

No. 710,120.

Patented Sept. 30, 1902.

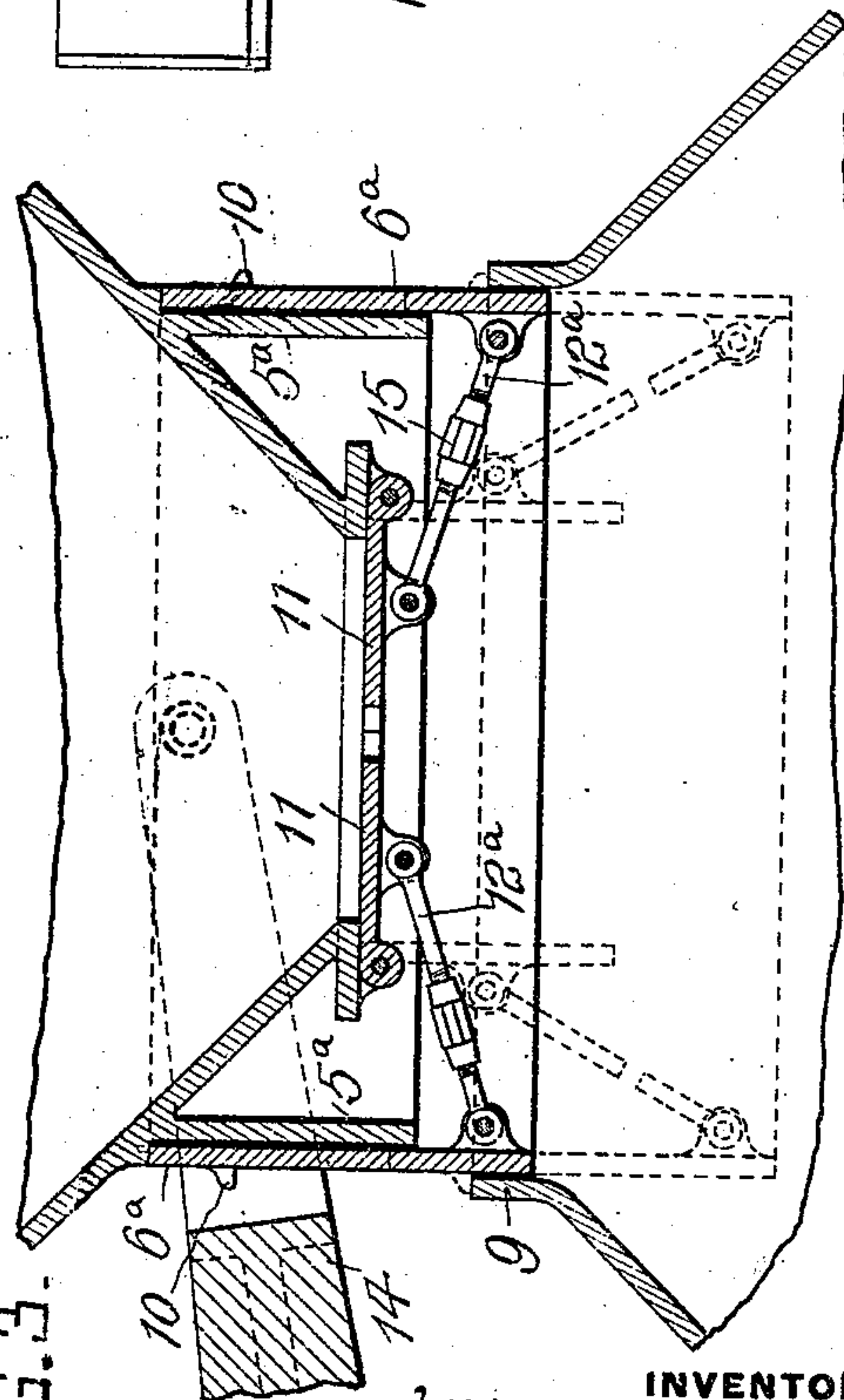
