July 17, 1934. T. J. ARNESON 1,967,188

PROCESS AND APPARATUS FOR TREATING EYES

Filed Dec. 20, 1930 2 Sheets-Sheet 1

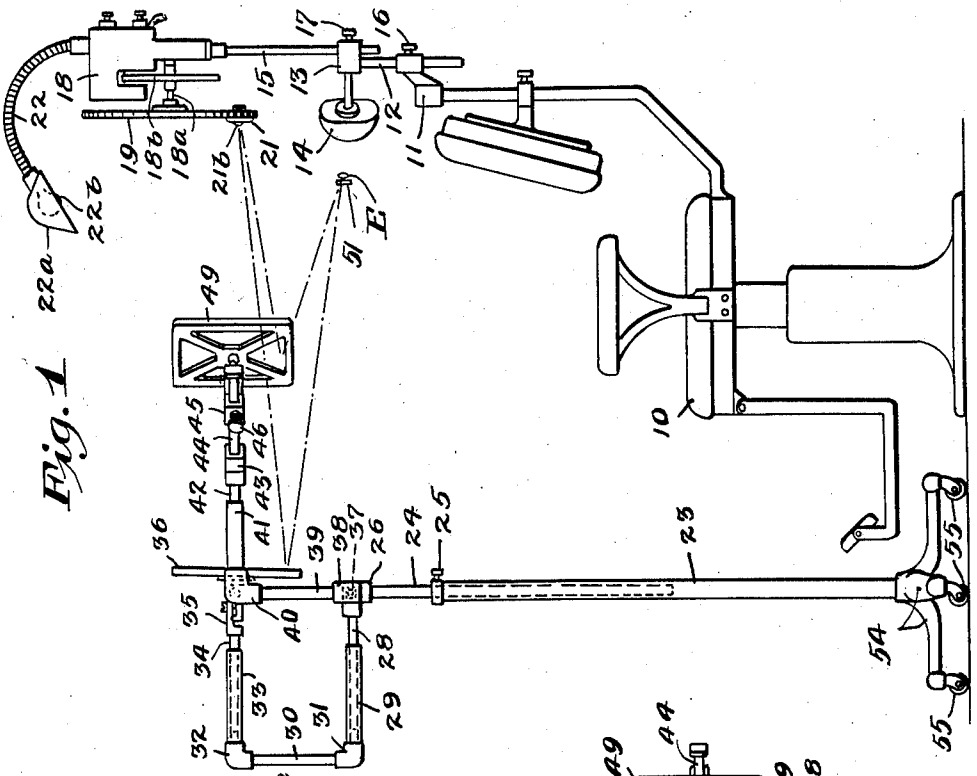


Fig. 1

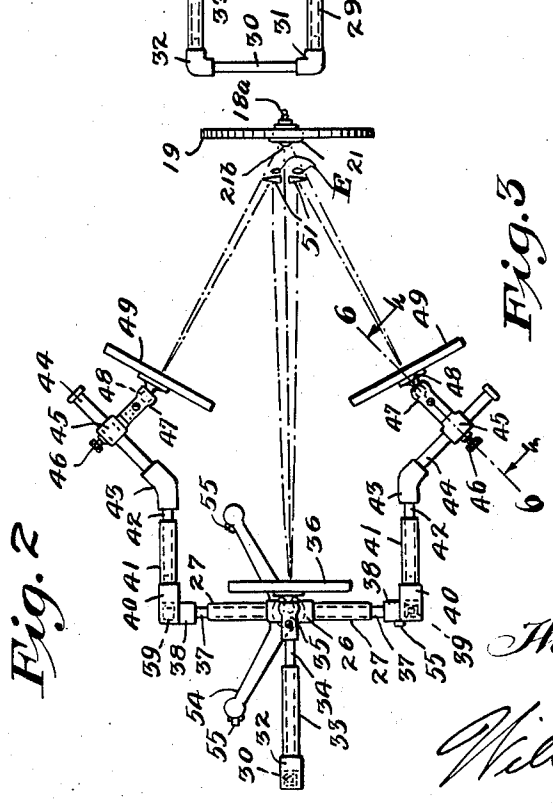


Fig. 2

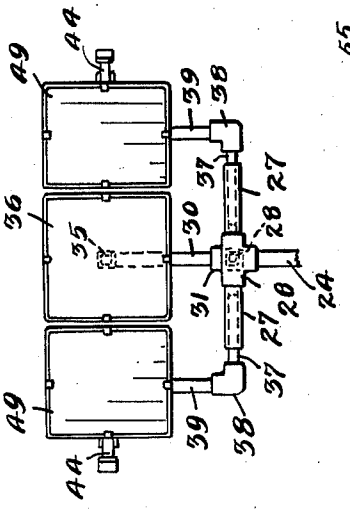


Fig. 3

Inventor
Theodore J. Arneson
By his Attorneys
Williamson & Williamson

July 17, 1934. T. J. ARNESON 1,967,188

PROCESS AND APPARATUS FOR TREATING EYES

Filed Dec. 20, 1930 2 Sheets-Sheet 2

Fig. 4

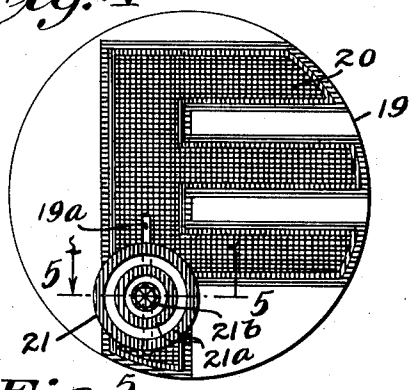


Fig. 6

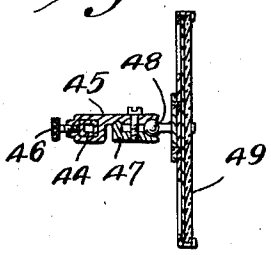


Fig. 5

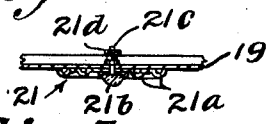


Fig. 9

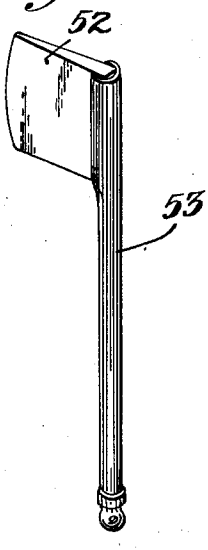


Fig. 7

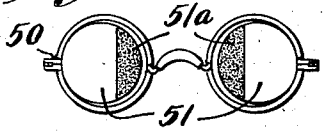
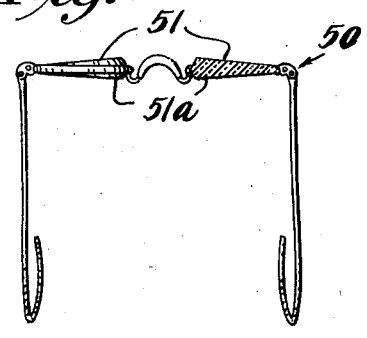


Fig. 8



Inventor
Theodore J. Arneson
By his Attorneys
Williamson & Williamson

Patented July 17, 1934 1,967,188

UNITED STATES PATENT OFFICE

1,967,188

PROCESS AND APPARATUS FOR TREATING EYES

Theodore J. Arneson, Minneapolis, Minn.

Application December 20, 1930, Serial No. 503,783

11 Claims. (Cl. 88—20)

This invention relates to methods and apparatus for treating and testing eyes.

It is the main object of this invention to provide novel and improved methods and apparatus for treating convergent, alternating and divergent squint.

The objects and advantages of the present invention will more fully appear from the following description made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the various views and in which apparatus that may be used for carrying out my methods is disclosed.

