

No. 618,049.

Patented Jan. 24, 1899.

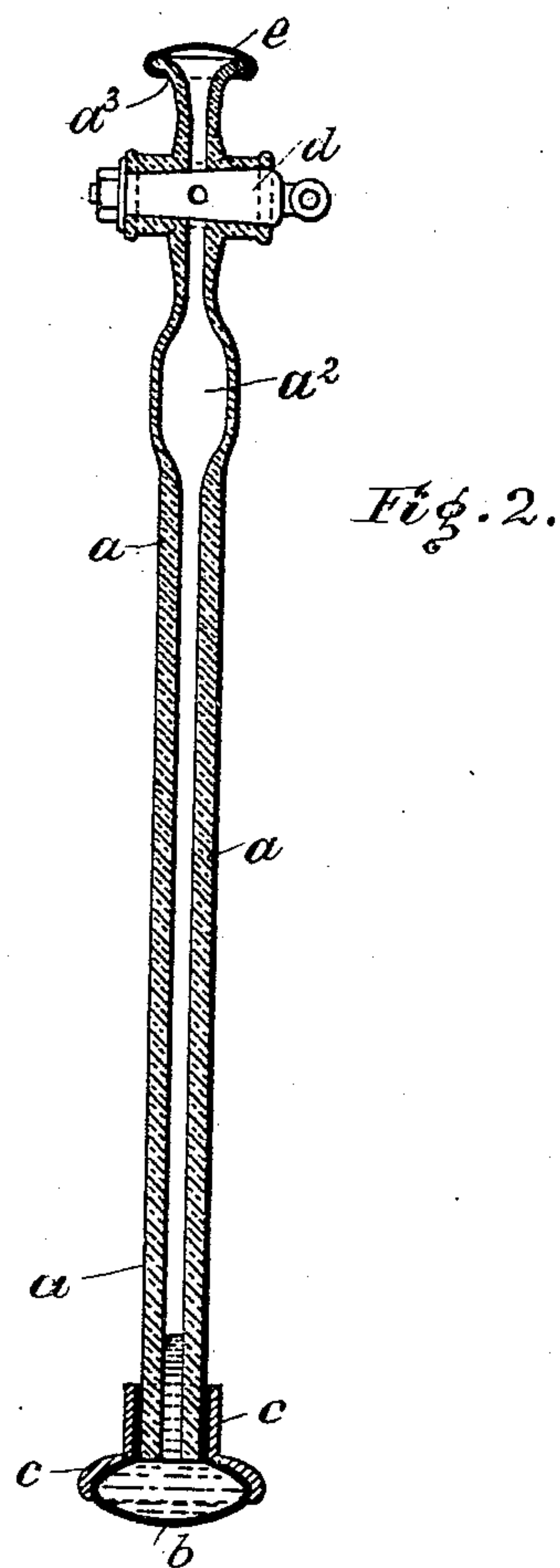
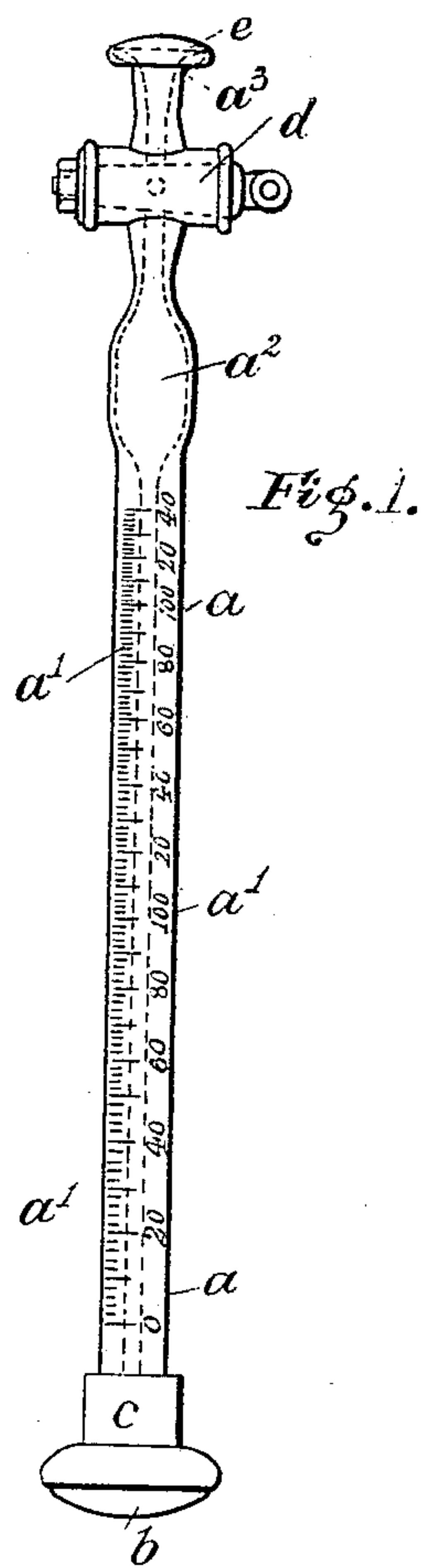
H. L. BARNARD, J. J. HICKS & L. E. HILL.

