

No. 670,351.

Patented Mar. 19, 1901.

B. SCHWERIN.

APPARATUS FOR ELECTRO ENDOSMOTICALLY FREEING MATERIALS FROM FLUIDS.

(Application filed July 26, 1900.)

(No Model.)

Fig. 1.

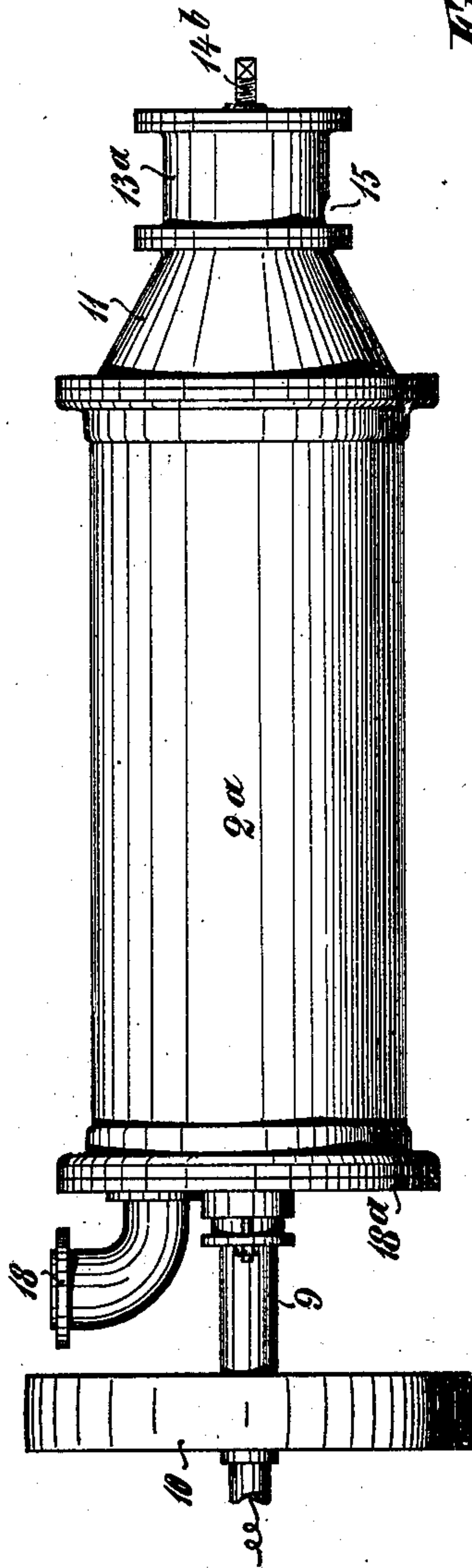


Fig. 3.

