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PATENTED OCT. 31, 1905.

H. J. HORSTMANN.  
AMALGAMATOR.

APPLICATION FILED FEB. 27, 1905.

6 SHEETS—SHEET 1.

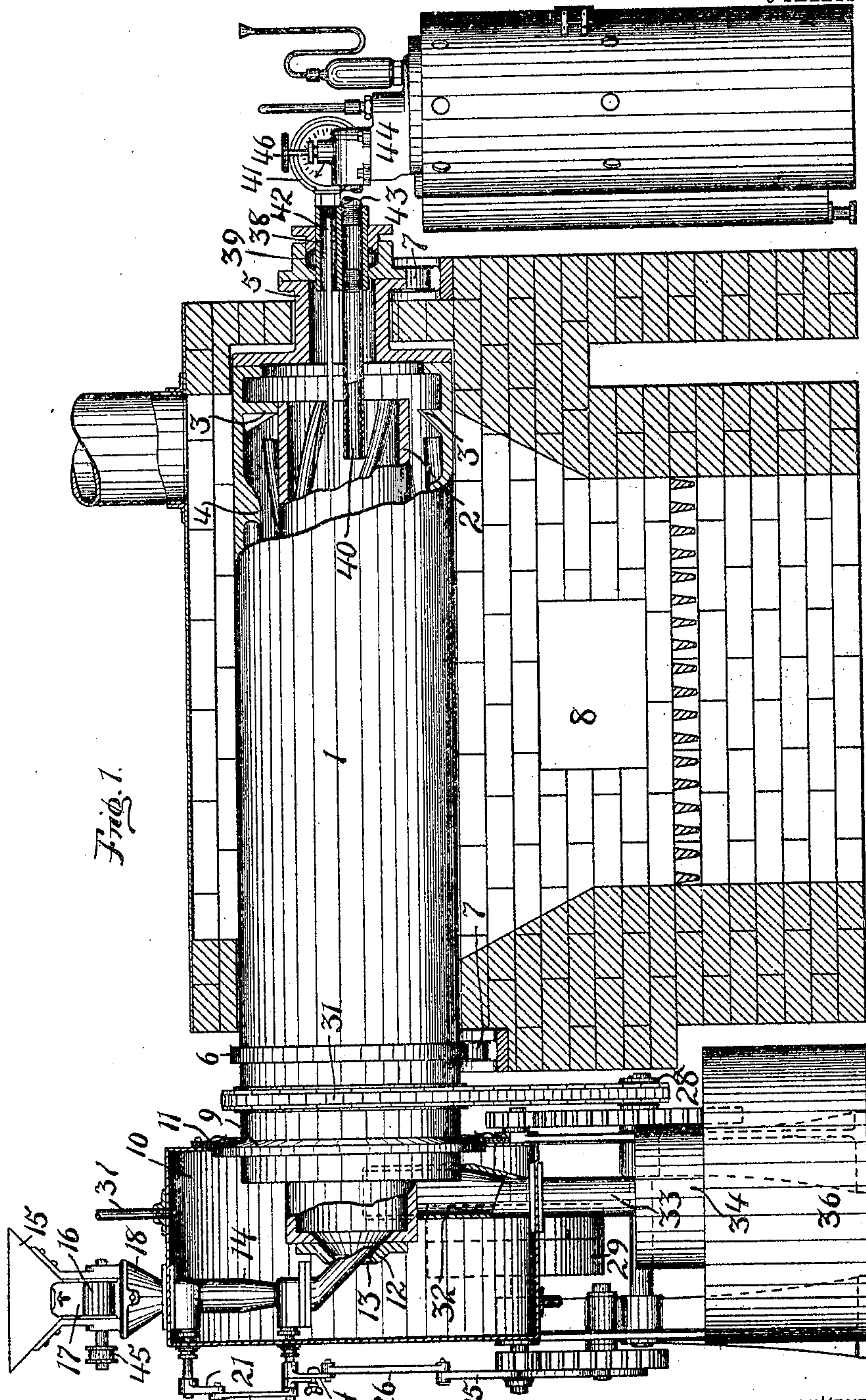


Fig. 1.

