

No. 618,791.

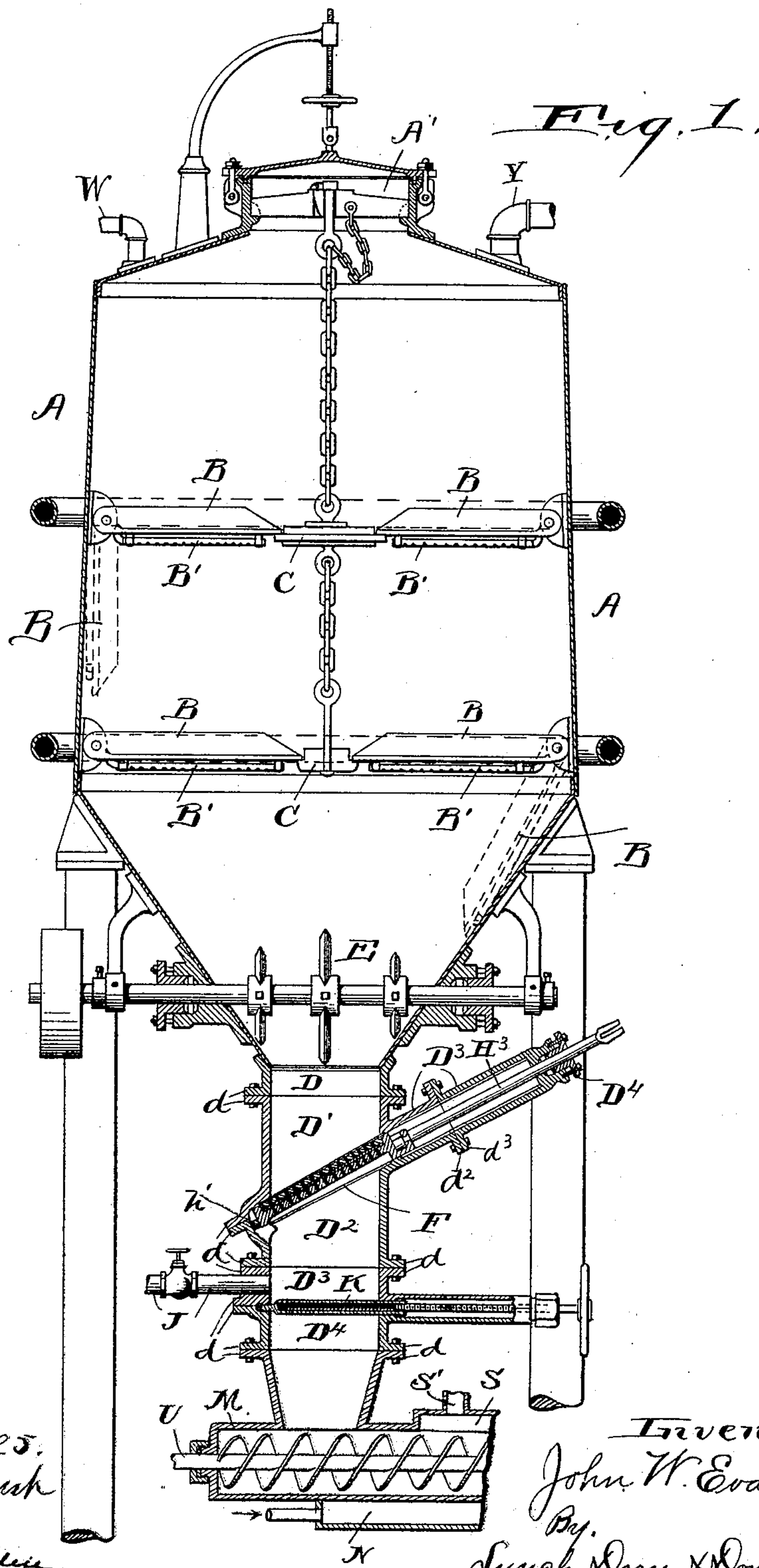
Patented Jan. 31, 1899.

J. W. EVANS.
APPARATUS FOR EXTRACTING OIL.

(Application filed Apr. 8, 1896.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses:
E. B. Gilchrist
Ella E. Tilton

Inventor:
John W. Evans.
By:
Synch. Dorner & Donnelly,
his Attorneys.