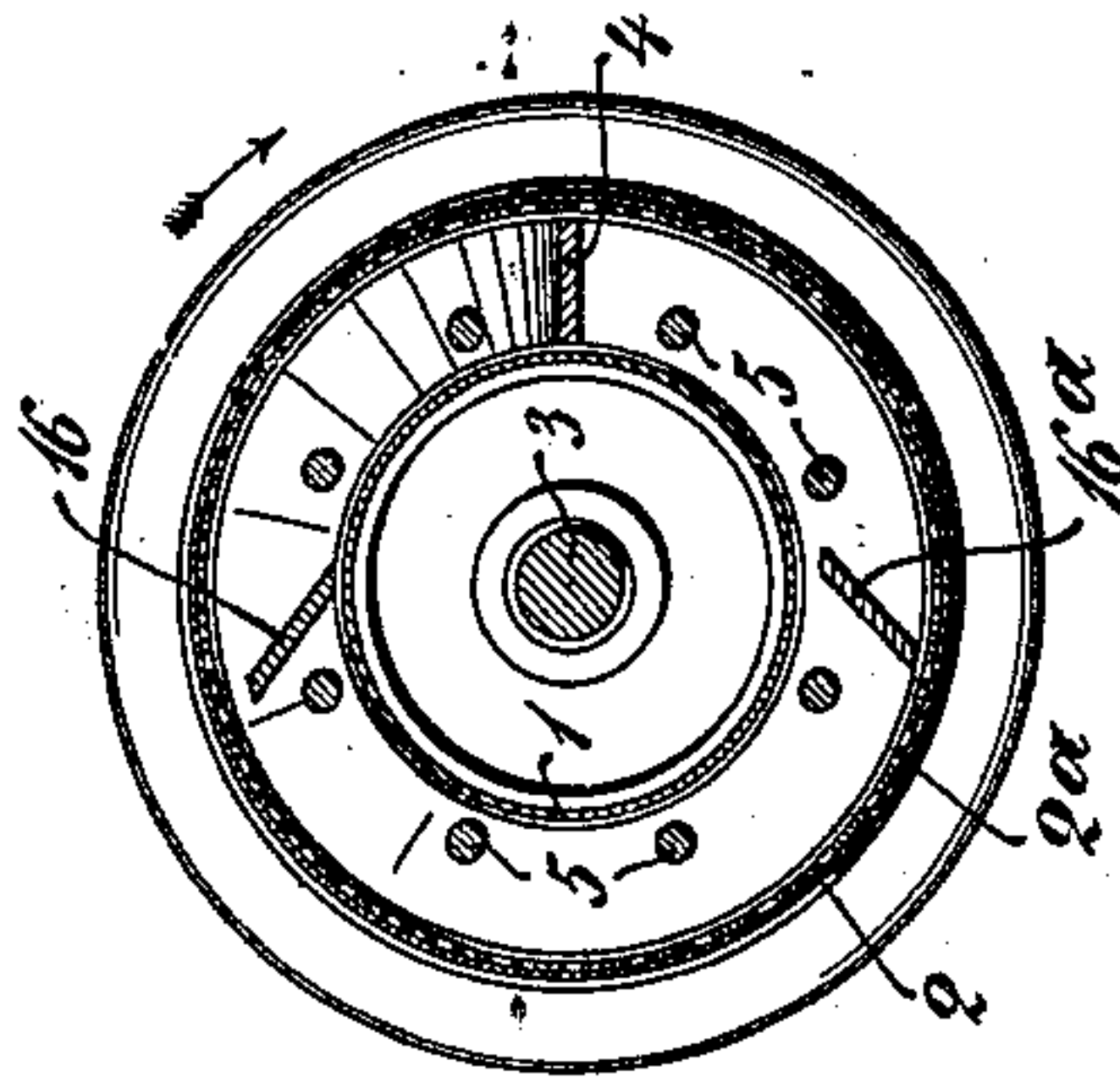
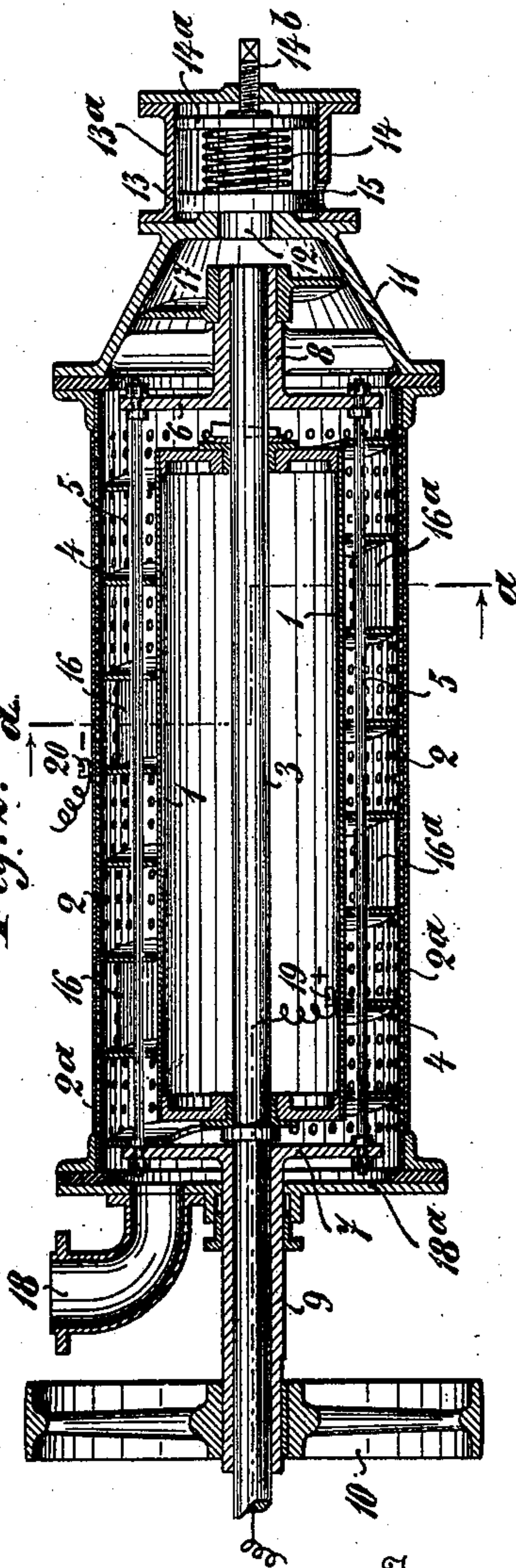


