S. E. DIESCHER.

MANUFACTURE OF SEAMLESS TUBES.

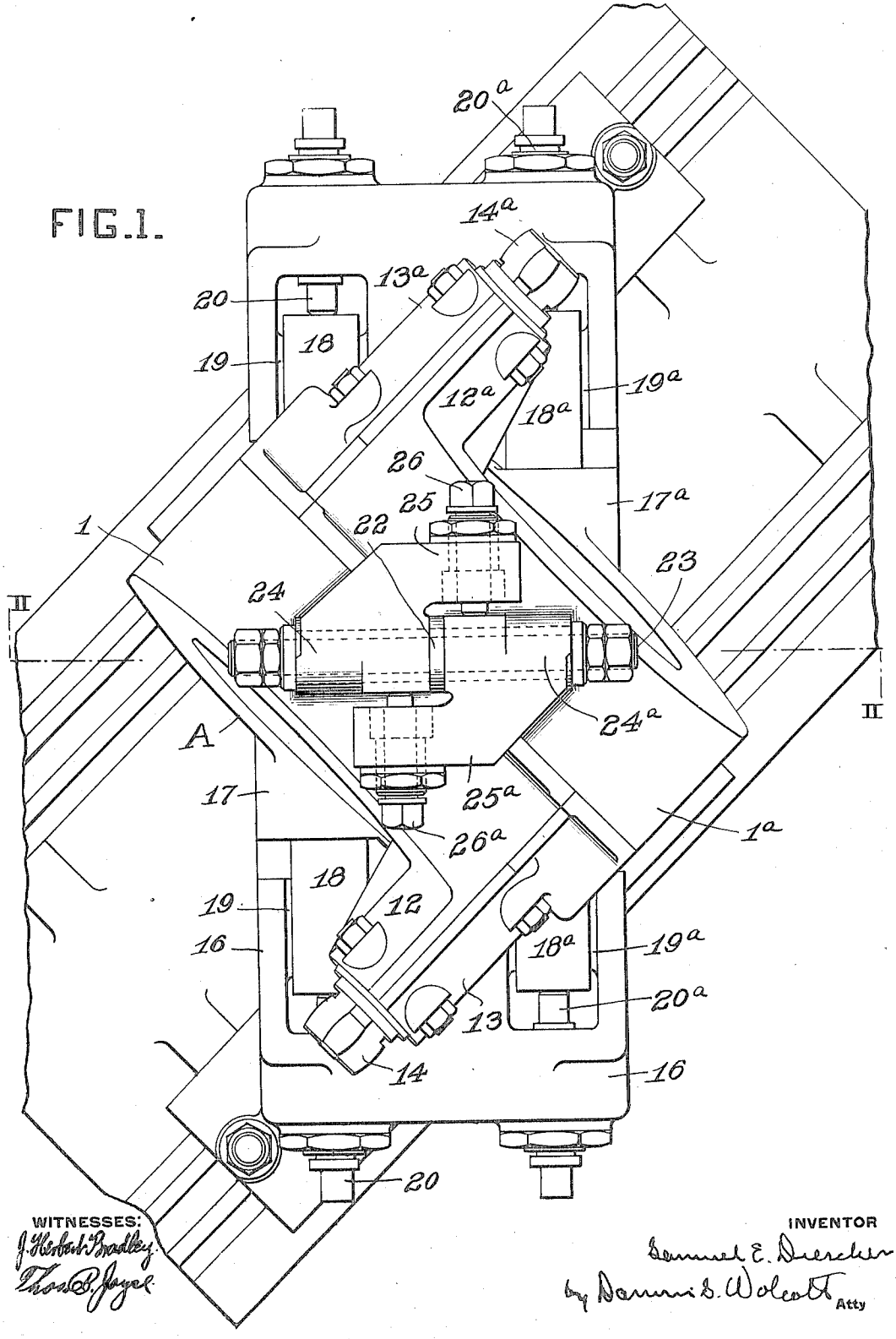
APPLICATION FILED NOV. 29, 1912.

1,067,806.

Patented July 22, 1913.

4 SHEETS-SHEET 1.

FIG. 1.



