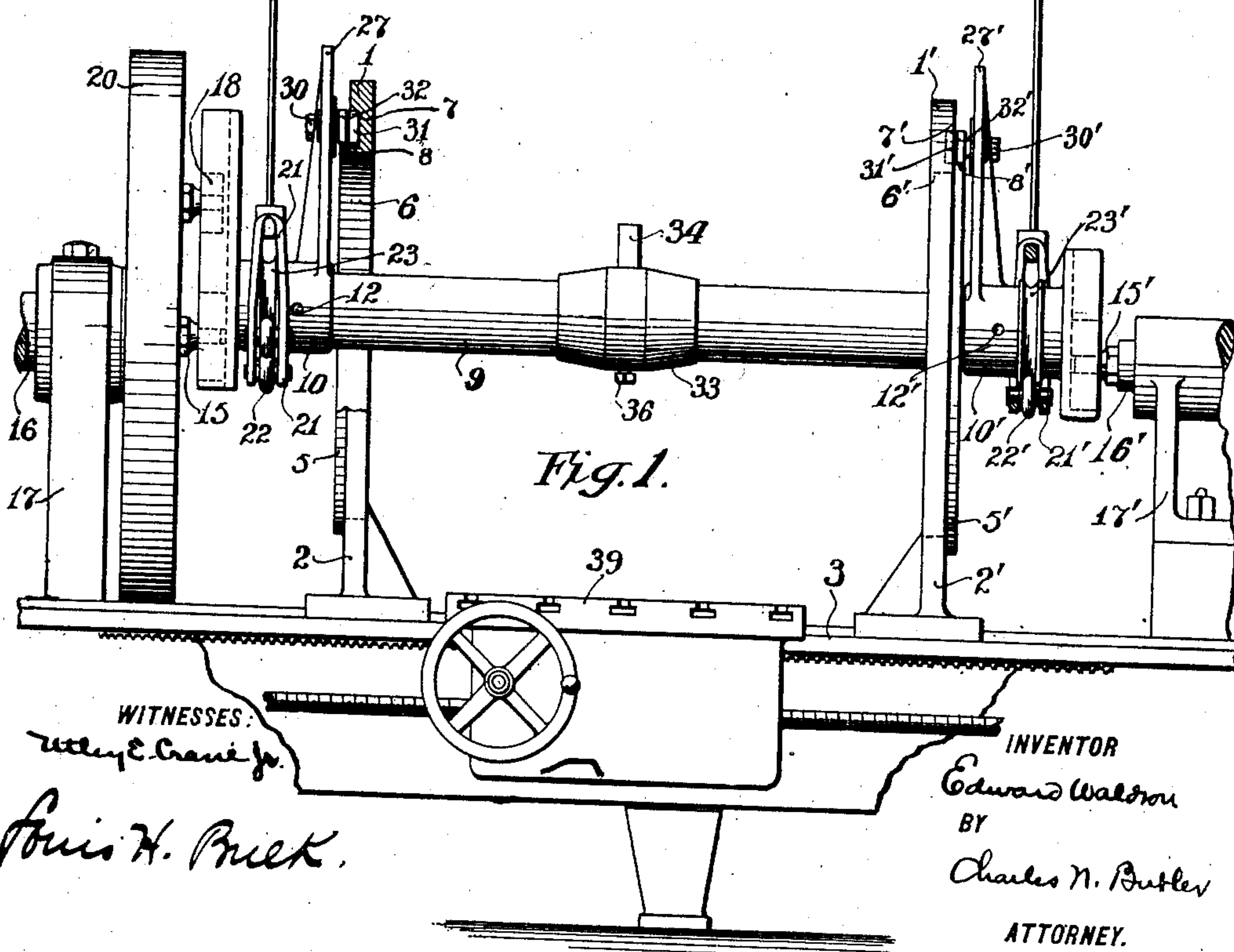
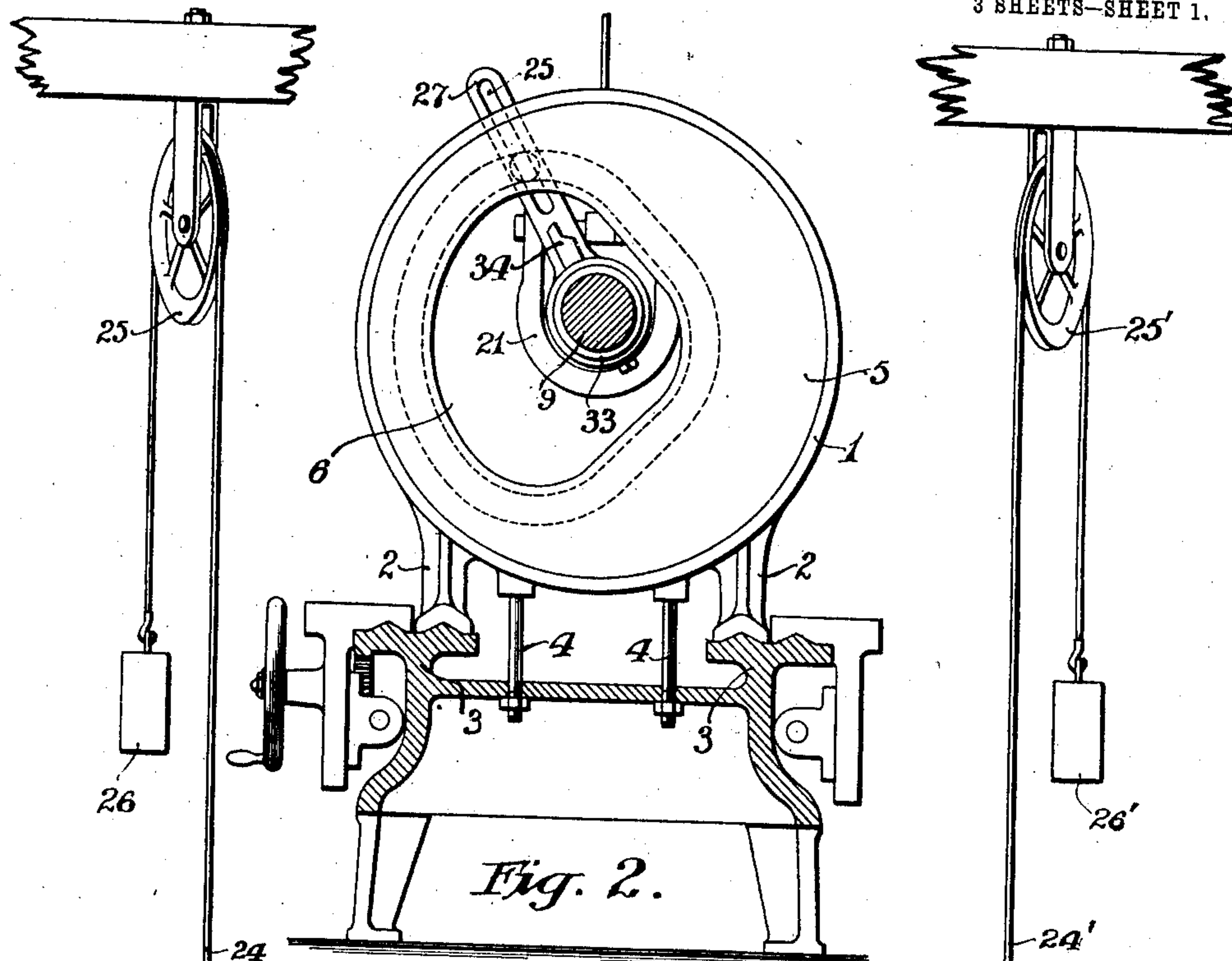


