SIMPLE PHOTOGRAPHIC AND PHOTO-MICROGRAPHIC APPARATUS.

A photographic outfit that will do very good execution may be purchased for a few dollars, but notwithstanding the small expense, many are deterred from making a beginning in photography on account of the first outlay.

While first class photographic instruments can be made only by makers having the greatest skill and large experience, an ordinary camera that will serve the purposes of the amateur may be made by the amateur himself with the expenditure of an insignificant sum for materials.

Figs. 1 to 12 show a camera tube, box, and tripod the materials of which cost less than a dollar. The construction is within the range of any one having a little mechanical ability. The camera is intended for 4 by 5 plates, therefore the size of the plate holder and the focal length of the tube will determine the size of the camera box. To avoid turning the camera or plate holder, the box is made square, and the inside dimensions of the plate holder are such as to permit of placing the plate either horizontally or vertically, according to the subject to be photographed. The plate holder is 5¾ inches square inside, and is provided with a wooden back of sufficient thickness to support the hooks employed for holding the plate. There are four V-shaped wire hooks, *a*, at the bottom of the holder, two for receiving the end edge of the plate, and two farther apart, and arranged higher up, for receiving the side edge of the plate; and near the top of the holder there are three Z-shaped hooks, *a*, one in the center for engaging the end edge of the plate, and one near each side of the holder for receiving the side edge of the plate. The top of the frame is slotted, and the sides and bottom are grooved to receive the slide, which covers the plate before and after exposure. To the under surface of the upper part of the frame of the plate holder is attached a looped strip of elastic black cloth, such as broadcloth or beaver, which closes over the slot of the plate holder, as shown in Fig. 10, when the slide is withdrawn, and thus shuts out the light. The interior of the plate holder, as well as the slide, should be made dead black, by applying a varnish made by adding three or four drops of shellac varnish to one ounce of alcohol, and stirring in lampblack until the required blackness is secured.

The main frame of the camera box is made square, and is secured at right angles to the base board. The frame is provided with a narrow bead or ledge that will enter the front of the plate holder and exclude the light.

To the front of the frame are secured four trapezoidal pieces of pasteboard, of the form and size given in Fig. 6. These pieces of pasteboard are secured to each other and to the camera box frame by tape, glued on as shown. If the box is made of junk board, it may be nailed together with wire nails. In this manner a pyramidal box is formed which is strong, light, and compact. In the smaller end of the box is fitted the beveled centrally apertured block shown in Fig. 7. The aperture of this block must be made to fit the camera tube shown in Figs. 1 and 2, after having received a lining of plush or heavy felt.

The camera tube may consist of paper or metal. Paper answers well, and costs nothing. The internal diameter of the tube is determined by the diameter of the lenses. Ordinary meniscus spectacle lenses of eight inch focus are employed. These lenses are secured in place by paper rings, shown in Fig. 3, the inner rings being glued in place, the outer ones being made removable for convenience in cleaning the lenses. The lenses are arranged with their convex sides outward; the distance between them is 1¼ inches, and in one side of the tube, half way between the lenses, is made a slot to receive the diaphragms, as shown in Figs. 1 and 2. Upon each side of the slot, within the tube, are secured flat rings, shown in Fig. 4, which together form a guide for the diaphragms, as shown in Fig. 2.

The tube is adjusted at the proper focal distance from the plate by temporarily securing at the back of the box a piece of ground glass or tracing paper, in exactly the same plane as that occupied by the plate in the plate holder. The tube is then moved back and forth until a focus is obtained which shows the image fairly sharp throughout the field. In arranging for a fixed focus, it is perhaps best to favor the foreground rather than the distance. The tube should move with sufficient friction to prevent it from being easily displaced. By using a small diaphragm, it will be found unnecessary to focus each subject separately.

In Fig. 12 is shown a combination of cheap lenses devised by Mr. Henry Mead, which is effective for portraits and for other classes of work when focusing is admissible. It consists of two meniscus lenses, each of 8½ inch focus, having their convex sides arranged outwardly, and a plano-concave lens, 16 in. focus, arranged with its concave side against the concave side of the outer lens of the system. The plano-concave and the rear meniscus lenses are arranged 1½ inches apart. Diaphragms may be used as in the other case, and a box about 8 inches deep will be required.

