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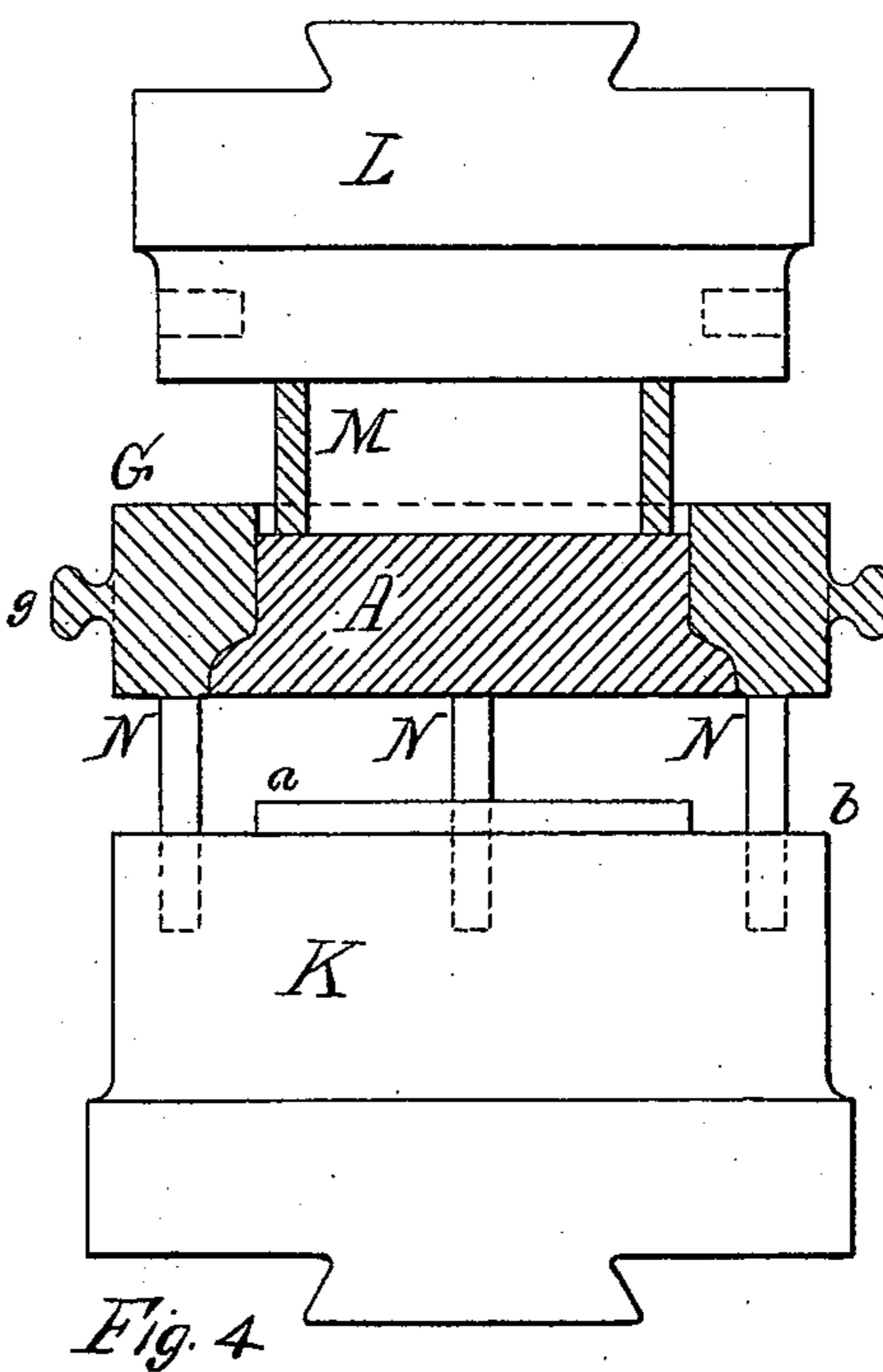
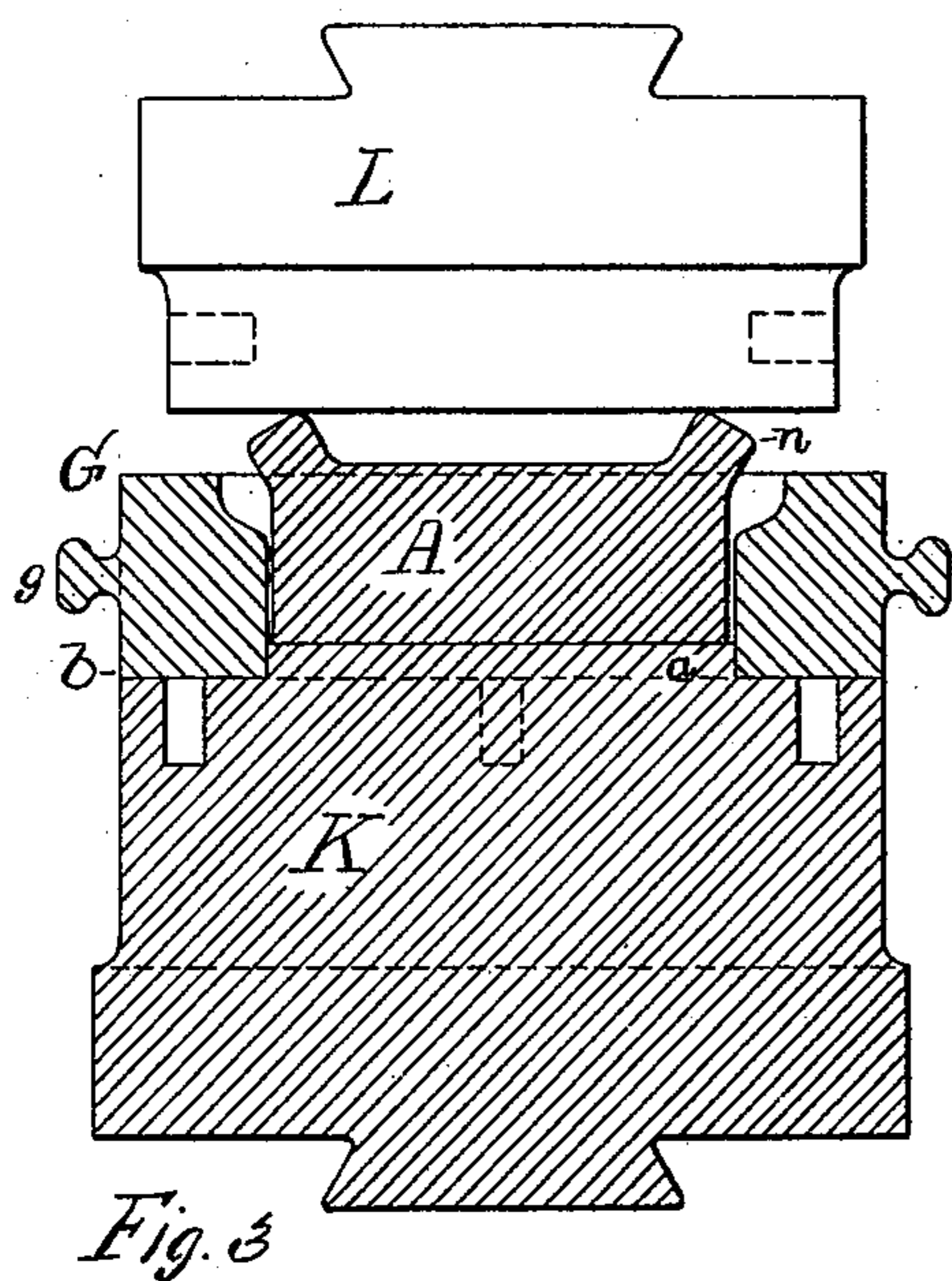