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Henry J. Horstmann

INVENTOR

BY A. G. Burns

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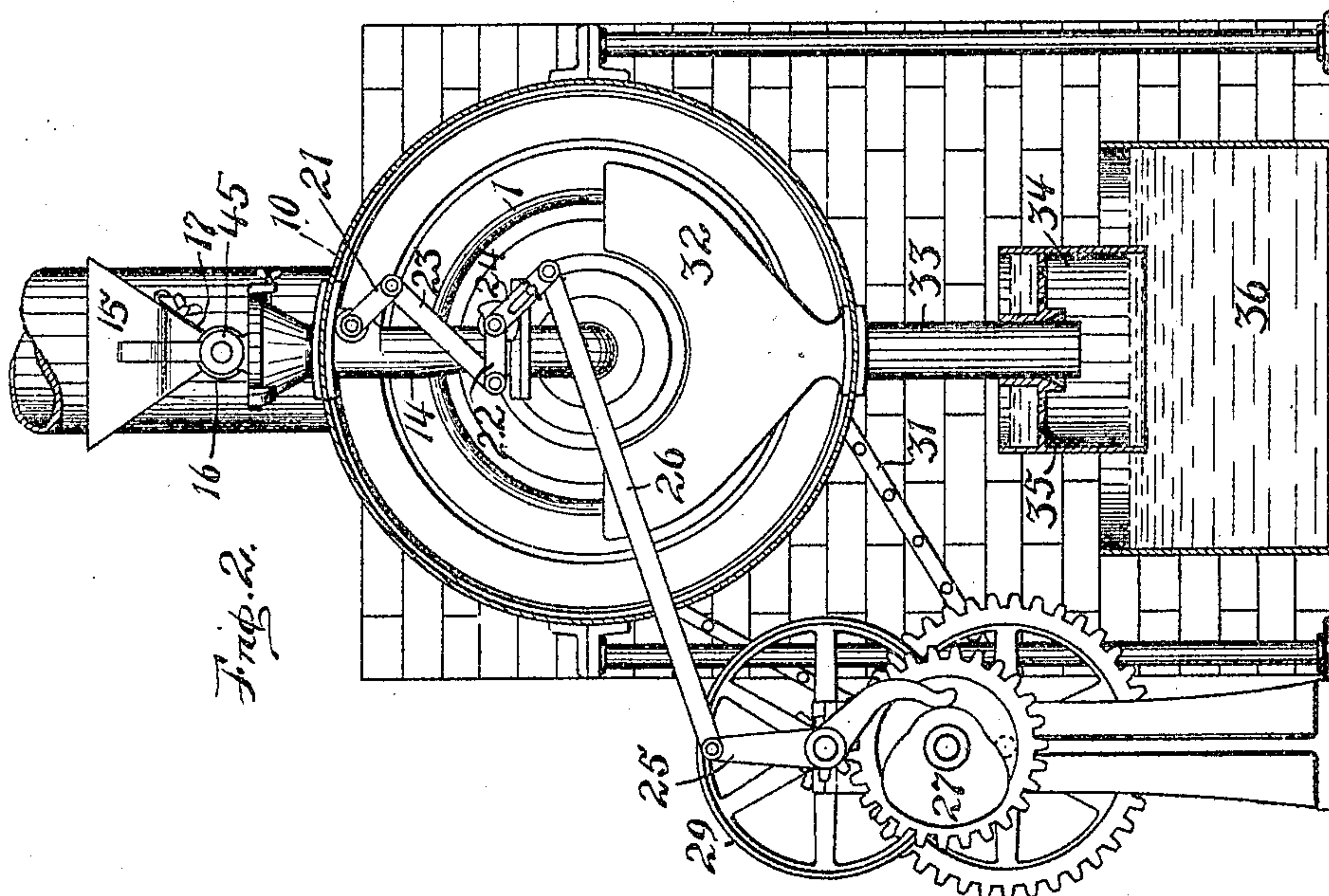