The tripod is formed of a triangular centrally apertured board, to which are hinged three tapering wooden legs, by means of ordinary butt hinges, as shown in Fig. 11. The base of the camera box is secured to the tripod by means of an ordinary thumb screw.

This outfit will enable the amateur to cultivate his tastes, and learn much about photography. Dry plates will of course be used. They are procurable almost anywhere, and are inexpensive. As to the treatment of plates after exposure * and printing and toning, the reader is referred to the works on the subject of photography. The amateur who possesses one of the microscopes described in a previous article of this series may arrange it for projection as described on page 393 of vol. lvi. of the SCIENTIFIC AMERICAN, and may insert the end of the microscope tube in the camera box above described, after removing the tube, and project the image of the microscopic object on the sensitive plate, and thus produce good negatives of the objects, from which prints may be made which will be interesting both to the operator and his friends. The eyepiece of the microscope referred to is a very good objective for photo-micrography. In photographing microscopic objects, it will be necessary to employ a focusing ground glass, and to focus very carefully by the aid of a magnifier.

Slow plates are preferable for this use, as they bring out the detail much better than fast plates. The time of exposure will vary with the object, from fifteen seconds to a minute or more.

Fig. 13 shows the arrangement of the lantern, the microscope, and the camera box. It will be noticed that the annular space in the end of the camera box around the microscope tube is stopped by a black cloth wound loosely around the microscope tube. This and other precautions are necessary for preventing the light from reaching the plate except through the object and the microscope. G. M. H.

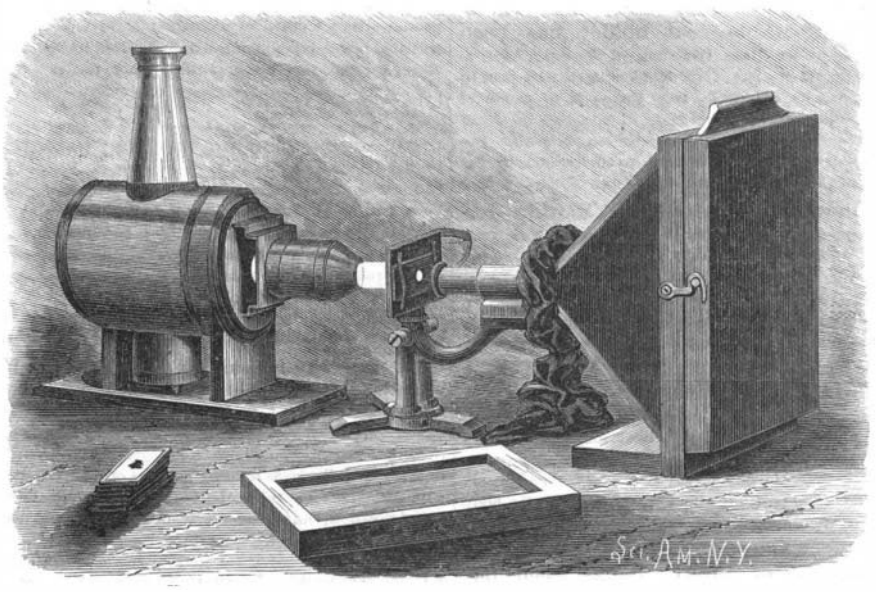
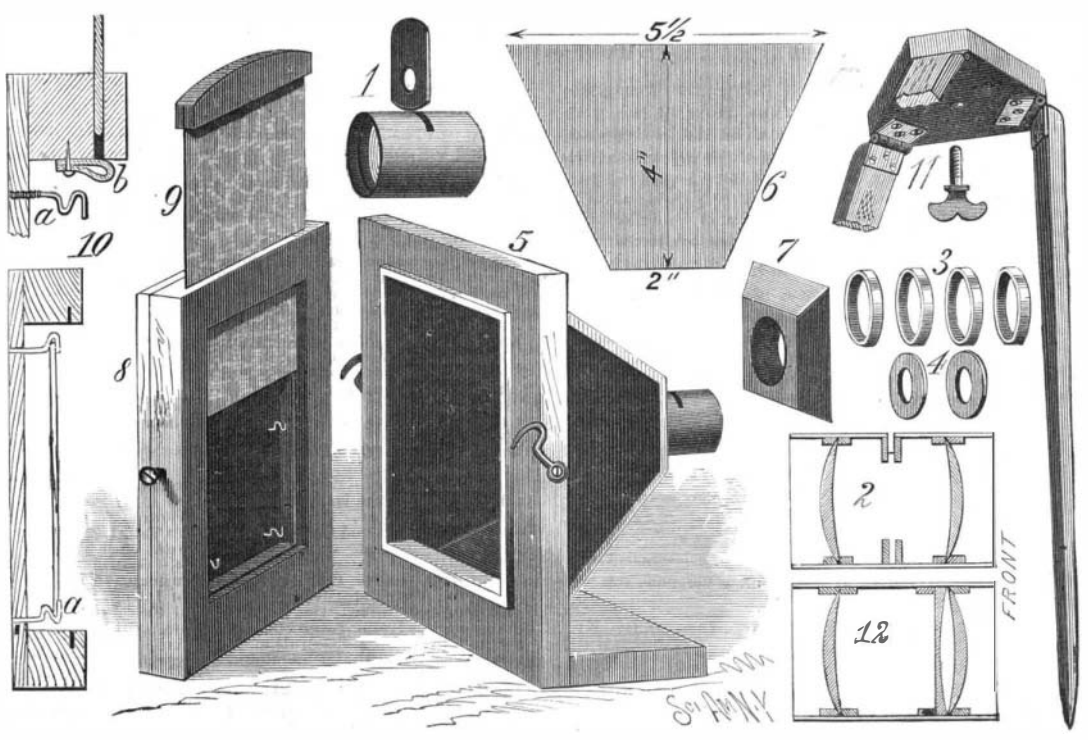


