G. F. BEACHLER.

SPHYGMOMANOMETER.

APPLICATION FILED AUG. 13, 1914.

1,225,395. Patented May 8, 1917.

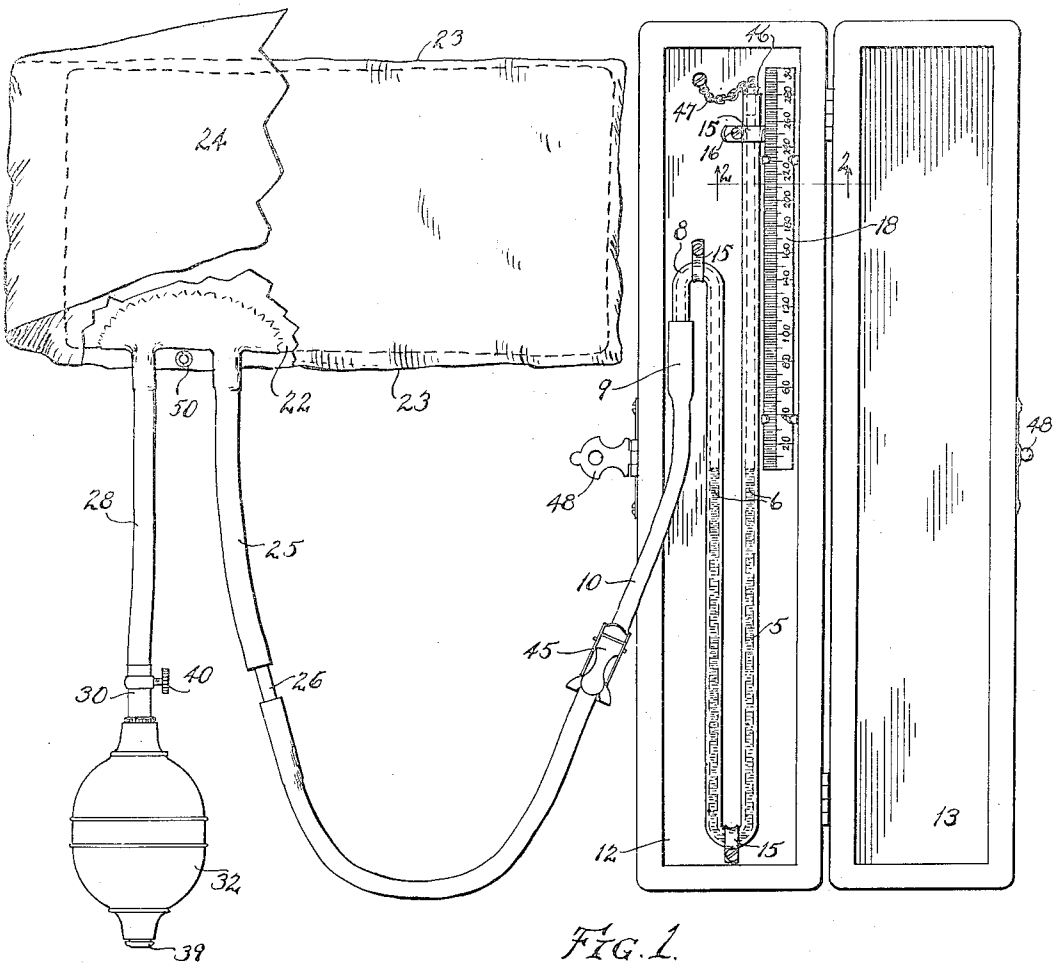

FIG. 1.

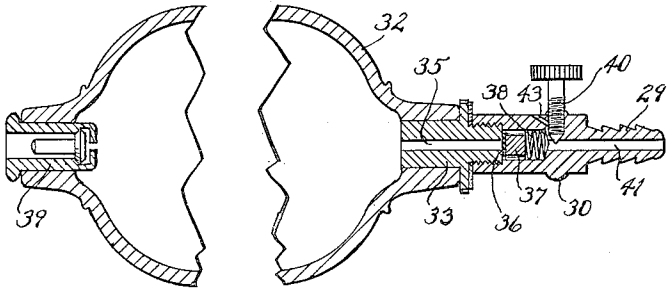

FIG. 3.

