

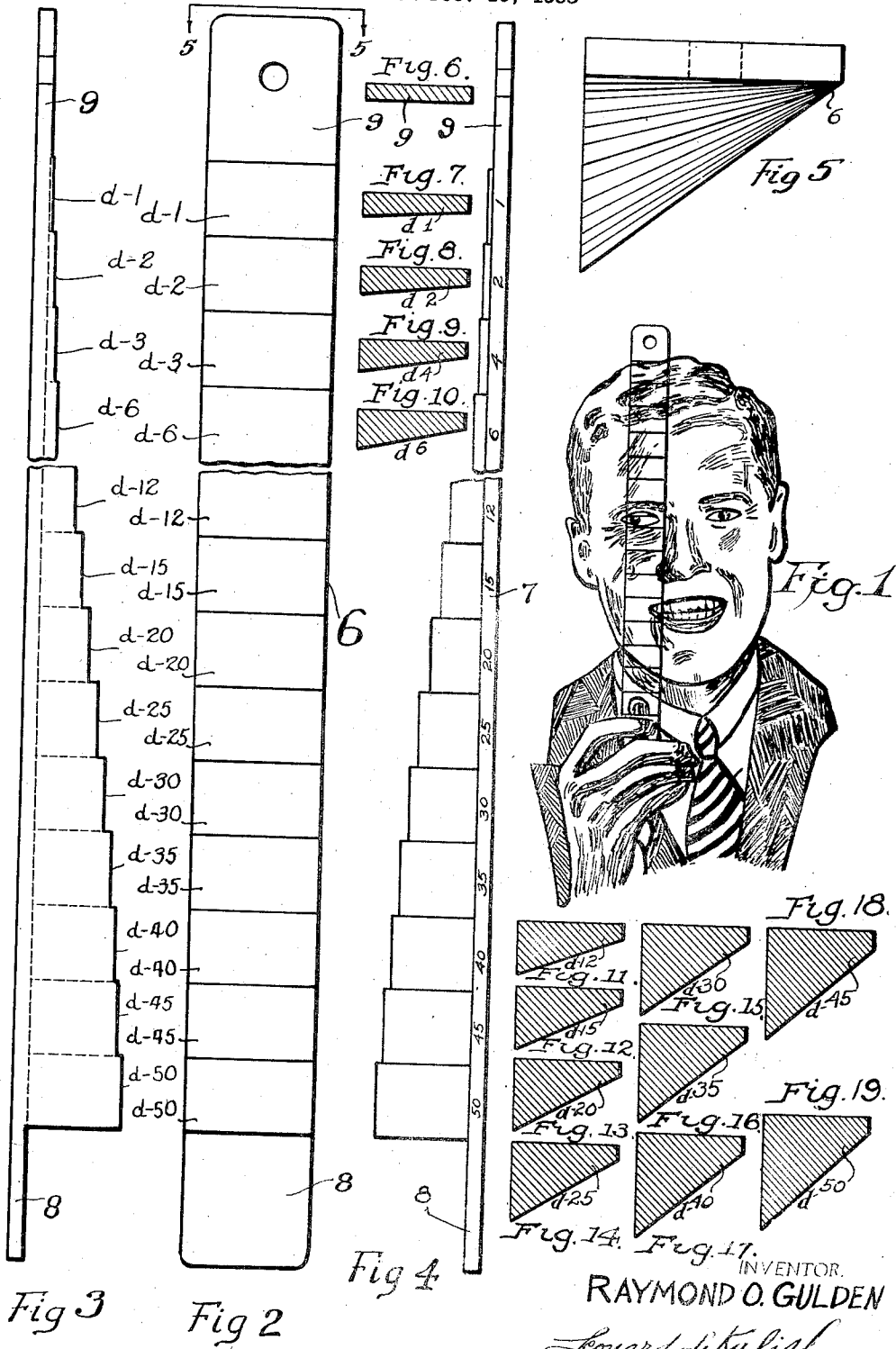
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2,229,410

OPTICAL APPARATUS

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## UNITED STATES PATENT OFFICE

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## OPTICAL APPARATUS

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2 Claims. (Cl. 128—76.5)

The present invention relates to ophthalmological apparatus for the diagnosis as well as the treatment of eye defects resulting more particularly from a condition of insufficiency or unbalance or lack of equilibrium of the extrinsic muscles of the eye.

The present invention relates more particularly to an optical exerciser for treating or exercising the muscles of the eye thereby to correct misalignment of the eye; one form of misalignment being more commonly referred to as "cross-eyedness."

Many forms of apparatus for this purpose have been devised in the past, as for instance, the various forms of apparatus shown in United States Patents Nos. 1,738,986; 1,948,901; 2,035,511 and 2,114,060. The present invention contemplates, however, a simpler and more effective form of apparatus for the purpose.

