

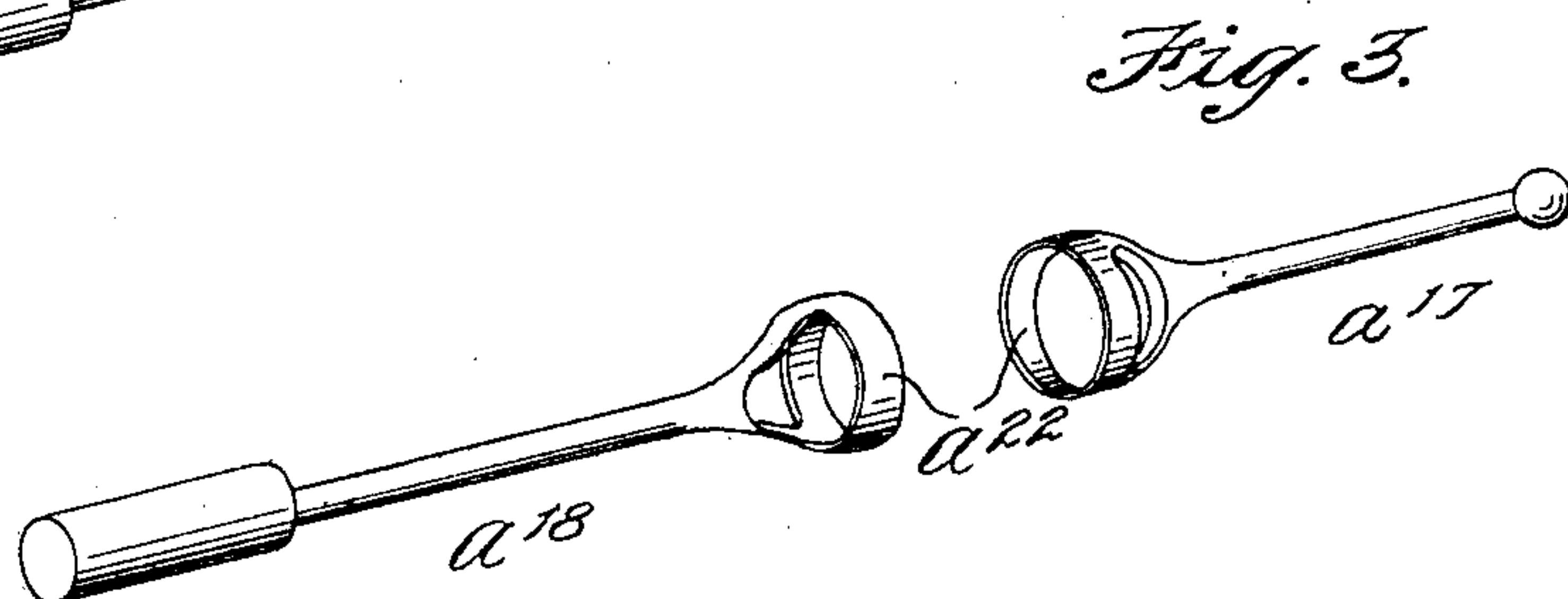
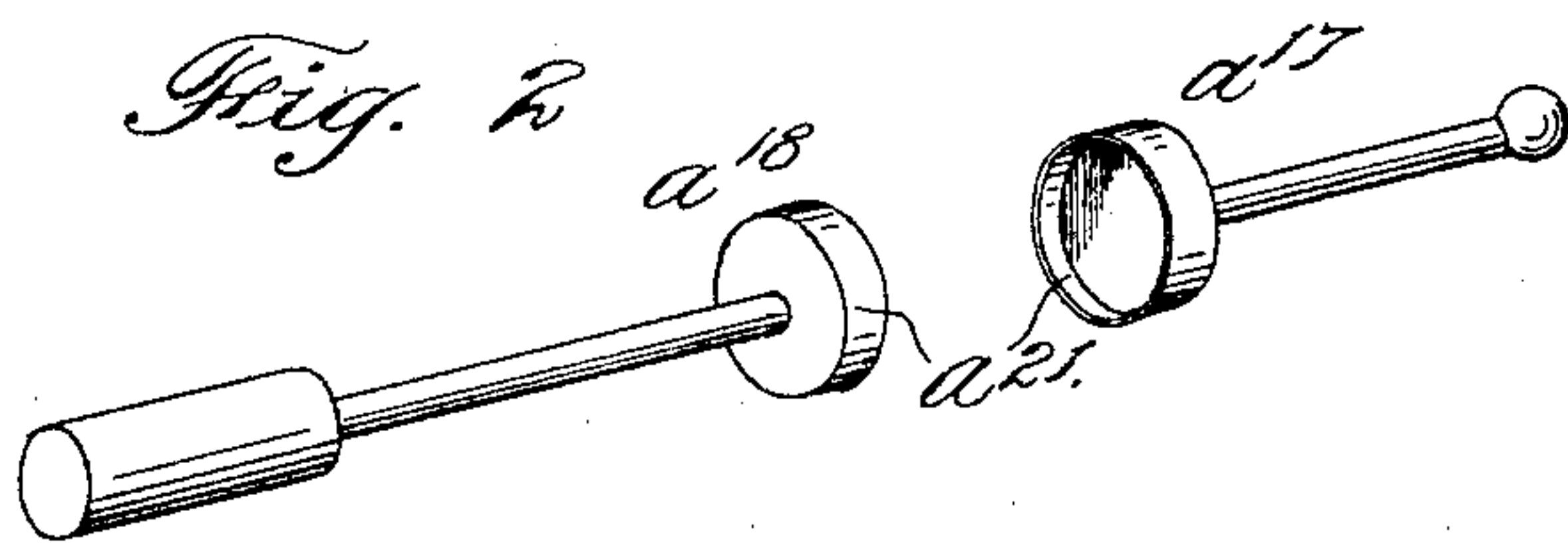