Fig. 2. a.



Witnesses
Marcus L. Byng.
Alfred H. Dowell

Inventor
B. Schwerin
By Julian P. Powell
His Attorney

UNITED STATES PATENT OFFICE.

BOTHO SCHWERIN, OF MUNICH, GERMANY.

APPARATUS FOR ELECTRO-ENDOSMOTICALLY FREEING MATERIALS FROM FLUIDS.

SPECIFICATION forming part of Letters Patent No. 670,351, dated March 19, 1901.

Application filed July 26, 1900. Serial No. 24,954. (No model.)

To all whom it may concern:

Be it known that I, BOTHO SCHWERIN, a subject of the King of Prussia, Emperor of Germany, residing at No. 6 Prinz-Ludwig-Strasse, Munich, Bavaria, German Empire, have invented a new and useful Apparatus for Electro-Endosmotically Freeing Materials from Fluids, of which the following is a specification.

10 This invention relates to apparatus for carrying out the process of electro-endosmotically freeing mineral, vegetal, and animal materials from fluids, as described in another application of mine, Serial No. 24,953, filed 15 July 26, 1900, and has for its object to provide for continuous working of said process.

For this purpose the present invention essentially consists in a vessel constructed with electrically-conductive side walls for constituting opposite electrodes, of which at least 20 the negative one is permeable to the fluid, and within which vessel a conveying device is arranged between an inlet for the material to be treated and an outlet for the material 25 treated, so that the material which is continuously supplied to the apparatus is caused to pass in a continuous flow from the inlet to the outlet in contact with said electrodes.

It is preferred to combine with this apparatus means for exerting a pressure upon the 30 material in a direction opposite to its flow in order to secure good contact between the material and the electrodes, as also means for causing the material while traveling from the 35 inlet to the outlet to pass from the negative electrode to the positive one, and vice versa, for the purpose of preventing too dry a layer of material being formed in front of the positive electrode.

40 In order that my present invention may be fully understood, I will proceed to describe in a more detailed manner the form in which I prefer to carry it into practice, reference being had to the annexed drawings, of which—

45 Figure 1 is an elevation of the apparatus; Fig. 2, a vertical central section through the same; and Fig. 3, a cross-section on line *a a*, Fig. 2.

