G. BENNETT, SR.

HEMOGLOBINOMETER.

APPLICATION FILED JUNE 18, 1920.

1,390,422.

Patented Sept. 13, 1921.

3 SHEETS—SHEET 1.

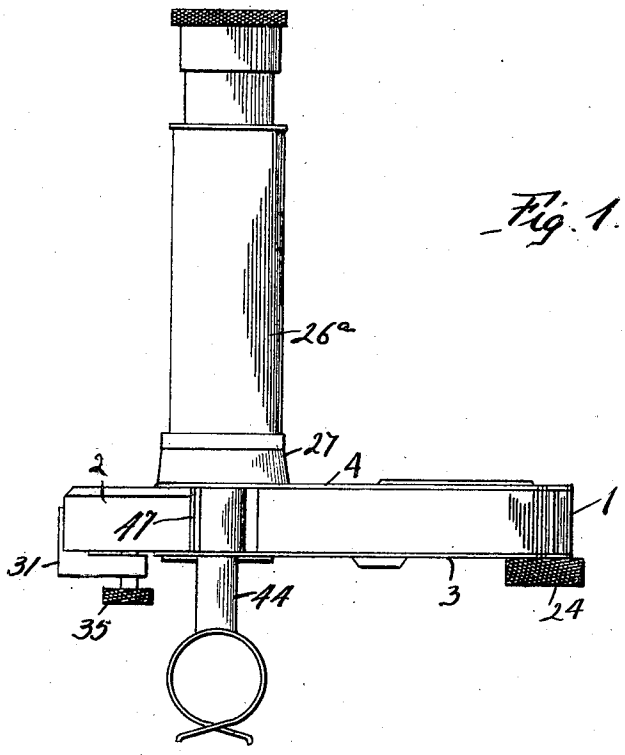
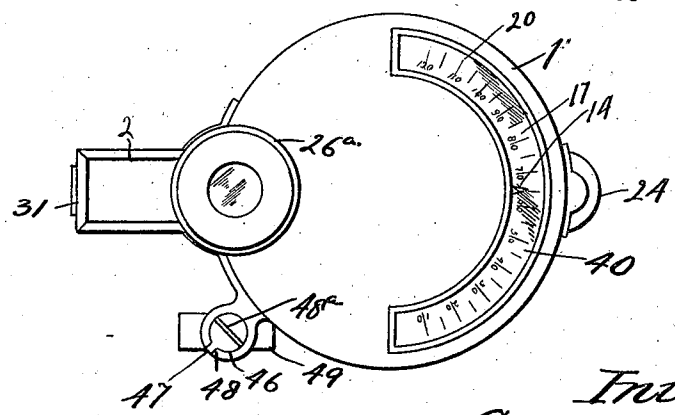


Fig. 1.

Fig 2



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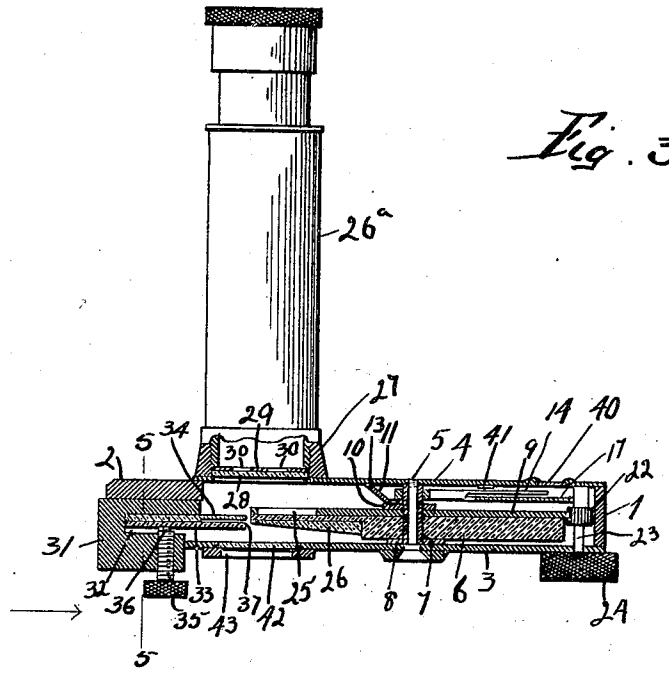


Fig. 3.