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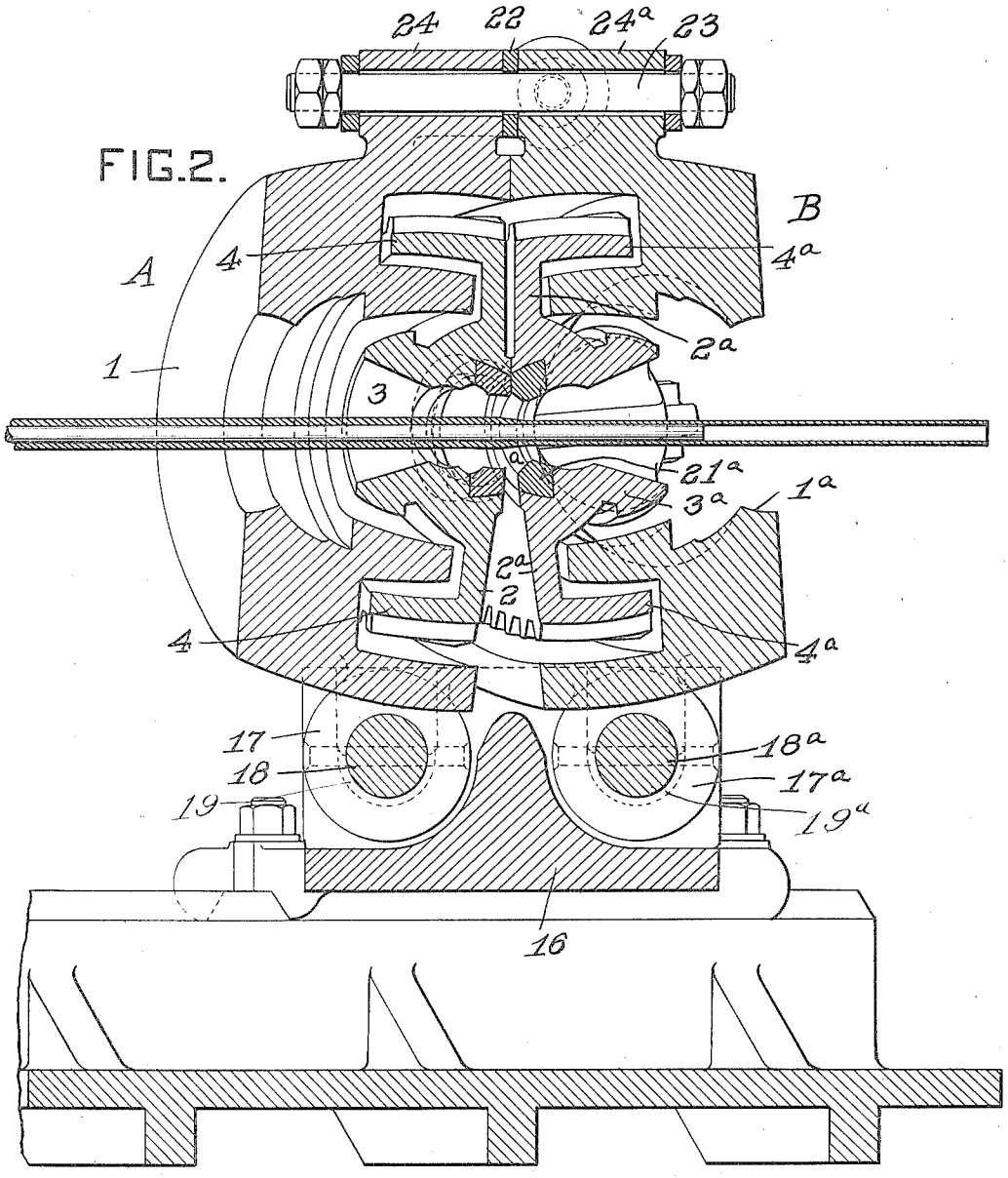
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4 SHEETS—SHEET 2.

FIG. 2.



