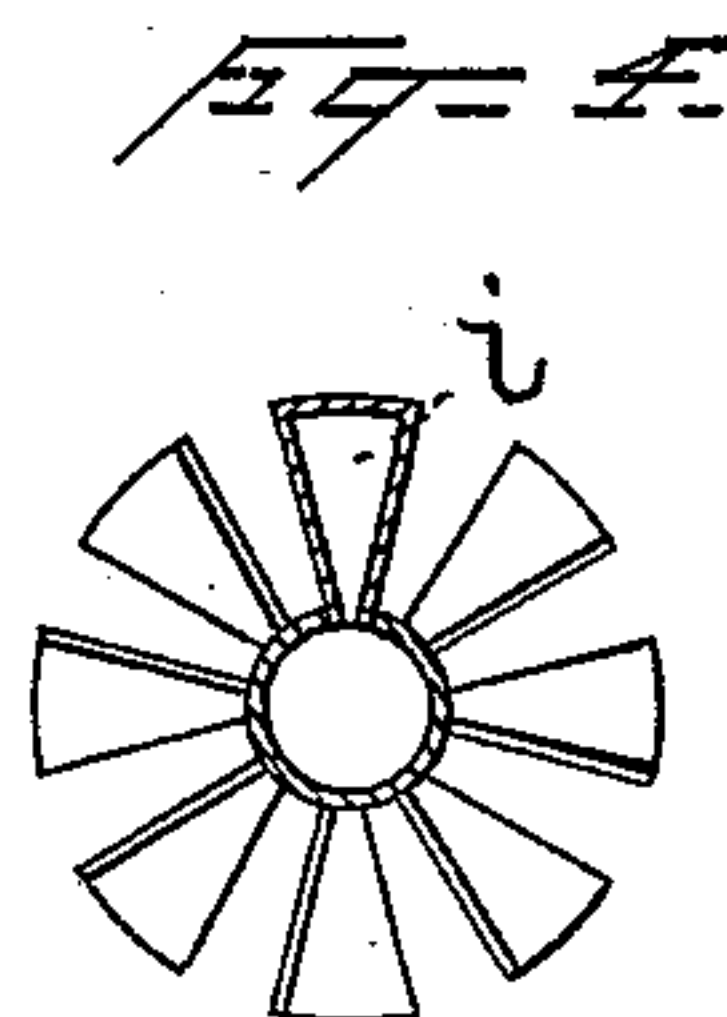