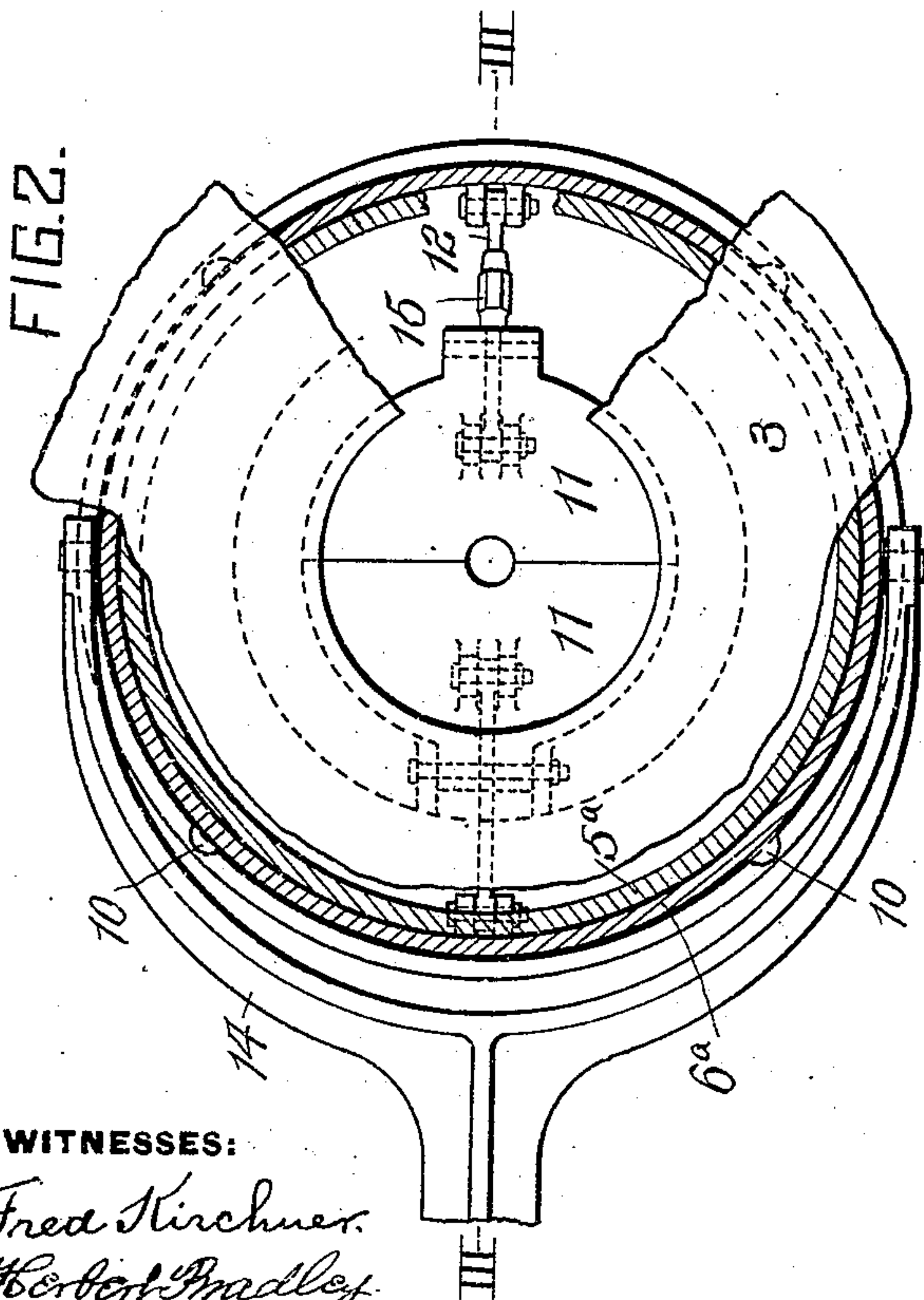
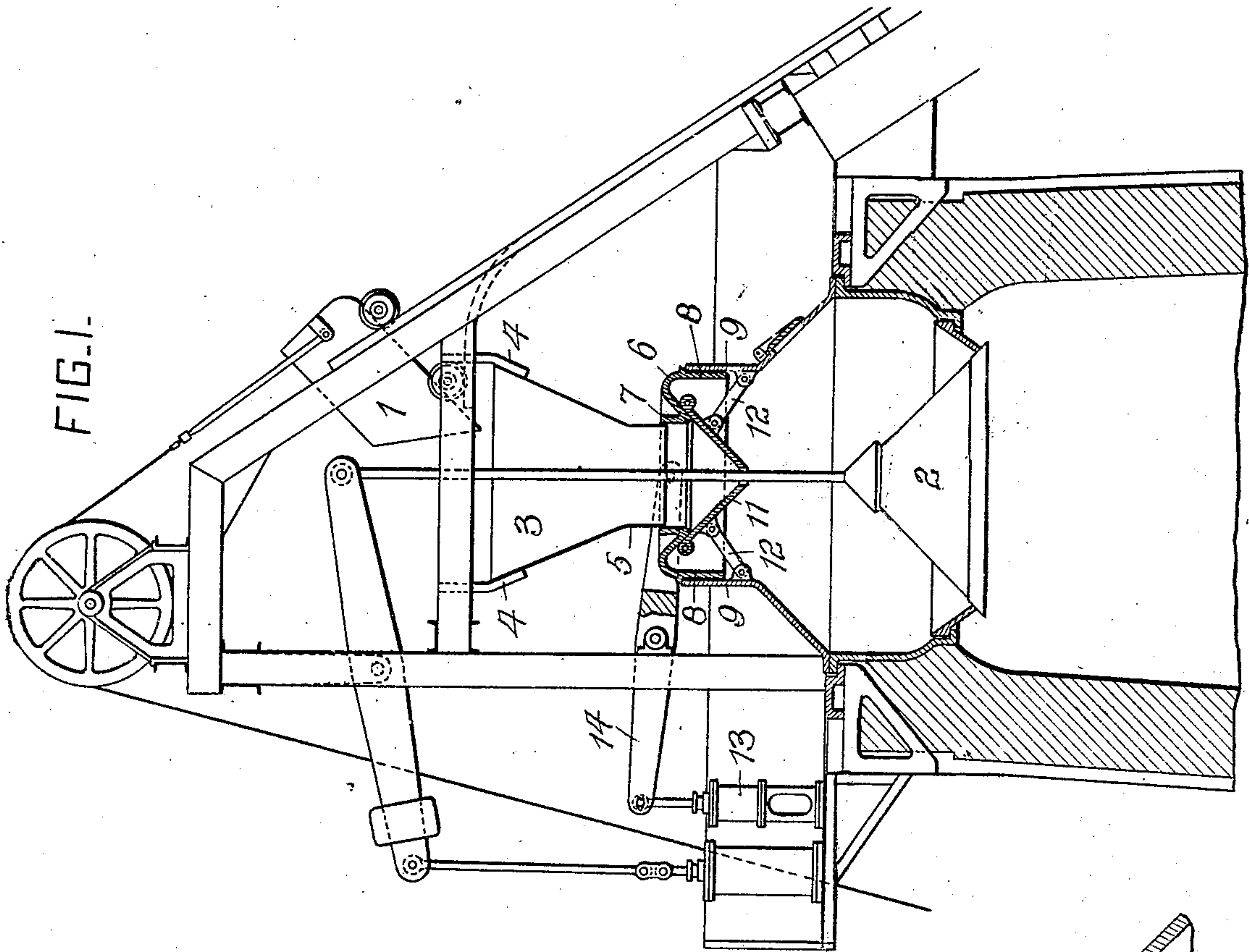
G. C. SHACKLEFORD.

