

No. 620,113.

Patented Feb. 28, 1899.

W. M. FABER, JR.

TUBE CLEANER.

(Application filed Apr. 15, 1897.)

(No Model.)

Fig. 2.

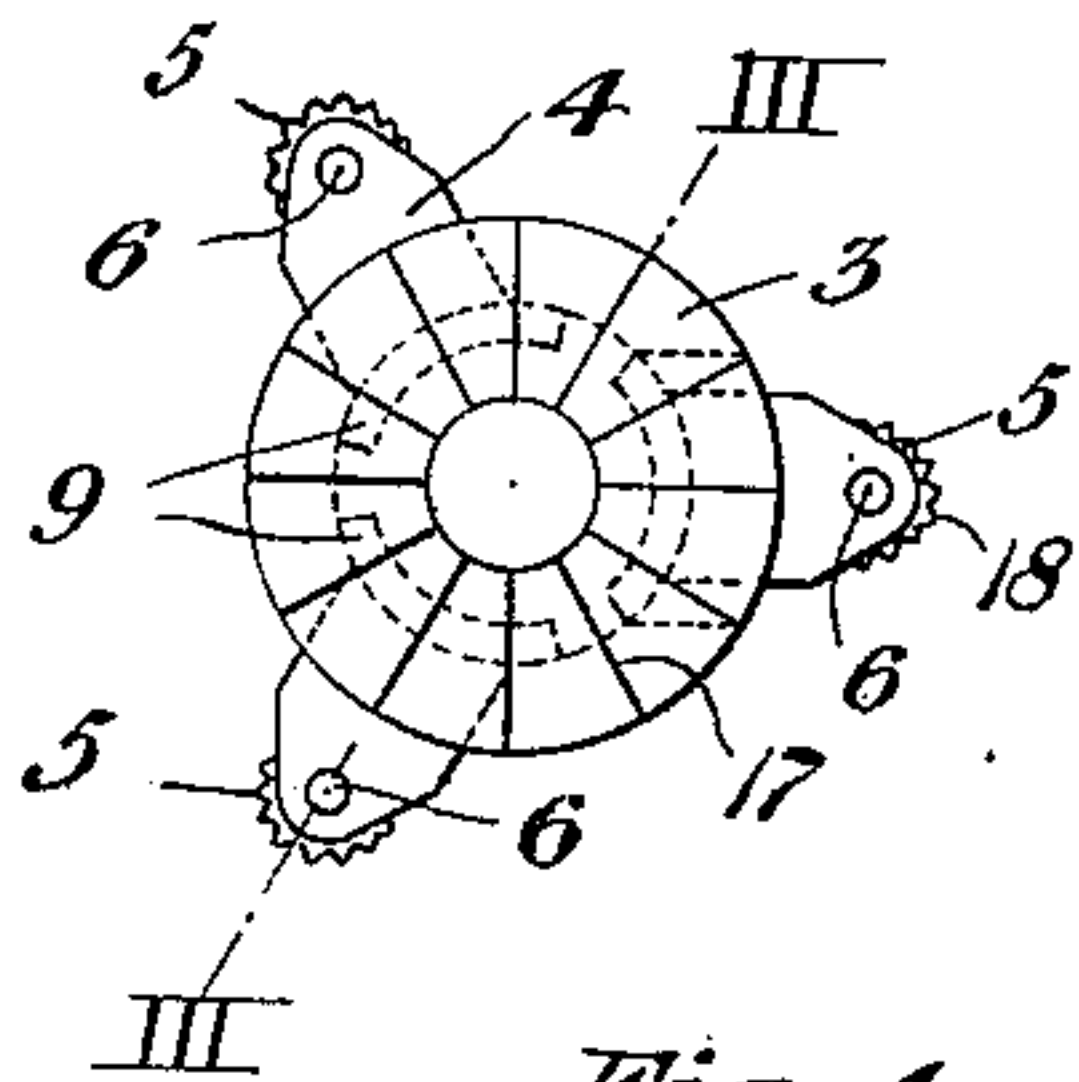


Fig. 1.

