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[21] Appl. No. **688,852**
[22] Filed **Dec. 7, 1967**
[45] Patented **Sept. 22, 1970**

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[54] **MANOMETER DEVICE**
5 Claims, 9 Drawing Figs.

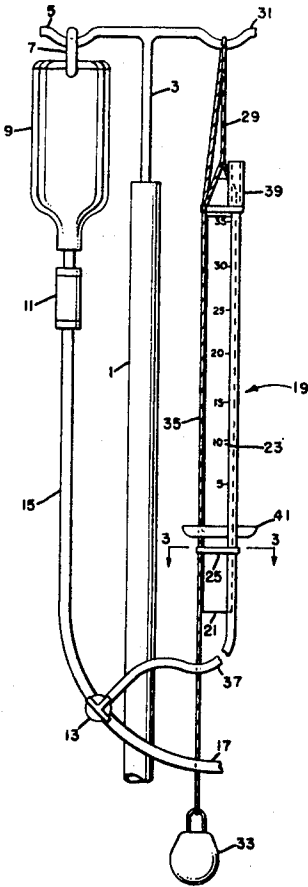
[52]	U.S. Cl.....	128/2.05
[51]	Int. Cl.....	A61b 5/02
[50]	Field of Search.....	128/2.05; 128/214

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ABSTRACT: A manometer device for use in the measurement of central venous pressure and peripheral venous pressure comprising a flat, longitudinal member having centimeter indicia thereon and two upstanding guides each having two holes formed therethrough. One hole of each guide mounts tubing to register centimeters of water reading with reference to the centimeter indicia, and the other hole of each guide vertically mounts the manometer device on cord or other tubing. A hole and its associated guide function as a clamp for adjustable vertical mounting of the manometer device.



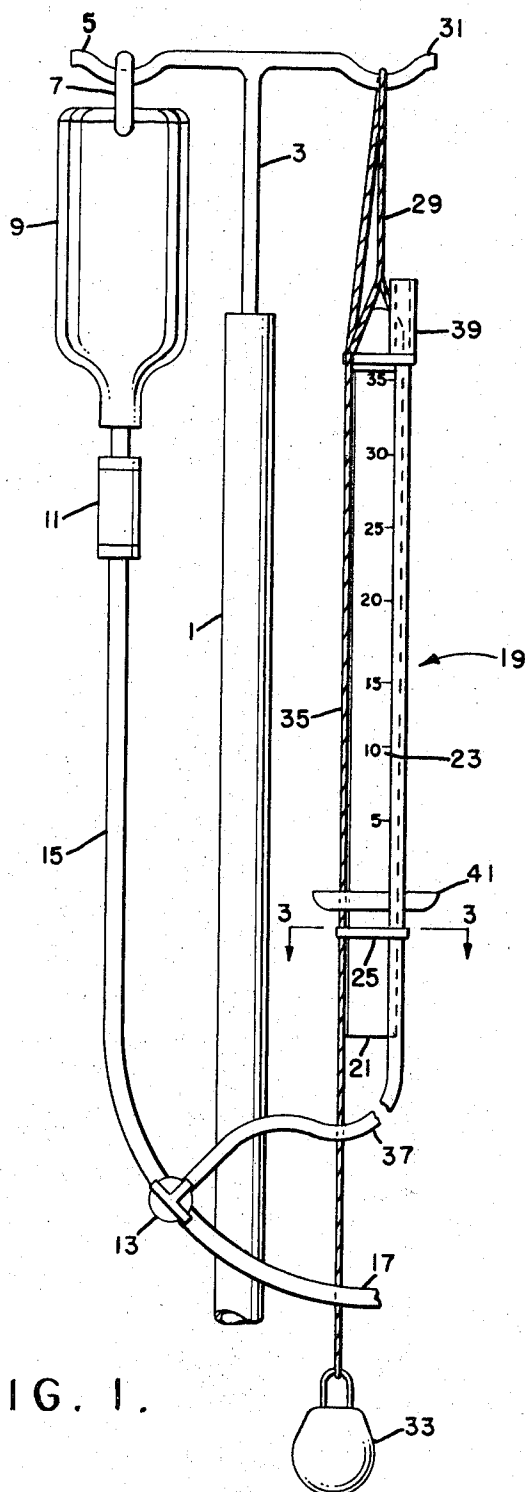


FIG. 1.