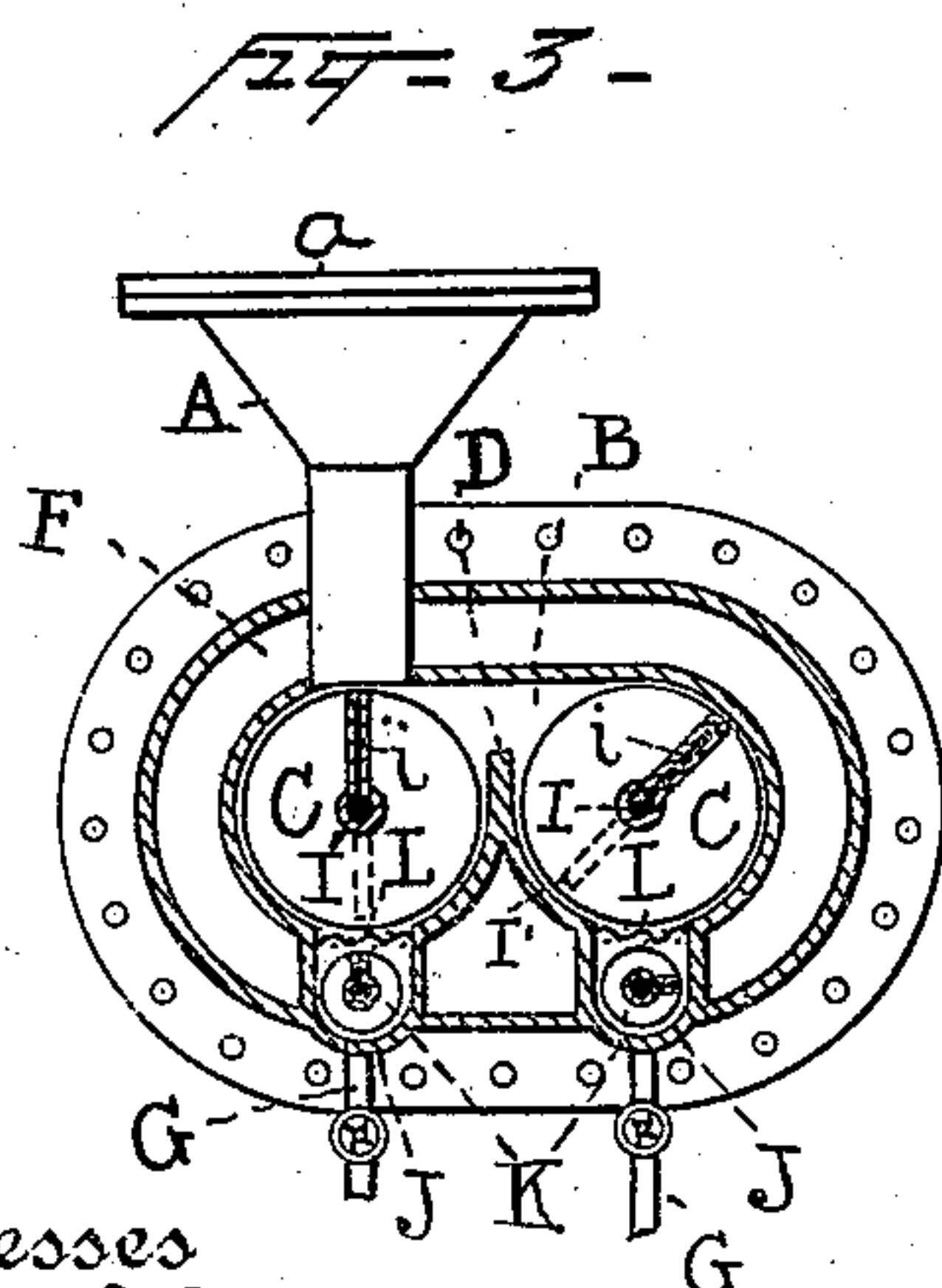
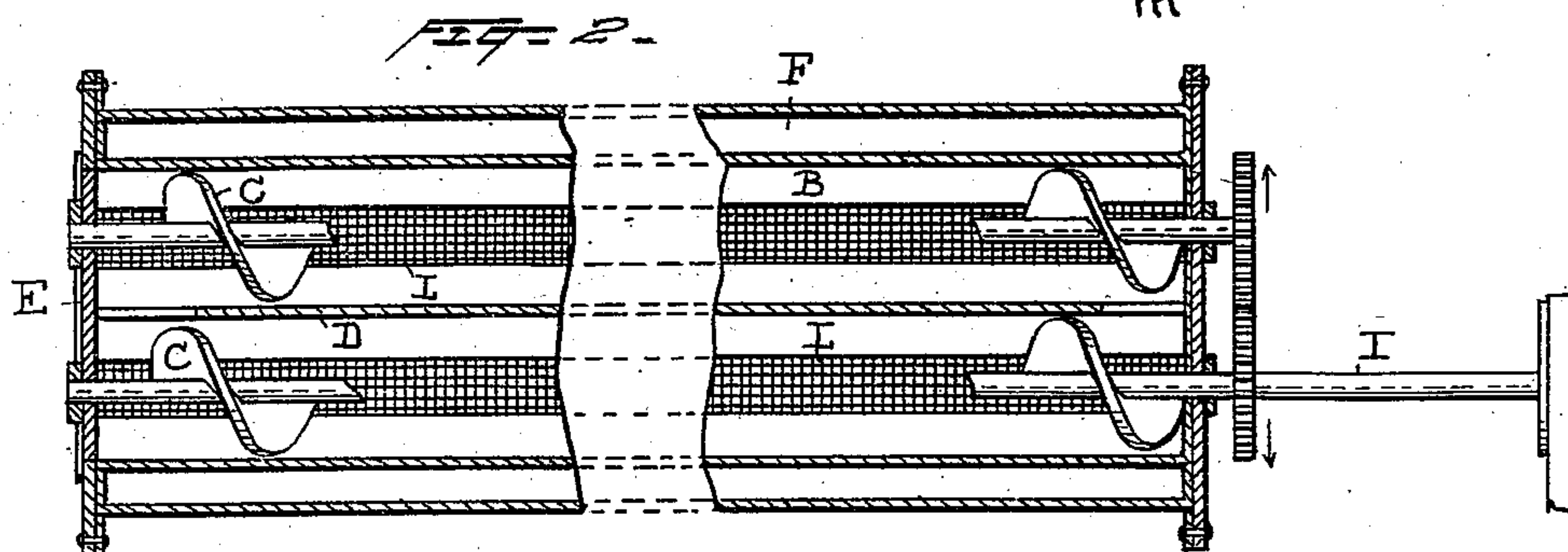
