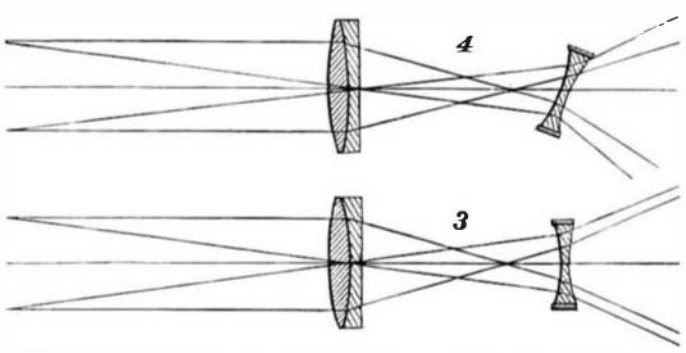
THE AUTO-PHORO-OPTOMETER.

This is an optical instrument designed for correcting errors of refraction in the human eye, and disequilibrium between any pair of its muscles.

The difficulties encountered, the profound knowledge required and long practice absolutely essential to the scientific prescribing of spectacles are little understood by the public and appreciated less.

Most persons suppose that "glasses go by numbers," and buy them as they would a pair of boots. Comparatively few consult an oculist or a prescribing optician, but those who do get their "views enlarged" in more senses than one; they learn with surprise that lenses must be made especially for them; they get a general idea of astigmatism, yet wonder how it is that a single eye may require a lens stronger in one diameter than in the others, and can scarcely believe that an eye may be "near sighted" in one diameter and "far sighted" in another. As to muscle troubles, few people know that prisms are prescribed mounted in spectacle frames.



COURSE OF THE LIGHT IN THE AUTO-PHORO-OPTOMETER.

Those who have sat in an oculist's chair and submitted to the tests in vogue remember the experience as extremely tedious, disagreeable and expensive. The "trial frame" is a trial indeed, and as the many lenses and their combinations are tried and changed the patient's eyes become so strained and fatigued that his answers are very unsatisfactory, and the result is often an imperfect "fit," even though the oculist be a man of unquestioned eminence and ability. Such a man will not deny the truth of this paragraph. What then are the chances for accurate work at the hands of a "prescribing optician"? He has not the thorough knowledge of the oculist. He is a busy merchant, and besides he charges no fee for his examination and cannot devote much time to the case. Yet the prescription work done by opticians to-day is largely in excess of that which reaches the oculists. In fact a new profession—a very profitable one—is rapidly growing up, and seems destined to take its place by the side of dentistry. It is ably represented by the most advanced opticians, many of whom prefer being known as "refractionists." A notable movement has recently occurred in Boston, where the New England Association of Opticians has been successfully inaugurated, with a large and constantly increasing membership.

The instrument here illustrated has been exhibited at one of the meetings of the New England Association of Opticians by its inventor, Dr. Homer A. Huntington, who in an able lecture demonstrated the correctness of its principles and the simplicity and rapidity of its action. It is so nearly automatic and so thoroughly under control of both the patient and the operator as to be susceptible in a moment to very "fine" adjustment. Primarily the instrument is a small telescope mounted upon an upright stand. The lenses are those common in opera glasses, with the difference that two auxiliary interchangeable eyepieces are used in correcting myopia (near sight), and the minus lens of the ordinary eyepiece is so arranged as to tilt upon an axis at right angles to the principal optical axis or line passing from a distant object centrally through both lenses. This eyepiece, a, also revolves in common with the disk, A, so that it can be tilted in any plane, i. e., at any angle from 0 to 180. The tilting of this lens is entirely new in optics. The aberration so caused has been recognized only as a thing to be carefully avoided in the placing of lenses in optical instruments. That the tilting of a lens of certain power at a given angle is equivalent to the employment of a cylindrical lens, the inventor claims as the discovery of a new principle, doing away with the employment of a multiplicity of lenses and yet indicating them all, and rendering the correction of astigmatism as simple as the measuring of liquids.

Those familiar with the subject will find no difficulty in understanding the remaining parts of the instrument. In testing for hypermetropia, the draw tube is closed, 0 being indicated on the outer circle of figures, which are white; on revolving the disk, B, an outward movement is communicated to the draw tube, which can be opened to the extent when + 10 are indicated. Should the case be one of myopia, one of the auxiliary eyepieces, —10, is used, and the values are indicated on the inside scale (red) of the disk, B, which is revolved in the opposite direction from what it is in testing for hypermetropia. Should the case be one exceeding —10, then the other auxiliary eyepiece, —20, is used, so that the entire range of the instrument is from +10 to —20 for the distance type, printed with appropriate type to allow for the magnifying power of the instrument, which practically is not a disadvantage.

Muscle testing by the phoro-optometer is exceedingly simple, and is based on the principle of decentering, esophoria and exophoria being indicated by the pointer and scale on disk, C, and hyperphoria on the quadrant, D.

