

No. 708,977.

Patented Sept. 9, 1902.

W. H. MOTTER.

COMBINED ORE ROASTING AND FUME SAVING APPARATUS.

(Application filed Nov. 25, 1901.)

(No Model.)

2 Sheets—Sheet 1.

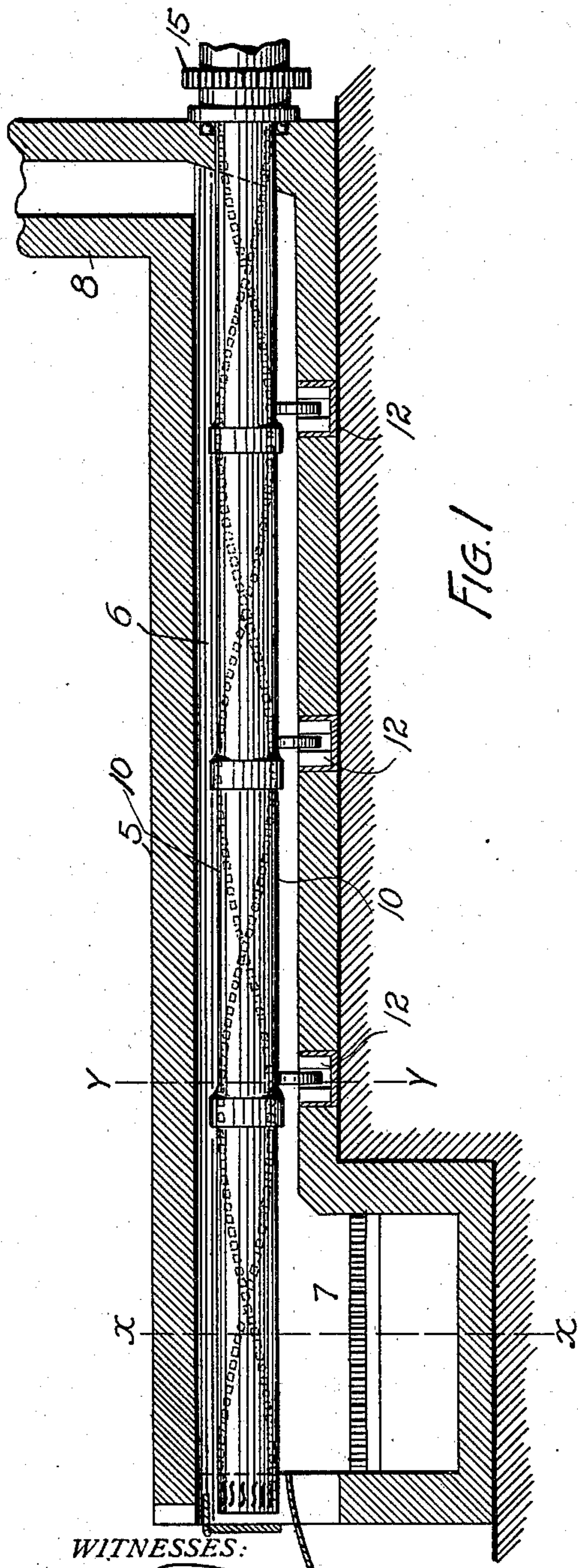


FIG. 1

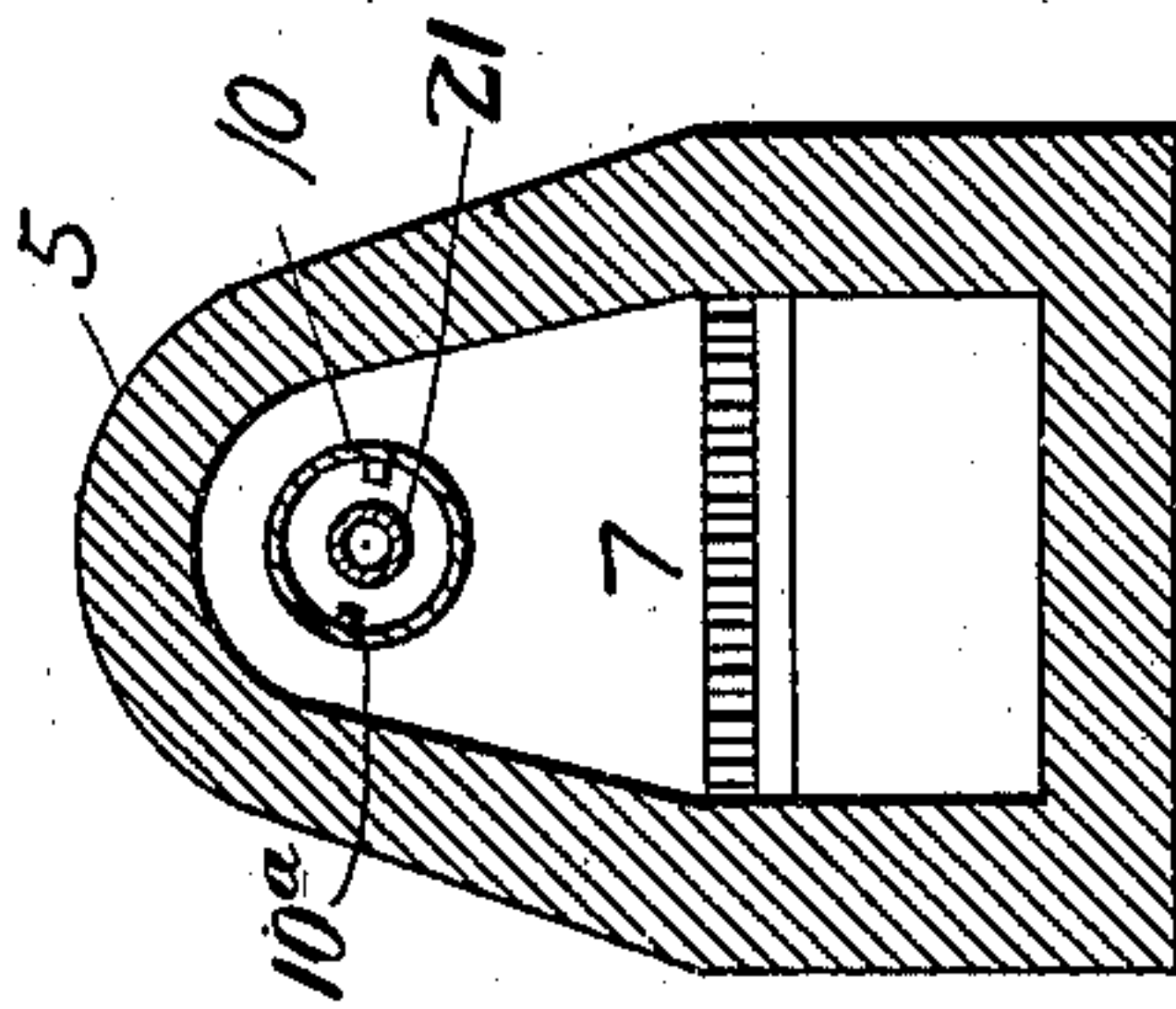


FIG. 2