BLAST FURNACE.

(Application filed June 14, 1902.)

(No Model.)

3 Sheets—Sheet 1.



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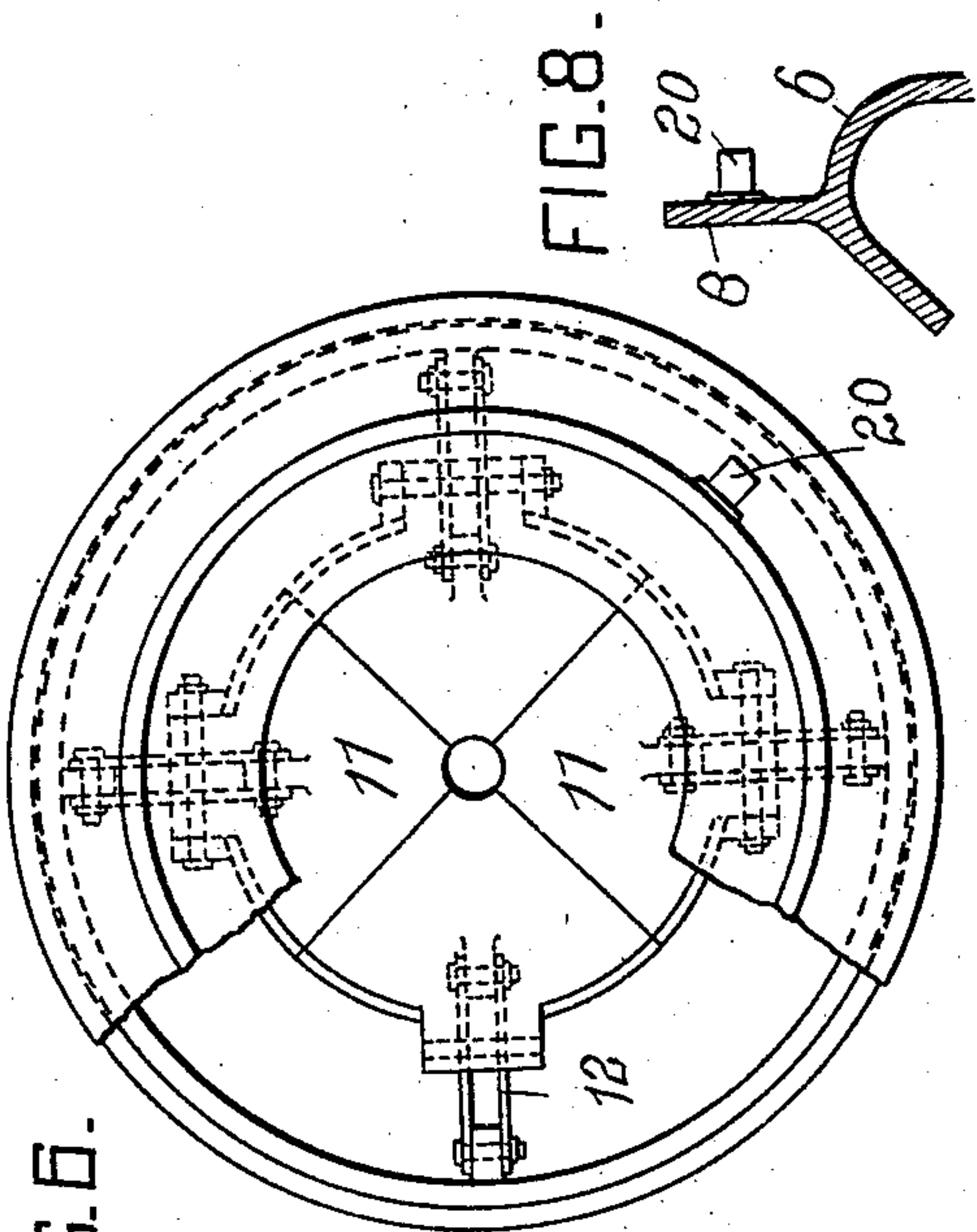


FIG. 6.