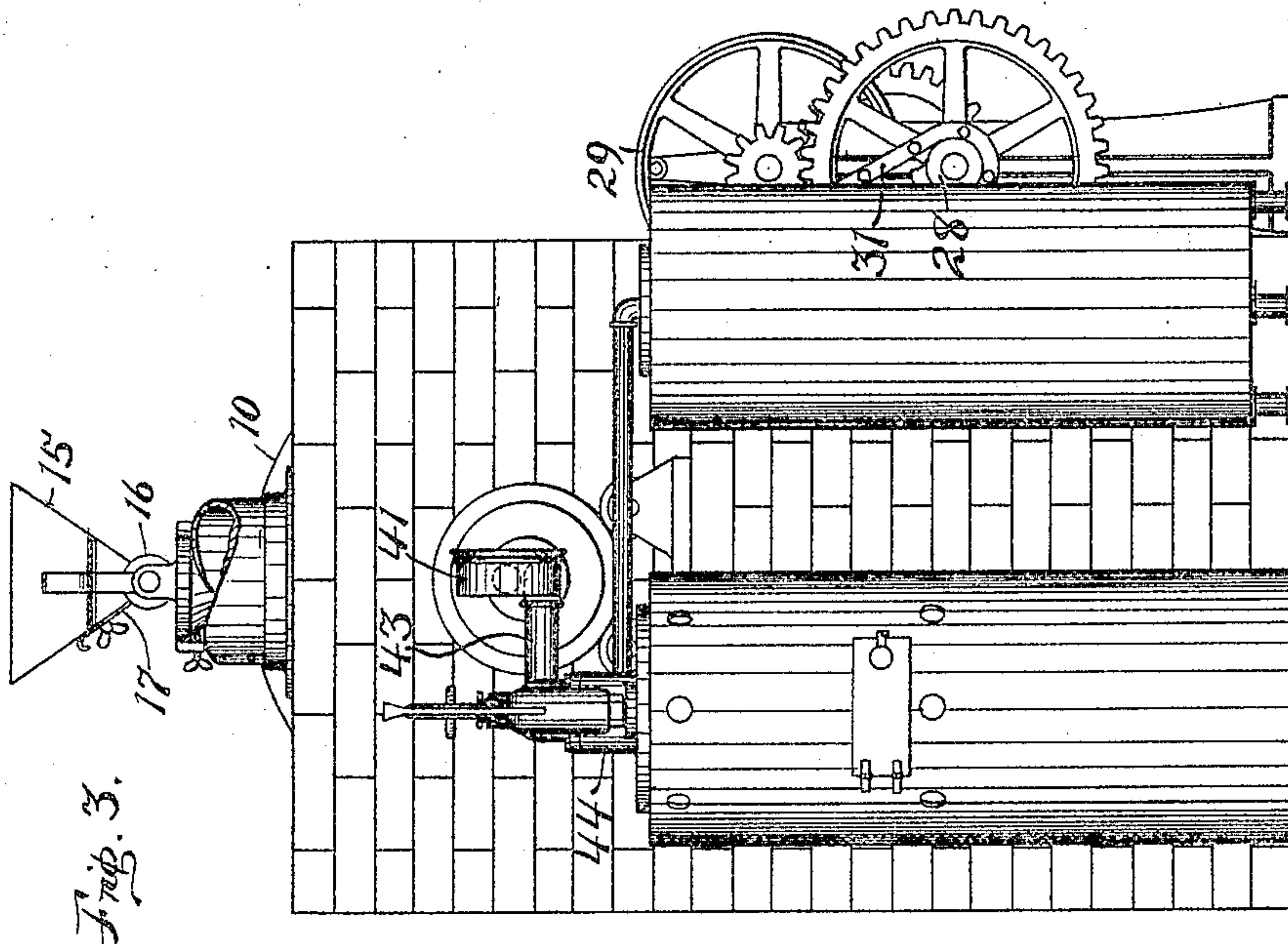
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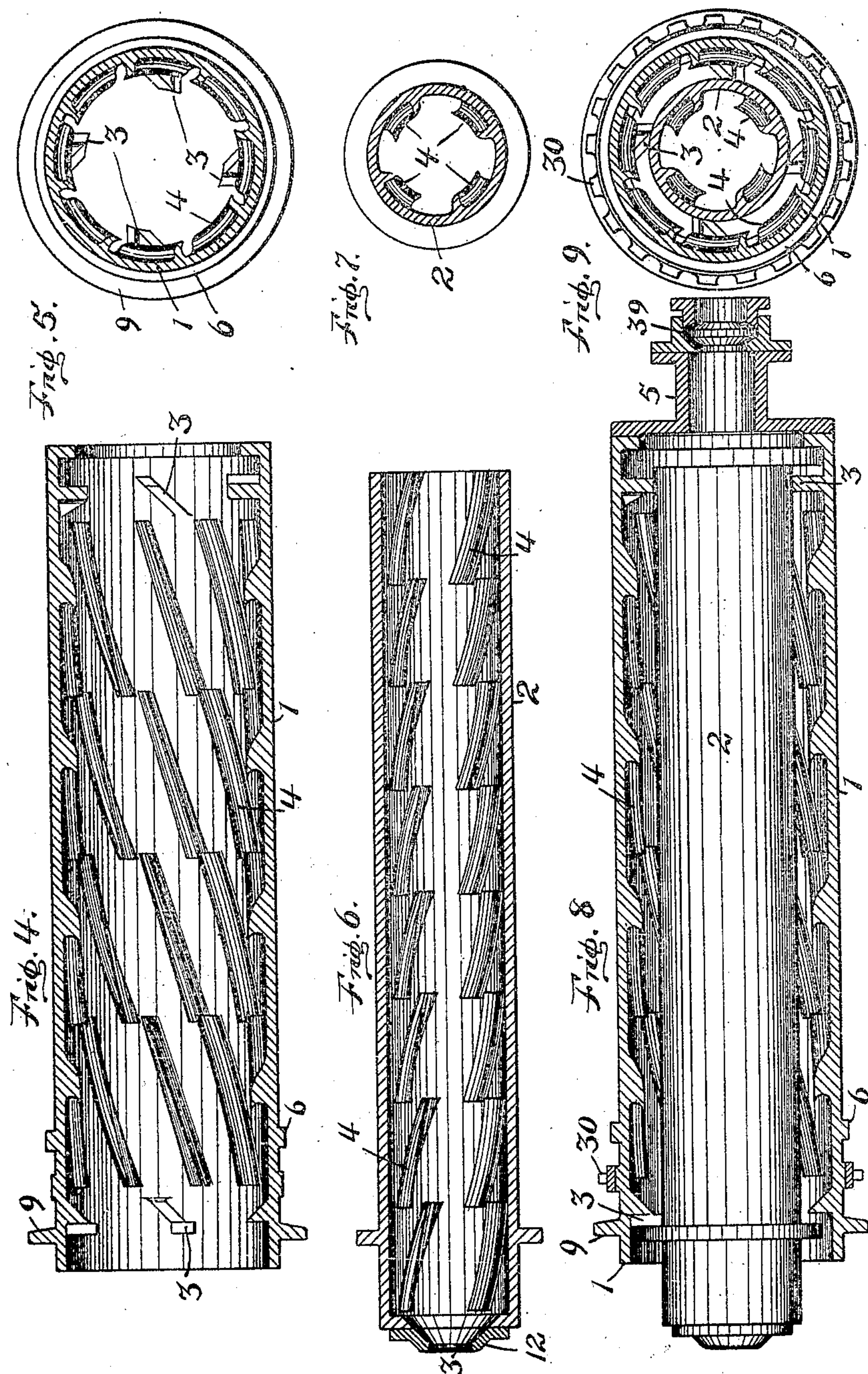
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6 SHEETS—SHEET 3.



