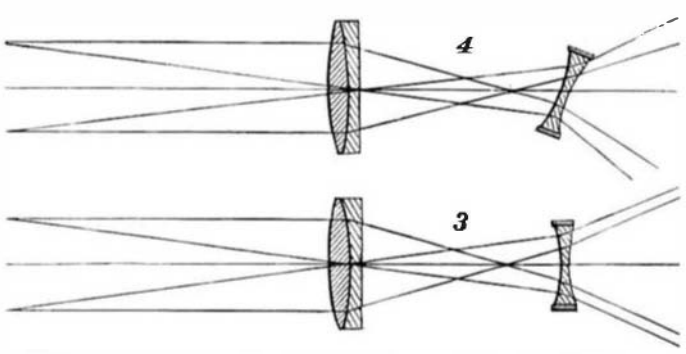
THE AUTO-PHORO-OPTOMETER.

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.

DR. HUNTINGTON'S AUTO-PHORO-OPTOMETER.

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.

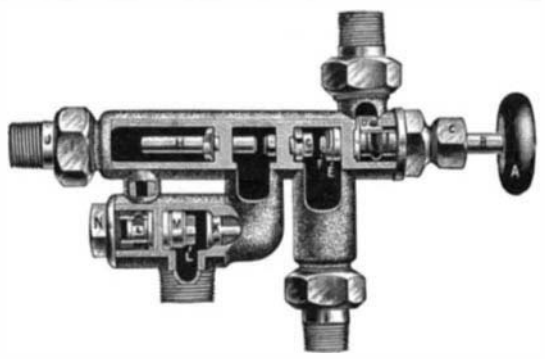
Business communications regarding this instrument may be addressed to Mr. A. G. McKenzie, optician, 156 Charles Street, Boston, Mass., who has acquired an interest in the invention.

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



INJECTOR—SECTIONAL VIEW.

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.

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.

Apoplexy.

We make the following brief abstracts from an interesting article in the Medical Record by Charles L. Dana, M.D., of New York City, entitled "Some New Observations upon the Causes, Mode of Onset, and Prognosis of Apoplexy:"

Many writers have based their statements upon statistics which have been handed down from the now somewhat venerable records of French and English hospitals and from the systematic writers on this subject of half a century ago. In this country, at least, there has not been, so far as I know, any extended critical analysis of large numbers of cases of cerebral hemorrhage or of acute softening.

The total number of cases I have utilized for study is 182, of which 100 were non-fatal and 82 fatal.

One-third of the cases are in females, and the special apoplectic age is between forty and fifty years. Three-fourths of all adult apoplexy occurs between the ages of thirty and sixty, being pretty evenly distributed between the fourth, fifth, and sixth decades. If one were to leave out syphilitic cases, however, we should find that the most serious decade was that between the fifty-first and the sixtieth year. After the age of seventy apoplexy is relatively rare and is little to be feared.

Taking hemiplegia as a whole, I find that a very distinct history of syphilis was found in 36 out of the total 100 non-fatal cases. In 4 the attack was due to the puerperium; in 1 it followed typhoid; in 5 the patients worked in lead or were painters; in 1 there was Bright's disease; in 5 there was a severe cardiac trouble; in 5 the patients were drivers and heavy drinkers; in 10 others exposure and heavy drinking were striking elements in the history.

This accounts for two-thirds of the cases, one of these thirds being syphilitic. This fact that syphilis causes one-third of all cases of apoplexy has not, I think, been heretofore brought out, though I feel sure that the experience of neurologists will confirm it.

If a person has not had syphilis and is not a drinker, the chances of his dying of apoplexy are very greatly lessened. The remaining one-third of the cases has still to be accounted for, and this third includes, for the most part, I believe, cases of intercranial hemorrhage, rather than softening. The most important factors here are heavy eating, with insufficient exercise, and some congenital tendency to arterial disease due to a gouty or rheumatic diathesis. Excessive mental work does not lead to apoplexy, and brain workers do not die of this disease unless they are intemperate in eating, drinking, and perhaps in smoking, though on this latter point I feel doubtful. Two of my cases only gave a history of excessive use of tobacco as the sole predisposing cause. It is often stated, and is commonly believed, that one attack of apoplexy predisposes to another, and that a person who has had a vessel broken or occluded is extremely liable to have a second attack within two or three years, but the frequency of repeated attacks seems from a study of my cases to be much exaggerated.

It is, I have no doubt, the experience of many that persons who have had a moderate attack of cerebral hemorrhage may live for many years in fairly good health.

