968,981.

H. D. REESE & A. J. GLAXON.

OPTOMETER.

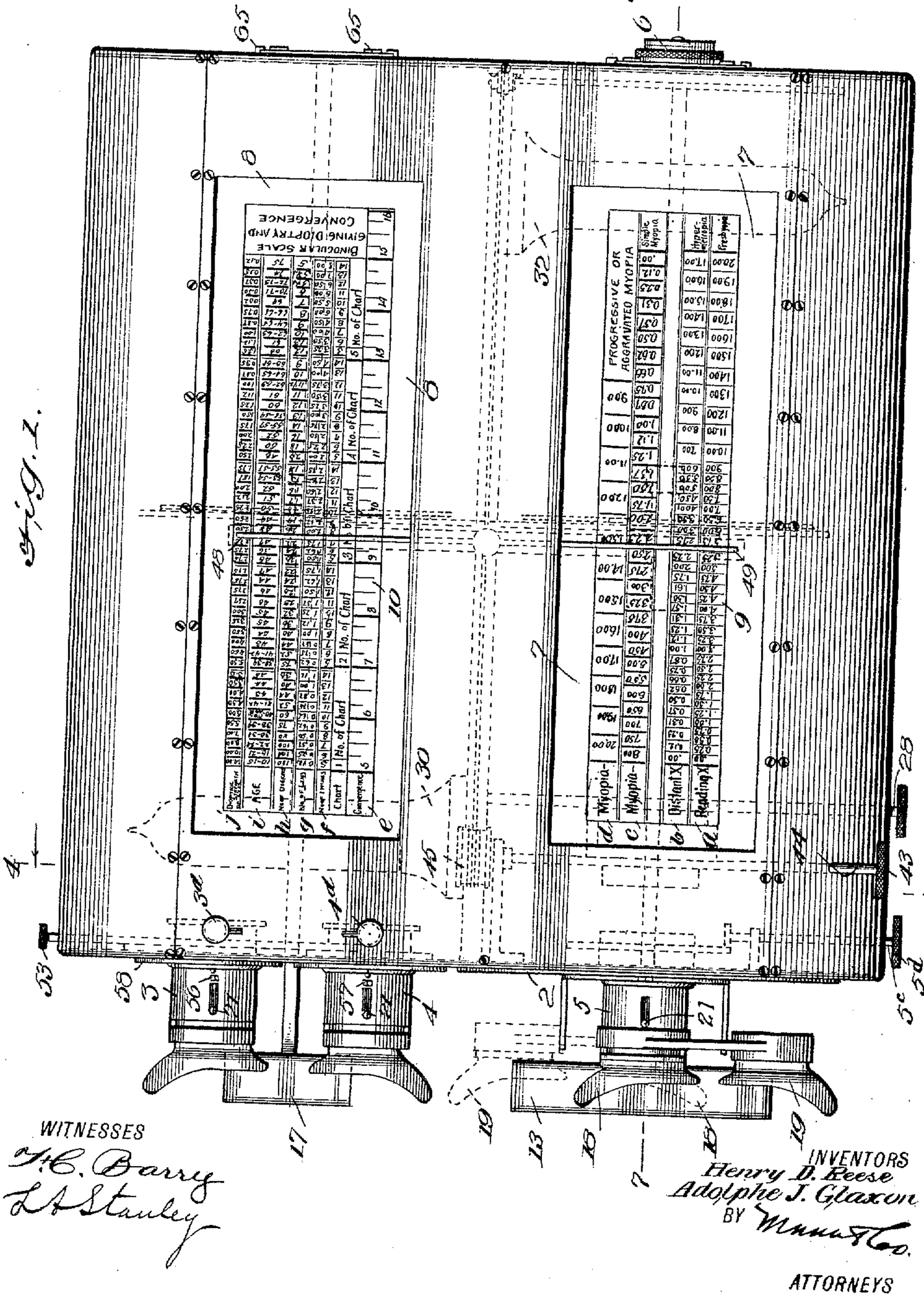
APPLICATION FILED AUG. 6, 1909.

Patented Aug. 30, 1910.

5 SHEETS—SHEET 1.

for daylight ill.

Fig. 1.



WITNESSES

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5 SHEETS—SHEET 2.

Fig. 2.

