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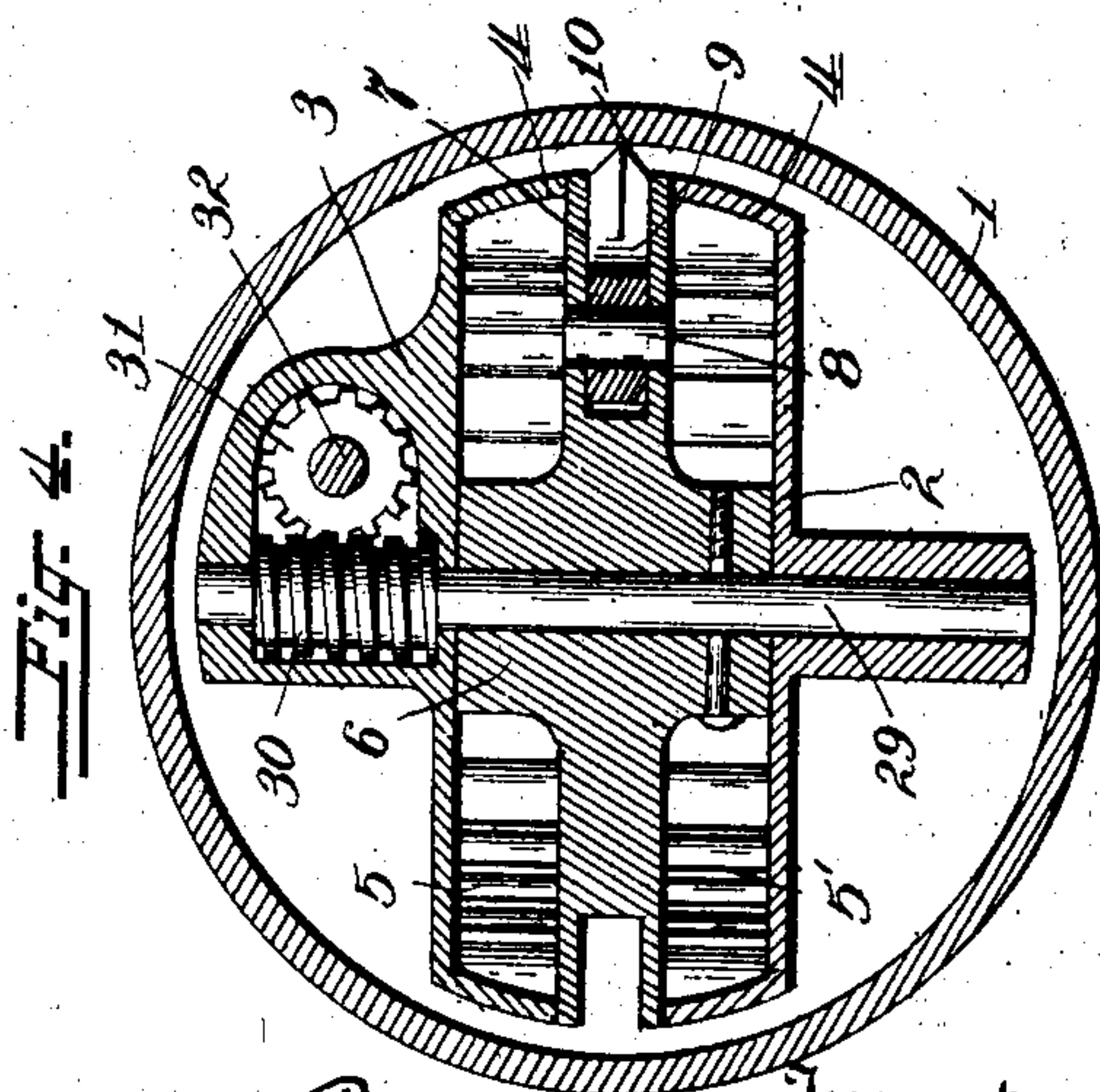