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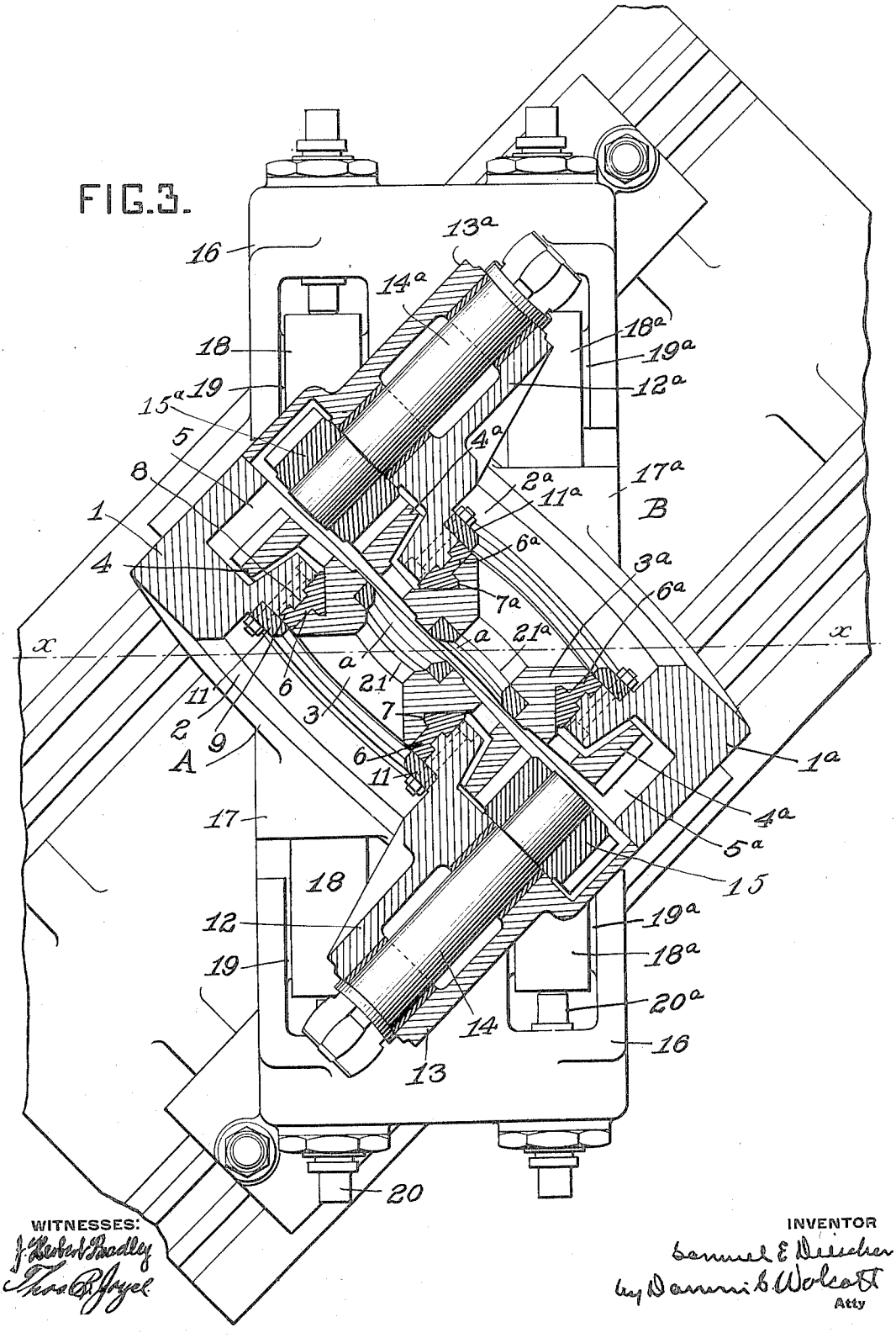
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4 SHEETS—SHEET 3.

FIG. 3.



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4 SHEETS—SHEET 4.

FIG. 4.

