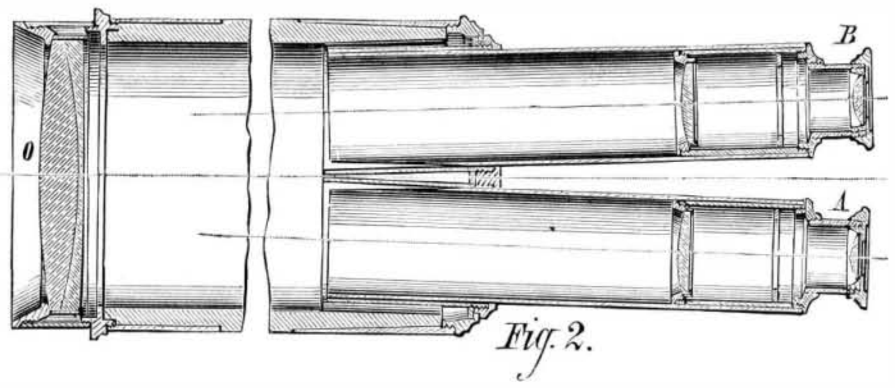
tity, and therefore to double its original intensity. It needs no far-fetched philosophy to prove to ourselves that the brilliancy of the binocular telescope is doubly as great as that of a single telescope of like aperture and focal length, for we know that twice as much light enters two eyes as enters one, and is united by the brain in a single field. If a doubt could exist upon this point we have only to make a tube by rolling up a sheet of paper, place its end about one eye, so as to shut out all light but that which enters the tube, and direct our vision toward a plane surface in low light, for in low light we will be better able to appreciate the difference of illumination. The surface brought under examination will everywhere appear as an even tint except the portion bounded by the tube, which will come out as a bright spot upon a gray background. Independent of every other proof this fact alone demonstrates that two eyes double the illumination of all images of external objects formed on the retina; again therefore it is proved that the binocular telescope is doubly as luminous as the single one of like aperture and focal length, and as it is well known that space penetrating power is invariably proportioned to the brilliancy of illumination produced in the field of view, it follows from this *one* superior quality alone that a binocular telescope has double the value of a single one for all purposes of astronomical research. But since an amplification of the image accompanies this increase in brilliancy, we must also have the equivalent of an increase, in the magnifying power, of double that of the single instrument, and that, too, without increasing the power of the eyepiece, and consequently without any diminution of the field of view as would result from the use of an eyepiece of higher power. As it is a well known fact that all discoveries of celestial objects, and all our most accurate micrometric measurements, have been made with low powers, it follows that the binocular instrument combines all the valuable properties of the single instrument in more than double its proportions.



SECTION OF BINOCULAR COMET SEEKER.

The great refractor in the National Observatory at Washington has a clear aperture of twenty-six inches and a focal length of thirty-two feet; another arranged for binocular vision and placed alongside of it would double the luminosity of the field of vision, and therefore have twice its space-penetrating power. A single telescope, to have the same brilliancy of illumination or light transmitting power, would require an objective of thirty-six inches aperture and to be of the same focal length. But as it would be impossible to correct such a lens to the same degree of excellency as that of one of like focal length and less diameter, a like degree of perfection of figure could not be obtained; added to this, the lens would require to be at least one third thicker, and would therefore absorb light in a like proportion. As difficulties of this kind increase in proportion to the square of the diameter of the objective, it follows that a single refracting telescope cannot be made equal in space-penetrating power to a binocular refractor having measurements in duplicate to that now in the National Observatory, and *that* as it now stands has less than half the space-penetrating power which can be given it. This could be done by simply adding a duplicate instrument, making it binocular. This, however, is not all. A refracting telescope having a light-receiving capacity equal to such a binocular would require an objective of thirty-six inches in clear aperture, but owing to the increasing difficulties of correcting such a lens it would be necessary to increase rather than diminish its focal length; but if we assume it to be in exact proportion it will then require to have a focal length of forty-five and a half feet, which at once compels the building of an observatory of correspondingly increased proportions, and expenses would be double that of the binocular instrument, while the latter would still remain vastly superior to the former. Hence, instead of being, as the preceding report of the authority from the Naval Observatory asserts, *doubly expensive*, it would not be half the expense of a single instrument theoretically its equal, though practically far inferior. The nation, therefore, stands to-day with an observatory capable of accommodating a telescope of twice the space-penetrating power possessed by the one now mounted there, by the mere expense of the additional telescope. But the way to such obvious and cheap improvement is barred by an authority capable of committing himself in writing to the positive declaration that a telescope already constructed is impossible of construction, closing the door in the face of obvious progress, through *a knowledge* of, or a *want of knowledge* of the subject, we leave the reader to judge.