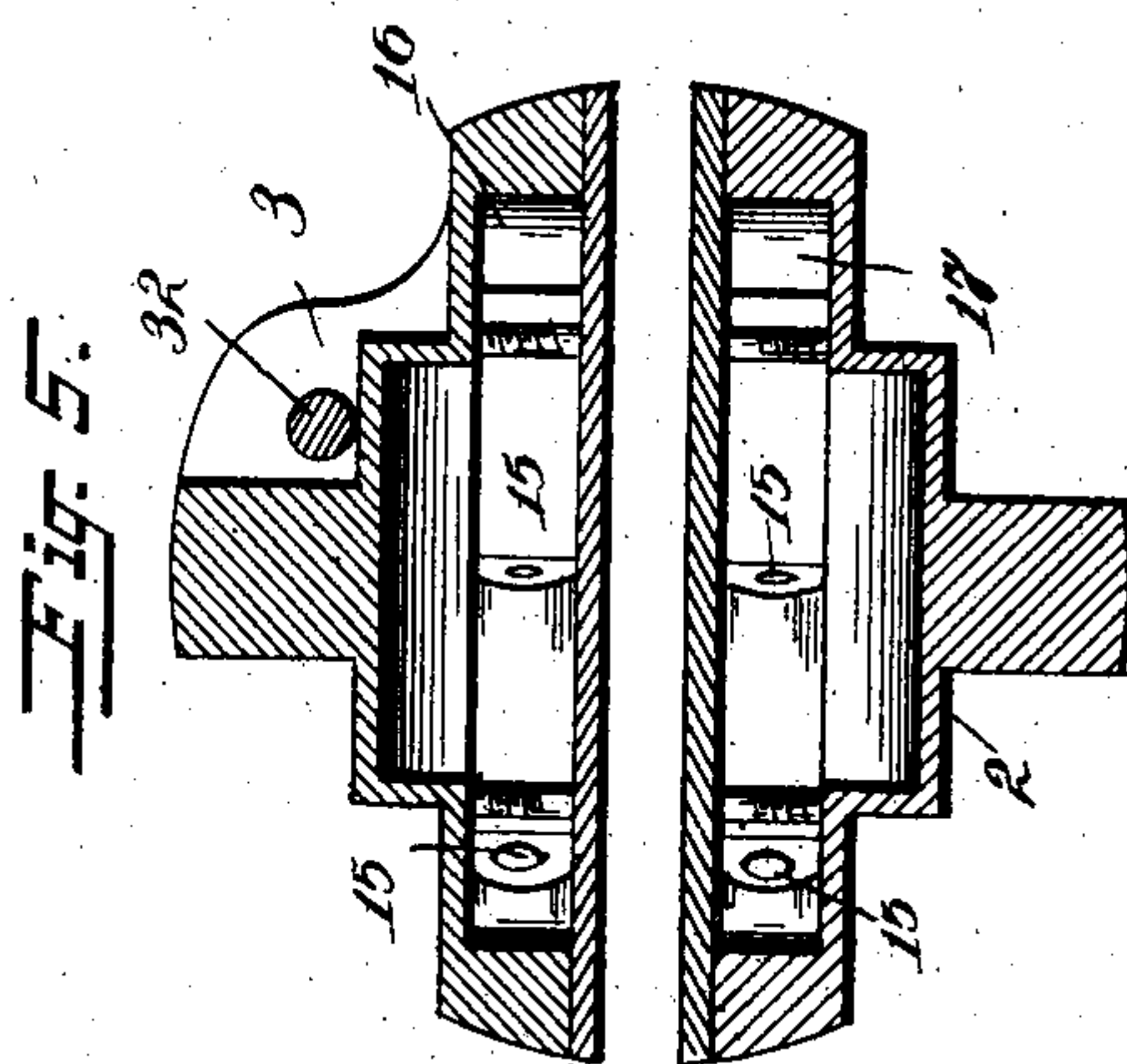
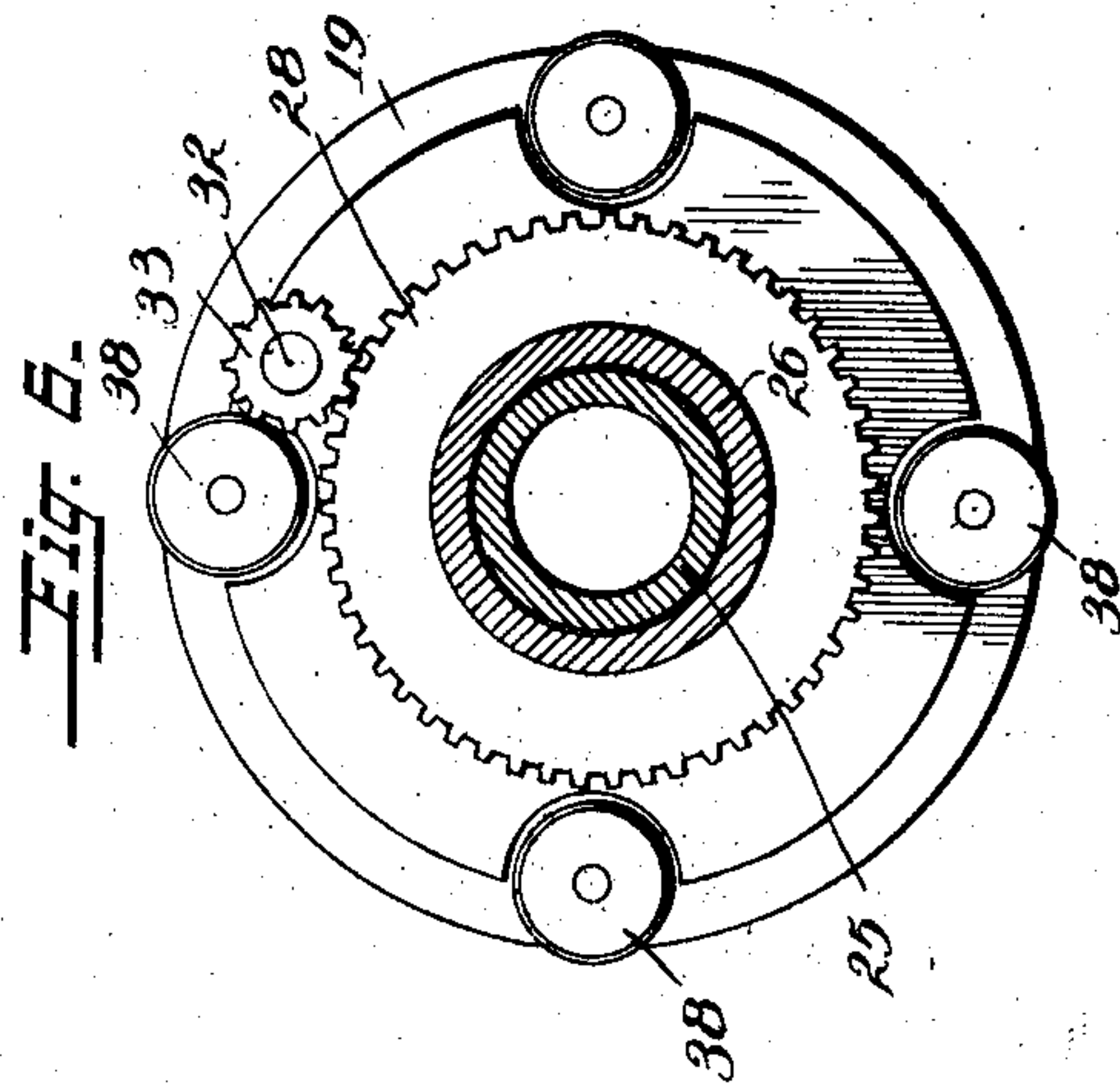
