Feb. 5, 1929. 1,701,258

H. CLEMENT ET AL

OPHTHALMOLOGICAL APPARATUS

Original Filed Nov. 9, 1923 3 Sheets-Sheet 1

Fig. 1.

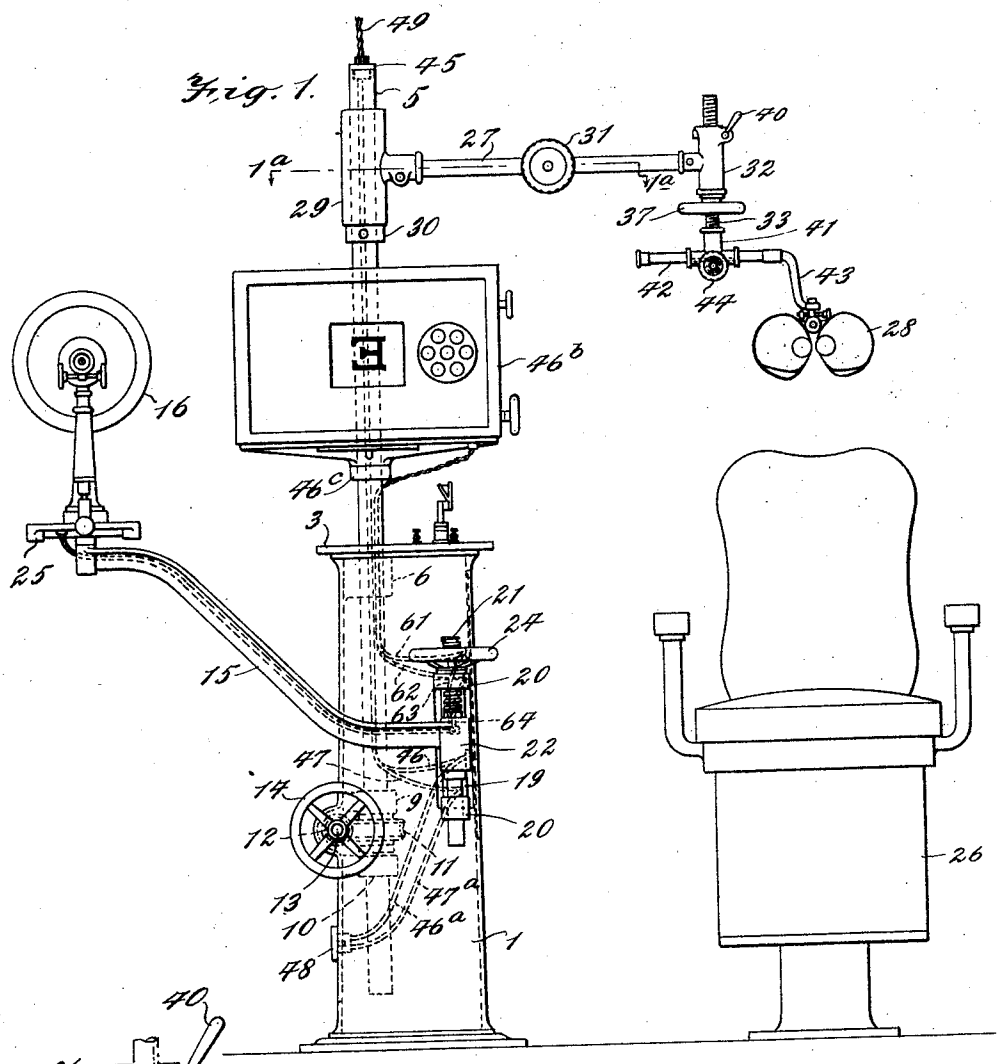


Fig. 2.