One phase of the present invention consists, among other things, of a graded multi-prism preferably arranged in the form of a bar with successive prismatic portions of varying angle or cross-section ranging from 1 to 50 diopters, more or less, in suitable steps, and so arranged that by placing the device in front of the eye requiring the exercise, the eye will be deflected in the direction required for correction or for the corrective exercise of the muscle to an extent depending on the height or level to which the device is raised, that is, depending on the portion of the device which is presented to the eye. By starting with the small angle portion and gradually applying larger angles of the device to the eye, gradually increasing exercise may be obtained. The direction of the deflection is controlled by presenting one or the other side of the prism to the eye, that is, it is controlled by the direction in which the narrow part of the cross-section of the prism is disposed in relation to the eye.

Another phase of the present invention consists of forming an optical exercising device of the character stated of a transparent synthetic organic material which will be substantially non-brittle and light and have a suitable index of refraction.

The present invention further consists of other novel features which will appear more fully from the following detailed description.

For the purpose of illustrating the invention, there is shown in the accompanying drawing one form thereof which is at present preferred, since the same has been found in practice to give satisfactory and reliable results, although

it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

Referring to the drawing in which like reference characters indicate like parts,

Figure 1 represents a perspective view of a device embodying my present invention, shown in actual use.

Figure 2 represents a front elevational view of the same, drawn approximately to full-size scale.

Figure 3 represents a side elevational view of the same viewed from the wide part of the prism.

Figure 4 represents an opposite side elevational view viewed from the narrow part of the prism.

Figure 5 represents a top plan view generally in the direction of the line 5—5 of Figure 2 but on an enlarged scale of approximately 2 to 1.

Figures 6 to 19 inclusive represent cross-sectional views taken through the terminal portion 9 and through the successively inclined portions  $d-1$  to  $d-50$  inclusive (generally in the direction of the arrows 5—5).

The optical exercising device of the present invention designated generally by the numeral 6 is preferably formed of a single solid bar or column of transparent synthetic organic material, as for instance methyl methacrylate resins or other acrylic resins, some of which are known under the trade mark "Lucite" of the E. I. du Pont de Nemours & Co. and under the trade mark "Plexiglas" of the Rohm & Haas Company (of Philadelphia).

The device of the present invention is provided with a successive series of prismatic portions ranging from 1 to 50 diopters, more or less. The number of prismatic portions may vary according to the gradation desired. In practice, I have found that an optical exercising device of this character is suitable if made of fifteen (15) prismatic portions of the following diopters: 1, 2, 4, 6, 8, 10, 12, 15, 20, 25, 30, 35, 40, 45 and 50.

In the illustrations of Figures 2, 3 and 4, I have broken away part of the device in order to reduce its length in the illustration.

The successive prismatic portions I have designated by the letter "d", which I use here as an abbreviation for diopter, together with the numerical value.

The cross-section of each prismatic portion is preferably a right angular triangle but with the

triangle slightly cut off or truncated at the acutest apex thereof so as to form the flat edge 7 of approximately  $\frac{1}{8}$ " in width, more or less, which is then continued at each end of the device, that is, beyond the prismatic portions  $d$ —50 and  $d$ —1 in the form of the flat handle portions 8 and 9 respectively.

In addition to the acrylic resins hereinabove referred to, other transparent resins may also be used and similarly other transparent cellulose and cellulose derivatives such as cellulose acetate, etc. products may also be used in forming the optical device of the present invention.

I may also form the optical exercising device of the present invention of glass, and more particularly of what is known as tempered glass, although I prefer to use the synthetic organic materials. The tempered glass here referred to is one which is given a special heat treatment after the glass has been cut, ground, or otherwise formed to the final shape, and which cannot be thereafter cut or ground without disintegration.

The device of my present invention is useful both as an optical exercising device as well as an optical diagnosing apparatus, and while for the sake of brevity the device is referred to in the claims as "optical exercising apparatus," by this term the device is intended to be comprehended whether used as an optical exercising device or whether used as diagnosing apparatus.

One or both of the handle portions 8 and 9 may be left unpolished, that is, with non-reflecting or more or less opaque surfaces, so that when the exercising device is passed before the eye, in a way to present the gradually increasing or gradually decreasing angles, the handle member may be presented to the eye so as to block out the vision completely.

If desired, the variations in prismatic angle or diopter may be continuous gradations instead of more or less distinct steps as shown, as for instance by continuous curved surface in place of the stepped surface with the variations

in angle being infinitesimal variations over infinitesimal distances on the length of the bar or column. In the preferred embodiment, however, the graduations are of distinct steps as more or less shown.

The column either with the distinct steps or with the gradual change as last hereinabove indicated, may also be formed hollow of a transparent material such as any of the materials hereinabove mentioned and then filled with a fluid of suitable optical property, such as water, or other fluid, although in the preferred embodiment the column or bar is solid and of the same material throughout.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described the invention, what is hereby claimed as new and desired to be secured by Letters Patent, is:

1. Optical exercising apparatus comprising an integral multi-prism bar of transparent material having a successive series of prismatic portions producing successively varying total light-ray deviation, with the basal portions of said prismatic portions extending along a common edge of said column.

2. Optical exercising apparatus comprising an integral bar of transparent material having a manually graspable handle portion at one end thereof, and a successive series of prismatic portions of successively varying power extending therefrom, with their basal portions being disposed along an edge of said bar, and with the prism faces on one side of said bar being coplanar.

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