(No Model.) 2 Sheets—Sheet 1.

C. E. GOULD.

MACHINE FOR MAKING ROLLED FORGINGS.

No. 385,752. Patented July 10, 1888.

Fig. 1.

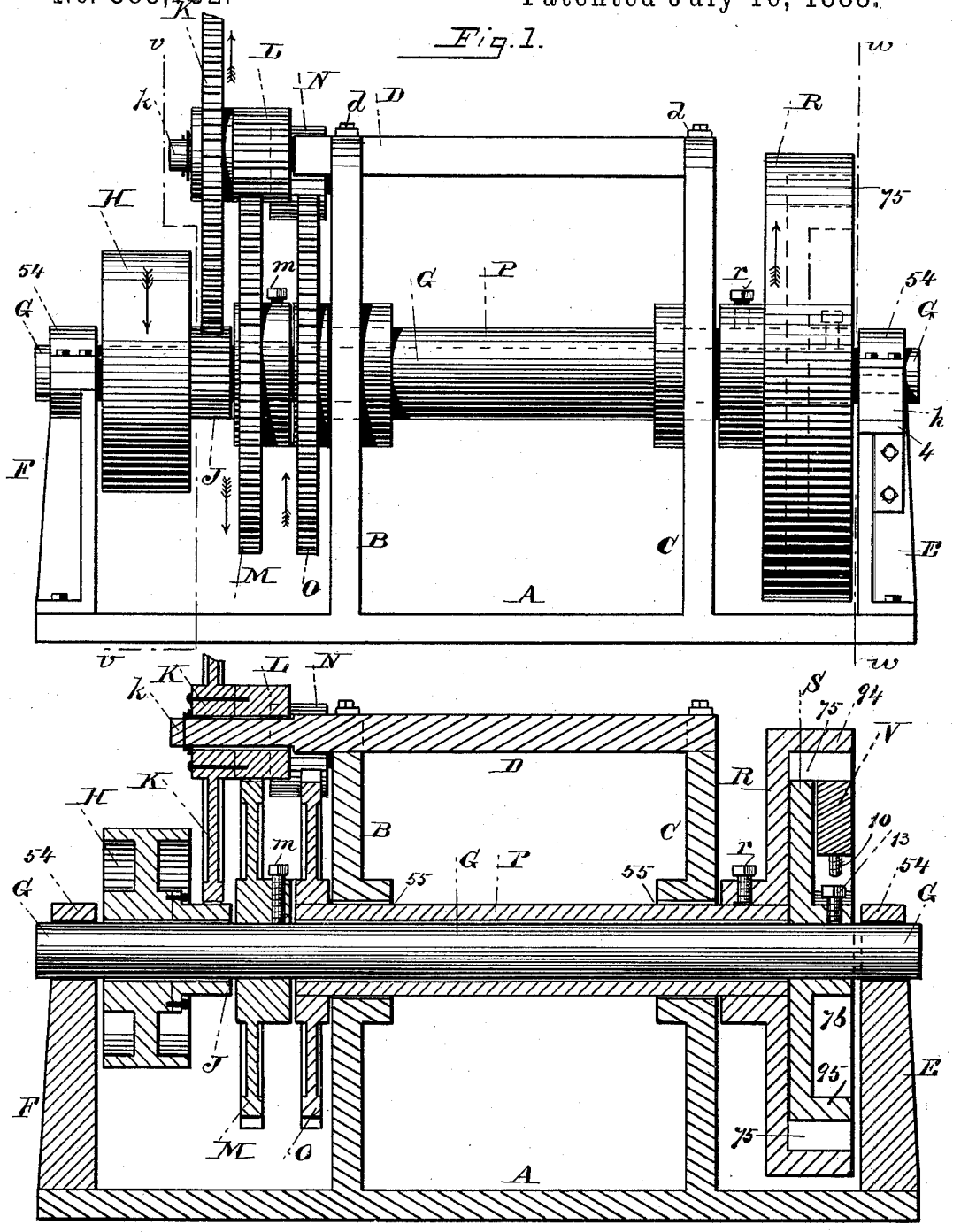

Fig. 3.

WITNESSES:
Robt. W. Matthews.
C. M. Gurney.

INVENTOR.
Charles E. Gould,
PER C. A. Snow & Co.
ATTYS.

