No. 634,539. Patented Oct. 10, 1899.

C. F. PRENTICE.

OPTHALMOMETER.

(Application filed May 13, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

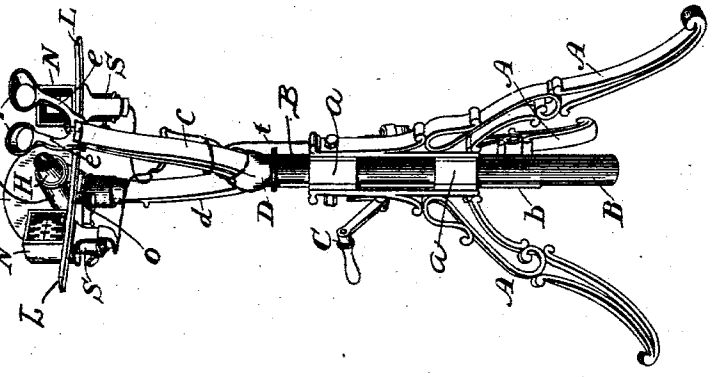
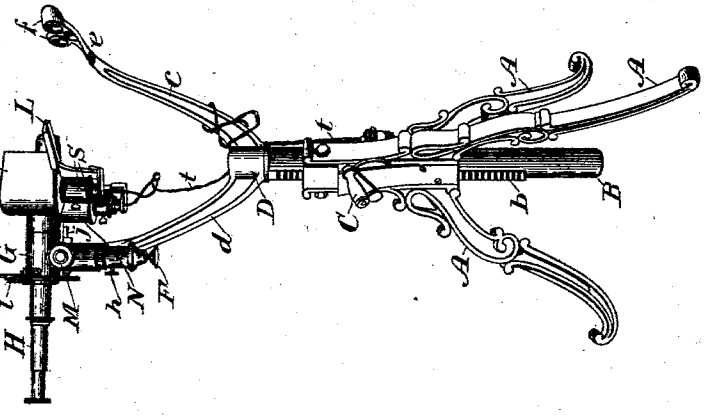


Fig. 1.



Witnesses:
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J. C. Olsen

Inventor:
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Fig. 3.

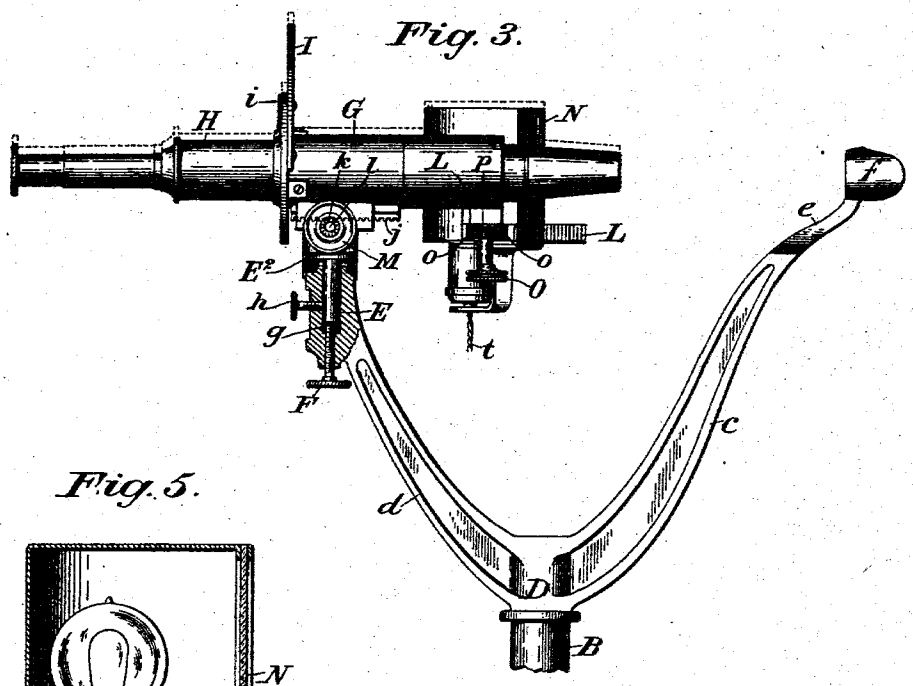

Fig. 5.

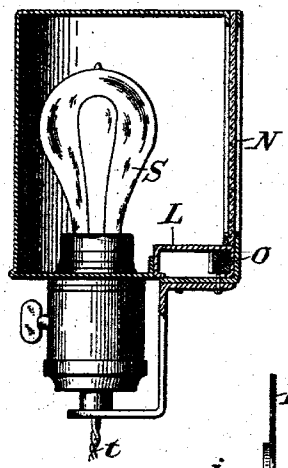

Fig. 4.