No. 826,755.

PATENTED JULY 24, 1906.

E. WALDRON.
BORING MECHANISM.
APPLICATION FILED JUNE 2, 1905.

3 SHEETS—SHEET 1.



WITNESSES:

Wm. E. Crane Jr.

Frederic H. Prick.

INVENTOR

Edward Waldron

BY

Charles N. Butler

ATTORNEY.

No. 826,755.

PATENTED JULY 24, 1906.

E. WALDRON.
BORING MECHANISM.
APPLICATION FILED JUNE 2, 1905.

3 SHEETS—SHEET 2.

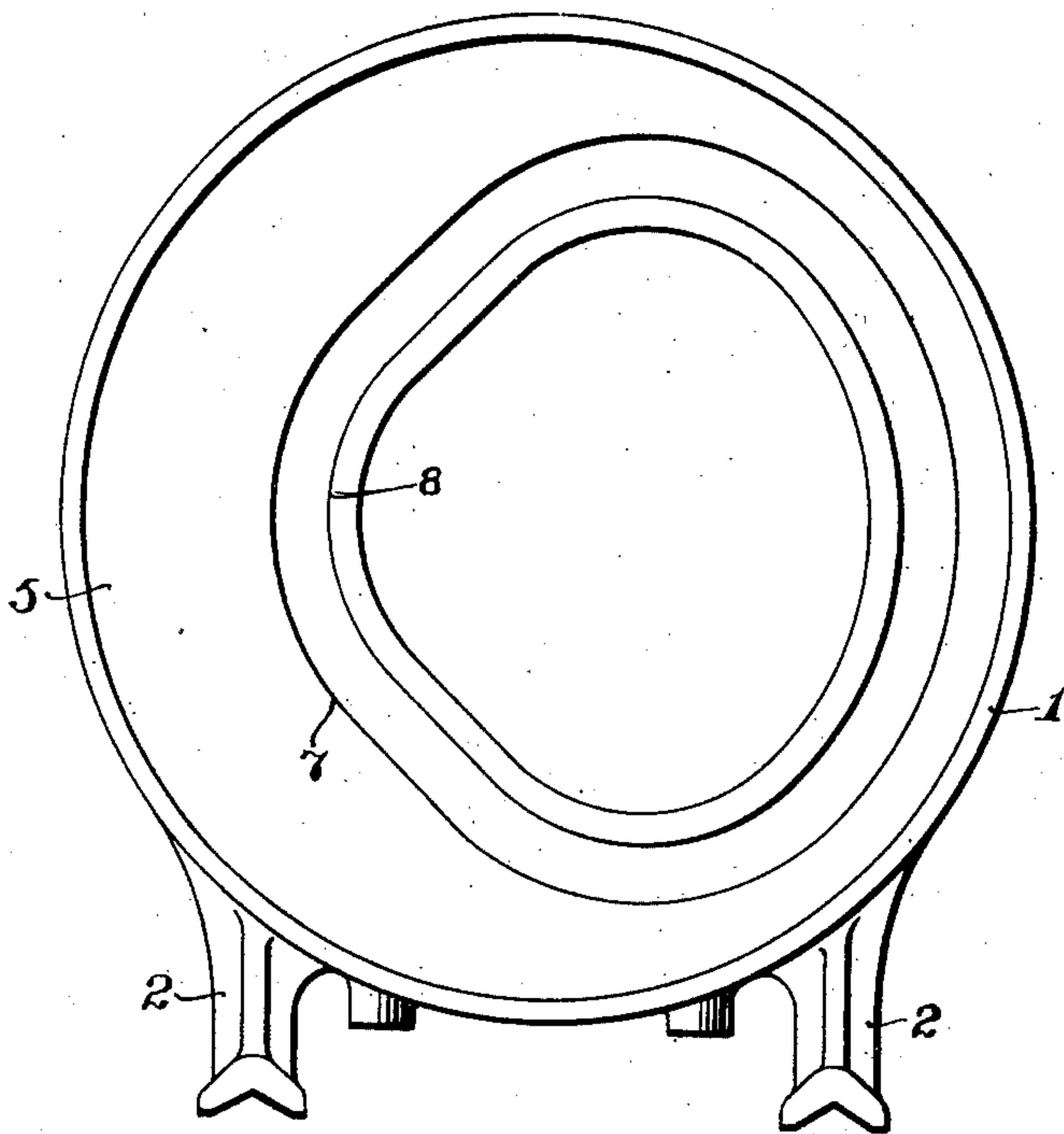


Fig. 3.

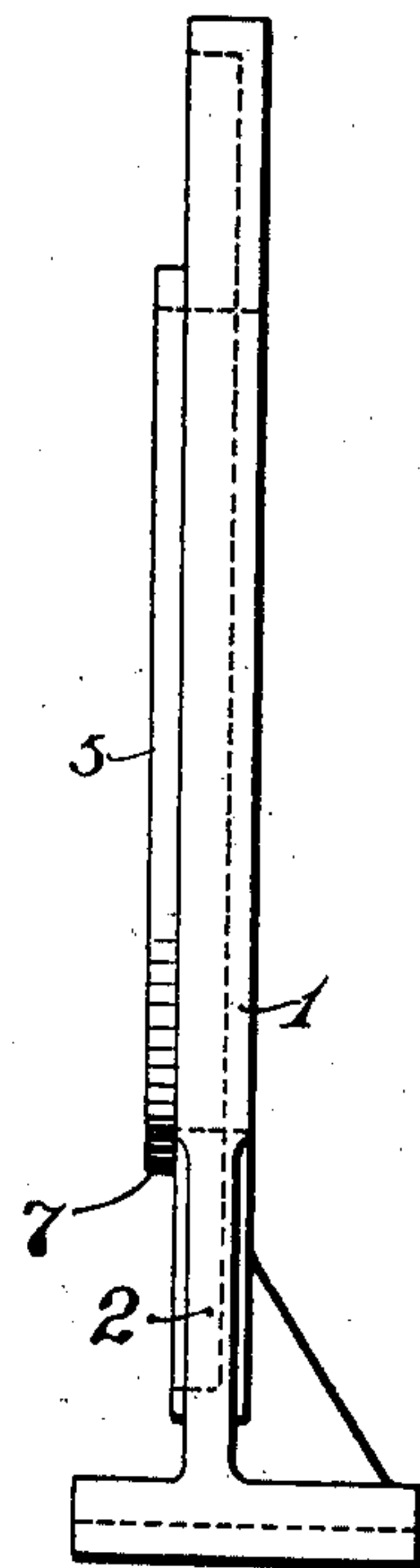


Fig. 4.