(No Model.) 2 Sheets—Sheet 2

C. E. GOULD.

MACHINE FOR MAKING ROLLED FORGINGS

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Fig. 4.

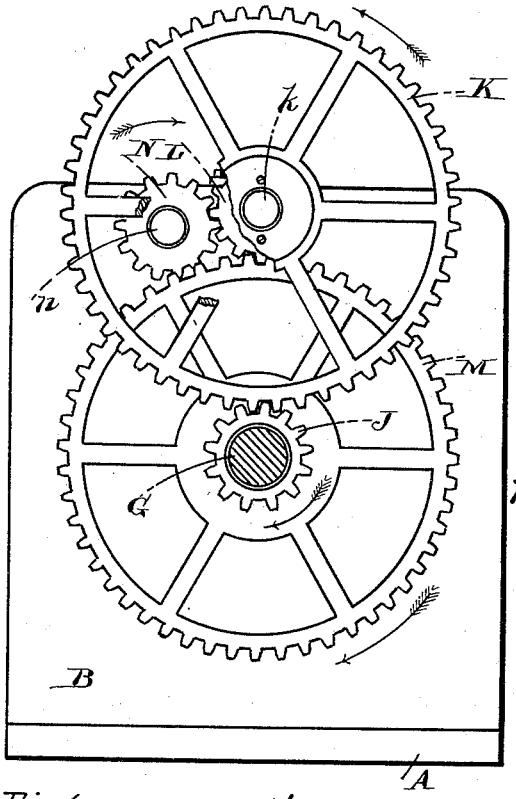


Fig. 2.

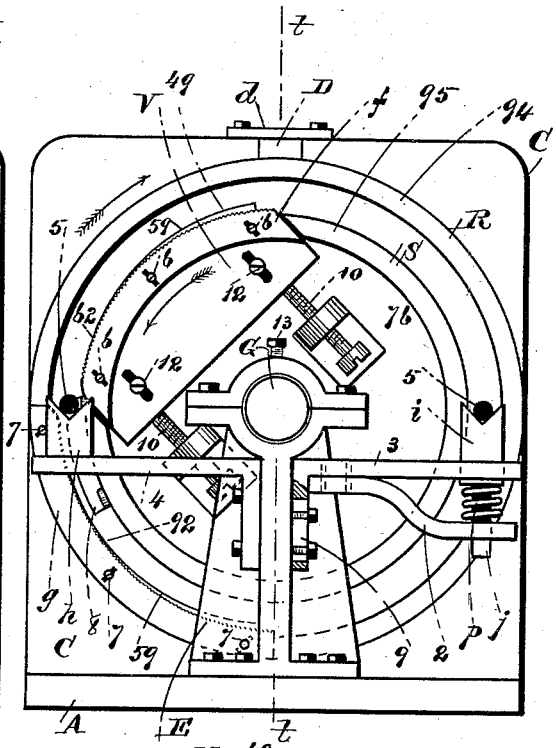


Fig. 6.

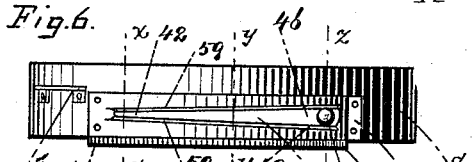


Fig. 7.

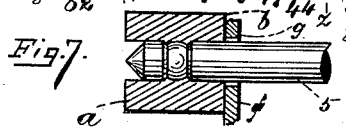


Fig. 8.

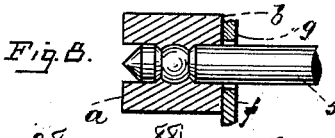


Fig. 9.

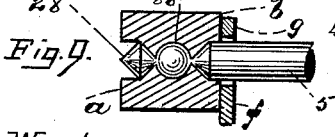


Fig. 10.

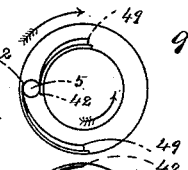


Fig. 11.

