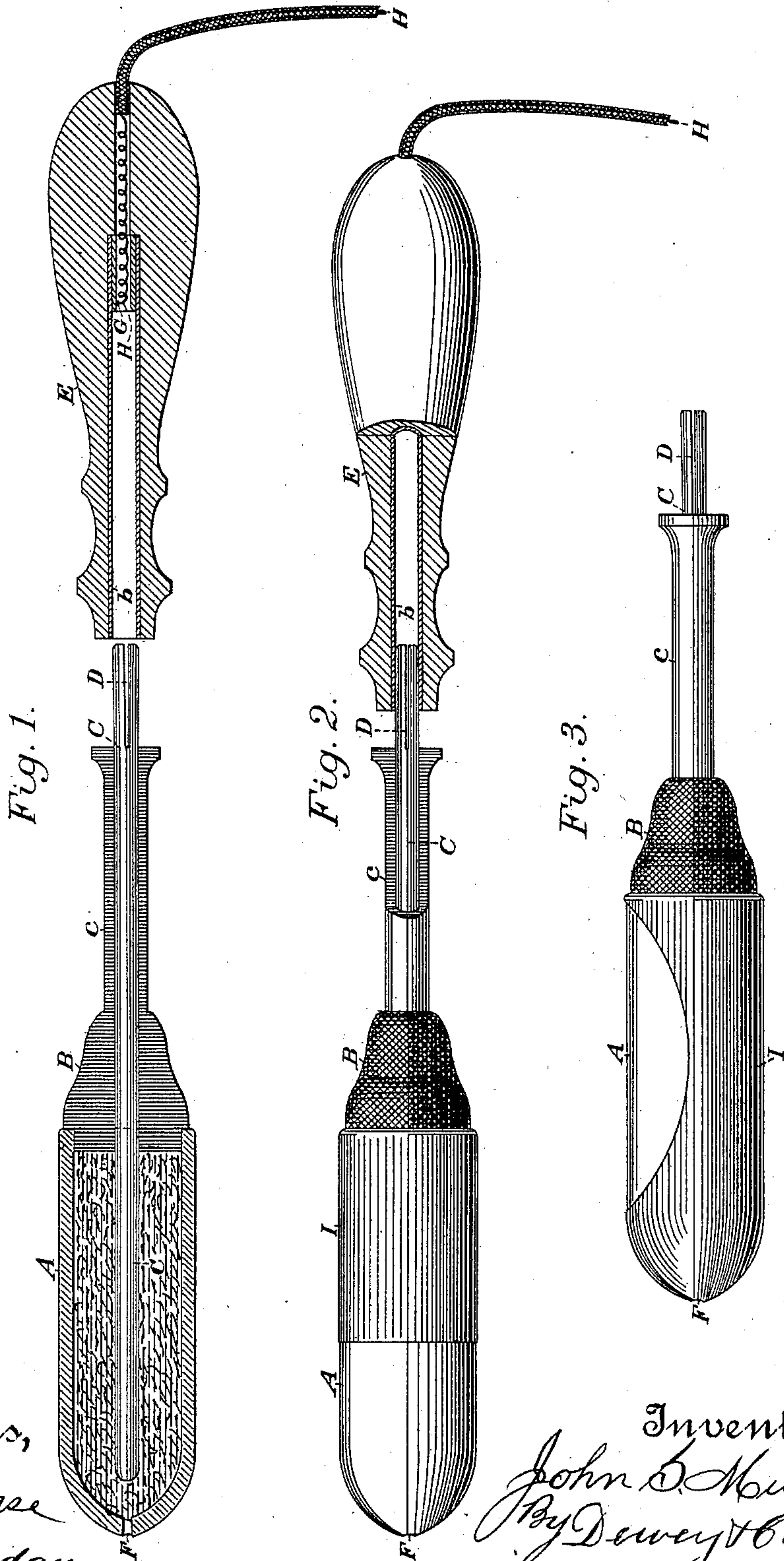


(No Model.)

J. S. MUIR.  
THERAPEUTIC ELECTRODE.

No. 600,290.

Patented Mar. 8, 1898.



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# UNITED STATES PATENT OFFICE.

JOHN S. MUIR, OF SAN FRANCISCO, CALIFORNIA.

## THERAPEUTIC ELECTRODE.

SPECIFICATION forming part of Letters Patent No. 600,290, dated March 8, 1898.

Application filed August 24, 1897. Serial No. 649,334. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN S. MUIR, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Therapeutic Electrodes; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to a novel method of constructing therapeutic electrodes for the especial purpose of introducing medicinal and chemical substances into the tissues of the human body through the agency of electricity for therapeutical effects.

It consists in a means for producing such effects through the agency of voltaic or constant currents of electricity by what is known as "cataphoric medication," "electric osmosis," or "anodal diffusion."

It also consists in the construction of therapeutic electrodes for the purpose of effecting electrolysis or the electrochemical decomposition of electrolytic substances through the agency of electrical currents within the body of the electrode, and also a means for simultaneous diffusion of one or more of the products of this electrolysis into these tissues of the body adjacent to the electrode.

Referring to the accompanying drawings, Figure 1 is a longitudinal section of my apparatus. Fig. 2 is an exterior view and partial section, showing one form of insulating-coating. Fig. 3 is a view showing another form of the same.