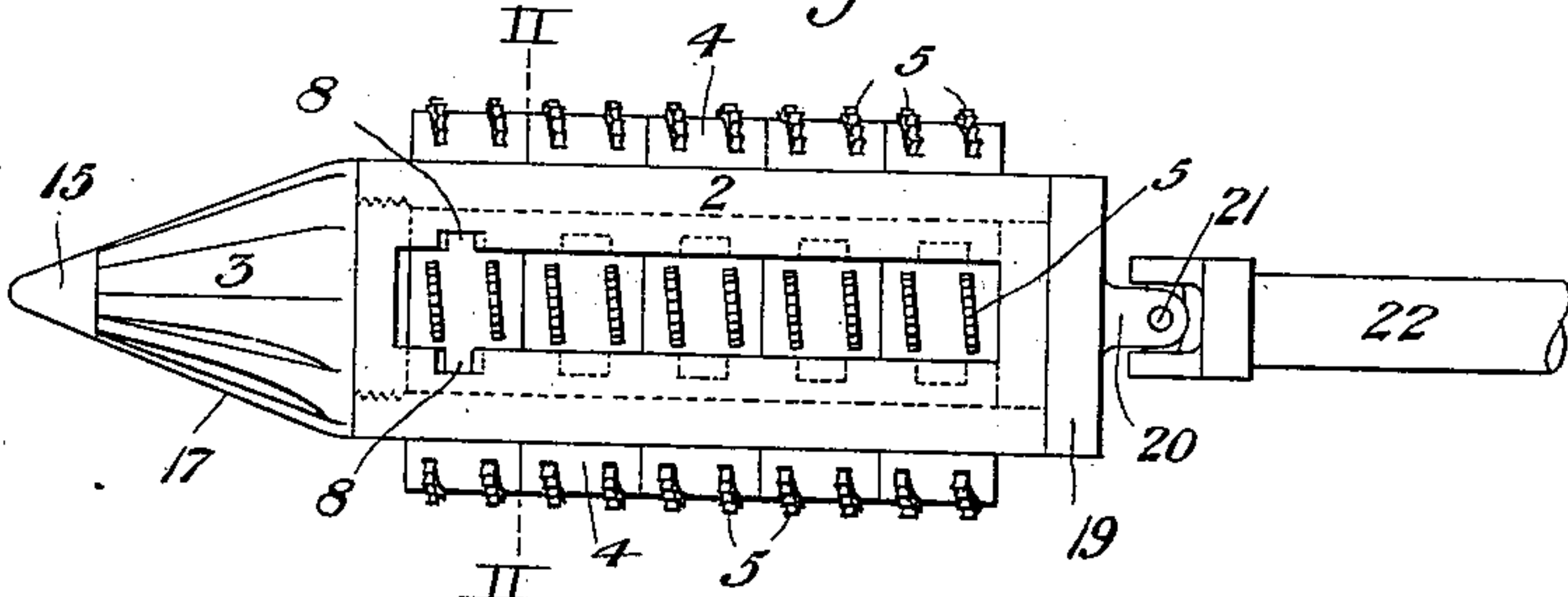


Fig. 4.

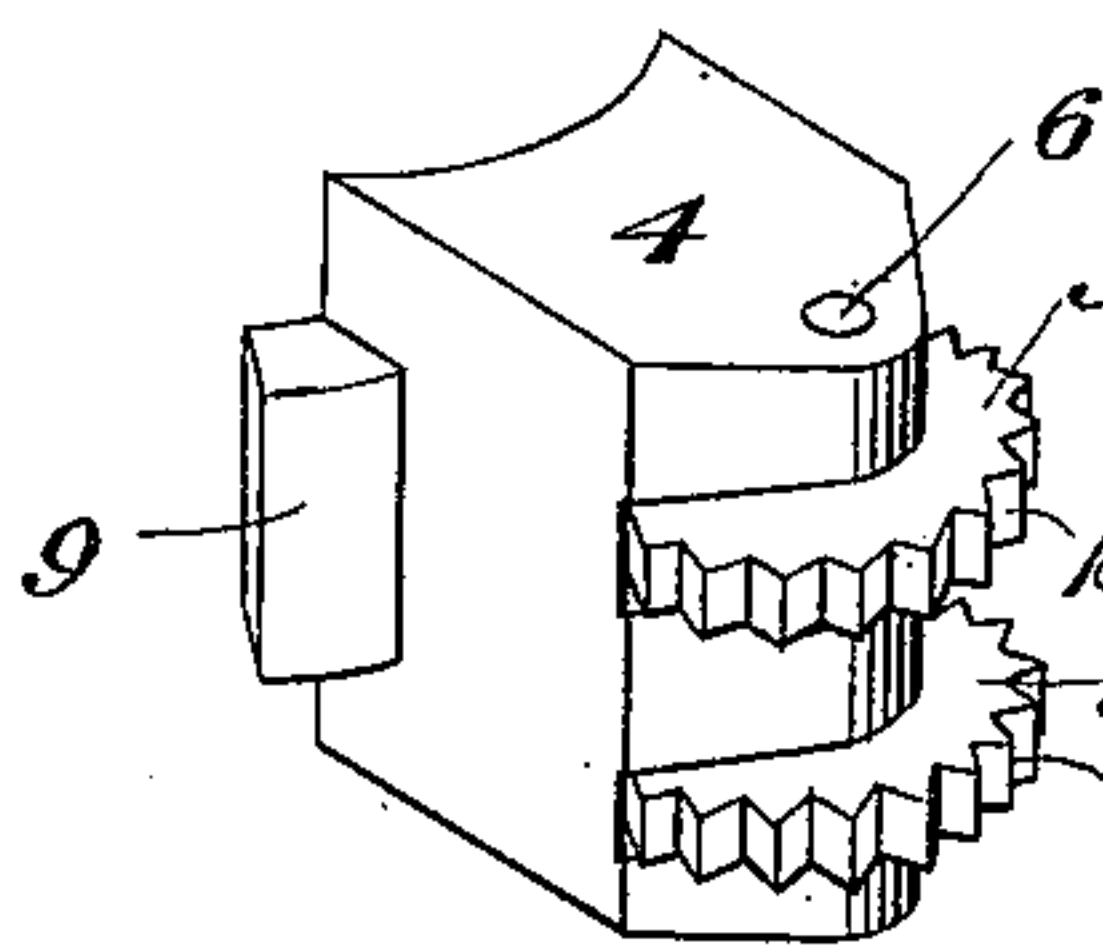


Fig. 3.