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UNITED STATES PATENT OFFICE.

CHARLES F. PRENTICE, OF NEW YORK, N. Y., ASSIGNOR TO EDWARD B. FOX AND RICHARD A. STENDICKE, OF SAME PLACE.

OPHTHALMOMETER.

SPECIFICATION forming part of Letters Patent No. 634,539, dated October 10, 1899.

Application filed May 13, 1899. Serial No. 716,653. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. PRENTICE, of Manhattan borough, New York city, State of New York, have invented a new and useful Improvement in Ophthalmometers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to instruments used for the purpose of determining the amount and character of the errors of refraction in the human eye, and more especially to that species of such instruments known to the ophthalmologist as the "Javal-Schiotz" ophthalmometer.

My invention has for its objects to improve in principle of construction and mode of operation the ophthalmometer as made previous to my invention and which, as I have made and successfully used the instrument, I have denominated the "Prentice keratometer."

As is well known to those skilled in the art to which my invention most nearly appertains, the Javal-Schiotz ophthalmometer is composed of two entirely separate and disconnected parts or contrivances, one comprising the telescope and the "mires" or "targets," with their connected devices or mechanism, and the other comprising the devices for affording a rest for the chin of the patient and for steadying his head laterally in the right position for an examination of the eyes, together with suitable lamps for illuminating the targets, (on the other part of the ophthalmometer,) these two disconnected parts of the instrument being each placed on an ordinary table having a vertically-adjustable pedestal or in some cases on a metallic base or supporting plate, which in turn rests on the table-top. In all such instruments, however, as heretofore made there have existed several objectionable features relative to the mechanical construction involved and in the action or mode of operation of the instrument, among which may be mentioned these, viz.: first, a lack of stability in the relative positions of the aforesaid two parts of the instrument; second, an objectionable cumbersomeness and discomfort to the patient or person under examination in the shades necessary to shield the patient's eyes from the glare of light from the target-illuminating lamps or burners; third, a lack of capacity in the eye rests or supports to hold the patient's face and eyes laterally in one and the right position with comfort to the patient, and, fourth, lack of perfect facility in the necessary adjustments of the telescope.

I have found by actual experiment with and a comparatively long practical use of my improved instrument that in these important particulars and others my invention possesses great merit.

To enable those skilled in the art to which my invention most nearly relates to make and use instruments embodying either in whole or in part and in either the precise forms I have shown or under some mere modifications thereof my said improvements, I will now proceed to more fully describe the same, referring by letters to the accompanying drawings, which form part of this specification and which I have had made from an instrument which I use successfully every day and have so used for some time back in the practice of my profession in New York city as an "opticist."

In the several figures of the drawings the same part will be found always designated by the same letter of reference.

Figure 1 is a perspective view of one of my improved instruments, taken from a point of view transverse to a line or vertical plane in which sit both the patient and the examiner, or, in other words, taken from a point of view approximately the same as that from which would be made a side elevation in mechanical drawing. Fig. 2 is another perspective view of the instrument, taken from a point of view in rear of, slightly above, and slightly to the left of the head of a patient were one sitting with his head in the proper position for an examination of his eyes. Fig. 3 is a partial side view, on a somewhat enlarged scale and illustrating by dotted lines the vertical adjustability of the telescope and its attachments. Fig. 4 is a partial top view on the same scale as that of Fig. 3 and illustrating the usual adjustment on a vertical axis of motion of the telescope. Fig. 5 is a detail ver-

tical sectional view of one of the targets, illustrating particularly the means for and manner of illuminating the same.