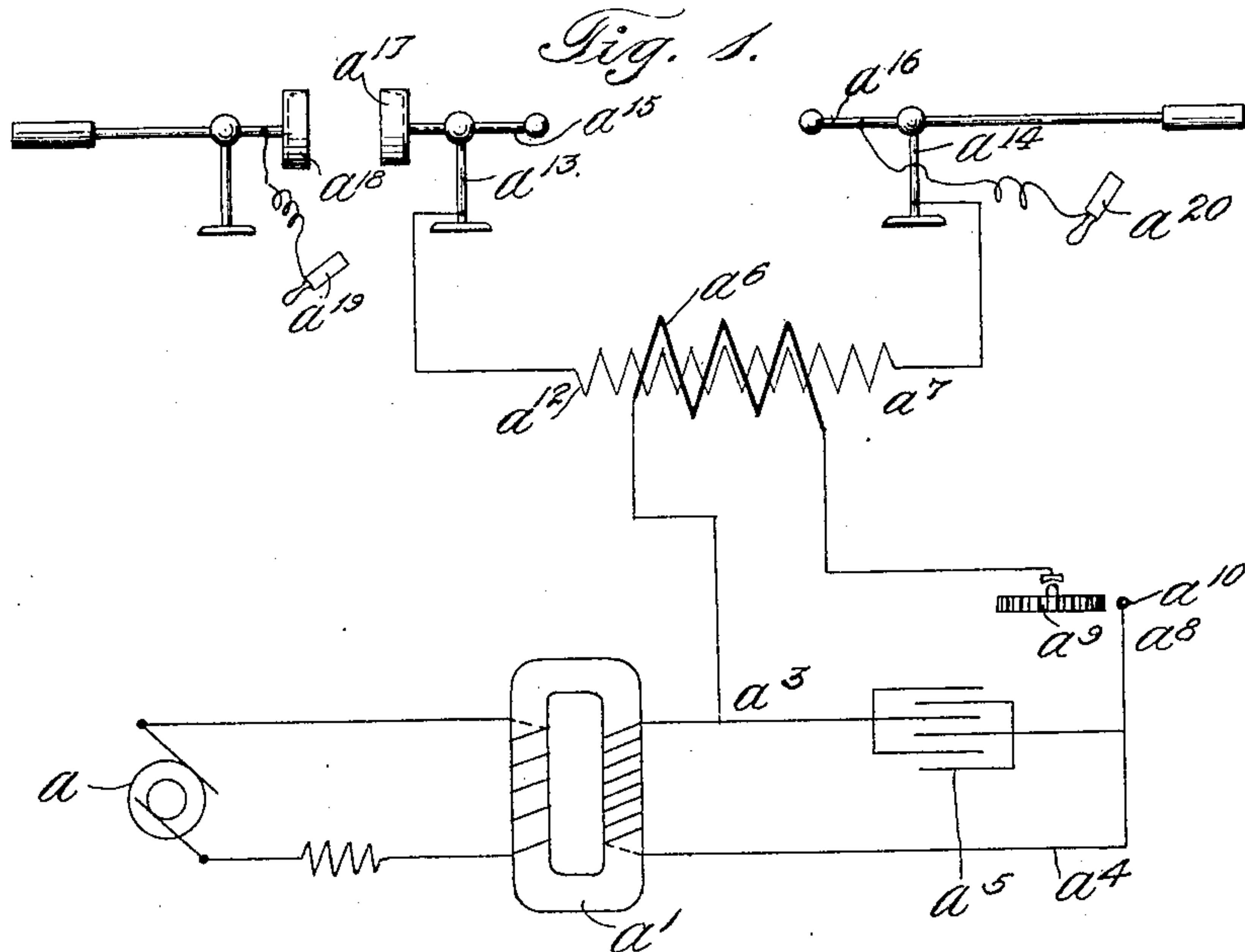
No. 775,871.