The great binocular telescope which I propose is capable, without additional expense, of adjustments with which one eye receives the light direct from the telescope and the other by prismatic reflection.

Whatever may be the nature of the power which created animal life, be it sentient or the unfolding of successive causes, it would not have been so particular to endow each race and each individual of each race with two eyes if there did not lie behind it some potent reason, for nature never wastes her resources any more than she forgives self-mutilation or any another transgression of her laws.

It is but a few years ago that a gentleman left with a professional astronomer for examination one of my binoculars of thirty inches focal length; after some time the astronomer reported that in using the instrument he found he could see just as well with one tube as with both, and with one eye as with two. In looking farther into the matter it turned out that the astronomer had nearly lost the use of one of his eyes from the fact that he invariably used the other when observing the heavens through his great telescope, by which its companion had become dimmed and mutilated, finally unfitting him for the normal binocular vision of every-day life.

This same character of visual mutilation results from the

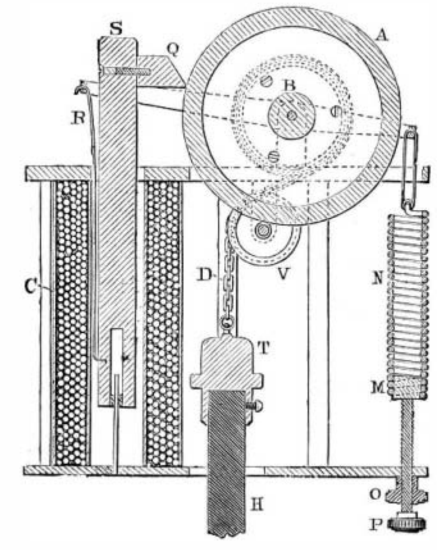


Fig. 2.—SECTION OF REGULATOR.

use of the one-eyed microscope, and has led to an effort to construct that instrument upon the principles of binocular vision. But as another law of vision has been transgressed in the instrument produced, the effect upon the eyes is yet very unsatisfactory. In every case, however, where monocular vision is persevered in, nature will be sure to enter her protest by inflicting the common penalty.

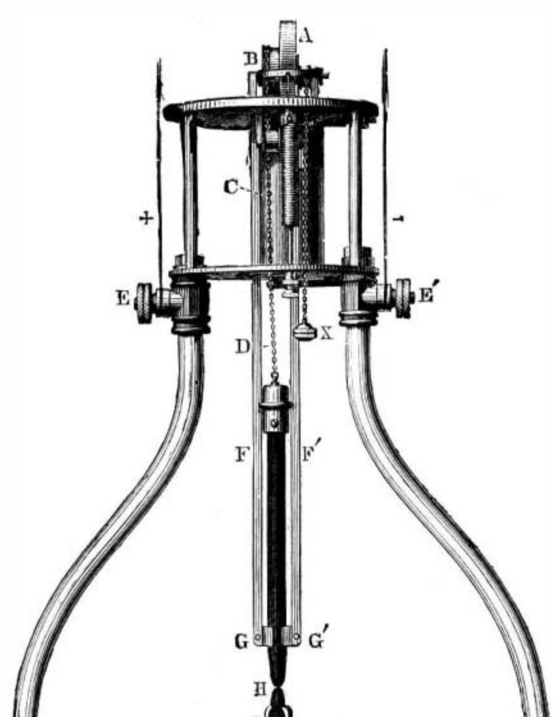


Fig. 1.—HOLCOMBE'S ELECTRIC LIGHT APPARATUS.

