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J. ULRICH.  
FLUE OR TUBE CUTTER.

APPLICATION FILED MAY 6, 1901. RENEWED JAN. 16, 1904.

NO MODEL.

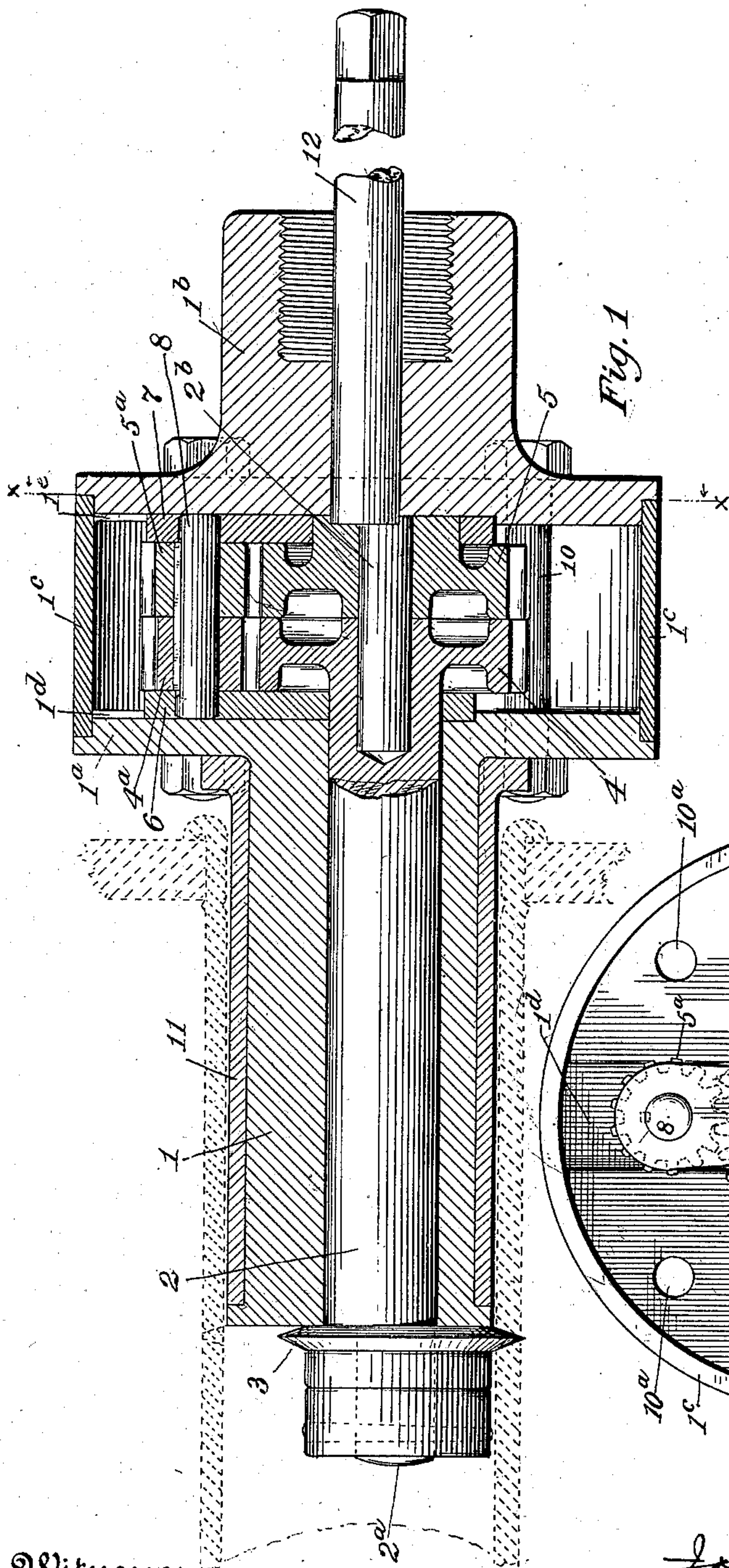


Fig. 1

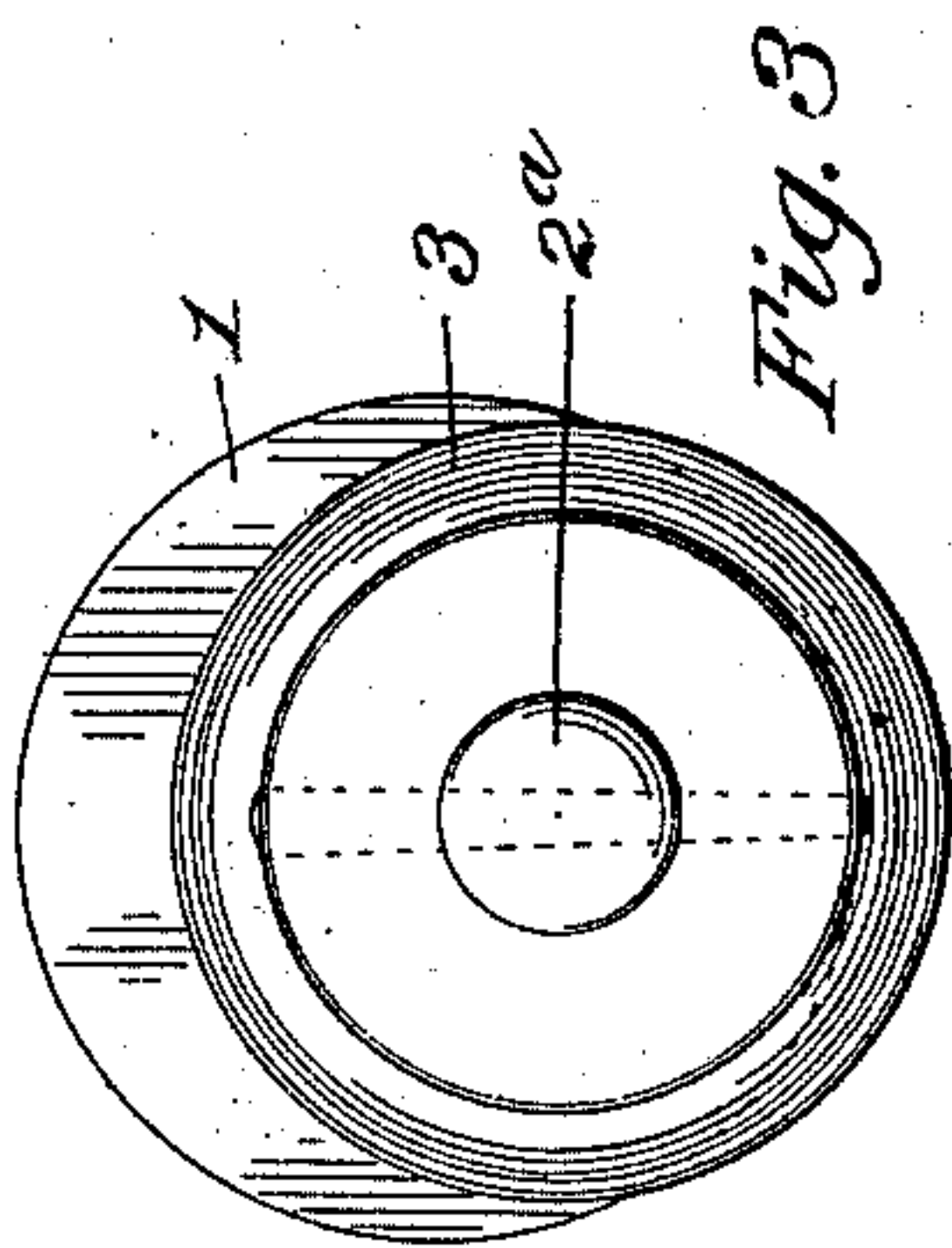


Fig. 3

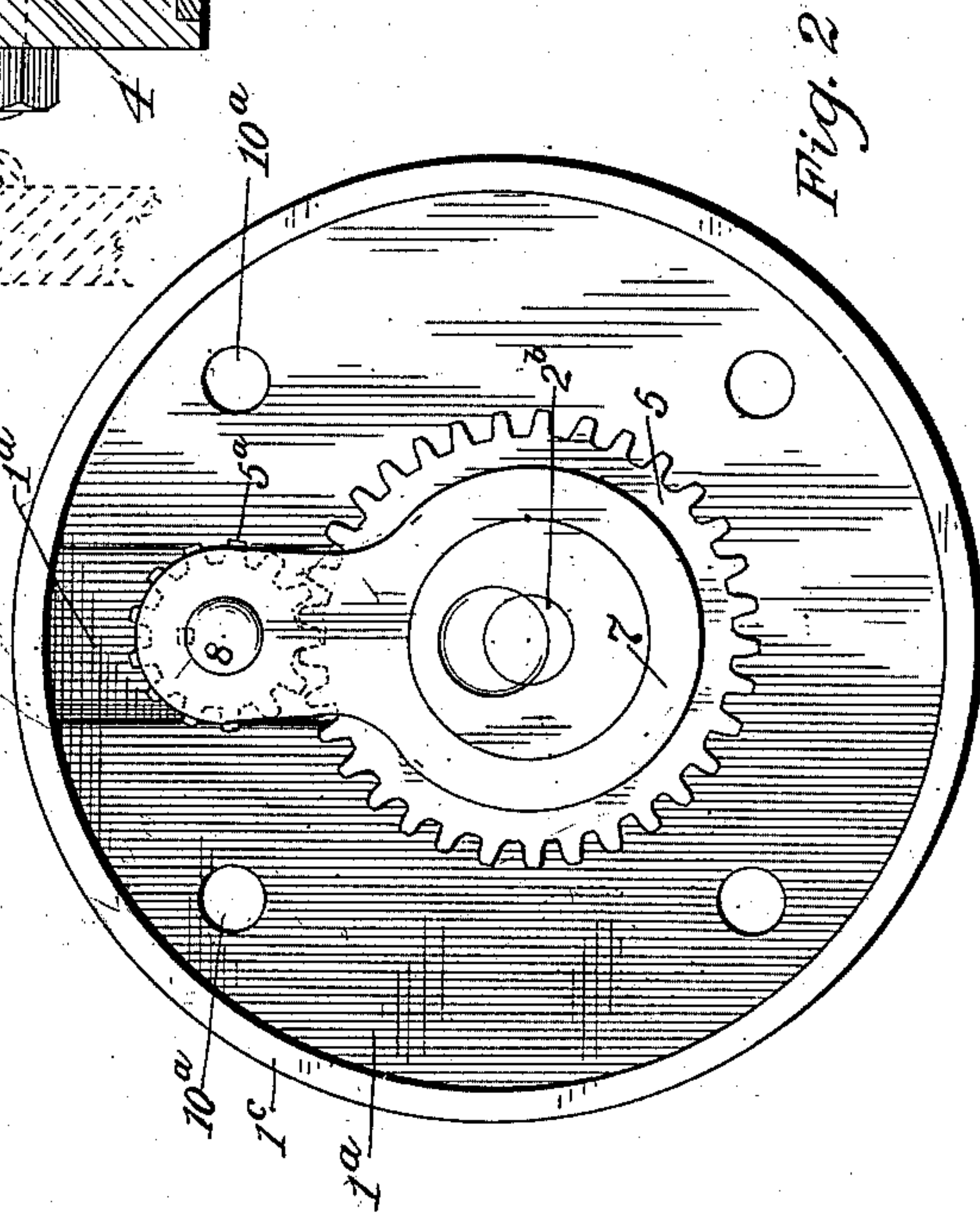


Fig. 2

Witnesses  
Thos. E. French  
Silas Martin

Inventor  
John Ulrich  
by Lindel & Lindel  
his Attorney



# UNITED STATES PATENT OFFICE.

JOHN ULRICH, OF COLUMBUS, OHIO.

## FLUE OR TUBE CUTTER.

SPECIFICATION forming part of Letters Patent No. 752,728, dated February 23, 1904.

Application filed May 6, 1901. Renewed January 16, 1904. Serial No. 189,378. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ULRICH, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have  
5 invented certain new and useful Improvements in Flue or Tube Cutters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it ap-  
10 pertains to make and use the same.

The object of this invention is to provide a simple and effective tool for rapidly cutting tubes, and particularly for cutting out worn boiler-tubes.

15 The invention consists in the construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of the device. Fig. 2 is a view taken on a plane  $x x$ , Fig. 1,  
20 the rear head of the differential-gear casing being removed. Fig. 3 is a view in elevation looking toward the cutting end of the tool.

In the several views, 1 is the main spindle, which has an enlarged end 1<sup>a</sup> to form one  
25 head of a chamber to contain a differential gearing to feed the cutter, as will be hereinafter explained. This spindle 1 is bored eccentrically to contain another spindle or shaft 2, upon the outer end of which is a short ec-  
30 centrically-located stud-shaft 2<sup>a</sup> to receive the cutter 3.