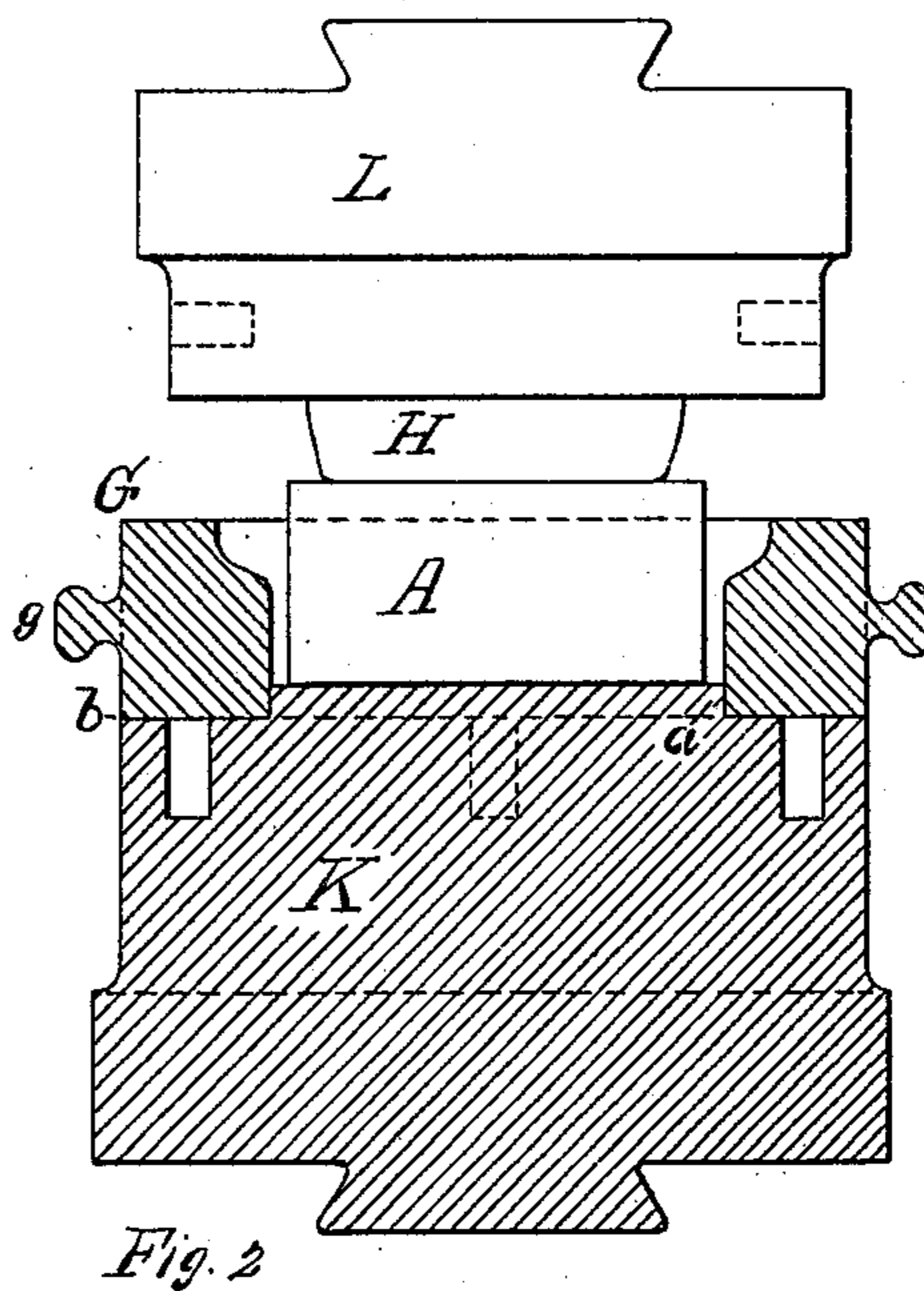
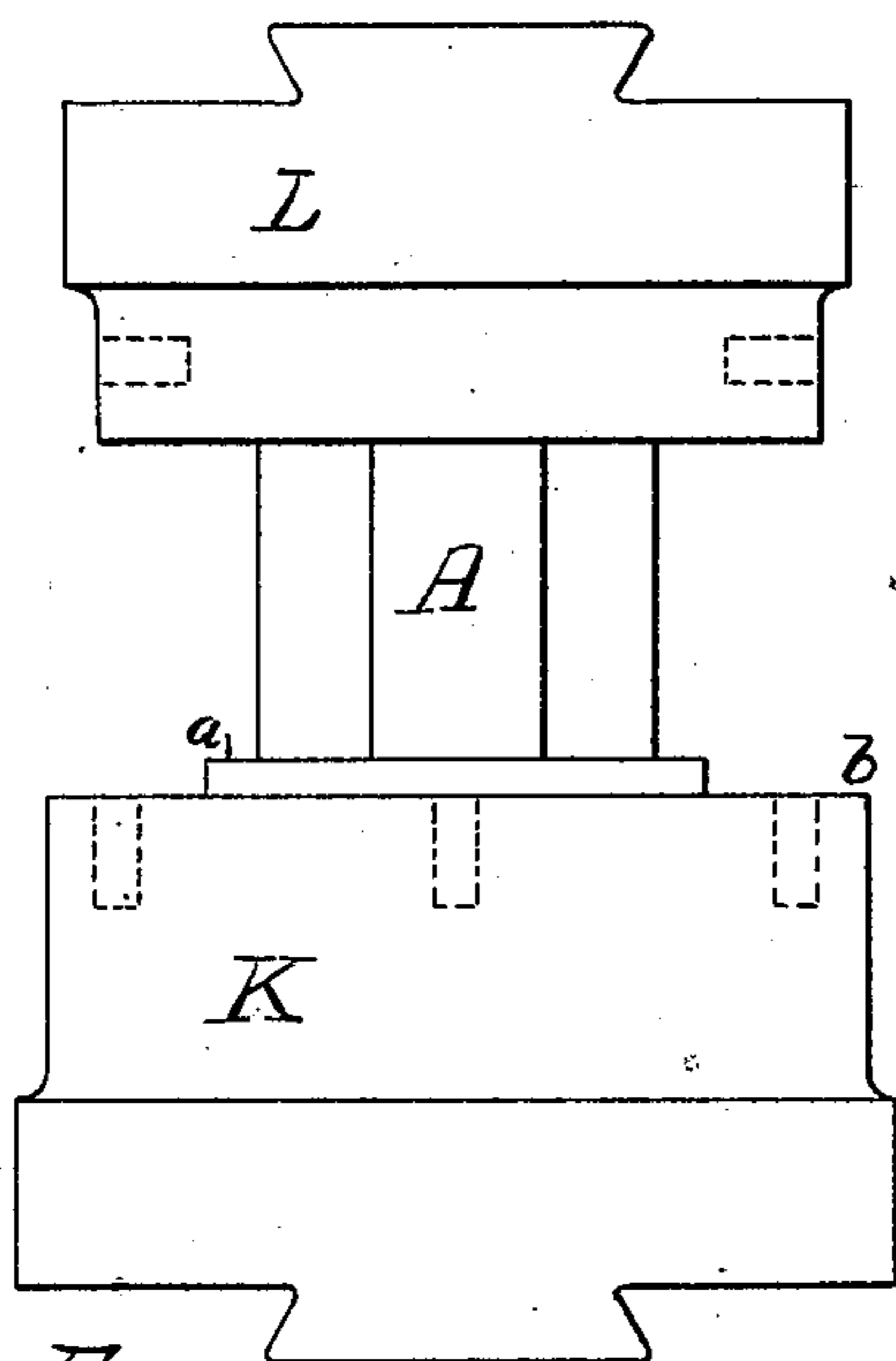
3 Sheets—Sheet 1.