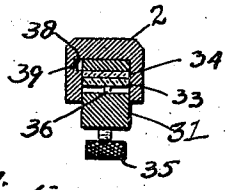


Fig. 5.

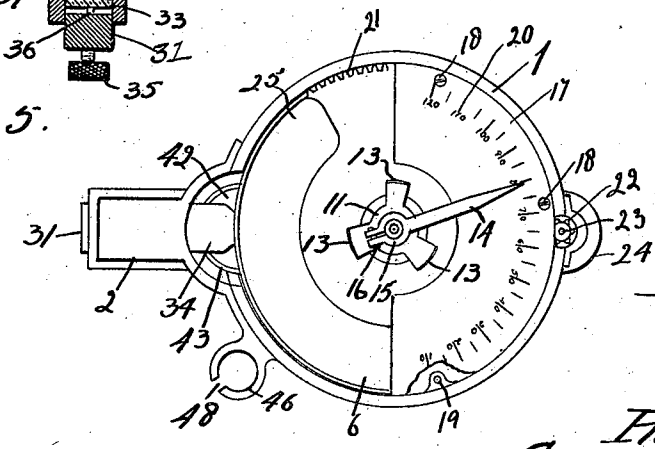


Fig. 4.

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3 SHEETS—SHEET 3.

Fig. 6.

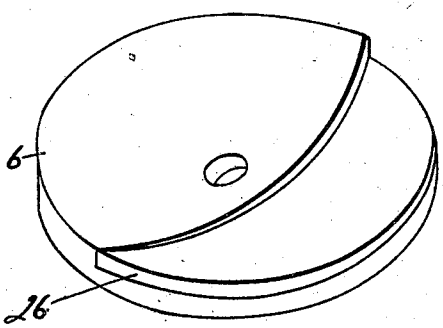


Fig. 10.

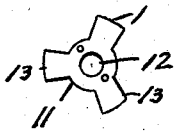


Fig. 11.

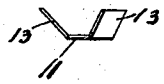


Fig. 7.

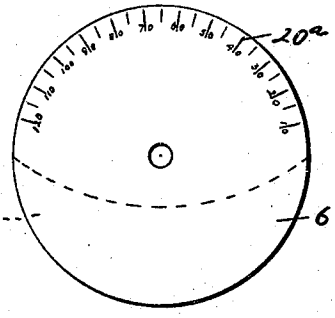


Fig. 12.

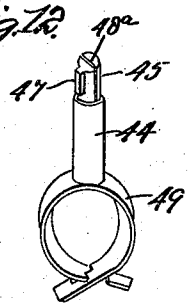


Fig. 13.

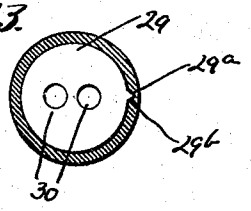


Fig. 8.

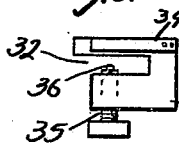
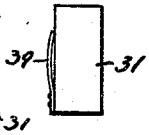


Fig. 9.



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UNITED STATES PATENT OFFICE.

GEORGE BENNETT, SR., OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO AMERICAN INSTRUMENT COMPANY, A PARTNERSHIP COMPOSED OF GEORGE BENNETT, SR., HARRY W. POHLKE, AND WILLIAM D. KIDNEY, OF PHILADELPHIA, PENNSYLVANIA.

HEMOGLOBINOMETER.

1,390,422. Specification of Letters Patent. Patented Sept. 13, 1921.

Application filed June 18, 1920. Serial No. 389,846.

To all whom it may concern:

Be it known that I, GEORGE BENNETT, Sr., a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Hemoglobinometers, of which the following is a specification.

My invention relates to a new and useful improvement in hemoglobinometers, for ascertaining the amount or proportion of hemoglobin in a given sample of blood by comparing such blood sample with a standard color by the rays of light from a single source passing through said blood sample and a ruby glass, said rays reaching the eye of the observer through a single eye piece.