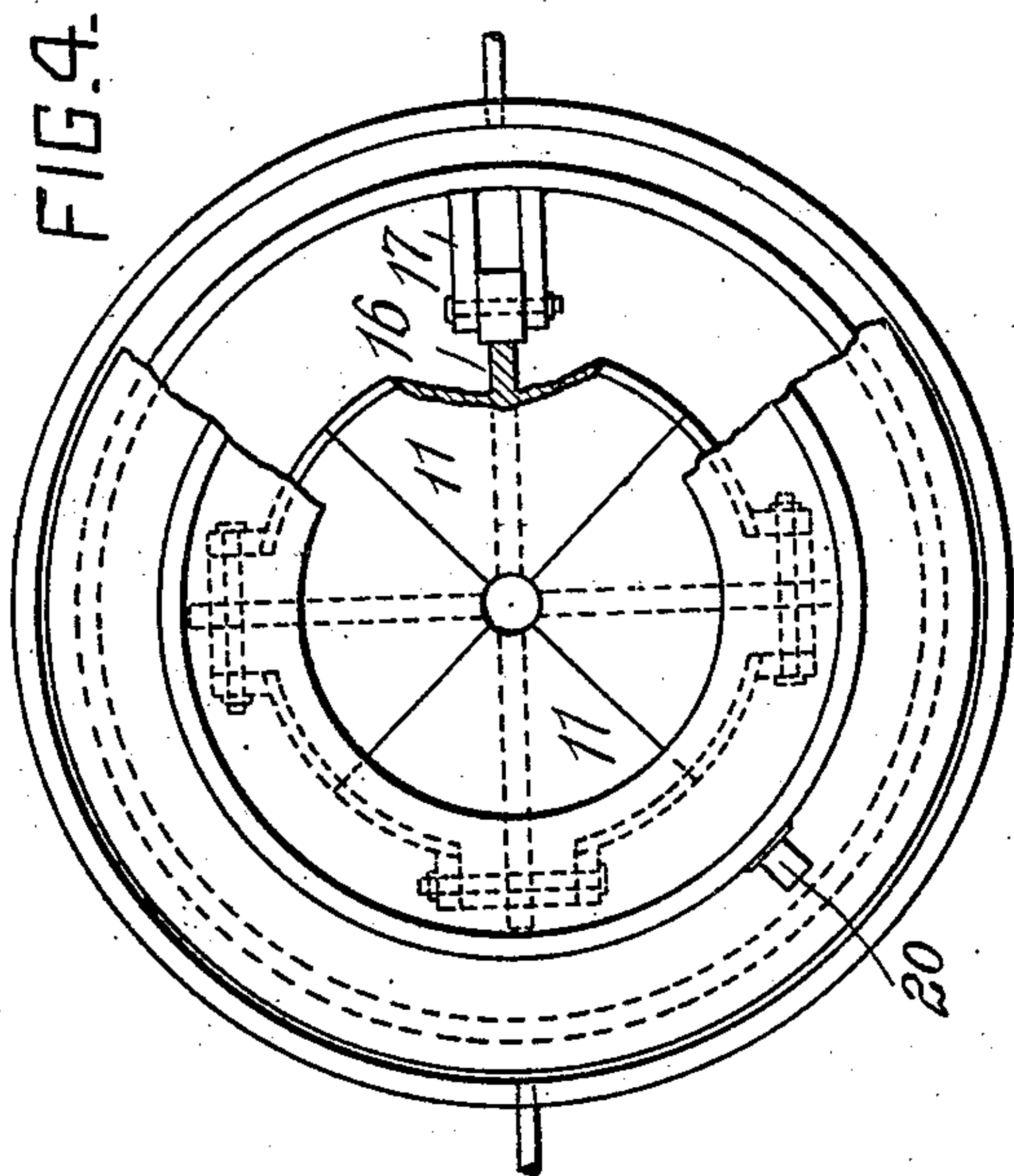


FIG. 4.

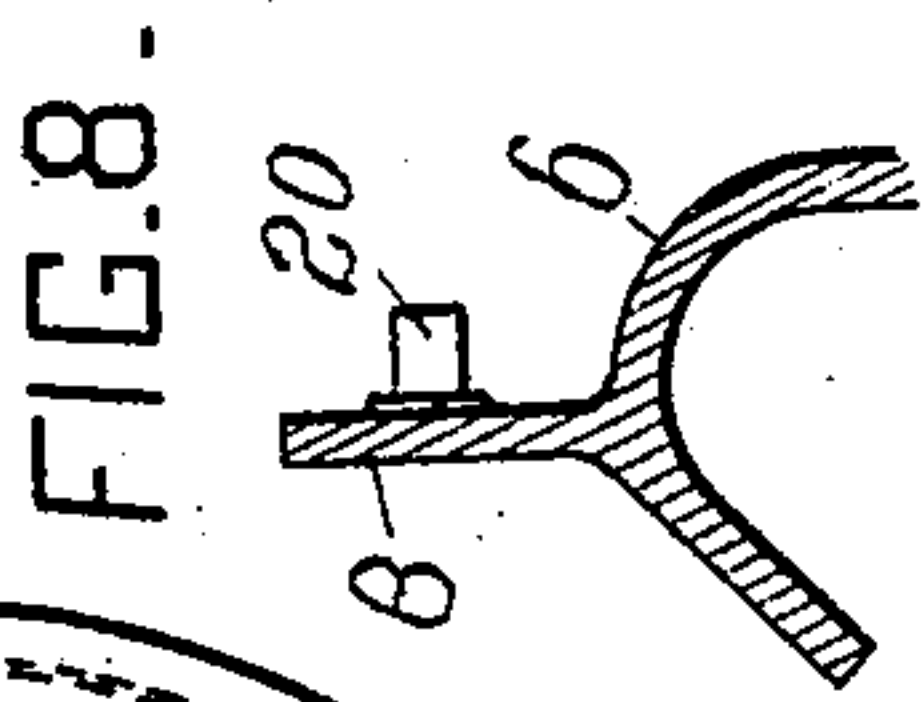


FIG. 8.

