

No. 747,749.

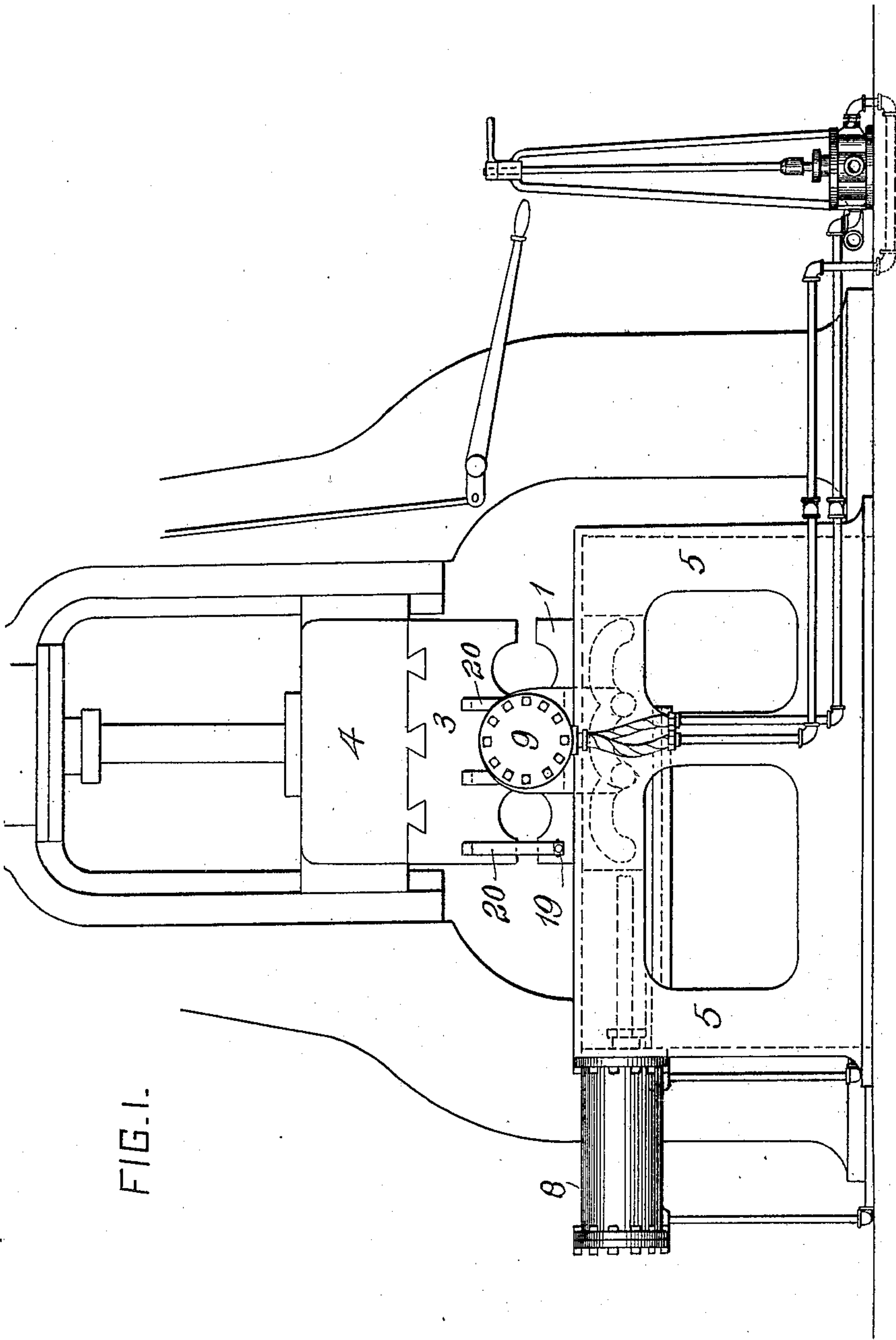
PATENTED DEC. 22, 1903.

D. J. MORGAN.
FORGING APPARATUS.

APPLICATION FILED APR. 23, 1902.

NO MODEL.

5 SHEETS—SHEET 1.



WITNESSES:

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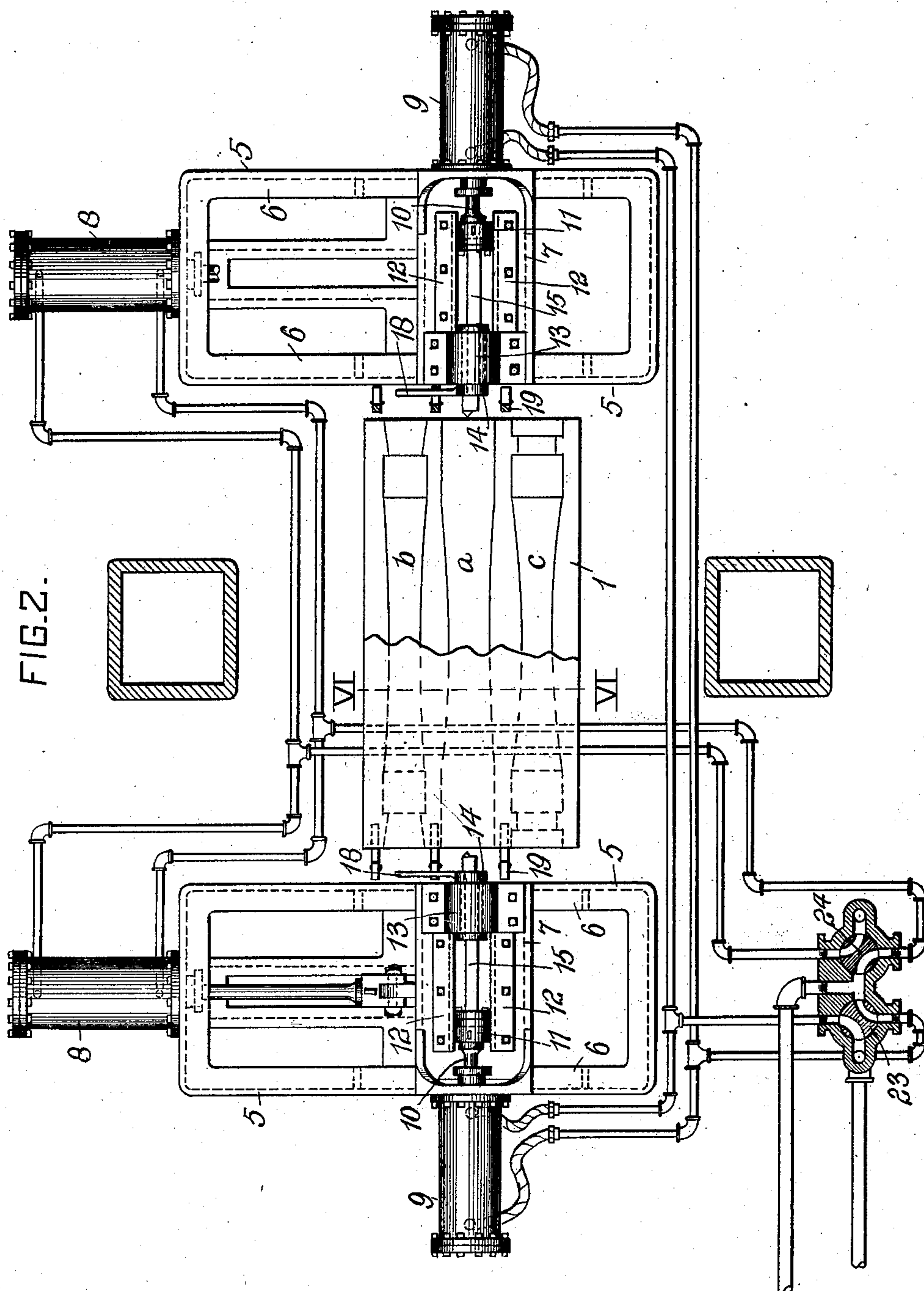
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6 SHEETS—SHEET 2.



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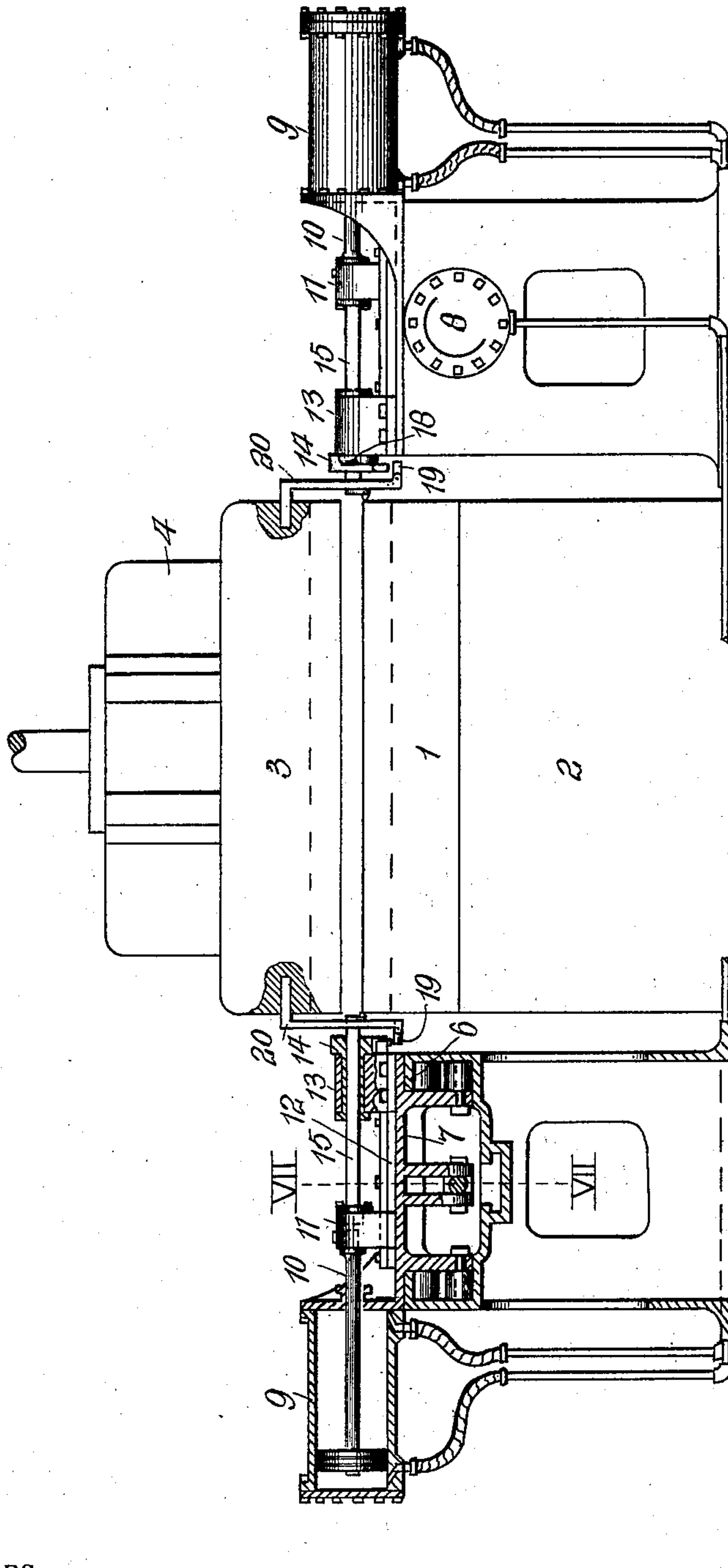
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5 SHEETS—SHEET 3.

