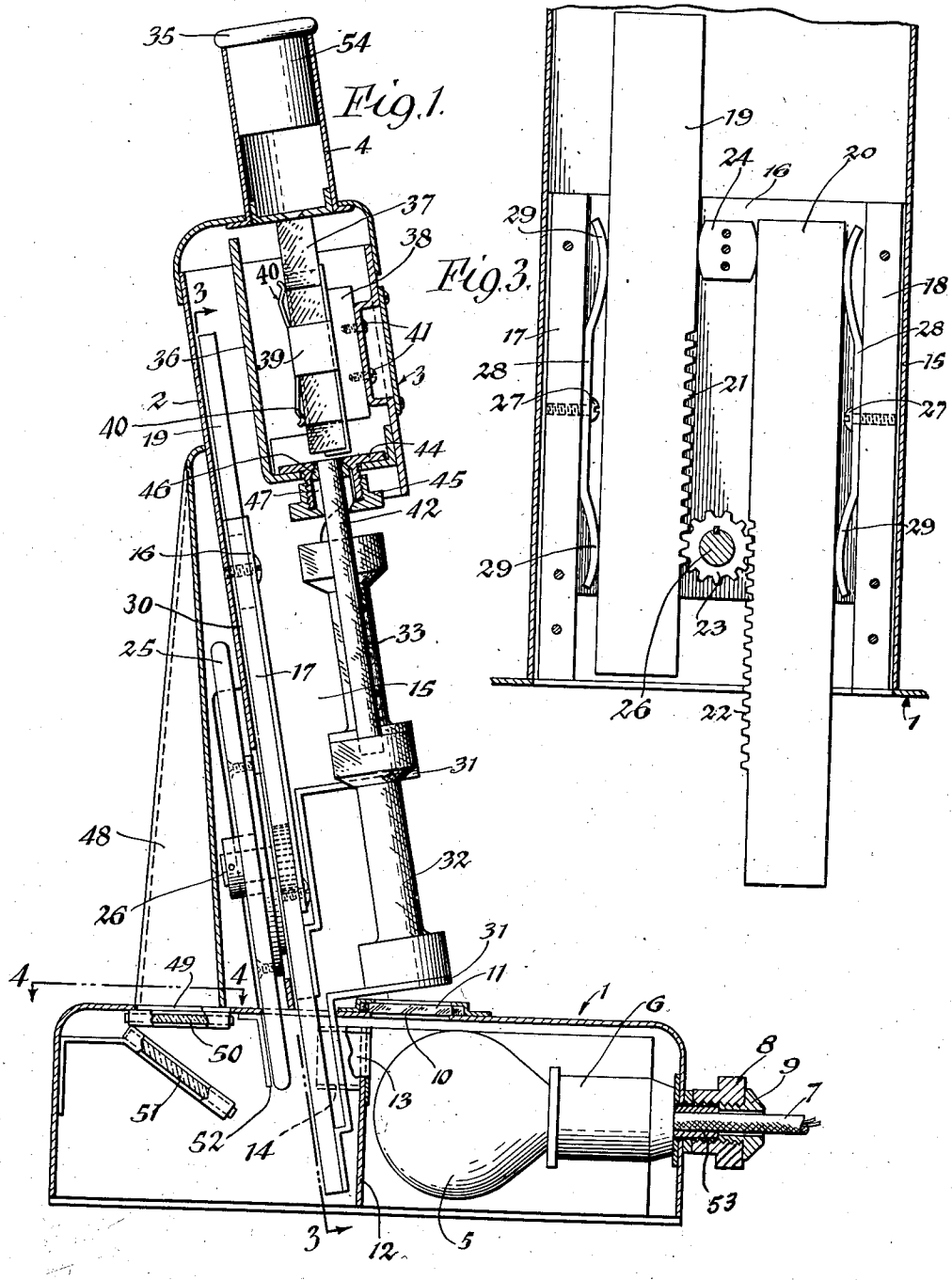
July 18, 1944. R. S. ESTEY ET AL 2,353,716

COLORIMETRIC APPARATUS

Filed Feb. 19, 1941 2 Sheets-Sheet 1



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Fig. 2.