The conditions of modern civilization undoubtedly are tending to increase the number of cases of apoplexy, particularly those due to rupture of blood vessels. The fact that under better sanitary conditions more people reach the apoplectic age is one cause of this. The gradual lessening of the number of acute infectious fevers and the consequent lessening of mortality from such diseases increase the proportionate number of deaths due to diseases of the arterial system; in fact, the stress of modern civilization shows them more, so far as organic disease is concerned, upon the arteries than it does upon the nervous system. The increased opportunities for indulgence in luxurious modes of living, and in excessive eating and drinking, tend to impair the integrity of the coats of the arteries, and to promote conditions of arterial fibrosis. Already this fact may be demonstrated by the statistics of our great cities, as well as deduced from the known laws of pathology.

In New York City the deaths from apoplexy and paralysis have increased from 314 in 1866 and 272 in 1867 to 1,194 in 1892 and 1,171 in 1893.

The deaths from these causes between the ages of twenty-five and sixty-five have increased from 219 in 1866 and 197 in 1867 to 939 in 1892 and 931 in 1893.

Here the deaths from apoplexy and paralysis have quadrupled, while the total death rate has increased from about 25,000 to a little over 40,000, i. e., it has about doubled.

As to the exciting causes of attacks of apoplexy, some misapprehension apparently prevails. We all know that many fatal cases occur in persons who have been on a drunken spree, and that of all exciting causes of fatal strokes alcohol is the most potent. On the other hand, in my experience very few attacks take place, as is currently supposed, during some especial mental or bodily strain.

The frequency with which attacks occur in the morning after breakfast, or in the evening, is somewhat noteworthy. Few cases occurred in the middle hours of the day.

The apoplexies are increasing in disproportionate frequency, owing partly to the facts: that more people live to the apoplectic age; that there is a larger urban population, with all that that implies in regard to the use of alcohol, the prevalence of syphilis, and the greater intemperance in eating and working.

Apoplexy does not especially affect brain workers if they live temperately, but rather spares them.

Apoplexy is sometimes a conservative agent, calling a halt to excessive activity and intemperate living, and actually prolonging life.

About one-fourth of those stricken with apoplexy die from the attack (hemorrhages being the most dangerous, thrombosis, especially syphilitic, being least so).

The average duration of life of those who have and survive one attack is over five years. The chances of a second attack before the fourth year are always considerable, yet do not amount to fifty per cent, and are inconsiderable so far as hemorrhages are concerned. Thromboses are much more apt to recur than hemorrhages.

The Production of Camembert Cheese.

The popular small cheeses made in France and Germany, but used everywhere, being largely exported from these countries, are divided into two classes—one is used within a few days after the making, the other being cured for later consumption. It is plain that the latter description of cheese is more suitable for extensive manufacture on this account than the older kind, known as fromage frais, and, on account of the greatly improved quality, the cured ones are known as fromage fin. This term is fully justified by the most careful process of curing, by which the sharper ammoniacal taste and odor are got rid of, and a soft, rich, buttery consistence and a pronounced and pleasant flavor are given by the slow and careful curing. It is a noteworthy fact that this method of curing, which has been in use for more than a century and has been slowly evolved by gradual experience, is based on the most correct scientific principles. A typical cheese of the cured kind is the Camembert, so called from the place of its original manufacture, where it was first made in the year 1791 by a dairyman named Peynel. The manufacture now amounts to several millions of cheeses annually, and employs the whole population of this district. The method of manufacture of this popular cheese is exceedingly delicate and demands the greatest care in the most minute details, beginning with the milking of the cows—indeed, before this, for the feeding and lodging of them are fully considered in respect of the avoiding of everything that might interfere with the perfect purity of the milk and the preservation of all the fine qualities of the pasture of this especially favored district. This extreme care accompanies all the work in the dairy until the milk is finally and carefully strained. The milk having been drawn, is strained immediately, and is set apart for three hours for the cream to rise. There is then a thin pellicle of cream on the milk, which is removed and churned into a very fine quality of butter. The milk, for the convenience of the special manipulation, is set in broad earthen jars, each holding five or six gallons, and, as each has been skimmed, it is set on a heater and warmed until the common well-known pellicle or skin forms on the surface and wrinkles or creeps as it is called. The temperature at which this happens is somewhat over one hundred degrees. The rennet is then added, one tablespoonful to each jar of milk, in which there are twenty liters, equal to about twenty-one quarts. The rather high temperature of the milk when the rennet is added brings the curd quickly, and at the end of five or six hours each jar is set on a low bench, in a sloping direction so as to bring the contents to the extreme edge, and the curd is then dipped out into the moulds, which are of cylindrical shape.