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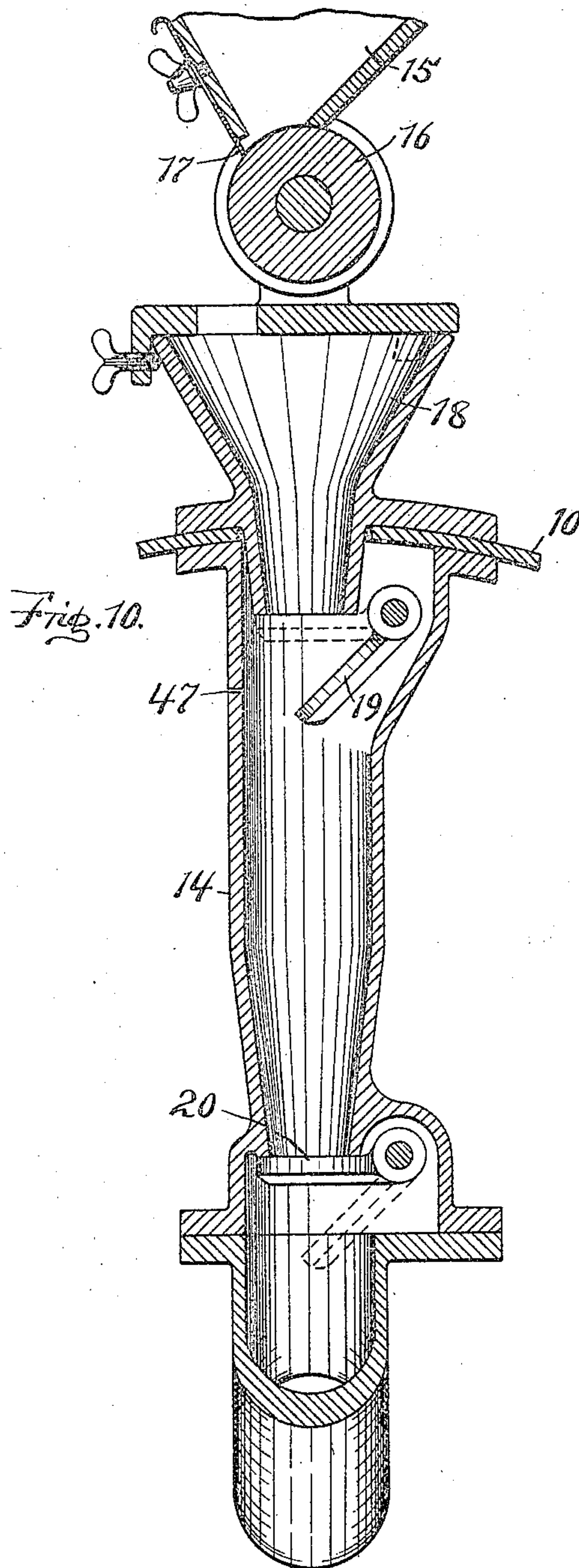
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6 SHEETS—SHEET 4.