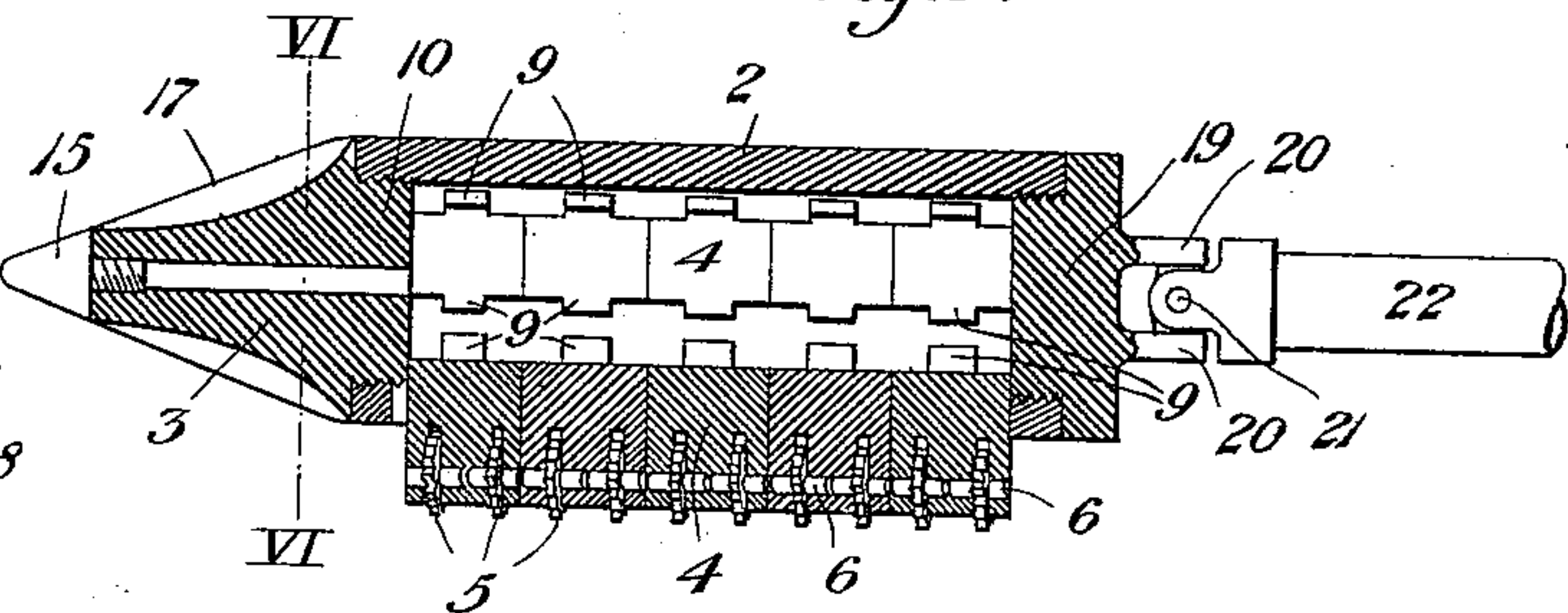


Fig. 6.

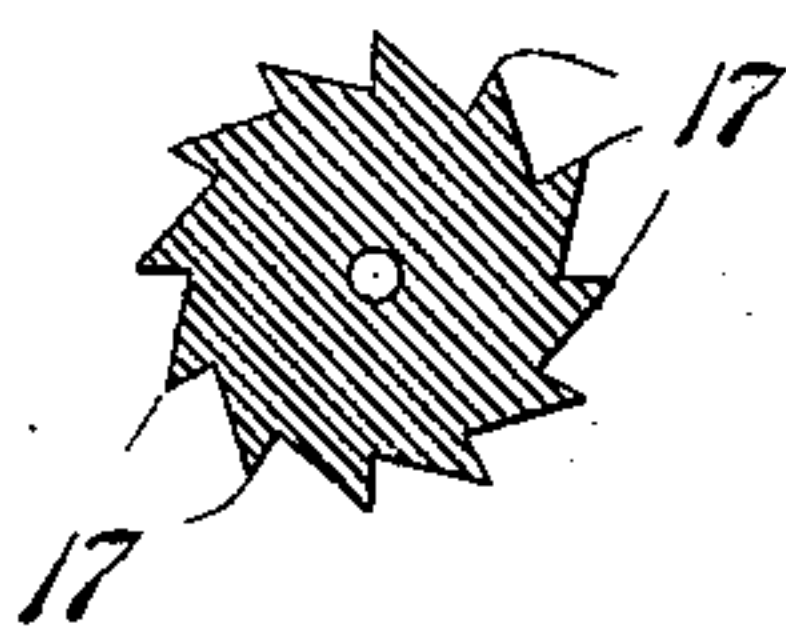


Fig. 5.