1 and 2, Figs. 2 and 3, are two stationary 50 cylinders coaxially placed one in the other in horizontal position. The inner cylinder 1 constitutes the positive electrode and the outer

one, 2, the negative electrode. The latter is so constructed as to be permeable to the fluid to be driven out—for instance, with wire-gauze or perforated sheet metal provided with an external coating of suitable filtering material, as canvas or cloth 2^a. The inner electrode is supported by a stationary shaft 3, extending in the common axial line of both electrodes, of which the outer one is supported 60 by standards, (not shown,) both electrodes being carefully isolated from adjacent parts, as indicated in Fig. 2 by thick black lines.

In the annular interval between the electrodes 1 and 2 is located a spiral 4, extending through the whole length of said interval and constructed with a suitable non-conductive substance or with metal covered with such substance at all points. It is rigidly 65 connected by longitudinal bolts 5 with two disks 6 and 7, both of which are loosely mounted by the respective sleeve-like hubs 8 and 9 upon the shaft 3. The hub or sleeve 9 carries a belt-pulley 10 for imparting rotary motion to the spiral 4. Opposite this pulley the 75 apparatus is closed by a plate 18^a, carrying a bent pipe 18, which communicates through an opening in said plate with the interval between the cylindrical electrodes 1 and 2. 80 This pipe 18 is the inlet for the material to be treated and is to be connected with a feed-pump, (not shown,) the material being reduced to the state of a mud, sludge, slime, or pulp. At the opposite end of the apparatus the 85 outer cylinder 2 has adapted to it, with the interposition of an insulating-ring, a hollow extension 11 in the form of a truncated cone and provided in its top with a centrally-located opening 12. In front of the outside of 90 this opening is arranged a sliding disk 13, guided by the wall of a cylindrical housing 13^a, and between this disk and a disk 14^a, which is adjustable by means of the screw 14^b, is located a spiral spring 14, which tends to 95 close the plate 13 upon the opening 12 with a pressure depending upon the adjustment of disk 14^a. In the under side of the housing 13^a is provided an opening 15, constituting the outlet proper for the material treated. 100

To the spiral 4 are secured upright plates 16 and 16^a in an oblique position, as shown in Fig. 3. The plates 16 extend from the outer edge of the spiral toward the inner edge of

same, having an interval between their inner edges and the inner edge of the spiral, while the plates 16^a extend from the inner edge of the spiral toward the outer edge of same, leaving an interval between their outer edges and the outer edge of the spiral. Within the conical extension 11 a short screw-blade or spiral 17 is secured to the hub or sleeve 8.

19 and 20 are binding-screws for connecting the electrodes 1 and 2 with the source of electricity. (Not shown.)

The operation of this apparatus is as follows: The peat-pulp or pulp of other material is fed through the pipe 18 into the annular space between the two cylindrical electrodes 1 and 2. Supposing the electrodes in connection with the source of electricity, when the pulp reaches the electrodes the electrical circuit is at once closed, current passes through the pulp, and water begins to percolate through the outer cylinder 2. The spiral 4 is then caused to rotate, when the pulp is conveyed toward the opening 12, where it is first arrested by the spring-controlled plate 13 closing said opening until the pressure of the material causes the plate 13 to recede a distance dependent on the adjustment of spring 14, when the material finds its way past the plate 13, through the annular interval formed between this plate and the edge of the opening 12, and is finally discharged through the opening 15. According to the adjustment of spring 13 a greater or smaller counter-pressure is opposed to the travel of the material and thereby good contact secured between the latter and the electrodes. During its passage through the apparatus the material is repeatedly acted upon by the plates 16 and 16^a, causing it to pass from the outer electrode 2 to the inner electrode 1, and vice versa, so that too dry a layer of material is prevented from forming in front of the positive electrode 1.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. An apparatus for electro-endosmotically freeing mineral, vegetal and animal materials from fluid, composed of a vessel constructed with electrically-conductive side walls forming opposite electrodes of which at least the negative is permeable to fluid, and a conveying device located within said vessel between an inlet for the material to be treated and an outlet for the material treated, the inlet being provided at one end and the outlet at the opposite end of the vessel, substantially as and for the purpose described.