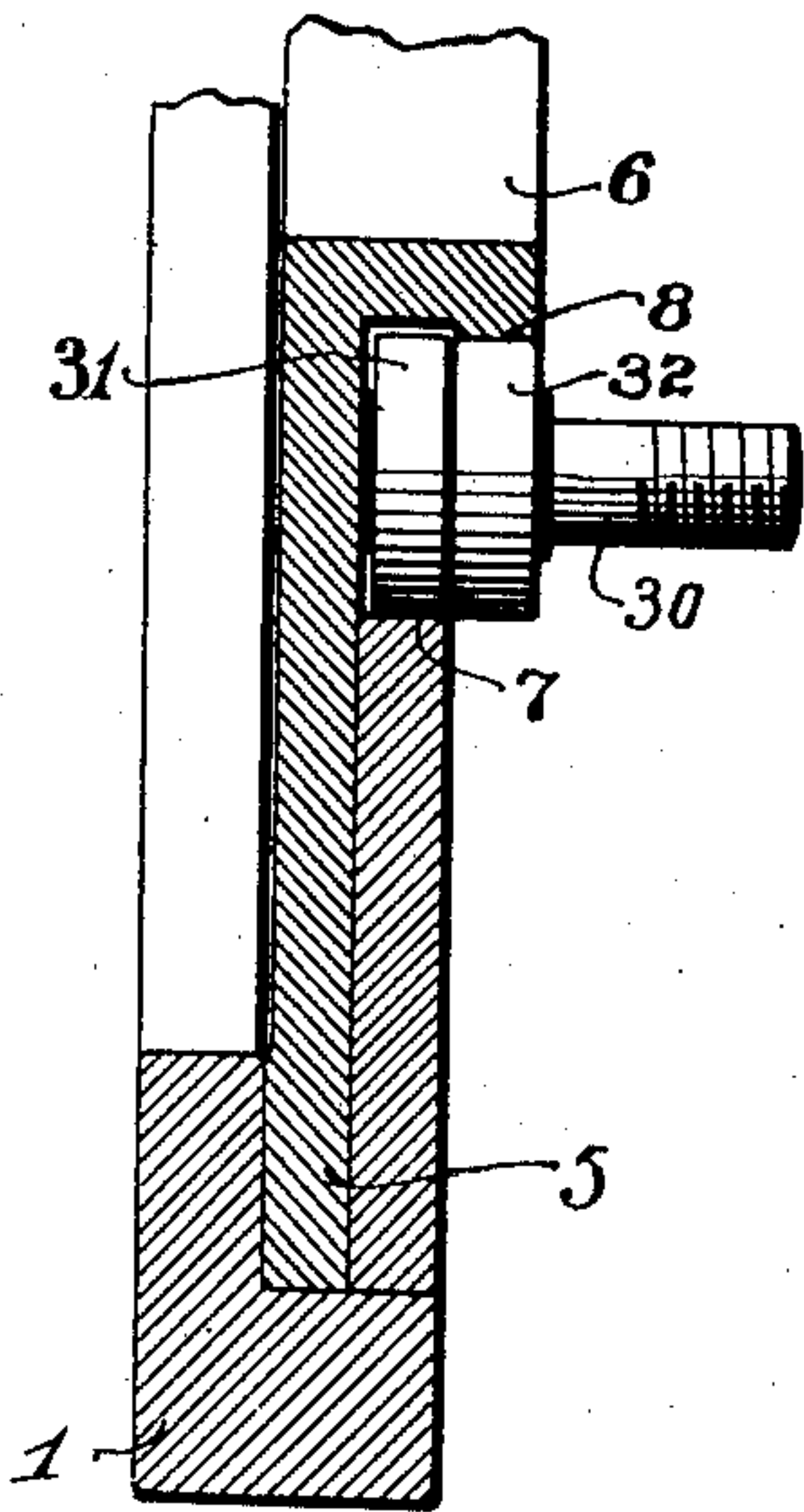


Fig. 5.

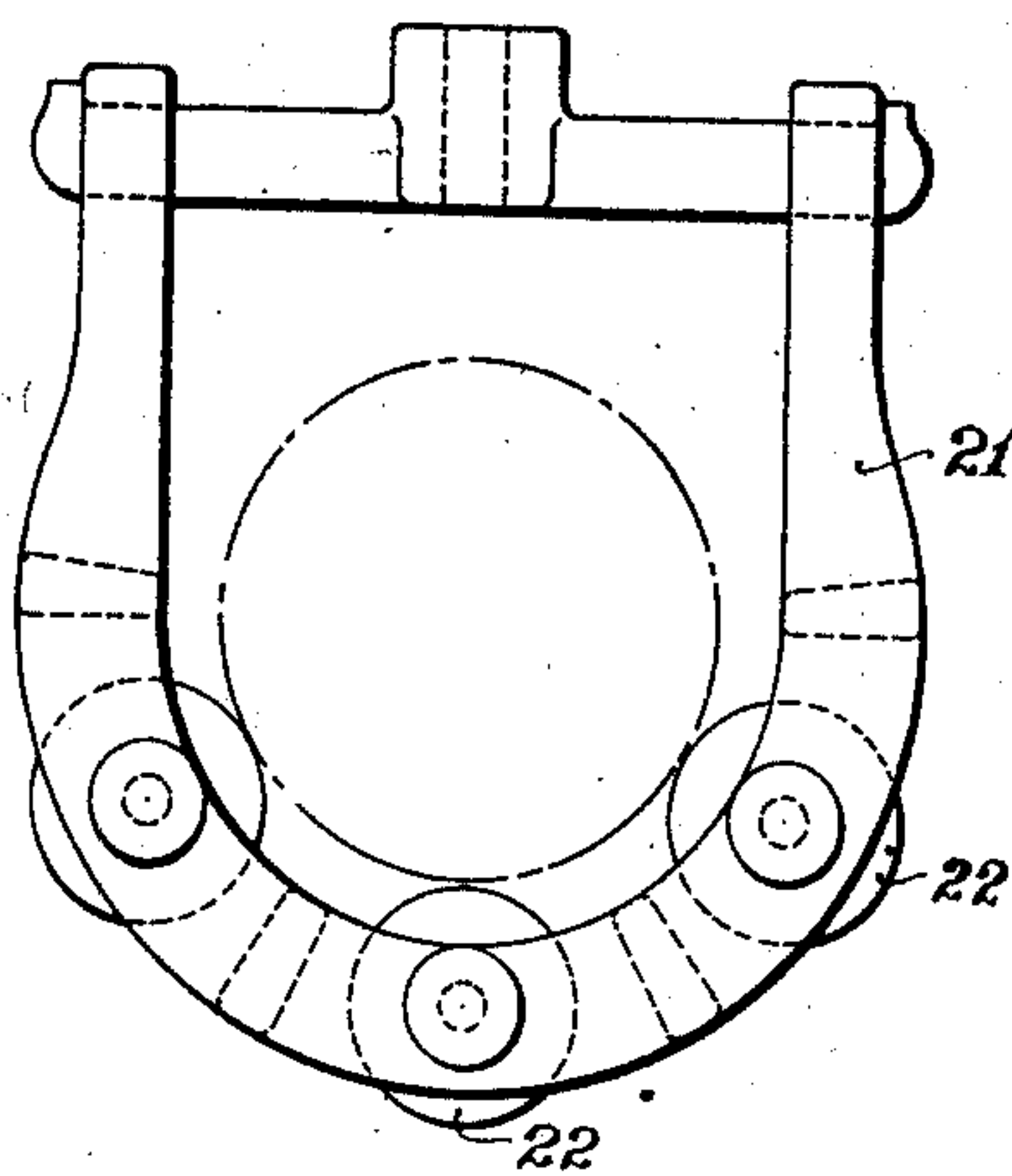


Fig. 6.

