June 2, 1925. 1,540,241

G. F. BEACHLER

SPHYGMOMANOMETER

Filed April 8, 1922

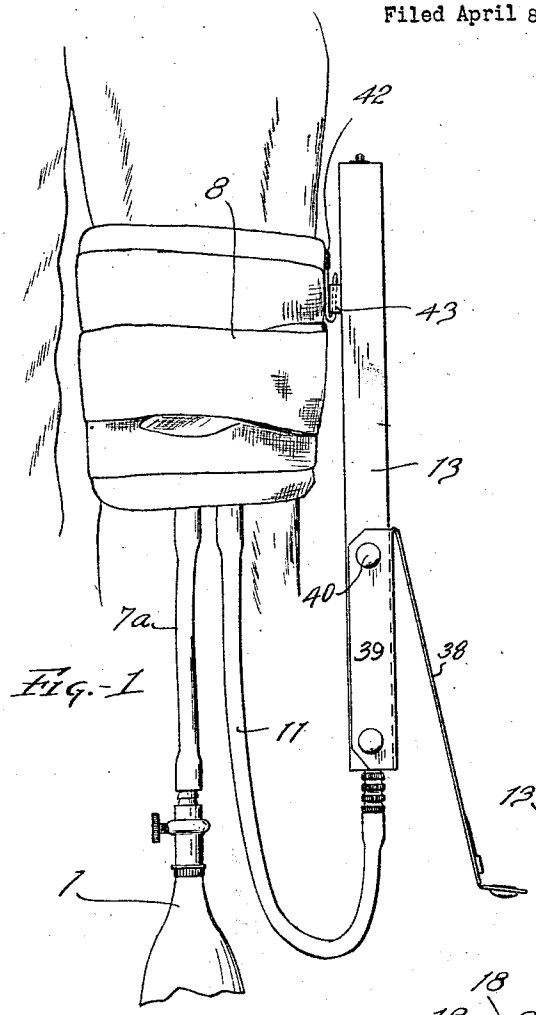


Fig.-1

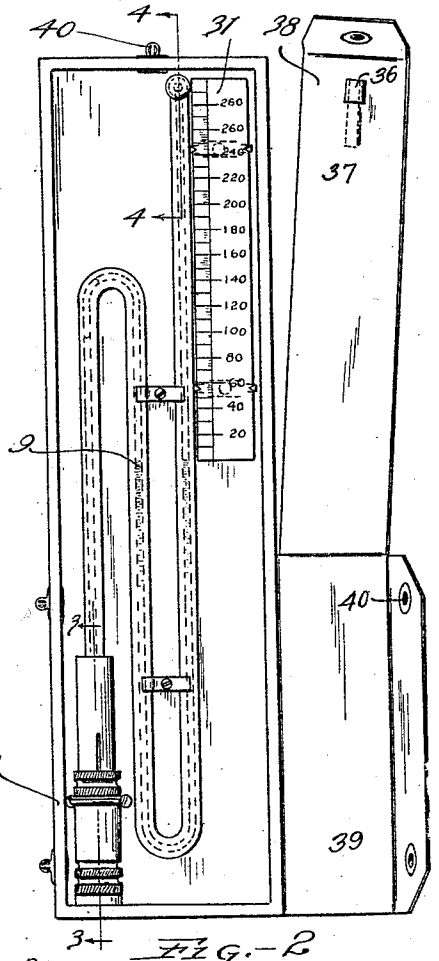


Fig.-2

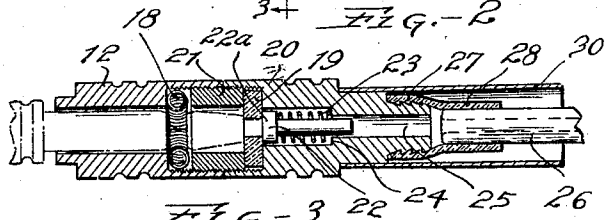


Fig.-3

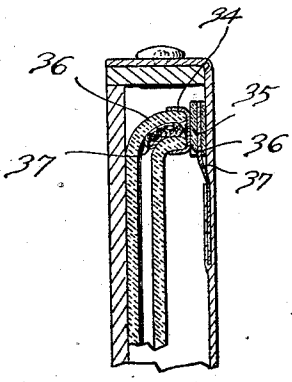


Fig.-4

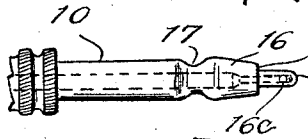


Fig.-5

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UNITED STATES PATENT OFFICE.

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SPHYGMOMANOMETER.

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To all whom it may concern:

Be it known that I, GEORGE F. BEACHLER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Sphygmomanometers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to a mercury column sphygmomanometer and is more particularly concerned with a novel arrangement of the various parts whereby the instrument may be compactly arranged and encased and be readily carried in the pocket.

In portable instruments, such as are in use in the medical profession for the determination of blood pressure, a mercury column is usually attached to a pneumatic tourniquet bag by a flexible tube. Considerable difficulty has been experienced with the mercury column parting in the tube. Another annoyance is that if the bag is detached from the column tube, the mercury will escape therefrom unless both ends of the tube are plugged. It frequently occurs that the plugs are misplaced or lost.