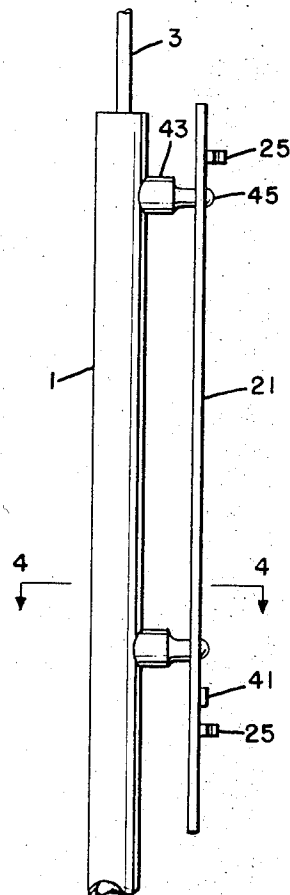


FIG. 2.

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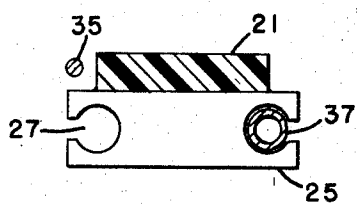


FIG. 3.

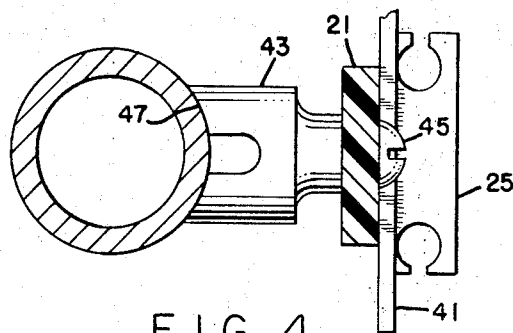


FIG. 4.

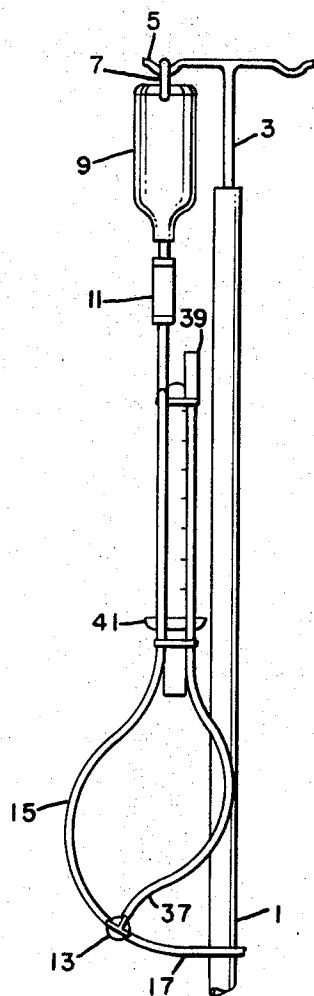


FIG. 5.

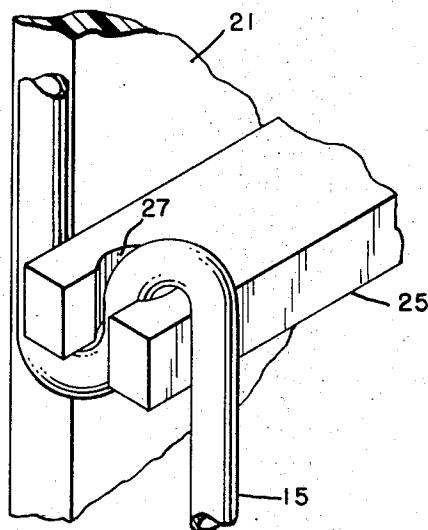


FIG. 6.