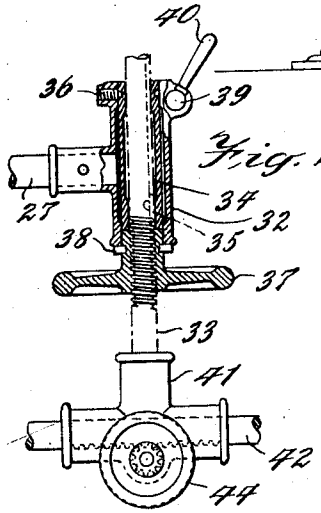
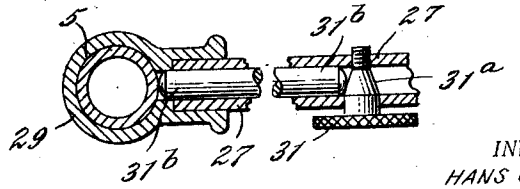


Fig. 1a



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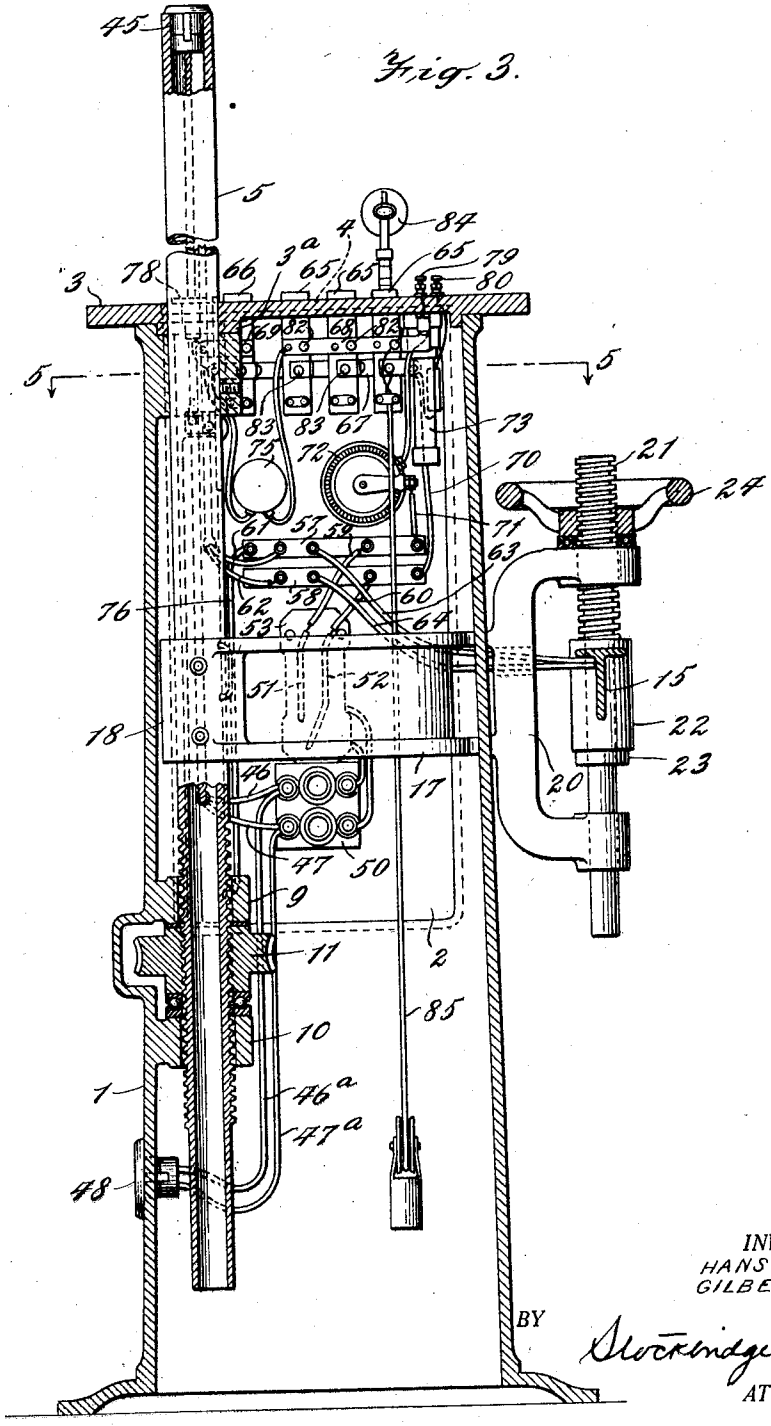
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Fig. 3.



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OPHTHALMOLOGICAL APPARATUS

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Fig. 4.