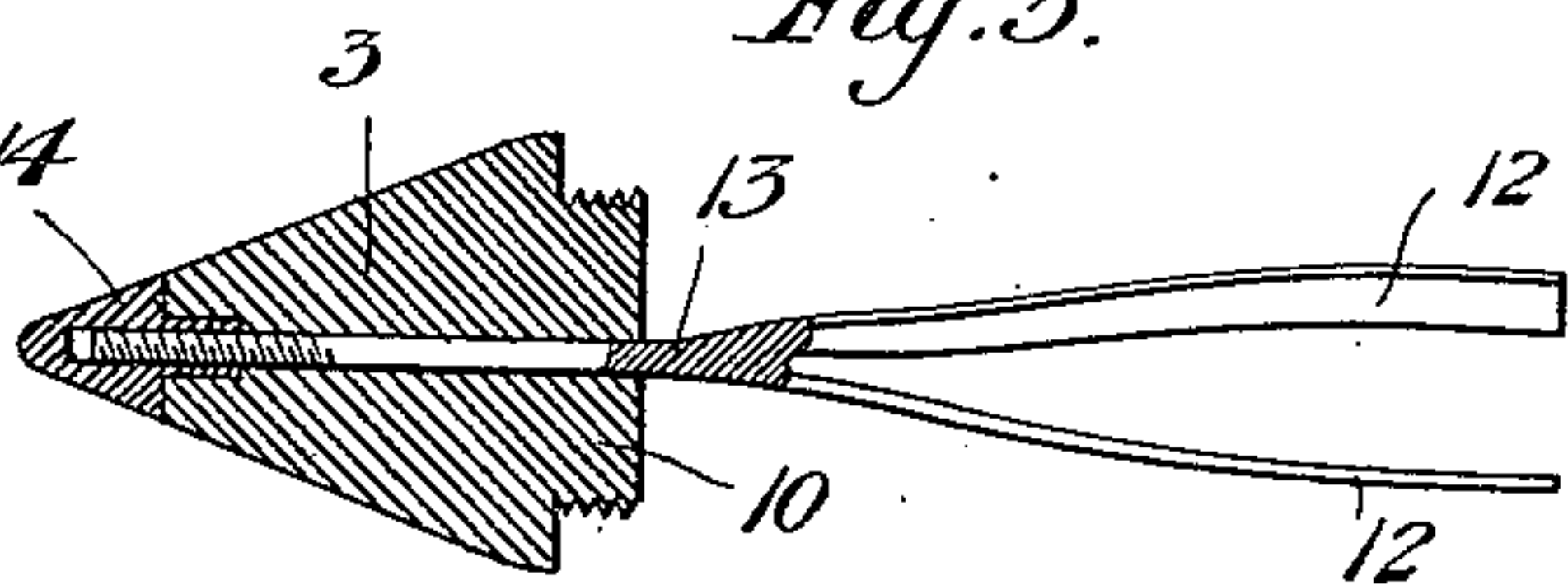


Fig. 8.