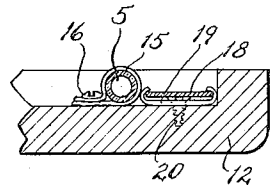

FIG. 2.

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SPHYGMOMANOMETER.

1,225,395. Specification of Letters Patent. Patented May 8, 1917.

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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 sphygmomanometers of the mercury tube type and the general object is to provide a more efficient and accurate instrument of this nature which shall be simple in construction. More specific objects are to so arrange the mercury tube that the pressure to be ascertained acts against weight of the mercury, causing it to rise in direct proportion to the pressure, allowing the use of a standard scale such as a metric scale; to provide for adjusting the scale with relation to the column of mercury to allow for variation in its volume, and to so construct the parts that they may be cheaply manufactured and readily replaced when broken or lost. Another object is to so arrange the parts of the instrument that they may be so carried in a compact box forming the standard or mounting for the tube when in use, that the danger of breaking the tube is eliminated. Still another object is to provide convenient and simple means for taking the diastolic pressure after taking the systolic pressure.

Other objects and features of my invention will become apparent in the following specification and the essential characteristics are hereinafter set forth in the claims.

In the drawings, Figure 1 is a front elevation of my instrument, showing the box or case in which it is carried, in the open position, and showing the pneumatic connections to the bag to be bound around the patient's arm; Fig. 2 is a transverse section through the scale and upper portion of the mercury tube, showing the means for mounting the same in the cover of the case, this section being taken substantially on the line 2—2 of Fig. 1; Fig. 3 is a longitudinal transverse section through the bulb and showing the arrangement of the air valves.

Referring to the drawings by reference numerals, 5 indicates a substantially U-shaped glass tube adapted to be partially filled with mercury, as indicated at 6, and having one leg of the U extending upwardly, (substantially vertically when in use) and open at its upper end. The other side of the U is bent downwardly upon itself, as at 8, providing a connection for a rubber tube or similar flexible tube, indicated at 10. The mercury tube is preferably mounted in the shallow cover 12 of a box 13, forming a case for the instrument. The tube is secured to the cover by means of elastic straps 15 looping around the tube and having suitable small screws passing through the ends and into the cover as indicated at 16. There are preferably three of these straps, one in each of the turns or connecting portions of the tube, and one at the upper end of the vertical portion, as shown. These straps are preferably made of leather and extend around the tube in a loop, providing one thickness between the tube and the cover, forming a cushion, while the strap itself forms an elastic support for the tube, allowing a slight movement thereof, which tends to prevent breakage due to jarring and also allows expansion and contraction of the tube due to change in weather conditions, without the breaking of the same.

Parallel with the vertical portion of the tube 5, and slidably secured to the cover 12, is a scale 18. This may be any form of scale desired, but is preferably a metric scale. It is slidably secured to the cover 12 by means of narrow strips 19, each having a screw 20 passing through the middle of the same and into the cover, and having each end curled upwardly and resiliently or yieldingly engaging the edges of the strip, as shown in Figs. 1 and 2. This allows the scale to be adjusted to conform to the varying volume of mercury due to weather conditions or losses of mercury, it being only necessary, to adjust the instrument, to set the same in a vertical position and bring the lower end of the scale 18 opposite the upper ends of the two mercury columns, which are at the same level under normal conditions. Now, it will be seen that when pressure is applied to the tube 10, acting downwardly on the column or mercury shown at the left, it will raise the column of mercury in the tube opposite

the scale, the reading corresponding to the pressure applied.

Accordingly, to take the blood pressure, I use a substantially flat rubber bag 22, carried in a cloth sack 23, having a band 24 extending therefrom and of such a length as to be wound several times around the arm or limb of the patient. This bag is connected with the tube 10 by a short tube 25, adapted to receive at its end a glass connection 26. A second comparatively short tube 28 leads from the bag 22 and is adapted to receive a connection 29 of the valve 30, carried on the end of the usual collapsible bulb 32.