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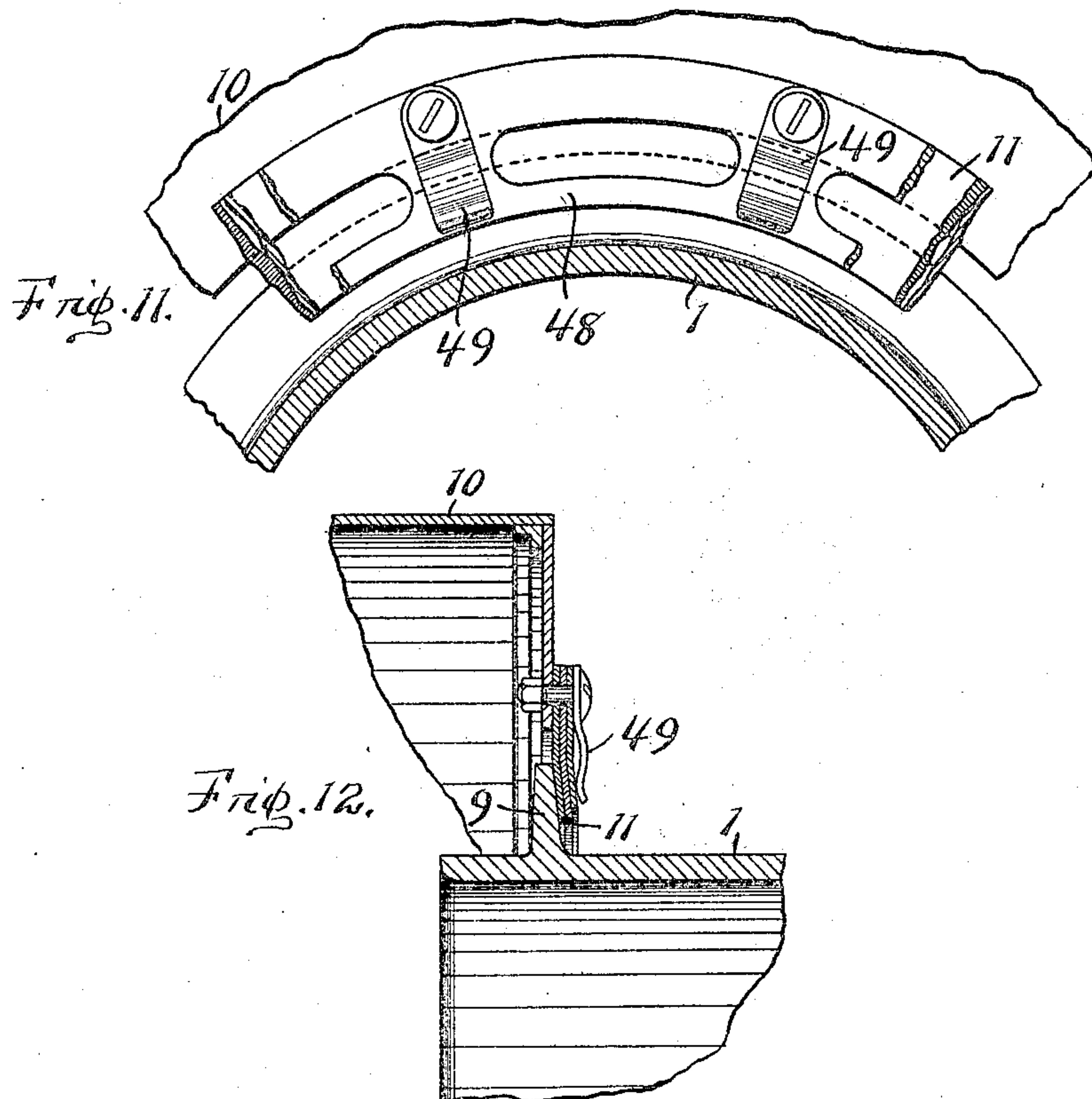
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5 SHEETS—SHEET 5.