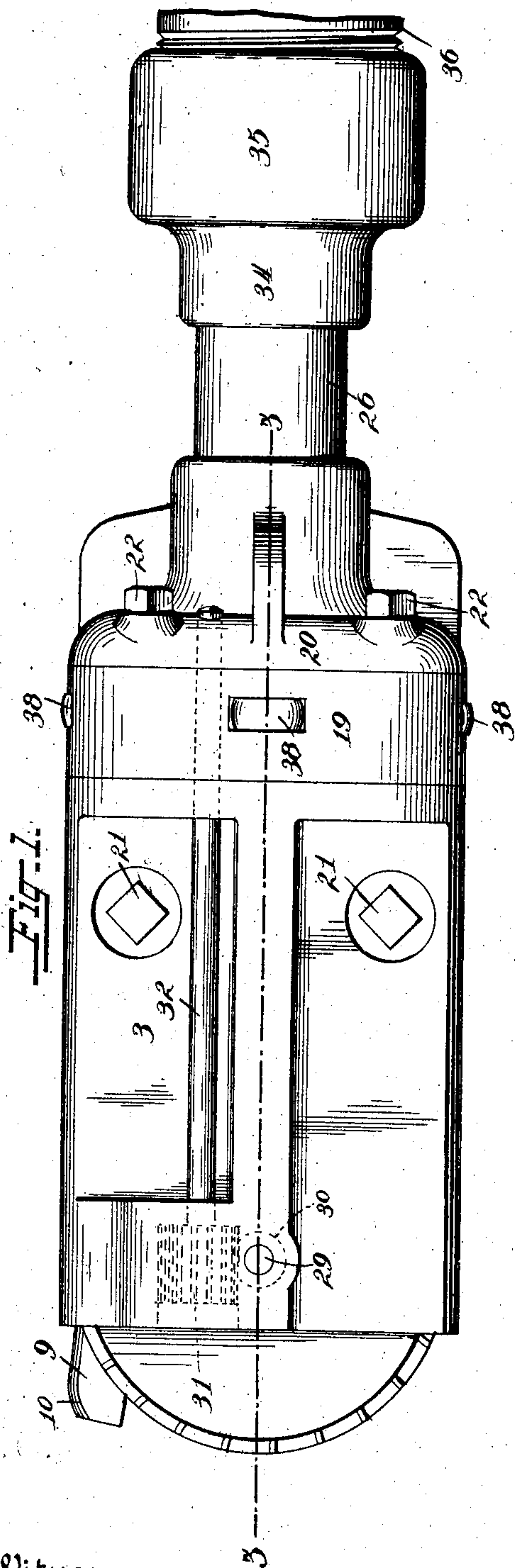
PATENTED OCT. 30, 1906.