S. H. RALSTON.

DIE FOR FORGING SOLID METAL CAR WHEELS.

No. 602,196.

Patented Apr. 12, 1898.



Witnesses
James H. Harrison
W. Leithard

Samuel H. Ralston Inventor
Sam E. P. Hanson
Attorney

(No Model.)

3 Sheets—Sheet 2.

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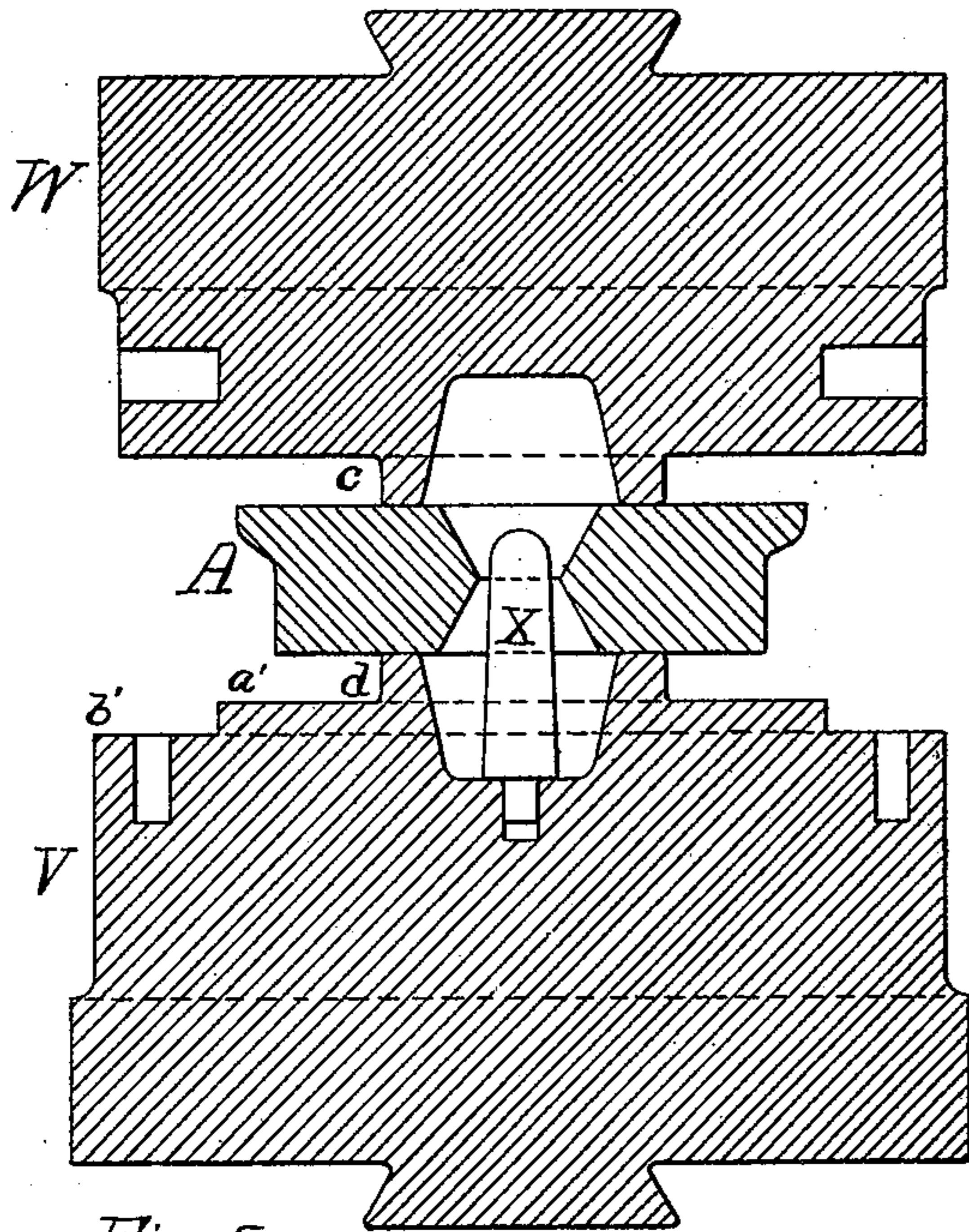