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# UNITED STATES PATENT OFFICE.

HENRY J. HORSTMANN, OF FORT WAYNE, INDIANA.

## AMALGAMATOR.

No. 802,987.

Specification of Letters Patent.

Patented Oct. 31, 1905.

Application filed February 27, 1905. Serial No. 247,453.

*To all whom it may concern:*

Be it known that I, HENRY J. HORSTMANN, a citizen of the United States of America, and a resident of Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Amalgamators, of which the following is a specification.

My invention relates to improvements in mercury-vapor amalgamators; and the object thereof is to provide a suitable machine for carrying on continuously the application of mercury-vapor to ore without objectionable escape of mercury-fumes. This object is accomplished by the construction illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the machine, partly in central section. Fig. 2 is a front end elevation with the front of the hood in transverse section. Fig. 3 is a rear end elevation. Fig. 4 is a longitudinal section of the outer revolving barrel. Fig. 5 is a central transverse section of the same. Fig. 6 is a longitudinal section of the inner revolving barrel. Fig. 7 is a central transverse section of the same. Fig. 8 is a longitudinal section of the outer revolving barrel with the inner barrel mounted therein. Fig. 9 is a central transverse section of the same. Fig. 10 is a vertical section showing the feeding device. Fig. 11 is a detail view showing the construction of the joint between the hood and outer barrel. Fig. 12 is a detail view of said joint in section in a plane at right angles to that of Fig. 11.

Similar numerals of reference indicate corresponding parts throughout the several views, and referring now to the same—

1 and 2 are revolving barrels, the latter ranging in the former and supported by arms 3. In each of said barrels are numerous spirally-disposed wings 4. The outer barrel 1 has at its rear end a head 5 and an external tread-ring 6 near its opposite end and is supported upon rollers 7. The major part of said barrels extend into heating-chamber 8. At the forward end of the barrel 1 is an annular flange 9, and a stationary hood 10 incloses the forward ends of said barrels, the said flange having a frictional contact with a packing-ring 11, which is secured to said hood. The said packing-ring is composed of layers of asbestos reinforced upon the outside by a metallic plate 48, and said ring is held against the flange 9 by springs 49, which act against said plate. The forward end of the inner barrel 2 has a head 12, with a central opening 13 therein, and

a chute 14 extends down through said hood and through said opening 13.