C. S. DEAN.

STEAM BOILER TUBE AND FLUE SCRAPER OR CLEANER.

APPLICATION FILED JULY 14, 1905.

2 SHEETS—SHEET 1.



Witnesses  
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By Geo. W. Hamilton  
his Attorney



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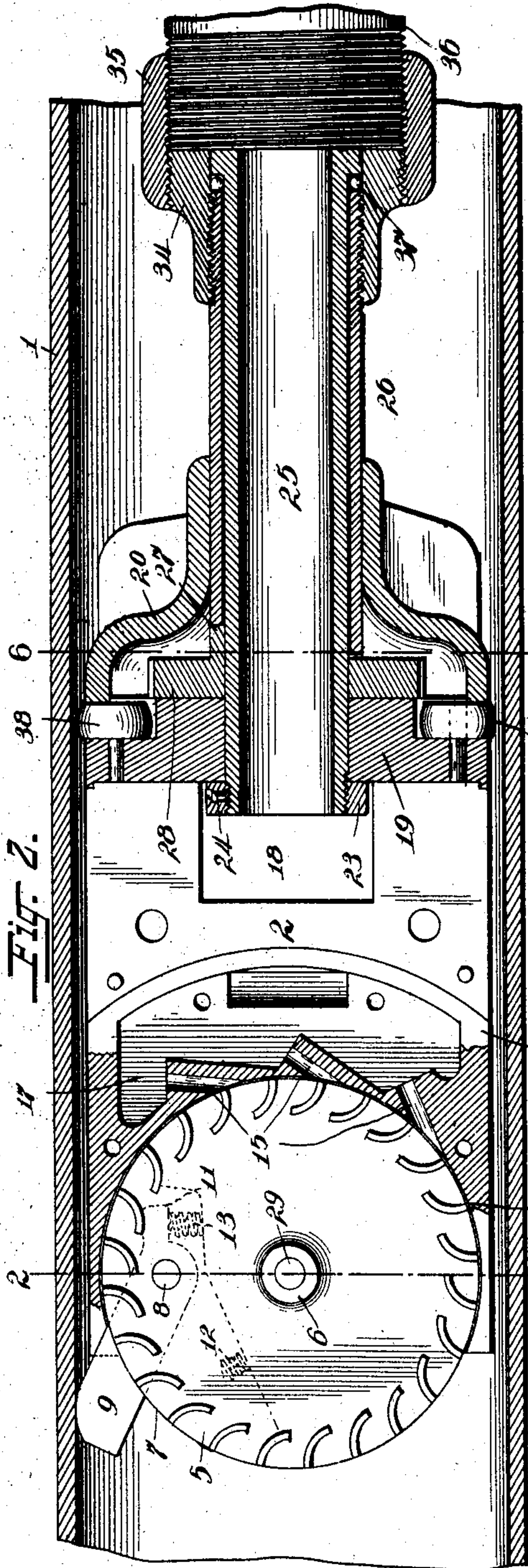
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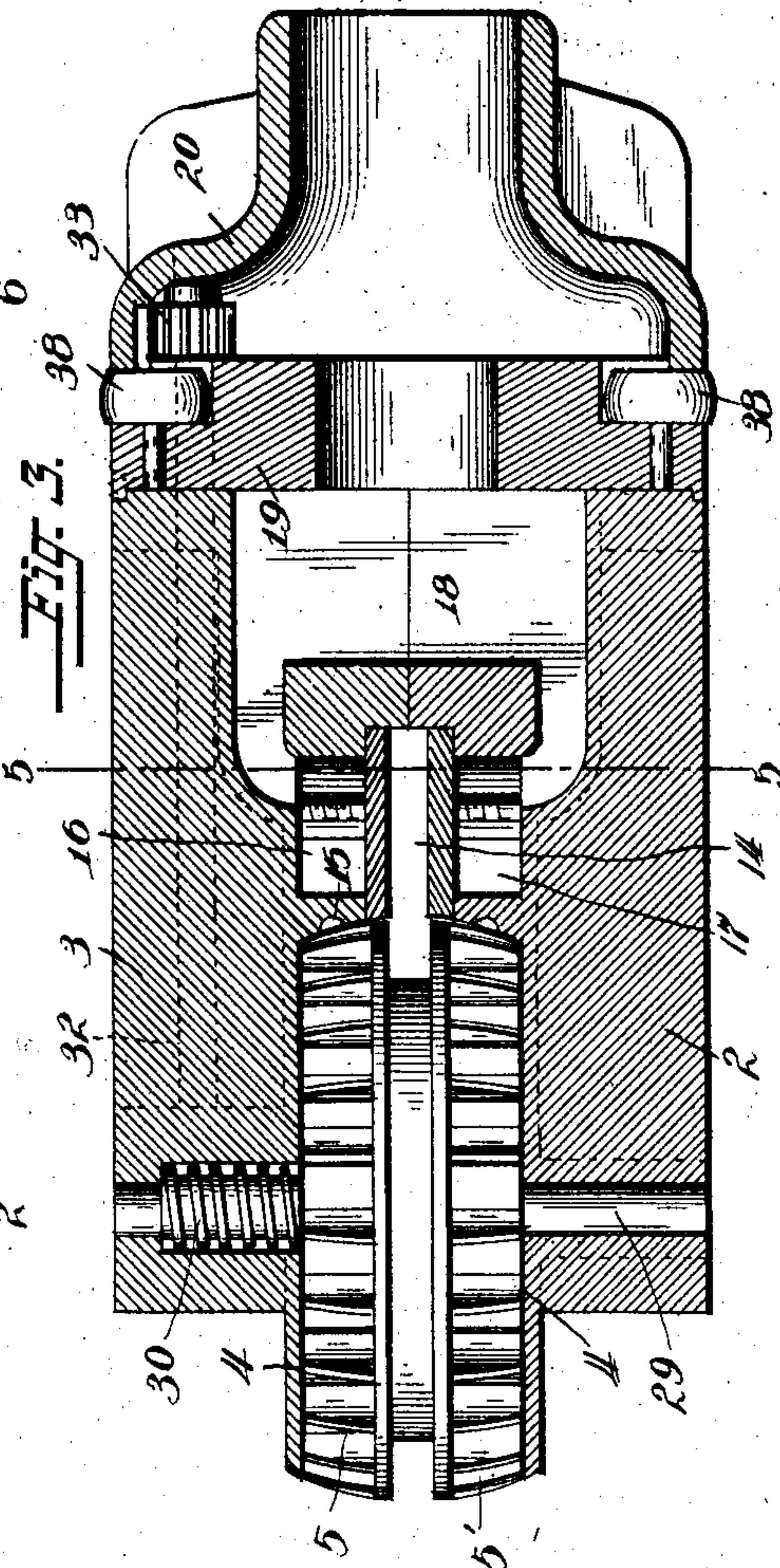
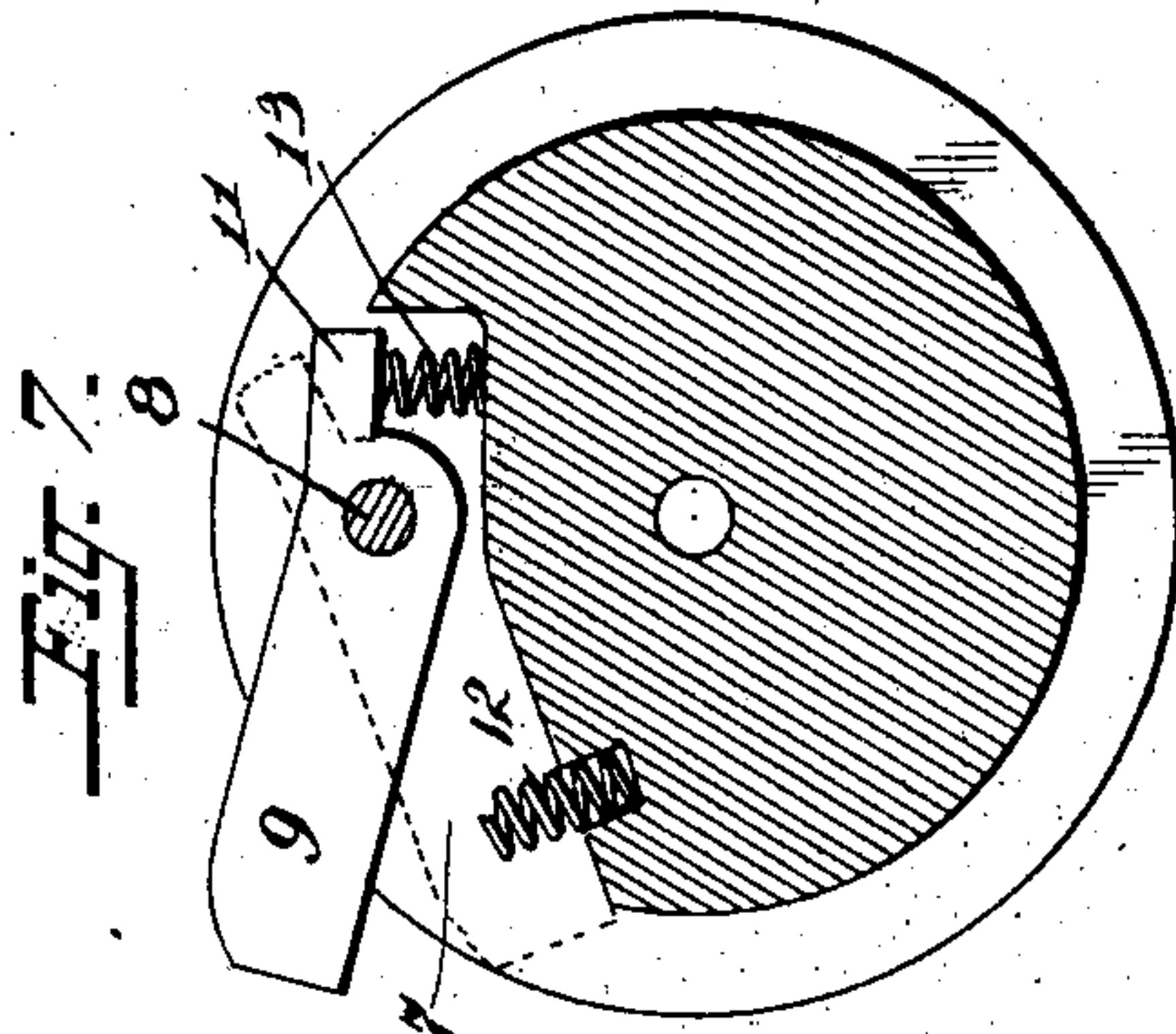
STEAM BOILER TUBE AND FLUE SCRAPER OR CLEANER.