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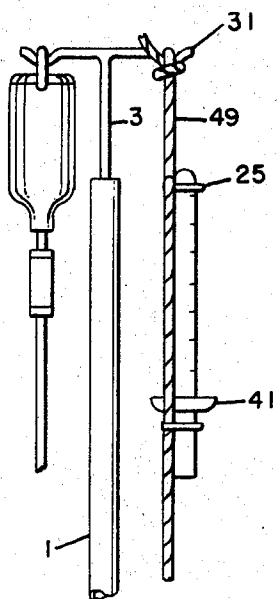


FIG. 7.

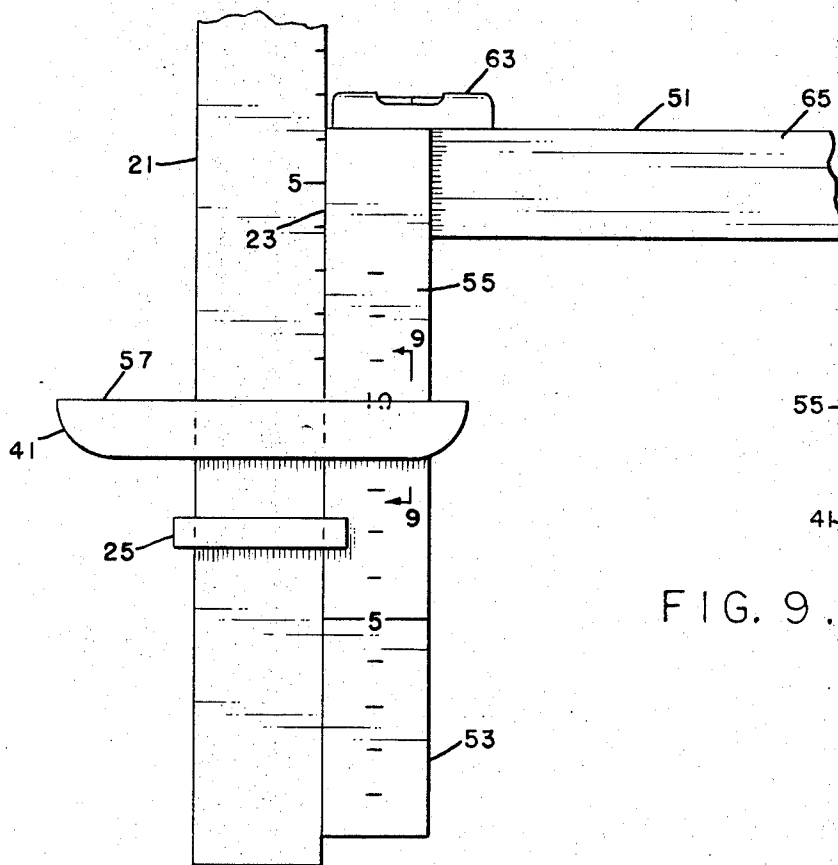


FIG. 8.

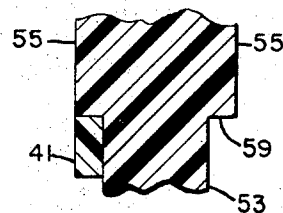


FIG. 9.

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MANOMETER DEVICE

This invention relates to a manometer device for use in the measurement of central venous pressure (hereinafter referred to as CVP) and peripheral venous pressure.

Reusable glass manometers costing approximately \$10.00 each were utilized at one time in peripheral venous pressure measurement. A glass manometer was reusable after being cleaned, sterilized and repackaged. Nevertheless, there always remained the question if the glass manometer was sterile. Taking apart the glass manometer, cleaning and sterilizing same was a nuisance and required considerable time. Simple arithmetic soon established the fact that the labor cost for cleaning, sterilizing and repackaging a glass manometer approximated the cost of a disposable, sterile manometer. Therefore, a disposable manometer was developed in the art to replace the glass manometer.