Upon the inner end of the spindle or shaft 2 is fixed concentrically therewith a gear-wheel 4, and concentrically with this gear,  
35 but loosely with respect thereto on the same shaft 2 or conveniently upon a smaller stud 2<sup>b</sup>, is another gear-wheel 5 of smaller diameter than the wheel 4. Supported in yokes 6 and 7 is a shaft 8, having fixed or keyed thereto  
40 pinions 4<sup>a</sup> and 5<sup>a</sup>, that mesh with the gear-wheels 4 and 5, respectively. The gears, pinions, and yokes just referred to are inclosed in a chamber or drum, one head of which, as before stated, is formed by the part 1<sup>a</sup> and  
45 the other by a head 1<sup>b</sup>, with a surrounding rim 1<sup>c</sup>, held between them by ordinary bolts 10, passed through holes 10<sup>a</sup> in the parts 1<sup>a</sup> and 1<sup>b</sup>. The yokes 6 and 7, supporting the pinions 4<sup>a</sup> and 5<sup>a</sup>, fit and are held in recesses 1<sup>d</sup>  
50 and 1<sup>e</sup>, so that when the drum and the spindle

are rotated these yokes are carried with the drum and the pinions carried or revolved around the gears 4 and 5; but the gear 5 is held from rotating by a stationary pin 12, passing centrally through the head 1<sup>b</sup>, but eccen-  
55 trically into the gear 5. The pin 12 is shown to have a squared outer end that is to extend into a corresponding hole or socket in any stationary object beyond the machine—say, for example, the frame of the driving-motor—  
60 so that the head 1<sup>b</sup> can rotate around said pin 12, while that pin holds the gear 5 stationary. The diameter and the number of teeth on the pinions 4<sup>a</sup> and 5<sup>a</sup> should differ. As a practical  
65 example of the construction of the gears 4 and 5 and the pinions 4<sup>a</sup> and 5<sup>a</sup> it may be stated that the gear 5 can have thirty-three teeth, the gear 4 thirty-two teeth, the pinion 5<sup>a</sup> thirteen teeth, and the pinion 4<sup>a</sup> twelve  
70 teeth, so that when the drum is given one rotation the relative position of the gears 4 and 5 will be changed about one tooth with respect to each other. In other words, the shaft 2 will be slightly turned in the spindle 1 and the stud-shaft 2<sup>a</sup>, carrying the cutter, moved  
75 inward or outward, according to the initial position of the shaft 2 and the direction of rotation of the drum. Thus it will be gathered that as the spindle 1 is rotated the cutter can be  
80 fed outward to cut progressively deeper into the sides of the tube until it is finally severed.

In Fig. 1 I have shown in broken lines a fraction of a boiler sheet and tube therein, with my tool in position to cut out the tube. Around the spindle 1 I have shown a bush-  
85 ing or sleeve 11 to give bearing to the tool in the tube to be cut with the cutting end of the device.

The head or part 1<sup>b</sup> is shown to be threaded to receive a power-driven shaft, and because  
90 the main spindle is rigidly connected to this head that spindle is driven when the power-shaft is operated.

An important feature of my invention consists in the journaling of the cutter on the end  
95 of the cutter-holding shaft beyond the main spindle, because by this construction the cutter can be given complete revolutions in one direction to carry the cutter to its innermost and outermost positions, and thus avoid the  
100



necessity of stopping and reversing the driving mechanism to withdraw the cutting-tool.

Although I regard the differential-gear mechanism for feeding the tool herein shown  
5 as novel, other mechanisms can be substituted to accomplish the same result.

Viewed generally the main spindle comprises not only the part that enters the tube to be cut, but also the drum on the outer end  
10 that contains the differential cutter-feeding gearing.

What I claim, and desire to secure by Letters Patent, is—

1. In a tube-cutting device, the combination  
15 of a main spindle, a cutter-holding shaft journaled eccentrically therein, a cutter eccentrically mounted on and in fixed relation to the end of said cutter-holding shaft and beyond the main spindle, combined with a differential  
20 gearing between the main spindle and the cutter-holding shaft adapted to feed the cutter by rotation only of the main spindle and cutter-holding shaft, substantially as described.

2. In a tube-cutting device, a main spindle,  
25 a cutter-holding shaft journaled therein, a cut-

ter on said shaft mounted stationarily and eccentrically with respect thereto, a gear on said cutter-holding shaft, a gear held stationary with respect to the main spindle, and pinions for differentiating the motion of the gear of  
30 the cutter-holding shaft with respect to the main spindle, substantially as described.

3. In a tube-cutting device, a main spindle, a cutter-holding shaft journaled eccentrically therein, a cutter mounted eccentrically on said  
35 cutter-holding shaft, combined with a differential gearing comprising a gear 4 secured to or forming a part of said spindle, a stationary gear 5, a shaft 8 carried and revolved by the main spindle, pinions 4<sup>a</sup> and 5<sup>a</sup> engaging the  
40 gears 4 and 5, substantially as described, whereby the cutter-holding shaft is rotated within the main spindle to feed the cutter as set forth.

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

JOHN ULRICH.

Witnesses:

GEORGE M. FINCKEL,  
SAMUEL W. LATHAM.