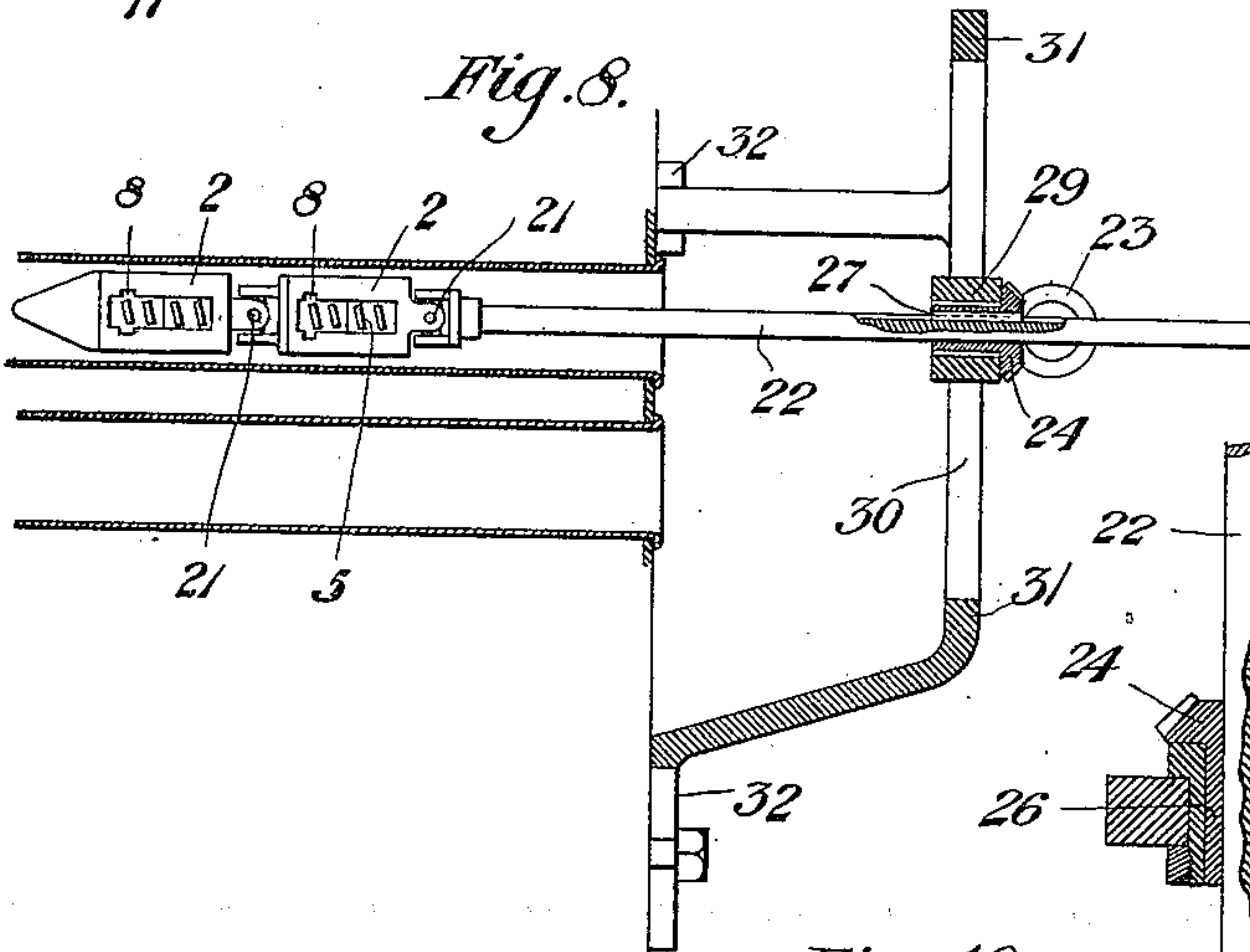


Fig. 7.

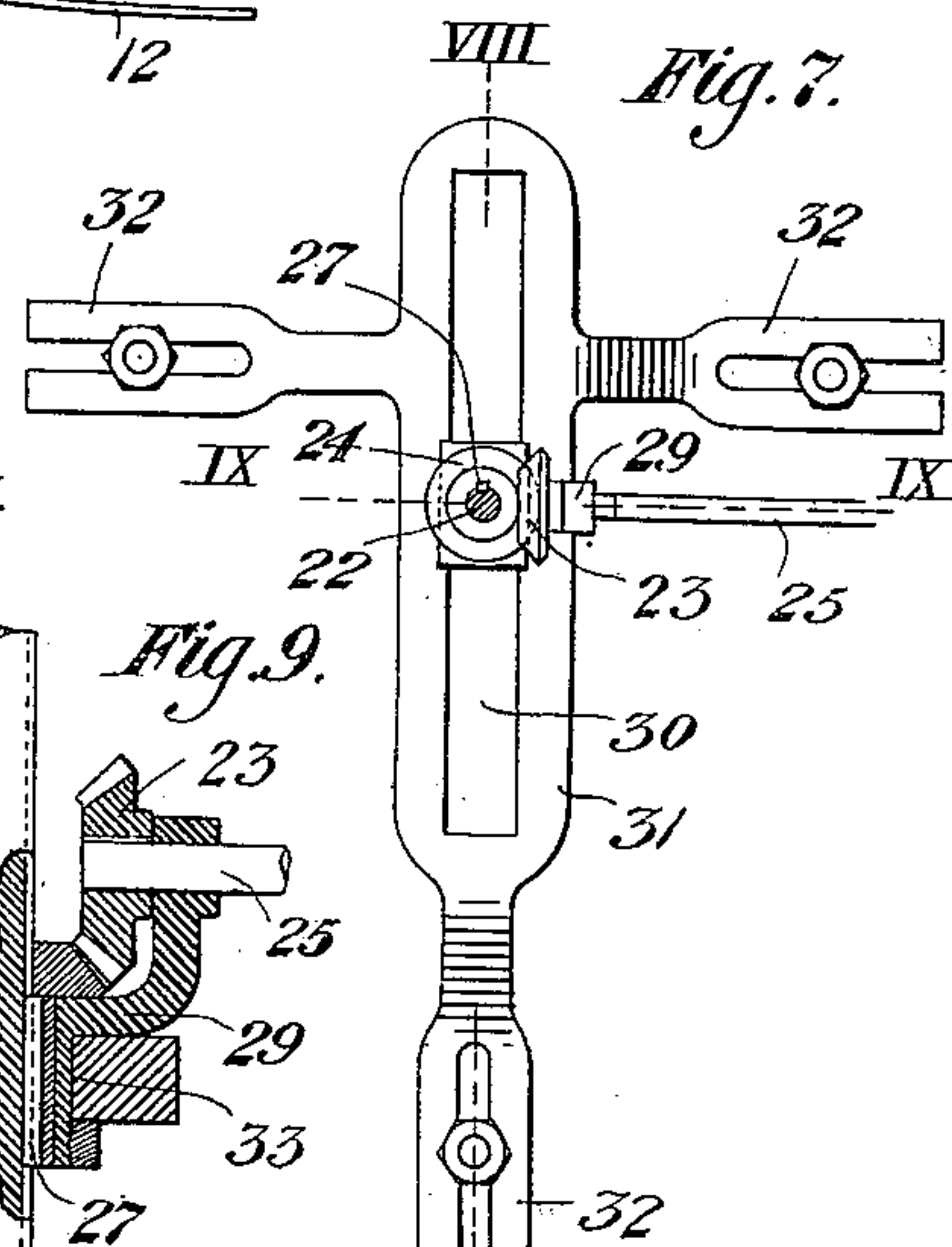


Fig. 9.