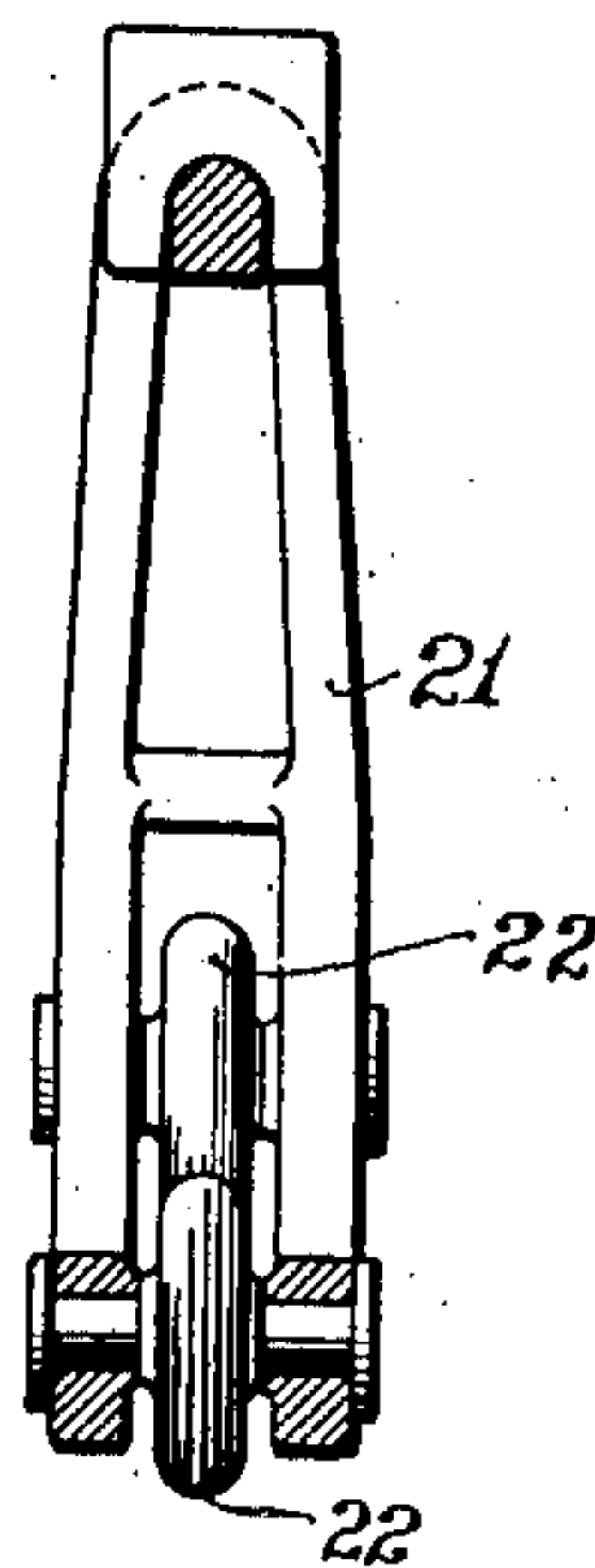


Fig. 7.

WITNESSES:
Wm. E. Crane Jr.
Lewis H. Buck

INVENTOR
Edward Waldron
BY
Chas. N. Butler
ATTORNEY.

No. 826,755.

PATENTED JULY 24, 1906.