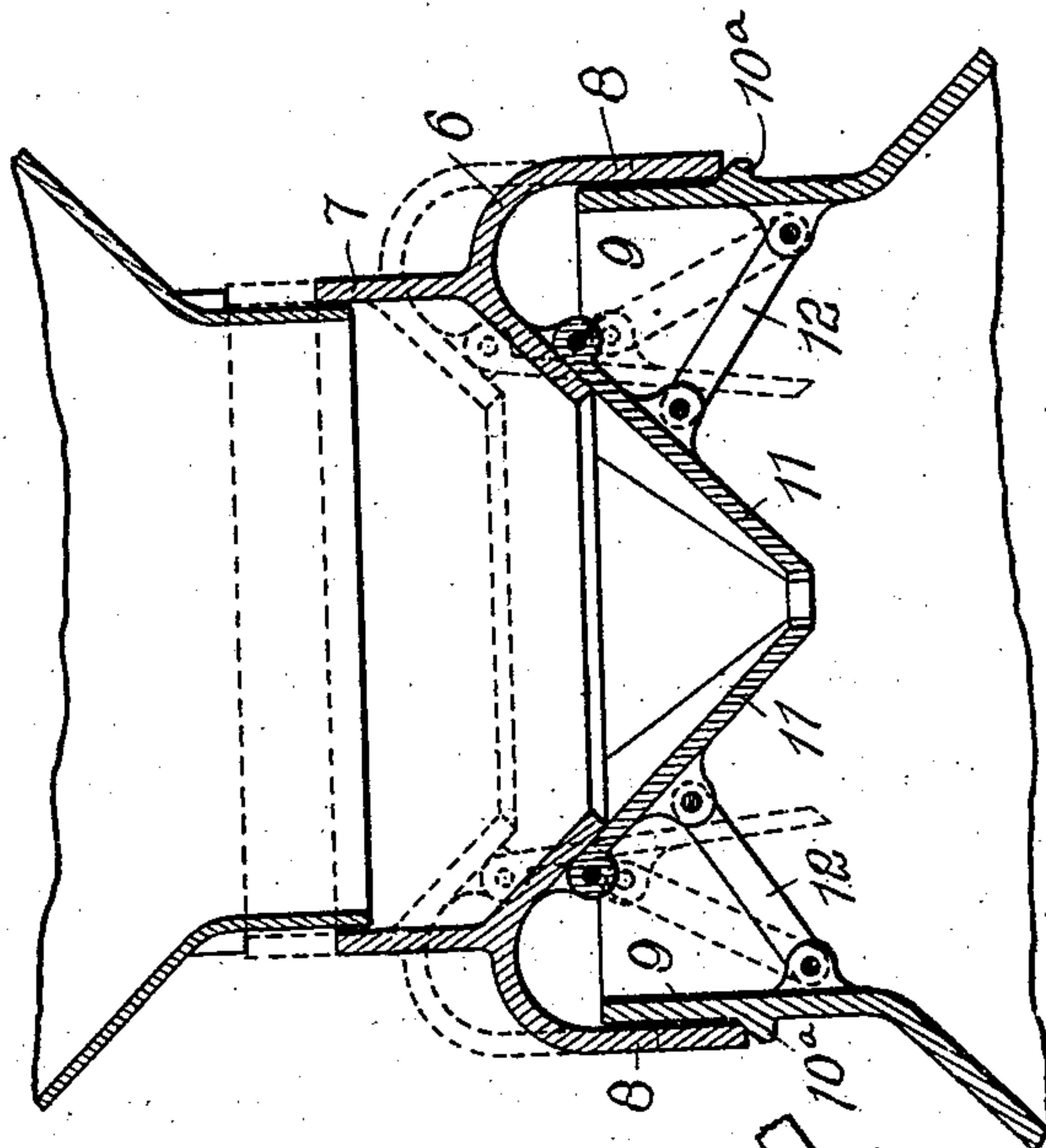


FIG. 7.

FIG. 5.