PATENTED NOV. 22, 1904.

F. F. STRONG.  
VARIABLE AIR GAP CONDENSER.

APPLICATION FILED MAY 23, 1904.

NO MODEL.



*Witnesses*

John E. Porter.

A. M. Rice

*Inventor,*

Frederick F. Strong

by Geo. H. Maxwell  
Attorney

## UNITED STATES PATENT OFFICE.

FREDERICK F. STRONG, OF BOSTON, MASSACHUSETTS.

## VARIABLE AIR-GAP CONDENSER.

SPECIFICATION forming part of Letters Patent No. 775,871, dated November 22, 1904.

Application filed May 23, 1904. Serial No. 209,299. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK F. STRONG, a citizen of the United States, and a resident of Boston, in the Commonwealth of Massachusetts, have invented an Improvement in Variable Air-Gap Condensers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to an electric air-gap condenser or convective discharge apparatus for use with high-frequency currents, and is specially adapted for therapeutic work.

Without attempting to set forth herein the advantages and requirements of the employment of high-frequency current for therapeutic work it is sufficient to point out that my present invention aims to provide means for rendering it safe and convenient to apply this current directly to the patient the same as if derived from a static machine, my apparatus operating to produce a discharge in the form of a continuous spray or brush, the air between the electrodes acting as a partially-porous dielectric through which the discharge filters rhythmically and continuously. To this end I employ, in connection with suitable mechanism for establishing a proper high-frequency current, a pair of separated electrodes having the two requisites of capacity and edges or points. These edges or points permit of a convective discharge in the form of a brush or spray as distinguished from that of a sphere or a plane without discharge edges from which only a disruptive discharge takes place.

The constructional details of my invention and further advantages and the operation thereof will appear more fully in the course of the following description, reference being had to the accompanying drawings, and the invention will be further defined in the appended claims.

In the drawings, Figure 1 shows the apparatus partly in side elevation and partly in diagram. Figs. 2 and 3 are perspective views of different forms of electrodes.

Referring more particularly to Fig. 1, where I have illustrated the entire apparatus, let  $a$  indicate a generator for supplying alternating

current, which passes through an electromagnetic transformer  $a'$ . Conductors  $a^3$   $a^4$  connect with a condenser  $a^5$  and thence to a primary  $a^6$  of an electrostatic transformer or special oscillator  $a^7$ . On one side, herein shown as in the wire  $a^1$ , I introduce a spark-gap  $a^8$  of high speed, shown as a wheel  $a^9$ , having radial terminals coöperating with a ball  $a^{10}$ . The terminals of the secondary  $a^{12}$  of the oscillator connect to posts  $a^{13}$   $a^{14}$ , respectively provided with usual discharge-rods  $a^{15}$   $a^{16}$ .

My variable air-gap is arranged to coöperate with one of these terminals, one portion,  $a^{17}$ , thereof being shown as mounted on the rod  $a^{15}$ , and in proper alinement therewith is the other part,  $a^{18}$ , thereof. Hand-electrodes  $a^{19}$   $a^{20}$  are connected in series with the secondary around the air-gap condenser  $a^{17}$   $a^{18}$ , as shown.

In Figs. 1 and 2 I have shown the discharge-terminals of the air-gap condenser as cup-shaped or in the form of plates having their rims  $a^{21}$  projecting forward to transmit the spray-like or convective brush-discharge, and in Fig. 3 I have shown rings  $a^{22}$ , although various other forms may be used with good results provided they present discharge edges and have capacity as distinguished, for instance, from a sphere (which discharges practically from a single point) or from a plane arranged to discharge from its interior surface, (thereby producing a disruptive discharge and being incapable of producing a spray-like continuous discharge.)

From the foregoing it will be understood that I do not limit myself (excepting in certain of the subjoined claims) to the particular embodiment herein shown, but intend to include any means capable of receiving a high-frequency current and of discharging the same in the form of a spray or convective brush adapted to therapeutic service. My apparatus simply causes surges in or periodically modifies the high-frequency current, utilizing the edges of the plates, rings, or other capacity-possessing electrodes  $a^{17}$   $a^{18}$ , thereby converting the current into a safe and efficient agent for local application directly to the body of the patient. By this means it is possible to produce intermittent muscular contractions which cannot be pro-



duced by the high-frequency current in its unmodified form.

In use the electrode  $a^{20}$  is grasped by the patient in one hand and the applying-electrode  $a^{19}$  (which may be a vacuum electrode or any other kind required for the particular place or treatment) is either held in the other hand or locally applied, the result being that all the advantageous effects of the high-frequency current are secured without its unpleasant qualities, but modified and rendered harmless, as above explained.

Having described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The herein-described apparatus, comprising means for producing a current of excessively high frequency, an applying-electrode, and a convective discharge means, in series therewith between said electrode and said producing means for interposing in the current a convective spray-discharge, thereby modifying the current for therapeutic work.

2. The combination with apparatus for pro-

ducing a high-frequency current, of cooperating electrodes in series with one terminal of said apparatus, said electrodes each having discharge areas of large capacity.

3. In an apparatus of the kind described, electrodes in series, each having discharge edges for transmitting a convective spray-discharge across the intervening air-gap.

4. Opposite electrodes, each having continuous discharge edges for transmitting a convective spray-discharge across the intervening air-gap, combined with a source of high-frequency current in series therewith.

5. The herein-described cooperating electrodes, each having a forwardly-projecting discharge rim or edge.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK F. STRONG.

Witnesses:

T. M. STRONG,

GEO. H. MAXWELL.