The cost of the disposable manometer with its associated piece of tubing ranges from \$1.50 to \$3.75 when purchased in quantity. By using a separately disposable 30-inch length of tubing with the manometer device of this invention, instead of the prior-art disposable manometer with its associated piece of tubing, the cost can be decreased from \$1.50—\$3.75 to 25—35 cents for the 30-inch length of tubing.

The object of this invention is to solve the discussed problem of the art of the high cost of the disposable manometer with its associated tubing by replacing same with the separate 30-inch length of tubing utilized with the manometer device of the invention.

This object and other objects of the invention should be discerned and appreciated by reference to the drawings, wherein like reference numerals refer to similar parts throughout the several views, in which:

FIG. 1 is a view of one embodiment of the manometer device of the invention;

FIG. 2 is a view of another embodiment of the manometer device of the invention;

FIG. 3 is a view taken in the direction of the arrows 3—3 of FIG. 1;

FIG. 4 is a view taken in the direction of the arrows 4—4 of FIG. 2;

FIG. 5 is a view of the manometer device of FIG. 1 mounted on the branch tubing communicating with the drip chamber;

FIG. 6 is a blown-up, fragmentary view of FIG. 5 in perspective;

FIG. 7 is a view of the manometer device of FIG. 1 mounted on a cord attached to the extension of the intravenous pole;

FIG. 8 is a view of the manometer device utilized with a modified accessory instrument; and

FIG. 9 is a view taken in the direction of the arrows 9—9 of FIG. 8.

In FIG. 1 of the application for U.S. Letters Patent of Paul E. Rockwell, M.D., for "Accessory Instrument for the Measurement of Central Venous Pressure," Ser. No. 634,310, filed Apr. 27, 1967, U.S. Pat. No. 3,413,970, granted Dec. 3, 1968, is shown a view of a patient disposed to receive a venous infusion by means of prior art facilities and the detailed description with reference thereto describes feeding the patient with venous infusion fluid, then filling the manometer with venous infusion fluid and then leveling of the venous infusion fluid in the manometer to render the measurement of the patient's CVP. The set-up shown in FIG. 1 of this application for CVP measurement is similar to the set-up shown in FIG. 1 of Dr. Rockwell's patent.

In FIG. 1 of the drawings is shown an intravenous pole 1 with a double-branch extension 3. Branch 5 carries the hanger 7 of an intravenous bottle 9 disposed in inverted relationship. Bottle 9 communicates with the drip chamber 11. The three-way valve 13 has branch tubing 15 and 17 which communicate, respectively, with drip chamber 11 and the needle (not shown) which preparatory thereto was inserted, normally, in the patient's antecubital vein. And prior to the effectuation of

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a communicating relationship of tubing 17 with such inserted needle, a catheter (not shown) was threaded through such needle and into the patient's superior vena cava.

Reference numeral 19 generally refers to the manometer device of this invention. The manometer device comprises a flat, vertical, longitudinal member 21 having centimeter indicia 23 thereon. Up-standing from the lower portion and up-standing from the upper portion of longitudinal member 21 are similar respective guides 25. The two guides 25 each have two vertical holes formed therethrough, as shown in FIG. 3.

A cord 29 is trained over branch 31 of extension 3. One end of cord 29 is in the form of a closed loop that is disposed beneath upper guide 25 of the manometer device 19. Weight 33 is carried on the other end of cord 29, as shown. The intermediate portion 35 of cord 29 is disposed within the holes 27 on the left sides of guides 25, as viewed in FIG. 1. Weight 33 is a counterbalancing weight. Hence, if the manometer device is moved vertically up or down, the manometer device 19 will remain in the vertical position to which it is disposed.

A 30-inch tubing 37 carries on one end a plastic adapter 39 having an external diameter greater than the diameter of any of the holes 27 to thereby function as a limit stop when tubing 37 is sufficiently disposed through the hole 27 on the right side of the upper guide 25, as viewed in FIG. 1, until plastic adapter 39 abuts the upper surface of the upper guide 25. The other end of tubing 37 is rendered in communicating relationship with a branch of the three-way valve 13, as shown.