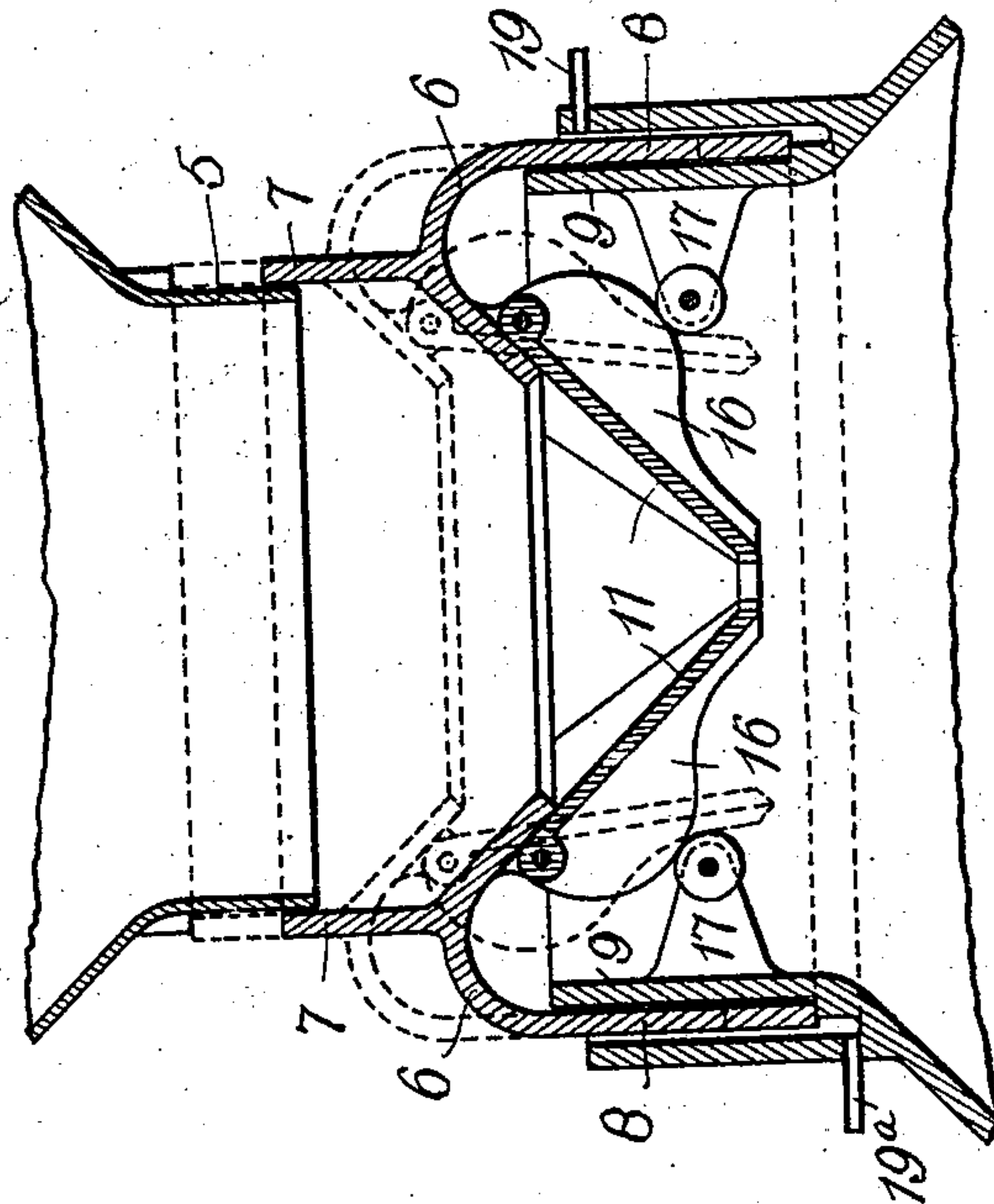


FIG. 9.

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FIG. 11.

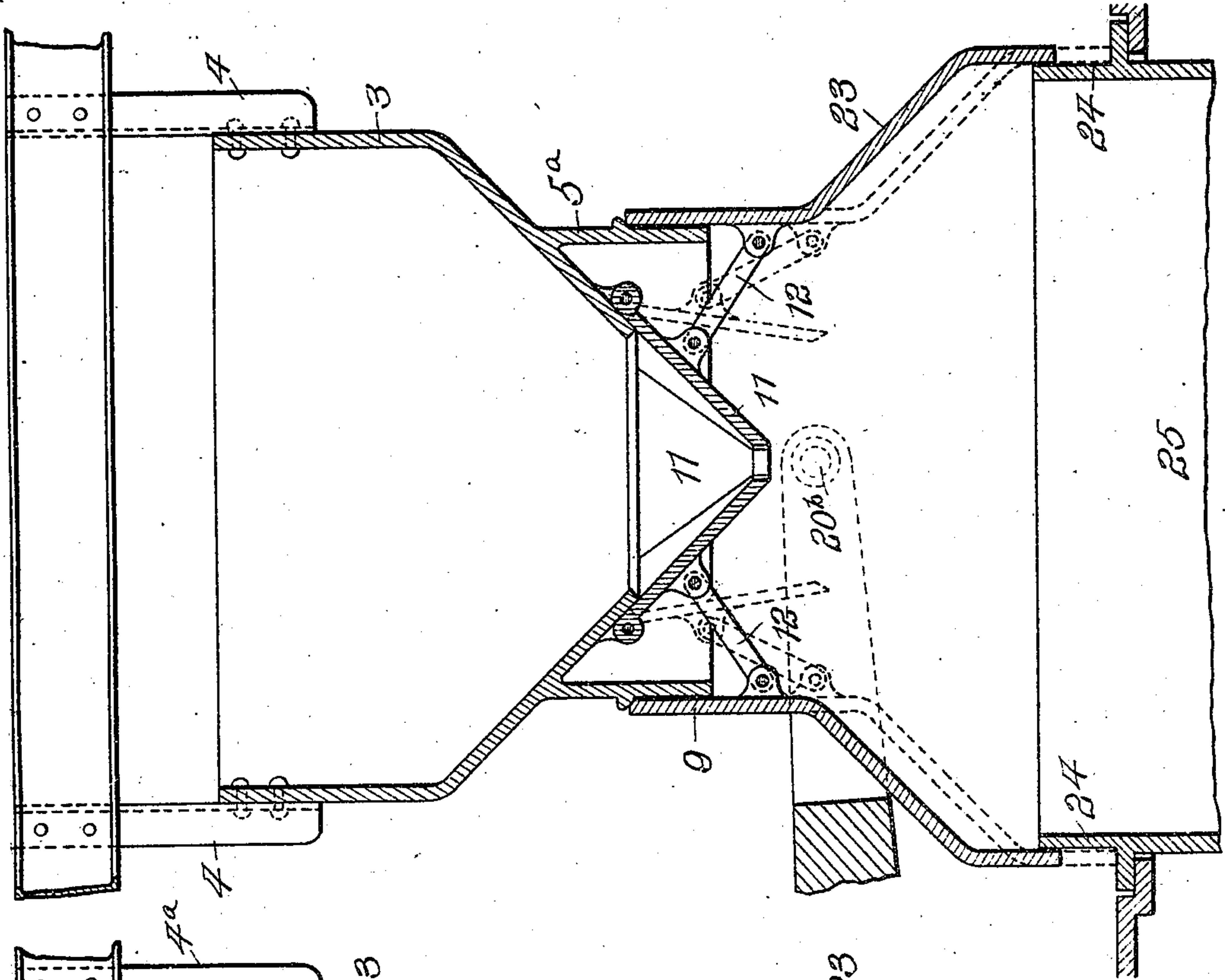
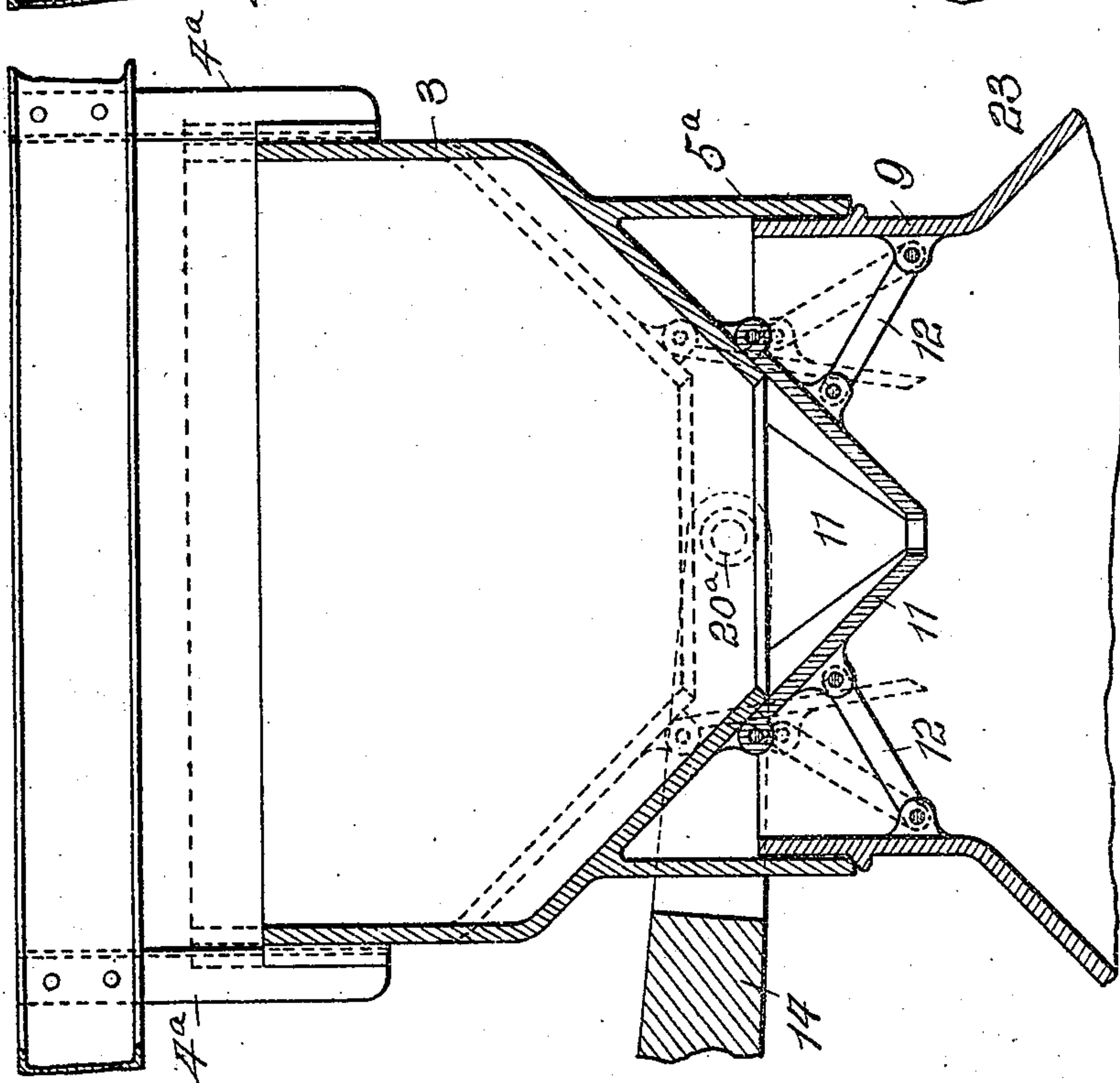