APPLICATION FILED JULY 14, 1905.

2 SHEETS—SHEET 2.



Witnesses  
Milton Lenoir  
Sarah V. Lockwood



Inventor  
Cyrus S. Dean  
by Geo. W. Hamilton  
his Attorney



# UNITED STATES PATENT OFFICE.

CYRUS S. DEAN, OF BUFFALO, NEW YORK, ASSIGNOR TO ALBERT D. JAMIESON, OF BUFFALO, NEW YORK.

## STEAM-BOILER TUBE AND FLUE SCRAPER OR CLEANER.

No. 834,459.

Specification of Letters Patent.

Patented Oct. 30, 1906.

Application filed July 14, 1905. Serial No. 269,694.

*To all whom it may concern:*

Be it known that I, CYRUS S. DEAN, a subject of the King of Great Britain, residing at Buffalo, county of Erie, and State of New York, have invented certain new and useful Improvements in Steam-Boiler Tube and Flue Scrapers or Cleaners, of which the following is a specification.

This invention relates to steam-boiler tube and flue scrapers or cleaners.

In water-tube boilers scale is deposited in the tubes by the water, and this deposit sometimes becomes quite thick and very difficult of removal.

The object of the present invention is the provision of a scraper or cleaner intended for use on both fire and water tubes or flues, but particularly adapted for the removal of the thick and hard scale in the tubes of water-tube boilers, which will be of improved construction and operate in a novel manner to cut off or remove the scale rapidly and effectively from the entire inner area of the tube.