SPHYGMOMETER.

(No Model.,

(Application filed Sept. 9, 1898.)

3 Sheets—Sheet 1.



Witnesses:  
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Nellie Callahan.

Inventors:  
Harold Leslie Barnard,  
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by W. H. Finckel, Atty.

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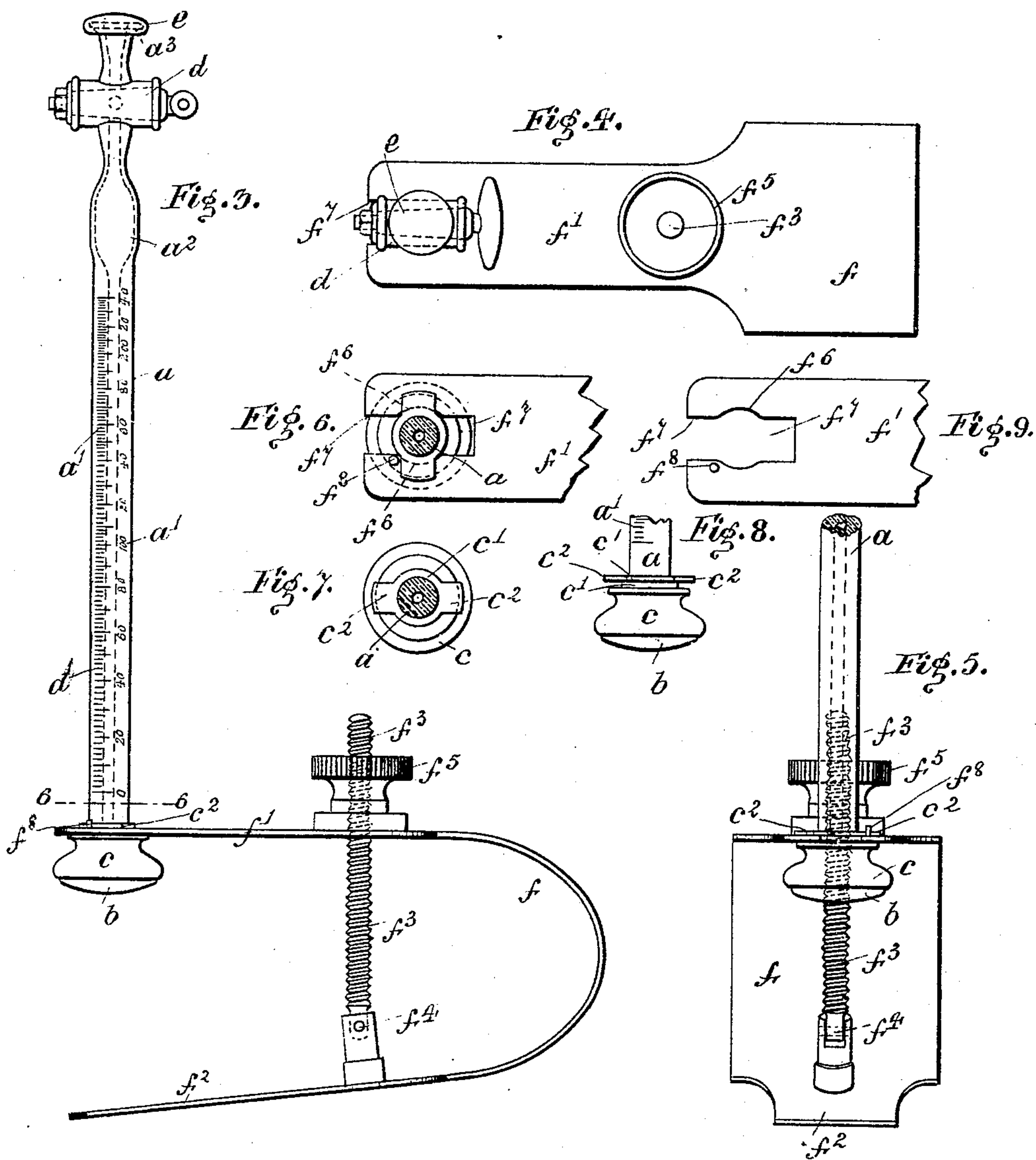
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(Application filed Sept. 9, 1898.)

