

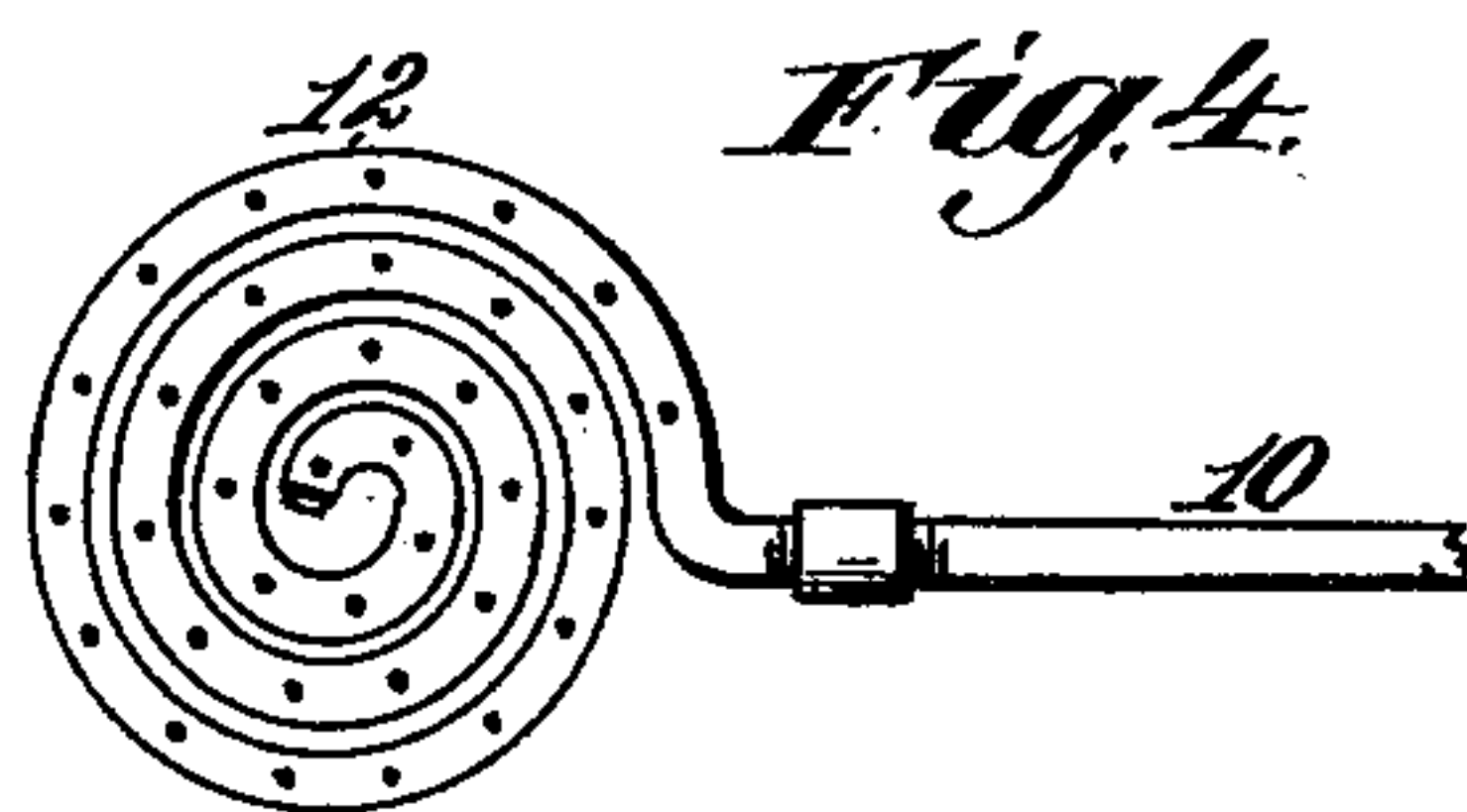