A is a three-legged stand or tripod, within the tubular body portions *a* of which is arranged to slide vertically the cylindrically-shaped bar or rod B, which supports or carries, as will be presently explained, all the working and operating parts of the instrument. Said rod B is capable of only a vertical or up-and-down movement within the tubular embracing body portions *a* of the stand A, being formed with a longitudinal feather or rib *b*, working in splines or vertical interior grooves in the said stand's body, and the said feather or rib is toothed to form a vertical rack, the teeth of which engage with those of a spur-pinion suitably mounted on the said stand and actuated, through the medium of certain connections, by an ordinary handled crank C, (see Figs. 1 and 2,) all in such well-known manner that by turning the said handled crank C in one or the other direction the racked supporting-bar B will be moved up or down within the body portion of the tripod or stand A, as circumstances may require, for the purpose of either elevating or depressing, at the pleasure of the operator or opticist, the mechanisms or parts supported upon or by said adjustable bar B. To the upper end of said bar B is firmly secured by bolts or otherwise the circular base of a fork-shaped or bifurcated casting, the two arms *c* and *d* of which carry, respectively, the device for holding steadily and comfortably in the desired position the head of the person whose eyes are to be examined and all the other parts of the instrument. To the upper end of the arm *c* is bolted or otherwise removably secured or fastened a small U-shaped casting *e*, integrally with the upper ends or legs of which by preference are connected the two duplicate devices *f f* for supporting the patient's face or head comfortably in exactly the given position desired for the purposes of an examination of his eyes. The peculiar shape of each of these parts *f f* and their relative arrangement to each other and to the rest of the instrument are important and will be fully understood by a visual inspection of the several Figs. 1, 2, 3, and 4, in which they may be viewed from so many different points as will convey a correct impression as to just how they are shaped and positioned. Only through a series of experiments have I been able to produce the desired effects with reference to this part of the instrument.

There is a very considerable variation, I have found in practice, between different people as to the size of the nose, the distance apart of the eyes, and the conformation of the face in the vicinity of the eyes, especially as to the shape and degree of projection, beyond the eyes, of the eyebrows, so that it has not been a problem easy of solution to devise the set of face supports or steadiers I have produced, that through a long practice now in the treatment of many hundreds of patrons of all ages, sizes, and of both sexes I have found to perfectly answer the designed purpose in every instance.

The space between the two rim-like parts *f f* must be sufficient to easily accommodate a nose of the greatest (normal) width, and the aperture of each device must be large enough, measured vertically and horizontally, to suit the largest and most deeply-set eyes, while at the same time the conformation of each device must be such that a person with one or another shape of face at the vicinity of the eyes and with eyes far apart or near together can, while seated in the patient's chair, (with the latter adjusted, as usual, to the proper elevation,) have these steadying devices applied so that they will with perfect comfort support or steady and maintain the patient's face in exactly the right position for examination of both eyes. By having the U-shaped part *e*, with its steadying devices *f f*, made removable, as shown, however, this part can be easily removed and some differently-shaped support substituted therefore, made differently to suit some particular and unusual conditions—as, for instance, the face of some person of abnormal shape.

The upper end of the arm *d* of the bifurcated casting is formed with a vertically-located cylindrical socket *g*, (see Fig. 3,) in which is fitted, so as to be capable of both a vertical or up-and-down movement and a revoluble movement about its axis a pivotal supporting stud or spindle E, the enlarged upper end or head E^2 of which supports or carries (in a manner to be presently explained) the telescope and all its attachments and coöperative devices. The said pivoted stud E is supported by or rests upon the upper end of a set-screw F, that, as shown, (see Fig. 3,) is tapped into the solid upper part of the arm *d* and that is formed or provided in the ordinary way with a knurled head, by means of which it may be easily turned in one or the other direction by the operator to either bodily elevate the telescope and its attachments or permit them to descend. In other words, by turning in or out the set-screw F the operator raises or lowers, and thus adjusts to exactly the right elevation relatively to the patient's eyes, the telescope and its attachments.

The telescope H, which is fitted or provided, of course, with the usual birefringent prisms, is mounted revolubly in the tubular holder G, within which it is also held against any endwise movement therein. This holder-tube G is, however, mounted on or in the upper portion of the head E^2 of the revoluble and vertically-adjustable pivoted stud E in such manner as to be capable of movement endwise through the medium of the longitudinally-arranged downwardly-projecting rack *j*, the teeth of which engage with those of a spur-pinion *k*, fast in an arbor *b*, that is arranged

to turn freely in the head-stock E^2, and the outwardly-projecting end of which has a knurled head M designed to be manipulated by the operator of the instrument for the usual purpose of setting the telescope (and its attachments) endwise nearer to or farther from the object of examination.

To the rearmost end or portion of the tubular holder or non-revoluble sleeve G is attached a thin sheet of metal or protractor-like semicircular plate I, on the back side of which is marked a scale arranged concentrically to the revoluble telescope H, while on the latter is a radially-projecting pointer or hand *i*, arranged in close proximity to the rear surface of the protractor-plate I, all in the manner shown for the well-known purpose of oscillating the telescope about its axis to place the targets in various planes, either vertical to or more or less oblique to a plane passing horizontally through the center of the cornea of the patient's eye.