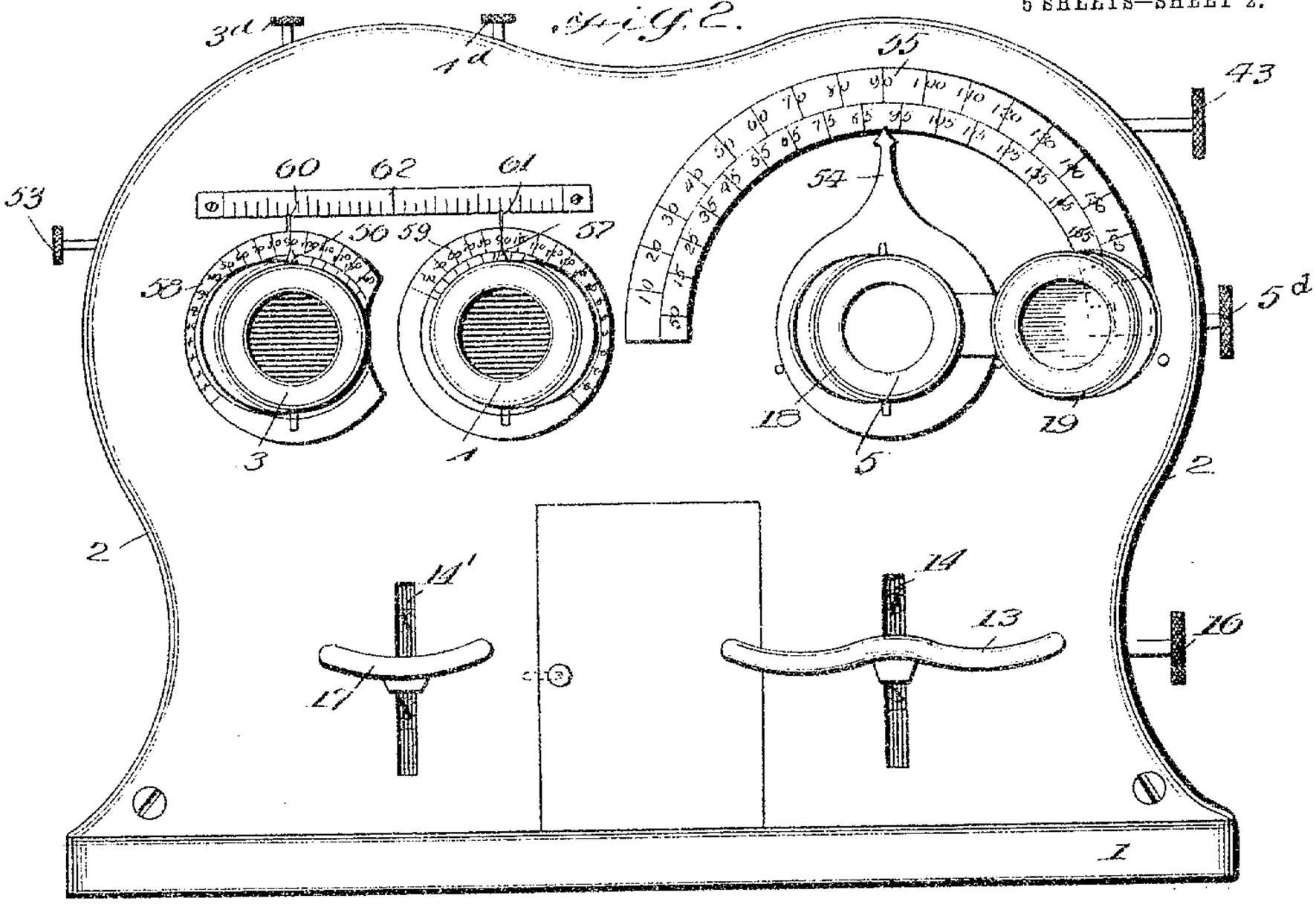
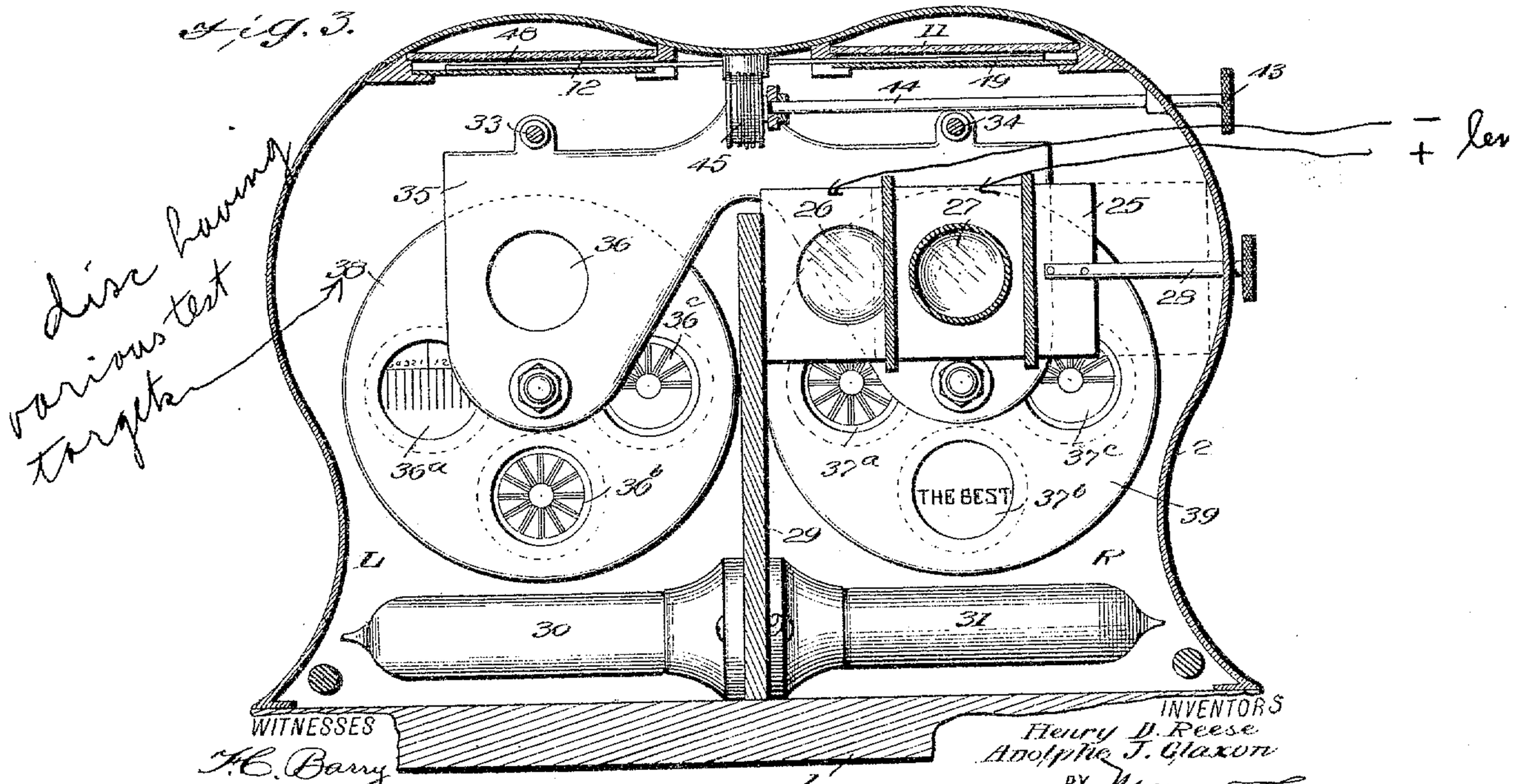


Fig. 3.