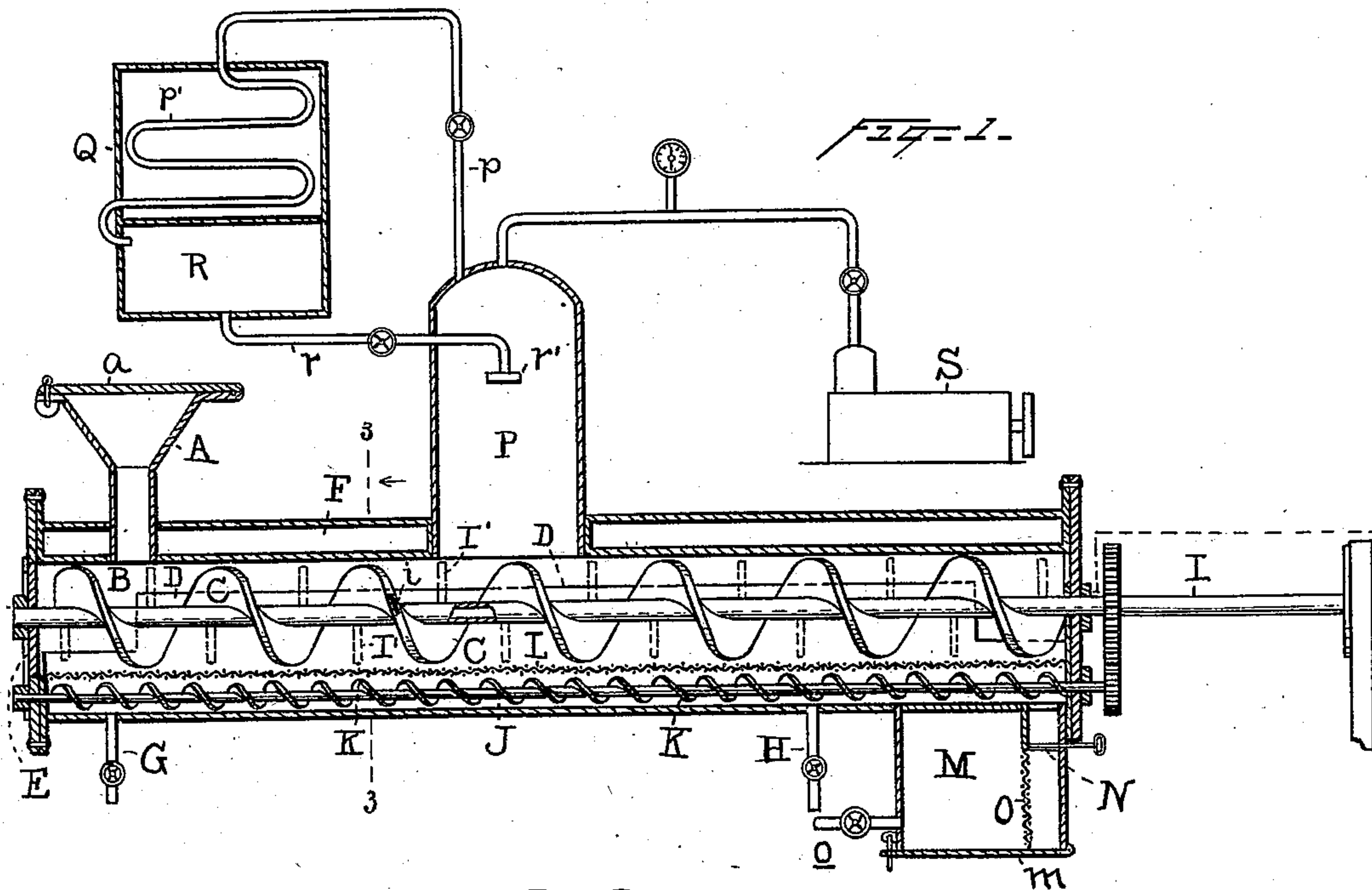