FIG. 10.



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UNITED STATES PATENT OFFICE.

GIBBON C. SHACKLEFORD, OF ALLEGHENY, PENNSYLVANIA.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 710,120, dated September 30, 1902.

Application filed June 14, 1902. Serial No. 111,759. (No model.)

To all whom it may concern:

Be it known that I, GIBBON C. SHACKLEFORD, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Blast-Furnaces, of which improvements the following is a specification.

The invention described herein relates to certain improvements in feed mechanisms for blast-furnaces. In order to obtain an even distribution of the materials fed into a blast-furnace resort has been had to devices for closing the lower end of the feed-hopper, so that the material after being charged thereinto is collected and retained and then discharged centrally upon the apex of the bell, so as to be evenly distributed around the latter and by the latter into the furnace when the bell is lowered. Different forms of doors or closing devices for the feed-hopper have been employed with varying success; but objection has been made to the use of doors in this connection on account of the difficulty in operating the same.

The invention described herein relates to certain improvements in the arrangement of doors for the feed-hopper and in means whereby the same may be operated and a full discharge area between the feed-hopper and bell may be attained.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a view, partly in section and partly in elevation, of the upper part of a blast-furnace having my improvements applied thereto. Fig. 2 is a sectional plan view. Fig. 3 is a sectional view on a plane indicated by the line III III, Fig. 2, of adjacent portions of the feed-hopper and bell-chamber. Figs. 4 and 5 are views similar to Figs. 2 and 3, illustrating a modification of my improvement. Figs. 6 and 7 are also views similar to Figs. 2 and 3, illustrating a further modification of the improvement. Figs. 8 and 9 are sectional detail views, and Figs. 10 and 11 are sectional views illustrating further modifications of my improvement.