A feeding device consisting of a hopper 15, with a revolving wheel 16 at its bottom and an adjustable gate 17 at its intersection therewith, is mounted upon a receiving-funnel 18, which forms a part of the chute 14. A valve 19 is arranged in the upper part of the chute and is adapted to close the lower end of said funnel 18, and a similar valve is located in said chute near the lower part thereof. The said valves have in connection therewith cranks 21 and 22, respectively, which are located external of said hood and are connected by a bar 23, so that when one of said valves is open the other will be closed. A lever 24 is fixed upon the stem of the lower valve 20 and has connection with a pivoted actuating-lever 25 by means of a bar 26. The lower end of the lever 25 has relation with a cam 27, to be actuated by rotation of the latter.

A sprocket-wheel 28 is mounted in connection with the driving mechanism 29, and a sprocket-ring 30 is secured around the barrel 1, and a driving-chain 31 is trained over said sprocket-wheel and ring so that said barrel will be rotated. It will appear that when the outer barrel is rotated the inner barrel mounted therein will be rotated accordingly.

A funnel 32 is arranged within the hood 10 and extends partially under the forward end of the barrel 1 and receives the discharge from said barrel, and a discharge-pipe 33 leads from said funnel 32 and extends externally of said hood. Upon the lower part of the discharge-pipe is secured a cylinder 34, having a perforated horizontal web 35 a short distance from its top, and the lower end of the cylinder 34 extends into water contained in a receiving-tank 36.

A pipe 37 leads from the upper part of the hood 10 and is intended for connection with suitable apparatus to cause slight vacuum within the hood and barrels.

A stationary plug 38 extends centrally into the head 5, and a packing-box 39 is provided to prevent leaking between the head and plug. A pipe 40 extends from said plug into the forward end of the inner barrel, and a pyrometer 41 is mounted in connection with the plug 38, with its stem 42 extending into the inner barrel 2. The pipe 40 is intended to charge the interior of the barrels 1 and 2 with vapor of mercury and for that purpose has connection by means of a pipe 43 with a retort 44, in which said vapor of mercury is generated.



The said retort and its appurtenants may be of any suitable construction capable of supplying the required vapor.

In the operation of this invention the cam 5 27 and the sprocket-wheel 28 are set in motion by the driving mechanism 29, and thereby the barrels will rotate continuously and the valves 19 and 20 will successively and alternately close and open. The wheel 16 of the feeding 10 device is also rotated continuously by means of its pulley 45. Heat is then applied to the barrels by building a fire in the heating-chamber 8, and when suitably heated vapor of mercury is supplied to said barrels by turning 15 the valve 46, which controls the supply from the retort 44. The ore to be treated is in pulverulent form and dry, and, if desired, may be hot when placed in the hopper 15. The ore thus supplied is carried by the rotating wheel 16 20 beneath the gate 17, from whence it gravitates into the chute 14, through which it passes as the valves 19 and 20 are actuated. A small vent 47 is made in the chute 14 to allow the passage of air or gas from within the hood into the chute, or 25 vice versa. From said chute the ore enters the inner barrel and because of the wings 4 is more or less disseminated within said barrel and caused to move therein toward its rear end, from whence it is discharged into the corresponding end of the outer barrel. The behavior 30 of the ore in the outer barrel is similar to that in the former barrel, except that its movement is in the opposite direction and is discharged at the forward end of said outer barrel into the funnel 32, from whence it passes 35 through the discharge-pipe 33 into the water in the tank 36. Water is suitably supplied to the cylinder 34, and a body of water is thereby maintained therein above the perforated web 35, and the water which passes 40 through the web condenses the vapor in the cylinder 34, which enters therein with the discharged ore from the pipe 33. The ore upon entering the tank 36 is chilled by the water 45 contained therein, and the escape of mercury-vapor is thereby prevented.

During the passage of ore through the barrels, as above described, the mercury-vapor contained in the barrels intermingles with the 50 ore, with the result that the amalgamable portion of the ore becomes more or less affected by the vapor, such as to render said portion readily recoverable by subsequent treatment with amalgamating-plates, such as are common 55 in the art for treating ore.

It is particularly desirable that the ore in passing through the machine shall undergo a change in temperature from one extreme at or above that of the vapor of mercury supplied 60 to the barrels from the retort down to a temperature somewhat lower, or vice versa. The proper degree of heat and the range of temperature to be employed is best determinable by more or less experimentation, since 65 ores vary in composition and degree of re-

belliousness. Likewise is determined the quantity of ore to be passed through the machine within a given period of time, as is also the volume of mercury-vapor to be supplied.