2. In apparatus for electro-endosmotically freeing mineral, vegetal and animal materials from fluid, the combination, with a source of electricity, of two opposite electrodes of which at least the negative one is permeable to the fluid, an inlet for the material to be treated at one end of the interval between said electrodes, an outlet for the material treated at the opposite end of said interval, means for feeding materials through said inlet, and means

for conveying the material from the inlet to the outlet, substantially as and for the purpose described.

3. In apparatus for electro-endosmotically freeing mineral, vegetal and animal materials from fluid, the combination with a source of electricity of two opposite electrodes of which at least the negative one is permeable to the fluid, an inlet for the material to be treated at one end of the interval between said electrodes, an outlet for the material treated at the opposite end of said interval, means for feeding material through said inlet, means for conveying the material from the inlet to the outlet, and means for exerting pressure upon the material in the direction opposite to that in which it is conveyed, substantially as and for the purpose described.

4. In apparatus for electro-endosmotically freeing mineral, vegetal and animal materials from fluid, the combination, with a source of electricity, of two opposite electrodes of which at least the negative one is permeable to the fluid, an inlet for the material to be treated at one end of the interval between said electrodes, an outlet for the material treated at the other end of said interval, means for passing the material from the inlet to the outlet, and means for passing the material from the negative electrode to the positive one, and vice versa, substantially as and for the purpose described.

5. In apparatus for electro-endosmotically freeing mineral, vegetal and animal materials from fluid, the combination, with a source of electricity, of two opposite electrodes, of which at least the negative one is permeable to the fluid, an inlet for the material to be treated at one end of the interval between said electrodes, an outlet for the material treated at the other end of said interval, means for feeding material through said inlet, means for conveying the material from the inlet to the outlet, means for exerting pressure upon the material in the direction opposite to that in which it is conveyed, and means for passing the material from the negative electrode to the positive one, and vice versa, substantially as and for the purpose described.

6. In apparatus for electro-endosmotically freeing mineral, vegetal and animal materials from fluid the combination, with a source of electricity, of two cylindrical electrodes, coaxially placed one in the other, so as to leave an interval between them, of which electrodes at least the negative one is permeable to the fluid, an inlet for the material to be treated at one end of said interval, an outlet for the material treated at the opposite end of said interval, means for feeding material through said inlet, a spiral located in said interval and combined with means for imparting rotary movement to it, substantially as and for the purpose described.

7. In apparatus for electro-endosmotically freeing mineral, vegetal and animal materials from fluid, the combination, with a source of

electricity, of two cylindrical electrodes co-
axially placed one in the other so as to leave
an interval between them, of which electrodes
at least the negative one is permeable to the
5 fluid, an inlet for the material to be treated
at one end of said interval, an outlet for the
material treated at the other end of said in-
terval, means for feeding material through
said inlet, a spiral located in said interval
10 and combined with means for imparting ro-
tary movement to it, and a spring-controlled
plate in front of said outlet, substantially as
and for the purpose described.

8. In apparatus for electro-endosmotically
15 freeing mineral, vegetal and animal materials
from fluid, the combination, with a source of
electricity, of two cylindrical electrodes co-
axially placed one in the other so as to leave

an interval between them, an inlet for the
material to be treated at one end of said in- 20
terval, an outlet for the material at the op-
posite end of said interval, means for feed-
ing material through said inlet, a spiral lo-
cated in said interval and combined with
means for imparting a rotary movement to 25
it, a spring-controlled plate in front of said
outlet, and plates obliquely fixed to the spi-
ral, substantially as and for the purpose de-
scribed.

In testimony whereof I have hereunto set 30
my hand in presence of two subscribing wit-
nesses.

BOTHO SCHWERIN.

Witnesses:

WALLY SEITZ,
HECK KACHEL.