* will be to gradually roll the plate to the form of the lower roll *b*, so that the concave plate will be formed by rolling the said plate *r* once or several times between the said rolls *a* and *b* and gradually passing the roll *a* from its initial to its end position along the lower roll *b*, as will be readily understood.

I may under some circumstances dispense with the centering device, as at *t*, and, as indicated at Fig. 4, I can roll a hollow conical

body into a tapered body having curved walls (as indicated in dotted lines in the said figure) in that the shape of the lower roll is such that it gradually increases in diameter toward its outer end and in that its curve corresponds to the curve to be imparted to the walls of the work being done. This form of the invention would be well adapted for making the end sections of torpedoes, as will be readily understood.

I wish it to be clearly understood that the embodiment of my invention as herein described is by no means the only form. It might be varied in a great variety of ways. I may, if desired, adjust the position of the top roll by hand—for instance, by simply substituting hand-wheels for the bevel-gears illustrated. In fact, any means may be substituted for adjusting the top roll. I have mentioned the adjustable roll as the top roll; but it will be obvious that the parts might be arranged vice versa.

In Fig. 4 the roll b' will roll the body s from the form shown in full lines to that indicated in dotted lines.

The shape of the axially-stationary roll is quite immaterial. It might be formed with flutings, so as to impart to the work being done flutings or corrugations, as illustrated in Fig. 5 at x x'.

The metal may be worked in a hot or cold condition, and the machinery is by no means confined to the working of sheet metal, since it will be evident that plates or metal in any size or thickness might be worked.

The roll a may be provided with a disk a' at its end, by means of which after the plate has been shaped a flange may be bent on the same.

I claim broadly—

1. In a rolling-mill the combination of a pair of positively-driven rolls one member of which is tapered and means for tipping or tilting one member axially along the other so as to cause any point along its length to cooperate with the corresponding point along the length of the other member to work the plate between them in the manner and for the purpose substantially as described.

2. In a rolling-mill the combination of a pair of positively-driven rolls, one member of which is tapered and means for tipping or tilting one member axially along the other so as to cause the longitudinal surfaces of the two rolls to contact with the metal between them at corresponding points consecutively throughout the length of both rolls and means for pivotally supporting the metal to rotate in an approximately horizontal plane between the said rolls substantially as described.

3. In a rolling-mill the combination of a pair of positively-driven rolls, one member of which is tapered toward its ends and provided with a corrugated longitudinal section, the second member being also provided with corresponding corrugations and means for tipping or tilting one member longitudinally on the other so as to cause the corresponding points along the length of the two rolls to contact with the metal between them in the manner and for the purpose substantially as described.

4. In a rolling-mill the combination of a pair of positively-driven rolls one member of which is tapered toward the ends and both members of which are provided with corrugated longitudinal sections the convex parts of one being adapted to engage the concave corrugations of the other, means for tipping or tilting one member along the other axially, so as to cause the corresponding points of the length of both rolls to contact with the metal between them consecutively and means for pivotally supporting the plate or metal being worked at a point slightly distant from one end of the two rolls in the manner and for the purpose substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

EUSTACE WOOLNOUGH HOPKINS.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.