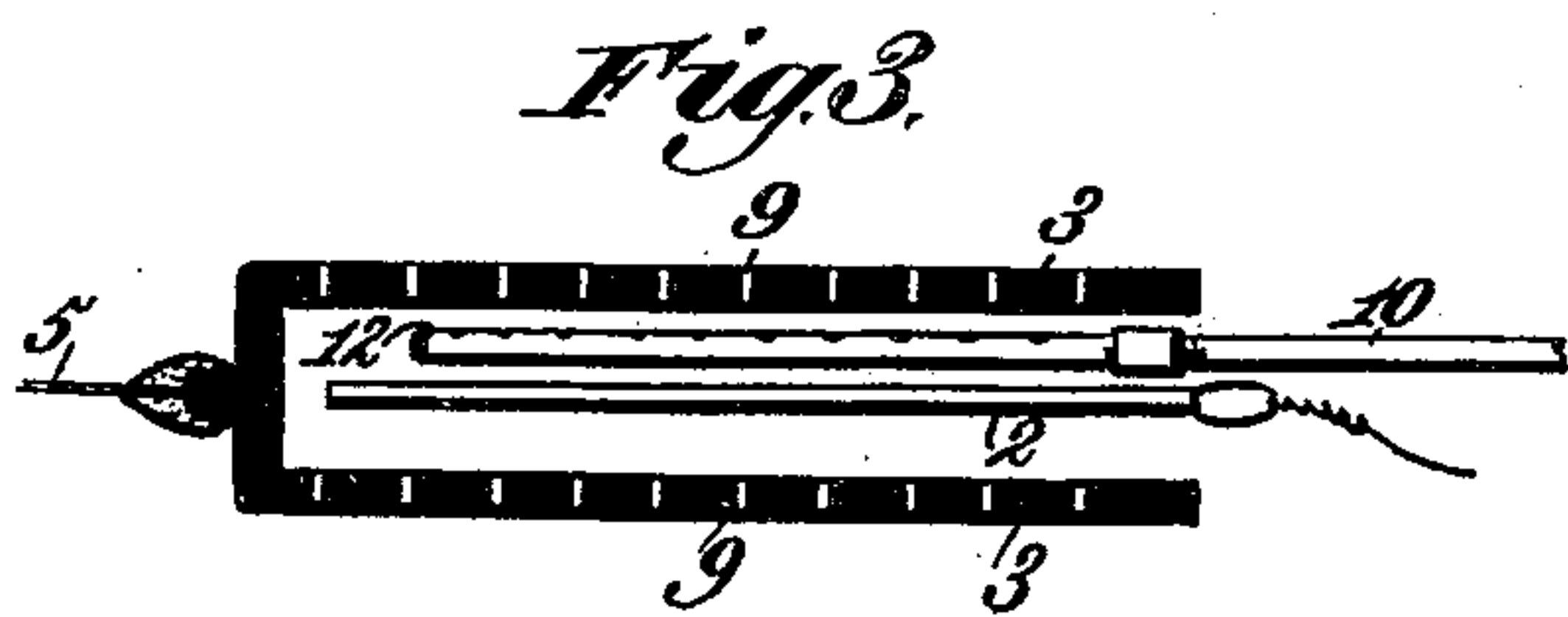
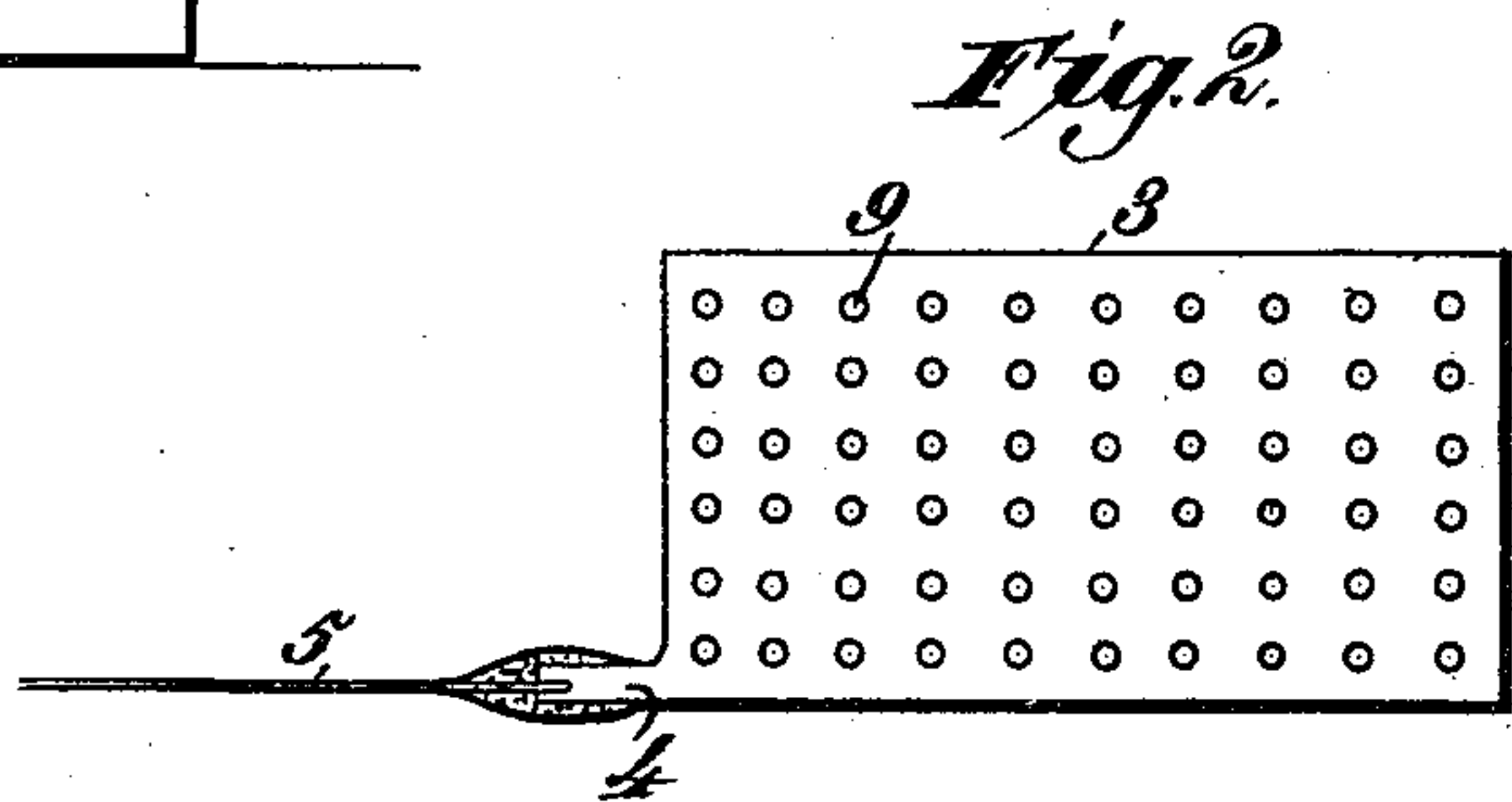