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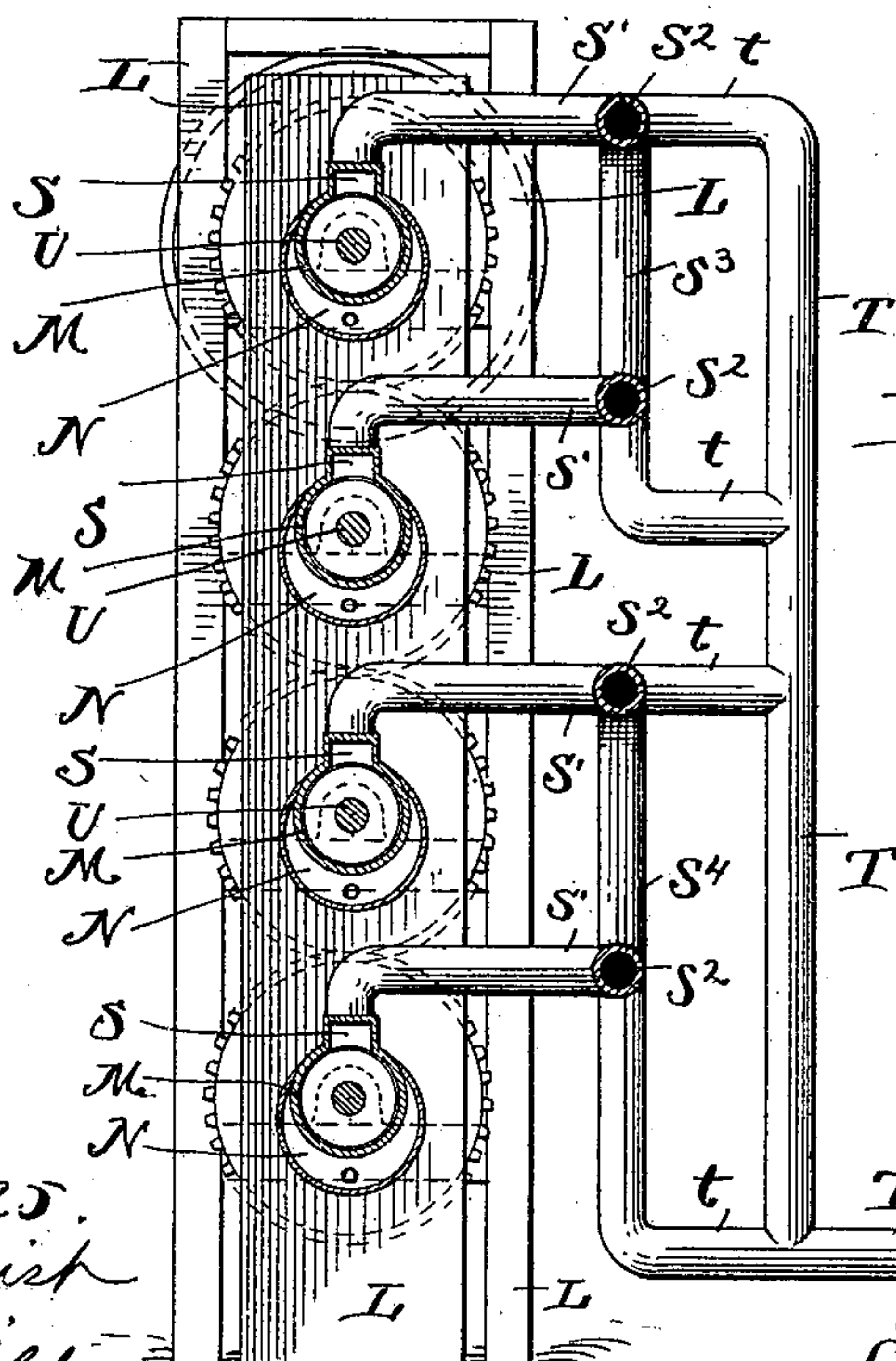