Fig. 5

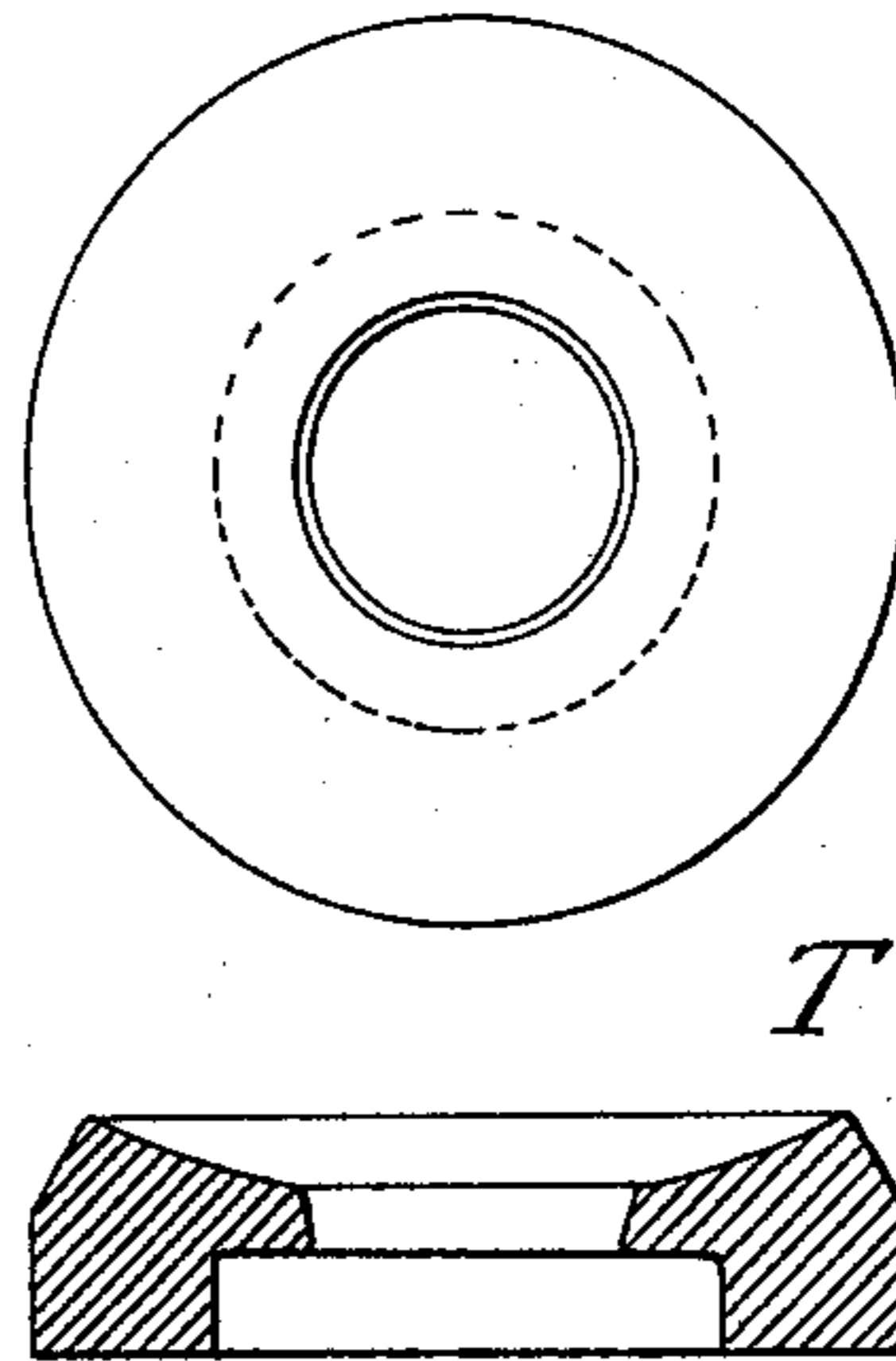
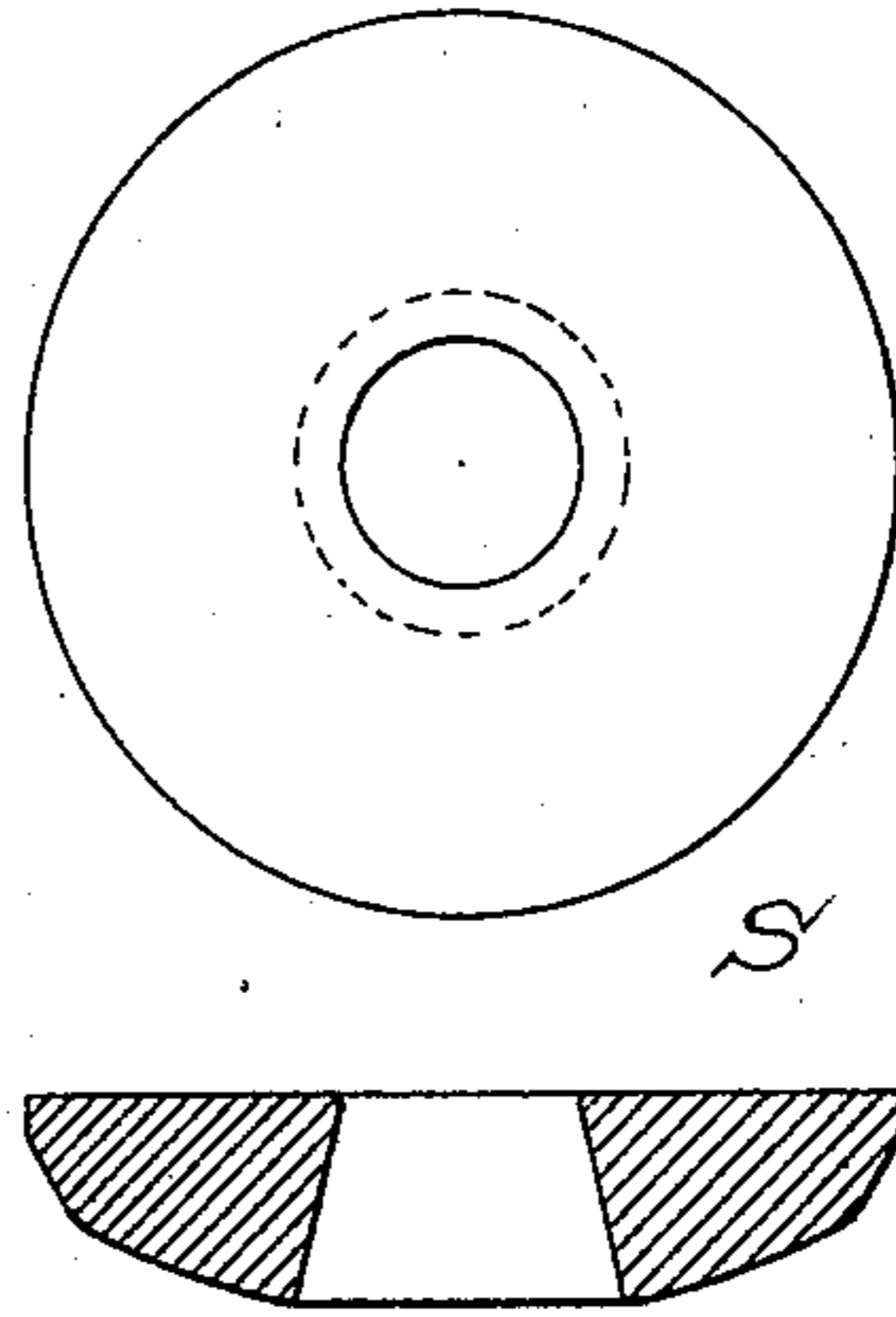


Fig. 7

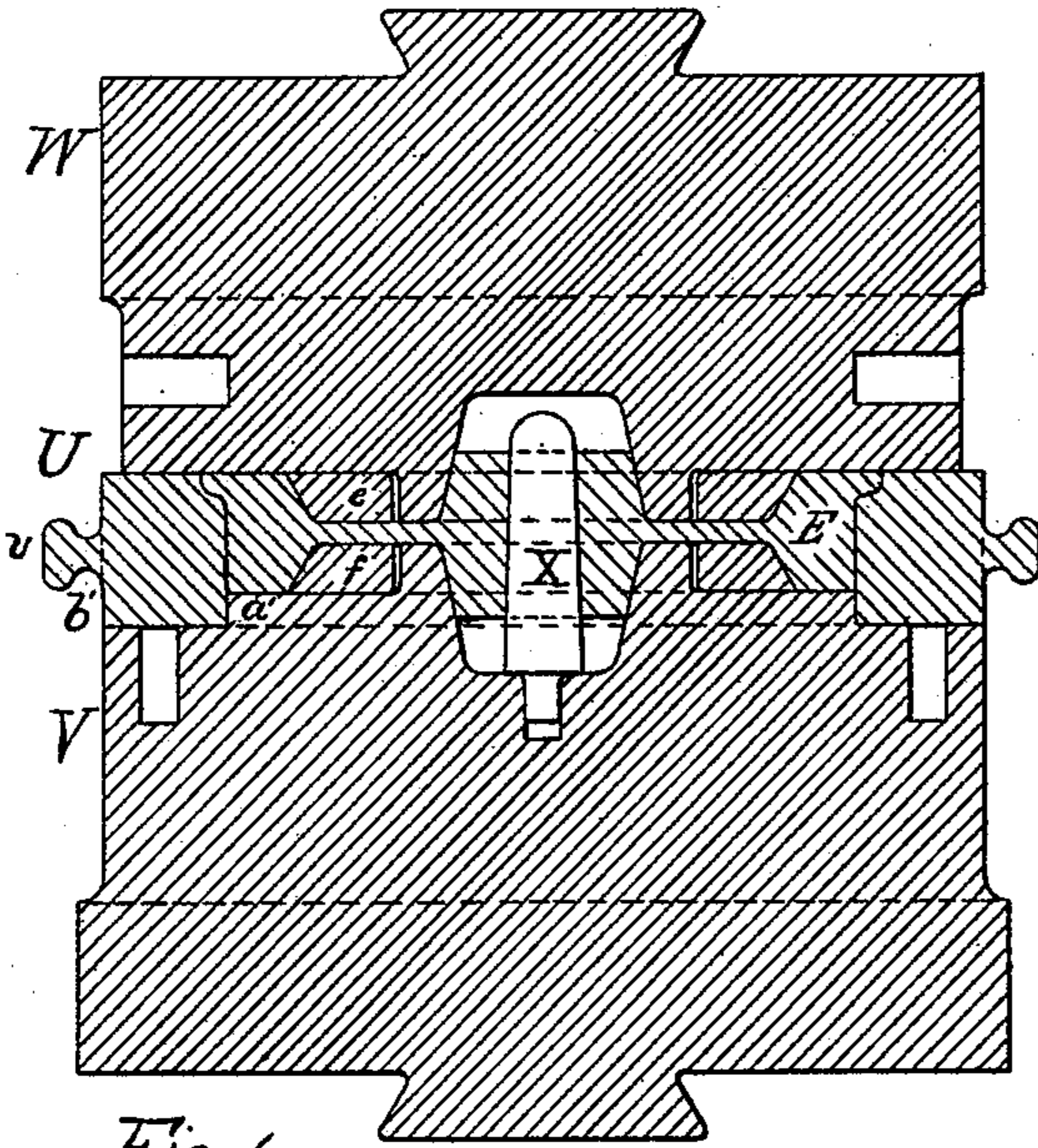


Fig. 6

Witnesses:

James H. Harrison
W. L. Litchard

Samuel H. Ralston
Inventor

Samuel P. Hanson
Attorney

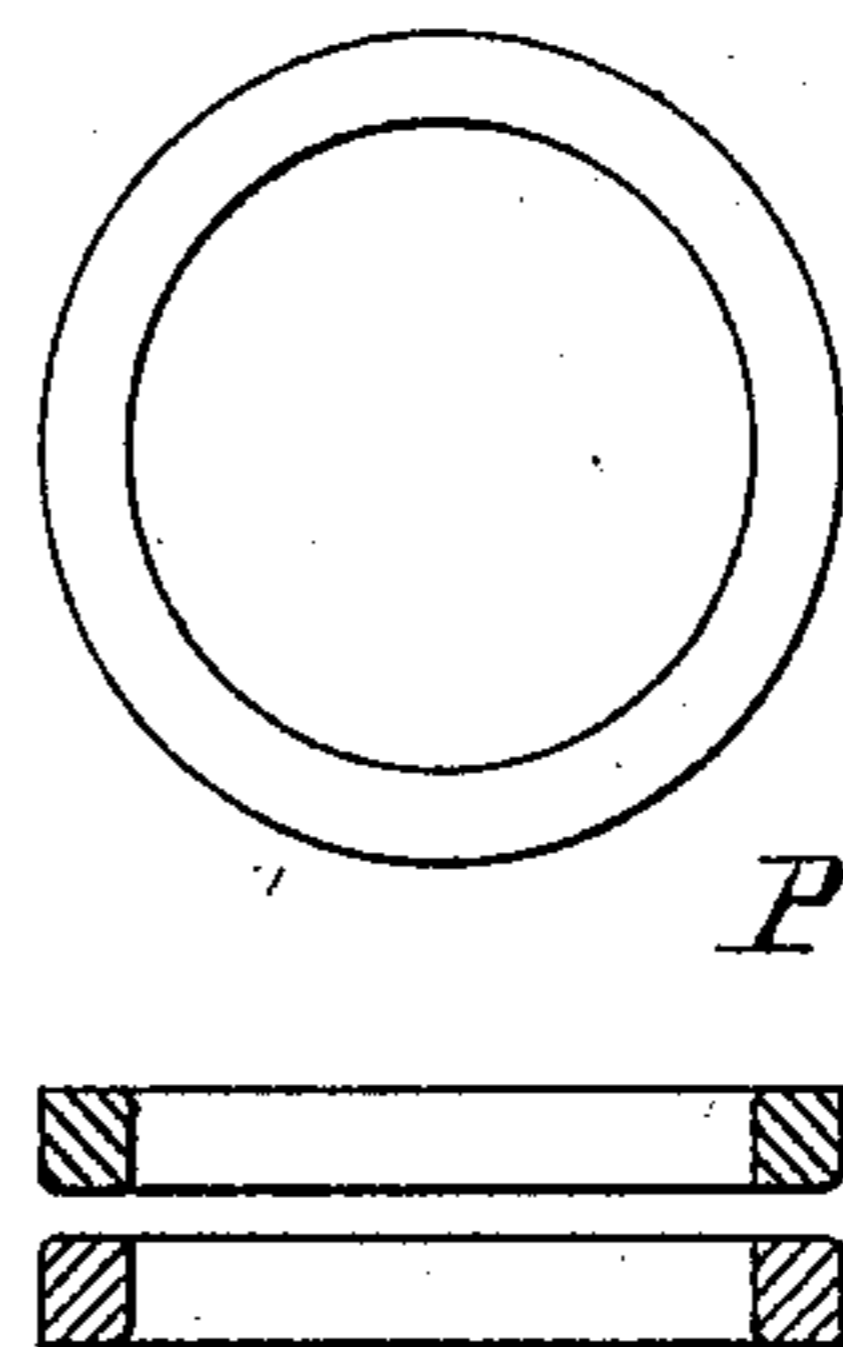
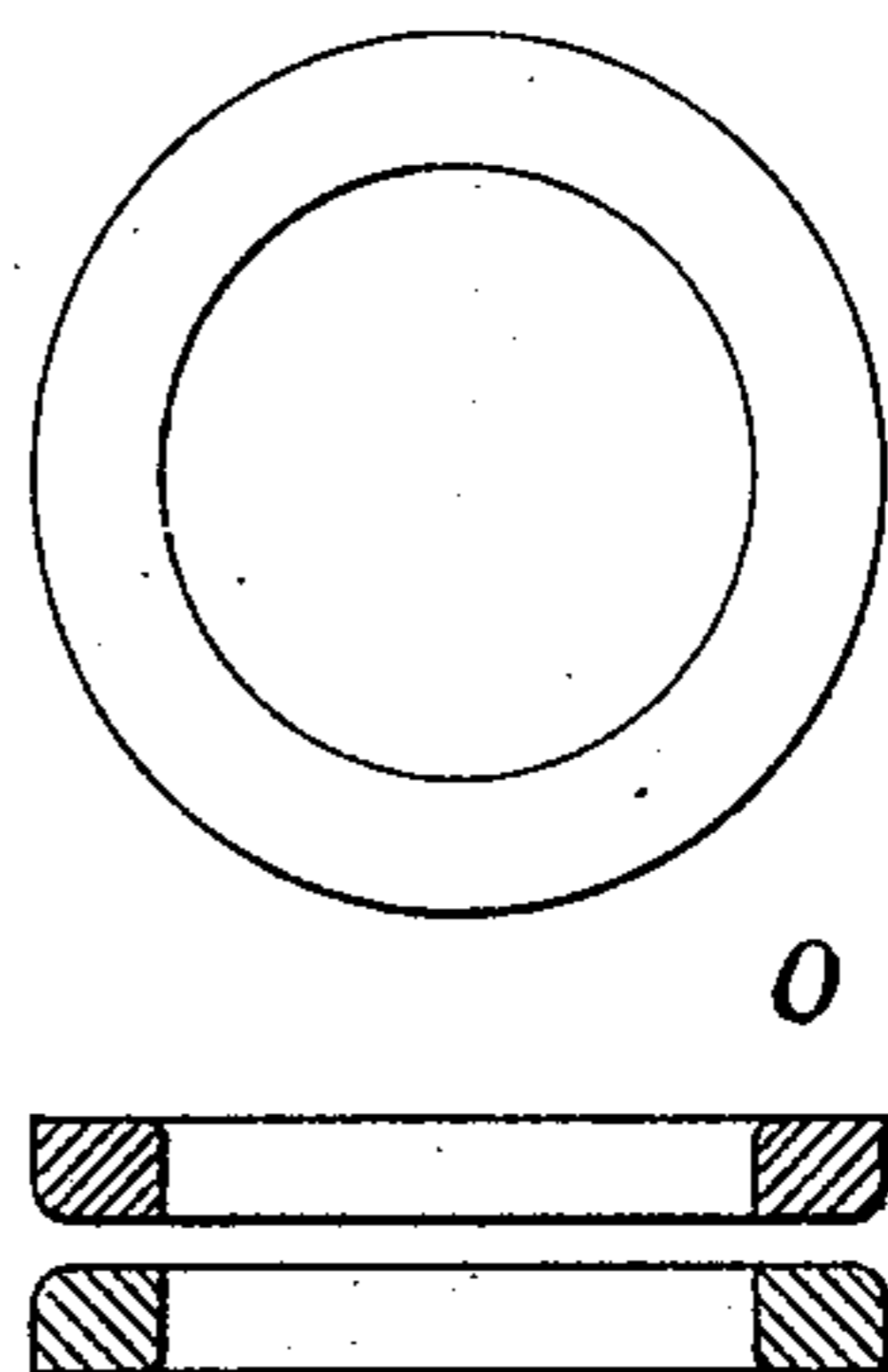