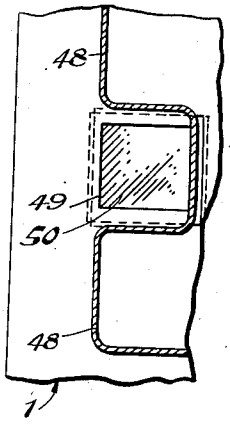


Fig. 4.

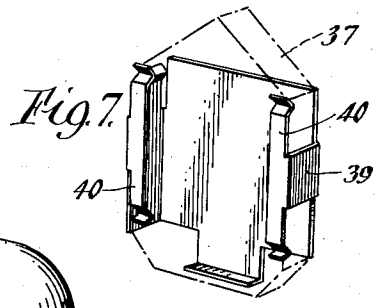


Fig. 7.

Fig. 5.

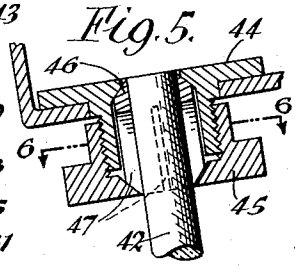
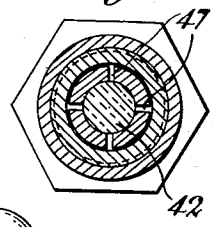


Fig. 6.



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COLORIMETRIC APPARATUS

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Application February 19, 1941, Serial No. 379,688

9 Claims. (Cl. 88—14)

This invention relates to colorimetric apparatus and has particular reference to a combined haemoglobinometer and micro-colorimeter.

An object of the invention is to provide a new and impoved colorimetric apparatus which requires only a small amount of specimen for comparison of the color of said specimen with a color standard or with other colored substances.

Another object of the invention is to provide a colorimetric device of the type set forth which will be simple and economical in construction and efficient in operation.

Another object of the invention is to provide a new and improved device of the type set forth which may be formed from sheet and bar stock and does not require the hand fitting of parts as required with previous instruments of this type and which therefore is considerably more economical to manufacture.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings. It will be understood that many changes may be made in the details of construction and arrangement of parts without departing from the scope of the invention as set forth in the accompanying claims. We therefore do not wish to be limited to the exact details of construction and arrangement of parts shown and described as the preferred form has been shown by way of illustration only.

Referring to the drawings:

Fig. 1 is a sectional view of a colorimetric apparatus embodying the invention;

Fig. 2 is a front view thereof partly in section;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1 looking in the direction of the arrows;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1 looking in the direction of the arrows;

Fig. 5 is a cross section of the plunger securing means;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 5 looking in the direction of the arrows; and

Fig. 7 is a perspective view showing the prism in its support.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the device comprises a base 1 supporting the upright support 2, the housing 3 and eyepiece 4.

In the base member 1 is positioned the lamp 5 secured to the socket 6 and adapted to receive current through the wires 7 from the usual current supply. The wires 7 extend through a slot in the base 1. The lamp 5 and socket 6 are secured to the wall of the base 1 adjacent the slot by means of the member 8 which has a threaded portion in engagement with the hollow threaded member 9 and also in threaded connection with the threaded extension 53 on the socket 6.

The said base 1 also has in its upper face an opening 10 over which is placed a light diffusing screen or the like 11. In said base is placed a vertical partition 12 separating the lamp chamber from the remainder of the base and preventing light from entering the remainder of the base except through the opening 13 in said vertical partition 12. If desired, said opening 13 may also be provided with a circumferential flange 14 to direct the light as hereinafter described.