Fig. 1 is a view in side elevation illustrating my novel apparatus for treating convergent and alternating squint, as well as apparatus that may be used for treating divergent squint;

Fig. 2 is a plan view of the same, the motor, light and chair not being shown;

Fig. 3 is a view in front elevation of the upper portion of the mirror stand;

Fig. 4 is a view in elevation illustrating the face of the rotating disk;

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 4, as indicated by the arrows;

Fig. 6 is a vertical section taken on the line 6—6 of Fig. 2, as indicated by the arrows;

Fig. 7 is a view in front elevation of a pair of prismatic spectacles that may be used;

Fig. 8 is a plan view of the spectacles shown in Fig. 7, one portion of the spectacles being shown in horizontal section; and

Fig. 9 is a perspective view of an auxiliary prism that may be used.

The apparatus will be first described and the methods of treating and testing eyes will then be explained in connection with the apparatus shown.

There is preferably provided a chair 10 of a type that can be conveniently used for opthalmic purposes. This chair may include a bracket 11 secured to the back support, which bracket has a guide portion within which a bar 12 is mounted for vertical adjustment. A second bracket 13 is secured to the upper end of the bar 12 and this bracket carries the usual head support 14 and also has a vertical guideway within which a bar-like standard 15 may be conveniently mounted for vertical adjustment. The bracket 11 carries a set screw 16 for adjustably holding the bar 12 with the head rest 14 placed at the proper level for supporting the head of a patient sitting in the chair 10. Bracket 13 carries a set screw 17 for adjustably holding the standard 15 at a desired level. The standard 15 has secured to its upper end a variable speed reversible electric motor 18 of any suitable type and including a forwardly projecting motor shaft 18*a* and a disk 18*b*. The detailed construction of the motor 18 illustrated will not be described, inasmuch as any type of variable speed and reversible motor may be substituted for the motor 18, or any other suitable source of power may be used for driving the shaft 18*a*. The shaft 18*a* carries at its forward end a disk 19 which is of special construction. This disk has an irregular shaped figure 20 painted, printed or otherwise impressed thereon, which figure is colored to sharply contrast with the background of the disk. The figure 20 that is preferably used is roughly formed in the shape of the latter E, and this figure as viewed in Fig. 4, includes a vertical bar eccentrically disposed on the disk and three horizontal bars joining the vertical bar, the vertical bar projecting downwardly to the edge of the disk below the lower horizontal bar. The main central portions of the bars forming the Figure 20 are preferably, though not necessarily, colored black, while the marginal edges of the bars will preferably, though not necessarily, be colored by contrasting lines of red and blue, all as indicated by the shading Fig. 4. The background of the disk 19 will preferably be colored white to bring out the Figure 20 in sharp contrast. The disk 19 is provided with a slot 19*a* which extends longitudinally of the long bar vertically disposed as shown in Fig. 4, and a target 21 is carried by the disk in an eccentric relation thereto and mounted for adjustment in the slot 19*a*. The target 21 includes a circular plate 21*a* having concentric corrugations formed therein preferably alternately colored red and white as indicated. There is a button 21*b* formed of glass and preferably of red color and having its surface cut in facets centrally located relative to the plate 21*a* and this button has secured thereto a screw 21*c* which projects through the slot 19*a*. A thumb nut 21*d* fits onto the rear end of the screw 21*c* and is adapted to be used to hold the target on the disk 19 in a desired adjusted position in the slot 19*a*. It will be seen that the spacing of the target 21 from the center of the disk can be readily varied by moving the disk upwardly or downwardly in the slot 19*a* after the thumb nut 21*d* is loosened. There is preferably secured to the upper end of the motor 18 a goose neck lamp 22 including a shade 22*a* and an electric bulb 22*b* adapted to be positioned above the disk 19 to throw light on the same.