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5 SHEETS—SHEET 3.

Fig. 4.

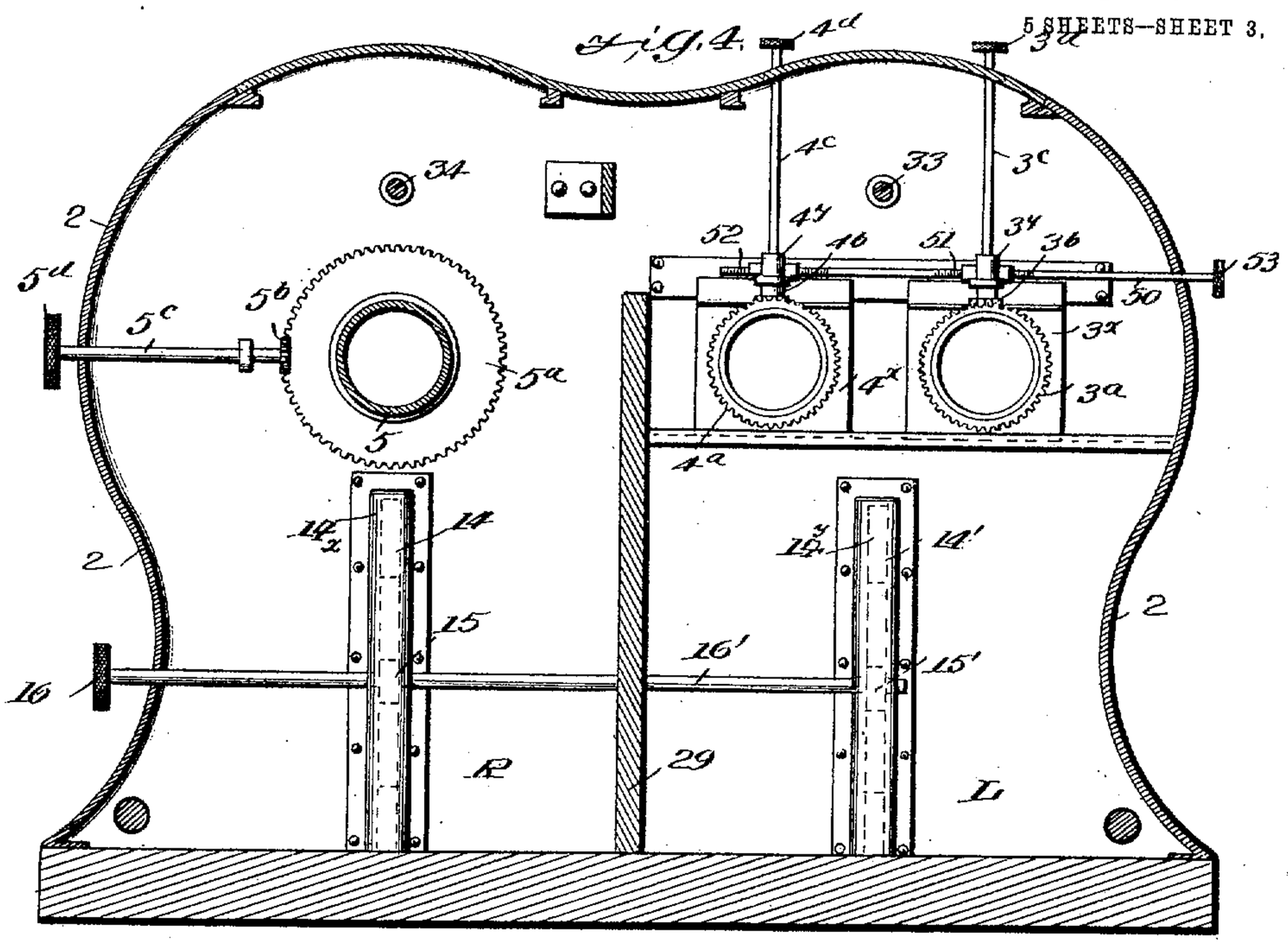


Fig. 5.