(No Model.)

3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

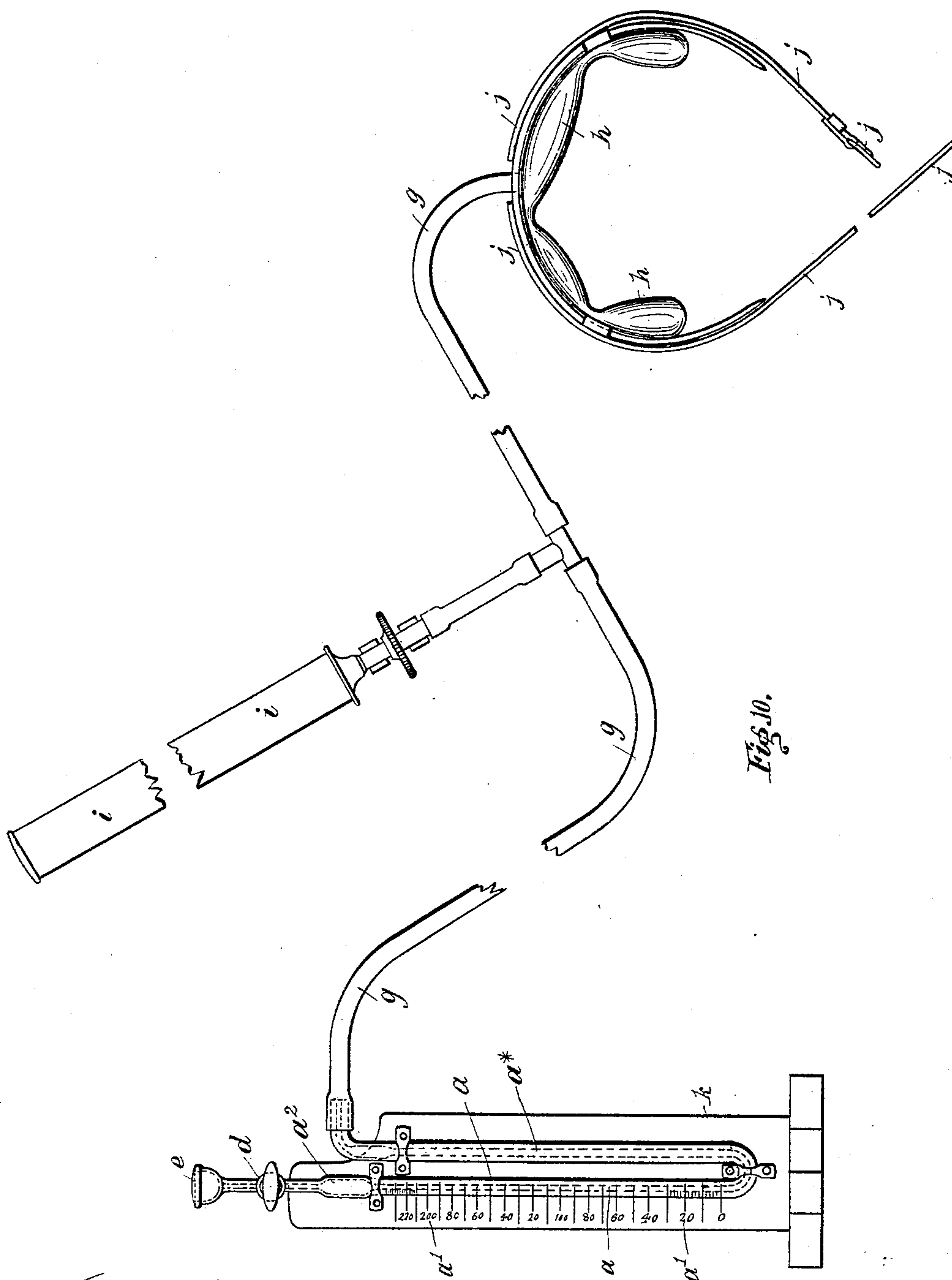


Fig. 10.

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# UNITED STATES PATENT OFFICE.

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## SPHYGMOMETER.

SPECIFICATION forming part of Letters Patent No. 618,049, dated January 24, 1899.

Application filed September 9, 1898. Serial No. 690,596. (No model.)

*To all whom it may concern:*

Be it known that we, HAROLD LESLIE BARNARD, JAMES JOSEPH HICKS, and LEONARD ERSKINE HILL, subjects of the Queen of Great Britain, residing at London, England, have invented certain new and useful Improvements in Sphygmometers, of which the following is a full, clear, and exact description, and for which we have made application for a patent in Great Britain, No. 7,144, dated March 24, 1898.

We will describe our invention in connection with the accompanying drawings, in which—

Figure 1 is a front elevation, and Fig. 2 a vertical section, of the simplest form of our improved sphygmometer. Fig. 3 is a front elevation, and Fig. 4 is a plan, of an improved sphygmometer attached to one arm of a clamp provided with means for pressing the arms more or less together. Fig. 5 is an end elevation of the clamp with the lower part of the sphygmometer removably fixed therein. Fig. 6 is a sectional plan drawn on line 6 6 of Fig. 3. Fig. 7 is a sectional plan, and Fig. 8 a front elevation, of the lower part of the sphygmometer shown at Figs. 3 to 6 and its holding means. Fig. 9 is a plan of the end of the upper arm of the clamp, and Fig. 10 is a general view showing a sphygmometer of U shape connected by a tube with a pump and with a flaccid bag capable of being bound more or less tightly around the arm or other portion of the body.

In all the figures like parts are indicated by similar letters of reference.