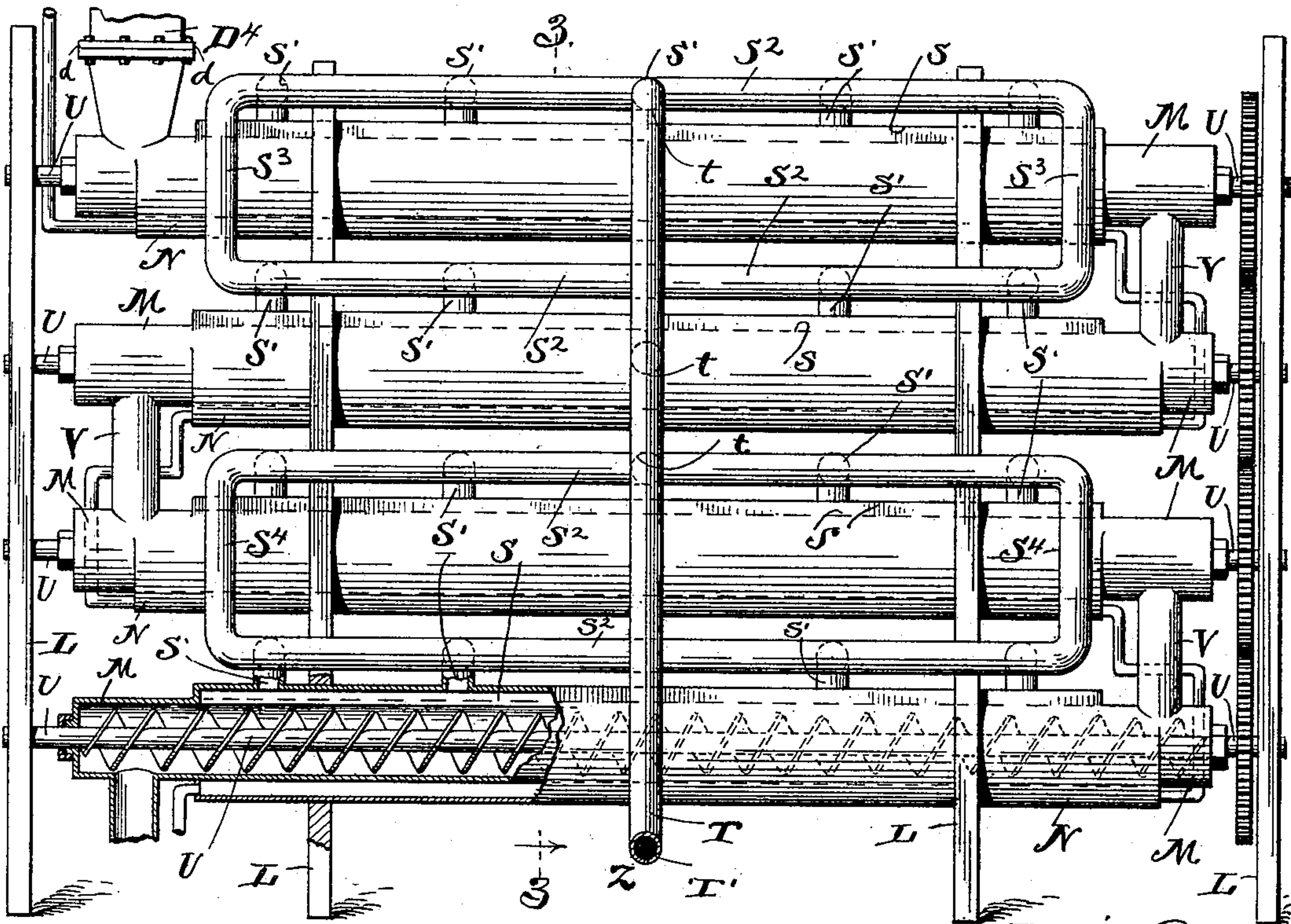
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(No Model.)