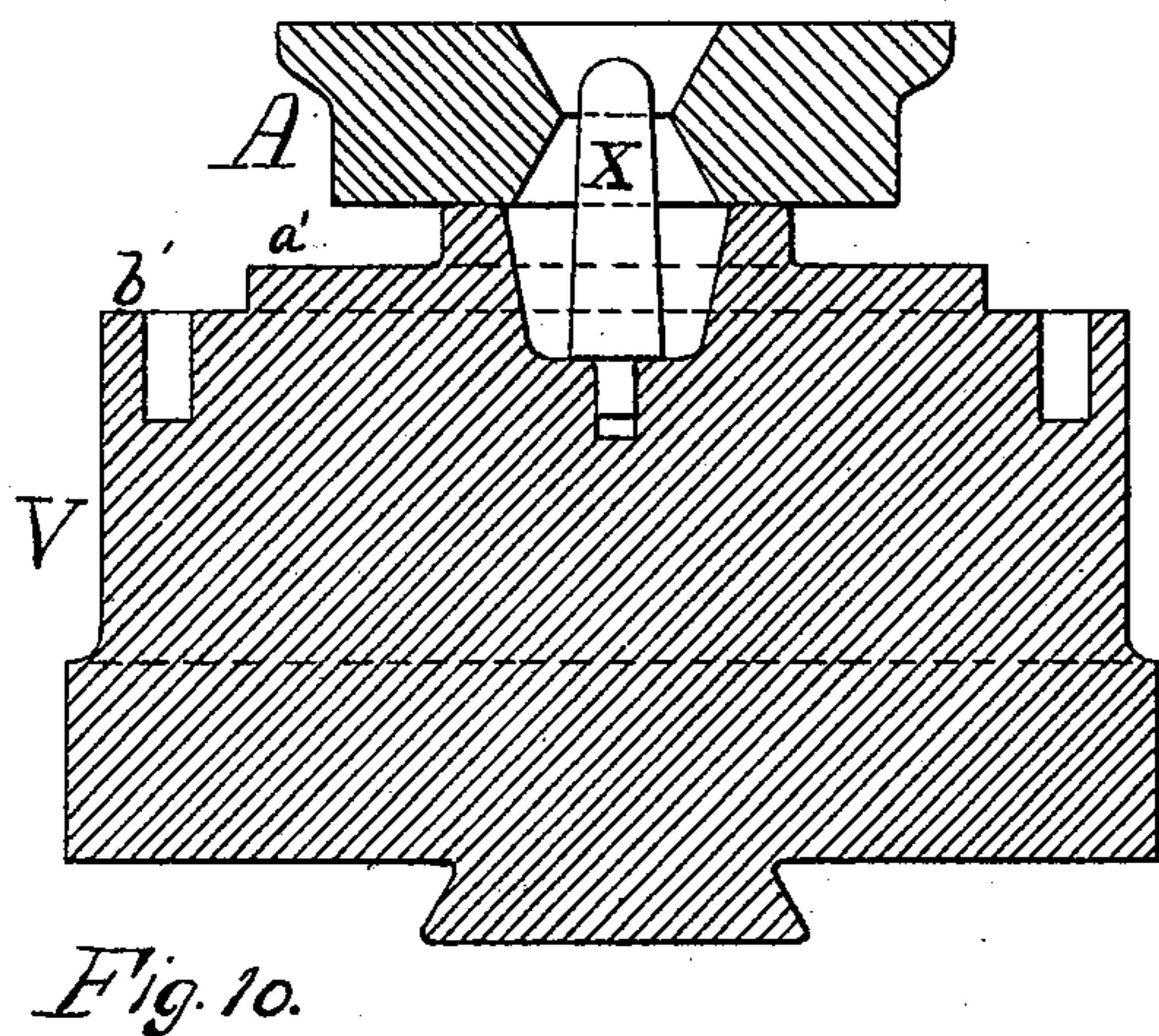
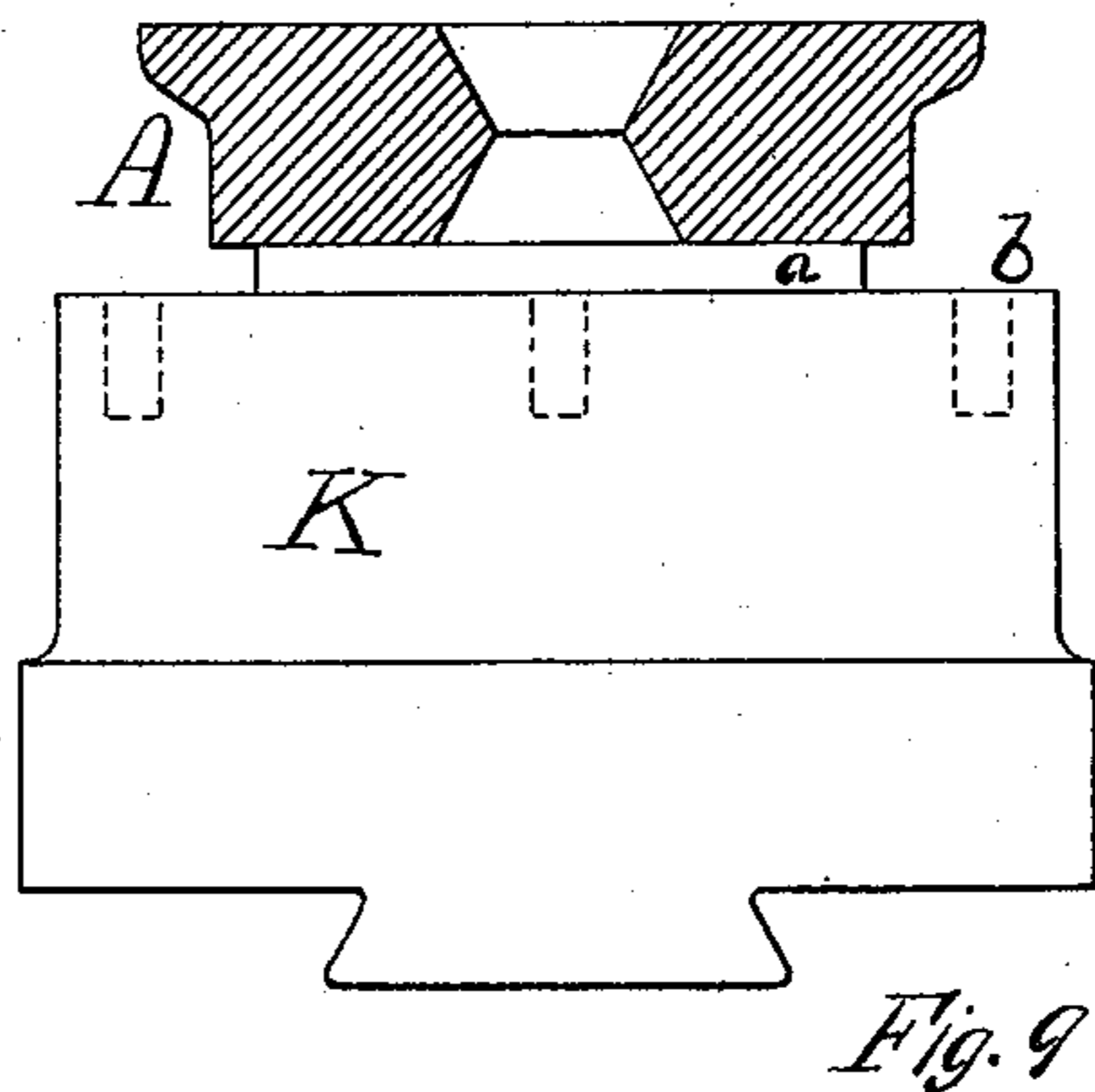
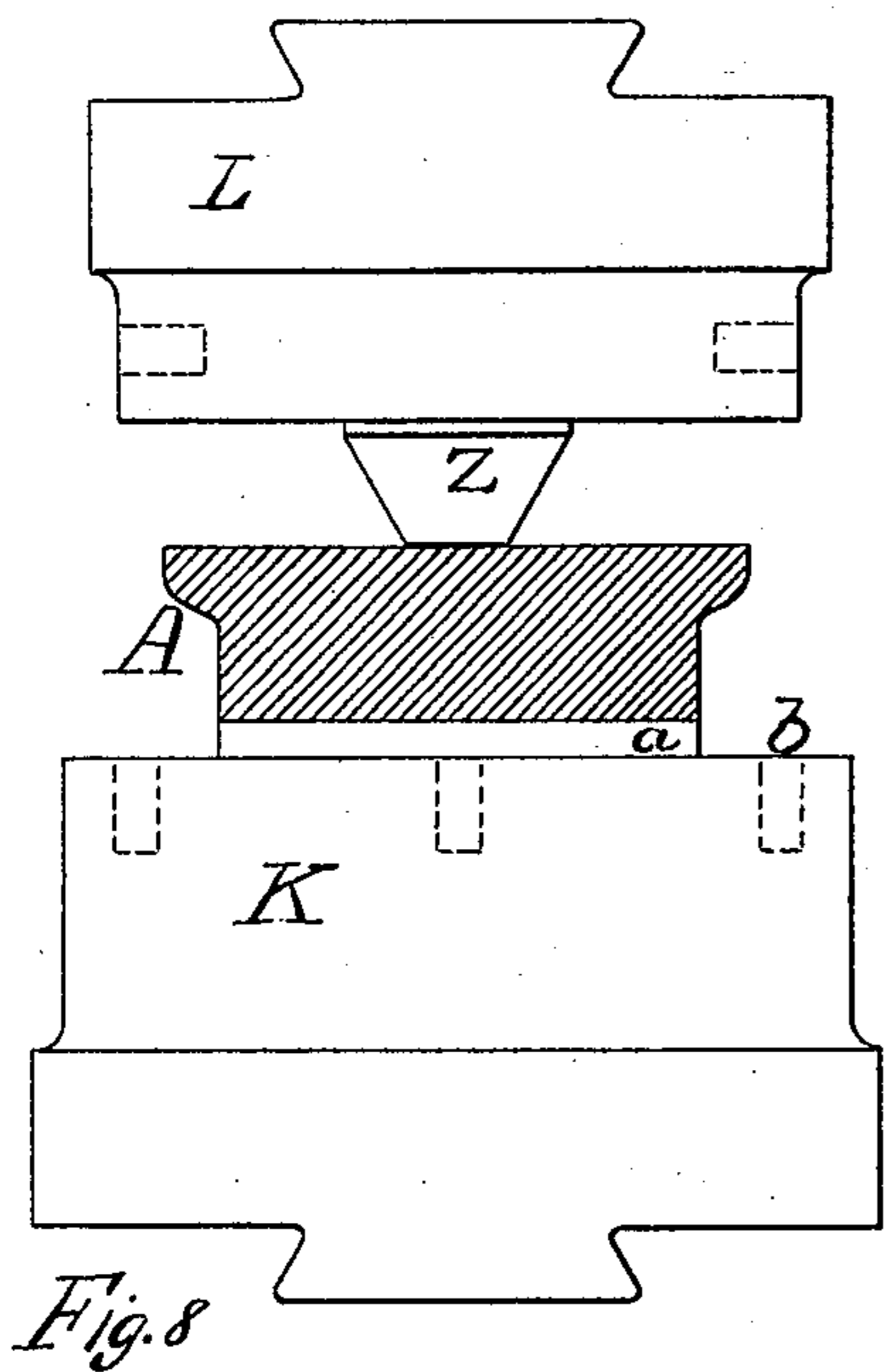
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3 Sheets—Sheet 3