A mirror stand is provided for supporting three

mirrors and although this stand may be variably constructed, it is shown in the drawings as including a vertical pipe 23 supported on a four legged spider 54 to which castors 55 are secured, in order that the stand may be readily moved on a floor from one place to another. A vertical rod or pipe 24 fits within the pipe 23, projects above the same and is extensible upwardly and downwardly relative thereto, there being a set screw 25 in the upper end of pipe 23 provided to hold the rod 24 at the desired level from the floor. The rod 24 carries at its upper end a four-way fitting 26 to which a pair of oppositely disposed and laterally projecting horizontal sleeves 27 are secured, the said sleeves being rectangular in vertical cross section. A horizontal bar 28 of rectangular shape in vertical cross section is secured to the fitting 26 and extends forwardly therefrom at right angles to the sleeves 27 and a sleeve 29 receives the bar 28 and is adjustable forwardly and rearwardly on this bar. The sleeve 29 is secured to a vertical pipe or bar 30 by an elbow 31, and a similar elbow 32 connects the upper end of the pipe 30 to a horizontally disposed sleeve 33 similar in all respects to the sleeve 29, but spaced above the same. A bar 34 of rectangular shape in vertical cross section slidably fits within the sleeve 33 and this bar at its forward end carries an adjustable clamping socket 35 within which a ball mounted on the rear side of what may be called a main mirror 36 fits. The mirror 36, it will be readily seen, can be extended forwardly or rearwardly relative to the vertical pipe 23 of the stand, can be raised and lowered as the bar 24 is raised and lowered, and it can be tilted at a desired angle by reason of the universal joint formed by the socket 35 and the ball fitting therein. Fitting within the two sleeves 27 are bars of rectangular shape in cross section and these bars are extensible laterally inwardly and outwardly from the sleeves 27 and these bars have secured to their outer ends elbows 38 to which vertical pipes 39 are connected. The pipes 39 carry elbows 40 at their upper ends which have rearwardly projecting horizontal sleeves 41 secured thereto. The sleeves 41 are of rectangular shape in vertical cross section and carry rearwardly projecting bars 42 for forward and rearward sliding movement therein. The rear ends of the bars 42 are connected to elbows 43 to which horizontal bars 44 of rectangular shape in vertical cross section are secured. The bars 44 diverge outwardly toward their rear ends at approximately 45° angles to the bars 42. Mounted on the bars 44 for adjustable sliding movement are sleeve carrying arms 45, set screws 46 being applied to these arms for holding them on the bars 44 at desired adjusted positions. The arms 45 have clamping sockets 47 formed at their free ends within which ball members 48 secured to the backs of what may be called auxiliary mirrors 49 fit. The two auxiliary mirrors 49, it will be seen, can be raised or lowered to the desired level from the floor as the main mirror 36 is raised or lowered. The mirrors 49 may be spaced nearer or farther apart by sliding the bars 37 in the sleeves 27 and the auxiliary mirrors can be adjusted forwardly and rearwardly relative to the main mirror 36 by sliding the bars 42 forwardly and rearwardly in the sleeves 41. Also adjustment of the mirrors along diverging lines can be made by loosening the set screws 46 and sliding the arms 45 on the bars 44. The mirrors may be given the desired tilt due to the universal joints formed by the ball socket 47 and ball members 48. Preferably as many parts of the mirror stand as possible will be made of hollow construction to lighten the same. The spider 24, however, will be made preferably from solid material so as to give the stand stability.

As part of my apparatus, I provide a pair of spectacles shown in Figs. 7 and 8, which include a spectacle frame 50 carrying circular prismatic lenses 51 of triangular formation in horizontal cross section. These lenses 51 are preferably mounted for rotation in the spectacle frame 50, so that they may be turned with their widened or base portions outwardly or with their base portions inwardly. The lenses 51 at their rear sides have frosted segments 51*a* adjacent the base edges of the lenses. I also use in connection with my apparatus triangular shaped prisms 52 having bases mounted in holders 53.