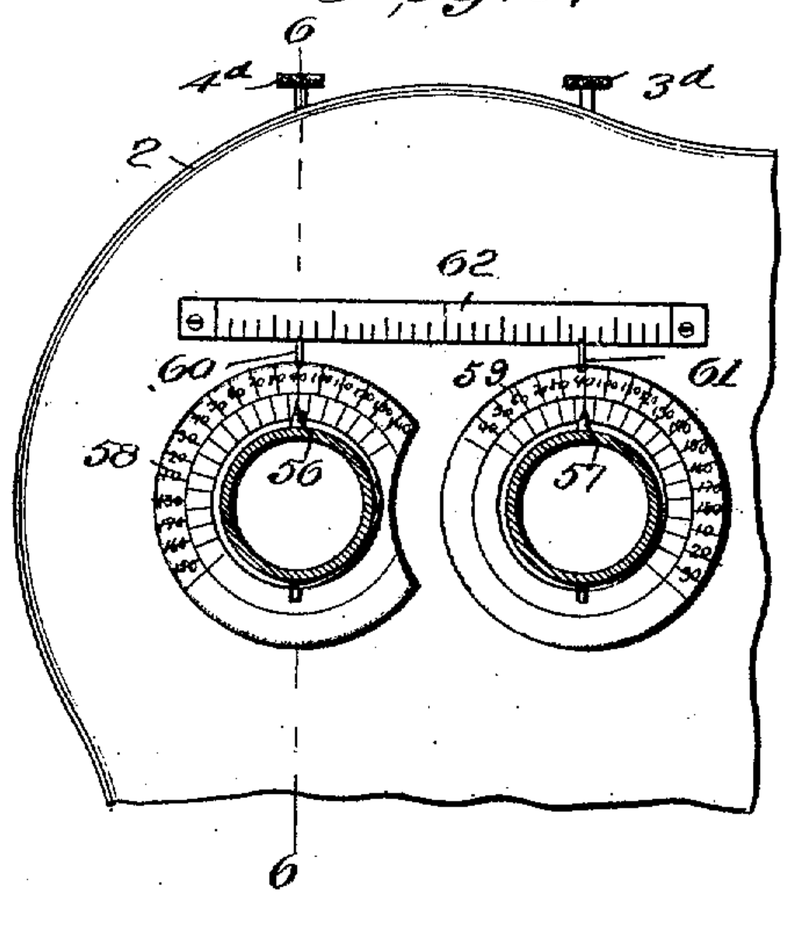
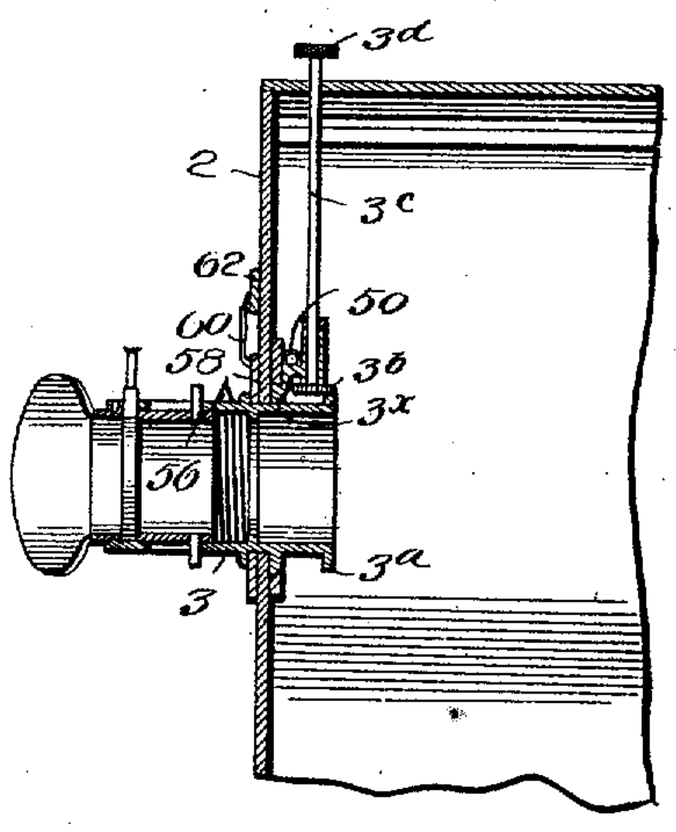


Fig. 6.



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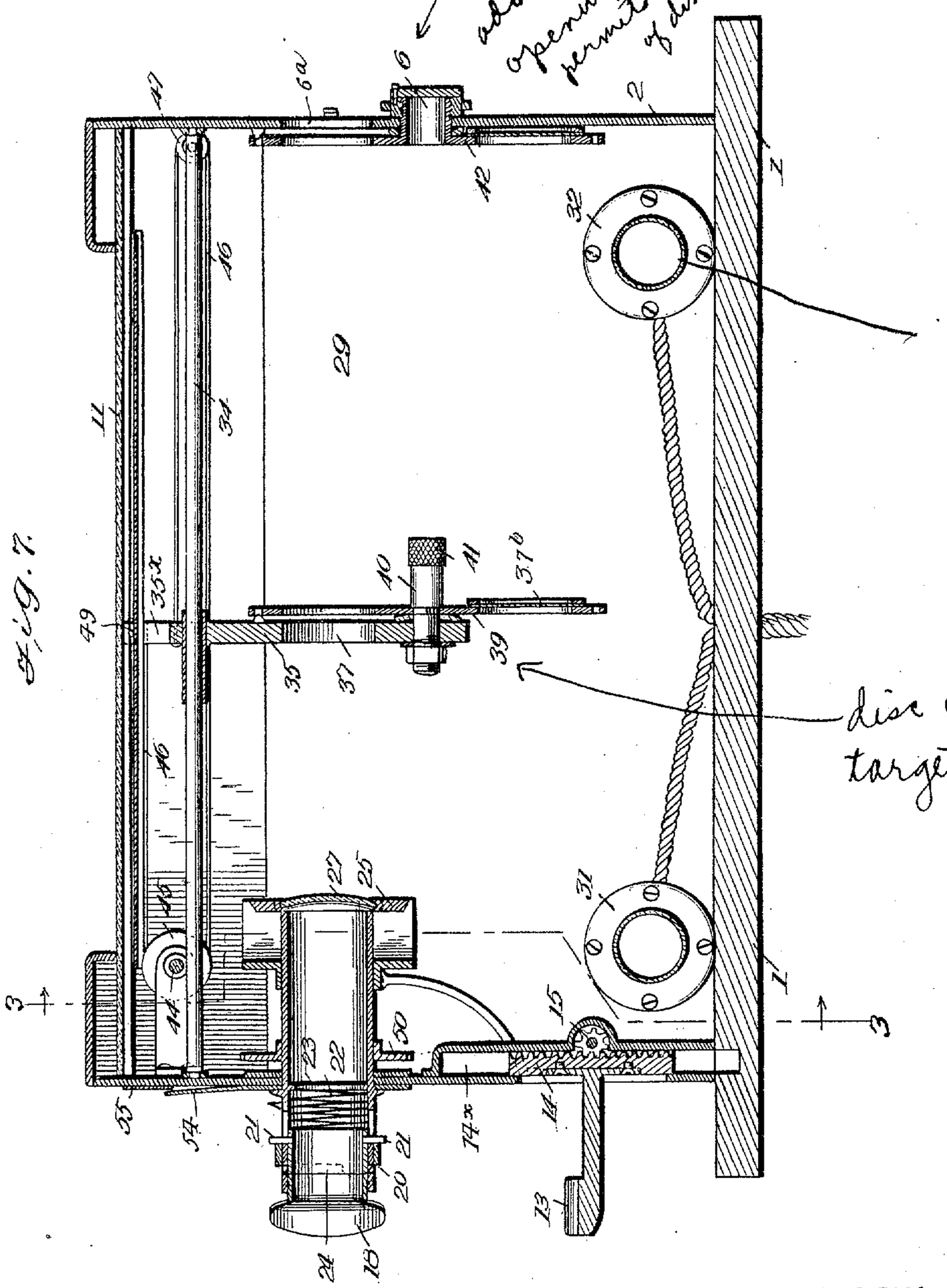
5 SHEETS—SHEET 4.