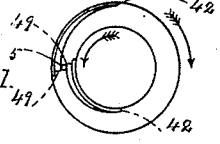
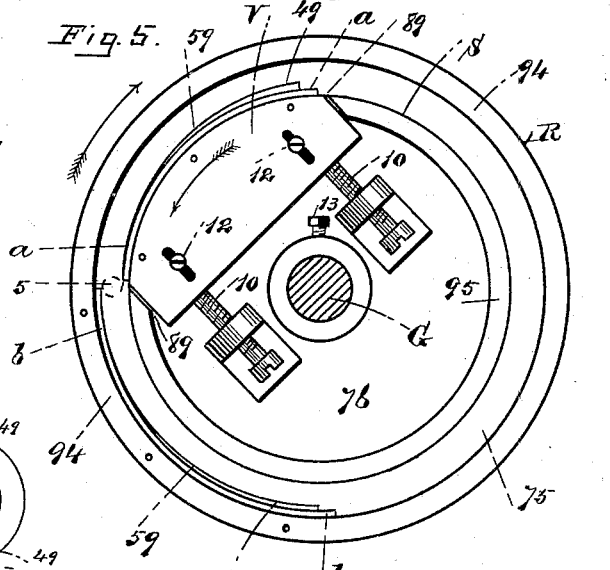


Fig. 5.



WITNESSES=
Robt. H. Matthews.
C. M. Spinney.

INVENTOR=
Charles E. Gould,
PER C. A. Shaw & Co.
ATTYS.

UNITED STATES PATENT OFFICE.

CHARLES E. GOULD, OF LEOMINSTER, MASSACHUSETTS, ASSIGNOR OF FIVE-SIXTHS TO FRANK H. COOK, WILLIAM S. REED, AND CHARLES E. DRESSER, ALL OF SAME PLACE; GEORGE D. BURTON, OF NEW IPSWICH, NEW HAMPSHIRE, AND GEORGE W. WEEKS, OF CLINTON, MASSACHUSETTS.

MACHINE FOR MAKING ROLLED FORGINGS.

SPECIFICATION forming part of Letters Patent No. 385,752, dated July 10, 1888.

Application filed April 3, 1888. Serial No. 269,439. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. GOULD, of Leominster, in the county of Worcester, State of Massachusetts, have invented a certain new and useful Improvement in Machines for Making Rolled Forgings, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front side elevation of my improved machine; Fig. 2, an end elevation as viewed from the right in Fig. 1; Fig. 3, a vertical longitudinal section taken on the dotted line *t t* in Fig. 2; Fig. 4, a vertical transverse section taken on the dotted line *v v* in Fig. 1, certain parts being shown in side elevation and a portion of one of the gears represented as broken away to show the pinion in the rear; Fig. 5, a vertical transverse section taken on the dotted line *w w* in Fig. 1, certain parts being shown in side elevation and the serrated plates removed; Fig. 6, a top plan view of the inner disk, showing the bed-die and gage; Figs. 7, 8, and 9, respectively, enlarged vertical transverse sections taken on the dotted lines *x x*, *y y*, and *z z* in Fig. 6, including, also, corresponding portions of the upper die and serrated plate, the bar or ingot being shown in side elevation in the dies to illustrate the operations of the machine; Fig. 10, a diagram showing the position of the dies as they engage the bar; and Fig. 11, a diagram showing the position of the dies as they leave the bar.

Like letters and figures of reference indicate corresponding parts in the different figures of the drawings.

My invention relates to that class of machines for making rolled forgings which are provided with two forming-dies, one of which is moved over or past the other while in contact with the bar or ingot being acted upon; and it consists in the certain novel features hereinafter set forth and claimed, the object being to produce a simpler, cheaper, and more effective device of this character than is now in ordinary use.

The nature and operation of the improvement will be readily understood by all conversant with such matters from the following explanation.

In the drawings, A represents the bed, and B C E F vertical standards, these parts constituting the body or frame-work of the machine.

The standards B C are extended above the standards E F and provided centrally with corresponding transverse openings, 55, for the reception of parts hereinafter described. A shaft, G, is journaled horizontally in boxes 54 on the standards E F, said shaft passing through the openings 55 in the standards B C and being provided with a gear, M, which is firmly secured thereto by the set-screw *m*. Disposed on the shaft G there is a loose sleeve, P, of such length as to project beyond the standards B C, said sleeve being provided at one end with a fixed gear, O, and at the other with a disk, R, which is adjustably secured thereto by the set-screw *r*.