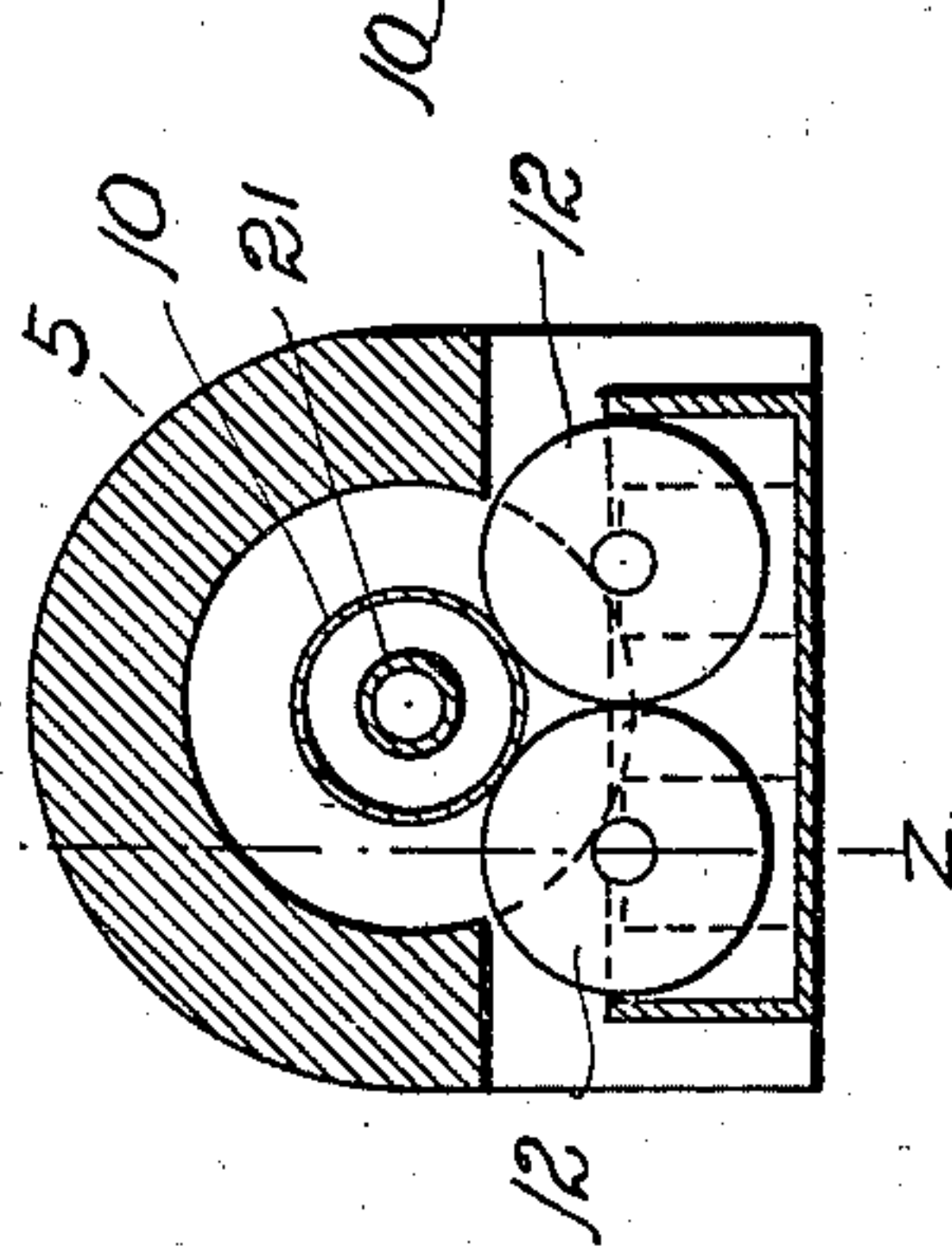


FIG. 3

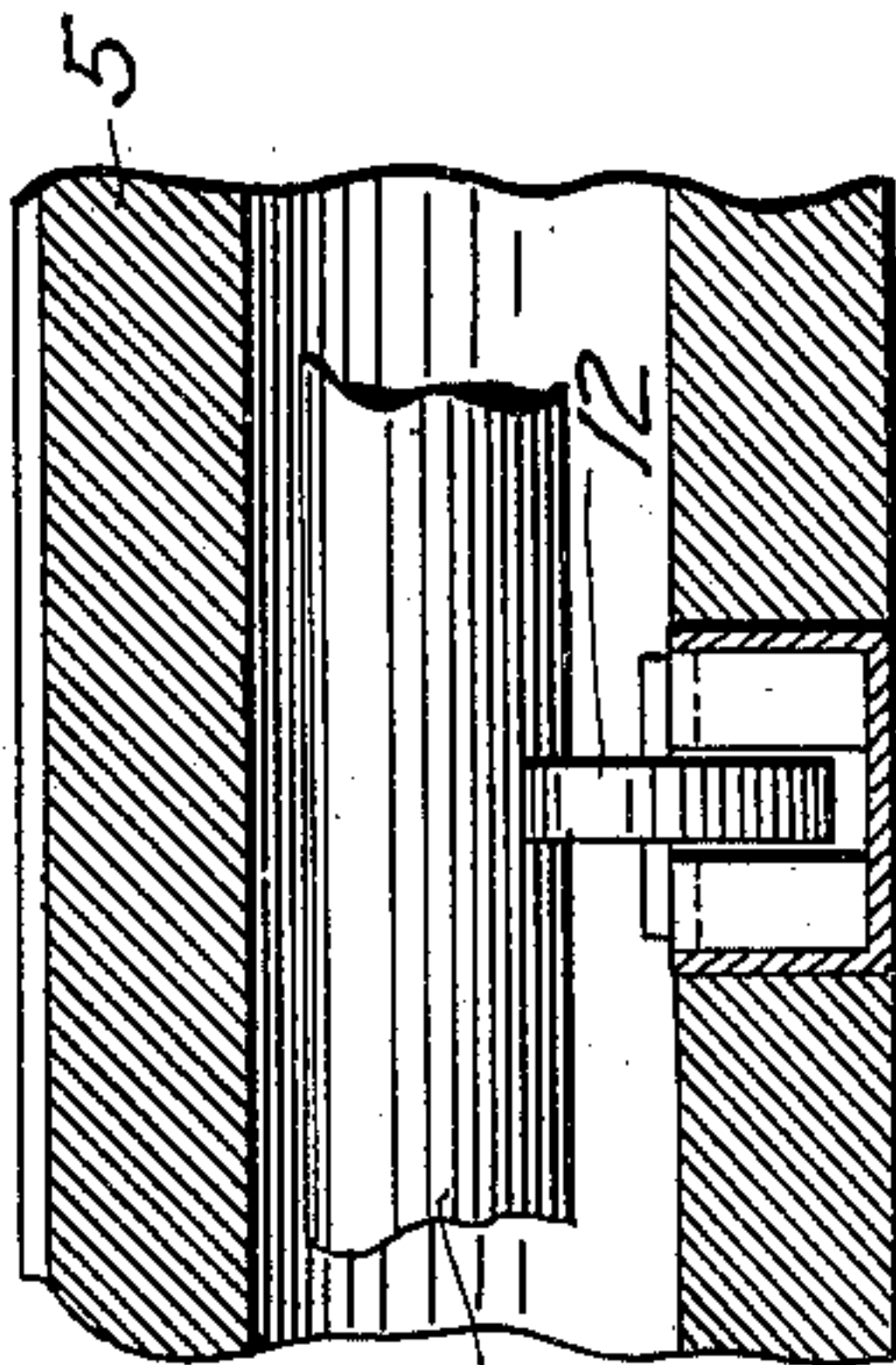


FIG. 4

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No. 708,977.