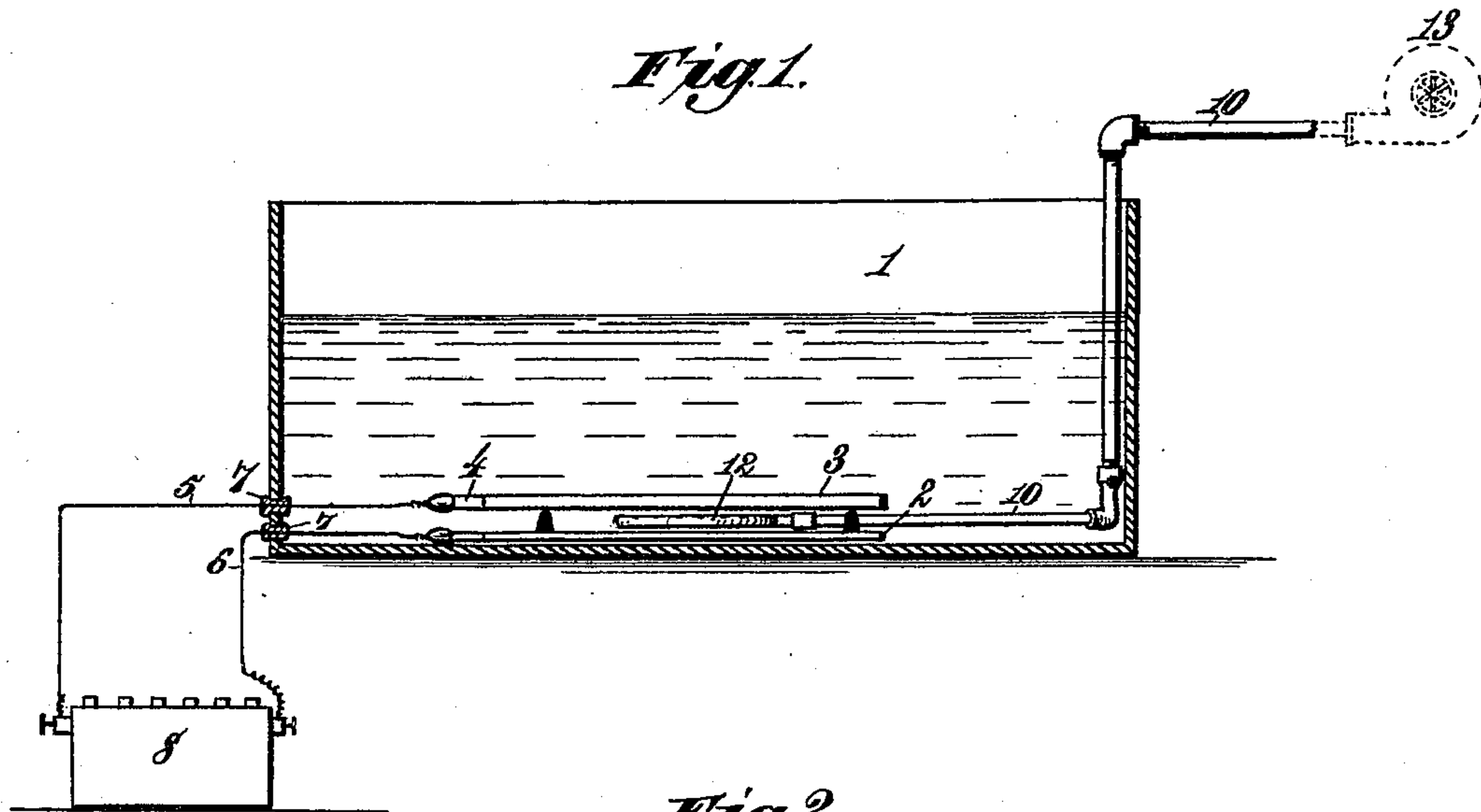
(No Model.)