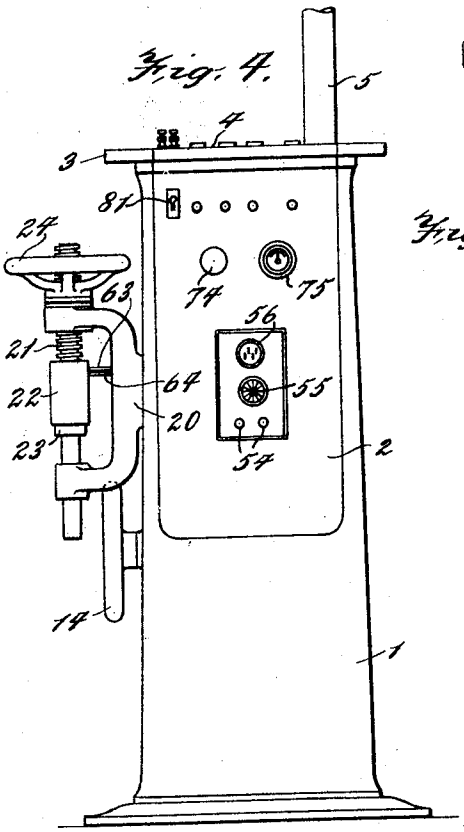


Fig. 6.

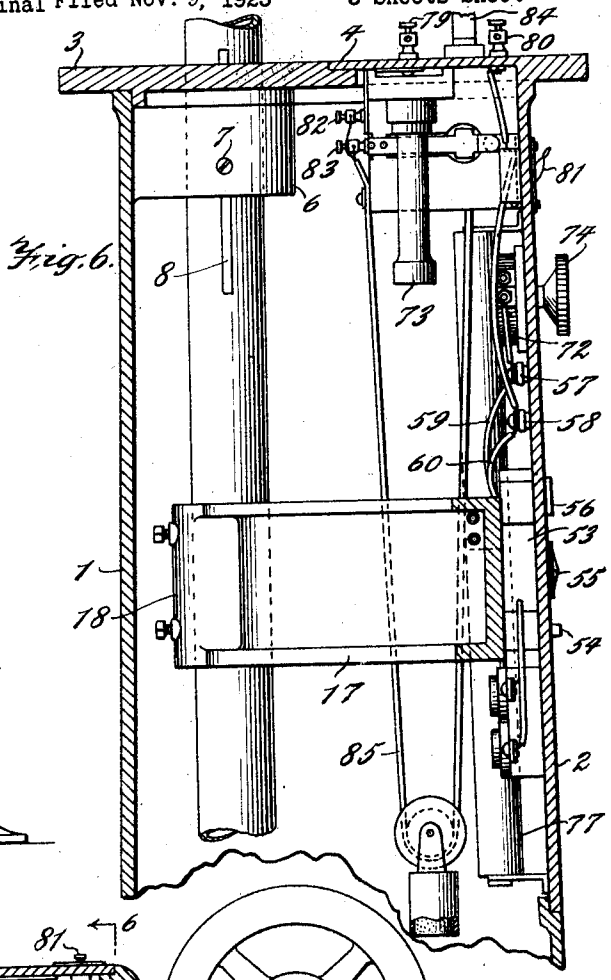
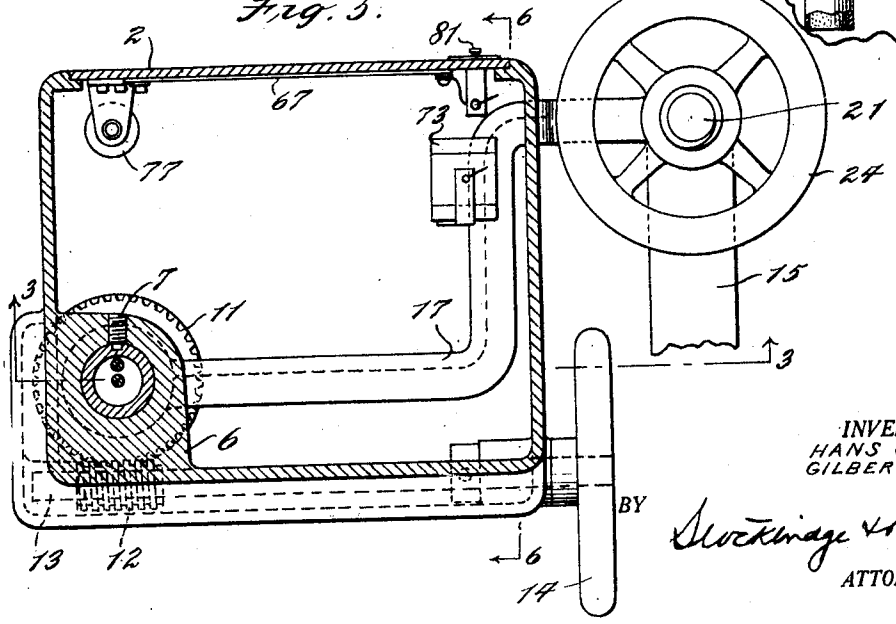