The most important claim for this instrument is that it requires no skill and that any one of average intelligence can do as accurate work with it after the third day as the most accomplished optician with the old trial case can do after as many years, and in one-tenth of the time. In the words of the inventor, "What steam is to travel, what the telephone is to speech, is the auto-phoro-optometer to dioptrics." A very important point consists in the fact that the instrument forms with a screen an excellent artificial eye, invaluable to the student. Fig. 3 shows the course of the rays in a Galilean telescope or opera glass, and Fig. 4 shows the effect on the light beam of tilting the negative or eye lens. In the position shown it becomes practically a negative cylindrical lens.

Business communications regarding this instrument may be addressed to Mr. A. G. McKenzie, optician, 156 Charles Street, Boston, Mass., who has acquired an interest in the invention.

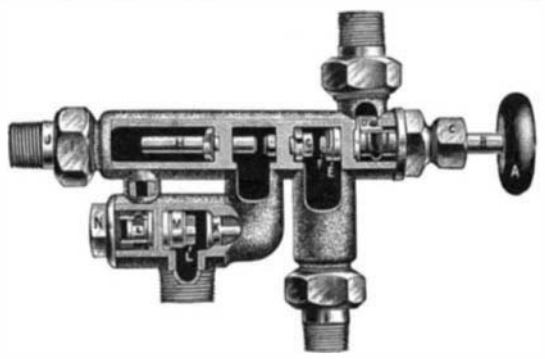
DR. HUNTINGTON'S AUTO-PHORO-OPTOMETER.

THE INTERNATIONAL INJECTOR.

We illustrate herewith in perspective and sectional views a new injector for which the makers claim most excellent results. It has been designed to combine all the good features of both automatic and positive injectors of the past, and is claimed to surpass both in working qualities. The principal new feature in the International is the fact that the current of water to the boiler is established against atmospheric pressure instead of against direct boiler pressure as heretofore. This is accomplished by the combination of overflow valve, K, and pressure valve, L. When the injector starts, the steam passing through the steam jet, F, and suction jet, G, passes down through the overflow chamber, forcing valves, K and L, away from their seats and opening the passageway through the overflow for the escape of steam, which by its pressure against the valve, H, holds both valves away from their seats.

A vacuum being created between jets, F and G, the water is lifted, and passing through the suction jet, G, and combining and delivery jet, H, on its way to the boiler, passes down through the secondary overflow, and out through the passageways between pressure valve, L, and pressure valve collar, M. As the pressure increases in the delivery chamber around the delivery jet, H, valve, L, is gradually forced to its seat against the collar, M, but does not finally close until the current to the boiler is firmly established. The valve, K, in the meantime is closed by the vacuum in the overflow chamber. By a new construction of the parts in the steam chamber, the same valve handle, A, opens valve admitting steam to the injector, and at the same time regulates the amount of water supply, therefore no valve is required in the suction pipe, nor is one necessary in the steam pipe except as a convenience, should it be desired to remove the injector at any time while carrying steam on the boiler. The combination and delivery jet, H, has no spill holes.

The makers claim for this injector that it will start at 13 to 15 pounds steam pressure and work from that point up to 250 pounds steam pressure, giving it a range of 235 pounds, and that it is automatic and restarting at any and all pressures. It lifts the water vertically 20 to 22 feet, and handles a hot water supply of 135 degrees at 65 to 80 pounds of steam, 125 degrees at 125 pounds of steam. By delivering the minimum capacity it will put water into the boiler at 200 degrees at 80 pounds steam, and at 260 degrees at 150 pounds to 200 pounds of steam, the water being taken from a 4 foot lift at 74 degrees.



INJECTOR—SECTIONAL VIEW.

The parts are made interchangeable and are all easily accessible for cleaning, and the injector is fully guaranteed. It is manufactured by the World Specialty Company, 113 Seventh Street, Detroit, Mich.

The Columbian Exposition Awards.

The Director of the Mint says that the medals which were awarded to the exhibitors at the Columbian Exposition of 1893 will be ready for distribution about June 1. The superintendent of the Bureau of Printing and Engraving says that the diplomas will be finished about the end of March. The long delay has not been borne very patiently by those who are to receive the awards, and was caused by the rejection of the design for the reverse of the medal by the Quadro-Centennial Committee. The medal was designed by the sculptor Augustus St. Gaudens. After its rejection, a new design was prepared by Charles E. Barber, of the United States Mint, so that the medal as issued will be the joint work of Messrs. St. Gaudens and Barber, the former doing the obverse, the latter the reverse. The 23,700 bronze medals are to cost $30,000. If, however, any exhibitor should prefer a gold medal he is authorized to have one, provided he pays for the gold himself. The medals will all be alike, except for the names of the exhibitors inscribed on them. The diplomas will be about 22 by 18 inches in size, and the design was made by Will A. Low, an artist of New York City. It will be a fine example of the engraver's art.

AN AUTOMATIC INJECTOR ADAPTED TO WIDE RANGE OF PRESSURE.