The principal objects of my present invention are; first, to so construct an instrument of this character that it shall be entirely dust proof, all of the parts being inclosed; second, to provide for the changing of the observation holes through which the rays of light pass after passing through the sample of blood and the testing glass so as to especially adapt the instruments for use by various persons having different sight conditions; third, to provide for the positive rotation of the test glass so as to avoid the discrepancies in adjustment which have heretofore been attendant upon the adjustment of said disks by frictional contacts; fourth, to provide a pointer or hand for indicating the graduations at which the test glass is set and to provide for the adjustment of said hand independent of the disk so as to calibrate the instrument or adjust it to the sight of any particular individual, said calibration being effected by comparisons with a standard color for such instruments; fifth, to provide for sufficient friction upon the test glass disk to prevent its accidental displacement after being set; sixth, to provide a candle holder which will hold a candle in proper relative position to the observation openings and permit the ready adjustment of said candle; seventh, to provide a blood holder for the sample of blood to be tested that will always pass into exact position relative to the test glass and be there held by frictional contact so as to prevent accidental displacement; eighth, to provide for the reading of the adjustments of the test glass without changing the position of the instrument while in use and in general, to increase the efficiency of such an instrument and render it more adaptable to the purposes for which it is used.

With these ends in view, this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains, may understand how to make and use the same, I will describe its construction in details, referring by numerals to the accompanying drawings forming a part of this application, in which:—

Figure 1, is an edge view of a homeglobinometer made in accordance with my improvement.

Fig. 2, is a plan view of Fig. 1, looking downward.

Fig. 3, is a view similar to Fig. 1, the body of the device being in section.

Fig. 4, is a face view of the instrument the face plate being removed to show the interior construction and arrangement of the parts.

Fig. 5, is a section at the line 5—5 of Fig. 3 looking in the direction of the arrow.

Fig. 6, is a perspective of the test glass holder or disk showing the test glass thereon.

Fig. 7, is a reverse plan view of Fig. 6 showing the graduation marks directly upon the test glass disk.

Fig. 8, is a detail view of the blood holder clamp.

Fig. 9, is an edge view of Fig. 8.

Fig. 10, is a detail view of the friction spring.

Fig. 11, is an edge view of Fig. 10.

Fig. 12, is a detail perspective of the candle holder.

Fig. 13, is an enlarged detail of the observation disk.

In carrying out my invention as here embodied, 1 represents the casing which is preferably of circular shape carrying the offset 2, 3 and 4 being face plates fitted to the casing so as to inclose the operating parts of the instrument therein.

5 represents a spindle in the form of a screw which passes through the face plate 3 and is threaded into the face plate 4, and

upon this spindle is journaled the test glass disk 6 so as to revolve thereon. The test glass disk is intended to be made of opaque glass or porcelain or similar material, and in order that it may not contact and revolve directly upon the spindle 5 I provide a bushing 7 which passes through the center of the disk and carries a flange 8 which bears upon one side of the disk while the gear plate 9 is fitted against the opposite side of the disk all being firmly held together by the nut 10 which threads upon said bushing, said bushing being of sufficient length to contact with the face plate 4 so as to exactly position the disk within the casing; and in order that said disk may be held by friction against accidental displacement I provide the spring washer or friction member 11 which has a hole 12 through the center thereof for fitting over the projecting end of the bushing, and this friction member is also provided with the spring prongs or legs 13 which are so bent as to bear upon the underside of the face plate 4, while the body thereof bears against the outer surface of the nut 10.

14 represents a pointer hand having a hub 15 adapted to fit snugly upon the projecting end of the bushing 7, said hub being split and having the screw 16 run projections therefrom so as to clamp the pointer hand upon the bushing as will be readily understood, this form of clamping the pointer hand upon the bushing will permit of said hand being adjusted relative to the disk to which the bushing is rigidly secured for the purpose hereinafter set forth.

17 represents a dial which is secured stationary within the casing by means of the screws 18 passing through said dial and threaded into the lugs 19, the pointer hand being adapted to move over the face of said dial, said dial having graduations 20 inscribed thereon.

In order that the test glass disk may be positively and accurately revolved the gear teeth 21 carried by the gear plate 9 mesh with the pinion 22 carried upon the shaft 23, and this spindle projects through the face plate 3 and has secured thereon the thumb knob 24 by which arrangement the gear plate and the disk and pointer hand carried thereby will be revolved by the revolving of the thumb knob and as the diameter of the pinion is small relative to the diameter of the gear plate it will require a number of rotations of the pinion to effect a partial revolution of the gear plate, thus tending to increase the accuracy of the adjustment of said gear plate by the disk carried thereby, and when the proper adjustment has been effected the friction member 11 will hold the parts against accidental displacement as before stated.