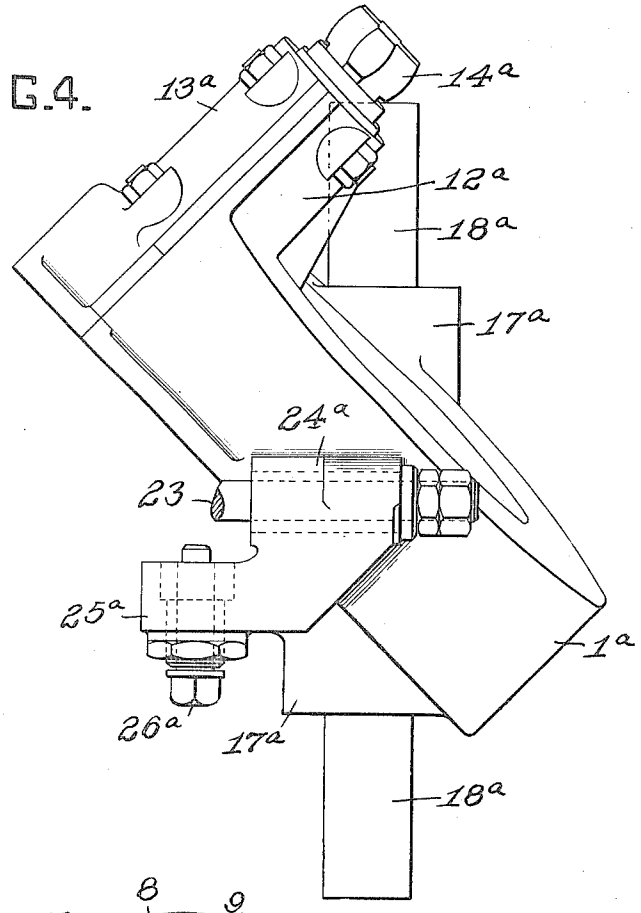


FIG. 5.

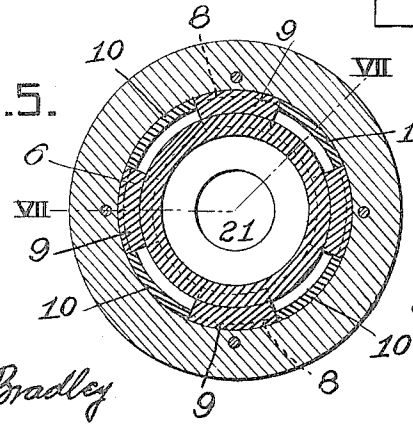
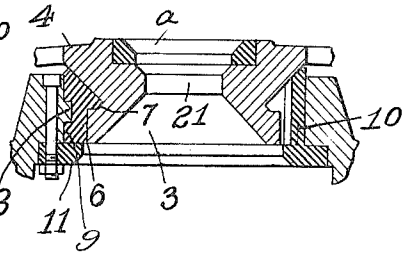


FIG. 6.



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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF SEAMLESS TUBES.

1,067,806. Specification of Letters Patent. Patented July 22, 1913.

Application filed November 29, 1912. Serial No. 734,151.

To all whom it may concern:

Be it known that I, SAMUEL E. DIESCHER, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in the Manufacture of Seamless Tubes, of which improvements the following is a specification.

The invention described herein relates to mechanism for reducing hollow billets to seamless tubes, by subjecting the walls of the billet to compression between concave exterior surfaces and convex interior surfaces, such pressure being applied progressively along and around the billet.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification, Figure 1 is a top plan view of my improved mill; Fig. 2 is a sectional elevation, the plane of section being indicated by the line II—II Fig. 1; Fig. 3 is a sectional plan view, the plane of section being coincident with the axis of the billet shown in Fig. 2; Fig. 4 is a plan view of one of the units of the improved mill; Fig. 5 is a section through the hub of one of the disks and its bearing on a plane at right angles to the axis of the disk, and Fig. 6 is a transverse section of the hub and bearing, the plane of section being parallel with the axis of the disk.

My improved mill consists of two members A and B similar in construction but oppositely arranged with reference to each other when in operation. These members consist of annular housings 1 and 1^a which form bearings for the annular disks 2 and 2^a, which in the construction shown are formed with hubs 3 and 3^a and with flanges 4 and 4^a projecting laterally from the same sides of the disks. The hubs project into the central openings in the housings and the flanges into annular recesses 5 and 5^a formed in the inner faces of the housings as clearly shown in Fig. 3. While the hubs may be held in position in the housing by any suitable means the construction shown is well adapted to that purpose and consists in so forming the brasses or liners 6 and 6^a as to engage both the hubs and the walls of the central openings in the housings. As shown in Fig. 3 the hubs 3, 3^a are grooved for the reception of hook like projections 7, 7^a on the brasses which as shown in Fig. 5 are made in sections. On the inner walls of the openings in the housings are formed a series of ribs 8 spaced a distance apart a little greater than the lengths of the brasses, which are first put in position on the hubs, and the latter inserted in the openings in the housings, the brasses passing between the spaced ribs 8. The hubs and sections of brasses are turned so that lugs 9 in the brasses will pass behind the ribs 8, thus locking the hubs in position. In order to hold the ribs 8 and lugs 9 in alinement keys 10 are slid in between adjacent ribs and brasses as shown in Figs. 5 and 6. It is preferred that these keys should be formed on or secured to annular plates 11, 11^a, which are bolted to the housings, as shown in Fig. 3.