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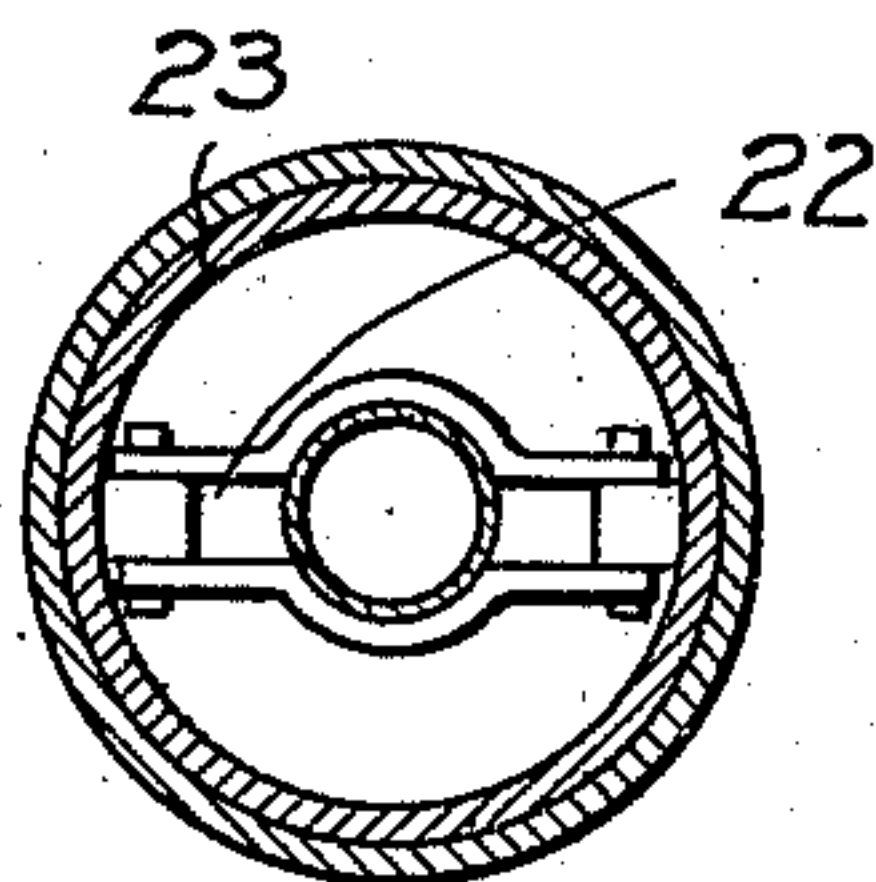
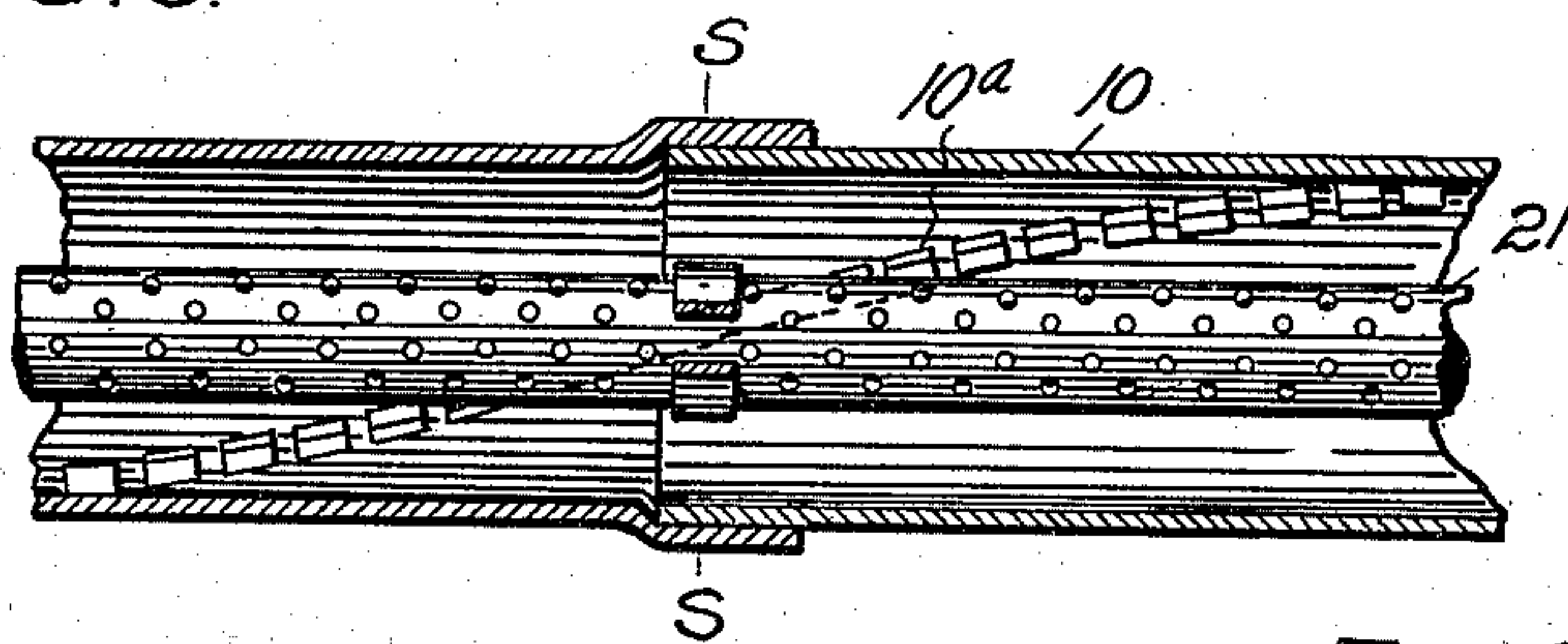