The gear plate 9 has an arcuate slot 25 formed therein in alinement with that portion of the test glass 26 carried by the disk which is utilized for the passage of the rays of light in comparing the color between any given thickness of the test glass and the sample of blood; said test glass being usually cemented to a recessed portion of the disk.

26[a] represents a telescope or observation tube which is threaded into the boss 27 carried by the face plate 4, and the threaded end of this tube is adapted to hold in place a glass disk 28 and an observation disk 29, said observation disk having two holes 30 formed therethrough adjacent each other for the purpose of permitting the rays of light to pass through the sample of blood and the test glass to reach the eye placed at the opposite end of the observation tube, the glass disk 28 being for the purpose of excluding dust at this point and the observation disk being removed for the purpose of interchangeability. The object of making the observation disk interchangeable as just stated is to accommodate different persons using the instrument since certain defects in the human eye such as astigmatism require the placing of the holes through these observation disks at various distances apart to accommodate the degree of the defect in the eye of the person using this instrument.

The observation disk 29 has a projection or spline 29[a] which passes into the groove 29[b] for positioning this disk so that the holes therethrough will always come into proper alinement with the blood holder and test glass.

31 represents the blood holder clamp which has a slot 32 therein for the reception of the blood holding plates 33 and 34, and this clamp has a thumb screw 35 threaded through the lower portion thereof so that its end will project into said slot; said end having a non-metallic tip 36 for contact with the blood holder plate 33 so as to firmly clamp these plates within the slot without a tendency to break the same.

The blood holder plate 33 is of transparent material such as clear glass while the plate 34 is of opaque glass, porcelain or the like and is so reduced in thickness as to reduce the thin slot or space 37 when the two plates are placed together as shown in Fig. 3, this space being adapted to receive the sample of blood to be tested. The offset 2 carried by the casing 1 is slotted for the reception of the clamp 31 and one wall of this slot has a longitudinal groove 38 formed therein for the reception of the plate spring 39 which is secured to one side of the clamp so that when the clamp is passed into the slotted offset this spring will pass into the groove and act as a key or spline to hold the clamp in proper position and will also force the clamp firmly against the opposite wall of the slot so as to always hold it in exactly the same position

when inserted in the offset. A further advantage of this spring is that it creates sufficient friction to hold the clamp against accidental displacement after the latter has been inserted in the offset.

40 represents a glass which is set in a circular opening formed in the face plate 4, said glass being held in place by suitable clips 41 or in any other convenient manner. This glass lies over the graduations upon the dial 17 so that these graduations may be read in connection with the pointer hand 14 and serves to make the instrument dust proof at this point.

42 represents a disk of glass closing the opening 43 through which the rays of light pass to the telescope 26ª, and this glass may be held in place in any suitable manner for the purpose of making the instrument dust proof at this point.

In order that a candle may be properly held relative to the opening 43 I provide a shank 44 having a reduced portion 45 for fitting into the slot 46 carried by the casing 1 and this reduced portion of the shank is provided with a spline 47 which passes into the slot 48 formed in the socket so as to bring the shank into fixed relative position to the casing, and in order that the shank may be removably held within the socket the reduced portion 45 thereof is split as indicated at 48ª so as to form a spring pressure upon the side walls of the socket as will be readily understood.

The shank 44 has secured thereto the spring clamp band 49 the outer portion of said band being cut away so that the ends thereof may interlock as clearly shown in Fig. 12, and this clamp is intended to hold the candle and permit the latter to be adjusted up or down as occasion may require so that the flame therefrom may be kept in the proper relative position to the opening 43. The interlocking of the ends of the clamp band provides for the outward springing of this band since the interlocking sections provide an effective stop; and this arrangement also permits the ends of the band to project in opposite directions and in substantially the same plane so that the pressure against these ends will release the grip upon the candle and permit its ready adjustment.

The test glass 26 as here shown is a semicircular wedge shaped prism of ruby glass secured to the portion of the disk 6 which is reduced in thickness by cement or otherwise. As this test glass is turned in front of the observation holes 30 the color of the light passing from the candle through said glass will vary in color as varying thicknesses of this test glass are brought into the path of said light, and this variance will be indicated upon the dial by the corresponding graduation registering with the pointer hand as light from the same source passes at the same time through the sample of blood and simultaneously reaches the eye of the observer, an arcuate comparison can be made between the color of the blood and the color of the light passing through the test glass and when these two colors correspond the scale will indicate the proportion of hemoglobin in said plate.