FIG. 3.



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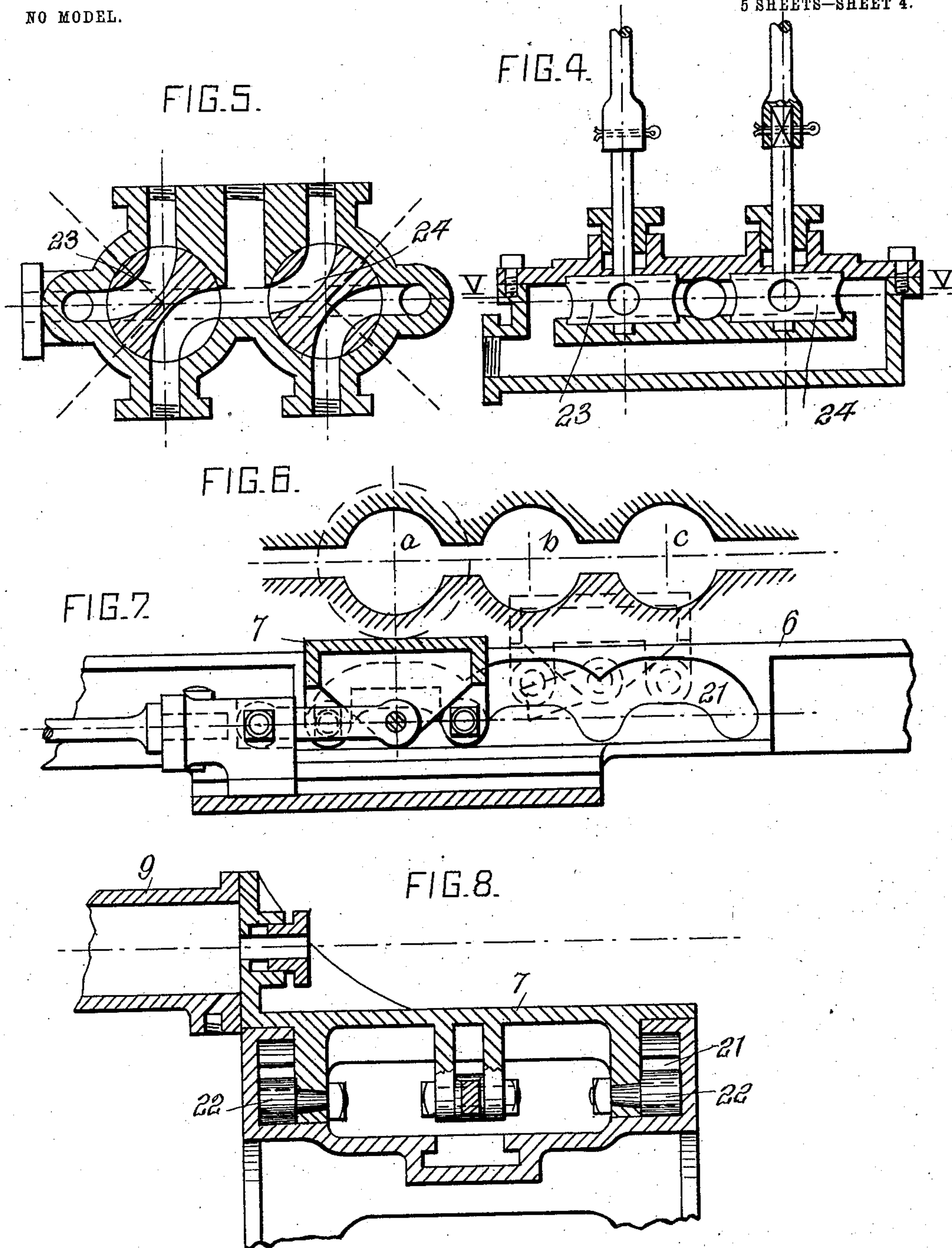
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5 SHEETS—SHEET 4.



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5 SHEETS—SHEET 5.

FIG. 9.