The far-off problems of space, and many of the nearer ones, will remain unsolved until a generation arrives upon the planet sufficiently in earnest to use the resources nature has endowed them with, and who will comprehend that self-mutilation is not one of the stepping stones to wisdom.

We now introduce the binocular microscopic telescope, so named because, by the mere placing of a lens of peculiar construction on each tube, it is changed from a telescope to a microscope having the power of magnifying objects at distances very much greater than were before attainable, thus enabling the observer to bring under observation objects situated at distances varying from one to ten feet.

As it is mounted on a tripod it can be stationed among the grasses and having universal motion, insect life can be followed and studied in the domain of their native activity, enabling the observer stationed in his easy chair to fill the office of war correspondent to the extensive, deadly, and desperative battles of ants which so frequently occur in summer time. Thus he can watch "the busy bee" as he trowels up the walls of his cells, and to superintend the operations and habits of insect life generally without disturbing the subjects or making them even aware that they are under observation. It has, however, graver phases to the medical profession, the power to bring under microscopic observation offensive diseases of the skin, while the observer is yards away from the point under examination. When the lenses are removed which make it a microscope, it is transformed into a telescope for ordinary terrestrial or astronomical use.

Fig. 3 presents A, the objective end of the binocular microscopic telescope, in its capacity of telescope, the lines of its vision being parallel, as shown by the continuation into space of the dotted lines, B B. C of the same illustration represents two cells containing portions of a lens whose original form and relative size is shown by their curves having a common connection; they are, therefore, oblique achromatic lenses cut from corresponding parts of a larger lens whose focus is at D. When the cells, C, are placed in position over the object glass of the telescope, as shown by the dotted lines there, its lines of vision will then be directed to the focus, D, of the lenses, C. Objects occupying this focus will appear magnified in proportion to the power used. The same result can be obtained by using ordinary magnifying lenses in connection with achromatic prisms.

This instrument is not intended to rival, or in any way to trench upon the domain of the table microscope, but to meet requirements for which the latter is not adapted. The table microscope can only examine objects located at very short distances from its objective, never greater than four inches, while the microscopic telescope will magnify them at the distance of ten feet and under. The table microscope is pre-eminently fitted for great magnifying power, and though the microscopic telescope may have its magnifying power increased *ad libitum*, the work it is designed for makes it undesirable to go beyond moderate magnifying powers. In examining a battle of ants, for example, it is necessary to keep the power sufficiently low to admit a group of the combatants into the field of view. Or, when an insect is found among the grasses, in his native jungles, tending to business, very high magnifying powers would make it impossible to follow his motions, as his apparent speed would be increased in the same proportions as his dimensions. If, however, the objects be stationary, there is no limit to the magnifying power which may be used so long as the illumination is sufficient. This principal is equally applicable to the single form of telescope.

The binocular microscopic telescope has been presented before the New York Microscopic Society, and the inventor had the honor to receive from that body its official vote of thanks for progress in microscopy, so that, as in the case of my double-eyed comet seeker, it is now too late to declare its construction to be an impossibility.

NEW ELECTRIC LAMP.

We illustrate herewith an electric lamp invented by Mr. Alfred G. Holcombe, of 31 Park Row, New York city. It possesses several points of novelty, and seems to be constructed on correct principles. The light is produced by means of an arc, and the regulation of the current is effected by an axial magnet having a core which contacts with a soft iron disk placed on an arbor carrying a drum on which is wound a chain connected with the upper or positive carbon carrier. The lower carbon is carried upward by a spring acting continuously, the rate of feeding depending on the rate of consumption.

In the engraving, A, is an iron disk mounted on an arbor at the top of the lamp. Upon the same arbor there is a drum, B, which supports the carbon by means of a chain, D. An axial magnet, C, at the top of the lamp contains a soft iron core, S, provided near its upper end with a beveled projection, Q, which lightly touches the iron disk, A.