A horizontally-arranged bar, D, is secured by caps and screws *d* in the tops of the standards B C, said bar projecting beyond the standard B and having its outer end turned down to form the journal *k*, on which is loosely mounted a gear, K, and pinion L, said pinion being secured firmly to the gear and intermeshing with the gear M on the shaft G. A horizontal stub-shaft, *n*, projects outwardly from the upper portion of the standard B at the rear of and slightly below the journal *k*, on which is loosely mounted an intermediate pinion, N, which intermeshes with the pinion L on the journal *k* and gear O on the sleeve P. A pulley, H, and pinion J are loosely mounted on the shaft G, said pinion and pulley being firmly secured together and the pinion intermeshing with the gear K on the journal *k*.

The disk R, secured to the sleeve P, is provided centrally on its outer side with a circular chamber, 75, in which is disposed a smaller disk, S, provided on its outer side with an an-

nular chamber, 76, said last-named disk being mounted on the shaft G and adjustably secured thereto by the set-screw 13, the outer sides of said disks, when arranged as described, being preferably flush.

A segment of the rim 95 of the disk S is cut out, as shown at 89, and fitted to work in said cut on the wall of the chamber 76 there is a block, V, the outer edge of which is curved to correspond approximately with the curvature of the periphery of the disk S, said block being provided with screws 10, by which it may be adjusted, and screws 12, by which it may be secured in any desired position on said disk.

An elongated bed-die, *a*, (see Fig. 6,) is secured to the curved outer edge of the block V, said die being arranged longitudinally on said block at right angles to the shaft G, and curved outwardly to correspond approximately with the curvature of the periphery of the disk S, the longitudinal peripheral outline of said die constituting an arc of a circle, through the center of which circle the axial line of said disk passes. This die is centrally provided in its outer or working face with a longitudinal groove, 44, which is curved in cross-section, and increases gradually both in width and depth from its narrower end, near 42, to its wider end, near 46, at which point said groove is nearly semicircular in cross-section.

Projecting outwardly from the working-face of the die *a*, along each side of the groove 44, there is a flange or cutting-boss, 59, said bosses gradually increasing in height from the narrower end, 42, of said groove to its wider end, 46, and being highest at or near the point 49, as shown in Figs. 5, 10, and 11.

An elongated upper die, *b*, (see Fig. 5,) provided with diverging longitudinally-arranged cutting-bosses 59, and having a groove, 44, (not shown,) between them, all constructed in substantially the same manner as the die *a*, is secured to the inner face of the rim 94 of the disk R, said die *b* being curved outwardly to correspond approximately with the curvature of said rim. The longitudinal facial outline of said die constitutes an arc of a circle, through the center of which circle the axial line of said disk passes.

The die *b* is arranged in the same vertical plane with the die *a* on the disk S, but is curved in a reverse direction from the die *a*, or in such a manner that its cutting-bosses 59 and groove 44 face inward instead of outward, and is also reversely arranged on the rim 94, or so that when the machine is in operation and the disks S R revolving in the direction indicated by their arrows, the lower or converging ends, 42, of the cutting-bosses 59 on the respective dies will meet and pass each other first, and the higher or diverging ends, 49, last, as shown in Figs. 5, 10, and 11.

When the dies *a b* are placed exactly opposite each other in position for use, their working-faces are adjacent and approximately in parallelism, and they stand in a plane which passes longitudinally through the centers of both, whether the disks R S are arranged vertically, as shown, or otherwise, the die *a* being curved outward on said plane with respect to its working-face, and the die *b* curved inward on said plane with respect to its working-face, their working-faces being respectively convex and concave in vertical longitudinal section, and the orbit through which the die *b* passes greater than that of the die *a*.

Projecting horizontally from the left-hand side of the standard E (see Fig. 2) there is a bracket, 4, and from the right-hand side a bracket, 3, said brackets being rendered adjustable on said standard by slots and bolts 9. The bracket 4 is provided near its outer end with a rest, *h*, having a V-shaped notch in its upper end for receiving and "centering" the bar or ingot 5, the location of said rest being opposite the annular space between the rims of the disks S R. This rest may be made adjustable on the bracket, if desired, by any suitable means for that purpose. A rest, *i*, having a V-shaped notch in its upper end, is fitted to work vertically in a hole near the outer end of the bracket 3, said rest being located opposite the space between the rims of the disks S R, and provided with a stem, *j*, at its lower end, which works vertically in a hole near the outer end of an arm, 2, on the inner side of said bracket. A spring, *p*, is disposed around the stem *j* of the rest *i*, between the arm 2 and bracket 3, said spring acting expansively to force the rest upward when depressed by the action of the dies.