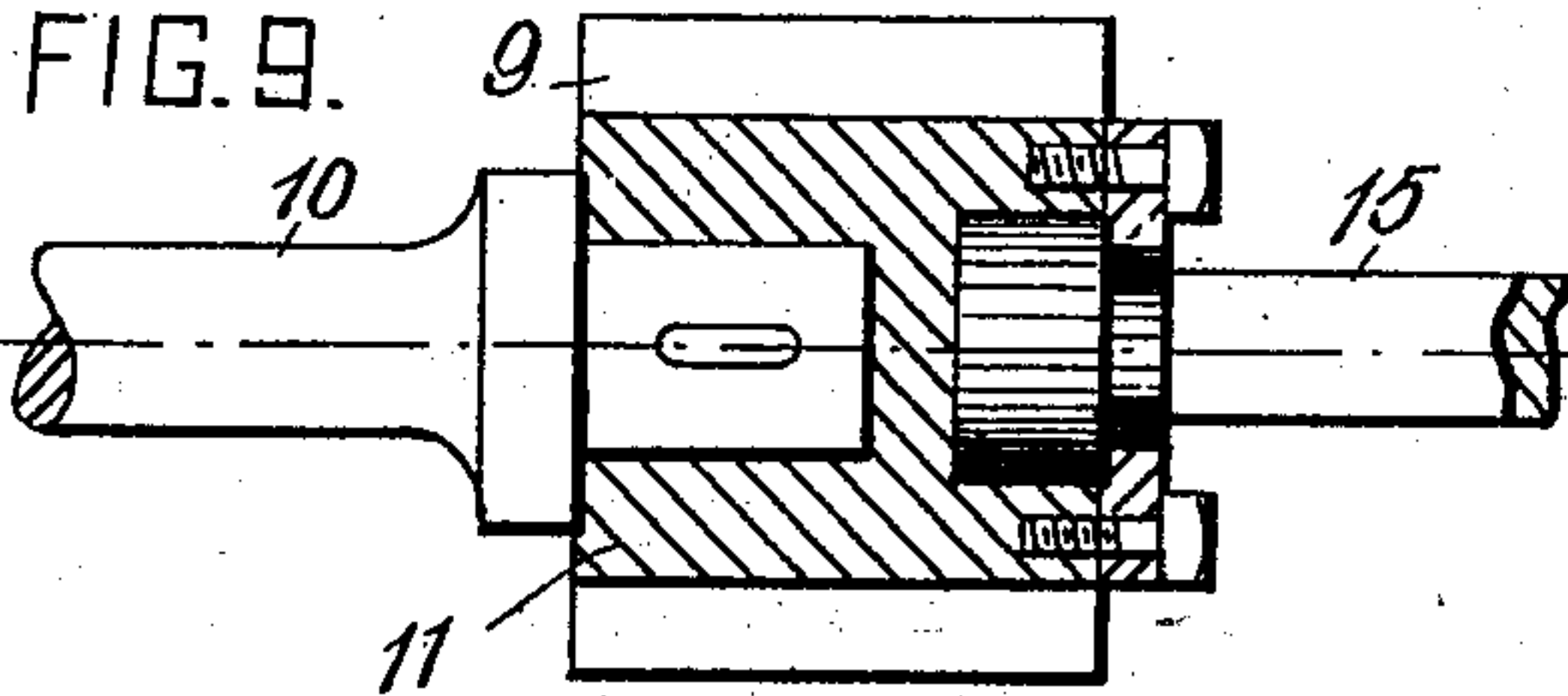


FIG. 10.

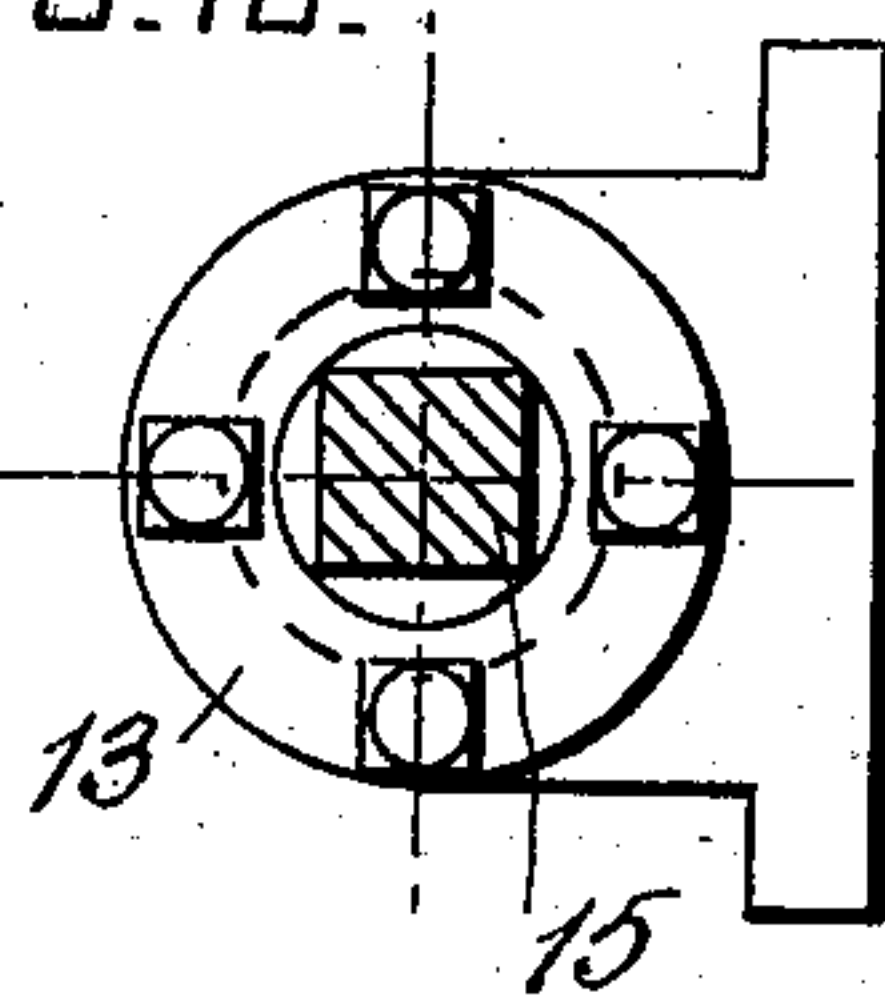


FIG. 11.