Fig. 5.



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UNITED STATES PATENT OFFICE.

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OPHTHALMOLOGICAL APPARATUS.

Original application filed November 9, 1923, Serial No. 673,728. Divided and this application filed October 11, 1926. Serial No. 140,797.

Our invention disclosed and claimed herein, by reason of a requirement of division made by the Patent Office, was divided out of our copending application for patent, Serial No. 673,728, filed November 9, 1923, for ophthalmological apparatus, and which became Patent No. 1,625,075, April 19, 1927. The present application is directed more particularly to the mechanical features of the apparatus, while the patent issued on the parent application is directed more particularly to what may be termed the electrical features, some of which are disclosed but not claimed herein.

Our invention has particular reference to stands or similar structures adapted to support in one unitary assembly or group all of the diagnostic instruments which will ordinarily be employed in making a thorough optical examination, this invention being an improvement upon the apparatus disclosed in Patent No. 1,494,666, issued May 20, 1924, to Hans Clement, one of the co-applicants of this application.

An object of our invention is to provide a device of this sort which will be relatively simple and compact and which will provide a rigid support for the larger instruments and also provide convenient attachment and support for the smaller diagnostic instruments in such a manner that all of the instruments may conveniently be brought successively to one point for examination before the eyes of the patient without fatigue to the patient or loss of time.

Other objects of our invention are to provide an apparatus which will permit of the use of the regular city current for illuminating the small as well as the larger diagnostic instruments, and an arrangement for leading in the current and for supporting the current controlling devices wherein they are concealed while at the same time rendering the controlling devices conveniently operable by the refractionist.

Other objects and advantages of our invention will appear from the description herein of the particular embodiment of our invention illustrated in the accompanying drawings.

In accordance with our invention, we provide an enclosed compartment or cabinet which serves as the base of the device and which supports a vertically adjustable standard carrying upper and lower arms arranged to swing on vertical axes. In carrying out the invention, these axes are disposed in horizontally offset relation so as to be out of axial alignment with each other. On the ends of these arms are supports for the large instruments, such as an ophthalmometer and a refractor or other phoro-optometer. By adjusting the standard these instruments may be simultaneously raised or lowered, and in carrying out the invention means are also provided for independently raising or lowering at least one of the arms, and for horizontally adjusting one of the instrument supports. In this way the two instruments may be so adjusted that they can be brought around to the same examination point. In carrying out the invention, we also provide on the standard a suitable test chart in line with the refractor so faced as to enable the patient to see the reflection thereof in a mirror in front of the patient.

Within the base cabinet are contained the current controlling devices, the operating knobs or handles for which are disposed on an exterior face of the cabinet. Current may be led in through the base or the lead-in wires may conveniently enter through the standard which will be made hollow for this purpose. Current is led from the current controlling devices by wires neatly arranged leading to the ophthalmometer and to the test chart.

Our invention includes other features of construction and details and arrangements of parts, as will hereinafter more fully appear. We shall now describe the illustrated embodiment of our invention and shall thereafter point out our invention in claims.