My apparatus is used in testing eyes for both convergent and divergent squint and is also used in treating patients for correction of both divergent and convergent squint. With my previous so-called "Eye testing apparatus" upon which I secured a United States patent on March 22, 1927, Patent No. 1,622,215, I was able to test and treat eyes for divergent squint. My present apparatus is a great improvement over the apparatus disclosed in my Patent No. 1,622,215 for treating divergent squint due to my new construction of rotating disk and also due to the fact that I use prisms such as the prisms 51 in spectacles shown in Figs. 7 and 8, or prisms such as the prisms 52 shown in Fig. 9 with my apparatus. In treating a patient for divergent squint, the mirror stand, although it may be used, need not necessarily be used, and the rotating disk 19 need not be mounted on a chair such as the chair 10. The patient to be treated will preferably be seated so that he faces the rotating disk 19, or if the chair and mirror stand are used, the patient may be seated in the chair 10, so that the image from the rotating disk 19 will be reflected to the main mirror 36 and thence to the eyes of the patient. The auxiliary mirrors, if the mirror stand is used, will be swung out of the way. The spectacles shown in Figs. 7 and 8 will be applied to the eyes of the patient for divergent squint with the widened base portions of the prisms 51 turned outwardly. When the rotating disk 19 is set in operation, the patient will follow the button 21*b* of the rotating target 21 with his eyes without moving his head. The faceted button 21*b* being of a bright color, preferably red, and located in the center of the target made in concentric alternating bands of color, will cause central fixation of the eyes on the button, while the figure 20 on the disk will produce peripheral fixation. As the figure 20 is irregular in shape, eye fatigue is prevented by reason of the constant change in appearance of the figure 20 as the disk rotates. The monotony of staring at a single object with a never varying background is thus relieved, and the eyes of the patient will not tire. Of course, as the disk rotates, the eyes of the patient will follow the target 21 and this will exercise the eyes. The prisms 51 with their bases disposed outwardly will cause the muscles of the eyes to strain to move the pupils of the eyes inwardly if the target is to be properly viewed without blurring and without causing the patient to see double. The frosted portions 51*a* on the prisms 51 of the spectacles will, of course, be disposed outwardly when a patient is being treated for divergent squint and these frosted portions will tend to

draw the eyes inwardly. As the motor 18 is a reversible and variable speed motor, the speed and direction of rotation of the disk 19 may be varied for different patients and for the same patient after having been treated by use of the apparatus for sometime. Also the target 21 can be adjusted to and from the center of the disk 19, so that the target may be caused to move in circles of greater or less diameter for producing variance in the amount of movement given to the patient's eyes during treatment. Of course, the distance that the patient may be placed from the disk, may be also varied for different cases. After the patient has been treated for sometime with the use of merely prisms 51 found in the spectacles, the angularity of the prisms used may be increased, or if desired, the prisms 52 can be used in conjunction with prisms 51. As the eye sight of the patient becomes better from treatment, the angularity of the prisms will be greatly increased, the number of dioptrics used in various prisms being varied for different patients.