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5 SHEETS—SHEET 5.

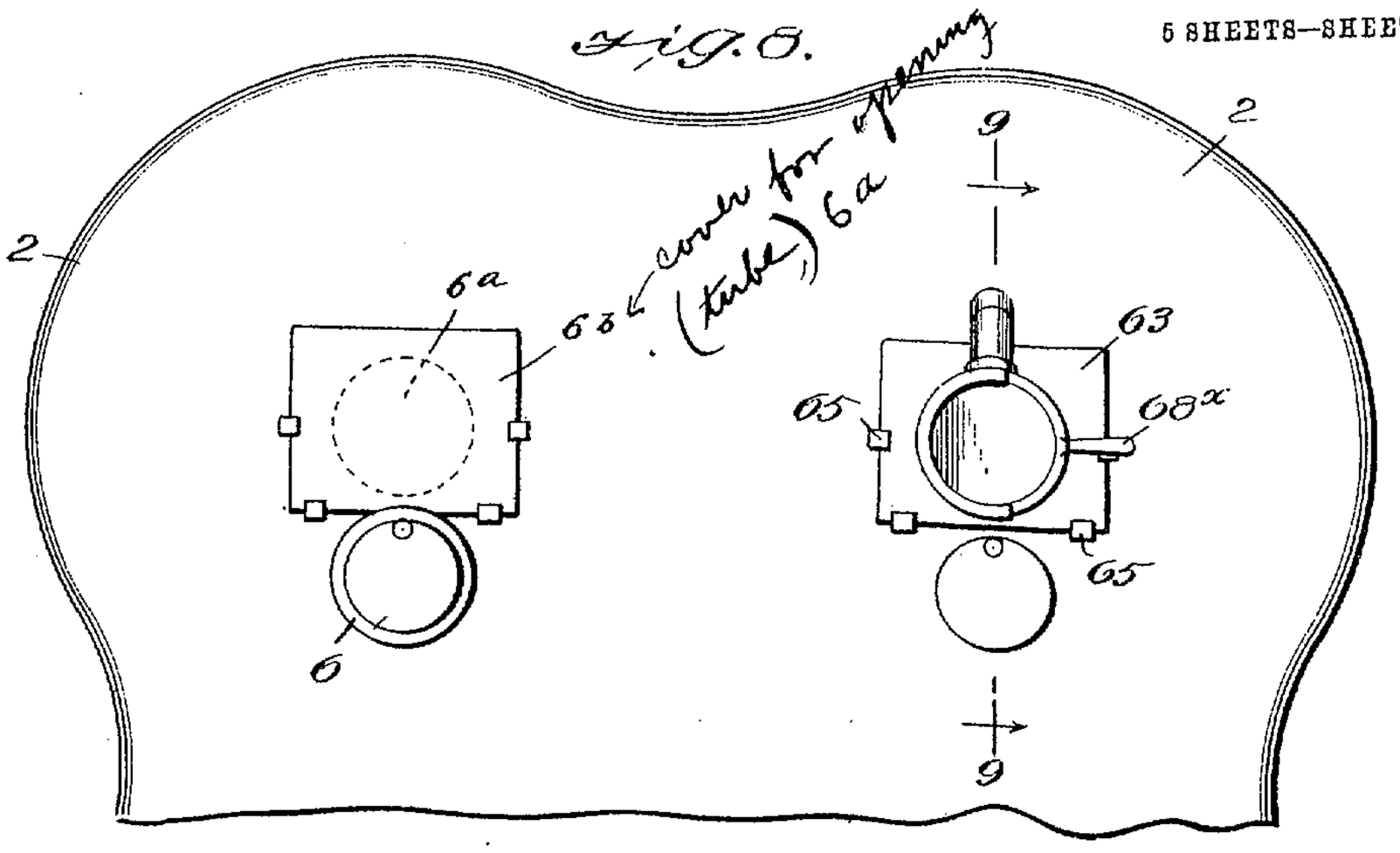

Fig. 8.