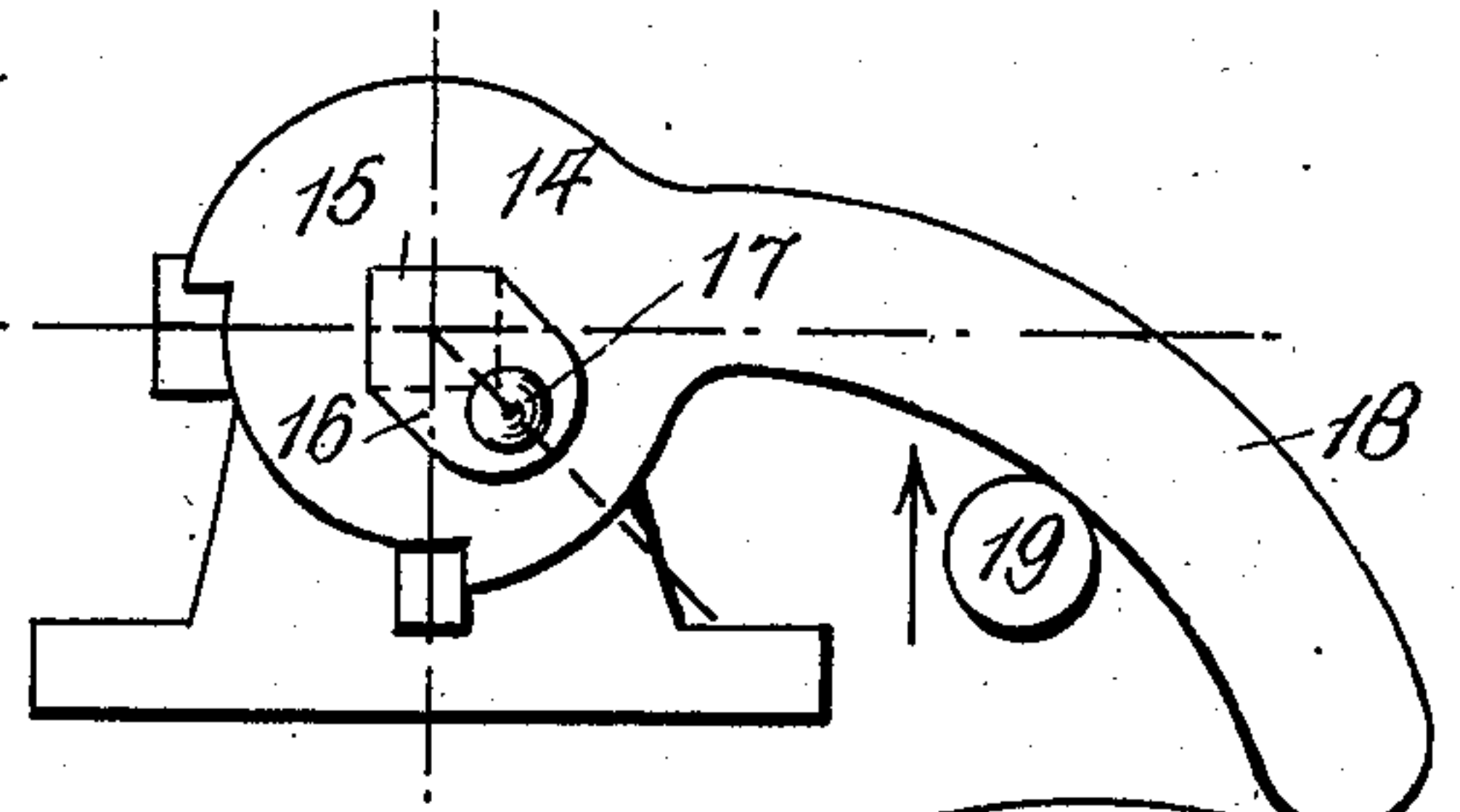
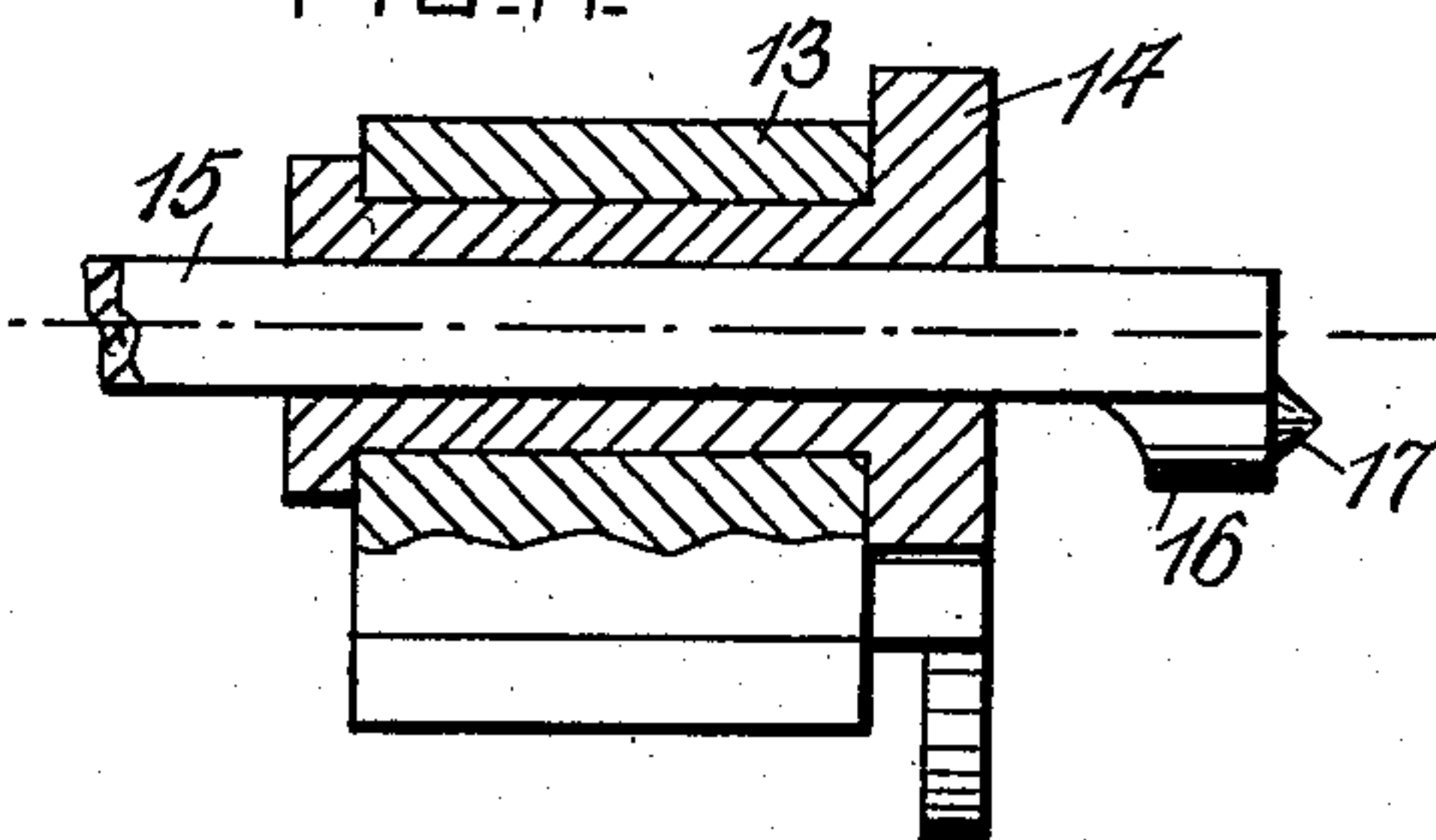


FIG. 12.

