A sample of the drug was handed to Mr. McClung, one of the senior students, for the estimation of the polygalic acid. He used Quevenne's process, and obtained of the pure acid 3.5 per cent. Methyl salicylate was abundant, as shown by the ferric chloride test.

It would seem from the above that this specimen handed to me by Professor Dyche represented a good sample of senega; its quality equal to the average root of the market.

I have planted some of the roots, which seem to be full of vigor, and hope to be able at some future time to classify the plant.—*Am. Jour. of Phar.*

A NEW INSTRUMENT FOR QUICKLY DETERMINING REFRACTIVE ERRORS OF THE EYE.

By ELMER STARR, M.D., Buffalo, N. Y., Lecturer on Ophthalmology in the Medical Department of the University of Buffalo.

THE refraction of an optically perfect eye is such that parallel rays of light entering it are brought to a focus on its retina. Any deviation from this condition constitutes an error of refraction, and requires for its correction some variation of the luminous rays from parallelism.

The generally adopted method of determining the refraction of the eye is to use test types placed at such a distance that the rays of light emanating from them may be regarded in practice as parallel; and the deviation from parallelism necessary to correct a refractive error is effected by placing a lens in front of the eye. Besides this procedure there are many other methods of changing the course of luminous rays coming from a test object. The single convex lens is the simplest means of varying the direction of luminous rays, and has for this reason been often used in optometry.

If an object is placed at the focus of a convex lens, the rays of light coming from this object will, after passing through the lens, be parallel. The farther the object is removed from the lens, the more the rays will converge after passing through it, and in this way the deviation necessary to correct an hypermetropia may be obtained. On the other hand, if the object is brought from the focus nearer to the lens, the rays which leave the lens will be divergent; and this change is such as to adapt it to the refractive condition of a myopic eye.

Cocius, Smee, Von Graefe, Badal, and others have made use of this principle in constructing optometers, the test objects of which consist of threads or lines, or of letters and figures placed at the focus of a lens of three or four inch focus.

All these optometers have the disadvantage that

Fig. 1. When M and P are in contact, rays a and a' continue in their original direction. The effect of moving M from p to p' is shown by the broken line.

they provoke a certain effort of accommodation, inasmuch as the observer is conscious of the proximity of the test object. It is important that the accommodation be excluded in determining the static refraction of the eye; otherwise, the dynamic being added to the static refraction, the real error may be masked.

Then, too, some of these instruments do not serve to determine the visual acuteness because of the change in the size of the retinal image which they produce; the measure of visual acuteness is given by the size of the retinal image, and the acuteness of vision in one eye is comparable with that in another only when we know the size of the smallest retinal image that each can distinguish.

An optometer is fitted for the simultaneous determination of visual acuteness and refraction only on condition that the retinal images of all eyes examined by it have the same size.

The instrument here described fulfills these conditions completely, and has none of the disadvantages of the single convex lens.

The instrument consists of a cylindrical tube about 15 cm. long, mounted on a stand, which admits of its being regulated for height and inclination. Within the tube a 16 D. convex lens (P, Fig. 1) is fixed, at a point $6\frac{1}{4}$ cm. from the proximal end; that is, at just the focal length of the lens. Beyond the convex lens, and moved by means of a rack and pinion, is a concave 16 D. lens (M, Fig. 1). The effect of this concave lens is to render parallel rays divergent, but this effect is neutralized by the convex glass when the two lenses are in contact. When, however, the two lenses are separated from each other, the convex glass more than neutralizes the divergence caused by the concave glass and the rays are made to converge. The action of the system will be better understood by reference to Fig. 1.

The eye whose refraction is to be tested is situated at the end of the tube at E. The effect of the concave lens, M, upon the parallel rays a and a' is to cause them to diverge, so that they leave the glass in a direction as if they came from the point, O, which is the focus of the lens, M, which in this case is $6\frac{1}{4}$ cm. in front of the glass. The effect of the convex glass, P, then, upon the rays, a and a' , is the same as if the rays proceeded directly from the point, O; in fact, the point, O, may be considered, in this respect, as the object. Now, as already stated, when an object is placed at the focus of a convex lens, rays of light coming from this object will, after passing through the lens, be parallel; and if the object be removed from the lens, the rays will converge after passing through it. So that if the lens, M, be brought into contact with lens, P, so that O falls in the focus of lens, P, the rays, a and a' , will leave P parallel; and if the lens, M, be moved away from P so that O falls outside the focus of P, the rays, a and a' , leave P convergent, and the amount of the convergence depends upon the distance of O from P—that is, upon the distance the lenses, M and P, are separated. Calculation shows that

for every $\frac{1}{100}$ cm. the lenses are separated the effect is the same as a one-diopter convex lens, or +1 D.; or a separation of the glasses 6.25 cm. is identical with a +16 D. lens.* It will be seen, then, that every possible degree from zero or nothing up to +16 D. can be obtained with this combination. For any concave or minus combination it is only necessary to place in the proximal end of the tube at E a minus lens of such power as to neutralize the converging rays coming from the lens, P, when M and P are $6\frac{1}{4}$ cm. apart. That is, when the lenses stand in this position, their effect is just neutralized by a concave 16 D. lens placed in the end, E, of the instrument, and the rays of light then leave this lens parallel again and the combination once more stands at zero. If now the lenses M and P are brought nearer together, the result is a combination weaker than +16 D., so that the concave lens at E more than neutralizes this effect, and the rays leave the instrument divergent, or as they would after passing through a single concave lens; so that by this means every possible degree from 0 up to -16 D. can be obtained.