(No Model.)

W. S. PIERCE.  
APPARATUS FOR EXTRACTING OIL. .

No. 556,065.

Patented Mar. 10, 1896.



Witnesses  
 Morris & Clark.  
 John R. Taylor.

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# UNITED STATES PATENT OFFICE.

WALTER S. PIERCE, OF NEW YORK, N. Y.

## APPARATUS FOR EXTRACTING OIL.

SPECIFICATION forming part of Letters Patent No. 556,065, dated March 10, 1896.

Application filed July 27, 1894. Serial No. 518,702. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER S. PIERCE, a citizen of the United States, residing at New York city, in the county and State of New York, have invented a certain new and useful Improvement in a Combined Digester and Drying Apparatus, of which the following is a specification.

The object of my invention is an apparatus wherein can be carried on several successive steps desirable for the separation of oleaginous substances from such materials as cotton or other seed, refuse of any kind, &c., and drying the residue to convert it into a useful product—as, for instance, a fertilizer.

My apparatus is designed, first, to act as a digester, and is so constructed as to maintain the material undergoing treatment in a constant state of agitation, so as to insure a thorough and intimate mixture of the contents, which in most cases are composed of the material undergoing treatment and a solvent, usually of the hydrocarbon class, added thereto to facilitate the separation of the oils, fats, &c., from the balance of the material. Such separation is hastened by heating the material and its admixed hydrocarbon, preferably by means of a jacket to contain steam or other heating medium, surrounding the containing-vessel and mixer or stirrer.

Another step carried on in my apparatus is that of separating the admixed hydrocarbons from the oleaginous substances dissolved out of the material undergoing treatment. This is readily accomplished by continuing the heat in the surrounding jacket and preferably providing a space in which the hydrocarbon vapors may be collected and from which they may be drawn off to a suitable condenser.

Another operation which may be carried on in my apparatus is that of thoroughly drying the residuum remaining after having drawn off the dissolved oleaginous substances and the volatilized hydrocarbon vapors. This is preferably accomplished by employing a vacuum-pump to maintain a vacuum, heat being still maintained in the heat-jacket, whereby the moisture evaporated is drawn off, the operation of the stirring device being continued while the vacuum is on and thus facilitating the drying.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of an apparatus embodying my invention, represented partly in diagram. Fig. 2 is a plan view of the main part of my apparatus. Fig. 3 is a transverse section taken on the line 3 3 of Fig. 1; and Fig. 4 is an end view of a modified form of conveyer or stirrer, partly in section.