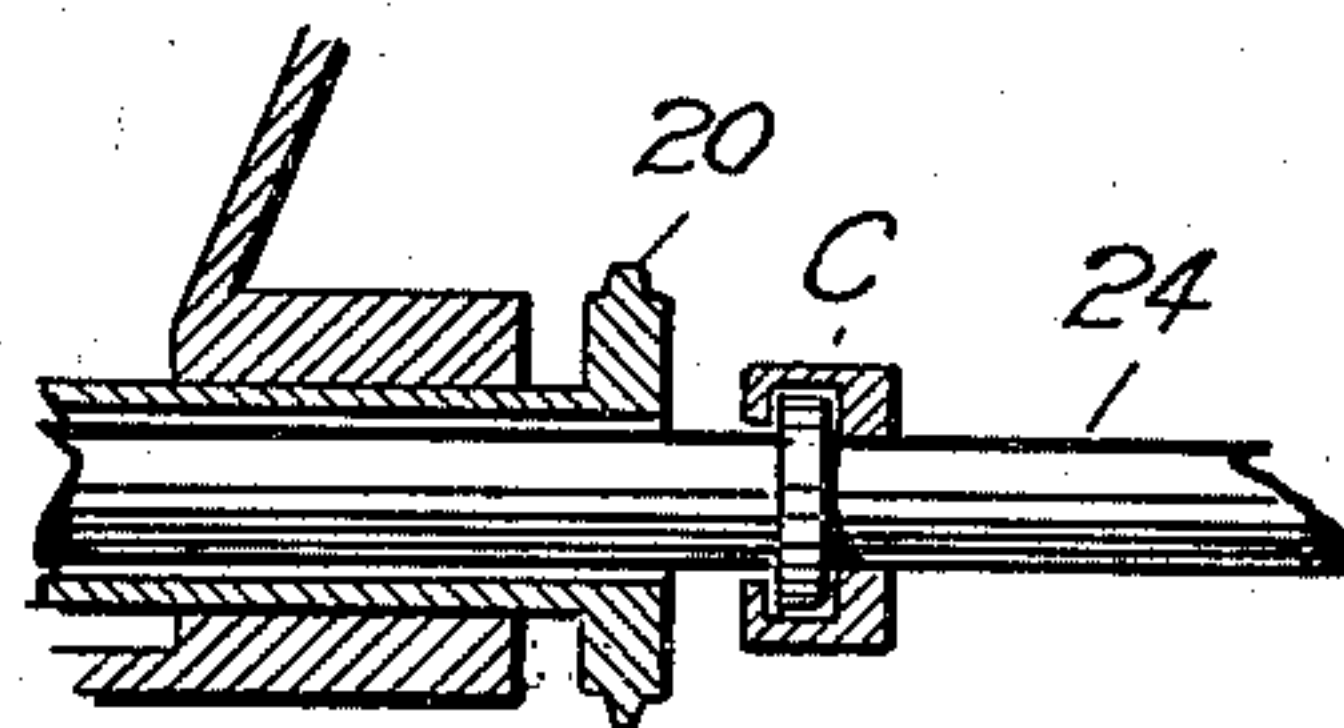
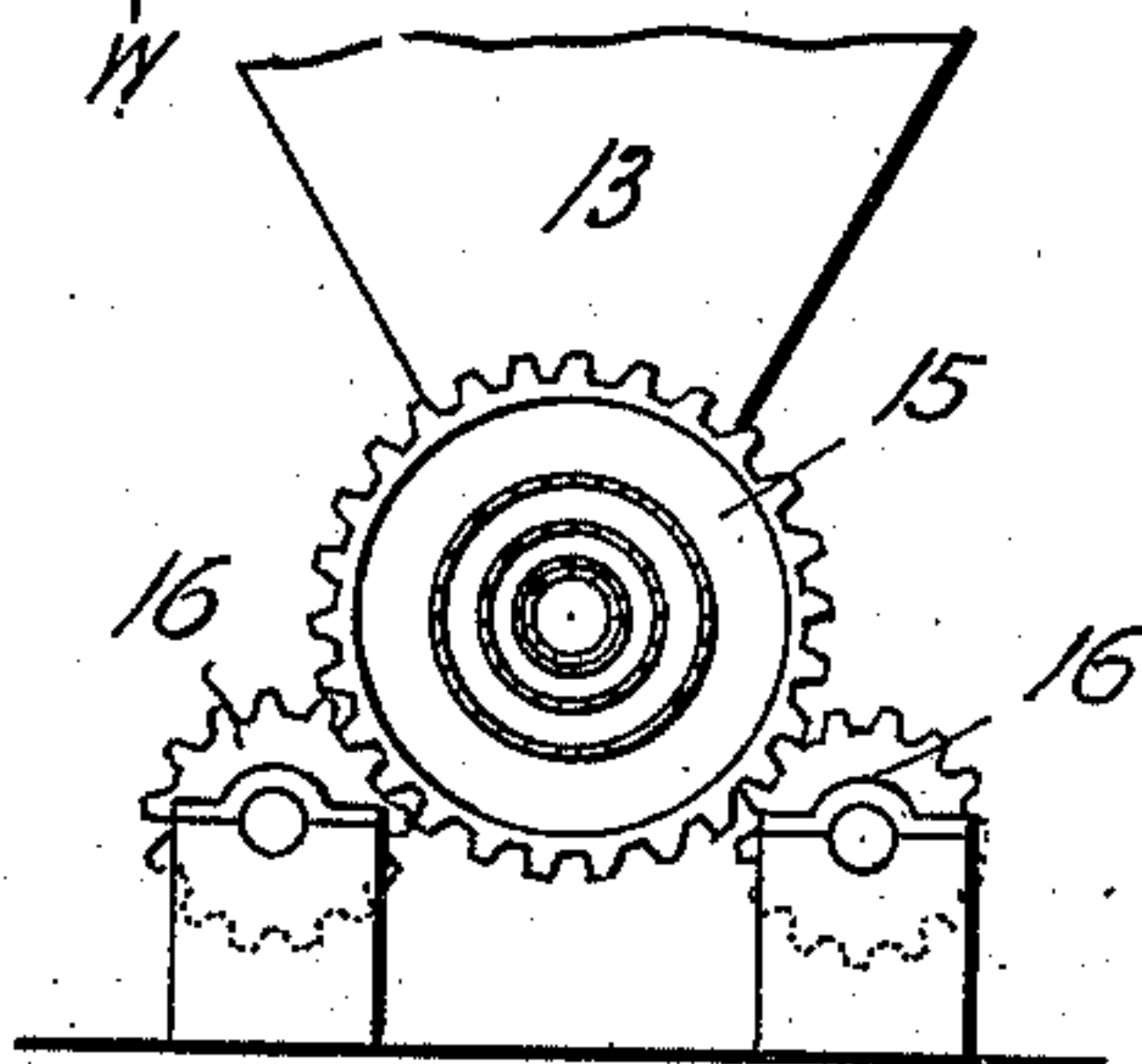
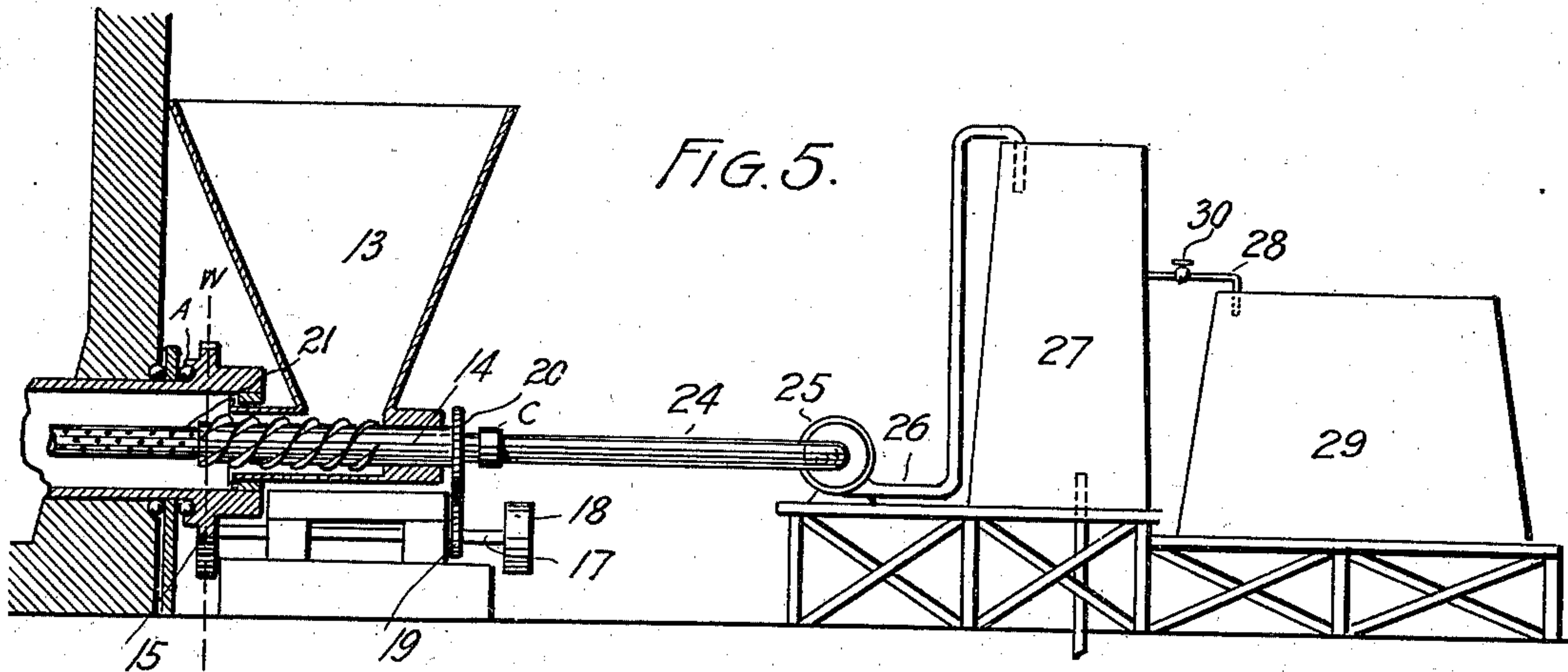
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WITNESSES:  
*[Signature]*  
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# UNITED STATES PATENT OFFICE.