4 Sheets—Sheet 2.



Witnesses.
E. B. Gilchrist
Ella E. Tilden

In witness whereof
 I, John W. Evans,
 Clerk of the Court,
 do hereby certify that
 the foregoing is a true
 and correct copy of
 the original of the
 same as the same
 is on file in the
 office of the Clerk of
 the Court.
 In testimony whereof
 I have hereunto
 set my hand and
 the seal of the
 Court at
 the City of
 New York, this
 10th day of
 January, 1881.
 John W. Evans,
 Clerk of the Court.

No. 618,791.

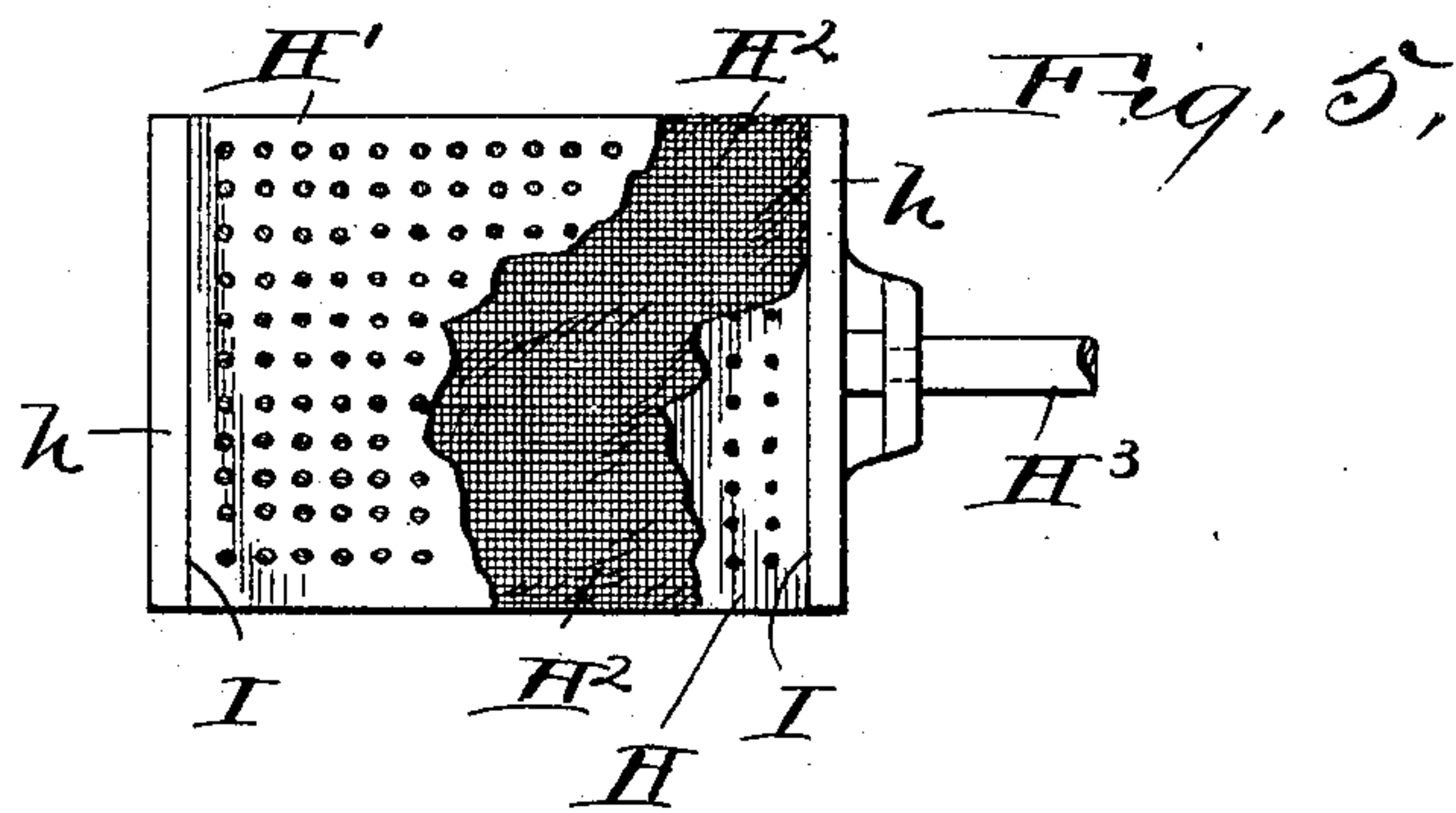
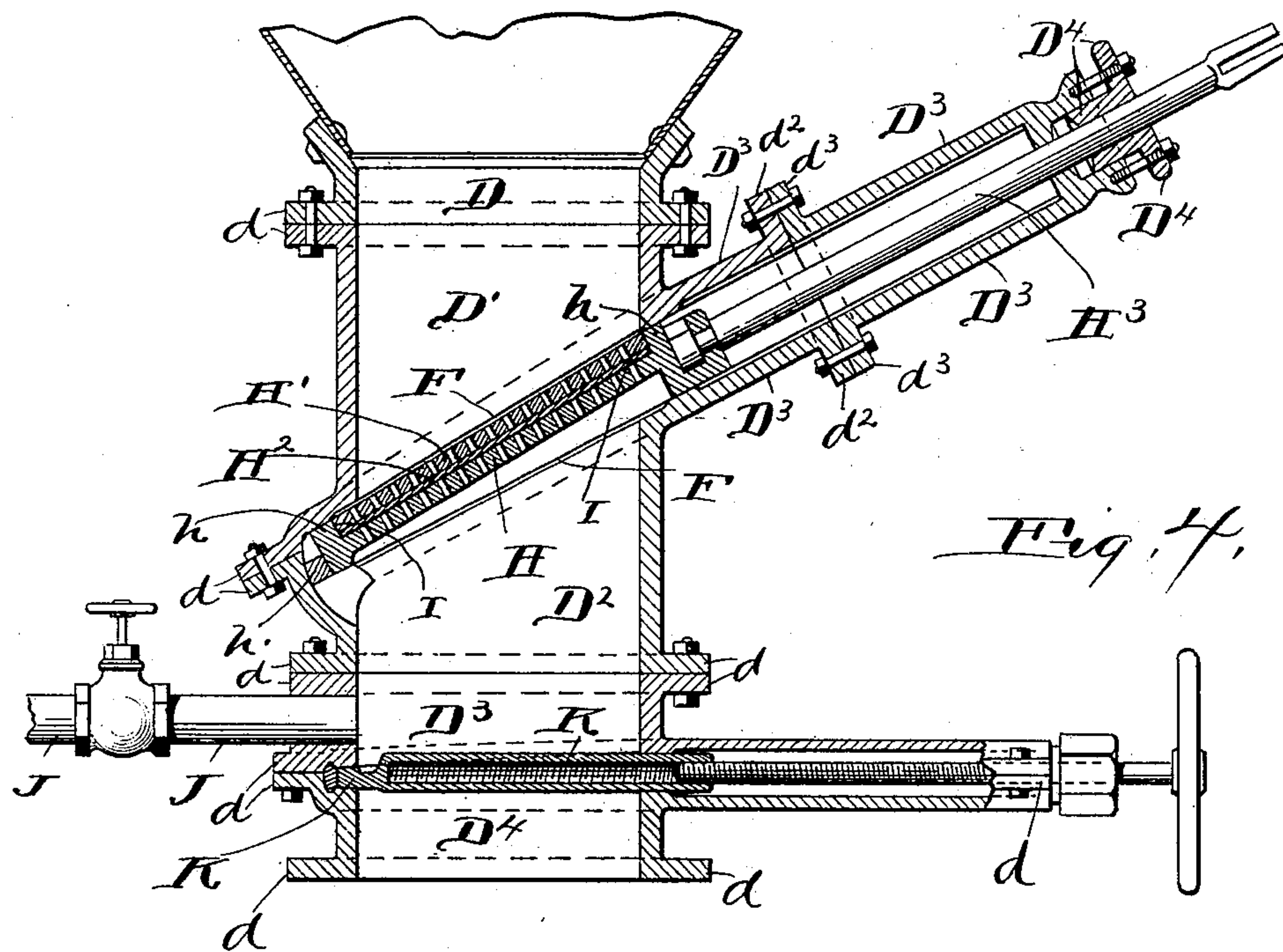
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4 Sheets—Sheet 3.