The valve 30 is preferably carried by a nipple member 33 mounted in the end of the bulb 32 and having a passage 35 adapted to be closed by a small disk 36 normally pressed against the end of the nipple 33 by a slidable plug 37 having suitable grooves for the passage of air, and pressed toward the rubber disk by a spring 38. The opposite end of the bulb is provided with a suitable inlet valve as shown at 39 in Fig. 3.

Pressure within the bulb and bag may be gradually released under the control of a screw valve comprising a screw 40, threaded radially into the valve member 30 and having a conical end closing a port communicating with a passage 41 of the valve 30. Leading from the threaded opening for the screw 40, is a small passage 43 adapted to allow the escape of air from the passage 41 when the screw 40 is screwed outwardly sufficiently to allow this passage of air, by uncovering this opening.

The operation of the instrument is as follows: The bag 22 is wrapped tightly about the arm of the patient and secured by the band 24. A communication between this bag and the mercury tube is established by opening a suitable clamp valve 45 on the tube 10, the bulb 32 is then operated to raise the pressure in the bag and the tube until the pulse of the patient may no longer be felt, or in other words, disappears. This pressure will act downwardly on the column of mercury at the left, raising the column of mercury at the right in direct proportion to the pressure on the first column. The reading is taken by noting the height at which the top of the column of mercury opposite the scale, stands. The diastolic blood pressure may then be taken by unscrewing the valve screw 40, sufficiently to allow the air to gradually escape from the bag 22 and the tube 10, through the small passage 43 described, which allows the column of mercury to gradually fall, with a fluctuating movement due to the pulse action. The point at which the greatest fluctuations occur may be noted on the scale, and this corresponds to the diastolic pressure.

After using the instrument, the valve 45 on the tube 10, is closed and the upper end of the vertical mercury tube is closed by a plug 46, shown as carried on a suitable chain 47, secured to the cover 12. The bag and band 24 may then be rolled tightly and packed into the box 13, and the cover 12 then closed and secured by a suitable catch indicated at 48. The sack 23 for the bag 22, preferably has an opening substantially the width of the broken away portion in Fig. 1, to allow the insertion of the bag, which is then held from drawing out of the sack by means of a glove fastener closing the two flaps between the tubes 25 and 28, the glove fastener being positioned as indicated at 50.

It will be seen from the foregoing description that I have provided an efficient and simple instrument accomplishing the objects above set forth. Some of the features of my instrument are, that it may be packed in the small convenient case, as described, and when so packed there is no danger of breaking and no danger of losing the mercury, the mercury tube being constructed merely of a tube having a standard bore and bent to the desired shape, allows the cheap manufacture of the tube, while the elastic mountings described prevent the breakage of the same but allow the ready replacement thereof if desired. Also, by the arrangement of connections described I use a single bulb with a two tube pneumatic bag so that the pressure may be raised by pumping air directly into the bag which causes the mercury to rise with a regular movement, practically unaffected by the pumping action of the bulb.

Having thus described my invention, what I claim is:

1. In a sphygmomanometer, the combination with a pneumatic bag, of a tube leading to the bag, a collapsible bulb attached to the tube for inflating the bag, a screw valve adjacent the bulb and adapted to vent the passage leading therefrom and adapted to be operated by the hand operating the bulb, a separate tube leading from the bag, a U-shaped mercury tube connected with the last named tube having one leg extending higher than the other, a scale opposite this last named leg, means for removably closing the upper end of the leg of the tube adjacent the scale, and means for closing the tube leading from the bag to the mercury tube.

2. In a sphygmomanometer, the combination with a mercury tube, of a flexible tube leading thereto, a pneumatic bag connected with the last mentioned flexible tube, a separate flexible tube leading to the bag, a collapsible bulb for inflating the bag through the last mentioned tube, a valve casing secured to the collapsible bulb and having a passage connecting the bulb with the flexi-

ble tube leading therefrom, a check valve closing toward the bulb and mounted in said casing, a vent passage in the valve casing on the side of the valve away from the bulb, and a screw closing said vent opening and adapted to be operated by the hand operating the bulb.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

GEORGE F. BEACHLER.

Witnesses:
JUSTIN W. MACKLIN,
JAY COMSTOCK.