I claim—

1. In apparatus of the class described, a revolving barrel having internal spirally-disposed wings and being adapted to cause ore passing therethrough to become disseminated throughout its interior; a stationary vacuum-hood surrounding the discharge end of the barrel and having a closed relation therewith; a chute having valves therein and communicating with said barrel; a funnel within said hood and extending partially under the discharge end of the barrel; a receiving-tank adapted to contain water; a discharge-pipe extending external of said hood and connected with said funnel and communicating with said tank; and a retort having a connection 75 with said barrel for charging the interior thereof with vapor. 80 85

2. In apparatus of the class described, two revolving barrels each having spirally-disposed wings adapted to cause ore passing 90 therethrough to become disseminated throughout its interior, and one of said barrels being arranged within the other, and the inner barrel being provided with a head at one end with a central opening therein, and the outer 95 barrel having a head at its end opposite the head on the inner barrel; a stationary vacuum-hood surrounding the discharge end of the outer barrel and having a closed relation therewith and inclosing also the corresponding end 100 of said inner barrel; a chute communicating through said hood and head of the inner barrel; a receiving-tank adapted to contain water; a funnel adapted to receive the discharge 105 from the outer barrel and communicating with said tank; and a retort having connection with said barrels for charging the interiors thereof with vapor.

3. In apparatus of the class described, a heating apparatus having a heating-chamber 110 therein; a revolving barrel extending into said heating-chamber, the said barrel having internal wings adapted to cause ore passing therethrough to become disseminated throughout the interior thereof; a stationary vacuum-hood 115 surrounding the discharge end of the barrel and having closed relation therewith; a chute in connection with suitable feeding mechanism communicating through said hood and being adapted to supply said barrel with ore; a receiving-tank adapted to contain water; a funnel located at the discharge end of said barrel and having communication through said hood 120 with said tank; and a suitable retort having connection with said barrel for charging the interior thereof with vapor. 125

4. In apparatus of the class described, two revolving barrels each having internal wings adapted to cause ore passing therethrough to become disseminated throughout its interior, 130



and one of said barrels being arranged within the other; a head secured to each of said barrels respectively at their opposite ends; a stationary hood surrounding the discharge end of the outer barrel and having a closed relation therewith and inclosing also the corresponding end of said inner barrel; a chute communicating through said hood and head of said inner barrel; a receiving-tank adapted to contain water; a cylinder having a horizontal perforated web, the lower end of said cylinder extending into said tank; a funnel adapted to receive the discharge from the outer barrel and having a discharge-pipe in connection therewith which extends through the web of said cylinder; and means in connection with said barrels for charging the interiors thereof with vapor.

5. In apparatus of the class described, a rotative cylinder having internal wings adapted to cause ore passing therethrough to become disseminated throughout its interior; a stationary vacuum-hood surrounding the discharge end of the barrel and having a closed relation therewith; a chute communicating through said hood for supplying ore to said barrel; a funnel adapted to receive the discharge from said barrel and communicating through said hood; two valves located in said chute; a suitable driving mechanism connected with said barrel to actuate the same and having also a connection with said valves to successively and alternately actuate the same; and a suitable retort having connection with said barrel for charging the interior thereof with vapor.

6. In apparatus of the class described, a heating apparatus having a heating-chamber therein; a revolving barrel extending into said heating-chamber and having internal wings adapted to cause ore passing therethrough to become disseminated throughout its interior; a stationary vacuum-hood surrounding the discharge end of the barrel and having a closed relation therewith; suitable mechanism for supplying said barrel with ore; a tank having relation through said hood with said barrel and being adapted to receive the discharge therefrom, and a suitable retort having connection with said barrel to charge the interior thereof with vapor.

7. In apparatus of the class described, a revolving barrel having internal wings and being adapted to cause ore passing therethrough to become disseminated throughout its interior; a stationary vacuum-hood surrounding the discharge end of the barrel and having closed relation therewith; a suitable mechanism for supplying ore to said barrel; suitable apparatus communicating through said hood for receiving the discharge from said barrel and condensing the fumes passing therefrom; and a retort having connection with said barrel for charging the interior thereof with vapor.

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

HENRY J. HORSTMANN.

Witnesses:

J. W. DICKENS,  
H. J. LAMPKE.