The core, S, is connected with a wire, R, with a lever that is pivoted on the arbor of the disk, A, and is connected with a spring, N, which opposes the action of the axial magnet, C.

The chain, D, runs over a sheave, V, to change its direction, and is attached to a carbon holder, T, placed between parallel vertical guides, F F'.

The guide, F', is pivoted and provided with a spring, which tends to throw its lower end toward the guide, F, and thus clamp the carbon, H, lightly between clips, G.

The lower or negative carbon is forced upward by a spring contained in the case, L, and its upward movement is checked by the platinum fingers, I, which reach over upon the base of the cone formed by the burning away, so that the lower carbon is fed upward only as it is consumed.

The arc is formed at H. The current to operate the lamp is taken through binding posts, E E, on opposite sides of the lamp. When the lamp is in operation and in its normal condition, the beveled nib, Q, of the core, S, of the axial magnet adheres to the iron disk, A, holding the carbons the proper distance apart to produce an arc suited to the current. Should the current increase, the core, S, is drawn downward into the axial magnet, thereby separating the carbons increasing the length of the arc. Should the current diminish, the spring, N, acting through the connecting lever, raises the core, S, and turns the disk, A, so as to bring the carbons nearer together. Should the current cease, the disk, A, is entirely released, and the upper carbon, H, descends of its own gravity until it touches the lower carbon, when it is in condition to receive the current and become relit.

The upper carbon may be raised at any time by pulling on the chain, X, which is wound upon the arbor of the disk, A, in a direction opposite that of the chain, D. The length of the arc may be varied by adjusting the spring, N, so as to offer more resistance to the action of the axial magnet.

The lower carbon and carbon holder may be readily removed from the lamp frame by turning the casing, L, a quarter of a revolution. And the spring actuating the carbon carrier may be stopped by pressing the button, K, when it is desired to put in a new carbon.

The lamp seems well calculated to avoid the imperfections found in other lamps. It gives a steady, strong light, with arc always in the same position. There is no lost mechanical motion, and the regulating mechanism absorbs an amount of energy equivalent to but one candle power of the current.

Why the Needle Points Northerly.

A San Francisco gentleman lately wrote to the Superintendent of the U. S. Coast Survey, Professor C. T. Patterson, asking the reason why the magnetic needle points to the north. In reply Professor Patterson wrote as follows, and possibly many more than the original inquirer may be glad to read his simple statement of the facts of the case.

The reason why the ne dle points in the northerly direction is that the earth in itself is a magnet, attracting the magnetic needle as the ordinary magnets do; and the earth is a magnet as the result of certain cosmical facts, much affected by the action of the sun. These laws have periodicities, all of which have not as yet been determined.

The inherent and ultimate reason of the existence of any fact in nature, as gravity, light, heat, etc., is not known further than that it is in harmony with all facts in nature; even an earthquake is in perfect harmony with, and the direct resultant of, the action of forces acting under general laws.

A condensed explanation in regard to the needle pointing to the northward and southward is as follows: The magnetic poles of the earth do not coincide with the geographical poles. The axis of rotation makes an angle of about 23° with a line joining the former.

The northern magnetic pole is at present near the Arctic circle on the meridian of Omaha. Hence the needle does not everywhere point to the astronomical north, and is constantly variable within certain limits. At San Francisco it points about 17° to the east of north, and at Calais, Maine, as much to the west.

At the northern magnetic pole a balanced needle points with its north end downwards in a plumb line; at San Francisco it dips about 63°, and at the southern magnetic pole the south end points directly down.

The action of the earth upon a magnetic needle at its surface is of about the same force as that of a hard steel magnet, 40 inches long, strongly magnetized, at a distance of one foot.