A plate, *f*, (see Fig. 2,) is attached to the outer face of the block V, and rendered adjustable thereon by slots and screws 6. Said plate stands opposite the die *a*, and is provided with an outwardly-curved serrated edge, 62, the curvature of its edge corresponding approximately with the curvature of the rim 95 of the disk S. A curved plate, *g*, is secured to the side of the rim 94 of the outer disk, R, said plate being serrated on its inner edge, as shown at 92, and rendered adjustable on said rim by slots and screws 7. This plate stands opposite the die *b*, and the curvature of its serrated edge corresponds approximately with the curvature of the rim 94 of the disk R.

The plates *g f* are so arranged or adjusted that when they stand opposite each other the distance between their serrated edges will be slightly less than the diameter of the rod or ingot 5, and hence when said rod is inserted in the machine to be acted upon by the dies it will be grasped between the plates and rotated continuously until it has passed the dies, thereby preventing imperfections in the work, which would be liable to result if rotary movements were not imparted to the rod.

The object in fitting the rest *i* to work vertically in the bracket 3 and providing it with the spring *p* is to enable it to yield sufficiently to compensate for the difference in the diameters of the disks S R. For instance, the disk S being of less diameter than the disk R, the

plate *f* will not travel quite so far in a given time as the plate *g*, and hence, in addition to the rotary movements imparted by said plates to the rod or ingot 5 around its own longitudinal axial line, said rod will be "fed" or caused to advance a slight distance laterally in a direction the reverse of that in which the inner or smaller disk, S, is rotating, the speed of the outer serrated plate, *g*, being slightly greater than that of the inner plate, *f*, thereby causing the rod to roll or travel along the plate *f* while being rotated around its own axis.

As the die *b* is always moving upward and its companion die *a* downward when they pass the rest *h*, it is unnecessary to provide any devices at that point for neutralizing the result of the difference in the speed of the serrated plates, as the rod will be merely raised thereby a slight distance from the rest *h* and dropped again onto said rest when the dies have passed it; but at the opposite side of the disks the die *a* is moving upward and its companion die *b* downward when they pass the rest *i*, and hence it is necessary that said last-named rest should yield sufficiently to permit the downward lateral movement of the rod at that point which is caused by the greater speed of the plate *g*, as described.

A stop, 8, (see Fig. 6,) is secured to the periphery of the disk S near the end 42 of the bosses 59, against which the rod 5 strikes when it is inserted in the machine, said stop being made adjustable on said disk by slots and screws in the usual manner.

The gears K M O and pinions J L N are respectively uniform in diameter, and it will be obvious that when power is applied to the pulley H to revolve it in the direction indicated by its arrow the disks S R will be revolved in opposite directions, as indicated by the arrows thereon.

In the use of my improvement, the machine having been first started up and the rod 5 properly heated, said rod is placed horizontally on the rest *h* and pushed inwardly between the rims 94 and 95 of the disks R S until its end strikes the stop 8, in which position it is caught by the serrated plates *g f* and revolved. The approaching dies *a b* next engage the rod on opposite sides thereof, the ends 42 of the bosses 59 being first brought into action, and as the dies pass each other form the ball 88, in a manner that will be readily understood by all conversant with such matters without a more explicit description.

The successive steps in the formation of the ball 88 are shown in Figs. 7, 8, and 9, the ball having been partially formed or outlined when reaching the line *x*, (see Figs. 6 and 7,) advanced to a greater state of perfection on reaching the line *y*, (see Figs. 6 and 8,) and the die-work finished on passing the line *z*. (See Figs. 6 and 9.) The cutting-bosses 59 completely bisect the rod at the sides of the ball, the waste pieces 28 being broken off and the ball detached from the rod before the rod is removed from the machine, the higher portions, 49, of the bosses on the die *a* passing closely to those on the die *b* without being brought into actual contact therewith.

The operation of feeding the rod to the machine at the right-hand sides of the disks S R being substantially the same as already described, it is not deemed essential to more particularly allude to the same, it being understood that the rest *i* yields as the dies pass it, and resumes its normal position after they have passed.