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Witnesses
James H. Harrison
W. L. Litchford

Samuel H. Ralston
Inventor
Sam'l. P. Hanson
Attorney

UNITED STATES PATENT OFFICE.

SAMUEL H. RALSTON, OF NORRISTOWN, PENNSYLVANIA.

DIE FOR FORGING SOLID-METAL CAR-WHEELS.

SPECIFICATION forming part of Letters Patent No. 602,196, dated April 12, 1898.

Application filed December 22, 1896. Serial No. 616,626. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL H. RALSTON, a citizen of the United States, residing at Norristown, county of Montgomery, and State of Pennsylvania, have invented a new and useful Improvement in Dies for Forging Car-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable those skilled in the art to make and use the same.

My invention relates to new and improved dies for forming and finishing car-wheels, whereby the same are more economically and more quickly and easily formed and finished. It consists, first, in a pair of plain flat dies L K, Figures 1, 2, 3, and 4, of which the upper die is supplied with one or more flat or convex forming-plates or hammer-blocks H, Fig. 2, which displace sufficient metal to form a rudimentary flange *n*. For the flat or convex hammer-block H a concave plate or loose concave die can be used and a similar result can be produced; but I prefer to use the hammer-block H, as shown in the drawings. Sufficient metal can also be displaced to form the rudimentary flange by the use of the plain flat die L. On the lower die K, Fig. 1, with its centering-plug *a* and its shoulder *b*, is placed a wall-ring G, Fig. 2, by which the die is changed into a forming-die. The wall-ring G is bored to the form which the tread and flange of the wheel-blank is to take and rests upon the shoulder *b*, fitting closely to the centering-plug *a*, but is loose enough to be easily lifted off and replaced. Into this forming-die the ingot A is placed, (see Fig. 2,) and the die L and hammer-block H being lowered the blank is driven home into the wall-ring G, so that when the onset of the dies is complete the rudimentary flange is formed, after which the hammer-block H is removed, the die L is farther lowered, and by pressure the rudimentary flange is driven and turned downward and outward into the flange-groove of the wall-ring, thus forming the wheel-blank A, Fig. 4. This wheel-blank A is then removed from the wall-ring G preparatory to forging a hole in the hub. To facilitate this removal, the wall-ring G is supplied with trunnions *g* and a ring M M, Fig. 4, is laid upon the wheel-blank, while the wall-ring G rests upon posts N N, Fig. 4. The wheel-blank is

then removed by pressure from above. A punch may also be used to remove the blank. The hole in the hub is then formed by resting the wheel-blank A upon the die K and then by placing a conical punch Z under the die L and upon the wheel-blank A. (See Fig. 8.) The die L and the punch Z, being driven home, form a depression in the center of the wheel-blank, and thereupon the wheel-blank is turned upside down, and the depression just formed being filled or not, as may be desired, the operation is repeated, and a hole is formed extending through the wheel-blank in the shape shown in Fig. 9. The blank is then ready to be placed between the finishing-dies.