The chief improvement in my present apparatus over my previously patented apparatus, appears in connection with the treatment of convergent squint known as cross eyes. The patient to be treated for convergent squint will preferably be seated in the chair 10 and the head rest 14 will be adjusted so as to properly support the back portion of the head of the patient. The eyes of the patient will take the position designated by the letter E in Figs. 1 and 2 of the drawings. The motor 18 will be set in operation to rotate the disk 19 and the mirror stand will be moved on the floor to the desired spacing from the eyes of the patient. The main mirror 36 will then be adjusted so that as the patient looks into the mirror, the image of the rotating disk 19 may be clearly viewed by both eyes of the patient. As the mirror 36 may be adjusted in height, and longitudinally to and from the eyes of the patient and as the mirror can be tilted at any desired angle, it will be readily seen that there is no difficulty involved in properly positioning the mirror relative to the eyes of the patient and to the disk 19. The two auxiliary mirrors 49 will then be adjusted relative to the eyes of the patient and to the disk 19, so that the left hand auxiliary mirror may reflect an image from the rotating disk to the left eye of the patient, while the right hand mirror 49 may reflect an image from the rotating disk to the right eye of the patient. The spectacles shown in Figs. 7 and 8 will be applied over the eyes of the patient with the bases of the prisms 51 turned inwardly as shown in the drawings. The patient will then focus his head so that the eyes may run directly to the main mirror 36 and the patient will fix his eyes on the image of rotating target 21 and move his eyes in a circular path as the disk 19 rotates, so as to follow the button 21b of the target. At the same time that the patient looks into the main mirror 36 with both eyes, he will follow the image of the rotating target in the left hand auxiliary mirror 49 with his left eye and will follow the image of the target as reflected by the right hand auxiliary mirror 49 with his right eye. By following the images of the rotating disk as reflected by the auxiliary mirrors 49, while at the same time following the image of the rotating disk in the main mirror 36 with both eyes, the extrinsic muscles of the eyes will be exercised and the eyes of the patient will tend to diverge instead of to converge. Of course, the frosted portions 51 of the spectacles will assist materially in preventing the eyes from following their normal tendency to converge, inasmuch as the patient to see must follow around the outer edges of the frosted sections of the prisms 51. As the patient continues his exercises, prisms of greater angularity or greater prism dioptrics will be substituted for the original prisms 51 in the spectacles or the prisms 52 may be used to supplement the action of the prisms 51. By use of the three mirrors, together with the base in prisms, the muscles of the eyes will be gradually built up, so that the eyes instead of tending to converge constantly and cross, will properly focus on an object. Of course, the rotating target as in treating divergent squint keeps the attention of the patient and produces an even development of the muscles of the eyes, while the eyes are focused in divergent relation. It is sometimes desirable to adjust the auxiliary mirrors laterally inwardly and outwardly relative to the central mirror, and this can be readily accomplished by use of the present stand. Also the longitudinal position of the auxiliary mirrors may be adjusted relative to the line between the main mirror 36 and the eyes of the patient. It is, of course, not essential that the chair 10 be used in treating convergent squint but the chair is convenient for properly locating the patient, the rotating disk 19 and the three mirrors that are used.

Alternating squint will be treated by use of the present apparatus by use of the three mirrors 36 and 49 in much the same manner as convergent squint is treated. It will be readily understood that the eyes can be tested for convergent, divergent and alternating squint by use of the present apparatus by determining the fusion power of the eyes by placing prisms of different known prism dioptrics over the eyes either base inwardly or base outwardly and thus determining the number of prism dioptrics that can be used before the eyes will not fuse, i. e. before the eyes will see two images of the rotating disk in one or more of the mirrors. It will be seen that my method of treating convergent squint consists essentially in simultaneously reflecting three images from a single target, preferably a rotatable target to the eyes of the patient, one image of which will be reflected to both eyes of the patient in a straight forward line of vision, one image of which will be reflected to one eye of the patient along a line angular to the straight forward line of vision and at one side thereof, and the other image of which will be reflected to the other eye of the patient along a line angular to the straight forward line of vision and at the other side thereof. In the drawings Figs. 1 and 2, the dotted lines indicate the line of vision from the two eyes of a patient when the patient is being treated for convergent squint.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts of my apparatus and in my methods for treating and testing eyes without departure from the scope of the present invention, which generally stated, consists in the matter shown and described and set forth in the appended claims.

What is claimed is:—

1. The method of treating eye squint which consists in bringing a rotating target into the straight forward line of vision of both eyes of the patient, while at the same time bringing a rotating target into a line of vision from the left eye of the patient laterally spaced to the left of the straight forward line of vision of the patient and simultaneously bringing a rotating target

into a line of vision from the right eye of the patient laterally spaced to the right of the straight forward line of vision of the patient.

2. The method of treating convergent and alternating eye squint which consists in locating triangular prisms base inward ahead of the eyes of the patient, bringing a rotating target into the straight forward line of vision of both eyes of the patient, simultaneously bringing a rotating target into a line of vision from the left eye of the patient laterally spaced to the left from the straight forward line of vision of the patient and simultaneously bringing a rotating target into a line of vision from the right eye of the patient laterally spaced to the right of said straight forward line of vision.

3. The method of treating convergent and alternating eye squint which consists in simultaneously reflecting three images from a single target to the eyes of the patient, one image of which is reflected to both eyes of the patient along a straight forward line of vision from the patient, one image of which is reflected to one eye of the patient along a line angular to the straight forward line of vision and at one side thereof and the other image of which is reflected to the other eye of the patient along a line angular to the straight forward line of vision and at the other side thereof.