A is a hopper, through which the material to be treated is fed, and is provided with a cover *a* adapted to hermetically close the mouth of the hopper. This hopper feeds its material into a chamber B, wherein operates a screw or other conveyer C. This chamber B, as shown in the drawings, is provided with a pair of screw conveyers C, separated from one another by a partition D, which partition at each end is cut away for a portion of its length, so as to admit of the material being fed from one compartment to the other compartment, provision being made, as shown in Fig. 2, for the operation of the conveyers in opposite directions, whereby a continuous feed of the material undergoing treatment may be carried on over and over again through the machine. At one end the chamber B is hermetically closed by a door E, which also serves as the discharge-point for the dried residue when the same has been completely treated.

Surrounding the chamber B and other parts, as will be hereinafter explained, is a heat-jacket F, preferably supplied with steam through an entrance-pipe G, and having an exit-pipe H to keep up the circulation and draw off condensed moisture and water.

The conveyers C are preferably mounted on a hollow shaft I, and the blades or flights are themselves hollow, so that steam or other heating medium may be admitted thereto, whereby the material undergoing treatment will not only be heated from the steam-jacket, but also from the shaft and the blades or flights. I also mount on the hollow shaft I short arms I', also preferably hollow and communicating with the interior of said hollow shaft, so as to be heated by the steam admitted thereto. These arms are designed to facilitate the breaking up of the material undergoing treatment.

In Fig. 4 I have shown a modified form of



conveyer, the blades being hollow, as shown, and separated from one another, whereas in Fig. 1 the screw is continuous, although hollow, as shown at *i*. Steam may be admitted and  
 5 kept in circulation in the hollow shaft and blades or screw in any of the well-known ways.

Beneath each of the conveyers C is located, in a chamber J of smaller dimensions than the chamber B, a smaller conveyer K, which  
 10 conveyer, however, need not be heated. The chambers J and B communicate, being separated merely by a sieve or screen L, said chambers J being designed to receive the fatty substances and water separated from  
 15 the contents of the chamber B.

M is a vessel located at the discharge end of the chamber or chambers J, wherein are collected the oils, fats, &c., fed forward by the conveyer K through said chamber J.  
 20 This vessel M is provided with a gate or valve N, to be opened at suitable intervals to permit the contents of the chamber J to flow off, and is divided into two compartments by a sieve O, whereby whatever solid matter may  
 25 enter with the liquid fatty substances will be separated, such liquid substances being drawn off through the pipe *o*. A hinged bottom *m* permits the solid accumulations in the compartment behind the screen to be re-  
 30 moved.

P is a chamber in which are collected the hydrocarbon vapors, which pass off through pipe *p* to the condenser-worm *p'* in the condenser Q, and thence as a liquid into the  
 35 chamber R, which may form a part of the condenser, as shown, or be a separate vessel. From this vessel R the hydrocarbon is again carried to the apparatus through the pipe *r*, and discharged preferably in the dome P  
 40 through a rose or other spray *r'*.

S is a vacuum-pump, communicating by pipe *s*, as shown, with the dome or chamber P.

The operation of my apparatus may be described as follows: A quantity of material to  
 45 be treated equal to the cubic capacity of the chamber B (and by the chamber B, I include its divisions) is introduced through the hopper A and the solvent poured in upon it, and the lid of the said hopper is closed and her-  
 50 metically sealed. Preferably the solvent suitable to the material undergoing treatment is showered upon the top of the material in the chamber B from the dome P and while said material is being fed past said dome, so as to  
 55 secure an equable distribution of the solvent. The quantity of solvent to be employed will of course depend upon the nature of the material undergoing treatment. Steam, if that is the heating medium employed, may, while  
 60 the solvent is being admitted, be circulated through the steam-jacket F. The solvent will dissolve out the fats, oils, water, &c., contained in the material undergoing treatment, and the liquids will percolate through such  
 65 material and into the chambers J, the screen L serving to keep out solid material from such chambers. Meanwhile the hydrocarbon

solvent is being volatilized by the continued heating action of the jacket F and creating a pressure. I prefer that the pressure should  
 70 be about forty pounds per square inch, which causes the hydrocarbon to permeate thoroughly every particle of the material treated.

