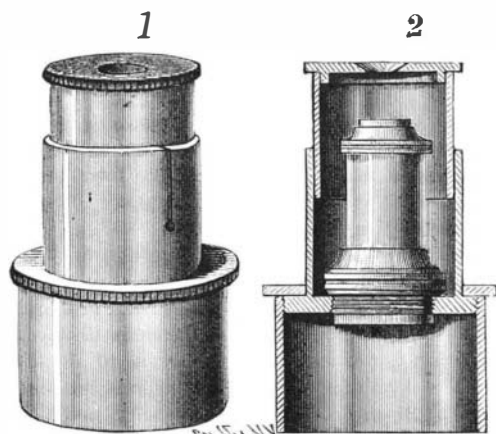


SUGGESTIONS IN OPTICS.

BY GEO. M. HOPKINS.

Every investigator, whether induced to examine into things for pleasure or profit, has at hand optical appliances capable of double use which would permit of greatly extending fields of investigation if such



OBJECTIVES USED AS EYE PIECES.

uses were to suggest themselves. To many the suggestions here given will not be entirely novel, while to others they may be new and may prove of considerable value.

Having a spy glass or small telescope, and desiring a microscope of low power, one has only to use the compound erecting eye piece of the spy glass. This suggestion has often proved of value to the writer during an outing. An eye lens of a field glass or opera glass has served as an amplifier for the microscope, and a hand magnifier has been used as a condenser. A microscopist short of eye pieces may press his objectives into the service by producing a mount like that shown in perspective in Fig. 1 and in longitudinal section in Fig. 2. This mount fits into the top of the microscope tube and is provided with a fillet having the screw for receiving objectives large end down. In the upper and smaller end of the mount is inserted the cylindrical part of the perforated cap. The writer has used Bausch and Lomb objectives of the professional series, one-fifth, one-half, three-quarters, one inch and two inch for this purpose with good results. After having used the adapter with the objective in the manner described, the writer learned that Mr. John Phinn published a similar device some years since.

The value of an eye piece for focusing the image in the camera in certain kinds of work does not seem to be generally acknowledged. In this case the ground glass is removed and a positive eye piece is supported so that its focus and the focus of the photo lens coincide in the same plane. An easy way to arrange this is to insert a piece of plate glass in the place of the ground glass, and provide the eye piece with a foot resting on the plate glass, the eye piece being adjusted so that it will be focused on an image formed at the inner surface of the plate glass. The plate glass may be dispensed with if means are provided for supporting the eye piece so that it will unerringly focus at the focal plane of the camera, while at the same time it can be readily moved about into all parts of the field. This method of focusing is particularly advantageous in photo-micrography, when it is often difficult to see the image when it is received on a

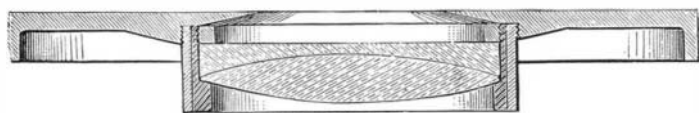


FIG. 5.—MICROSCOPE STAGE WITH TELESCOPE OBJECTIVE.

ground glass focusing screen. By the use of the eye piece, focusing is made simple.

Many photographers have attempted to extemporize a telescope by using a part of the photographic combination as a telescope objective. This scheme has generally failed, as a part of the combination is not usually corrected for a perfect image when used with a full aperture. By using a complete photo lens of any first class make as a telescope objective, and employing in connection with it an eye piece of suitable power, a telescope is formed which is of some service.

This combination can be used in the camera box in the manner illustrated in Fig. 3, or the photo lens and eye piece may be fitted to opposite ends of an ad-

justable tube, telescope fashion. This will be found more convenient in use. With a good sized photo objective and eye piece of suitable power the observer will derive a great deal of satisfaction from star gazing, and when a compound erecting eye piece is borrowed, even from a small spy glass, the combination of the two forms a very useful terrestrial telescope.

There is no reason why a microscopist, especially if he is a naturalist, should not make use of the telescope in some of his investigations. Watching insects and the smaller animals at work is an interesting occupation which may be carried on by the aid of a small telescope, provided the objective be sufficiently perfect to permit the use of powerful eye pieces.