The upright support 2 is secured at its lower end to the upper portion of the base 1 and has the marginal flanges 15 on either side thereof. On the upright support 2 is secured a bearing plate 30 which extends the width of said member 2 and is of substantially the height of the outer bearing plate 16. The edges of said bearing plate 30 are secured to the supports or blocks 17 and 18. These blocks or supports 17 and 18 may be formed integral with the bearing plate 30 or may be secured thereto by other suitable means.

There is provided a pair of rack members 19 and 20 adapted to slide between the bearing plate 30 on the upright 2 and the outer bearing plate 16 and having portions 21 and 22 formed with teeth adapted to be moved by the pinion 23 which is positioned adjacent the lower edge of said bearing plate 16. Adjacent the upper edge of said bearing plates 16 and 30 is provided the spacing member 24 which may be formed integral with the first bearing plate 30 or formed separate and secured thereto by screws or the like. This spacing member 24 is of such width that the racks 19 and 20 are held parallel with each other so that they can be moved up or down by movement of the dial 25 which is secured to the shaft 26 on which shaft is also positioned the pinion 23. A reference or fiduciary member 52 is positioned adjacent the dial 25 for use in reading said dial.

The supporting members 17 and 18 have secured thereto by means of screws or the like 27 the bent blade spring members 28 having portions 29 adapted to bear against the outer edges of the racks 19 and 20 to keep the upper portions of said rack members in engagement with said

spacing member 24 and the toothed portions thereof in engagement with the pinion 23. It is pointed out that because of the spring members 28 there may be considerable tolerance in the width of the rack members 19 and 20 without disturbing the operation of the instrument as any such tolerance or variation is taken up by said spring members.

Secured to the lower portions of the rack members 19 and 20 are the cup supports 31. These may be secured to said racks 19 and 20 by screws or other suitable means and extend outwardly from said rack members and are adapted to support the cups 32 and 33 respectively one of which is adapted to contain a color standard and the other the unknown specimen to be compared, or both may contain specimens of unknown color values for comparison with each other.

The cup members 32 and 33 are preferably formed of glass or other transparent material although they may be formed of any desired material so long as they have transparent bottoms adapted to be positioned over openings 34 on the cup supports to allow light to pass therethrough.

The eyepiece tube 4 contains the conventional eyepiece 54 adapted to be focused by raising or lowering the tube by grasping the upper flange thereof 35 with the fingers.

The body member 3 has the flange or shield 36 adapted to prevent the entering of external light into the optical elements of the instrument. In this body member 3 is supported the prism member 37 which is removably positioned in the prism support, which support is adjustable as a unit and comprises a block 38 to which is secured the resilient member 39 including the resilient fingers 40 adapted to retain the prism in the support. The block 38 is adjustably secured to the body 3 of the instrument by means of screws or the like 41. It will be seen from Figs. 1 and 7 that by removing the eyepiece assembly 4 the prism may be removed from the resilient support and from the instrument for cleaning or the like and then replaced therein without disturbing its adjusted position in the instrument.

The screws 41 project through slots in the wall of the housing 3 and these slots permit horizontal and vertical adjustment of the prism assembly.

Adjacent the lower edge of the housing 3 are supported the plungers 42 and 43. These plungers are removably secured to the lower portion of said housing by a connection shown in detail in Figs. 5 and 6 and comprising two threaded telescoping members 44 and 45. The members 44 and 45 have threaded portions adapted to threadedly engage with each other and there is provided a member 46 having the vertical slots 47 adapted to provide this member 46 with the desired resiliency. The member 46 has a central bore adapted to be aligned with openings in the members 44 and 45. Also the said member 46 has tapered portions adjacent its outer ends adapted to engage correspondingly tapered portions surrounding the openings in the members 44 and 45. The plunger members 42 and 43 are preferably formed of glass or other transparent material to allow the passage of light therethrough and as shown in Figs. 5 and 6 extend into the aligned openings in said members 44, 45 and 46 and then by tightening the screw connection between the members 44 and 45 the member 46 is compressed and due to the slots 47 firmly clamps the plunger 42 in adjusted position. It will be readily seen that because of the simple operation of this clamp arrangement, by merely loosening the member 45 the plunger member 42 may be raised or lowered to desired adjustment and then by tightening the said member 45 the plunger will be clamped or locked in said adjusted position.