Fig. 1 is an elevation of a complete apparatus embodying our invention;

Fig. 1ª is an enlarged horizontal section taken on line 1ª—1ª of Figure 1;

Fig. 2 is an enlarged detail in sectional elevation of the vertical adjusting means for the refractor support;

Fig. 3 is an enlarged sectional elevation of the base cabinet taken on line 3—3 of Figure 5;

Fig. 4 is an elevation of the base cabinet as viewed from the right in Figure 1;

Fig. 5 is a horizontal section of the same taken on line 5—5 of Figure 3, with the jacks for the small instruments omitted; and

Fig. 6 is an enlarged sectional elevation of the upper part of the base cabniet taken on line 6—6 of Figure 5.

The enclosed compartment or cabinet 1 serves as the base for the apparatus. This cabinet is shown as rectangular in cross section and is composed of cast iron or other suitable material. It is in form an elongated box standing on end and open at both its top and bottom, three of the walls being solid and the fourth wall being provided from its top for more than half of its length with an opening, in which is set a suitable panel 2 carrying the current controlling apparatus, as will be hereinafter described. The top 3 of the cabinet is a removable rectangular plate, a portion of which is cut out on one side to receive a top panel portion 4 which is a right angle extension of the panel 2 and forms a flush continuation of the surface of the top 3, certain of the electrical parts being also carried by this top panel portion 4, as will hereinafter appear.

Entering through a hole provided in the top 3 is a hollow or tubular vertical standard 5, which extends with its lower end into the cabinet 1 and also extends a suitable distance above the cabinet, as appears in Figure 1. This standard carries the horizontally swinging arms for the larger instruments as well as the test chart, and is made vertically adjustable with respect to the base cabinet. To guide the standard in its vertical movement, bosses are cast on the adjacent wall of the cabinet 1, the standard passing through guide holes in these bosses. An upper boss 6 for this purpose is disposed near the top of the cabinet, the inner face of the plate 3 being provided with a boss 3^a (Fig. 3) corresponding in shape to that of the boss 6 and positioned to rest upon it when the top plate 3 is in place. To prevent rotation of the standard 5, a set screw 7 in the boss 6 extends into a longitudinal groove 8 in the standard 5.

Below the boss 6, the same wall of the cabinet 1 has two spaced bosses 9 and 10, (see Figs. 3 and 5) which serve as lower bearings for the standard 5. Between the bosses 9 and 10 bears a worm wheel 11, which serves to feed the standard 5 up and down. For this purpose, the standard is longitudinally threaded for a portion of its length and the worm wheel 11 is internally threaded and is disposed upon the threaded portion of the standard. To rotate the worm wheel 11, a worm 12 is provided in engagement with the worm wheel, which worm is on a longitudinally manually operable shaft 13, which bears a its ends in suitable bearings provided for it in the adjacent wall of the cabinet 1. On the end of the shaft 13 outside of the cabinet is a hand wheel 14 and it is evident that by the rotation of this hand wheel the elevation of the standard is adjusted through the parts just described.

Swinging arm 15 for supporting an ophthalmometer 16 or other diagnostic instrument is carried by the standard 5 through the medium of a suitable bracket arm 17. This bracket which may be a casting, has at its inner end a hub 18 which is secured upon the standard 5 above the boss 9 by set screws, as shown. This bracket has two right angle bends or elbows, whereby its end which extends outside of the cabinet is offset to near the opposite side of the cabinet from the standard 5. The first leg of the bracket extends from the hub parallel to the shaft 13 to the vicinity of the wall of the cabinet adjacent the hand wheel 14, whence it extends parallel to that wall to near the opposite corner of the cabinet, and then again turns at right angles parallel to the first leg and extends out through the wall of the cabinet, an elongated opening 19 being provided in the wall of the cabinet for this purpose and to allow for the vertical adjustment of the bracket.

The extension of the bracket 17 outside of the cabinet divides to form a forked bracket 20, the arms of which are disposed in vertical alignment and serve as bearings for a vertical screw 21, which is screw threaded for a portion of its length at its upper end and for the rest of its length is smooth. The arm 15 has a hub portion 22 which surrounds the smooth portion of the screw 21 so as to pivot freely thereon, resting upon a thrust collar 23 on the screw 21. A hand wheel 24 is provided with internal screw threads and engages over the upper end of the screw 21. It is evident that the weight of the arm 15 and of the parts carried thereby is taken by the wheel 24 where it bears on top of the upper arm of the forked bearing 20, a thrust bearing being interposed between the wheel and arm, as shown. As the hand wheel 24 is turned the screw 21 and the arm 15 are raised and lowered. On the outer end of the arm 15, is a support 25 for the ophthalmometer 16. The arm 15 is curved upwardly from its hub 22 so as to bring the ophthalmometer at substantially the proper height for the examination of the eyes of the patient sitting in the chair 26. This height may, of course, be varied both by the manipulation of the hand wheel 14 and of the hand wheel 24.