A. E. WOOLF.

PROCESS OF AND APPARATUS FOR BLEACHING BY ELECTROLYSIS.

No. 471,454.

Patented Mar. 22, 1892.



Witnesses:
Robert G. Pratt,
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By *James L. Norris,*
Atty.

UNITED STATES PATENT OFFICE.

ALBERT E. WOOLF, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO ROSAMOND WOOLF AND THOMAS J. MONTGOMERY, OF SAME PLACE.

PROCESS OF AND APPARATUS FOR BLEACHING BY ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 471,454, dated March 22, 1892.

Application filed December 8, 1891. Serial No. 414,417. (No model.) Patented in England February 6, 1892, No. 23,329.

To all whom it may concern:

Be it known that I, ALBERT E. WOOLF, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Processes of and Apparatus for Bleaching by Electrolysis, (for which I have obtained British Patent No. 23,329, dated February 6, 1892,) of which the following is a specification.

My invention relates to processes and apparatus for bleaching textile and other fabrics, tissues, and materials.

It is the purpose of my invention to provide a process in which the sea-water, wherein are the several reagents essential to my invention, is employed as an electrolyte and in which one step shall consist in the introduction of atmospheric air between the electrodes in the vat, whereby the action of the bleaching products of electrolysis upon sea-water is intensified by the oxygen present and by the conversion of the air, whereby I am enabled to produce better results at less expense and in less time than has heretofore been practicable, and to secure, also, a substantial uniformity of results in a series of successive bleaching operations.