The second and final part of the operation is performed on a set of finishing-dies W V, Figs. 5 and 6. These dies have raised collars *c* and *d* on their working faces, of similar section and size, forming the hub-pocket. The lower die V is so formed that besides the collar *d* its top forms a centering-plug *a'* and a shoulder *b'* for the wall-ring U, Fig. 6. In the hub-pocket of the die V a mandrel X, Fig. 10, is inserted in a hole bored to receive it and from which it can easily be removed. The object of this mandrel X is to prevent the hole in the hub of the wheel being closed by the onset of the dies. By further operation of the dies W V, Fig. 5, the metal around the hub is displaced and forced outward radially into the rudimentary rim, leaving part of the plate or web of the wheel between the collars. The rim and web are then enlarged and extended by means of loose plating rings or collars O P, Fig. 11, used in pairs between the dies and blank. Each pair of these rings is larger in diameter and in section than the preceding pair, and a sufficient number must be driven to enlarge the forging to a size almost equal to the diameter of the finished wheel. The forging being removed, upon the shoulder of the die V is placed a wall-ring U, (provided with several depressions extending across it from the flange-groove to the outside of the ring to form relief-ports for the escape of surplus metal,) and which is so made that when in position it alters the die to a finishing-die. The upper die W, the lower die V, the mandrel X, the wall-ring U, and a final pair of loose collars *e f* form a matrix for the finished wheel, Fig. 6. The forging is then

placed therein, resting upon one of the loose collars *f*, Fig. 6. The mate of this collar *e*, Fig. 6, is then put in position on top of the forging. The die *W* is lowered, driving the collar home, thus forming the finished wheel.

The wheel may have a straight plate or web, or it may be dished at pleasure by using collars of suitable shape *S* and *T*, Fig. 7.

A finished wheel can be produced with two heatings of the metal, using one hammer; but when two hammers are used only one heating of the metal is necessary.

My invention enables the formation of a finished wheel, in a short time and with very few blows, which are all central with and normal to the center line, of a very much improved quality, inasmuch as the operation causes the metal to flow outward from the center or hub, thus conforming to the laws governing the flow of metals.

The whole operation of reducing, forming, plating, and finishing the wheel can be performed on one set of dies, by the use on the dies of several pairs of differently sized and shaped plating rings or collars, with the punch *Z*, the mandrel *X*, and the wall-rings *G* and *U*.

I do not claim the conical punch *Z* and the mandrel *X*, both of which have been used before for similar purposes, but not in the way set forth.

Referring to the drawings, like letters designate like parts.

Fig. 1 shows a pair of plain dies *L K* with the ingot *A* between them at commencement of operations. Fig. 2 shows the dies *L K*, the forming or wall ring *G* with its trunnions *g*, the partially-forged ingot *A*, and the hammer-block *H*. Fig. 3 shows the dies *L K*, the ring *G*, and its trunnions *g*, and the wheel-blank *A* after the formation of the rudimentary flange *n* and the removal of the hammer-block *H*. Fig. 4 shows the dies *L K*, the ring *G*, the wheel-blank *A* turned upside down (after the onset of the dies, as shown in Fig. 3) in position preparatory to being removed from the ring *G*. *M* is a ring placed upon the wheel-blank *A*, by which it is removed by means of pressure from above. A punch may be used instead of this ring *M*. Fig. 5 shows the dies *W V* with the mandrel *X* in the hub-pocket, the wheel-blank *A* and the collars *c d*, which form the hub-pockets and are the first plating-rings. Fig. 6 shows the dies *W V*, the wall-ring *U*, the mandrel *X*, the finished wheel with a straight plate or web *E*, a pair of loose plating rings or collars *e f*, the centering-plug *a'*, and a shoulder *b'* for the wall-ring. Fig. 7 shows a pair of plates or collars *S* and *T*, by means of which the plate or web of the wheel may be dished. The shape of these collars may be varied, so as to make the plate or web of the wheel of any desired shape. Fig. 8 shows the punch *Z*, which is constructed in the shape of a truncated cone, in position prior to the formation of the hole in the hub. Fig. 9 shows the flanged blank *A*, resting upon a die, after the operation and removal of the punch *Z*. Fig. 10 shows the

die *V* with the mandrel *X* in the hub-pocket and the flanged blank *A* resting on the die *V*. Fig. 11 shows two pairs of loose collars *O* and *P*.

I claim as my invention—

1. In combination the upper die *L*, having a plain flat surface, the lower die *K* having a raised center *a*, with a plain flat surface, which forms a centering-plug and the shoulder *b* formed around the centering-plug, by depressing the outer edge of the die below the level of the centering-plug, and a wall-ring *G*, which rests on the shoulder *b* and around the raised center to form the wall of the anvil-die, substantially as described.

2. In combination, the upper die *L*, having a plain flat surface, the hammer-block, unattached to the upper die and resting upon the center of the blank, the lower die *K* having a raised center *a*, with a plain flat surface to form a centering-plug and the shoulder *b*, formed around the centering-plug by depressing the outer edge of the die below the level of the centering-plug and a wall-ring *G*, which rests on the shoulder *b* and around the raised center to form the wall of the anvil-die substantially as described.

3. In combination the plain-surfaced upper die *L*, the lower die *K* having a raised centering-plug *a*, with a plain flat surface, thereon, the depressed shoulder *b* surrounding the centering-plug and a wall-ring *G*, and its flange-groove therein fitting closely around the centering-plug and resting upon the shoulder substantially as described.

4. In combination the die *W* having the fixed ring *c*, around its center, the die *V*, having the fixed collar *d* around its center, the raised portion *a'* constituting a centering-plug and the circular shoulder *b'* formed by depressing the die near its periphery, substantially as described.

5. In combination the die *W*, having the fixed ring *c*, around its center, the die *V* having the fixed collar *d*, around its center, the raised portion of *a'* with plain flat surface, constituting a centering-plug and the circular shoulder *b'* formed around the centering-plug, by depressing the face of the die near its periphery, the wall-ring *U*, having a flange-groove therein and constructed and arranged to fit around the centering-plug, substantially as described.

6. In an apparatus for forging and extending the web of a wheel-blank radially from the hub toward the tread, the combination of the die *W* having the fixed ring *c* near its center, and the die *V*, with the fixed ring *d*, near its center and having a raised center around the ring *d*, forming a centering-plug *a'* with a plain flat surface, substantially as described.

7. An apparatus for forging, forming and finishing a solid-metal car-wheel consisting in the combination with the die *W* having the fixed ring *c* around its center, the die *V* having the fixed collar *d* around its center, the raised portion *a'* constituting a center-

ing-plug and the circular shoulder *b'* formed around the centering-plug by depressing the face of the die near its periphery the loose plating-rings *e* and *f* and the wall-ring *U*, having a flange-groove therein fitted around the centering-plug *a'* substantially as specified.

8. In apparatus for forging, forming and finishing a solid-metal car-wheel and causing the metal of the blank to flow radially outward from the hub to the tread and flange the combination with the die *W* its fixed collar *c* and the loose plating-ring *e*, of the die *V* with its fixed collar *d*, the loose plating-ring *f* and the wall-ring *U* having a flange-groove therein substantially as described.

9. In apparatus for forging and shaping the web of a solid-metal car-wheel the combination of the dies *W*, *V*, with the fixed collars *c* and *d*, the wall-ring *U* with its flange-groove therein and the loose plating-rings *S*, *T*, substantially as described.

10. An apparatus for forging solid-metal car-wheels, the combination of the dies *L*, *K* and their wall-ring *G*, for forging and flanging a wheel-blank, with the dies *W*, *V*, and their wall-ring *U*, with the fixed and loose

collars for forging, forming and finishing a solid-metal car-wheel.

11. The combination of the dies *L*, *K*, the plate or punch *H*, and the wall-ring *G*, having a flange-groove for forming a flange on a solid-metal wheel-blank by blows or pressure at right angles to the sides of the blank, with the dies *W*, *V*, their fixed collars *c* and *d*, the loose collars *e* and *f*, and the wall-ring *U* having a flange-groove thereon, for forging, forming and finishing the flanged blank into a finished car-wheel.

12. In an apparatus for producing car-wheels the combination of means for forging a flange on a wheel-blank by blows or pressure at right angles to the side of the wheel-blank, with means for shaping and finishing by forging, so constructed and arranged as to cause the metal to flow radially outward from the hub to the tread and flange under an operative force.

SAMUEL H. RALSTON.

Witnesses:

JAMES S. DAVISON,
F. M. HUTCHINSON.