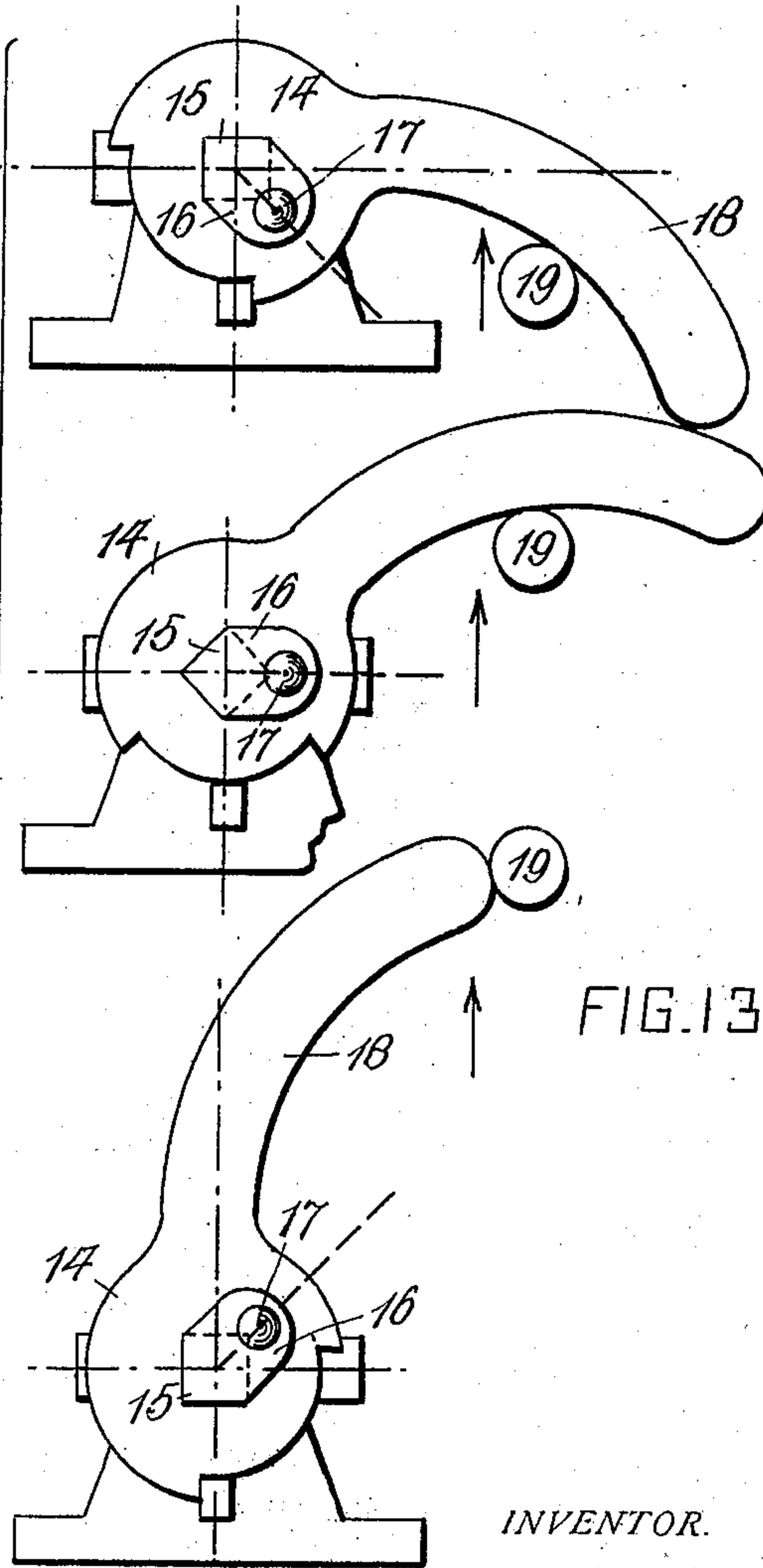
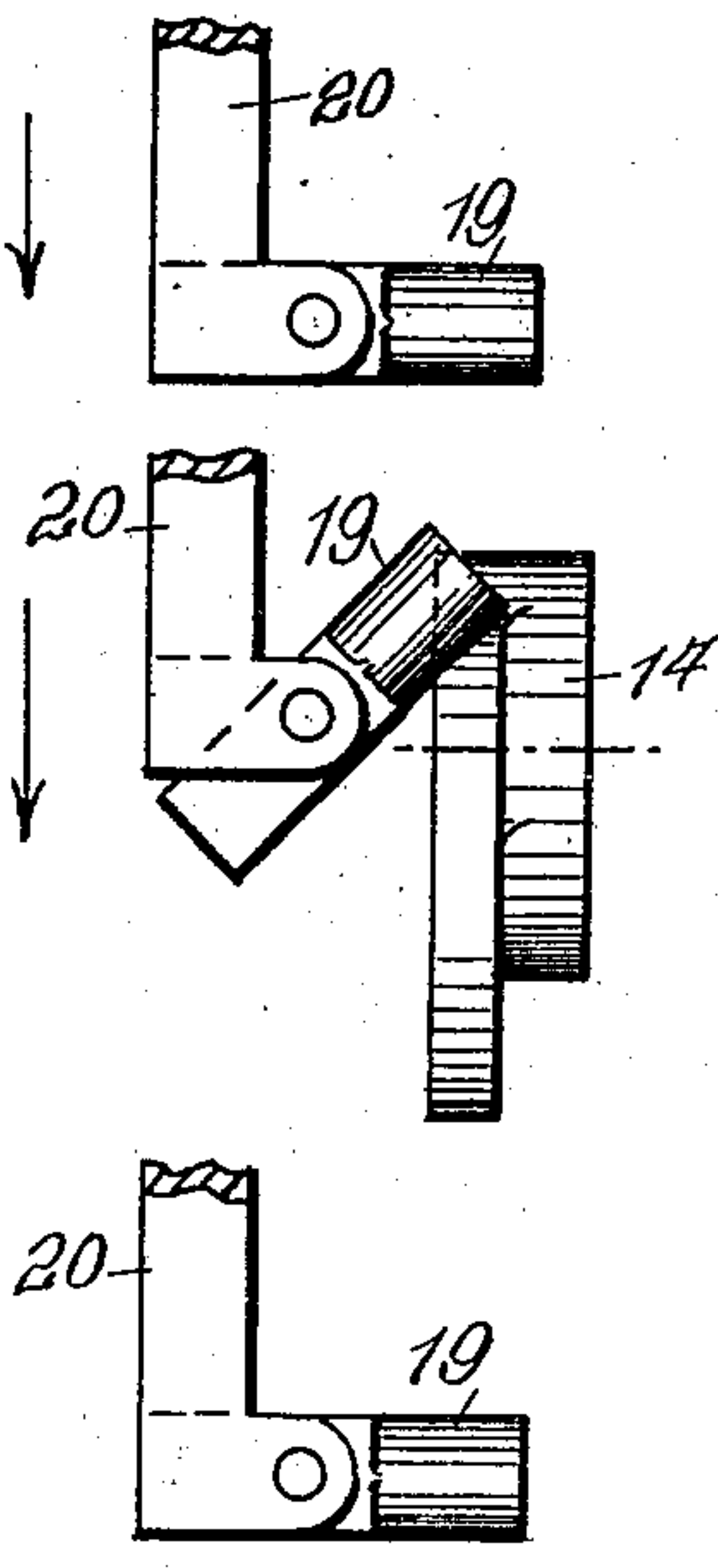