cover for (tube) 6a

show retinoscope attachment

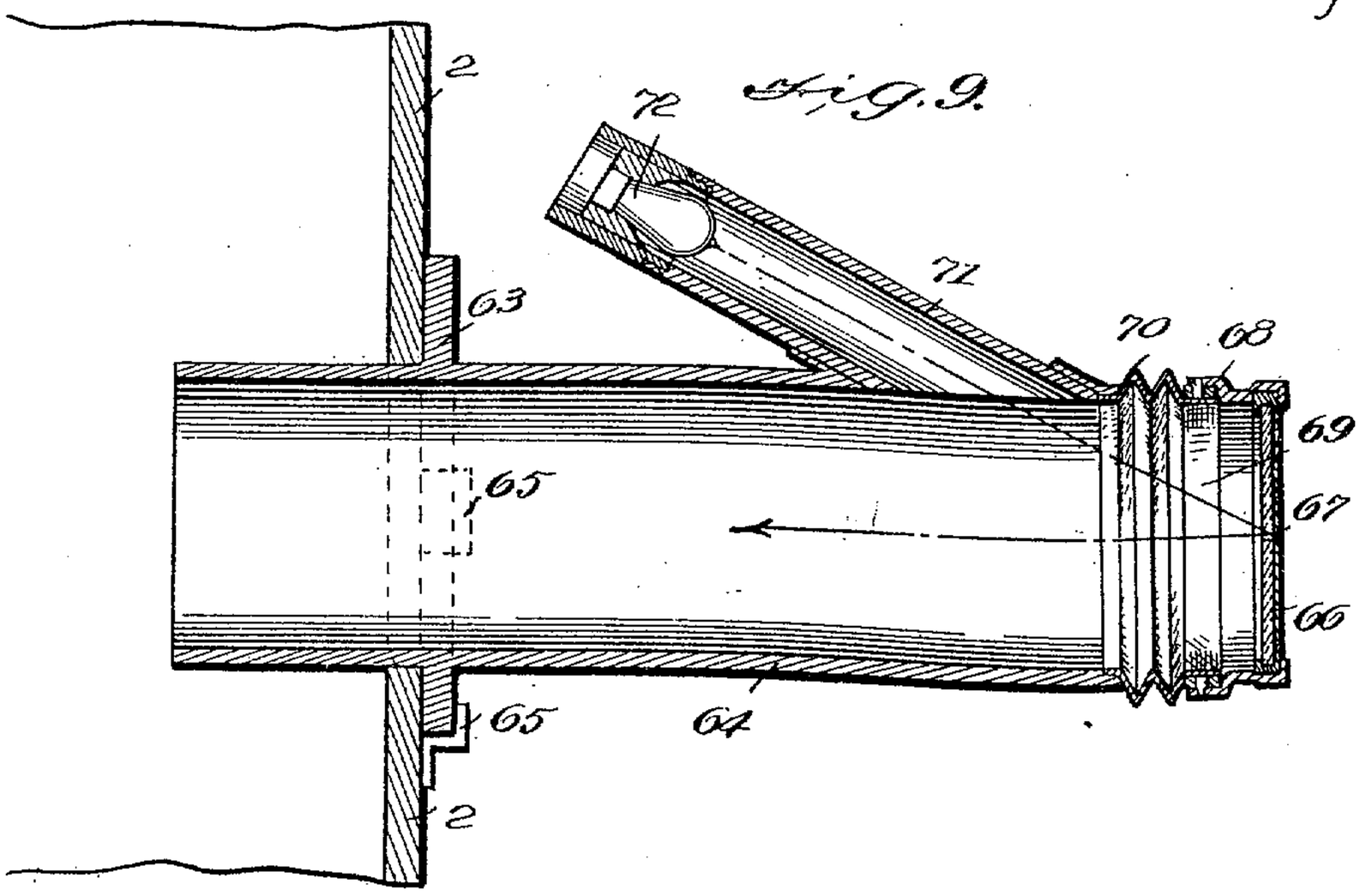

Fig. 9.

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UNITED STATES PATENT OFFICE.

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OPTOMETER.

968,981. Specification of Letters Patent. **Patented Aug. 30, 1910.**

Application filed August 6, 1909. Serial No. 511,650.

To all whom it may concern:

Be it known that we, HENRY D. REESE, a resident of Abbeville, in the county of Abbeville and State of South Carolina, and ADOLPHE J. GLAXON, a resident of New York, in the county of New York and State of New York, both citizens of the United States, have made certain new and useful Improvements in Optometers, of which the following is a specification.

Our invention relates to improved means for the examination of eyes and for testing the eye-sight, and it consists in the combinations, arrangements and constructions herein described and claimed.

An object of our invention is to provide a device of the same nature as that disclosed in the prior patent to Henry D. Reese, Serial No. 858,213, June 25, 1907, but which has certain improvements over the latter, which will be fully explained in the following specification.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

Our invention is illustrated in the accompanying drawings in which similar reference characters indicate like parts in the several views, and in which—

Figure 1 is a plan view of the major portion of the device, the base and certain other parts being omitted for the sake of clearness. Fig. 2 is a front view of the device; Fig. 3 is a section along the line 3—3 of Fig. 7; Fig. 4 is a section along the line 4—4 of Fig. 1 looking in the direction of the arrow; Fig. 5 is a detail view of a portion of the device showing the openings and scales of the lens tubes and the means for measuring the pupilar distance; Fig. 6 is a section along the line 6—6 of Fig. 5; Fig. 7 is a longitudinal section along the line 7—7 of Fig. 1; Fig. 8 is a view of the rear end of the device with the retinoscope attachment, and Fig. 9 is an enlarged section of a portion of the device along the line 9—9 of Fig. 8.