In the practice of my invention the feed mechanism, consisting of the skip or inclined

way, a car 1 and the connection for operating the same, the bell 2 and its chamber, and the operating mechanism for the bell, are constructed in the usual or any suitable manner. The feed-hopper 3 is supported by the framework on the top of the furnace in any suitable manner, preferably by means of brackets 4, secured to a transverse beam of such framework. The feed-hopper 3 is provided at its lower end with a neck 5, having parallel sides adapted to act as a guideway for the ring 6, having sleeve portions 7 and 8, which bear, respectively, upon the neck 5 of the hopper and a neck 9, having parallel sides and formed on the upper end of the bell-chamber. This construction permits of the movement of the carrying-ring 6 along the neck portions of the hopper and bell-chamber without unsealing the latter. In order to insure a sealing of the bell-chamber, a shoulder 10 is formed on the sleeve portion 8 and adapted when the ring 6 is lowered to bear on the upper edge of the sleeve 9, thereby forming a tight seal against the escape of gases. Two or more doors 11, adapted to close the lower end of the hopper when the ring is in normal position, are pivotally mounted upon the ring 6. These doors in the construction shown in Fig. 1 are held closed when the ring is lowered by means of links 12, pivotally connected to the doors and to lugs formed on the neck portion 9 of the bell-chamber. When the ring is raised by means of the fluid-pressure cylinder 13 and the lever 14 operated thereby, the doors 11 will swing or be forced outwardly and assume a vertical position or one parallel or approximately parallel with the neck portion of the feed-hopper and outside the walls of the same, thereby giving a full opening from the hopper to the bell-chamber. When the ring 6 is lowered, the links 12 will force the doors to a closed position around the rod supporting the bell 2.

In the construction shown in Figs. 2 and 3 the doors 11 are pivotally connected to the lower end of the feed-hopper, and the links 12^a are connected at their ends to the doors 11 and to lugs formed on a ring 6^a, which is provided with shoulders 23 to limit the downward movement of the ring. In this construction an auxiliary guide-neck 5^a is formed on the lower

end of the receiving-hopper. It is preferred that the link 12^a should be made adjustable as to length, such adjustability being effected by any well-known means—such, for example, as that shown, consisting of a turn-buckle 15, having right and left hand threads for engaging similarly-threaded ends of sections forming the link 12^a.

In Figs. 4 and 5 the doors 11 are pivotally connected to the ring 6, which is constructed substantially similar to that shown in Fig. 1; but in lieu of employing links for closing the doors 11 ribs 16, having curved edges, are formed on the back walls of the doors and bear upon abutments 17, formed on the neck of the bell-chamber and preferably provided with anti-friction-rollers, as shown. The ribs on the doors and their supporting-abutments on the neck of the bell-chamber are so proportioned and constructed, as shown in Figs. 4 and 5, that when the ring 6 is lowered the doors will be forced inwardly to a closed position; but when the ring is raised the doors are permitted to swing outwardly to a position substantially parallel with the neck of the feed-hopper. In lieu of employing shoulders to seal the joint between the ring 6 and the bell-chamber a water-sealed joint may be formed by an annular recess 18 in the upper end of the bell-chamber for the reception of guiding portion 8 of the ring 6. Suitable inlet and outlet pipes 19 and 19^a are employed for maintaining a constant body of water or other liquid in this annular recess.

In Figs. 6 and 7 is shown a construction substantially similar to that shown in Fig. 1, except that the guiding portion 8 of the ring passes outside of the neck 9 of the bell-chamber and its lower edges rest upon a shoulder 10^a, formed on the neck 9.

It is preferred that the lever 14 should be bifurcated at its inner end and provided with bearings for trunnions 20, formed on opposite sides of the ring 6, as shown in Figs. 1 and 2, so that an even and regular movement of the ring 6 may be attained. In lieu of making the link 12 adjustable as regards its length its point of connection with the bell-chamber may be made adjustable, as shown in Fig. 9, such construction consisting of a rod 21, provided with an eye at its inner end and threaded for the reception of adjusting-nuts 22, as shown.

As shown in Figs. 10 and 11, the ring 6 may be omitted and the desired movement of the doors 11 effected by shifting either the feed-hopper 3, as shown in Fig. 10, or the upper portion 23 of the bell-hopper, as shown in Fig. 11. In the construction shown in Fig. 10 the feed-hopper 3 is supported and shifted by the lever 14, the bifurcated arms of this latter

engaging the trunnions 20^a, which are secured to the sides of the feed-hopper, as shown. In this construction the neck 5^a of the feed-hopper moves along and is guided by the neck 9 of the bell-hopper and bears, when lowered to close the doors, on the shoulder 10 on the neck 9. The feed-hopper is laterally supported and guided in its movements by brackets 4^a, secured to the frame on the furnace.

In the construction shown in Fig. 11 the upper portion 23 is made vertically movable and is guided in such movement by the neck 5^a of the feed-hopper (which is secured to the frame on the furnace by brackets 4) and by a neck 24 on the lower portion 25 of the bell-hopper. The movement of the portion 23 is effected by the lever 14, which engages trunnions 20^b on the portion 23 of the bell-hopper. In both constructions the doors 11 are pivoted on the feed-hopper and the outer ends of the links 12 to the bell-hopper.

It is characteristic of the improvement described herein that the movement of the closing doors is effected by means of a movable member or ring interposed between the feed-hopper and bell and suitable interposed connections, whereby on a vertical movement of such movable member the doors are forced to a closed position and by its movement in an opposite direction the doors will swing open, such movement being effected either through a direct pull on the doors or by reason of gravity, or both.

I claim herein as my invention—

1. A blast-furnace having in combination a feed-hopper, a bell-chamber, doors, arranged between the hopper and chamber, means for closing said doors, the closing means and the doors being carried by suitable independent supports movable relative one to the other to close the doors, substantially as set forth.

2. A blast-furnace, having in combination, a feed-hopper, a bell-chamber, doors arranged between the hopper and bell-chamber, a movable ring, means for closing the doors operative on the shifting of the ring, substantially as set forth.

3. A blast-furnace, having in combination, a feed-hopper, a bell-chamber, a movable ring, doors pivotally connected to said ring and adapted to close the feed-hopper, and links having their ends pivotally connected to the doors and the bell-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GIBBON C. SHACKLEFORD.

Witnesses:

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H. M. CORWIN.