Witnesses,
E. B. Gilchrist
Ella E. Tilden

Inventor:
John W. Evans.
By
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his Attorneys.

No. 618,791.

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(No Model.)

4 Sheets—Sheet 4.

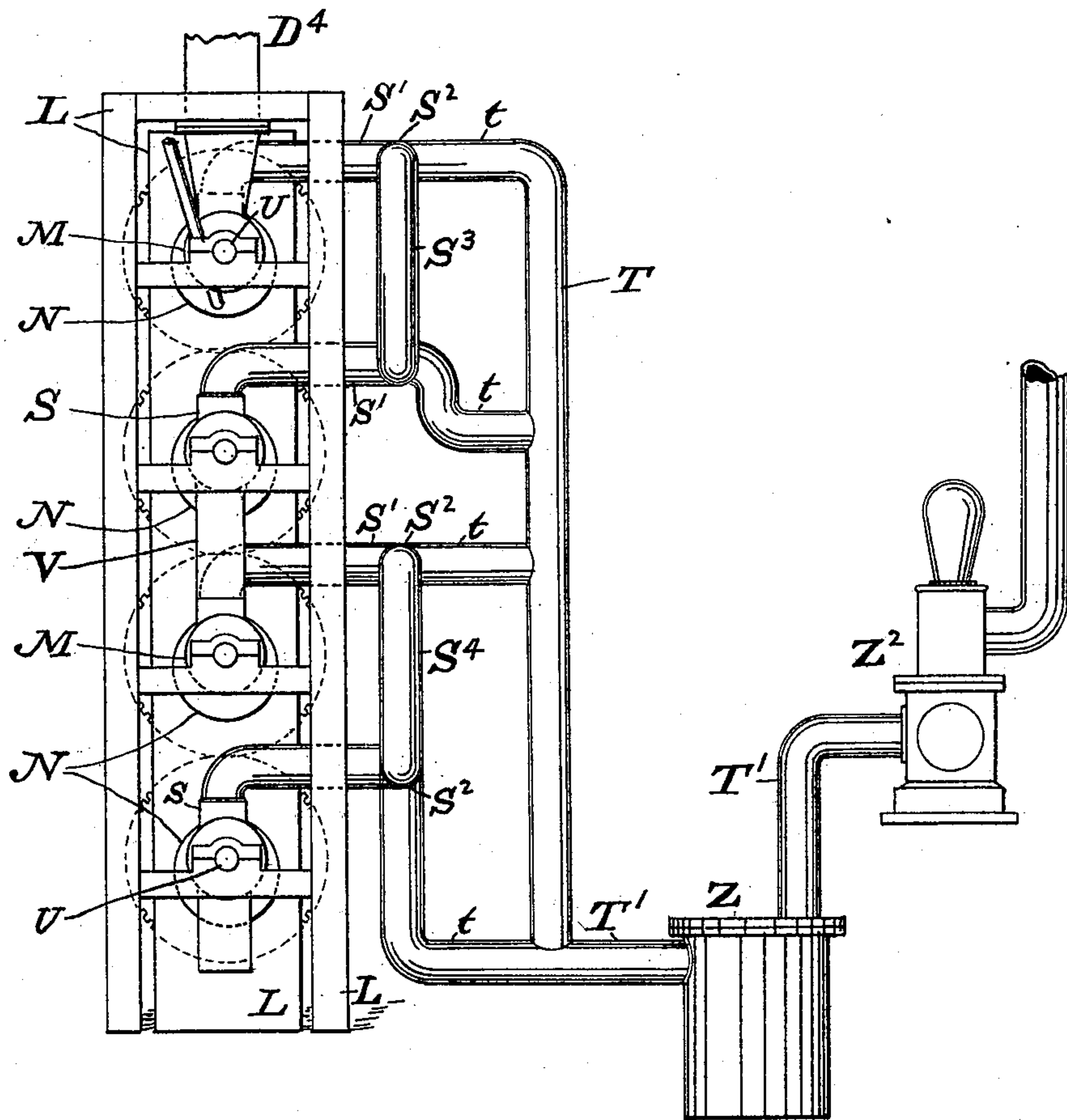


Fig. 6

Witnesses
L. J. Randall.
L. B. Smith

John W. Evans Inventor
By his Attorney
C. W. Vance

UNITED STATES PATENT OFFICE.

JOHN W. EVANS, OF CLEVELAND, OHIO.

APPARATUS FOR EXTRACTING OIL.

SPECIFICATION forming part of Letters Patent No. 618,791, dated January 31, 1899.

Application filed April 8, 1896. Serial No. 586,677. (No model.)

To all whom it may concern.

Be it known that I, JOHN W. EVANS, of Cleveland, Cuyahoga county, Ohio, have invented certain new and useful Improvements in Apparatus for Extracting Oil from Grain and other Oil-Containing Material; 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 pertains to make and use the same.

My invention relates to apparatus for the treatment of grain, seeds, and other vegetable matters by the solvent process for the extraction of their contained oil when such grain, seeds, &c., are designed for or susceptible of subsequent treatment and use in the manufacture of other products from their remaining constituents—as, for instance, the manufacture of whisky, alcohol, beer, &c.

The object of my invention is to utilize and save such oil which in the ordinary process of manufacture is wasted; and my invention consists in the novel apparatus especially designed for such purpose, although applicable also to other uses.

In the drawings, Figure 1 is a view in elevation of a percolator especially designed for use in the extraction of oil by the solvent process. Figs. 2 and 3 are respectively side elevations and sectional views of a device especially adapted for separating the remaining solvent from the meal or other material after the oil has been extracted. Figs. 4, 5, and 6 show enlarged views of some of the details.

A represents a percolator provided with the usual feeding or charging opening A' at its upper end and also the usual solvent and vent pipes W and Y, as will be hereinafter set forth. Breakers or supports B B may be also provided for holding up the mass in the percolator to prevent it from packing, these breakers being preferably provided with pipes B' B' for introducing hot air into the mass after the oil and solvent have been drawn off.

The breakers are supported at their outer ends in any suitable manner on the sides of the percolator and are held in horizontal position at their free ends by a suitable support, such as a ring or center piece C, which is suspended from a chain C', which in turn extends from the top of the percolator and is operated either to raise or lower it in any

suitable manner—such, for instance, as the manner shown in the drawings. It will be understood that these breakers are loosened at their inner ends when it becomes desirable to empty the percolator of the material, and when thus loosened they will fall or drop down and lie against the sides of the percolator, as shown in dotted lines in Fig. 1.

At the lower end of the percolator, which is preferably formed funnel-shaped, is the discharge-opening D, both for the mixed solvent and oil or for the meal, as it is desired or becomes necessary to discharge either the one or the other. Directly above the discharge-opening D is an agitator E, provided with radial teeth and so constructed and attached as to be revolved when it is desired to empty the meal or crushed material as it falls and to keep it from becoming clogged or from choking the outlet D.

Inasmuch as the discharge-opening at the lower end of the tank is used for the purpose of discharging either the mixed solvent and oil or the meal or other material I have provided suitable valve mechanism whereby either function may be performed, as desired, without interference. This construction is as follows:

The lower end of the discharge-opening is elongated and formed into a spout D' D² D³ D⁴, made in sections and joined by means of flanges *d d d d* and suitable bolts passing through them. I prefer to form this spout rectangular in cross-section, but do not limit myself to such shape. Between two of the sections, as D' D², or at that part where they meet, I form a valve seat or way F, tapering toward the lower end and inclined toward one side, as are also the flanges and meeting joint of the sections D' and D².