While I have here shown a simple and effective instrument for carrying out the objects intended it is obvious that certain modifications might be made therein, such as inscribing the graduations 20 directly on the back of the test glass disk 6 as indicated at 20ª and in Fig. 7 locating the pointer hand 14 in a stationary position so that the turning of said disk would carry the graduations beneath the hand and thereby permit the determining of the adjustment of said disk. I therefore do not wish to be limited to the exact details of construction as herein shown as these may be varied within the limits of the appended claims without departing from the spirit of my invention.

Having thus fully described my invention, what I claim as new and useful is:—

1. In a hemoglobinometer, a casing, a revoluble test glass disk mounted within said casing, a gear plate secured to said disk, said gear plate having an arcuate slot therein for the passage of light through the test glass carried by the disk, a pinion meshing with the teeth of said gear plate, a shaft upon which said pinion is secured, one end of said shaft projecting outside of the casing and carrying a thumb knob for revolving said shaft, a dial having graduations marked thereon, said dial being located within the casing, a section of glass set in one face of the casing so as to bring said graduations into view, a pointer hand so connected with the disk as to revolve therewith and register with the various graduations upon the dial, a friction member for imparting sufficient friction to the disk to prevent its accidental displacement when adjusted, and means for holding the sample of blood adjacent the test glass.

2. In a hemoglobinometer, a casing, a revoluble test glass disk mounted within said casing, a gear plate secured to said disk, said gear plate having an arcuate slot therein for the passage of light through the test glass carried by the disk, a pinion meshing with the teeth of said gear plate, a shaft upon which said pinion is secured, one end of said shaft projecting outside of the casing and carrying a thumb knob for revolving said shaft, a dial having graduations marked thereon, said dial being located within the casing, a section of glass set in one face of the casing so as to bring said graduations into view, a pointer so connected with the disk as to revolve therewith and register with the various graduations upon the dial,

a friction member for imparting sufficient friction to the disk to prevent its accidental displacement when adjusted, and means for holding the sample of blood adjacent the test glass, an observation tube and an observation disk removably located at the base of said tube, said observation disk having two holes therein.

3. In a hemoglobinometer, a test glass disk, a bushing passing through the center of said disk, a gear plate secured upon the disk by said bushing, a pointer hand adjustably mounted upon the bushing so as to provide for the calibration of the instrument, a stationary dial over which said hand travels, said dial carrying predetermined graduations, means for revolving the gear plate and disk secured thereto, and a test member consisting of a wedge shaped ruby glass secured to said disk.

4. In a hemoglobinometer, a test glass disk, a bushing passing through the center of said disk, a gear plate secured upon the disk by said bushing, a pointer hand adjustably mounted upon the bushing so as to provide for the calibration of the instrument, a stationary dial over which said hand travels, said dial carrying predetermined graduations, means for revolving the gear plate and disk secured thereto, a test member consisting of a wedge shaped ruby glass secured to said disk, a blood holder comprising a transparent section of glass and an opaque section of glass held together by a clamp screw.

5. In a hemoglobinometer, a casing, a slotted offset carried by said casing, a clamp adapted to slide into said slotted offset, a plate spring carried by the clamp, said spring arranged to slide in a groove formed in one wall of the offset so as to act as a key for holding the clamp in place, and a clamp screw threaded through a portion of the clamp, inner end of said screw carrying a non-metallic strip for contact with the glasses inclosing the blood holder.

6. In a hemoglobinometer of the character described, a dust proof casing, a split socket carried by said casing, a shank having a reduced slotted portion adapted to fit within said socket, a spline carried by the reduced portion of the shank, said spline adapted to pass between the split ends of the socket and the clamp carried by the shank, said clamp consisting of a spring band, portions thereof being cut away and interlocking.

7. In an instrument of the character described, a dust proof casing carrying two face plates, glass covered openings formed in said face plates, a test glass disk mounted within the casing so as to rotate, means for rotating said disk, a test glass carried by the disk, a blood holder adapted to slide in the casing and be held in position by friction, an observation tube carried by one of the face plates of the casing, and an observation disk located in the base of said tube, said disk having two holes located adjacent each other.

In testimony whereof I have hereunto affixed my signature.

GEORGE BENNETT, SR.