It is my purpose, also, to provide an electrolytic bleaching process one step of which consists in driving atmospheric air or a suitable gas or gases through or into the magnetic field between the electrodes, whereby a more or less complete conversion of the air is produced, the action of the ozone modification of oxygen set up by the electrolysis in the bleaching-vat being intensified by the presence of atmospheric oxygen in the magnetic field, the oxidizing power of the ozone in the presence of chlorine materially aiding the action of the latter, expediting the process, and enabling me to secure much better results.

It is one object of my invention to provide an electrolytic apparatus for bleaching purposes in which a volume of air or other suitable gas or gaseous compound shall be caused to traverse the magnetic field by being introduced between the electrodes, which are perforated to diffuse it, and permit ready passage from the magnetic field between the

electrodes, thus producing a more or less complete decomposition by which oxygen and the ozone modification of oxygen are produced, thereby forming an oxygenated compound of chlorine which possesses increased bleaching power without detriment to the substances operated upon.

My invention consists to these ends in the art, method, or process hereinafter fully explained and in the apparatus to be described as one of many convenient forms of mechanical organizations by which said process may be conveniently practiced, said process and apparatus being also particularly pointed out in the claims which conclude this specification.

To enable others skilled in the art to understand my said invention and to practice said process, as well as to make, construct, and use apparatus suitable for such purpose, I will describe said invention in detail, reference being had to the accompanying drawings, in which a preferred form of apparatus is shown.

Figure 1 is a vertical section, partly in elevation, showing said apparatus. Fig. 2 is a detail view of one of the electrodes removed from the apparatus. Fig. 3 is a partial vertical section showing a substitute construction. Fig. 4 is a detail view of one form of the air-conduit.

In the said drawings, the reference-numeral 1 indicates any suitable form of vat or receiving-tank constructed of any material suitable for the purpose. I may use any of the known forms of vat, or I may employ special constructions; but my invention is well adapted to use with the vats or receiving-tanks of any familiar form, which I may modify in some particulars, as hereinafter pointed out. Within this receiving-tank I arrange electrodes 2 and 3, the first being the positive element, formed, preferably, of platinum, and the latter the negative element, usually made of carbon. To utilize both surfaces of the positive electrode, I prefer to place it between two negative electrodes 3, as shown in Fig. 3. I may employ, however, electrodes of any other kind and of any approved material. From one end of each electrode projects a terminal 4, preferably, though not necessarily,

integral with the electrode. These terminals provide convenient attachments for the denuded ends of the conductors or cable-wires 5 and 6, which are usually solder-jointed to said terminals, but may be fastened in any preferred form. The joint is then covered by any protector capable of resisting the corrosive action of the products of electrolysis—such, for example, as gas-proof paint, paraffine, adhesive tape, or other suitable material. The wires are led out of the receiving-tank through the side or end thereof, and for this purpose they may be packed through openings in the wall by any effective means, such as an elastic plug 7, for which any preferred device may be substituted. The wires 5 and 6 are led to the poles of a storage-battery 8 of any approved type, the cells being of such number and so constructed as to yield the electric energy required for various sizes of electrodes, or for the various capacities of the tanks, or in proportion to the work to be done.

It will be understood that I may employ other sources of electric energy—such, for example, as a dynamo; but I prefer the storage battery because of the ease with which its yield may be regulated in accordance with the requirements of any particular case.

The negative electrodes 3 are usually provided with perforations 9, formed at suitable intervals and of any suitable size. I prefer, however, to adopt such a number and diameter of these perforations as shall not materially diminish the surface area of the electrode, though by somewhat increasing the thickness of the latter and proportioning the diameter of the openings 9 properly a limited increase in the efficient surface may be secured. The purpose of this construction is to permit the passage of the gases produced by decomposition of the menstruum or fluid composing the electrolyte and to avoid obstructing the size of the gas-bubbles in a material degree by the presence of an imperforate electrode. It will readily be understood that the necessity of this construction may be avoided in various ways so familiar to those skilled in the art as to require no specific mention.