E. WALDRON.
BORING MECHANISM.
APPLICATION FILED JUNE 2, 1905.

3 SHEETS—SHEET 3.

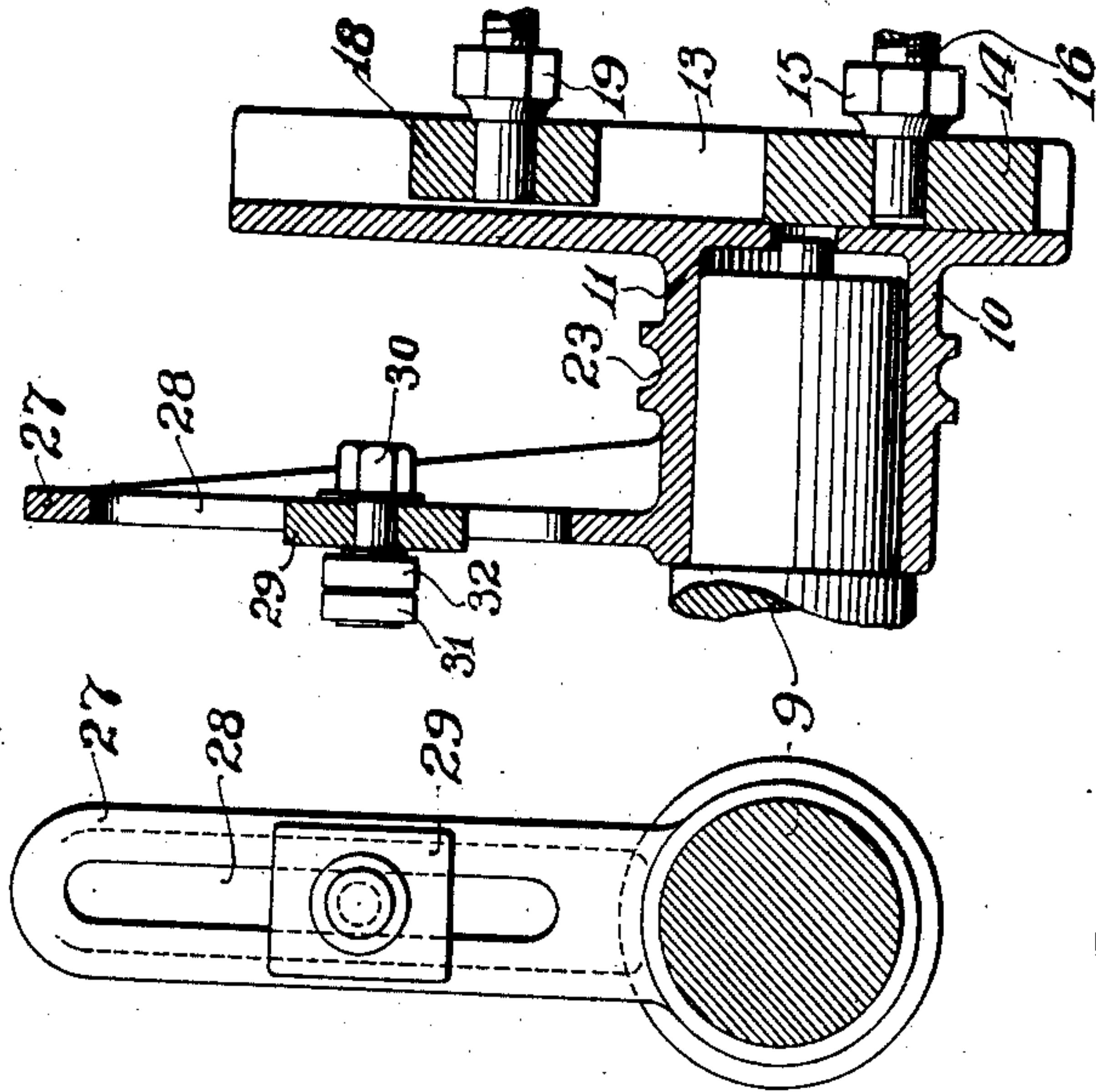