4. The method of treating convergent and alternating eye squint which consists in simultaneously reflecting three images from a single rotating target to the eyes of the patient, one image of which is reflected to both eyes of the patient along a straight forward line of vision from the patient, one image of which is reflected to one eye of the patient along a line angular to the straight forward line of vision and at one side thereof and the other image of which is reflected to the other eye of the patient along a line angular to the straight forward line of vision and at the other side thereof.

5. The method of treating convergent and alternating eye squint which consists in placing triangular prisms bases inward in front of the eyes of the patient and simultaneously reflecting three images from a single target to the eyes of the patient, one image of which is reflected to both eyes of the patient along a straight forward line of vision from the patient, one image of which is reflected to one eye of the patient along a line angular to the straight forward line of vision and at one side thereof and the other image of which is reflected to the other eye of the patient along a line angular to the straight forward line of vision and at the other side thereof.

6. The method of treating convergent and alternating eye squint which consists in placing triangular prisms bases inward in front of the eyes of the patient and simultaneously reflecting three images from a single rotating target to the eyes of the patient, one image of which is reflected to both eyes of the patient along a straight forward line of vision from the patient, one image of which is reflected to one eye of the patient along a line angular to the straight forward line of vision and at one side thereof and the other image of which is reflected to the other eye of the patient along a line angular to the straight forward line of vision and at the other side thereof.

7. An optical apparatus for the treatment of convergent and alternating eye squint comprising in combination, a target adapted to be mounted adjacent the head of the patient, means for rotating said target, a main mirror forwardly disposed from said target and positioned to reflect an image from the target to the two eyes of the patient and a pair of auxiliary mirrors mounted forwardly from said target and respectively laterally disposed relative to the two side edges of said main mirror, one of said auxiliary mirrors being positioned to reflect an image from said target to the right eye of the patient and the other of said auxiliary mirrors being positioned to reflect an image from the target to the left eye of the patient.

8. An optical apparatus for the treatment of convergent and alternating eye squint comprising in combination, a target adapted to be mounted adjacent the head of the patient, a main mirror forwardly disposed from the target and positioned to reflect an image from the target to the two eyes of the patient, a pair of auxiliary mirrors mounted forwardly from said target and respectively laterally disposed relative to the two side edges of said main mirror, one of said auxiliary mirrors being positioned to reflect an image from said target to the right eye of the patient and the other of said auxiliary mirrors being positioned to reflect an image from said target to the left eye of the patient and triangular prisms having their bases inwardly disposed adapted to be positioned in front of the eyes of the patient.

9. The apparatus defined in claim 8, and means for rotating said target.

10. An optical apparatus for the treatment of convergent and alternating squint comprising in combination, a chair within which a patient is adapted to be seated, a rotating target mounted above said chair, a mirror stand disposed forwardly from said chair and movable to and from said chair, a main mirror mounted on said mirror stand for universal adjustment and adapted to be positioned to reflect an image from said target to both eyes of the patient and a pair of auxiliary mirrors mounted on said mirror stand in lateral relation respectively from the two side edges of said main mirror and adjustable, one of said auxiliary mirrors being adapted to be positioned to reflect an image from the target to the right eye of the patient and the other of said auxiliary mirrors being adapted to be positioned to reflect an image from the target to the left eye of the patient.

11. An optical apparatus for the treament of converging and alternating eye squint, comprising in combination a target, means for rotating said target, means for mounting said target relative to the head of a patient to be viewed by both eyes of the patient in the straight forward line of vision and a pair of mirrors mounted respectively laterally relative to the forward line of vision, one of said mirrors being so positioned relative to said target and said second mentioned means as to reflect an image of said target from a point laterally to the right of the forward line of vision to the right eye of the patient and the other of said mirrors being so positioned relative to said target and said second mentioned means as to reflect an image of said target from a point laterally to the left of the forward line of vision to the left eye of the patient.

THEODORE J. ARNESON.