WILLIAM H. MOTTER, OF DENVER, COLORADO.

## COMBINED ORE-ROASTING AND FUME-SAVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 708,977, dated September 9, 1902.

Application filed November 25, 1901. Serial No. 83,654. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. MOTTER, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in a Combined Ore-Roasting and Fume-Saving Apparatus; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in roasting-furnaces; and it consists of the features, arrangements, and combinations hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a vertical longitudinal section taken through my improved ore-roasting apparatus, the front part being broken away for lack of room on the sheet. Fig. 2 is a cross-section taken on the line  $xx$ , Fig. 1. Fig. 3 is a similar section taken on the line  $yy$ , Fig. 1, the parts being enlarged. Fig. 4 is a section taken on the line  $zz$ , Fig. 3, a carrying-wheel being shown in elevation. Fig. 5 is a fragmentary section taken through the front part of the furnace, the fume-saving attachment being shown in elevation. In this view the parts are shown on a larger scale than in Fig. 1. Fig. 6 is a section taken on the line  $ww$ , Fig. 5, parts being shown in elevation. Fig. 7 is an enlargement of part of Fig. 5. Fig. 8 is a fragmentary section taken through the rotary conveyer of the apparatus, the perforated inner pipe being shown in elevation. Fig. 9 is a cross-section taken on the line  $ss$ , Fig. 8.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a masonry housing or casing inclosing a longitudinal chamber or flue 6, at one extremity of which is located the fire-box 7 and at the opposite extremity the stack 8.

Within the longitudinal chamber 6 and extending the entire length thereof is a rotary

conveyer 10, through which the ore travels during the roasting operation and wherein it is protected from direct contact with the products of combustion from the fire-box. This conveyer is mounted and turns on carrying-wheels 12, arranged in pairs located at suitable intervals. On the inner surface of the conveyer 10 are formed broken spirals or conveying-threads 10<sup>a</sup>. As shown in the drawings, there are two of these spirals running parallel to each other. The broken threads or spirals allow the ore to pass between their parts or sections, and thereby retard the speed of its travel through the conveyer and facilitate its exposure to the roasting action of the heat.

The ore to be treated is fed from a hopper 13 to a feed-screw 15, which delivers it to the forward or right-hand extremity of the conveyer 10, referring to Figs. 1 and 5. This conveyer is mounted on ball-bearings at its forward and rearward extremities, as shown at A and B. Its forward extremity is surrounded by a gear 15, which meshes with smaller gears 16, one of which is fast on a shaft 17, provided with a pulley 18, which may be connected by means of a belt (not shown) with a line-shaft or other suitable propelling apparatus for operating the conveyer and its connections. On the shaft 17 is made fast a gear 19, which meshes with the gear 20 on the feed-screw for operating the latter.