It will of course be understood that the temperature of the jacket F, while sufficient  
 75 to volatilize the hydrocarbons, is not high enough to volatilize or burn the fats, &c., which it is desired to recover. In addition to the heat from the jacket F, by admitting steam to the hollow shaft and blades of the  
 80 propeller and the arms I' thereof I insure that the center of the mass undergoing treatment will likewise be heated, thereby securing a uniform heat for the entire mass being treated.

As desired, the gate N may be opened and  
 85 the liquid fats, &c., accumulated in the chambers J drawn off into the vessel M and thence into other vessels, as desired. When all the fats have been rendered and drawn off, I next proceed to remove the volatilized hydrocar-  
 90 bons. This is done preferably through the pipe *p* by operating the cock therein and permitting said vapors to pass through the worm *p'* in the condenser Q, where the vapors are converted into a liquid. From thence the  
 95 liquid is fed to a suitable vessel R, from whence it may again be carried to the dome P or other point where it is to be introduced. In this connection it is well to state that I prefer to apply the hydrocarbons in the form  
 100 of a spray, as shown, so as to insure an intimate commingling of the same with the material to be treated.

When the hydrocarbons and fats have been withdrawn, it then remains to dry the resi-  
 105 due. This is accomplished quickly by operating the vacuum-pump S while the conveyers or stirrers C are continued in operation, it being understood that heat is maintained in the jacket F and also in the hollow con-  
 110 veyer.

When the material is suitably dried, it may be discharged by opening the door E at the end of the chamber B, when the conveyer  
 115 will feed it out.

By the arrangement shown in the drawings it will be apparent that a continuous feed of the material undergoing treatment through the apparatus may take place; likewise that  
 120 by a reversal of the direction of the gears at intervals the direction of feed may be changed. So, also, but one chamber and one condenser might be used, and by reversing the latter at proper intervals it would cause the material to be fed back and forth.  
 125

I claim—

1. The combination with two compartments, through each of which is conveyed the material in process of treatment, of a divid-  
 130 ing-partition cut off at each end, a screw conveyer in each compartment, and means for rotating same in opposite directions whereby a continuous feed from one compartment to the other of the material undergoing treat-



ment is obtained, substantially as and for the purpose set forth.

2. The combination with a pair of compartments, of a dividing-partition cut off at each end, a conveyer in each compartment, means for rotating same in opposite directions, whereby a continuous feed from one compartment to the other of the material undergoing treatment is obtained, a second chamber for each compartment, a sieve separating each chamber from its compartment, and a conveyer for each second chamber, substantially as set forth.

3. The combination with a pair of compartments, of a dividing-partition cut off at each end, a conveyer in each compartment, means for rotating same in opposite directions, whereby a continuous feed from one compartment to the other of the material undergoing treatment is obtained, a chamber beneath

the aforesaid compartments and separated therefrom by a sieve, and a conveyer in said lower chamber, substantially as set forth.

4. In an apparatus for treating fat-bearing substances, the combination of a semicylindrical trough or compartment having smooth imperforate walls, and with a screen occupying a small section at its lower portion, a second compartment beneath the same for receiving the liquid portion of the material passing through said screen, and a single conveyer in each of the compartments, substantially as set forth.

This specification signed and witnessed this 20th day of July, 1894.

WALTER S. PIERCE.

Witnesses:

EUGENE CONRAN,  
JOHN R. TAYLOR.