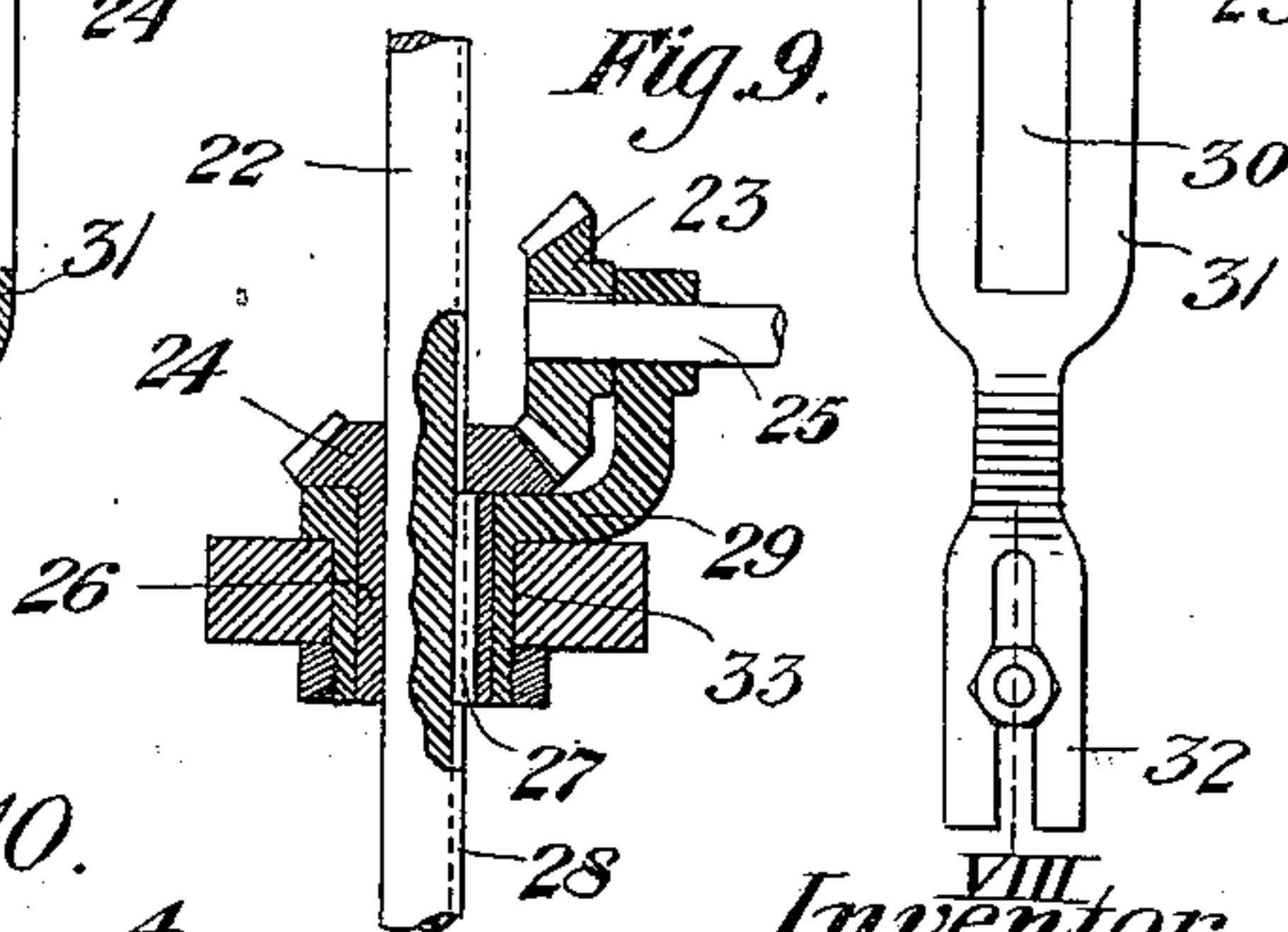
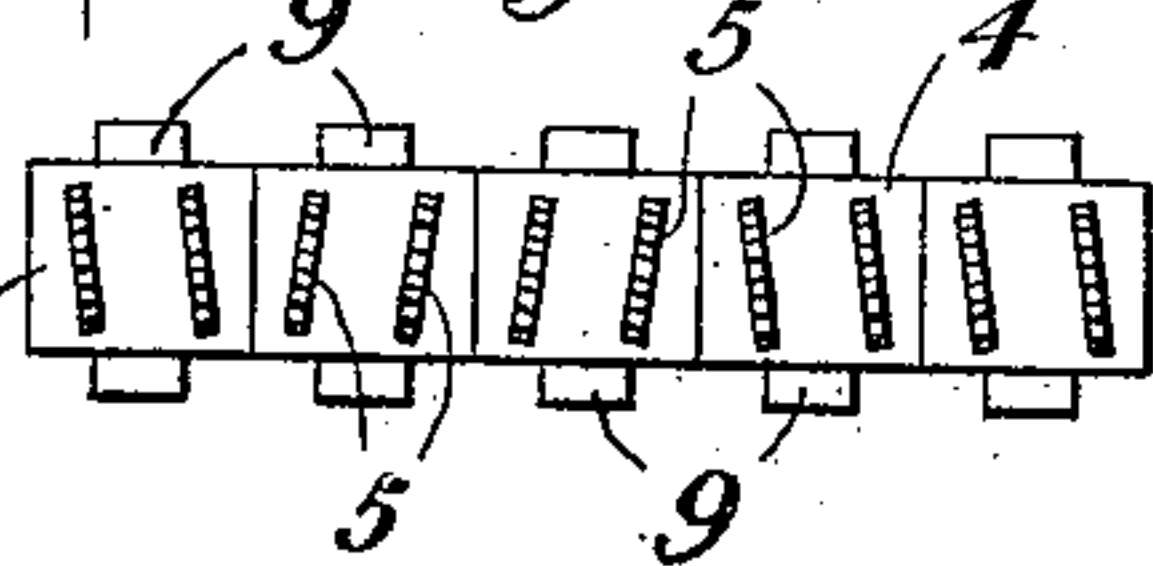


Fig. 10.