The machine represented is designed to be used at one and the same time by two workmen, who stand at opposite sides of the disks in feeding it, and respectively employ the rests *i h;* but it will be obvious that it may be used by either one or two workmen, as desired. The dies shown are also designed for forging balls or spherical bodies only; but it will also be obvious that the machine is equally well adapted for producing rolled forgings of other forms by merely changing the formation of the dies accordingly.

I do not confine myself to the use of the serrated plates *g f* for rotating the rod, as other means may be employed for that purpose; neither do I confine myself to adjusting the die *a* in the manner shown, nor to the specific means shown for revolving the die-carrying disks, as any suitable means for this purpose may be employed, nor to any special formation of the rests.

It will be obvious that by employing two disks revolving in opposite directions the capacity of the machine to perform work rapidly is greatly increased; but I do not confine myself strictly to revolving both die-carrying disks, as one could be made stationary and the other revolved within it or around it, as the case might be, without departing entirely from the spirit of my invention. The dies may also be moved past each other with reciprocating movements, one or both being returned to the starting point without having been fully revolved or carried entirely around the center of motion. The disks can also be arranged horizontally, or at any desired angle, if preferred. The words "longitudinal" and "longitudinally," as applied to the dies, refer to the general direction of the groove or grooves and cutting boss or bosses on their working-faces.

The bodies of the disks may be cut out to form spokes and lighten them, and their rims cut away at certain points, if desired. The disks may also be counterbalanced in any suitable manner.

Having thus explained my invention, what I claim is—

1. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a die having a working-face which is convex in longitudinal section, a companion die having a working-face which is concave in longitudinal section, means for supporting said dies, and means for causing one of the dies to move longitudinally past the other through the arc of a circle, their work-

ing-faces being adjacent as they pass, substantially as set forth.

2. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a die having a working-face which is convex in longitudinal section, a companion die having a working-face which is concave in longitudinal section, means for supporting said dies, and means for causing them to move longitudinally and simultaneously past each other in opposite directions through arcs of different circles, respectively, their working-faces being adjacent as they pass, substantially as described.

3. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a die having a working-face which is convex in longitudinal section, a companion die having a working-face which is concave in longitudinal section, means for supporting said dies, means for causing one of said dies to move longitudinally past the other through the arc of a circle, and a rest for the bar or ingot, the working-faces of the dies being adjacent as they pass, substantially as set forth.

4. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a die having a working-face which is convex in longitudinal section, a companion die having a working-face which is concave in longitudinal section, means for supporting said dies, means for causing the dies to move longitudinally and simultaneously past each other in opposite directions through arcs of different circles, respectively, and a rest for the rod or ingot, the working-faces of the dies being adjacent as they pass, substantially as described.

5. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides, and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working face which is convex in longitudinal section, and means for rotating one of said disks and carrying its die longitudinally past the companion die, said dies standing at right angles to the axis of the rotating disk, and being so arranged that their working-faces will be adjacent as they pass, substantially as set forth.

6. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working-face which is convex in longitudinal section, and means for rotating said disks simultaneously in opposite directions to carry the dies longitudinally past each other, said dies standing at right angles to the axis of the rotating disk, and being so arranged that their working-faces will be adjacent as they pass, substantially as described.

7. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit; a die having a working-face which is convex in longitudinal section, a companion die having a working face which is concave in longitudinal section, means for supporting said dies, means for causing one of the dies to move longitudinally past the other through the arc of a circle, their working-faces being adjacent as they pass, and means for rotating the rod or ingot, substantially as set forth.

8. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a die having a working-face which is convex in longitudinal section, a companion die having a working-face which is concave in longitudinal section, means for supporting said dies, means for causing them to move longitudinally and simultaneously past each other in opposite directions through arcs of different circles respectively, their working-faces being adjacent as they pass, and means for rotating the rod or ingot, substantially as described.

9. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a die having a working-face which is convex in longitudinal section, a companion die having a working-face which is concave in longitudinal section, means for supporting said dies, means for causing one of said dies to move longitudinally past the other through the arc of a circle, the working-faces of the dies being adjacent as they pass, a rest for the rod or ingot, and means for rotating the rod or ingot, substantially as set forth.

10. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a die having a working-face which is convex in longitudinal section, a companion die having a working-face which is concave in longitudinal section, means for supporting said dies, means for causing the dies to move longitudinally and simultaneously past each other in opposite directions through arcs of different circles respectively, the working-faces of the dies being adjacent as they pass, a rest for the rod or ingot, and means for rotating the rod or ingot, substantially as described.

11. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides, and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working-face which is convex in longitudinal section, means for rotating one of said disks and carrying its die

longitudinally past the companion die, said dies standing at right angles to the axis of the rotating disk and being so arranged that their working-faces will be adjacent as they pass, and a rest for the rod or ingot, substantially as set forth.

12. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working-face which is convex in longitudinal section, means for rotating one of said disks and carrying its die longitudinally past the companion die, said dies standing at right angles to the axis of the rotating disk and being so arranged that their working-faces will be adjacent as they pass, a rest for the rod or ingot, and means for rotating the rod or ingot, substantially as described.

13. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working-face which is convex in longitudinal section, means for rotating said disks simultaneously in opposite directions to carry the dies longitudinally past each other, said dies standing at right angles to the axis of the rotating disk and being so arranged that their working-faces will be adjacent as they pass, and a rest for the rod or ingot, substantially as set forth.

14. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working face which is convex in longitudinal section, means for rotating said disks simultaneously in opposite directions to carry the dies longitudinally past each other, said dies standing at right angles to the axis of the rotating disk and being so arranged that their working-faces will be adjacent as they pass, a rest for the rod or ingot, and means for rotating the rod or ingot, substantially as described.

15. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working-face which is convex in longitudinal section, means for rotating said disks simultaneously in opposite directions to carry the dies longitudinally past each other, said dies standing at right angles to the axis of the rotating disk and being so arranged that their working-faces will be adjacent as they pass, and two rests for the rod or ingot, one of which rests is adapted to yield, substantially as set forth.

16. In a machine for making rolled forgings, the combination of the following instrumentalities, to wit: a disk having a chamber opening outward through one of its sides and provided within said chamber with an inwardly-facing die having a working-face which is concave in longitudinal section, a disk disposed within said chamber and provided with an outwardly-facing die having a working-face which is convex in longitudinal section, means for rotating said disks simultaneously in opposite directions to carry the dies longitudinally past each other, said dies standing at right angles to the axis of the rotating disk and being so arranged that their working-faces will be adjacent as they pass, means for rotating the rod or ingot, and two rests for the rod or ingot, one of which rests is adapted to yield, substantially as described.

17. In a machine for making rolled forgings, the chambered disk R, provided with a concave die, as *b*, and mounted on the sleeve P, the disk S, mounted on the shaft G, within said chamber, and provided with a convex die, as *a*, and means for actuating said sleeve and shaft to rotate said disks in opposite directions, substantially as set forth.

18. In a machine for making rolled forgings, the chambered disk R, provided with a concave die, as *b*, and mounted on the sleeve P, the disk S, mounted on the shaft G, within said chamber, and provided with a convex die, as *a*, means for actuating said sleeve and shaft to rotate said disks in opposite directions, and means for rotating the rod or ingot, substantially as described.

19. In a machine for making rolled forgings, the chambered disk R, provided with a concave die, as *b*, and mounted on the sleeve P, the disk S, mounted on the shaft G, within said chamber, and provided with a convex die, as *a*, means for actuating said sleeve and shaft to rotate said disks in opposite directions, means for rotating the rod or ingot, and a rest for the rod or ingot, substantially as set forth.

20. In a machine for making rolled forgings, the chambered disk R, provided with a concave die, as *b*, and mounted on the sleeve P, the disk S, mounted on the shaft G, within said chamber, and provided with a convex die, as *a*, means for actuating said sleeve and shaft to rotate said disks in opposite directions, means for rotating the rod or ingot, and two rests for the rod or ingot, one of said rests being adapted to yield, substantially as described.

21. In a machine for making rolled forgings, the chambered disk R, provided with a concave die, as *b*, and mounted on the sleeve P,

the disk S, mounted on the shaft G, within said chamber, and provided with a convex die, as *a*, means for actuating said sleeve and shaft to rotate said disks in opposite directions, and means for adjusting the die on said disk S, substantially as set forth.