These moulds, made of pure tin, are twelve centimeters or four and three-quarters inches high and wide. They are open at each end and are set on mats of rushes sewn together. The moulds are filled with the curd, from which the whey drains through the rushes on to the sloping table, around which a groove is cut to carry it to the drain by which it flows away. As the whey drains from the curd, this shrinks in volume until the cheese has gained sufficient consistency to be handled out of the mould, which is at the end of the second day. They are then taken out of the moulds and sprinkled with salt and left on the mats three or four days longer. They are then placed in shallow wooden boxes with handles and are in this way removed to the drying room. Here they are arranged on frames, of which there are several tiers, and are exposed to a free circulation of air regulated by swinging shutters. These windows are not glazed, but they are protected by fine wire gauze to keep out the flies, and, as the direction of the wind varies, so the shutters are opened or closed fully or partially in such a manner as to direct the air currents over or under the cheeses lying on the lathed frames, through which the air has complete access to the cheeses. Here they remain from twenty to twenty-five days, according to the weather. They are then removed on large movable shelves to the curing cellar, where the circulation of the air is much increased by the management of windows similar to those previously described and the shutters fitted to them. At this time the fermentation in the cheese begins to throw off moisture which gathers on the surface of the cheese. At this stage the cheeses are removed to the finishing cellar, in which the windows are glazed and protected by inside blinds. In this place the cheeses remain a month or less, as the ripening may progress slowly or rapidly. During this time they are turned once in forty-eight hours. This constant turning is a special process for the fullest exposure of the cheeses to the air, and is practiced all through the curing, gradually increasing the time of the turnings if the ripenings may be proceeding too quickly. At the end of the term the cheeses are complete, and are packed in paper and put into boxes. They are then packed into wicker baskets and sent to market. They weigh about eight ounces and sell for about one shilling and sixpence each. The finest selected cheeses are sent to special customers who pay one-fourth more. The prices vary as the season or the demand and supply, but usually they remain about the same for years. Such a desirable cheese as the Camembert is, of course, imitated and sold at a less price, but on account of the strict way the French government has of controlling such things, the imitation is sold for what it really is, as fromage façon Camembert, which does not deceive the purchaser in any way.—Journal of the Society of Arts.

The Astronomical Programme for 1895.

C. A. YOUNG.

The astronomical programme of the year, so far as it is a matter of prediction, offers nothing of exceptional rarity or interest.

The number of eclipses is somewhat larger than usual, but three of the five are only small, partial eclipses of the sun, and are all invisible in the United States. The two eclipses of the moon, however, which occur on March 10 and September 3, are both total, and are both visible in this country from beginning to end. The first of them is also observable in Europe, and will therefore afford an opportunity for co-operative observations of the occultations of small stars that lie in the moon's path while it is obscured—observations which are of great value in determining the distance of the moon and the form and size of the earth. This year, also, the moon every month passes over the Pleiades, and their occultations possess the same value if observed at widely separated stations.

The sunspot maximum was reached two years ago, and the activity of the solar surface is now declining, so that there is no reason to look for any phenomena of special interest in that quarter for the present.

As for the planets, Mars is already far away, and for more than a dozen years will not again be as favorably situated as he was last autumn. Saturn is far to the south, and even at his opposition in April and May will be too low down for satisfactory observation. During the first three months of the year Jupiter, on the other hand, will be admirably placed and will monopolize the interest of observers; and during the spring and summer Venus will be splendid in the evening sky.

The only periodic comets whose return is due this year are Encke's and Brorsen's. The former, which completes its orbit every three and a third years (the shortest comet period known), came in sight early last November, but does not reach its perihelion until February, and is still under observation. It is very faint, seldom becoming visible to the naked eye, and the chief interest that attaches to it lies in the strange continual shortening of its period, a phenomenon which still remains without any certain explanation, though very generally supposed to be due to its collision with some invisible meteoric swarm. Brorsen's comet, which made its last visit in 1890, and has a period of five and a half years, is due again next summer; but it is unfavorably situated, and will be so faint that it may very possibly elude observation.

Of course, it is perfectly possible, and much to be desired, that some great comet may appear entirely unannounced, or that some "new star" may unexpectedly burst into brilliancy; but such phenomena do not come within the range of our prediction.

Probably before the close of the year the immense forty-inch telescope of the Chicago University will be erected in the magnificent observatory now building for it at Lake Geneva, Wisconsin; and it is possible that by that time the great instrument now being constructed for the observatory of the Cape of Good Hope may also be mounted, so that hereafter the southern hemisphere may possess at least one instrument comparable in power with those that are now so numerous in the northern. And yet, after all, the real progress of astronomy depends more upon the unobtrusive, faithful, laborious work of the mathematicians and routine observers than upon big telescopes and sensational discoveries.—Cosmopolitan.