In the seat or way F is a valve H of peculiar construction especially designed for and adapted to my device. This valve consists of a perforated plate H, which is provided with upwardly-projecting flanges or ledges *h*, which form a depression or pan-shaped recess *i*, into which is fitted a perforated plate H'. Between the plates H and H', I place a filtering cloth or medium H² of such character as to freely admit of the passage of the oil and solvent and prevent the passage of the particles of meal or other material being acted upon.

Plate H' is retained in its seat on plate H in any suitable manner, so that it may be easily removed in order to replace the filtering medium or cloth when it becomes necessary to do so. I have shown the top plate held down by the upper ledge of the valveway and the weight of the material in the percolator.

H³ represents a valve-stem secured in any manner to valve H and extending through a casing D³, provided at the side of the spout D' D², and thence through a stuffing-box D⁴ at the outer end of the casing D³. The casing D³ is partly formed by extensions which are integral with the spout D' D² and which are provided with flanges d² d², and at the outer end is formed by a casing, which is also flanged at d³ and attached to flanges d² d². All the flanges or joints are provided with suitable gaskets or packing. The casing D³ is chambered, so as to accommodate the valve H when it is drawn back by means of the stem H³, and a rubber packing may be provided at h', against which the inner end of the valve abuts when closed, thus forming a tight joint. By thus seating the valve the mass in the spout beneath the agitator is more or less prevented from packing, as it would were the valve at right angles to the spout or directly horizontal. The meal or other material will also feed through more easily when the valve is partly opened on account of its inclining, as shown, and hence the feed will be better regulated, inasmuch as the material will tend to slide down the incline instead of packing. The object of flanging the outer part of the casing D³ to the inner part is to admit of its being removed in order that the valve H may also be removed and repaired or provided with a new filtering cloth or medium. Any suitable mechanism, such as a lever, may be secured to the outer end of the valve-stem H³ to operate the valve. Beneath the valve H and communicating with the spout D' D² is a pipe J, which carries off the mixed oil and solvent to any suitable tank or device for separating the oil from the solvent. This pipe is preferably, but not necessarily, in part D³ of the spout and at the lower end of the space between the two valves.

K represents a slide valve or gate which is located beneath the pipe J and is preferably seated between the parts D³ and D⁴ of the spout. This valve seats oil-tight, so as to prevent the passage of any of the oil and solvent which passes through the holes and filter in valve H. It will thus be seen that all the mixed oil and solvent will pass out through the pipe J, inasmuch as the valve K is always kept closed or seated while the process of extracting the oil is in progress.

After the oil has all been extracted from the meal or other material and run off, with the solvent, through pipe J the valve in said pipe J is closed and the valves K and H are opened,

so as to leave a free passage through spout D' D² D³ D⁴. The agitator E is now set in motion and the breakers loosened, and the meal or mass is properly fed through the spout into a device especially adapted to purge it of the solvent used in extracting the oil therefrom. The solvent-extracting device is constructed substantially as follows:

Upon any suitable frame L L is mounted a number of long cylindrical conduits M M M M, which are wholly or partly incased by jackets N N N N, preferably communicating with each other. At the upper part of the casings M M vapor-chambers S are provided, said chambers communicating with the interior of the casing M and in turn being provided with vapor-pipes S', which in turn communicate with horizontal pipes S². The pipes S² are connected at their ends, as at S³ and S⁴, and at their central part they communicate with a vertical pipe T through suitably-arranged pipes t t t t, the whole system communicating with a pipe T', which may lead to a suitable vacuum-pump Z².

U U represent shafts extending through the casings M M, said shafts having conveying devices secured thereto and operated thereby in such a manner as to feed or carry the meal along to the ends of the casing M in alternately opposite directions, a connecting-spout V being provided between the casings for the passage of the meal from one to the other as it is carried to the ends of the casings. Suitable gearing is secured to the shafts, so as to operate them in the proper direction to carry the meal and feed it from one casing to the other.

Although I have described and shown my preferred apparatus as I wish to construct and operate it, still I do not wish to be understood as limiting myself to the exact construction herein described and shown, as it is apparent that modified constructions may be used without departing from my invention.