In carrying out our invention we provide a base 1 upon which is mounted a casing 2 preferably of metal, having front openings in which are mounted the lens tubes 3, 4, and 5, and a rear opening in which is mounted the tube 6. The tube 6 is for the purpose of providing a covered extension for the reception of the milled head 41, by which the test targets are brought into position, so that the latter can be moved to the end of the casing in the manner hereinafter described. Above the tube 6 is an opening 6^a which may be covered by the plate 6^b. The opening 6^a is for the purpose of admitting the external light in the use of the instrument, and the plate 6^b is for the purpose of shutting off this light when artificial light is to be used. The top of the casing has the rectangular openings 7 and 8 for the purpose of viewing the scales 9 and 10, which are covered by glass slides 11 and 12 respectively, (see Figs. 1 and 3.)

In the front part of the casing 2 is a vertically adjustable chin-rest 13, a portion of which projects within the casing, (see Fig. 7) terminating in a rack member 14 which meshes with a pinion 15 operated by the thumb-wheel 16, by which the rest may be raised or lowered as desired. A similarly adjustable chin-rest 17 is located underneath the lens tubes 3 and 4 and is adjustable by the same thumb-wheel 16 that shifts the chin rest 13, the shaft 16′ having on its end a pinion 15′ similar to the pinion 15 as clearly shown in Fig. 4, the racks 14 and 14′ being guided in the housings 14^x and 14^y respectively.

Rotatably mounted on the lens tube 5 are the eye-shades 18 and 19. The former has its axis coincident with that of the tube and the shade 19 revolves around it so as to take the dotted line position shown in Fig. 1.

From Fig. 7 it will be seen that the tube 5 is provided at one end with a slidable sleeve 20 having pins 21 projecting through slots in the upper and lower parts of the tube 5. The sleeve is held normally in a forward position by the spiral spring 22 which bears on a diaphragm 23. The sleeve, however, may be moved toward the rear to uncover a slot 24 into which a lens may be placed for testing the patient's eye.

At the rear end of the tube 5 is a slide 25, (see Figs. 7 and 3), arranged to hold a minus and a plus lens 26 and 27. This slide may be manipulated so as to bring either of the lenses 26 or 27 in registration

with the tube 5 by means of the handle 28. The lenses 26 and 27 are compound lenses and are so constructed for the purpose of neutralizing the refractive effects of the single lenses of which they are composed.

The casing is divided into two compartments R and L by the central partition 29. To the central partition are secured the electric lights 30, 31 and 32. Passing from the front to the rear through the compartments R and L are the parallel rods 33 and 34 upon which is slidably secured the yoke-shaped frame 35 (see Figs. 3 and 7), having the openings 36 and 37. Rotatably mounted on one end of the yoke 35 is a circular disk 38 having a series of test targets 36^a, 36^b, 36^c, etc., each of which is arranged to be brought into registration with the opening 36. A similar disk 39 is provided with targets 37^a, 37^b, 37^c. The disk 39 is secured to the rotatable shaft 40 which may be manipulated by means of the milled head 41 to bring any desired target in registration with the opening 37. A similar disk 42, (see Fig. 7) is rotatably mounted at the rear of the casing 2 and is also provided with targets similar to those on the yoke 35.

The yoke 35 together with the target disks may be shifted toward or away from the lens 26 or 27 or the lens tubes 3 and 4 by turning the thumb-wheel 43 shown in Figs. 1 and 3. The thumb-wheel 43 is mounted on a shaft 44 on the end of which is a drum 45 over which a cord or other flexible member 46 is wound. This cord is attached to the yoke 35 on one side, passes around the drum 45 back to a pulley 47 at the rear of the device and is fastened to the opposite side of the yoke. It will thus be seen that by manipulating the wheel 43 the yoke will be shifted to the front or rear. At the top of the yoke is an extension 35^x which bears a pair of oppositely extended pointers 48 and 49. These pointers extend through slots in the glass support and between the glass and the tables 9 and 10 in close proximity to the division marks on the tables.

In Fig. 4 we have illustrated the means by which the lens tube 5 may be rotated around its own axis. This consists of a gear 5^a mounted upon the tube and arranged to be engaged by a similar gear 5^b on the end of a shaft 5^c having a milled thumb-wheel 5^d. Both of the tubes 3 and 4 may be rotated by a similar device including the gears 3^a and 4^a arranged to engage the gears 3^b and 4^b respectively on the shafts 3^c and 4^c bearing the milled wheels 3^d and 4^d. The tubes 3 and 4 are mounted on the slides 3^x and 4^x. A rod 50 having right and left handed screw portions 51 and 52 respectively, engages extended portions 3^y and 4^y respectively of the slides 3^x and 4^x so that when the rod 50 is rotated by turning the milled head 53, the slides 3^x and 4^x, the tubes 3 and 4 and the rods 3^c and 4^c are moved toward each other or away from each other as desired. In order to permit a free movement of the rods 3^c and 4^c toward each other the casing 2 is slotted. On the tube 5 is secured a pointer 54 whose end is contiguous to a double scale 55 which gives in degrees the axis of the cylindrical lens. The lens tubes 3 and 4 are provided with similar pointers 56 and 57 respectively, and scales 58 and 59. The scales 58 and 59 have extending upwardly the pointers 60 and 61 which in connection with the scale 62 give the distance between the axis of the tubes, *i. e.*, the pupilar distance.

In Figs. 8 and 9 we have shown an attachment by which the tubes may be made into a retinoscope. This consists of a plate 63 bearing a tube 64 arranged to pass through the rear end of the casing 2, the plate being held to the casing by means of the cleats 65. At the rear end of the tube we arrange a mirror 66 provided with an opening 67 at its center. The mirror is set in a rotatable frame 68 which is carried on a sleeve 69, the latter being secured to the end of the tube by the bellows 70. The tube 64 has communicating with it an auxiliary tube 71 having at its upper end an electric light bulb 72.

From the foregoing description of the various parts of the device, the operation and use of the instrument may be readily understood.