Fig. 9.

Fig. 10.

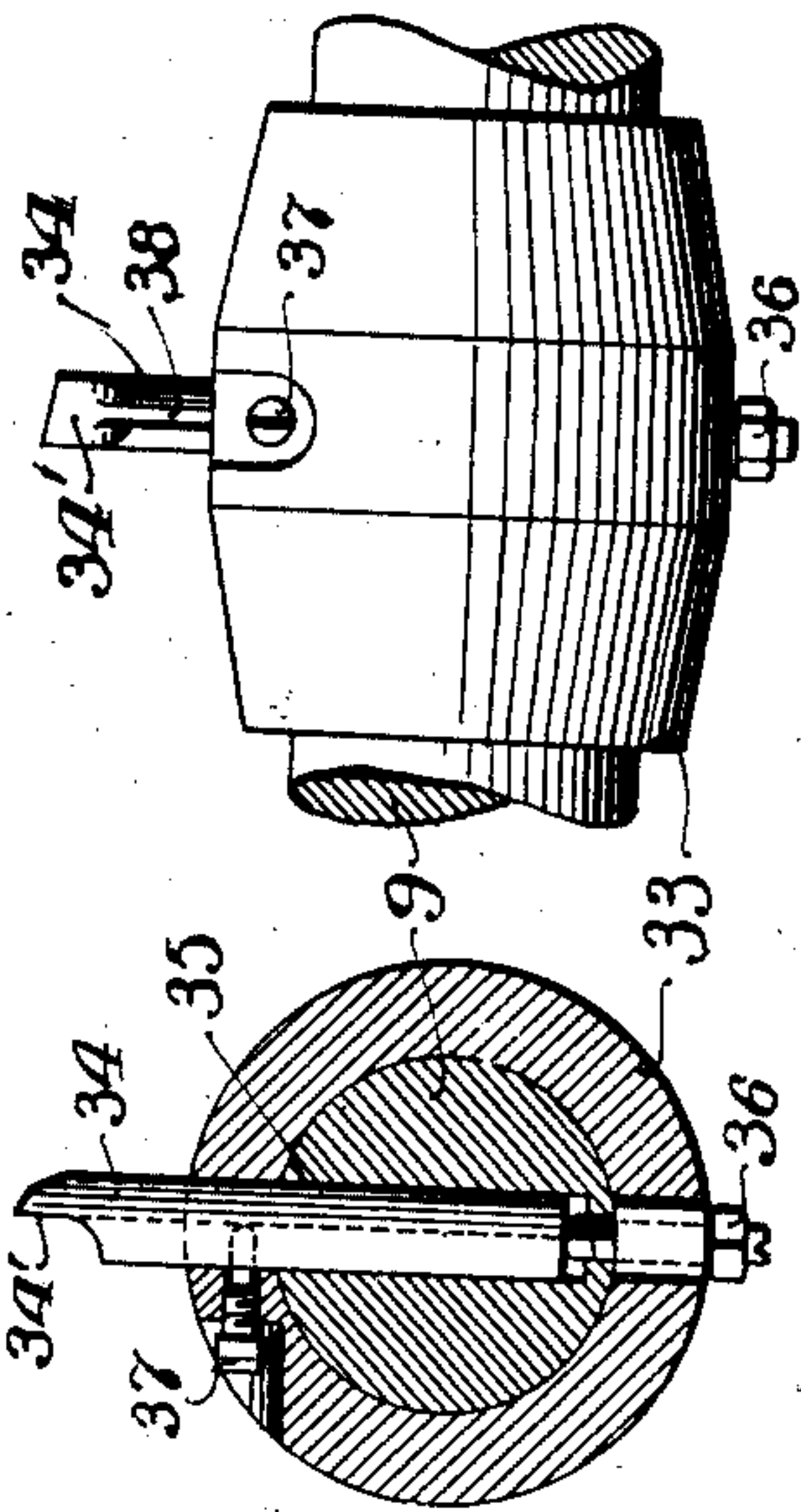


Fig. 11.

Fig. 12.