Supported on the standard 5 near its upper end is a hollow swinging arm 27 for supporting another instrument, such as the refractor 28. This arm is shown as carried by a sleeve 29 which surrounds the standard and bears against a thrust collar 30 on the standard. A knob 31 on the arm 27 is on the end of a taper screw 31^a threaded into the arm 27 and operating a push rod 31^b within the arm 27, which rod bears against the standard 5 and locks the arm 27 against rotation when the taper screw is set up, as shown in Fig. 1^a.

The refractor 28 is supported on the outer

end of the arm 27 in such a manner as to be adjustable relative to the arm in both a vertical and horizontal direction. The vertical adjustment is effected through the mechanism illustrated in detail in Figure 2.

On the outer end of the arm 27 is a T-casting 32, the vertical head of which is tubular and serves as a bearing for the vertical screw 33 on the lower end of which is carried the holder for the refractor 28 and the horizontally adjusting mechanism. Surrounding the screw 33 within the casting 32 is a sleeve 34, which is splined to the screw 33 by a key 35. The sleeve 34 is free to rotate within the casting 32 unless restrained by a clamp hereinafter described, but it is held against longitudinal movement in the casting by a set screw 36, the end of which engages in a circumferential groove near the upper end of the sleeve. A hand wheel 37 has an internally screw threaded hub which engages over the screw 33 immediately below the sleeve 34, the wheel being retained in place by a two-part retaining ring 38 which engages in a circumferential groove in the hub of the hand wheel just below the lower end of the casting 32, the retaining ring being secured, as by screws, to the lower face of the casting. A clamp screw 39 passes through ears on the casting at its top end and screws into one of them and serves when turned up to pinch the ears together and thus reduce the diameter of the upper end of the casting 32 which is slotted between the ears for a sufficient distance to permit of this distortion. A handle 40 is provided to operate the screw. The downward rotation of the handle 40 turns the screw to constrict the top of the casting and cause it to grip the sleeve 34 and hold it, and hence the screw 33, against rotation. It is evident that as the hand wheel 37 is rotated the screw 33 will be raised or lowered provided the sleeve 34 is locked against rotation by the clamp screw 39. When the sleeve 34 is released for rotation, it is evident that the screw 33 may be freely turned upon its own axis, which movement will cause the sleeve 34 and the hand wheel 37 to rotate therewith. Hence, the vertical position of the refractor will not be changed by the rotation of the screw 33, and it is evident that the screw 33 cannot be turned when the clamp handle 40 is depressed.

The lower end of the screw 33 is fixed in a T-casting 41, and a horizontal rod 42, which has on its end an attachment 43 for the refractor 28, is horizontally adjusted in the head of the T-casting 41 by turning a hand wheel 44, which adjustment is effected through any suitable mechanism, such as by a pinion on the shaft of the hand wheel which engages in rack teeth on the rod 42, as indicated by the dotted lines in Figures 1 and 2, or a construction for this purpose may be employed like that shown in the said patent to Hans Clement No. 1,494,666. A test chart holder or support 46^b of suitable construction is supported on the standard 5, resting upon a thrust collar 46^c on the standard. The height of the test chart is such that its medial horizontal line is in the plane of the line of vision of the refractor when the refractor is adjusted to the proper height for the average patient seated in the chair 26. The test chart is contained in a cabinet which is so mounted as to be rotatable about the standard 5, whereby the face of the chart can be brought to the proper plane for the patient using the refractor to see the reflection of the chart in a mirror in front of the patient.