It is pointed out that because the clamp engages the plunger at two separated points the axial alignment of the plunger is accurately maintained. Because of the small size of the plungers, accuracy in this alignment is important.

It is also pointed out that the member 44 may be formed separate or integral with the lower wall of the body 3 as desired.

Secured to the upper wall of the base 1 and to the upright support 2 adjacent the upper end thereof is provided the upright supporting member 48. This supporting member fits over the dial member 25 so that only the outer portions of the dial 25 are exposed, as shown in Fig. 2. The said exposed portions of the graduated dial 25 may be turned with the fingers to vary the adjustment of the cups and plungers.

This member 48 tapers in size from the bottom to the top as seen in the sectional view in Fig. 1 and has a substantially U-shaped center bend as will be seen from Fig. 4. In the portion of the upper wall of the base 1 surrounded by this U-shaped portion of the member 48 is provided a cut-out portion 49 covered by a window of glass or the like 50, below which opening 49 is positioned a mirror or reflector 51 which is positioned at such an angle that images therein may be seen from a point adjacent the eyepiece. The dial 25 is of a translucent or transparent material having reference marks thereon which are illuminated by light coming from the lamp 5 through the opening 13 in the partition 12 and are seen in the reflector 51 from a position adjacent the eyepiece of the instrument.

It will be noted that the supporting structure 48 surrounds on three sides the opening 49 in the casing 1 through which the reading is made so that it substantially eliminates extraneous light, etc., from said opening and thereby increases the visibility of such readings. Also that because of its shape such structure acts as an angle bar and gives added support to the upright 2 while at the same time increasing the visibility of the scale reading as stated above.

From the above it will be seen that we have provided simple, efficient and economical means for obtaining all of the advantages of the invention.

Having described our invention, we claim:

1. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination and adjustable relative to each other, a housing adjacent the upper end of said support, an eyepiece on said housing, an optical element in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a bearing plate on said upright support, upright edge members adjacent the edges of said bearing plate, a pair of rack members on said bearing plate, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member engaging said rack members and adapted to move said rack members in

opposite directions to change the relative position of said cup and plunger members, resilient means on said upright edge members and engaging said rack members for holding said rack members in engagement with said pinion, and scale means for indicating the adjustment of said cup and plunger members.

2. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination and movable relative to each other, a housing adjacent the upper end of said support, an eyepiece on said housing, an optical element in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a bearing plate on said upright support, a pair of rack members on said bearing plate, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member engaging said rack members and adapted to move said rack members in opposite directions to change the relative position of said cup and plunger members, means for holding said rack members in engagement with said pinion, scale means for indicating the adjustment of said cup and plunger members, said scale means having a portion extending into said base, a reflector in said base and in alignment with the portion of said scale means extending into said base, means comprising said source of illumination for forming an image of the reading on the portion of said scale extending into said base in said reflector and an opening in said base whereby the reflector may be observed from a point adjacent the eyepiece of the instrument.

3. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination and adjustable relative to each other, a housing adjacent the upper end of said support, an eyepiece on said housing, an optical element in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a bearing plate on said upright support, a pair of rack members on said bearing plate, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member engaging said rack members adapted to move said rack members in opposite directions to move said cup and plunger members relative to each other, resilient means engaging the edge of each of said rack members opposite the edge thereof engaging said pinion for holding said rack members in engagement with said pinion, and scale means for indicating the relative position of said cup and plunger members.

4. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination and adjustable relative to each other, a housing adjacent the upper end of said support, an eyepiece on said housing, an optical element in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a bearing plate on said upright support, a pair of rack members on said bearing plate, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member adjacent the lower portion of said bearing plate and engaging said rack members and adapted to move said rack members in opposite directions to move said cup and plunger members relative to each other, means engaging the edge of each of said rack members opposite the edge thereof engaging said pinion and adjacent the upper and lower edges of said bearing plate for holding said rack members in engagement with said pinion, and scale means for indicating the relative position of said cup and plunger members.

5. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination, a housing adjacent the upper end of said support, an eyepiece on said housing, and an optical element in said housing adapted to direct light emerging from each of said plunger members into said eyepiece, a bearing plate on said upright support, a pair of rack members on said bearing plate, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member adjacent the lower portion of said bearing plate and engaging said rack members adapted to move said rack members in opposite directions to desired position to move said cup and plunger members relative to each other, upright members engaging said rack members for holding said rack members engagement with said pinion, a spacer member adjacent the upper edge of said bearing plate, for retaining said rack members in parallel spaced relation and scale means for indicating the relative position of said cup and plunger members.

6. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination, a housing adjacent the upper end of said support, an eyepiece on said housing, and an optical element in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a bearing plate on said upright support, a pair of rack members on said bearing plate, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member adjacent the lower portion of said bearing plate adapted to move said rack members in opposite directions to change the relative position of said cup and plunger members, resilient members engaging said rack members for holding said rack members in engagement with said pinion, a spacer member adjacent the upper edge of said bearing plate for retaining said rack members in parallel spaced relation, and scale means for indicating the adjustment of said cup and plunger members.

7. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination and moveable relative to each other, a housing adjacent the upper end of said support, an eyepiece on said housing, an optical ele-

ment in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a pair of rack members on said upright support, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member engaging said rack members and adapted to move said rack members in opposite directions to change the relative position of said cup and plunger members, means for holding said rack members in engagement with said pinion, scale means for indicating the adjustment of said cup and plunger members, said scale means having a portion extending into said base, a reflector in said base in alignment with the portion of said scale means extending into said base, means comprising said source of illumination for forming an image of the reading on the portion of said scale extending into said base in said reflector and an opening in said base whereby the reflector may be observed from a point adjacent the eyepiece of the instrument.

8. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination and moveable relative to each other, a housing adjacent the upper end of said support, an eyepiece on said housing, an optical element in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a pair of rack members on said upright support, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member engaging said rack members and adapted to move said rack members in opposite directions to change the relative position of said cup and plunger members, means for holding said rack members in engagement with said pinion, scale means for indicating the adjustment of said cup and plunger members, said scale means having a portion extending into said base, a reflector in said base in alignment with the portion of said scale means extending into said base, means comprising said source of illumination for forming an image of the reading on the portion of said scale extending into said base in said reflector and means whereby the same may be observed from a point adjacent the eyepiece of the instrument, said means comprising an opening in said base, and said upright support having a portion partially surrounding said opening to substantially eliminate extraneous light from said opening and increase the visibility of the image of the scale reading on said reflector.

9. In a device of the character described, a base containing a source of illumination, an upright support on said base, two sets of cup and plunger members, the members of each set being in aligned relation with each other and with said source of illumination and moveable relative to each other, a housing adjacent the upper end of said support, an eyepiece on said housing, an optical element in said housing adapted to direct light emerging from each set of said cup and plunger members into said eyepiece, a pair of rack members on said upright support, means on each of said rack members and adjustable therewith for varying the relative position of one set of said cup and plunger members, a pinion member engaging said rack members and adapted to move said rack members in opposite directions to change the relative position of said cup and plunger members, means for holding said rack members in engagement with said pinion, scale means for indicating the adjustment of said cup and plunger members, said scale means having a portion extending into said base, a reflector in said base in alignment with the portion of said scale means extending into said base, means comprising said source of illumination for forming an image of the reading on the portion of said scale extending into said base in said reflector, and means whereby the same may be observed from a point adjacent the eyepiece of the instrument, said means comprising an opening in said base, and said upright support having a portion surrounding said opening on three sides thereof to substantially eliminate extraneous light from said opening and increase the visibility of the image of the scale reading on said reflector.

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