The general object of this invention therefore, is the provision of novel closure means for retaining the mercury in the tube when the tourniquet has been detached therefrom. While my invention is concerned primarily with the provision of novel means for connecting a tourniquet bag tube with the mercury tube and for sealing the tube, another object is to arrange the casing in such a manner that the instrument may be supported in a vertical position by the tourniquet bag when the same is attached to the arm of the patient.

Other objects and features of my invention will become apparent in the following description which relates to the accompanying drawings and the essential characteristics are hereinafter set forth in the claims.

In the drawings I have illustrated the method of attaching my device to the patient's arm as shown in Fig. 1; Fig. 2 is a front elevation of the instrument with the cover standing at an angle; Fig. 3 is a cross sectional view of the tube connections substantially along the line 3—3 of Fig. 2; Fig. 4 is a cross section of the upper end of the mercury tube substantially along the line 4—4 of Fig. 2; Fig. 5 is an enlarged view of a coupling member attached to the flexible tourniquet tube.

It has been the general practice in constructing a sphygmomanometer, to provide a mercury tube housed in a suitable casing to which a rubber hose or other hollow flexible connection communicating with a tourniquet bag is permanently attached. Such an arrangement in portable instruments is unsatisfactory in that the mercury column frequently becomes parted in the tube with consequent annoyance to the physician when placing the instrument in use. It frequently occurs, furthermore, that when the casing is being shaken or jolted to bring the parted mercury column together that the tube or the graduated scale becomes relatively displaced and not infrequently the tube is broken.

To overcome these defects I have provided a coupling member associated with a self closing valve connected with one end of a mercury tube whereby a tourniquet 8 and tube 11 may be placed in pneumatic communication with a mercury column 9 by inserting a male coupling member 10 carried by the tourniquet tube in a female portion 12 of a self closing valve secured to the instrument casing and to which the mercury tube may be flexibly connected. I have provided novel closing means on the other end of the mercury tube adapted to permit the ingress and egress of air to and from the top of the mercury column which may be automatically sealed to prevent the escape of mercury and air upon closing the casing.

The coupling member 10 may have a tapered portion 16 and an annular groove portion 17 formed near the outer end thereof. The tapered portion is adapted to spread or expand an annular spring member 18 and the groove forms a seat for the annular spring member 18, the latter being positioned within a female coupling member 12. The coupling member 12 may be joined to the valve body 20 by a threaded nipple 21, the end of which may serve to retain the spring member 18 in position while the other end may serve to retain a resilient valve seat 19 in contact with a suitable shoulder formed in the valve body 20. A valve stem 22 may be maintained in contact with the valve seat 19 by a suitable spring member 23 adapted to bear on a shoulder 24 formed in the valve body and the head 22^a of the

valve stem. A suitable opening 25 of sufficient size to permit the passage of air along the valve stem may extend to the inner end of the valve body to provide communication with the end 26 of the double U-shaped mercury tube 9. Suitable serrations 27 may serve to retain one end of a flexible connecting member 28 in position on the end of the valve body. The other end of this connecting member may be attached to the end 26 of the mercury tube.

When attaching the tourniquet tube to the casing the action of the various valve and coupling members will be as follows: As the tube coupling member 10 is inserted in the member 12, the spring member 18 is spread outwardly by the tapered end 16 and thereafter becomes seated in the annular groove 17, thus retaining the end 16^a of the male member 10 in abutting relation to the resilient member 19, thereby forming an air tight connection between the tourniquet and the mercury column within certain pressure limits. A projecting integral portion 16^b formed on the end of the member 10 may serve to raise the valve stem 22 out of contact with the resilient seat 19. A transverse opening 16^c permits the unobstructed passage of air from the tourniquet tube 11, whence it then may pass along the valve stem and through the opening 25 into the mercury tube 9.

Air may be forced gradually into the tourniquet bag 8 by a suitable inflating bulb 7, attached to the bag by a suitable hose member 7^a, when it will become distributed and compressed in the bag. The air will likewise be compressed in the flexible tube 11 and in the inverted U portion of the tube and consequently exert a pressure upon one end of the mercury column. A suitable scale 31 may be adjustably mounted adjacent the extended leg of the upright U-column above the normal position of the mercury whereby the air pressure displacing the mercury may be directly read.

It is essential that the upper end of the mercury tube be provided with a sealing member which will permit the air to escape from the tube as the mercury rises therein, but which will prevent the escape of the mercury. I have provided a very satisfactory and economical seal consisting of a resilient cap member 34 formed of rubber or other suitable material and which may be tightly fitted over an outwardly extending portion 36 of the mercury tube. This cap may have a small perforation 35 of sufficient size to permit the passage of air into and out the upper end of the tube. A small bit 37 of cotton or other porous material may be placed in the tube just within this flexible cap member.

This porous material prevents the mercury from reaching the opening in the seal 34. I have provided a resilient pad 36 carried by a flexible member 37 secured to the casing cover 38 which is adapted to press upon the outer surface of the seal cap and close the opening therein when the instrument is closed.