The housings are provided with bosses 12, 12^a and caps 13, 13^a which are suitably constructed to form bearings for the shafts 14, 14^a having keyed thereon pinions 15, 15^a adapted to intermesh with teeth formed in the flanges 4, 4^a of the disks.

As clearly shown in Figs. 1 and 3, the members, which as stated are similar in construction are mounted on a base 16 with the axes of the hubs out of alinement horizontally, such relative eccentricity being dependent upon the diameters of the tubes to be formed and the internal diameters of reducing faces hereinafter described. In order to bring the reducing faces in proper alinement transverse of the line of feed and also in proper relation as required by changes of the external diameter of the tubes to be formed the housings are so supported in the base 16 as to permit of their adjustment relative to each other. To these ends it is preferred that the housings should be formed with bosses 17, 17^a through which are passed shafts 18, 18^a said shafts having their ends so mounted in bearings or seats 19, 19^a in the base as to be capable of longitudinal and rotary movement.

As shown in Fig. 2, the bosses 17, 17^a are secured to the shafts so that by shifting the shafts longitudinally the relative positions of the members A and B may be changed thereby adapting the mill for the production of different sizes of tubes. In addition to this movement whereby the relative eccentricity of the members can be

varied the latter can be moved toward and from each other to bring the respective concave reducing faces so as to properly oppose each other when operating on a tube, and for other purposes which will be hereinafter stated. The longitudinal movements of the shafts and corresponding movements of the members A and B can be effected by any suitable means but preferably by means of screws 20, 20ª shown in Fig. 3.

As clearly shown in Fig. 3, the pierced billet mounted on a suitable mandrel is fed through the reducing members at an angle to the axes of the latter as indicated by the line *x*—*x*, Fig. 3 and to permit of this movement of the mandrel, billet and completed tube, the outer portions of the openings through the housing and hubs 3, 3ª are flared outwardly from the throats or reducing surfaces.

While the portions which operate directly on the billets may be formed integral with the hubs 3, 3ª it is preferred that the reducing surfaces should be formed on rings 21, 21ª arranged in seats formed in the inner walls of the hubs. The rings 21, 21ª are formed with reducing faces *a* having such an inclination that the pass formed by said faces flares sufficiently to permit of the entrance of the billet which after being caught by the rings will be fed along by them, the rate of feed being dependent of the vertical inclination of the rings to the axis of the billet.

While any suitable means may be employed for shifting the members A and B toward and from each other, whereby the reducing faces of the rings are brought into proper relation on opposite sides of the path of the billet and also given the proper feed inclination relative to the axis of the billet, it is preferred to employ washers 22 of different thicknesses interposed between the upper portions of the housings, as shown in Figs. 1 and 2. The two housings are drawn tightly against opposite sides of the washer by means of a bolt 23 passing through abutments 24, 24ª on top of the housings. As it may be desirable to shift the housings to vary the dimensions of the reducing pass without changing the feed angle of the rings 21, 21ª the openings through the abutments 24, 24ª for the passage of the bolt 23 are made sufficiently larger than the bolt to permit of any desired variation of the pass, such variation being effected by means of the screws 20, 20ª.

In order to lock the upper portions of the housings together when set by the screws 20 20ª for the formation of a given size of tube, the abutments 24, 24ª on the housings are provided with extensions 25, 25ª, so formed that the extension of one abutment will overlap the abutment on the other housing, as clearly shown in Figs. 1 and 4. Set screws 26, 26ª are passed in such manner through these extensions that the screw passing through the extension of one housing will bear against the abutment of the other housing, thereby locking the upper portions of the housing in the desired relation to each other.

It is well known to those skilled in the art, that in reducing a hollow tube on a mandrel by surfaces moving at an angle to the axis of the mandrel the metal will flow longitudinally along and transversely around the mandrel, and the rate of flow in either direction will be nearly inversely proportional to the relative extent of the area of contact of the billet on the mandrel in such directions. Hence, as, it is the object in reducing hollow billets to reduce its external diameter and increase its length, the longitudinal extent of the area of contact should be *nil*. This theoretically desirable condition is impossible, and in the present methods, *i. e.*, where convex or flat surfaces are employed to reduce hollow billets on mandrels, the conditions are nearly the reverse, the longitudinal extent of the area of contact of the billet on the mandrel, being very large and the transverse extent being very small. It is characteristic of the mill described herein employing concave reducing surfaces, that the relations of the longitudinal and the transverse extents of the areas of contact of the reducing surfaces on the billet are made to conform nearly that theoretically desirable. It will be observed by reference to Fig. 3 that there are two reducing members or surfaces simultaneously operative on the billet, and that such members are arranged in such relation to each other as to bear on the billet on diametrically opposite points and hence there is no tendency to flex or bend the mandrel.