Carried on the lower portion of longitudinal member 21 is a cross member 41 transversely disposed therewith. Longitudinal member 21 and its cross member 41 approximate a T-square. The upper surface of cross member 41 is aligned with the zero mark of the centimeter indicia 23, as shown.

The conventional procedure to effect CVP measurement of the patient, utilizing the manometer device of the invention, is as follows: First the physician ascertains by measurement the antero-posterior diameter of the patient's chest, half of which measurement is the reference locus of the vertical centimeter distance of the patient's superior vena cava from the skin of the patient's back. If the manometer device 19 is so vertically disposed that the zero mark of centimeter indicia 23 lies within the same horizontal plane passing through such ascertained reference locus of the patient's superior vena cava, then accurate measurement can be made of the patient's CVP. Next the three-way valve 13 is disposed in such position that communication of tubing 37 is closed and communication of intravenous bottle 9 through tubing 15 and 17 is opened thereby feeding the patient venous infusion fluid from intravenous bottle 9. Then the three-way valve 13 is disposed in such position that communication from intravenous bottle 9 through tubing 17 to the patient is shut off and communication from intravenous bottle 9 through tubing 15 and tubing 37 is opened thereby filling the tubing 37 with venous infusion fluid. Then the three-way valve 13 is disposed in such position that the only communication open is from tubing 37 through tubing 17 to the patient; hence, the patient is being fed venous infusion fluid from tubing 37. The fluid in tubing 37 will level itself shortly and the liquid line of venous infusion fluid in tubing 37, by reference to the centimeter indicia 23, will be the patient's CVP as measured in centimeters of water.

When the prior-art, disposable manometer is used in such conventional procedure, same is taped or clipped to one of the intravenous poles. During an operation the sterile, surgical drapes are often raised and taped, or otherwise secured, to intravenous poles for access to the patient's head for anesthesia purposes. Intravenous poles are used in this manner because of their height and convenient access for such drape securement purposes. After the initial CVP measurement the operating table is often elevated for the surgeon's convenience rendering CVP remeasurement inaccurate and necessitating that such prior-art, disposable manometer be untaped, raised to that new vertical position to assure accuracy of subsequent CVP remeasurement by rendering the zero mark of the centimeter scale in the same horizontal plane occupied by the

changed superior vena cava reference locus, and retaped in such redisposed vertical position. The drapes secured on the manometer's intravenous pole often interfere with this required raising of such prior-art, disposable manometer to such required new vertical position. However, with the manometer device of this invention the described and necessary vertical redistribution to assure accuracy in subsequent CVP remeasurement can be accomplished simply, easily and quickly without the necessity of further assistance by other occupied operating-room personnel in contrast to the need for such further assistance when the prior-art, disposable manometer is used. The differences in the diameters of the intravenous pole and its extension render clipped retention of the prior-art, disposable manometer to such extension difficult at times. Such simplicity, ease and quickness of vertical redistribution of the manometer device of this invention should be readily discerned from the detailed description of the drawing figures herein.

Also, compared to the prior-art, disposable manometer, the 30-inch tubing carried by the guides away from the centimeter indicia renders readings contrastingly and hence significantly easier.

In FIGS. 2 and 4, the manometer device shown differs structurally from manometer device 19 shown and described with reference to FIGS. 1 and 3 only in that two magnets 43, as shown, are mounted on the flat, longitudinal member 21 by means of screws 45 retentively engaged with tapped holes in magnets 43. The mating surfaces 47 of magnets 43 are complementary to the surface of the intravenous pole 1, as shown. The 30-inch tubing 37 would be disposed on this manometer device as it was in manometer device 19 of FIGS. 1 and 3, and the same procedure, as heretofore described, followed to effect CVP measurement of the patient. Magnets 43 function to facilitate the vertical disposition of the manometer device by movement of same up and down intravenous pole 1.