In using the instruments above described, the refractionist seats his patient in the chair 26 and then turns the hand wheel 14 until the refractor and the ophthalmometer are substantially at the correct height for the convenient use of the patient. If the refractor is the instrument first used, the arm 27 is swung around so as to bring the refractor before the eyes of the patient. If a further slight adjustment is needed either in a horizontal or vertical direction, such adjustment is effected either by turning the hand wheel 44 or the hand wheel 37, as above described. After the examination with the refractor is completed, the handle 40 is raised and the refractor is swung around on the axis of the screw 33 to a position at right angles to that shown in Figure 1, when the arm 27 is swung back so as to move the refractor out of the way. Then the arm 15 is swung around so as to bring the ophthalmometer 16 before the patient. If its height is not exactly right, a further slight adjustment can be effected by turning the hand wheel 24. The support 25 is so mounted upon the arm 15 that it can be rotated upon its vertical axis, thereby enabling the refractionist to bring the lens system in line with either eye of the patient.

Current for illuminating the lamps in the ophthalmometer 16 and the test chart 46^b is brought into the base cabinet 1 where a suitable current controller is disposed from whence it is led to the respective lamps. In the construction shown, the electrical attachment to an outside source of current, such as a lamp socket or a wall receptacle, may be made at either one of two places. The standard 5 is shown as hollow and a receptacle 45 is provided in the top end of the standard, which receptacle is connected to the current controlling mechanism through wires 46 and 47, which pass down through the hollow standard and thence out through a hole in the standard provided for that purpose. Alternatively connection to the outside source of current may be made through a receptacle 48 in one wall of the cabinet 1 near the bottom thereof, which receptacle is connected to the current controlling mechanism through wires 46^a and 47^a. In Figure 1 a cable 49 from an outside source of current is shown as

plugged into the receptacle 45. This current controlling mechanism is more fully disclosed and is claimed in the above noted parent Patent, No. 1,625,075.

The current controlling mechanism referred to also permits of the illumination of small diagnostic instruments from the regular city current which is employed to illuminate the ophthalmometer and the test chart. This current controlling mechanism is entirely contained within the cabinet 1 and is arranged to be conveniently operated from the exterior of the cabinet. This current controlling mechanism and its connections for the distribution of the current therefrom to the several points of utilization will now be somewhat briefly described.

The current controlling devices are all contained upon the inner face of the panel 2, and the low voltage attachments for the small instruments are all supported upon the top angle extension 4 of the panel 2. The wires 46 and 47 are connected to a fuse block 50 on the inner face of the panel 2, the other terminals of which block are connected to two conductors 51 and 52 on a plate 53 secured to the inner face of the panel 2. This plate 53 carries a manual switch 54, shown as of the push button snap type, also a pilot light 55 and a receptacle 56. The switch 54 is in the line of the wire 51, and the pilot light 55 and the receptacle 56 are connected in parallel across the wires 51 and 52. The wires 51 and 52 are connected to two conductive strips 57 and 58, preferably of copper, through wires 59 and 60 respectively. The copper strips 57 and 58 are attached to the inner face of the panel 2. For illuminating the lamp of the test chart, wires 61 and 62 are attached at their inner ends to the copper strips 57 and 58 and are led into the hollow standard 5 through a hole provided for that purpose, and are again brought out of the standard through a hole just below the bottom of the test chart, entering the bottom of the test chart, as shown in Figure 1. For illuminating the lamp in the ophthalmometer 16, wires 63 and 64 are also attached to the copper strips 57 and 58 and are brought out through the bracket 17 and the base of the forked bearing 20 through holes provided for that purpose, to the inner face of the arm 15 against which they are secured and run along the inner face of the arm and are led through the support 25 into the base of the instrument.

It is evident that the voltage of the lamps in the ophthalmometer and in the test chart, as well as that delivered to the receptacle 56 will be the full voltage of the supply circuit. This receptacle 56 merely provides for the user a convenient attachment for a lamp or for an instrument or any other translating device requiring the full circuit voltage. For the smaller instruments, such as ophthalmoscopes, retinoscopes and transilluminators, the lamps of which take a relatively small voltage, means are provided for the necessary reduction of the voltage and there are convenient supports in the cabinets for such instruments. In this way there is brought into one unit all of the instruments needed for examination purposes and a current supply to each instrument of the proper voltage. The low voltage electric circuits and the supports for the small instruments will now be described.