I have arranged the cover in such a manner that the upper part thereof may be released and dropped as shown in Fig. 1, thus exposing only the graduations on the scale and the upper portion of the mercury column. The lower portion of the cover may be hinged to the side of the casing. Suitable glove fasteners 40 secured to the top and side of the casing may serve as locking means for holding the cover on the casing when closed.

It is frequently desirable to have the instrument positioned in such a manner that the patient may not obtain a view of the reading on the scale. This is especially true in cases where the nervous conditions of the patient may affect the blood pressure. I therefore have arranged a hook member 42 on the tourniquet 8 and a suitable strap 43 on the back of the casing whereby the instrument may be suspended in a vertical position on the arm of the patient. Thus one hand of the physician may remain free to feel the pulse as the tourniquet bag is being inflated.

From the foregoing description of my invention it is to be readily seen that I have provided a portable instrument which may be quickly opened and assembled and which may also be carried in the pocket. It is to be further understood that by providing valves on both ends of the mercury tube which automatically seal upon the disconnecting and folding of the instrument, air may be trapped in both ends of the tube which serves to prevent the mercury from separating into slugs with intervening air pockets formed therebetween.

Having thus described my invention, I claim:

1. In a sphygmomanometer, the combination with a pneumatic bag and a U-shaped mercury tube, of a detachable means connecting the bag and one end of said tube, a valve incorporated in the connecting means adapted to automatically close when the pneumatic bag is detached from the tube, a casing, means for securing the mercury tube in said casing, said casing having a cover and means for making an air-tight seal at the other end of the mercury tube whenever the cover of said casing is closed.

2. In a sphygmomanometer, the combination of a U-shaped mercury tube, porous plugs in the tube for preventing the escape of mercury, a pneumatic bag, a scale mounted adjacent the mercury tube, connecting means between the bag and one end of the tube including a valve adapted to automati-

cally seal the tube when the bag is disconnected, a flexible tube on the bag, a coupling member at the end of the bag tube adapted to open the valve, a casing, means for securing the mercury tube in said casing, said casing having a cover adapted to enclose the tube and scale, and mercury tube sealing means associated with the cover and adapted to close the other end of the tube in an air-tight manner when the casing is closed.

3. In a sphygmomanometer having a pneumatic bag and a U-shaped mercury tube, the combination of a tube leading from the bag to the mercury tube and having one end terminating in a coupling member, a second coupling member secured to one end of the mercury tube and a retaining device associated with one of said coupling members for maintaining both coupling members in coupled relation.

4. In a sphygmomanometer having a tourniquet and a U-shaped mercury tube, the combination of a pneumatic bag, a flexible tube for connecting the bag with the mercury tube, a male pneumatic coupling member secured to one end of the flexible tube, a sealing valve associated with one end of the U-shaped mercury tube and adapted to be maintained open when said coupling member is connected thereto.

5. In a sphygmomanometer the combination with a tourniquet, of a pneumatic bag, a U-shaped mercury tube and a scale therefor, a portable casing, means for securing the mercury tube in said casing, said casing having a folding cover a flexible tube communicating with said bag and said U-shaped tube and means for automatically sealing the ends of the mercury tube upon the disconnecting of said flexible tube and the closing of said cover.

6. In a sphygmomanometer, the combination with a tourniquet having a pneumatic bag and inflating means therefor, of a casing, a mercury tube mounted therein, a flexible tube communicating with said bag and the mercury tube, a valve releasing mechanism secured to one end of the flexible tube, and a valve connected to the mercury tube and adapted to seal one end thereof upon disconnecting the flexible tube from the mercury tube.

7. In a sphygmomanometer the combination with a tourniquet, having a pneumatic bag and inflating means therefor of a U-shaped mercury tube, a scale therefor, a flexible tube connecting the bag to the mercury tube, a casing, means for securing the mercury tube and scale in said casing and connecting means secured to said tourniquet and said casing for detachably supporting the casing with the mercury tube in a vertical position when the instrument is in use.

8. In a sphygmomanometer the combination with a tourniquet, of a pneumatic bag, insulating means therefor, a mercury tube, a scale arranged adjacent the upper portion thereof, a casing, means for securing the mercury tube and scale in said casing, and a double fold cover for the casing whereby the scale and the column of mercury may be exposed upon opening one fold of the cover.

9. In a sphygmomanometer the combination with a tourniquet bag, of a mercury tube, a scale therefor, a casing, means for securing the mercury tube and scale in said casing, a removable cover for said casing, and means carried by the cover for sealing the upper end of the tube when the cover is in closed position on the casing.

10. In a sphygmomanometer, the combination with a pneumatic tourniquet bag, of a mercury tube having a self-closing valve mechanism secured to the lower end thereof, a flexible tube joined to the tourniquet bag, and a male coupling member secured to the end of said flexible tube and a female coupling member associated with said self-closing valve and adapted to receive said male coupling member, the junction of said members operating to open the valve whereby communication is established between the bag and the mercury tube when the coupling members are joined.

In testimony whereof, I hereunto affix my signature.

GEORGE F. BEACHLER.