In practice the tube of the instrument is graduated with a scale showing diopters and half-diopters, and the frame of movable lens, M, carries a pointer which indicates the number of diopters corresponding to the amount of separation of the glasses. A disk having a stenopæic slit and fitting into the end of the tube serves to determine the refraction of each meridian of the eye separately.

The advantages of this combination are decided, as it allows of the use of the ordinary test type placed at the usual distance, so that no effort of accommodation is caused by the proximity of the test object. Then, by this arrangement, the anterior focus of the eye is kept at the focus of the convex lens of the instrument, so that no enlargement of the test object is produced. In other words, the conditions are most favorable for determining the actual refraction of the eye.—*N. Y. Med. Jour.*

THE MONGOLIAN EYE.

In the *Boston Medical and Surgical Journal* of March 3, 1892, is an abstract of a paper by a Japanese medical man published in the *Sei-I-Kwai Medical Journal* of December 26, 1891. This observer has studied in detail the differences between the characteristic eye of the Mongolian nations and of the Caucasian race. The difference between the two is caused neither by the size of the eyeball nor the color of the iris, which is the same in both, but results from the shape of the eyelids. The epicanthus, a fold of the skin covering the inner canthus, is rare in adult white persons, but exists physiologically among the Japanese, so that it is sometimes called the Mongolian fold. In the majority of cases this fold runs obliquely inward and downward from the upper lid, so that the inner canthus is not round, as in white people, but sharp. When the fold is large it spreads to the inner part of the lower lid, in which case the upper lid does not cross the cornea horizontally, but obliquely, giving the peculiar expression to the eye often met with in Japanese. Another peculiarity of the upper lid in Mongolians is the lack of development of the orbital furrow, the groove below the eyebrows. The skin covering the upper lid is very loose, so that when the cartilage is raised the skin is thrown into a transverse fold. When this fold is well developed it droops slightly over the margin of the lid. This interferes with the eyelashes, directing them downward instead of forward. In Japanese the cilia are short and straight. On the lower lid they are sometimes so badly developed and so few in number that they appear at first to be absent. When well developed they are sometimes bent inward by the peculiar formation of the upper lid, and may seriously irritate the cornea. Except for this there is no great difference in the lower lid of Mongolians and Europeans. The margin is generally more curved in white people, so that there is often a portion of the sclerotic exposed between the lid and the cornea, a peculiarity, the author remarks, which makes "their eyes looking apparently upward generally." As the skin of the lid is less firmly connected to the subjacent tissues in the Japanese, entropion is more common, but ectropion less common, among them than among Europeans.

FILARIASIS.

"AMONG twenty-six officers and colonial officers admitted to the Val-de-Grace Hospital between May 1, 1890, and February 1, 1891," says the *Lancet*, "Professor Moty observed four cases of the above disease, and two other cases in the parents or friends of the patients. Four, however, of those admitted to the hospital had been abroad for so short a time that they may be left out of the calculation, leaving six cases among twenty-two persons who had spent a considerable time in the colonies. In spite of its frequency, this disease does not appear to be generally recognized abroad, as in none of the above cases had it been diagnosed. It was only upon undertaking an operation for the radical cure of a supposed hernia that the tumor was found to consist of dilated lymphatics. Professor Moty came to the following conclusions:

* The formula for determining the effect of a given separation of the lenses in this instrument becomes the same as the formula for determining the point at which the image made by a convex lens falls when the distance of the object from the lens is given. For the focus of the concave lens is virtually the object, and its distance from the convex lens manifestly depends upon the distance the lenses are apart.

Let f denote the focal length of the convex lens P; a , the distance of the object (focus of concave lens) from P; and x the focal length of the resulting combination.

Then the equation $\frac{a-f}{f} = \frac{f}{x-f}$ will give the value of any given movement of the concave lens, M.

Suppose the lens, M, be moved away from P 0.25 cm.; then the distance of object is 0.25 cm. + 6.25 cm. (focus of M); or $a = 6.50$ cm. Focus of P = 6.25 cm., or $f = 6.25$ cm.

Substituting these values in the equation, we have

$$\frac{6.50 - 6.25}{6.25} = \frac{6.25}{x - 6.25} \text{ whence } x = 162.50.$$

That is, the focus of such a combination falls 162.50 cm. behind the lens, P. But the lens, P, is placed 6.25 cm. in front of the eyehole of the tube; hence the focus falls 162.50 cm. - 6.25 cm. = 156.25 cm. behind the eye. A glass of 156.25 cm. focus is $\frac{100}{156.25}$ of a diopter, or 0.64 D. Therefore separating P and M 0.25 cm. equals $\frac{1}{156.25}$ D. From this it is easily calculated that the effect of moving M $6\frac{1}{4}$ cm. away from P is equal to a +16 D. lens.