By combining a small telescope objective of fine quality with a microscope stand, the microscopist is enabled to use his eye pieces to good advantage, the whole forming a fine telescope of great power. Such an instrument might properly be called a long range microscope. Fig. 4 shows an instrument of this kind in use. In the stage of the microscope stand is secured a fine objective—of about eight inch focus—borrowed from an engineer's transit. The open space between the lower end of the microscope tube and the stage does not interfere with the operation of the instrument.

Focusing is done by means of the milled head of the microscope. In the instrument illustrated eye pieces from one and a half to one-quarter inch focus are used. At a distance of eight or ten feet the operations of insects may be observed under considerable magnification.

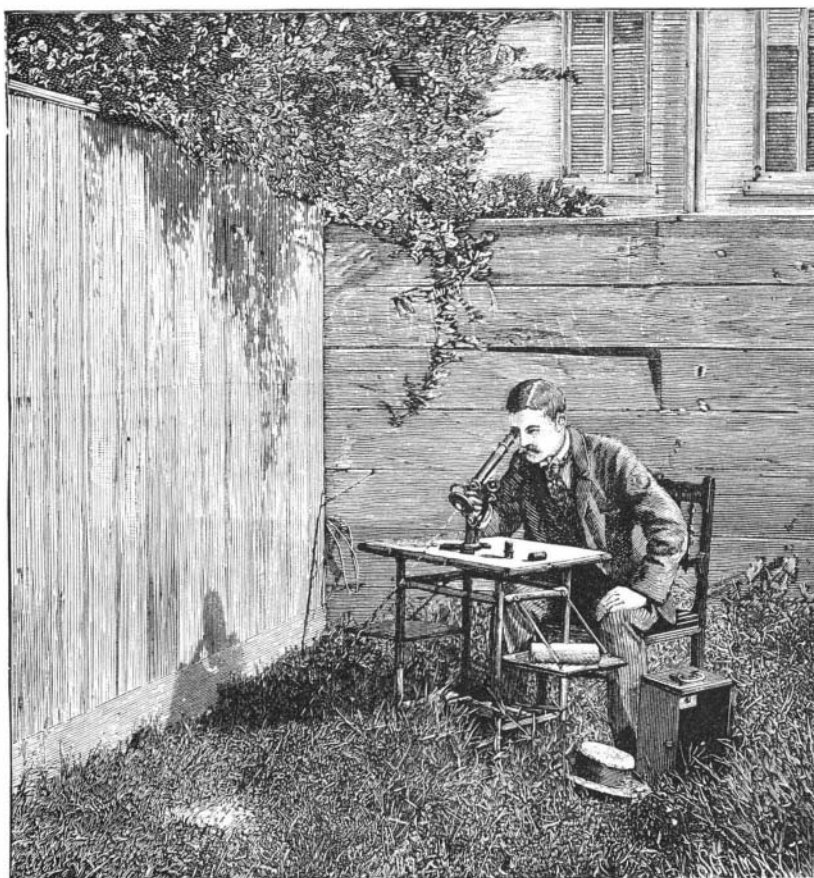


FIG. 4.—THE LONG RANGE MICROSCOPE.

Fig. 5 is a transverse section of the microscope stage, showing the position of the telescope objective.

Trades Union Folly.

Work on the new wing of the beautiful Mutual Life Insurance building, in New York City, has ceased. The building, which is to be fourteen stories high, has been carried up ten stories, and the electric wiring is going on in it. So far the wire men have cut holes for themselves, eight men being constantly employed in the building for that purpose. It seems, however, that some bricklayers, who were out of work, saw them, or heard of them, and appealed to their union to get the wire men out and themselves put in.

A deputation of bricklayers accordingly waited upon the superintendent of the building and demanded that the work of cutting holes in the walls should be given to them. They informed the superintendent that if this modest request was not complied with, all the bricklayers in the building would strike. While the superintendent was considering the matter, the walking delegate of the Electric Wire Men's Union appeared on the scene, and gave notice that if bricklayers were employed to do the cutting, all the wire men in the building would strike. As the building could not go on without both kinds of work-

men, the superintendent concluded to do nothing, but let the two unions settle the dispute for themselves; and the bricklayers in the building, forty-eight in number, accordingly dropped their tools and departed.