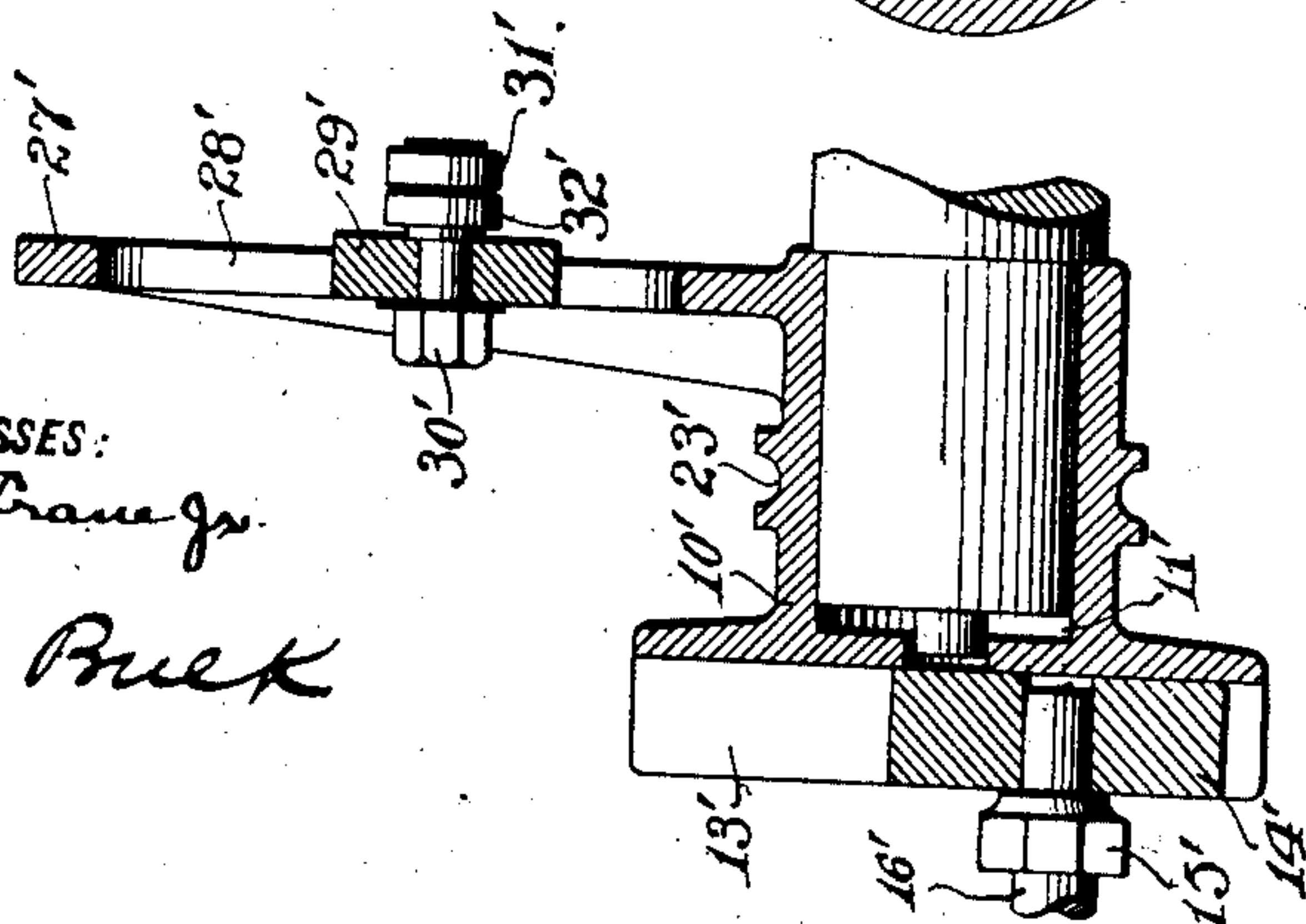


Fig. 8.

WITNESSES:
Wm. E. Crane Jr.
John H. Buck

INVENTOR
Edward Waldron
BY
Chas. N. Butler
ATTORNEY.

UNITED STATES PATENT OFFICE.

EDWARD WALDRON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
WALDRON FLEXIBLE ROTARY ENGINE COMPANY, OF CAMDEN, NEW
JERSEY, A CORPORATION OF NEW JERSEY.

BORING MECHANISM.

No. 826,755.

Specification of Letters Patent.

Patented July 24, 1906.

Application filed June 2, 1905. Serial No. 263,486.

To all whom it may concern:

Be it known that I, EDWARD WALDRON, a subject of the King of Great Britain, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain Improvements in Boring Mechanism, of which the following is a specification.

This invention relates to mechanism for boring chambers of irregular contour, such as are required in rotary engines or pumps, forming cams, and turning other irregular surfaces of like character; and it has for its leading purpose to provide simple apparatus applicable to a lathe for turning such surfaces automatically and accurately.

In the accompanying drawings, Figure 1 represents a side view of the invention applied to a lathe, parts being broken away. Fig. 2 is a transverse sectional view thereof. Fig. 3 is a face view, and Fig. 4 is a side view, of one of the formers. Fig. 5 is an enlarged transverse sectional view taken through part of a former. Fig. 6 is a face view, and Fig. 7 is a transverse sectional view, of a bearing for supporting the boring-bar guide-heads. Fig. 8 is a sectional view of the guide-head carried by the tail-stock of the lathe. Fig. 9 is a sectional view of the guide-head carried by the head-stock of the lathe. Fig. 10 is a face view of a guide-head, the boring-bar being shown in section. Fig. 11 is an elevation of the tool-holder and tool, and Fig. 12 is a sectional view of the boring-bar and tool-holder with the tool held therein.