Carried by the top panel 4 are four jacks, three of which, numbered 65 may, for convenience, be referred to as the three-volt jacks and the fourth one, numbered 66, may be referred to as the six-volt jack. Against the face of the panel 2 behind these four jacks runs a conductor strip 67 and on the front face of the three jacks 65 is secured another conductor strip 68 shorter than the strip 67 so as to extend only across the three jacks 65. On the front face of the jack 66 is also secured a short conductor strip 69. The copper strip 58 is connected to the conductor 67 through the wire 70 and the strip 57 is connected to the conductor 68 through the wire 71, rheostat 72 and resistance 73. The handle 74 for the rheostat 72 is on the external face of the panel 2. It is evident that the circuit is completed when the two conductors 67 and 68 are connected and this connection is controlled by the presence of an instrument in the respective jacks. By the adjustment of the rheostat 72 the voltage in this circuit may be regulated and is indicated by a volt meter 75 which is connected across the conductors 67 and 68.

The short conductor strip 69 on the front face of the six-volt jack 66 is connected to the strip 57 through wire 76 and resistance 77, which resistance is supported on the panel 2. The circuit for this jack 66 is also completed when there is a connection between the conductors 69 and 67, which connection is controlled by the presence of an instrument in the jack 66, as is the corresponding connection for the jacks 65. In parallel with the jack 66 is a six-volt receptacle 78 in the top panel 4. The receptacle 78 provides a convenient source of electric current at six volts for any purpose; and there is also provided an extra attachment for an instrument or any other translating device requiring three volts, the latter connection consisting of the binding posts 79 and 80 on the top panel 4. These binding posts are connected to the strips 57 and 58 in parallel with the conductors 67 and 68, this parallel connection for the binding posts being controlled by a manual switch 81 on the face of the panel 2.

To connect the conductors 67 and 68, the cables for the instruments for the several jacks are connected to binding posts 82 and 83 on the jacks, one series of binding posts being on the conductor 68 and the other series of binding posts being on the same face of

the jacks but having their connection to the conductor 67 automatically controlled as the instruments are inserted in and withdrawn from the respective jacks. This feature of construction is common to all of the jacks, including the jack 66 and the connection of its conductor 69 with the conductor 67. Each jack provides a vertical socket for the reception of the lower end of an instrument 84. As shown in Figures 3 and 6, the cable or cord 85 for the instrument 84 is sufficiently long to allow the instrument to be taken over to the examining position before a patient seated in the chair 26. One wire of this cable is connected to the binding post 82 and the other wire is connected to the binding post 83.

It will be observed that this apparatus brings into one convenient assembly all of the instruments to be used for making optical examinations, that all of the instruments or other devices requiring current are supplied from one source and that all of the wiring and electrical parts are concealed within the apparatus, although the operating parts therefor are conveniently accessible from the outside of the apparatus.

It is evident that various modifications may be made in the construction shown in the drawings and above particularly described within the principle and scope of our invention.

We claim:

1. An optical testing device comprising a base, a standard carried by the base and mounted for vertical adjustment with respect thereto, manually operable positively acting screw means for effecting such adjustment, an arm above the base mounted to swing on a vertical axis on the standard for vertical adjustment therewith, a head carried by the outer end of the arm, a supporting member depending from the head and guided thereby for vertical adjustment with respect thereto, manually operable positively acting screw means for effecting such adjustment of said member relatively to the head, and a support for a diagnostic instrument carried by the lower end of said member for vertical adjustment therewith, whereby initial vertical adjustment of the instrument may be obtained by adjusting the standard and final vertical adjustment thereof may be obtained by adjusting said member.

2. An optical testing device comprising a base, a horizontally projecting bracket arm mounted on the base for vertical adjustment with respect thereto, manually operable positively acting screw means for effecting such adjustment, an arm mounted to swing on a vertical axis on the outer end of the bracket arm and for vertical adjustment with respect thereto, manually operable positively acting screw means for effecting such adjustment of the swinging arm relatively to the bracket arm, and an instrument support mounted upon the outer end of the swinging arm, whereby two interdependent vertical adjustments are provided for the instrument, of which one may be an initial adjustment and the other may be a final adjustment.

In witness whereof, we hereunto subscribe our signatures.

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GILBERT S. DEY.