The main purpose for which my apparatus is designed is to extract and save the oil from seeds, grain, &c., as a preliminary step to the utilization of such seeds, &c., in other manufactures, and it is therefore important that such extraction should be so conducted as not to impair the availability of the material treated for use in such further manufacturing treatment. To effect this, I employ a solvent process founded in some respects upon the general principles of the solvent process heretofore employed for extracting oil, but in some respects modified therefrom and supplemented by additional features. The grain or other material from which the oil is to be extracted having been suitably ground or crushed, as the case may require, is placed into the percolator through the opening A' at the top of the percolator, and said opening being then properly closed and sealed the solvent, such as naphtha or like highly-

volatile substances, is introduced through a pipe W, which conveys the solvent from a tank preferably located above the percolator. After the mass or material in the percolator is thoroughly saturated with the solvent the valve in pipe J is opened, the valves H and K being meanwhile kept closed, and the mixed oil and solvent passes through the holes and filtering material in the valve H and is drawn off through the pipe J to a suitable tank, from whence it may be pumped or taken to be properly separated from the solvent. After the flow of oil and solvent has continued for a sufficient time—say about fifteen minutes, more or less—the valve in the pipe J is closed and the flow of oil and naphtha is stopped. A fresh supply of solvent is meanwhile being fed to the percolator from the supply-tank, and the object in closing the valve in pipe J is to give the fresh solvent time to act on the meal or mass and cut the oil. After the valve has remained closed for a short time it is again opened, and the mixed solvent and oil again passes off through said pipe J and into the tank. This process may be repeated as many times as is necessary until the oil is all extracted from the mass or material in the percolator, which is meanwhile kept saturated with the solvent. After the oil has all been removed from the material in the percolator, which is discovered by the naphtha flowing through pipe J without being mixed with oil, air is admitted to the upper part of the percolator to facilitate the outflow of the solvent, and the direction of the flow is altered by suitable valve mechanism, so that the solvent left in the material in the percolator is passed through pipe J into a separate tank, from whence it may be taken to be used as the first solvent upon the recharging or refilling of the percolator. After the naphtha has ceased to flow from the mass in the percolator valve J is closed and hot air is introduced into and through the mass through pipes B' B', which vaporizes in a great measure the solvent remaining in the material in the percolator, the vaporized solvent passing off through vent-pipe Y and from thence to a suitable condenser. In order to further purge the material in the percolator of the solvent still remaining, the lower valve K is opened to its full capacity and valve J is closed, and the valve H is drawn back or opened sufficiently to properly feed or allow the passage of the material in the percolator therefrom. The material as it passes down is agitated by means of an agitator E and now passes down through the spout to the specially-designed solvent-extracting device previously described, wherein the material is thoroughly freed or purged of the solvent by being agitated and at the same time carried forward or conveyed through the conveyer-casings and evaporating device, the casings being meanwhile properly heated either by

the introduction of hot air, hot water, or steam in the jackets surrounding them or in any other suitable way or by any other suitable heating medium; and I lower the volatilizing temperature of the solvent by maintaining a vacuum in the solvent-extracting apparatus, which vacuum will of course be greater or less according to the ordinary vaporizing-point of the particular solvent employed. The conveyers act to agitate the material during the process of conveying, and thus allow the heat to get at each and every particle of the same while it is being conveyed and acted upon, and thus the solvent is completely vaporized and passes off to the vapor-pipes and the material is thoroughly purged therefrom, and the meal (if grain is operated upon) when it comes from the machine is in the best possible shape for any use for which it may be desired, such as the making of starch, beer, whisky, or any other product which can be manufactured therefrom.

I may, if desired or required, place a dust-separator between the vacuum device or evaporating device and the pipe leading from the conveyers or evaporating device to catch and separate any finer particles which may be carried along with the vapor as it passes from the material in the evaporator to the condenser. This separator, if used, should be placed, as heretofore stated, some place between the suction device or vacuum device and the pipe leading thereto, as at Z. The meal or material after it has passed through the conveyer and evaporating device may be elevated and properly stored until ready for use.

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

1. In oil-extracting apparatus the combination of a percolator having detachable supports for the material to be treated, solvent-inlet pipes and oil and vapor outlet pipes, hot-air pipes adapted to introduce air into and throughout the contained mass, an agitator, a series of conveyer-cylinders into the upper one of which the percolator discharges and which cylinders discharge from one into another, heating-jackets partially inclosing the cylinders and communicating with each other but not with the interior of the cylinders, and vapor-chambers communicating with the upper part of the cylinders and with a vacuum device, substantially as described.

2. In apparatus for extracting oil from crushed or ground grain or other oil-containing substances, the combination with the percolator for receiving the crushed grain or material and the solvent, of an inclined perforated valve located above the solvent and the oil discharge pipe, said perforated valve being provided with a filtering medium, substantially as and for the purpose shown and described.

3. In an apparatus for extracting oil from

crushed or ground grain or other oil-bearing
substance, the combination with the perco-
lator, substantially such as described, of two
valves, one located above the oil and solvent
5 discharge pipe and being inclined and per-
forated and provided with a filter, and the
other located beneath said pipe, substantially
as and for the purpose shown and described.

In testimony whereof I sign this specifica-
tion, in the presence of two witnesses, this 6th 10
day of April, 1896.

JOHN W. EVANS.

Witnesses:

W. E. DONNELLY,
ELLA E. TILDEN.