We will first describe the instrument represented at Figs. 1 and 2.  $a$  is a glass tube which is provided with a flexible membrane  $b$  in connection with its lower end, such membrane consisting of an india-rubber bag, fixed to the tube  $a$  by pressure and, if desired, cement between the mount  $c$  and said tube  $a$ .

We supply such bag  $b$  and the tube  $a$  with a small quantity of any suitable colored water or other fluid. We divide and figure the tube  $a$ , as shown at  $a'$ , to represent millimeters of pressure by mercury, and we form at the upper end thereof an air-chamber  $a^2$ , above which we construct a tap  $d$ , and above said tap we

attach a flexible membrane  $e$  by means of a flange  $a^3$  at the upper end of the tube  $a$ , over which the cup-shaped membrane  $e$  is stretched.

The instrument as above described can be used by pressing the flexible membrane  $b$  by hand against an artery at any part of the body until the maximal pulsation of the meniscus of the fluid in the tube is obtained. At the point on the scale where this maximal pulsation is obtained the pressure is read, and this indicates the pressure in the artery.

Each time an observation is to be taken the tap of the instrument is first opened, and the column of liquid is set to the zero-point of the scale either by pressing the flexible membrane  $e$  or  $b$  in connection, respectively, with the top or bottom of the tube  $a$ . The tap is then closed, when the instrument is ready for use.

If only a small quantity of liquid is contained in the instrument, the flexible membrane  $e$  may be dispensed with; but if such liquid should rise above the zero-point without pressure being applied thereto the flexible membrane  $e$  is needed to enable the liquid to be depressed to the zero-point.