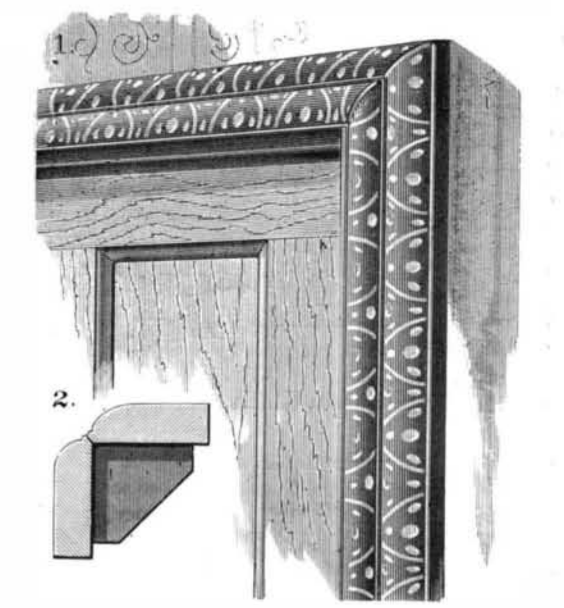
The foregoing is the accepted explanation of the fact that the needle points to the northward and southward. Of course no ultimate reason can be given for this natural fact any more than for any other observed fact in nature.

Cotton Planters' Association.

The annual meeting of the Mississippi Valley Cotton Planters' Association was held in New Orleans, May 18. The attendance was large. Resolutions were passed indorsing the Mississippi River Commission; claiming a right to representation in the National and State Cotton Exchanges; condemning the sale of cotton seed; approving the barge-line system of river transportation; and condemning speculations in cot ton futures by cotton factors. The officers elected for the ensuing year are: President, F. C. Morehead; Vice-Presidents, J. W. Vicks, Mississippi; H. R. Lucas, Louisiana; J. B. Killebrew, Tennessee; S. B. Cockrill, Arkansas; and Dr. J. B. Taylor, Alabama.

NEW STYLE OF MOULDING.

The annexed engraving represents a new style of carved moulding recently patented by Mr. H. D. Benjamin, of De Ruyter, N. Y The moulding, although quite simple, is very ornamental, and may be applied to doors, windows, cabinets, bookcases, and many articles of furniture. It forms an elegant corner for secretaries, and may be modi-



BENJAMIN'S IMPROVED MOULDING.

fied to adapt it to a great variety of uses. A ceiling cornice made of this style of moulding gives a finished appearance to the ceiling and walls. This invention relates more to the method of carving or ornamentation than to the particular shape of the moulding, and the carving may be varied to adapt it to different forms of moulding.

Further particulars may be obtained by addressing the inventor as above.

THE STEAM ENGINE INDICATOR.

The steam engine indicator is designed to register automatically upon paper the pressure of steam in the cylinder at every point of the piston's stroke. The form of the diagram thus drawn by it affords information of a variety of facts not otherwise readily obtained. It is now generally conceded that the indicator is an invaluable appendage to the steam engine, and when properly applied and understood, cannot be too highly estimated. The efficiency and economy of every engine made or sold ought to be proved by the indicator diagram. In fact, no builders of

CROSBY'S STEAM ENGINE INDICATOR.

first class engines now consider their canvass complete without showing a facsimile of the diagram of their engine.

Our engraving represents a Crosby indicator, which is probably the most perfect instrument of its class yet devised. The principle and action of indicators are so simple, and to most practical engineers now so well understood, that it will only be necessary to give the accompanying cut and description of the parts of this instrument to readily appreciate the advantages accruing from its use.