A New Process for Aluminum.

A dispatch from Duluth, August 22, says: "The Patent Office authorities sent to this city a chemical expert on an application for a patent for a new process of obtaining aluminum from its oxide. The process includes chemical combinations heretofore supposed to be impossible, and on this ground the application for a patent was rejected, the method being termed inoperative. Three entirely satisfactory tests were made by the government chemist, and he has returned to Washington. A copy of his report to the Patent Office was received here to-day. After detailing the tests as made by himself, he says that the process is operative, that it appears to be almost perfect in its results in obtaining the entire aluminum value of the oxide."

"The discoverer of this process and his Duluth associates say they can produce pure aluminum at a price considerably below that of any of the electrical processes, and cheaper, bulk for bulk, than copper. The native clay is useless. In fact, the only available mineral for the purpose is bauxite, which is an impure oxide of aluminum."

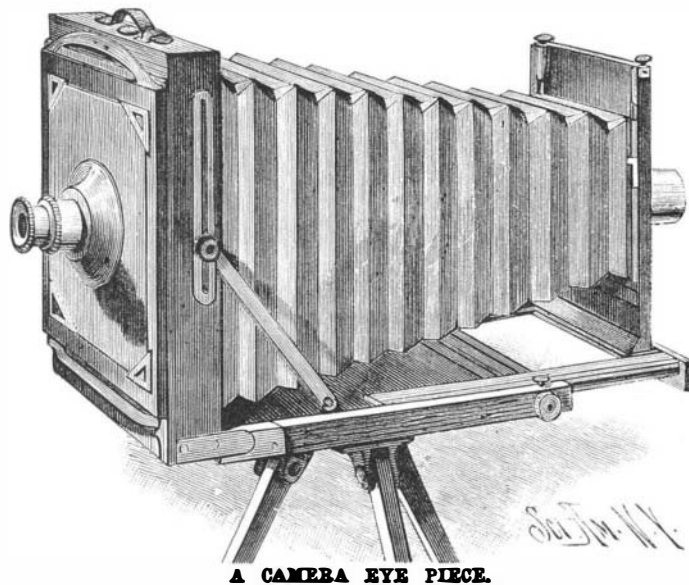
The Bruges Ship Canal.

Movements are being made for the commercial rehabilitation of the old town of Bruges in Belgium. Bruges was at one time the commercial center of Europe, or in other words the world. In the fifteenth century the "City of Bridges" attained the height of its prosperity and then gradually began a wonderful decline which reduced the capital city of West Flanders, the autocrat of commerce, to a third rate provincial town. Bruges enjoys an immortal celebrity in the history of art, for in the fine old city oil painting had its origin. Bruges was connected with the sea by canals which were blocked up by the Antwerpens until Bruges lost her prestige. The quaint old city is to be roused from its lethargy and restored once more to the world as a maritime mart. A ship canal will connect the now deserted canals with the sea.

The town has voted a subsidy of 2,000,000 francs to aid in the work. From an æsthetic point of view the canal will entail a loss, as it will be difficult to retain all the picturesque features of the quaint old Flemish city of which Longfellow sang so beautifully.

Military Ballooning in France.

Some experiments in military ballooning were lately made in Paris. Five balloons were sent up from the Esplanade des Invalides. The aeronauts in charge of them were instructed to descend within an hour as close as possible to Combs la Ville, after passing over a radius of twenty miles supposed to be occupied by an enemy. A number of cyclists were sent off with instructions to pursue and capture any of the five balloons that failed to cross the zone of investment. M. Jacques Courty, in the balloon Patriote, carried off the palm. He alighted within a mile of the church of Combs la Ville. The balloon directed by M. Picq touched the ground only a couple of hundred yards further from the town, while M. Compiègne alighted from a third balloon at Reaux. The other two balloons fell within the radius, and were captured by the cyclists.



A CAMERA EYE PIECE.