My electrode consists, essentially, of an electrochemical decomposing-cell A of suitable form and construction to adapt it to the anatomical portion of the human body upon which it is designed to operate. This decomposing-cell is, as here shown, formed of unglazed earthenware or baked pipe-clay and is sufficiently porous to affect the osmosis of liquids. It will be manifest that any electro-non-conducting material may be employed in the construction of the cell which will produce this result, the essential requirement being porosity to liquid electrolytes. As here shown, the cell is hollow and preferably rounded at one end. This rounded end has a small opening F for the introduction of the liquid electrolyte. The opposite end is closed by a stopper or plug B, secured therein by

any suitable cement. Through this stopper or plug passes a rod C of electroconducting material, such as metal or carbon or a combination of the two. The rod of electroconducting material passes through the plug B, to which it is secured, the inner end projecting centrally into the cell A and parallel with its inner walls. The outer end of the rod C projects outwardly from the cell and is covered with insulating material c and forms the stem of the electrode. The end of the rod C is left uncovered and is split or slotted, as shown at D. The split allows a certain elasticity in this portion of the rod, and the end being rounded it is adapted to slip into a metal socket or sleeve b, which forms the interior of the handle E. This handle may be of wood, ivory, vulcanite, or any other suitable material, and the tube is permanently secured to the interior. This tube is in electrical contact at G with a flexible electroconducting-cord H. The other end of the tube is of suitable interior diameter to receive the split or slotted projecting portion of the rod, which extends into the electrode, so that when the two are joined together by inserting the slotted portion of the rod into the tube the frictional resistance will be sufficient to hold them close together. This resistance can always be regulated by spreading or closing the slot in the rod. This device provides a ready means for attaching the electrode to the handle or detaching it therefrom, and it also allows of the interchangeability of electrodes of different form, size, density, &c., all of which can be applied to the same handle.

The interior of the electrode or porous cell A forms a space which is adapted to contain the electrolytic fluid to be used. It may, if desired, contain some form of absorbent material—such as asbestos, cotton fiber, charcoal, coke, or other substance—the object of which is to mechanically suspend the electrolytic fluid and maintain it in intimate contact with the electroconducting-rod C.

Figs. 2 and 3 illustrate the insulation of the electrode in different forms. In both cases the insulating material covers that portion of the electrode marked I, and it may consist of an enamel or insulating varnish of any kind, the object being to expose a certain portion only of the electrode in its porous condi-



tion, through which portion the electrolytic action and osmosis takes place. This enables me to limit the therapeutic action of the electrode to any desired extent. It will be understood that this insulation is used to limit the amount of surface exposed for diffusive action, the uninsulated portion being the part through which diffusion is effected.

In the practical application or use of this electrode the porous containing vessel or cell is filled with a suitable electrolytic fluid through the small aperture made at the rounded outer end, and the hole is then closed by a plug of wax or by other means. The electrode thus charged is introduced or placed with its uninsulated portion in contact with the part to be treated or in close proximity to the tissues through which diffusion is to be effected. In the majority of cases this electrode will be in electrical connection with the positive side of the battery. A circuit is completed through the body by means of a suitable cutaneous electrode in electrical connection with the opposite pole of the battery or generator. Some form of current-controller, such as is well known, may be included in the circuit, so that the current can be properly regulated. Electrochemical decomposition of the electrolytic fluid occurs at the surface of the electroconducting-rod C within the cell A. The electropositive ions will be liberated within the cell and at the surface of the electroconducting-rod C. The electro-negative ions will diffuse into the tissues in the direction of the cutaneous electrode and in proportion to the strength of the current and the length of time in which the current circulates.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A therapeutic electrode consisting of an electrochemical decomposing-cell of porous material adapted to contain an electrolytic fluid, an electroconducting-rod extending thereinto, and means whereby a current may be passed through the electrolyte within the porous cell.

2. A therapeutic electrode consisting of a hollow porous cell having a closable opening through which the cell may be charged with an electrolytic fluid, a centrally-disposed elec-

troconducting-rod fixed within the cell extending outwardly through the rear closed end thereof, and having an inclosing electro-insulating material, a non-conducting handle having an interior conducting-surface with which the conducting-rod is connected, a flexible conductor forming contact with the interior conducting-surface of the handle and leading thence to an electric battery or generator.

3. A therapeutic electrode consisting of a hollow porous cell shaped to fit the tissues upon which it is to act, said cell being adapted to contain an electrolytic fluid, an opening through which the cell may be charged, a conducting-rod extending axially into the cell through the closed opposite end thereof, said rod projecting through an insulated inclosing envelop and having the projecting end split as shown, in combination with an insulated handle having an interior conducting cylindrical surface adapted to fit and grasp the split end of the rod, and electrical connection between said interior surface and the battery or generator.

4. A therapeutic electrode consisting of a hollow porous cell so shaped as to fit the tissue to which it is to be applied and adapted to contain an electrolytic fluid, an opening in one end through which the cell is charged, a conducting-rod passing through the opposite closed end of the cell and axially disposed therein, connection between the outer end of said rod and an electrical generator and a non-conducting coating applied to the exterior of the cell whereby the porous and acting surface is restricted and shaped to fit the part to which it is to be applied.

5. A therapeutic electrode consisting of a hollow porous cell having a closable opening through which the cell may be charged, an electroconductor extending into the cell, an insulating-coating for the exterior portion of the conductor, and a means by which it may be connected with an electrical generator.

In witness whereof I have hereunto set my hand.

JOHN S. MUIR.

Witnesses:

GEO. H. STRONG,  
S. H. NOURSE.