In FIGS. 5 and 6, the manometer device 19 is shown mounted on branch tubing 15 and adjustably disposed in such vertical disposition by inserting branch tubing 15 in the holes 27 on the left sides of guides 25, as viewed in FIG. 5. In FIG. 6, branch tubing 15 is disposed in an S configuration with reference to the upper guide 25 and its hole 27 to permit such cooperating upper guide 25 and its hole 27 to function as a clamp to adjustably retain manometer device 19 in the vertical disposition as disposed. However, this described clamping function is not sufficient to close branch tubing 15 to prevent flow therethrough of venous infusion fluid from intravenous bottle 9. It should be appreciated that adjustable vertical disposition of manometer device 19 is accomplished by loosening that portion of branch tubing 15 from its S configuration, disposing manometer device 19 in the preferred vertical disposition and then redisposing the appropriate part of branch tubing 15 in the S configuration in conjunction with upper guide 25 and its hole 27, to again accomplish the cooperative clamping function.

In FIG. 7, the manometer device 19 is shown mounted on a cord 49 secured to and suspended from branch 31 of extension 3. As is shown in FIG. 7, manometer device 19 mounted on cord 49 is adjustably disposed in its vertical disposition in the same manner and with the same attendant clamping function by which the manometer device 19 was adjustably disposed in vertical disposition on branch tubing 15 in FIGS. 5 and 6. It should be noted that a similar S configuration is effected with cord 49 to accomplish the clamping function of the cooperating upper guide 25 and its hole 27. It should be appreciated that cord 49 could similarly be suspended from the ceiling of a hospital room.

In FIGS. 8 and 9, the manometer device 19 is shown utilized with a modified accessory instrument 51. The manometer device 19, of course, would be vertically disposed by any of the vertical mounting means heretofore shown and described for mounting the manometer device 19. The modified accessory instrument 51 is the accessory instrument shown in FIGS. 2 and 3 in Dr. Rockwell's patent, and modified by superposing

in fixed relationship on each flat side of vertical leg 53 the flat shoulder members 55.

As was previously described, the upper surface 57 of cross member 41 is aligned with the zero mark of the centimeter indicia 23 on the flat, longitudinal member 21. The shoulder portions 59 formed by flat shoulder members 55 are aligned with the ten centimeters indicia on vertical leg 53. Ten centimeters is the average ascertained, measured distance of an adult's superior vena cava from the skin of the back. Hence, when utilizing the accessory instrument in conjunction with CVP measurement of an adult, the terminal portion (not shown) of the accessory instrument 51 is disposed in contiguous relationship with the skin of the supine patient's back, the shoulder portion 59 of shoulder member 55 is disposed in abutting relationship with upper surface 57 of cross member 41 with the mutual lateral sides of longitudinal member 21 and vertical leg 53 maintained also in abutting relationship, as shown, and then longitudinal member 21 and vertical leg 53 are grasped and vertically disposed up or down as is needed to register an indication by air bubble level 63 that horizontal leg 65 of the accessory instrument 51 is level. Utilizing manometer device 19 with the modified accessory instrument 51 in the procedure as described affords the advantages of quick, simple and accurate setting and resetting of the manometer zero level which corresponds to the zero mark of centimeter indicia 23 lying within the same horizontal plane passing through the reference locus of the average adult's superior vena cava by merely leveling horizontal leg 65 with reference to air bubble level 63. Thereafter, the procedure described with reference to FIG. 1 to obtain the CVP measurement, and as would be here applicable thereto, is followed.

When utilizing the manometer device 19 for measurement of peripheral venous pressure, the set-up shown in FIG. 1 of this application for CVP measurement is followed but with the exception that the needle is inserted in a peripheral vein. The procedure thereafter followed is similar.