To this end the invention contemplates the provision of a rotary turbine-wheel carrying centrifugally-actuatable cutters or cleaners and having its axis of rotation disposed cross-wise of the tube or flue, in connection with novel means for automatically turning the turbine-wheel sidewise at a desired rate of speed, whereby as it advances through the tube or flue the cutting action is also carried on circularly in relation to the tube or flue, and thus successive zones of the tube or flue are completely cleaned as the device advances.

Associated with the foregoing novel features are other improved devices.

The invention is set forth in detail hereinafter, and the novel features are recited in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation; Fig. 2, a longitudinal section of my tube and flue cleaner shown within a tube or flue; Fig. 3, a section on line 3 3 of Fig. 1; Fig. 4, a section on line 4 4 of Fig. 2; Fig. 5, a section on line 5 5 of Fig. 3; Fig. 6, a section on line 6 6 of Fig. 2; and Fig. 7, a detail section through the turbine-wheel, showing the cutter and its springs.

An ordinary tube or flue of a steam-boiler is shown at 1.

The casing or shell is made in two longitu-

dinal halves 2 and 3, Figs. 1 and 2, which are circularly hollowed out at 4 in the line of their diameter for the reception of a rotary duplex turbine-wheel composed of the parts 5 and 5', cast integral with the connecting-hub 6 and separated by an annular space 7, in which are pivoted on a pin or pins 8 one or more cutters 9. Only one cutter is shown in the present instance, but more may be used, if desired. The cutter has a knife-edge 10 at its outer end and a toe 11 at its inner end. Springs 12 and 13, suitably seated against the hub 6, cushion the outward and inward movements of the cutter and deaden the noise, while also giving a rebounding action. The spring 13 prevents the cutter from striking the tube too hard and injuriously denting it.

Arc-shaped recesses 14 in the halves 2 and 3 permit the free swing of the cutter when traveling through the casing, for it will be understood that the centrifugal action on the cutter is quite strong on account of the very high rate of revolution of the turbine-wheel.

A plurality of tangentially-disposed ducts or ports 15 conduct the steam, air, or water (the motive fluid) to the vanes of the duplex turbine-wheel from the chambers 16 and 17, which communicate with chamber 18.

At the back of the halves 2 and 3 is a circular closure or head 19 and a hollow cap 20. The halves 2 and 3 are connected rigidly together by transverse bolts 21, and said parts 2 and 3, head 19, and cap 20 are fastened tightly together by longitudinally-extending bolts 22. Extending through the head 19 and cap 20 and rigidly connected thereto by the nut 23 and pin 24 is a tube 25. Loosely encircling the tube 25 is a sleeve 26, which is coupled or clutched at 27 to a gear 28, which is loose on tube 25 and lies against the head 19. The turbine-wheel is rigidly secured to a shaft 29, journaled in the halves 2 and 3, and said shaft has secured thereto a worm-wheel 30, which meshes with a worm 31, fast on a shaft 32, said shaft 32 carrying a pinion 33, which meshes with gear 28. The sleeve 26 carries a head 34 on its outer end, which is connected by coupling 35 to the hose 36, through which the motive fluid—such as air, steam, or water—is fed to the device to operate it. Ball-bearings 37 are used to minimize friction. Antifriction-rollers 38 are car-



ried by the head 19 to bear against the interior of the tube or flue 1, as the casing or shell turns therein, and thus minimize friction. The motive fluid, coming from hose 36, passes  
 5 through tube 25, and thence through chambers 18, 16, and 17, and ducts 15 to the duplex turbine-wheel, causing the latter to rotate very rapidly, resulting in an outward throw of the cutter or cutters 19. When the  
 10 cutter 19 is passing through the casing, it plays through the slot or recess 14; but at other times it strikes very rapidly against the tube or flue 1 and cuts the scale or other foreign substance therefrom.

15 It will be understood that the device is pushed through the tube or flue, and in thus passing through the tube or flue the cutter would only cut the scale in a straight line unless the turbine-wheel is rotated sidewise as  
 20 well as in its own plane.

The gears 30, 31, 33, and 28 provide for the automatic turning of the entire casing or shell of the device and the turbine-wheel carried thereby, in consequence of which the cutter  
 25 or cutters not only cut longitudinally of the tube, but also circularly thereof, and, as a result, the scale, soot, or other matter adhering to the interior of the tube or flue is cut out by successive zones and the action is very rapid  
 30 and complete.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a tube or flue scraper or cleaner, the  
 35 combination with a cleaner-head, of a rotary cutter carried by the cleaner-head with its axis of rotation positioned so as to lie crosswise of the cleaner-head.