22. In a machine for making rolled forgings, a die, as *a*, having a working-face which is convex in longitudinal section and provided on said face with a longitudinally-arranged groove, as 44, said groove being wider and deeper at one end than at the other, substantially as described.

23. In a machine for making rolled forgings, a die, as *a*, having a working face which is convex in longitudinal section, said die being provided on said face with a longitudinally-arranged groove which is wider and deeper at one end than at the other, as 44, and with cutting flanges or bosses at the sides of said groove, as 59, the flanges being higher at the wide end of the groove than at their opposite ends, substantially as set forth.

24. In a machine for making rolled forgings, a die, as *b*, having a working-face which is concave in longitudinal section, and provided on said face with a longitudinally-arranged groove, as 44, said groove being wider and deeper at one end than at the other, substantially as described.

25. In a machine for making rolled forgings, a die, as *b*, having a working-face which is concave in longitudinal section, said die being provided on said face with a longitudinally-arranged groove which is wider and deeper at one end than at the other, as 44, and with cutting flanges or bosses at the sides of said groove, as 59, the flanges being higher at the wide end of the groove than at their opposite ends, substantially as described.

26. In a machine for making rolled forgings, the die *a*, having a working-face which is convex in longitudinal section, and provided with the groove 44 and cutting-bosses 59, the die *b*, having a working-face which is concave in longitudinal section and provided with the groove 44 and cutting-bosses 59, and supporting and actuating mechanism for said dies, whereby one may be moved over or past the other longitudinally through the arc of a circle, their working-faces being adjacent as they pass, and their ends 42, respectively, in advance as they approach each other to pass, substantially as set forth.

27. In a machine for making rolled forgings, the block V, provided with a die on its curved edge, in combination with the disk S, mounted on the shaft G, and screws for adjusting and securing said block on said disk, substantially as described.

28. In a machine for making rolled forgings, the disk R, mounted on the sleeve P, and provided with a concave die, as *b*, means for adjustably securing said disk on said sleeve, the disk S, mounted on the shaft G and provided with a convex die, as *a*, means for adjustably securing said disk on said shaft, and actuating mechanism for the sleeve and shaft, whereby the disks may be revolved in opposite directions, substantially as set forth.

29. In a machine for making rolled forgings, a stop, as S, in combination with the disk R, provided with a concave die, as *b*, and disk S, provided with a convex die, as *a*, substantially as and for the purpose set forth.

30. In a machine for making rolled forgings, the ingot-rest *h*, in combination with the die-carrying disks S R and actuating mechanism therefor, said rest being arranged substantially as described.

31. In a machine for making rolled forgings, the yielding rest *i*, in combination with the die-carrying disks S R and actuating mechanism therefor, said rest being arranged substantially as described.

32. In a machine for making rolled forgings, the rest *h* and yielding rest *i*, in combination with the die-carrying disks S R and actuating mechanism therefor, said rests being arranged at opposite sides of the axis of the disk S, substantially as described.

33. In a machine for making rolled forgings, the plate *f*, having a curved serrated edge, 62, in combination with the disk S, carrying a die, as *a*, substantially as set forth.

34. In a machine for making rolled forgings, the plate *f*, having a curved serrated edge, 62, and secured to the adjustable block V, in combination with the disks S, carrying a die, as *a*, substantially as described.

35. In a machine for making rolled forgings, the plate *g*, secured to the disk R, and provided with a curved serrated edge, 92, substantially as set forth.

36. In a machine for making rolled forgings, the disk S, provided with the plate *f*, having the curved serrated edge 62, in combination with the disk R, provided with the plate *g*, having the curved serrated edge 92, said plates being arranged substantially as described.

37. In a machine for making rolled forgings, the journaled shaft G, provided with the gear M and disk S, the sleeve P, disposed on said shaft and provided with the gear O and disk R, the journaled pinion N, intermeshing with the gear O, the journaled gear K, provided with the pinion L, said pinion intermeshing with the gear M and pinion N, the pulley H, provided with the pinion J, and loosely mounted on the shaft G, said pinion intermeshing with the gear K, the journals *n k*, and suitable supports for said journals and shaft, combined and arranged to operate substantially as set forth.

CHARLES E. GOULD.

Witnesses:
GEORGE E. TISDALE,
ANDREW TISDALE.