That filariasis is an aseptie parasitic disease due to the presence of the *filaria sanguinis hominis*; that it is of frequent occurrence in the French colonies, and has been recently met with in New Caledonia. It most often appears as an enlargement of the glands and lymphatics of the groin and spermatic cord, due to the irritation of the filaria and its embryos. It can be recognized by such symptoms as chyluria, hæmaturia, etc., but the diagnosis in each case should be confirmed by the detection of the embryos in the blood. Neither internal nor palliative treatment is of the slightest use. Excision or amputation is necessary in severe cases, and is attended with the happiest results, the removal of the hypertrophied tissue causing the adult filaria to disappear."

THE FORMATION OF DEXTRINE.*

By M. R. PETIT.

THE process recommended by Payen for the manufacture of dextrine consists in heating to a temperature of 100° to 140° starch moistened with a small quantity of nitric acid. The dextrine thus obtained is either white or slightly colored and it almost always has some reducing action upon Fehling's solution. The author has examined the influence of different proportions of acid and that of the time of heating on the character of the product. In this examination he adopted the following data, based upon trials with a known mixture of starch, non-reducing dextrine, and glucose.

1. By digesting this mixture with water at from 40° to 50° C. for half an hour the glucose and dextrine are completely dissolved and the starch can be collected by filtration.

2. The rotatory power of the solution corresponds exactly with the sum of those of the glucose and of the dextrine.

3. If the solution is fermented after having added ammonium phosphate and potassium sulphate, the loss of rotatory power indicates exactly the amount of glucose introduced and the fermented liquid no longer acts upon Fehling's solution.

The dextrine obtained by heating for an hour at 125° C. still contained a minute quantity of starch. This amount becomes inappreciable when the nitric acid used amounts to 0.8 and 2 per cent. The following table shows the reducing power indicating the amount of material capable of reducing Fehling's solution when expressed as glucose for 100 of dextrine.

Percentage of acid.	Time of heating.				Starch unaltered for 1 gramme dextrine.
	1 h.	2 h.	3 h.	4 h.	
0.2	3.9	5.06	3.6	2.8	0.003
0.3	7.2	5.3	3.6	3.0	0.002
0.5	7.3	6.07	4.2	3.1	0.001
0.8	8.06	6.3	4.5	4.0	traces
2.0	9.5	7.1	5.4	4.5	traces

These results show that—

1. For a given amount of acid the reducing power decreases sensibly as the time of heating is increased.

2. For a given time of heating the reducing power is increased when the amount of acid is increased.

The rotatory power of the solutions presented analogous variations, but less marked.

Other trials between 100° and 140° showed that for a given amount of acid the decrease of the reducing power was more rapid as the temperature was higher, and that the reducing power was increased more rapidly for a given amount of acid and a given time of heating when the temperature was highest. These observations explain the fact that certain kinds of dextrine have scarcely any reducing power, very long continued heat, extending to 60 or 70 hours, being applied in the manufacture, and thus the reducing power is almost entirely destroyed. The author's experiments also show that dextrine prepared by Payen's method contains in addition to glucose a substance capable of reducing Fehling's solution and incapable of fermentation. It is considered that this may be of a nature analogous to the galletine of Scheibler and Mittelmeier, but some evidence has been observed of the existence of a compound resulting from oxidation of the starch by nitric acid and having the properties of an aldehyde.

MANUFACTURE OF OXYGEN FROM AIR.

DR. FANTA, the inventor of the process, recently explained the process and plant before the Society of Chemical Industry, Manchester. This was done by the aid of large drawings, and excellently constructed model apparatus, by which Dr. Fanta made some oxygen by his process. The chemical principles in the process are somewhat similar to the *Tessie du Motay* process, but there is a difference in the preparation of the compound with which the apparatus is charged.

The materials used are manganate of soda, and a little caustic soda, over which steam and air are alternately passed. When the steam passing through the retorts is no longer evolving oxygen, it passes over through the oxygen delivery pipe, and operates a valve which closes the passage to the holder. Again, the water from this condensed steam operates a simple piece of mechanism which opens and shuts the air and steam valves, so that the whole plant is automatic.

The reaction for the *Tessie du Motay* process the inventor gave as follows:

In this process, however, the steam passing first had a definite reaction which was at present only explained theoretically, though its action was undoubtedly established.

While the experiment was being conducted, Mr. Watson Smith explained that the experiment being performed had been made in his laboratory a few days before in a precisely similar manner, and as he had bought the chemicals and prepared the manganate of soda in accordance with the inventor's directions, he could speak to the experiment being a *bona fide* one.

* *Comptes Rendus*, cxiv., 76.