Fig. 13.—MICROSCOPE AND CAMERA ARRANGED FOR PHOTO-MICROGRAPHY.



SIMPLE PHOTOGRAPHIC CAMERA.

* See Supplement, No. 541.

Pita.

According to a report of Consul Burchard, of Ruatan, in Honduras, the pita plant has never been cultivated, but grows wild in patches on the borders of rivers and lagoons. The stalks of the plant contain the fiber of commerce, and grow sometimes to a height of 12 feet. The Indians scrape off the hard skin of the stalk with a bamboo knife, and thus obtain the fibers which form the heart of the stalk. Another plan is to steep the stalks in water until the skin decomposes; but this is said to injure the fiber somewhat. In recent years machines have been devised to decorticate the fiber, but these have all been failures, owing to the fact that no machine has yet been invented capable of operating on a profitable scale. In Honduras the pita or "silk grass" fiber is used chiefly for thread, nets, fish line, and cordage. Samples of the fiber sent to the United States and Europe have been manufactured into lace handkerchiefs, ribbons, and wigs. It is held to be a substitute for silk or linen; and if proper machinery were forthcoming, the wild pita fields of Honduras might be utilized in commerce. Consul Burchard indeed expresses the opinion that the fiber is destined to become a very important element in the future commerce and industry of this country.

A Curiosity in Photometry.

It is interesting at the present day, when the photometry of gas and electric lights has been brought to some degree of perfection, to read of an expedient adopted in former times in Paris to control the quality of the street lamps. The method has very recently been made public. The Police Department of Paris, in whose charge the matter was placed, had paper patterns cut out representing what they considered the proper size, or profile, of a gas flame. These were furnished to their inspectors, who compared them with the flames of the street burners, and judged accordingly of their quality. In case of deficiency, fines were imposed. These fines were levied, and not collected until some 600,000 francs stood against the gas company. The method was so crude that the authorities did not venture to submit it to a court of law. The devisers of the plan overlooked the fact that a small flame may, and often does, give more light than a large one, and reduced it all to a question of size. Nevertheless, our present system is far from perfect, from analogous causes. Complaints of its inaccuracy have grown more frequent since the introduction of water gas, and several have appeared during the last year. It is known that a water gas that shows sixteen candles on the bar photometer is far from satisfactory, while a sixteen candle coal gas will always be accepted as of good quality. The whiteness of the water gas flame probably introduces an error. This appears especially probable when we recollect that the standard of comparison is a candle having an extremely yellow flame. Polarization photometers have been little tried, and it is hardly known how efficiently they will act, but at this late day the absolute photometer has yet to be constructed. The effect of light on the human eye is the ultimate standard. This introduces a subjective element into the question that is very hard to cope with.