FIG. 13.

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UNITED STATES PATENT OFFICE.

DAVID J. MORGAN, OF PITTSBURG, PENNSYLVANIA.

FORGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 747,749, dated December 22, 1903.

Application filed April 23, 1902. Serial No. 104,253. (No model.)

To all whom it may concern:

Be it known that I, DAVID J. MORGAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Forging Apparatus, of which improvements the following is a specification.

The invention described herein relates to certain improvements in mechanism for forging car-axles, &c., and has for its object a construction and arrangement of parts whereby the article being forged may be turned axially from time to time and shifted from one shaping-matrix to another as the forging proceeds.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a view in elevation of my improved mechanism. Fig. 2 is a plan view of the same, the upper forging-die and its operating mechanism being removed. Fig. 3 is a view, partly in section and partly in elevation, showing the forging-dies and the shifting and turning mechanism. Fig. 4 is a sectional view, on a large scale, of the valve mechanism controlling the shifting and turning devices. Fig. 5 is a sectional view on a plane indicated by the line V V, Fig. 4. Fig. 6 is a sectional detail view showing the forming-matrices, the plane of section being indicated by the line VI VI, Fig. 2. Fig. 7 is a view, partly in section and partly in elevation, of the shifting mechanism on a plane indicated by the line VII VII, Fig. 3. Fig. 8 is a sectional detail view of the shifting carriage with a portion of the cylinder secured thereto, the plane of section coinciding with the axis of the cylinder. Figs. 9, 10, and 11 are detail views of the turning-stem and its operating parts. Figs. 12 and 13 illustrate portions of the turning devices in different positions.

In the practice of my invention one-half of the matrices employed for shaping the axle or other article are formed in a die-block 1, which is secured on a suitable anvil-block 2. The other portions of the matrices are formed in a block 3, secured to the movable head 4 of the steam-hammer or other suitable operating mechanism. These matrices are pref-

erably arranged in accordance with the successive operations on the axle, so that the axle may be shifted without reversal of its movement from one matrix to the other or others. On opposite sides of the anvil-block are arranged suitable stands or frames 5, provided with guides 6 for carriages 7, adapted to be shifted along the stands by means of fluid-pressure cylinders 8, so as to carry the axle or other article from one shaping-matrix to the other, as hereinafter described. Fluid-pressure cylinders 9 are secured to the carriages 7, with their axes parallel with the axes of the matrices in which the axles are to be shaped. The piston-rods 10 of these cylinders are secured to sliding blocks 11, adapted to move along guides 12, formed on the carriages 7 and in line vertically with the axes of the cylinders. Bearings 13 are secured to the carriages 7 on the side opposite the pistons, and in these bearings are mounted rotating heads 14, through which pass stems 15, having their outer ends secured to the sliding blocks 11 with freedom of rotation. The rotating heads 14 and the stems 15 are so constructed as to permit of a free longitudinal movement of the stems through the heads, but to insure the rotation of the stems with the heads when the latter are shifted, as hereinafter described. The inner ends of the stems 15 are provided with lateral projections 16, having studs or points 17, adapted to be forced into the ends of the axles or other article to one side of the axes of such article, so that when the stems 15 are rotated, as hereinafter described, an axial rotation of the axle or other article will be effected, so as to present new surfaces to the walls of the shaping-matrices. In order to effect the rotation of the stem and axles, the heads 14 are provided with curved arms 18, and fingers 19 are pivotally connected to brackets 20, secured to the upper or movable die-block 3. The operation of these parts to effect a rotation of the stem 15 and the article being forged is clearly illustrated in Figs. 12 and 13. As therein shown, the fingers 19 will as the upper die-block descends strike against the arms 18 and be turned on their pivotal points until they have passed below the arms, when the fingers will resume or drop to normal or horizontal position below the arms 18, as shown in the lower view in Fig. 12 and