To the body of the telescope and forward of the sleeve G, in which it is revolubly mounted, is attached firmly, by means of a pendent lug and a suitable clamping-screw, the curved or arc-shaped arm L, which carries the two targets N N, which, as usual, are adjustable toward and from each other in about the usual manner for the well-known purpose. The frames or boxes of these targets are secured respectively to sliding curved bars mounted in or on the curved supporting-arm L and formed with teeth at their adjacent edge that constitute curved racks *o*, equidistant, with both of which engages a pinion *p*, (see Fig. 4,) which when turned in one or the other direction by a thumb-head O (see Fig. 2) causes the two targets to equally move toward or from each other. Each of these targets is made about as usual—*i. e.*, presents the same sort of image for reflection by the eye, and by which the degree of astigmatism may be measured in diopters—except that within the target-box or behind the target proper is arranged an illuminating-burner, preferably an electric light S, (see Fig. 5,) the face of the target being translucent.

The telescope-adjusting mechanism comprising the pivoted stud E, arranged as shown and described, with the lifting-screw F and the binder-screw *h* for effectuating the raising and lowering and the securement in place when oscillated to a given position for the examination of one or the other eye of the patient, is very simple and efficient, and the rack-and-pinion mechanism for adjusting the telescope endwise in a right line is, it will be seen, both efficient and easy of perfect management by the operator.

In the use of my improved instrument the patient, as usual, occupies a chair placed properly and with the seat adjusted to the right elevation to insure the placement of the face-supporting devices *f f*, set at the proper elevation by vertically adjusting the pedestal-bar B, so that the patient's eyes will be kept in the right place without in the least discomforting or tiring him while undergoing an examination, and at the same time and by the same means an approximately proper adjustment vertically of the mechanism to be set to suit the purposes of the examiner is effectuated.

The examiner then by the means and in the manner hereinbefore explained can further adjust the examining mechanism mounted on arm *d*, so as to place the telescope at exactly the desired elevation (at just the right distance with the targets from the patient's eye) and so as to direct the telescope toward one or the other of the eyes of the patient, after which he proceeds, as usual, to move the targets toward or away from each other, so as to measure by the contiguity or overlapping of the targets' images in the eye the errors of refraction, oscillating the telescope on its axis, and determining the planes of bisection diametrically of the eye on which he desires to measure the degree of astigmatism, &c.

During all the adjustments and movements of parts during the entire examination there can be no possible variation in the relationship of the arm or standard *c*, which carries the eye steadying and supporting devices of the instrument, and the arm *d*, which carries all the rest of the mechanism, and this quality of the improved instrument, due to the mounting of all the parts on a single casting or frame, is of great importance and value, practically speaking.

t are merely the electrical wires, leading from any source of current-supply to the electric burners arranged within the lantern-like target-boxes, and which may of course be connected and arranged in any suitable manner.

Having now so fully explained the nature and advantages of my invention that those skilled in the manufacture of such instruments can easily make and use one such as I have shown and described, embodying either wholly or in part my improvements, what I claim as new, and desire to secure by Letters Patent, is—

1. In a keratometer, the combination, with a suitable floor-stand, or tripod, carrying a supporting bar or shaft, vertically adjustable therein, of a forked, or bifurcated, frame having its base securely connected with the upper end of said adjustable bar, or shaft, and carrying at the upper end of one of its arms, the device for affording support and rest for the face of the person whose eyes are to be examined; and carrying at the upper end of the other of its arms, all the other devices of the instrument; substantially as and for the purposes hereinbefore set forth.

2. In a keratometer, the combination with the vertically-adjustable supporting-arm *c*, of a pair of eye-rests or face-supporting devices carried at the free end of said arm upon a branched casting each branch of which terminates in a rim-like part *f* with an aperture

of sufficient size vertically and horizontally to adapt it for use with eyes and faces of different conformation, all substantially as specified.

3. In a keratometer, the combination, with a forked, vertically-adjustable, frame one arm of which supports the eye-rests, and the other of which supports all the other operative devices of the instrument, of the telescope-embracing and revolubly-supporting tube G, formed, or provided, at its lowermost portion, with a longitudinally-arranged rack; the pivoted stud E, mounted revolubly and adjustably, vertically, in the upper end of one of said arms and provided with means for its vertical adjustment, and a binder-screw, to prevent it from turning; and a pinion *k*, suitably mounted in the upper portion, or head-stock, of said pivoted stud, and in engagement with the said rack; the whole arranged and operating together in the manner and for the purposes hereinbefore set forth.

In witness whereof I have hereunto set my hand this 9th day of May, 1899.

CHAS. F. PRENTICE.

In presence of—
J. G. FREEMAN,
S. C. OLSEN.