The apparatus as described may be used for testing eyes as to the dioptric strength both for the near point and far point. In testing the eye, the patient is seated, and the chin-rest 13 is adjusted by means of the thumb-wheel 16 to the right height. If the patient's left eye is being tested the shades 18 and 19 are in the position indicated in full lines in Fig. 1, while if the right eye is being tested the shades are rotated to the position shown in dotted lines. In order to test an eye as to the dioptric strength thereof for the near point the disk 39 which has been previously rotated so as to bring a target in front of the opening 37, will be moved toward or away from the lens 27 by means of the hand-wheel 43 in the manner already described until the target coincides with the focus of the eye. This will happen when the characters on the target are most clearly visible. The pointer will then indicate in the column *a* the dioptric strength. The distant point is then gotten directly from the scale *b*. In case the patient should be myopic the lens 26 is used instead of the positive lens 27 and the readings will be taken from the columns *c* and *d*. In order to ascertain the cylindrical correction required for the proper lens for the patient the sleeve 20 in the tube 5 is pushed inwardly and a lens is placed in the slot 24 where it is held securely by means of the spring 22.

The tube 5 may now be rotated on its axis and the pointer 54 will indicate on the scale 55 the axis of the cylindrical lens.

In order to verify the results experimentally obtained by the apparatus on the right-hand side, the proper lenses indicated by the tests are placed in the tubes 3 and 4 on the lefthand side of the apparatus. The cylindrical correction may be verified by rotating the tubes by means of the thumb-wheels 3^d and 4^d independently of each other. The pupilar distance may be found by moving the tubes toward or away from each other by turning the wheel 53, the pointers 60 and 61 indicating directly on the scale 62 the distance. The disk 36^a may be used with the lens and when the image is clearest the pointer which crosses the chart 10 will then indicate in column *e* the convergence of the lens, the column *f* the distance in inches, the column *g* the number of the lens, the column *h* the cylindrical correction, the column *i* the approximate age of the patient, the column *j* the dioptric strength.

The apparatus may be used for exercising the muscles of the eye which may be attained by shifting the target screen back and forth or by rotating the tubes 3 and 4, and thereby working those muscles of the eye which tend to bring the image to a focus on the retina. This device is also designed to be used in the cure or correction of cross-eyes, in connection with a special form of lens which when used with the movable target tends to bring into play certain muscles whose development causes the turning of the eye into its natural position.

In the attachment shown in Figs. 8 and 9, the patient is supposed to be looking in through the lens tubes 3 and 4. The light of the lamp 72 is reflected upon the mirror 66, the operator being stationed immediately back of the mirror and looking through the small opening 67 in the center. The light is then reflected upon the eye of the patient at the other end of the device. By means of the handle 68^x, (see Fig. 8,) the mirror may be rotated or may be turned from side to side, the bellows arrangement 70 permitting the movement of the mirror until the light is reflected to the proper place on the eye. The neutralization of the eye is then determined in the usual manner. It will be noticed that with this construction the mirror may be moved by means of the handle so as to throw the light into the desired position. This feature is especially desirable and the apparatus for accomplishing it is simple in the extreme.

We claim:

1. In an optometer, a casing, a central partition therein dividing the casing into two compartments, a slidable yoke disposed above said partition, a rotatable target disk on each end of said yoke, a lens tube secured in the front part of one of said compartments and a pair of relatively movable lens tubes secured in the front part of the other compartment.

2. In an optometer, a casing, a central partition dividing the casing into two compartments, a longitudinal rod disposed in each compartment, a yoke suspended from said rods, a target disk on each end of said yoke, a lens tube carried by said casing at the front of each compartment for viewing the target, a transverse shaft carried by said casing and having a drum, a pulley at the rear of said casing, and a flexible connection attached to said yoke and arranged to pass around said drum and said pulley for moving the yoke toward and away from the lens tubes.

3. In an optometer, a casing, a lens tube carried in the front wall of said casing, a slide movably secured to said lens tube, a pair of lenses carried by said slide, each of said lenses being adapted to be brought into registration with the lens tube, a target disk mounted for movement toward and away from said lens tube and means comprising a thumb-wheel, a drum, and a flexible cord for moving said target disk.

4. In an optometer, a casing, a scale on the front exterior wall of said casing, a lens tube rotatably mounted in the front exterior wall of said casing adjacent to said scale, means for rotating said lens tube, a target movable toward and away from said lens tube and an adjustable chin-rest carried by said casing and movable relatively to said lens tube.

5. In an optometer, a casing, a lens tube rotatably mounted in said casing, a pair of compound neutralizing lenses, means for bringing either of said neutralizing lenses into registration with said lens tube, a movable target arranged to be brought nearer or farther from said neutralizing lenses, a scale and a pointer connected with said target for indicating on said scale the position of the target.

6. In an optometer, a casing, a target slidably mounted therein, a pair of lens tubes carried at the front end of said casing, a chin-rest disposed centrally of said lens tubes, and adjustable with respect to the tubes, means for rotating either of said tubes on its axis and means for moving said tubes toward or away from each other.

7. In an optometer, a casing, a central partition dividing said casing into compartments, means disposed in one compartment for measuring the dioptric strength of the eye, a tube disposed in the rear end of the other compartment, a mirror at the end of said tube, said mirror having a universal movement, a source of light arranged to be reflected by said mirror and a pair of observation tubes at the opposite end of the

compartment from said mirror into either of which the reflection may be transmitted by the mirror.

8. In an optometer, a casing, a lens tube carried in the front wall of said casing, a slide movably secured to said lens tube, a pair of lenses carried by said slide, each of said lenses being adapted to be brought into registration with the lens tube, and a target disk mounted for movement toward and away from said lens tube.

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Reese 858,213 (88-20)