the upper view in Fig. 13. As the die-block 3 moves up the fingers 19 will catch under the arms 18 and lift them, thereby turning the heads 14 and the stems 15 through any desired length of arc, and as the die-block reaches the upper limit of its movement the fingers will pass off from the arms, so as to permit the arms and heads to rotate back again to normal position so soon as the studs or pins 17 are withdrawn from engagement with the axle or other article.

It is necessary in order to shift the axle from one matrix to another that the axle should be lifted clear of the matrix in the lower die-block previous to any material lateral movement. To this end the guides 6 are provided with curved grooves 21, into which project pins 22, secured to the buggy 7 and preferably provided with antifriction-rollers. These grooves are so shaped that when the carriage 7 is shifted by fluid-pressure in the cylinders 8 its initial movement will be vertical, so as to lift the axle from the matrix, it being understood that the studs 17 on the stems 15 are in engagement with the ends of the axle. After this initial vertical movement of the carriage it is moved horizontally to bring the axle in position over the next matrix, whereupon the carriage will drop, so as to allow the axle to enter into the next matrix.

In operating my improved mechanism a heated blank is placed in one of the matrices, as *a*, in the lower die-block and the upper die-block caused to descend to shape the blank, and after one, two, or more shaping-blows of the upper die-block the stems 15 on the buggy 7, which has been previously adjusted to bring the stems into alignment with the matrix *a*, are forced inwardly, so that the studs or pins 17 will engage the ends of the blank. After this engagement of the studs with the axle each upward movement of the upper die-block will impart a partial rotation to the stems 15 and the blank carried thereby, so that on each stroke of the upper die a new portion of the blank will be presented for reduction. While the stems are forced inwardly, so that the studs or projection 17 are in engagement with the blank, the friction of the parts will prevent any rotation of the stems and axle by the weight of the arms 18 on the rotating head. Hence if it is desired that the blank should be rotated after each stroke the valve mechanism 23, controlling the flow of fluid-pressure to the cylinders 9, should be operated so that the stems 15 will be withdrawn as the upper die-block descends. By this withdrawal of the stems 15 the heads 14 and the stems can be rotated back by the weight of the arms 18, so that on the next up-stroke of the upper die-block the heads and stems can be rotated; but before such up-stroke of the upper die-block the stems should be forced inwardly by the proper manipulation of the valve mechanism 23, so as to cause the projection 17 to engage the ends of the

axle. After the desired reduction has been effected in any one of the matrices the stems 15 are forced inwardly, so as to engage the axles, and the carriage 7 is then shifted along its guideways by properly shifting the valve mechanism 24 so as to shift the partially-formed axle from one matrix to the other.

It will be seen by reference to Fig. 2 that brackets 20, carrying the turning-pins 19, correspond in number to the matrices employed, so that the turning of the article, as is necessary to avoid finning, may be effected while being operated on or shaped in each matrix. It is preferred to withdraw the stems 15 before each blow of the upper die-block in order to avoid any injury to such shifting and turning mechanism.

I claim herein as my invention—

1. In a forging apparatus, the combination of forging or shaping dies, longitudinally-movable stems for positively engaging the ends of the article operated on, and pins carried by one of the dies and adapted to engage and rotate the stems, substantially as set forth.

2. In a forging apparatus, the combination of forging or shaping dies, longitudinally-movable stems for positively engaging the ends of the article operated on, means for shifting said stems laterally and pins carried by one of the dies and adapted to engage and rotate the stems, substantially as set forth.

3. In a forging apparatus, the combination of forging or shaping dies, longitudinally-movable stems for positively engaging the ends of the article operated on, means for raising and laterally shifting the stems and pins on one of the dies adapted to engage and rotate the stems, substantially as set forth.

4. In a forging apparatus, the combination of forging or shaping dies, buggies arranged on opposite sides of the dies, longitudinally-movable stems mounted on said buggies and provided with eccentric pins or projections, rotatable heads provided with arms and mounted on the stems, and pivotally-mounted pins carried by one of the forging-dies and adapted to engage and shift said arms when said die is moved away from the other die, substantially as set forth.

5. In a forging apparatus, the combination of forging or shaping dies, buggies arranged on opposite sides of the dies, means for shifting the buggies back and forth, means for imparting a vertical movement to the buggies while being shifted, stems provided with means for engaging the article operated and means for shifting the stems toward and from the dies, substantially as set forth.

6. In a forging apparatus the combination of forging or shaping dies, longitudinally-movable stems provided with eccentric studs or points adapted to engage the ends of the article operated on and pins carried by one of the dies and adapted to engage and rotate the stems, substantially as set forth.

7. In a forging apparatus the combination

of forging or shaping dies, longitudinally-
movable stems provided with eccentric studs
or points for engaging the ends of the article
operated on, means for shifting said stems
5 laterally and pins carried by one of the dies
and adapted to engage and rotate the stems,
substantially as set forth.

8. In a forging apparatus the combination
of forging or shaping dies, longitudinally-
10 movable stems provided with eccentric studs
or points for engaging the ends of the article

operated on, means for raising and laterally
shifting the stems and pins on one of the
dies adapted to engage and rotate the stems,
substantially as set forth.

In testimony whereof I have hereunto set
my hand.

15

DAVID J. MORGAN.

Witnesses:

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F. E. GAITHER.