2. In a tube or flue scraper or cleaner, the  
 40 combination with a cleaner-head, of a rotary cutter carried by the forward part of the cleaner-head and projecting therefrom in advance thereof with its axis of rotation positioned so as to lie crosswise of the cleaner-head.  
 45 head.

3. In a tube or flue scraper or cleaner, the combination with a cleaner-head, of a rotary cutter carried by the cleaner-head with its axis of rotation positioned so as to lie crosswise of the cleaner-head, and means for automatically turning or rotating the rotary cutter sidewise in addition to its own rotation.  
 50

4. In a tube or flue scraper or cleaner, the combination with a cleaner-head, of a rotary turbine-wheel carried by the cleaner-head with its axis of rotation positioned so as to lie crosswise of the cleaner-head, and a cleaner or cutter operated by said turbine-wheel.  
 55

5. In a tube or flue scraper or cleaner, the combination with a cleaner-head, of a rotary turbine-wheel carried by the cleaner-head with its axis of rotation positioned so as to lie crosswise of the cleaner-head, and a centrifugal cutter carried by said turbine-wheel.  
 60

65 6. In a tube or flue scraper or cleaner, the

combination with a shell or casing, of a rotary turbine-wheel carried by the shell or casing with its axis of rotation positioned so as to lie crosswise of the cleaner-head, and a centrifugal cutter connected directly to said turbine-wheel and rotating in the same plane with said turbine-wheel.  
 70

7. In a tube or flue scraper or cleaner, the combination with a shell or casing, of a rotary turbine-wheel carried by the shell or casing with its axis of rotation positioned so as to lie crosswise of the cleaner-head, a cleaner or cutter rotated in the same general direction as that of the plane of rotation of said turbine-wheel, and means for automatically turning or rotating the turbine-wheel and cutter sidewise in addition to its own rotation.  
 75 80

8. In a tube or flue scraper or cleaner, the combination with a cleaner-head rotarily mounted to turn on its longitudinal axis, of a turbine-wheel carried by said cleaner-head with its axis of rotation positioned so as to lie crosswise of the cleaner-head, a cutter operated by said turbine-wheel and having its axis of rotation disposed crosswise of the cleaner-head, means for introducing a motive fluid through the cleaner-head to the turbine-wheel, and means operated by the turbine-wheel to automatically turn the cleaner-head on its longitudinal axis and thereby turn or rotate the cutter and turbine-wheel sidewise in addition to their other rotary movements.  
 85 90 95

9. In a tube or flue scraper or cleaner, the combination with a cleaner-head rotarily mounted to turn on its longitudinal axis, of a turbine-wheel carried by said cleaner-head with its axis of rotation positioned so as to lie crosswise of the cleaner-head, a cutter operated by said turbine-wheel and having its axis of rotation disposed crosswise of the cleaner-head, a hose for supplying a motive fluid to the cleaner-head and thence to the turbine-wheel, and gearing interposed between the hose and the turbine-wheel, whereby the turbine-wheel automatically turns the cleaner-head on its longitudinal axis and thereby turns or rotates the cutter and the turbine-wheel sidewise in addition to their other rotary movements.  
 100 105 110 115

10. In a tube or flue scraper or cleaner, the combination with a cleaner-head, of a rotary turbine-wheel, carried thereby with its axis of rotation positioned so as to lie crosswise of the cleaner-head, and a pivoted outwardly and inwardly swinging cutter rotating with the turbine-wheel and swinging in the same general direction as that of the plane of rotation of the turbine-wheel.  
 120

11. In a tube or flue scraper or cleaner, the combination with a cleaner-head, of a rotary turbine-wheel, carried thereby with its axis of rotation positioned so as to lie crosswise of the cleaner-head, and an outwardly and inwardly swinging cutter pivoted directly to  
 125 130



the turbine-wheel and swinging in the same general direction as that of the turbine-wheel.

12. In a tube or flue scraper or cleaner, the  
5 combination with a rotary turbine-wheel, of  
a pivoted outwardly and inwardly swinging  
cutter rotating with the turbine-wheel, and  
spring mechanism for cushioning the move-  
ments of said cutter.

10 13. In a tube or flue scraper or cleaner, the  
combination with a rotary turbine-wheel, of

an outwardly and inwardly swinging cutter  
pivoted to the turbine-wheel, and springs  
carried by the turbine-wheel for cushioning  
the movements of the cutter.

In testimony whereof I hereunto affix my  
signature in presence of two witnesses.

CYRUS S. DEAN.

Witnesses:

SARAH V. LOCKWOOD,  
E. EDMONSTON, Jr.