While it is preferred to employ a floating mandrel, it will be understood that the improvement described and claimed is in no way limited as regards the character or movement of the mandrel.

It is characteristic of the improvement described herein that reduction is effected by the action of a plurality of annular members having concave reducing surfaces arranged symmetrically around the billet so that the portions of the surfaces in contact with the billet will be in a common plane at right angles to the axis of the billet and so that space in each member does not occupy the space of the opening of another member. It is also characteristic of the improvement that the centers of rotation of the annular parts or members are in different planes at right angles to the axis of the billet.

I claim herein as my invention:

1. In a machine for reducing billets, the combination of two parts or members hav-

ing concave reducing surfaces and movable around relatively eccentric axes, the eccentricity of the axes of movement being such that the paths of movement of the reducing surfaces will overlap a distance proportional to the diameter of the billet to be reduced, said members being so arranged as to be simultaneously operative on diametrically opposite portions of the billet and having corresponding points within the working portions of said members on their respective axes lying in different planes perpendicular to the axes of the billet.

2. In a machine for reducing billets, the combination of two parts or members having concave reducing surfaces, and movable around axes relatively eccentric and at an angle to the line of movement of the billet, the eccentricity of the axes being such that the paths of movement of the reducing surfaces will overlap a distance proportional to the diameter of the billet to be reduced, said members being so arranged as to be simultaneously operative on diametrically opposite portions of the billet and having corresponding points within the working portions of said members on their respective axes lying in different planes perpendicular to the axis of the billet.

3. In a machine for reducing billets, the combination of two parts or members having concave reducing surfaces and rotatable around relatively eccentric axes in planes which do not intersect within the peripheries of the parts or members, the eccentricity of the axes being such that the paths of movement of the reducing surfaces will overlap a distance proportional to the diameter of the billet to be reduced, said members being so arranged as to be simultaneously operative on diametrically opposite portions of the billet.

4. In a machine for reducing hollow billets, the combination of a mandrel, two annuli having interior reducing surfaces movable around axes eccentric to each other and to the axis of the mandrel and lying in planes at an angle to the axis of the mandrel, the eccentricity of the axes of the annuli relative to each other being such that the paths of movement of the reducing surfaces will overlap a distance proportional to the diameter of the billet to be reduced and having corresponding points within the working portions of said members on their respective axes lying in different planes perpendicular to the axis of the billet.

5. In a machine for reducing hollow billets, the combination of a mandrel, two annuli having interior reducing surfaces movable around axes eccentric to each other, and to the axis of the mandrel and lying in planes at an angle to the axis of the mandrel, the eccentricity of the axes of the annuli relative to each other being such that the paths of movement of the reducing surfaces will overlap a distance proportional to the diameter of the billet to be reduced, said members being so arranged as to be simultaneously operative on diametrically opposite portions of the billet and having corresponding points within the working portions of said members on their respective axes lying in different planes perpendicular to the axis of the billet.

6. In a machine for reducing billets, the combination of two annular housings, two annuli having interior reducing surfaces rotatably mounted in the housings, means for adjusting the housings toward and from each other, and means for changing the angularity of the annuli with reference to each other.

7. In a machine for reducing billets, the combination of two annular pivotally supported housings, two annuli having interior reducing surfaces rotatably mounted in said housings, means for adjusting the housings on their pivotal axes, and means for shifting the housings in directions parallel with their pivotal axes.

8. In a machine for reducing hollow billets, the combination of a plurality of annular rolling parts or members having interior reducing surfaces bearing on the billet in the same plane transverse of the billet, the rolling members being so located relative to each other, that the open space of one will not occupy or coincide with the open space of another.

In testimony whereof, I have hereunto set my hand.

SAMUEL E. DIESCHER.

Witnesses:
ALICE A. TRILL,
THOS. B. JOYCE.