As shown in the drawings, the mechanism comprises a pair of formers consisting of the respective rings 1 1', provided with the feet 2 2', the latter engaging the bed 3 of a lathe, to which they are secured by the bolts 4, and the disks 5 5', having the irregular openings 6 6', and the concentric races 7 7' and 8 8' thereon, corresponding to the configuration to be bored. These rings or skeletons provide for the substitution of disks or body portions having different configurations as may be required for turning the particular surfaces desired.

The boring-bar 9 lies within the openings 6 6' and is revolved therein by the guide-heads 10 10', having the sockets 11 11', in which the bar is held by the pins 12 12'.

Races 13 13' in the respective guide-heads have the blocks 14 14' therein. The block 14 is carried by the center 15 on the spindle 16, revolving in the head-stock 17, and the block 14' is carried by the center 15' of the spindle 16', revolving in the tail-stock 17'. A second block 18 is engaged in the race 13 and is carried by the stud-bolt 19, set in the face-plate 20 of the lathe. Shackles 21 21', provided with rollers 22 22', engage the grooves 23 23' of the guide-heads and are supported by cables 24 24', passing through the sheaves 25 25' and having the weights 26 26' thereon, by which the guide-heads and boring-bar are counterbalanced. The respective guide-heads have thereon arms 27 27', provided with guides 28 28' for adjustably engaging the blocks 29 29', which carry the spindles 30 30', having the rollers 31 31' and 32 32' thereon. These rollers engage the corresponding races 7 7' and 8 8' of the formers.

A tool-holder 33 is sleeved on the boring-bar between the formers, and the tool 34 is set in the socket 35 of the bar and holder, the arrangement being such that the axes of the tool and guide-arms lie in a common plane. The tool is adjusted longitudinally in the socket by the set-screw 36 and is held against turning by the screw 37, set in the holder and engaging the longitudinal groove 38 of the tool, the cutting-face 34' of the tool and the bottom of the groove being in a common plane, so that the groove forms a guide for facing the tool.

The revolution of the live-spindle 16 and the face-plate 20 thereon is transmitted to the guide-head 10, the bar 9, and the guide-head 10'. The arms 27 and 27' of the guide-heads being engaged by the respective rollers thereon to the races in the former-rings 5 and 5', the guide-head 10 is reciprocated upon the blocks 14 and 18 and the guide-head 10' is reciprocated upon the block 14', so that the cutting edge of the tool 34 traces a surface symmetrical to the races of the formers. These races providing both internal and external guides for the rollers controlling the movements of guide-heads and the rollers of each pair moving independently on its own race, the movement of the tool is accurately guided and the movement is free. The work

being secured upon the carriage 39, the tool revolves therein and turns a configuration corresponding to that of the formers.

Having described my invention, I claim—

- 5 1. A boring-bar, a cutting-tool fixed to said bar intermediate of its ends, revolving races connected respectively with the ends of said bar, a revolving driving mechanism connected with one of said races, and a former
10 connected with and reciprocating said bar as it is revolved by said driving mechanism.
2. A boring-bar having a cutting-tool disposed transversely thereto, a revolving driving mechanism and a revolving supporting
15 mechanism, means for connecting said bar in reciprocating relation to said driving and supporting mechanisms and a stationary former connected with and reciprocating said bar and tool as they are revolved by said
20 driving mechanism.
3. A boring-bar, a cutting-tool connected in adjustable relation to said bar, stationary formers, guide-heads on the ends of said bar having revoluble connections with said form-
25 ers, and means for supporting and revolving said guide-heads.
4. A boring-bar, a cutting-tool disposed transversely and connected in adjustable relation to said bar, guide-heads having races
30 fixed to the ends of said bar, revolving mechanism with which said races are connected, and a former having a race connected with and controlling the movement of one of said guide-heads.
- 35 5. A boring mechanism comprising revolving tool-holding means, a radially-disposed arm fixed in relation to and revolving with said means, a stationary former having a race with which said arm is connected, and a re-
40 volving mechanism for supporting and revolving said device, said means having a reciprocating connection with said supporting and driving mechanism.
6. A boring-bar, a cutting-tool connected

therewith, guide-heads respectively fixed to 45 the ends of said bar, said guide-heads having races therein, revolving mechanism engaging said races, and formers having races with which said guide-heads have movable connections. 50

7. A boring mechanism comprising tool-
holding means, guide-heads fixed to the ends of said tool-holding means, said guide-heads having races therein, revolving mechanism with which said races have reciprocating con- 55 nections, stationary formers with races therein, and rollers eccentrically connected to said guide-heads and movable in the races of said formers.

8. A boring mechanism comprising a 60 former consisting of a skeleton and a body detachably connected thereto, said body having a race therein and an aperture there-through.

9. A boring mechanism comprising a 65 former consisting of a skeleton with feet thereon for supporting and holding it stationary and an apertured body having a race therein.

10. A boring mechanism comprising a bor- 70 ing-bar, means for holding a tool in adjustable relation thereto, guide-heads fixed to the ends of said bar, each of said guide-heads having an arm and a race, rollers connected adjustably to said arms, formers having races 75 for engaging and guiding said rollers, spindles having guides connected with the races of said guide-heads, and counterbalanced bearings for balancing said guide-heads and the mechanisms supported thereby. 80

In testimony whereof I have hereunto set my hand, this 31st day of May, A. D. 1905, in the presence of the subscribing witnesses.

EDWARD WALDRON.

Witnesses:

ROBERT JAMES EARLEY,
UTLEY E. CRANE, Jr.