When I employ the form and arrangement of electrodes shown in the drawings, I may perforate the negative electrode for the passage of the gases, which would otherwise be compelled to emerge at the sides and ends of the electrode.

The reference-numeral 10 indicates a conduit or tube of any suitable kind by which atmospheric air may be conveyed. This pipe may be composed wholly or in part of glass, hard rubber, or other material capable of resisting the action of the electrolyte or of the products of electrolytic action. Said tube may, however, be constructed in several parts of two or more different materials of the kind mentioned. It leads to or forms part, as the case may be, of a discharging-terminal 12 of any suitable form and provided with air-

exits. While I have shown this air conduit or tube entering the bleaching-vat from the top thereof, I may carry it horizontally through the side or end wall or through the bottom.

The conduit or tube 10 is connected with any form of air-forcing device, indicated conventionally by the numeral 13, as I do not consider it necessary to illustrate any particular type of such mechanism. The air flows from the terminal into the space between the electrodes 2 and 3, where the magnetic force is at its maximum. I may also use mechanical stirrers, either alone or in conjunction with the air.

In same cases it is desirable to cause the air to traverse the magnetic field, where it may be more or less affected by the electrical energy, and in this case a terminal 12 of suitable form is inserted between the electrodes 2 and 3.

The bleaching vat or tank 1 is filled to the usual point with sea-water in its natural state, and the fabrics, fiber, tissues, or materials to be operated upon are placed therein, after which the circuit of the battery or other source of energy is closed. Electrolysis is thereby established between the poles, the fluid is decomposed, the sodium, magnesium, and potassium chlorides are caused to part with their chlorine, which is liberated at the positive pole, and by forming the latter of platinum the liberation of ozone by the decomposition of the water is increased, and an oxygenated chlorine compound is formed at said pole which possesses marked bleaching qualities. It would seem, also, that the action of the ozone modification of oxygen may be more or less intensified by the introduction of the air-current between the electrodes in such manner that it may traverse the magnetic field and suffer more or less conversion.

Instead of a solid platinum electrode I may employ an electrode plated or coated with said metal; but I may substitute any other electrode of any approved material for either the platinum or the carbon electrode shown.

I use sea-water at a specific gravity of about 1.028 or 4° Baumé, or I may use rock-salt or sea-salt dissolved at substantially the density named.

Heretofore bleaching processes have been practiced in which chlorine has been liberated from solutions of chloride of magnesium by electrolysis, and I make no claim to such process.

It may be found convenient to use more than one group of electrodes, since in large vats they may be preferable to a single group of large electrodes. I regard this as a mere equivalent for the arrangement shown.

What I claim is—

1. In the art of bleaching, the process set forth, which consists in submitting sea-water to electrolysis, forcing atmospheric air into the electrolyte, discharging the same between

the electrodes, and submitting the materials to be bleached to the action of the products of electrolysis in the same vat or tank, substantially as specified.

5 2. In the art of bleaching, the process set forth, which consists in submitting sea-water to electrolysis, forcing atmospheric air into the electrolyte, discharging the same between the electrodes, and submitting the materials
10 to be bleached to the action of the products of electrolysis in the same vat or tank during agitation of the electrolyte, substantially as specified.

15 3. In a bleaching apparatus, the combination, with a vat or receiving-tank containing an electrolyte, of positive and negative electrodes arranged therein, a source of electric energy connected therewith, an air-forcing device, and an air conduit or tube entering

the electrolyte and having a discharging-terminal lying between the electrodes, substantially as described.

4. In a bleaching apparatus, the combination, with a vat or tank, of perforated positive and negative electrodes connected to
25 wires entering the tank, a storage-battery in circuit with said electrodes, an air-forcing device, and an air conduit or tube entering the tank and having a terminal provided with air-exits discharging between the electrodes, sub-
30 stantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

ALBERT E. WOOLF. [L. S.]

Witnesses:

JAMES A. RUTHERFORD,
ALBERT H. NORRIS.