I claim:

1. A manometer device for use with an accessory instrument for the measurement of a patient's central venous pressure; said manometer device comprising a longitudinal member, centimeter indicia, guides, a cross member and venous measuring tubing, said longitudinal member having said centimeter indicia thereon, said longitudinal member having upper and lower portions, said guides being upstanding from the surfaces of said upper and lower portions, said cross member being transversely disposed on said lower portion of said longitudinal member and having an upper surface in correspondence with the zero mark of said centimeter indicia, said longitudinal member having lateral sides, said cross member extending beyond said lateral sides of said longitudinal member, said guides having aligned holes removably receiving said venous measuring tubing, said venous measuring tubing registering centimeters-of-water readings with reference to said centimeter indicia in the utilization of said manometer device for central venous pressure measurement; said accessory instrument comprising an L-shaped rigid bar having a vertical leg normal to a horizontal leg, said vertical leg having lateral sides and a bottom, said vertical leg having indicia in the form of transverse line markings formed therein designating centimeter distances as measured from said bottom of said vertical leg, said vertical leg having flat shoulder members superposed in fixed relationship on each flat side of said vertical leg, said shoulder members having shoulder portions, said shoulder portions being aligned with the centimeter indicia on said vertical leg designating ten centimeters and, as such, thereby corresponding to the average ascertained, measured distance of a supine adult's superior vena cava from the skin of his back, said horizontal leg having a top side, said top side of said horizontal leg having an air bubble level whose bottom plane is secured with said top side of said horizontal leg and is in parallel correspondence with said horizontal leg, said horizontal leg carrying an extensible member, said extensible member having an integral end portion of sinusoidal con-

figuration depending therefrom, said integral end portion curving convexly outwardly thence concavely inwardly to its terminal portion, said integral end portion, as arranged and constructed with respect to said accessory instrument, being adapted for disposition over the supine patient's arm, then between the patient's arm and body, with its said terminal portion in contiguous relationship with the skin of the patient's back, said ten centimeters indicia on said vertical leg, and thereby said shoulder portions, of said accessory instrument—as thusly disposed with respect to a supine, adult patient and leveled with reference to its air bubble level—thereby lying within the same horizontal plane passing through such ascertained reference locus of the adult's superior vena cava; and said manometer device and accessory instrument, as described with reference to their arrangements and constructions, in use having the mutual lateral sides of said longitudinal member of said manometer device and of said vertical leg of said accessory instrument in abutting relationship and in use concomitantly having said upper surface of said cross member of said manometer device and said shoulder portion of said vertical leg of said accessory instrument in abutting relationship, and, by appropriate movement and disposition of said manometer device to achieve such described abutting relationships with said accessory instrument, and, upon leveling of said accessory instrument to ascertain the reference locus of the adult's superior vena cava, said zero mark of said centimeter indicia of said manometer device likewise lying within the same horizontal plane passing through such ascertained reference locus of the adult patient's superior vena cava.

2. The manometer device in accordance with claim 1, wherein said venous measuring tubing carries on one end an adapter whose external diameter is greater than the diameters

of said guide holes and functions as a limit stop with respect to said venous measuring tubing received by said guide holes.

3. The manometer device in accordance with claim 1, wherein said longitudinal member has magnets mounted in fixed relationship therewith and wherein said magnets are adapted for removably mounting and vertically positioning thereby said manometer device on an intravenous pole.

4. The manometer device in accordance with claim 1, wherein is further provided a cord, one end of which is in the form of a closed loop and the other end of which carries a weight, wherein said closed loop is disposed beneath said guide upstanding from said upper portion of said longitudinal member, wherein said weight functions as a counterbalance, wherein said cord is adapted for adjustably mounting said manometer device vertically with reference to an intravenous pole by training a portion of said cord over a branch extension of the intravenous pole and wherein said counter balancing weight functions to permit said manometer device to remain where disposed with reference to the intravenous pole.

5. The manometer device in accordance with claim 1, wherein said aligned guide holes are adapted for adjustable vertical positioning of said manometer device with reference to an intravenous pole by use of a cord or tubing fixed to such intravenous pole and wherein said cord or tubing is trained through said hole in said guide upstanding from said lower portion of said longitudinal member and is removably disposed in an S configuration in conjunction with said hole in said guide upstanding from said upper portion of said longitudinal member to thereby removably retain said cord or tubing thereat.

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