The instrument may, as shown at Figs. 3 to 8, be removably mounted in one arm  $f'$  of a clamp  $f$ , the two arms  $f'$   $f^2$  of which are capable of being pressed more or less together by a screw or bolt  $f^3$ , attached by pin-point  $f^4$  to the arm  $f^2$  and a nut  $f^5$ . In this case the mount  $c$  has a cylindrical portion  $c'$  to fit a cylindrical opening  $f^6$  in the jaw  $f'$ , (shown at Fig. 9,) and at the upper part of said cylindrical portion  $c'$  are two lugs  $c^2$ , capable of being passed through the slot  $f^7$  of the jaw  $f'$  and then of being turned at right angles thereto to secure the tube  $a$  to the clamp. The tube  $a$  is removed from the clamp  $f$  by the reverse action. With this arrangement the wrist is placed between the two arms  $f'$   $f^2$  of the clamp, so that the flexible membrane  $b$  at the lower part of the instrument rests on the radial artery, and the maximal pulsation is obtained by exerting pressure by means of the screw  $f^3$  and nut  $f^5$ .  $f^8$  is a stop to limit the motion of the lugs  $c^2$ . The instrument may, however, as shown at Fig. 10, be of



U shape, in which case one limb,  $a$ , is provided with the air-chamber  $a^2$ , tap  $d$ , and flexible membrane  $e$ , and with a scale and figures  $a'$  along the length thereof, as in the instruments above described, while the end of the other limb,  $a^*$ , is connected by a flexible tube  $g$  to a flexible chamber  $h$ , which by means of a strap and buckle  $j$  can be fastened around the arm or other part of the body. The said tube  $g$  is also connected to a pump  $i$ , whereby pressure can be applied to the interior of the flexible chamber  $h$  to cause pressure to be applied to the radial or other artery, which pressure also acts on the liquid in the glass tube. In this form of instrument the tube  $a a^*$  is mounted on a stand  $k$ , on which the scale and figures are marked. This enables the instrument to be placed in an upright position on a table or other support.

Instruments constructed as herein described require no correction for temperature, like the sympiesometer, in addition to which they can be made very compact for use.

We would here remark that we make no claim, broadly considered, to the use of a pump  $i$  and flexible chamber  $h$ , connected to a manometer, as one arrangement of such was shown and described in the specification of United States patent granted to us February 1, 1898, No. 598,343.

What we claim, and desire to secure by Letters Patent, is—

1. In a sphygmometer the combination of a glass tube having a scale and figures in connection therewith, a chamber formed with a flexible membrane in connection with the lower end, an air-chamber at the upper part, a tap above such air-chamber and a small quantity of liquid in the tube, substantially as herein set forth and for the purpose stated.

2. In a sphygmometer the combination of a glass tube having a scale and figures in connection therewith, a chamber formed with a flexible membrane in connection with the lower end, an air-chamber at the upper part, a tap above such air-chamber, a small quantity of liquid in the tube and a flexible membrane at the upper end of the tube  $a$ , substan-

tially as herein set forth and for the purpose stated.

3. In sphygmometers the combination of a U-shaped glass tube having a scale and figures in connection with one leg thereof, an air-chamber at the upper end of the said leg, a tap above said air-chamber, a flexible membrane above the tap, a supply of liquid in the glass tube, a flexible tube connected to said glass tube, and a flexible chamber and a pump connected to said flexible tube, substantially as herein set forth and for the purpose stated.

4. In sphygmometers the combination of a glass tube, having a scale and figures in connection therewith, a flexible chamber connected with the lower end of the tube, an air-chamber at the upper part, a tap above such air-chamber, a supply of liquid in the glass tube and means for applying the said flexible chamber with suitable pressure to a part of the human body substantially as herein set forth and for the purpose stated.

5. In sphygmometers the combination of a glass tube having a scale and figures in connection therewith, a flexible chamber connected with the lower end of the tube, an air-chamber at the upper part, a tap above such air-chamber, a supply of liquid in the glass tube, means for removably connecting said glass tube to a clamp and means for causing the said clamp to apply the flexible chamber with suitable pressure to a part of the human body substantially as herein set forth and for the purpose stated.

In testimony whereof we affix our signatures in presence of two witnesses.

HAROLD L. BARNARD.

JAS. J. HICKS.

LEONARD E. HILL.

Witnesses to the signatures of Harold L. Barnard and James J. Hicks:

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CLAUDE K. MILLS.

Witnesses to the signature of Leonard Erskine Hill:

GEO. P. S. KELSEY,

WALTER E. ROCHE.