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UNITED STATES PATENT OFFICE.

WILLIAM M. FABER, JR., OF PITTSBURG, PENNSYLVANIA.

TUBE-CLEANER.

SPECIFICATION forming part of Letters Patent No. 620,113, dated February 28, 1899.

Application filed April 15, 1897. Serial No. 632,356. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. FABER, JR., a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a new and useful Improvement in Tube-Cleaners, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a view in side elevation of a tube-cleaning tool made in accordance with my invention. Fig. 2 is a cross-section taken on the line II II of Fig. 1. Fig. 3 is a central longitudinal section taken on the line III III of Fig. 2. Fig. 4 is a perspective detail view, enlarged, of one of the removable cutter-holders. Fig. 5 is a sectional detail view of a cutter-tip. Fig. 6 is a cross-section on the line VI VI of Fig. 3. Fig. 7 is a face view of the supporting-framework for the driving-shaft. Fig. 8 is a central vertical sectional view taken on the line VIII VIII of Fig. 7. Fig. 9 is a sectional detail view of the driving-gear indicated by the line IX IX of Fig. 7, and Fig. 10 is a detail view showing a series of assembled holders provided with cutter-wheels arranged at opposing angles.

My invention consists in apparatus for removing scale and other accumulations from the interior of boiler-tubes, either straight or curved, and relates particularly to the construction and arrangement of the cutting-tool and the means by which it is applied.

As shown in the drawings, the tool comprises a main body or barrel 2, provided with a tip 3 and having mounted longitudinally along its sides one or more series of cutters or cutter-holders 4, provided with toothed wheels 5, mounted therein at suitable angles and free to rotate upon pins or axes 6. Three series or rows of such cutter-holders are shown in the drawings arranged parallel with each other, and I show five cutter-holders in each row, though these numbers may be varied. To accommodate these holders, I form in the barrel longitudinal slots, one for each row of holders, and preferably constitute the barrel of a short section of heavy pipe. The holders are introduced into the slots through lateral openings 8 at the ends of the latter and are of such thickness as to fit within the re-

spective slots and to be capable of outward motion on lines radial to the barrel; but they are confined and prevented from dropping out by means of lugs 9 at their inner sides, which fit within the tubular barrel at the inner side of the slot. When assembled in position, the several holders of each row abut against each other until the slots are full, and they are held in place by a plug or extension 10 on the tip 3, which is threaded and screwed into a socket at the end of the barrel, bearing against the end holders of each row and compressing them in position. In the rotary action of the tool at a high speed these holders and their cutting-wheels will be thrown outward into contact with the scale by the force of centrifugal motion and in action will thereby assume a proper distance from the center of the barrel for effective work in varying thicknesses of scale. A tapered plug 15 is screwed into the end of the tip 3.

The tip 3 is tapered and fluted exteriorly, as shown in Fig. 6, the edges 17 serving to cut and dislodge the scale when very heavily incrustated, so as to effect an entrance for the main body of the tool.

The wheels 5 are provided on their edges with sharp teeth 18, and I prefer to mount such wheels in the holders at such deflection from a right angle to the longitudinal center of the tool, as shown, that in its rotation the forward feed will be facilitated, the cutting-wheels thereby tending to act in the manner of a screw and to advance spirally through the boiler-tube when the tool is turned therein. The angle may be varied and an occasional wheel may be mounted at a reverse angle, thereby tending to retard the travel of the tool and more thoroughly to cut and disintegrate the scale.

The barrel 2 is closed at the back by a threaded plug 19, provided with lugs 20, to which I secure by a universal joint 21 the driving-shaft 22, which, if desired, may be flexible when the tool is to be used for cleaning curved tubes, although in usual practice I prefer to use a rigid steel shaft.

The shaft is driven by gears 23 24, the driving gear-wheel 23 being mounted on the end of a preferably flexible power-shaft 25 and meshing into the gear-wheel 24, which is provided with a neck 26 and a key 27, engaging

a continuous keyway 28 in the shaft 22. A supporting-bracket 29 for the gearing is mounted in a longitudinal slot 30 of a spider-frame 31, having slotted arms 32, by which
 5 the frame may be secured to the boiler-front in any desired position, the frame being held away from the face of the tubes sufficiently far to permit the cutting-tool to be withdrawn and shifted to another tube without removing the frame.
 10

The body portion 33 of the bracket 29 has flat sides and is adapted to aline with the inner edge of the groove 30 and to move freely therein to different positions of use, such
 15 movement being permitted freely by reason of the flexible shaft 25. In Fig. 8 I have shown the cutter-tool constituted of two barrels or sections coupled together and working in tandem, each having cutter-holders and
 20 cutters. Such construction is better adapted for curved tubes, as it enables the approximately full diameter of the cutter to be utilized, and it constitutes an important and valuable feature of my invention. In such
 25 construction the first section has a tapered tip, and the subsequent ones are joined by a flexible coupling, such as has been already described.

In operation the tip of the cutter is inserted
 30 in the end of the tube and power applied through the shaft and gearing at high speed, thereby inducing outward action of the cutting-wheels by centrifugal force, a slight inward pressure being exerted on the shaft 22
 35 until the cutting-wheels 5 enter, when the tool will be automatically fed forward by reason of the spiral arrangement of such wheels until the length of the tube has been traversed, when the cutter may be withdrawn.