Within the conveyer 10 and extending longitudinally therethrough is a concentrically-arranged perforated fume tube or pipe 21 in axial alinement with the feed-screw and passing therethrough, the latter being hollow for the purpose. This pipe 21 may be secured to the conveyer 10 in any suitable manner, whereby the two pipes are arranged to rotate in unison. As shown in the drawings, (see Fig. 9,) the pipe 21 is provided with two oppositely-disposed pairs of arms 22, arranged to embrace and clamp the adjacent parts or sections of the spiral of the conveyer 10. Each pair of arms is secured to the spiral section or lug by a bolt 23. These fastening devices are located at suitable intervals. The forward extremity of the pipe 21 is connected with a stationary fume-conduit 24 in such a manner as to allow the perforated pipe to turn in the performance of its function. A suitable con-



nection for this purpose is shown at C in Fig. 7. The pipe 24 leads to a suction-fan, through the instrumentality of which the fumes rising from the ore within the conveyer 10 pass into the perforated pipe 21, are carried thence to the fume-conduit 24, and forced through an outlet-pipe 26 into a tank 27, containing water, wherein the fumes are condensed and sulfurous acid formed from the sulfur. This acid rises to the top and is drawn off from the upper part of the tank when it has attained the desired strength through a pipe 28 into an acid-tank 29. The pipe 28 contains a valve or cock 30, which is normally closed.

From the foregoing description the operation of my improved apparatus will be readily understood. The ore to be treated passes from the hopper 13 to the feed-screw 14 below, whence the screw forces the ore into the rotary conveyer 10, which is surrounded by heat in the chamber 6 from the fire-box. The ore while traveling through the conveyer is subjected to the action of the heat, whereby the sulfur and other fumes which render the ore in its normal state refractory and interfere with the separation of the values from the gangue are volatilized and made to pass off in fumes which enter the perforated pipe 21 and are drawn by suction through said pipe and the conduit 24 and are forced into the water-tank 27 through the instrumentality of the suction-fan, as aforesaid. In this tank the sulfur fumes uniting with the water form sulfurous acid, which when of the proper strength is drawn off, as aforesaid. The rear extremity of the conveyer 10 is closed, and the roasted ore passes through slots D, formed therein. The rear extremity of the chamber 6 is also closed, as shown at E, only sufficient space being left for the exit of the roasted ore as it passes through the conveyer 10.

Having thus described my invention, what I claim is—

1. In a roasting-furnace, the combination with a source of heat and a chamber in communication therewith, of a rotary conveyer located in the chamber, a hollow feed-screw connected with the conveyer at one extremity, a perforated pipe concentrically arranged in said conveyer and passing through the feed-screw, and means connected with said pipe outside of the furnace, for drawing off the fumes rising from the ore during the roasting operation, substantially as described.

2. The combination with a source of heat and a chamber in communication therewith, of a rotary conveyer located in the chamber and having closed walls to protect the ore from coming in direct contact with the products of combustion, a hollow feed-screw connected with the conveyer at one extremity, a perforated pipe concentrically arranged in said conveyer and passing through the feed-screw, and means connected with said pipe outside of the furnace for drawing off the fumes rising from the ore during the roasting operation.

3. In a roasting-furnace, the combination with a combustion-chamber, of a rotary conveyer extending longitudinally thereof and provided on its inner surface with a broken spiral or a screw-thread for agitating the ore and causing it to travel through the conveyer whose walls are closed to prevent the ore from coming in direct contact with the products of combustion, a hollow feed-screw connected with the conveyer at one extremity, a perforated pipe concentrically arranged in said conveyer and passing through the feed-screw, and means connected with said pipe outside of the furnace for drawing off the fumes rising from the ore during the roasting operation.

4. In a roasting-furnace, the combination with a combustion-chamber, of a rotary conveyer extending longitudinally therethrough, a hollow feed-screw connected with the conveyer at one extremity, and a perforated pipe concentrically arranged in the conveyer and passing through the feed-screw for discharging the fumes from the conveyer, substantially as described.

5. The combination with a combustion-chamber, of a rotary conveyer located therein, a hollow feed-screw connected with the conveyer at one extremity, a perforated pipe concentrically arranged in the conveyer and passing through the feed-screw, the said pipe being connected to rotate with the conveyer, a stationary conduit connected with the said pipe, suction means connected with the conduit for drawing off the fumes rising from the ore during the roasting operation, a liquid-containing tank, and a conduit connected with said suction means for forcing the fumes into the liquid of the tank, substantially as described and for the purpose set forth.

6. The combination with a combustion-chamber, of a rotary conveyer mounted in operative relation therein, and having its walls closed to protect the ore from direct contact with the products of combustion, a pipe concentrically arranged in said conveyer and having openings in its walls to allow the fumes rising from the ore to enter, means for connecting the pipe and the conveyer to cause them to rotate in unison, a hollow screw for feeding the ore to the conveyer, the perforated pipe passing through said screw, a stationary conduit connected with the perforated pipe outside of the conveyer, the connection being such as to allow one pipe to turn upon the other, a liquid-containing receptacle, and means connected with said conduit for drawing off the fumes rising from the ore during the roasting operation, and forcing them into the liquid of the receptacle for the purpose set forth.

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

WILLIAM H. MOTTER.

Witnesses:

DENA NELSON,  
A. J. O'BRIEN.