A is a case or jacket inclosing a cylinder, into which a piston is nicely fitted to move without friction; to the upper side of this piston is attached a steel helical spring, the upper end of which is fastened to the cap or head of the cylinder; to the upper end of the piston rod, B, is directly jointed the short lever, C D, whose short end is jointed to the head of a vibrating standard at D, and its long end is jointed to the long lever, E F, at the point, C. The long arm of the lever, E F, is jointed at its outer extremity to a second vibrating standard at E, and to the other extremity is attached the pencil, F. To the case, A, is permanently attached the horizontal plate, G, at one end of which is jointed a corresponding plate, H, situated above the former and carrying the revolving drum, covered by the paper cylinder, I. To this drum is attached a cord, wound around a groove at its base and carried by the guide wheel, K, between the two extra guide wheels, L and M; the guide wheels, L and M, are attached to the arm, N, which swivels around a point in line with the axis of guide wheel, K, and is held in its proper position by the thumb nut, O. The drum carrying the paper cylinder, I, is rotated in one direction by the tension on the cord, and in the reverse direction by the reaction of a spring inclosed therein; the tension upon this spring may be adjusted to suit by the thumb nut at the open end of the drum. The plate, H, carrying the drum and paper cylinder, is held away from the pencil, F, by a spring situated between the plates, H and G, directly in line with the axis of the drum, until the operator desires to take a diagram. By pressing upon the handle, P, the paper cylinder is moved forward and the pencil comes in contact with the paper. Immediately upon removing this pressure the paper cylinder automatically assumes its former position. Two adjustable stops determine the amount of this motion and regulate the force with which the pencil presses upon the paper, a hair line being attainable without friction. The bushing which carries the pencil is bored to receive a graphite or metallic wire, and is supplied with means for holding it in any position desired. The piston rod is bored at each end almost half its length, leaving a thin partition or stop in the center; the upper chamber is used as a reservoir for a lubricant, and is provided with pin holes close to the partition to allow the oil to flow out and down, and so lubricate the rod and piston; the lower chamber allows the steam to enter and warm the lubricant, causing it to assume a more limpid form and flow freely in cold weather. The piston rod is thus made lighter without weakening it materially.

The pencil in this indicator is situated close to the piston rod, instead of projecting several inches to one side, as in other instruments of this class, and the paper is moved up to the pencil, instead of moving the pencil up to the paper, as heretofore. The parallel motion is new and perfectly true. There is a hot air chamber or jacket around the steam cylinder instead of steam chamber.

It is claimed that this indicator is free from some very objectionable features prominent in other makes. Friction always causes errors in registration, but at the same time it admits of drawing the diagram even and smooth, and deceives the operator into the belief that he has got a good diagram, while the reverse is true.

The manufacturers of the Crosby indicator have aimed by all possible means to avoid friction. The motion of the pencil in this indicator is always a uniform multiplication of the piston motion. The weight of reciprocating parts is reduced to the minimum, and the parts which require constant lubrication, such as the cylinder, piston, and rod, are automatically oiled.

This instrument is more easily operated than indicators in which it is necessary to be to some extent an expert, with a delicate sense of touch to determine just the proper force to employ in moving the pencil against the paper so as not to tear it or cause undue friction. In this indicator all this is pre-arranged so accurately that it is said a child can operate two indicators—one at each end of the engine cylinders—simultaneously, without difficulty, and obtain hair lines without friction. When properly adjusted, connected, and operated, diagrams made by this instrument may be implicitly relied upon. For further information address the Crosby Steam Valve and Gauge Co., corner Milk and Batterymarch Streets, Boston, Mass.

Novel Use for Empty Cans.

The works of the Duquesne Smelting Company—a Pittsburg enterprise—are located at the mouth of Sacramento Gulch, near Leadville, Col. A few weeks ago Superintendent Tate ran short of ore suitable for "flux," and was saved a great deal of worry by the proximity of an immense deposit of empty tin cans. Canned fruit, meat, and vegetables, it should be stated, are the mainstay of Colorado cooks. The back yards and waste places about Leadville are covered with millions of empty cans of every form and size. Superintendent Tate ordered a squad of Chinamen and two big charcoal wagons to the can pile, and soon had his smelter running on ore and tin cans. The latter supplied the needed elements, and the Duquesne will not run out of "flux" while there is an empty can in Leadville.

Patent Office Items.

Mr. Edison has just obtained a new patent for improvements on his original phonograph, by which the machine is made to speak to better advantage than ever before

A machine for making pies has lately been patented. This, taken in connection with the patent substitute for eggs, will be good news for boardinghouse keepers.

After a long contest with many other claimants, Mr. Emil Holtzmann, of Germany, has received a U. S. patent for the copying process now so extensively used, by which many copies of letters are taken from a sheet of soft glue. The patent is dated May 18, 1880, No. 227,629. It was patented in Germany in 1878.