40 Changes and modifications may be made in the construction and arrangement of the parts without departing from my invention as defined in the claims, since I desire to include as within the scope of my invention such variations as will suggest themselves to the skilled
 45 mechanic.

Having described my invention, what I claim is—

1. A tube-cleaner having a row of individual cutters mounted in individual adjustable
 50 holders in a longitudinal slot, substantially as set forth.

2. A tube-cleaner having a row of individual cutters mounted in individual adjustable
 55 holders in a longitudinal slot in which they are individually movable in an outward direction, substantially as set forth.

3. A tube-cleaner having a row of individual toothed cutters mounted in individual
 60 holders in a longitudinal slot parallel with the axial center of the cleaner, in which they are individually movable in an outward direction, substantially as set forth.

4. A rotary tube-cleaner having individual
 65 toothed cutting-wheels arranged in at least two parallel rows in individual holders, the several cutting-wheels arranged relatively to

each other at angles conforming to a spiral, whereby rotation of the cleaner within the tube will induce forward feeding of the cleaner, substantially as set forth. 70

5. A rotary tube-cleaner having two or more slots, parallel with each other and with the axis of the cleaner, and cutting-wheels mounted therein and set with their cutting
 75 edges at an angle across the slots; substantially as set forth.

6. A tube-cleaner consisting of a hollow barrel, longitudinal parallel slots therein having closed ends, cutter-holders adapted to be ad-
 80 justably mounted in the slots provided with toothed cutter-wheels in parallel rows, and means for retaining the holders in the slots; substantially as set forth.

7. A tube-cleaner consisting of a hollow barrel, provided with longitudinal slots, having closed ends, cutter-holders adapted to be mounted in the slots having lateral retaining-
 85 lugs and provided with pivoted toothed cutter-wheels set at an angle across the face 90 of the holders, with a threaded tapered tip screwed into the end of the barrel and bearing on the holders, substantially as set forth.

8. A tube-cleaner consisting of a hollow barrel provided with longitudinal slots having
 95 closed ends and lateral openings at one end, cutter-holders provided with lateral retaining-lugs mounted in the slots with toothed cutter-wheels set at an angle across the face of the holders and a threaded tapered tip
 100 screwed into the end of the barrel, substantially as set forth.

9. A tube-cleaner comprising a tubular barrel, having longitudinal slots, with closed ends, toothed rotating cutters mounted thereon in
 105 holders in rows, and a threaded plug screwed into the barrel and against the holders for holding the cutters in the slots; substantially as set forth.

10. A tube-cleaner comprising a tubular
 110 barrel having longitudinal slots with closed ends, and toothed rotating cutters mounted in rows in holders placed in the longitudinal slots provided with lateral retaining-lugs sub-
 115 stantially as set forth.

11. A tube-cleaner having cutter-holders in longitudinal slots parallel with the longitudinal center of the cleaner and toothed cutting-
 120 wheels mounted therein transversely to the longitudinal center of the cleaner and at an angle conforming to a spiral; substantially as set forth.

12. A tube-cleaner consisting of a body portion provided with closed end longitudinal slots having lateral openings at one end, cut-
 125 ters provided with lateral retaining-lugs adapted to be inserted in the slot, and a tapering corrugated tip inserted into the front end of the body portion and bearing on the holders; substantially as set forth. 130

13. A tube-cleaner consisting of a body portion provided with longitudinal slots, having closed ends, toothed rotating cutters mounted therein in holders and a plug fitted into the

back against the holders and provided with a driving-shaft coupling; substantially as set forth.

14. In combination with a boiler-tube cleaner consisting of a body portion provided with longitudinal slots, parallel with the longitudinal center of the cleaner, a series of angularly-arranged cutting-wheels mounted therein upon its periphery, a plug fitted into the back and provided with a driving-shaft coupling, a driving-shaft secured thereto provided with a keyway along its length, a frame adapted to be adjustably secured to the boiler-front, a gear-bracket mounted on the frame, gearing in the bracket engaging the shaft, and a driving gear and shaft meshing with the shaft-gearing; substantially as set forth.

15. A tube-cleaner having cutters arranged at an angle in a longitudinal slot parallel with the axis of the cleaner, adapting the cleaner to screw itself forward in the tube as it is rotated, a plug fitted in the back bearing against the cutter-holders and provided with a driving-shaft coupling, a bracket adapted to be adjustably secured to a boiler-front, a driving-shaft secured to the coupling and en-

gaging the bracket, and means permitting forward motion of the tool and shaft; substantially as set forth.

16. In combination with a hollow cylindrical body portion, slots having closed ends with lateral openings at one end and a tapered tip screwed into the end of the body portion; a cutter-holder having parallel sides, lateral retaining-lugs, and toothed cutter-wheels pivotally mounted in the holder; substantially as set forth.

17. In combination with a hollow cylindrical body portion, slots having closed ends with lateral openings at one end and a tapered tip screwed into the end of the body portion; a cutter-holder having parallel sides, lateral retaining-lugs, and toothed cutter-wheels pivotally mounted in the holder, at an angle transversely across its face; substantially as set forth.

In testimony whereof I have hereunto set my hand this 20th day of March, 1897.

WILLIAM M. FABER, JR.

Witnesses:

G. L. RODGERS,
W. T. HOWE.