



[The Editor of the Home Laboratory will be glad to receive any suggestions for this department and will pay for them, promptly, if available.]

Photo-micrography for Amateurs

By Norman Barden

PHOTO-MICROGRAPHS are pictures of minute or microscopic objects that have been magnified.

A micro-photograph is a microscopic picture of an object that can be seen with the unassisted eye.

The two terms, photo-micrography and micro-photography, should not be confounded, as their meanings are very different. Photo-micrographs show objects and their details which are far beyond the reach of the unassisted eye; while micro-photographs are oddities of the art of photography and are made to be viewed through the microscope.

There are two ways in which photo-micrographs may be made, namely, by using a single lens with a short focal length or by photographing the object through the whole microscope, i. e., photographing the image enlarged by the eyepiece. In the first case the eyepiece is not used at all, but in the second case the eyepiece is left in its position. It is this last

similar position. This is accomplished by using two retort stands as supports for the camera. To fix the camera at the right height, remove the lens and open the shutter. Put a few grains of sand upon a glass slide, place upon the stage and then focus the microscope upon them. Then hold the camera in such a position that the eyepiece of the microscope and the camera shutter nearly touch each other. Now adjust the retort stands so that they will support the camera in this position. Insert the ground glass in the camera and very slowly draw out the tube of the microscope. Soon a sharp image of the stand will appear upon the glass. Then the retort stands may be readjusted to hold the camera so that the camera shutter is about an eighth of an inch from the eyepiece of the microscope. This distance ought to allow room enough for the various adjustments that are required for the focusing of different objects. The diaphragm of the camera may be adjusted to exclude any light which might enter around the eyepiece. If possible have the eyepiece slip into the socket used for the lens, as this insures a light-tight fit. The drawing gives a clear idea of the arrangement of the microscope and camera. After the apparatus has been arranged, it will be necessary to put the room in a proper condition.

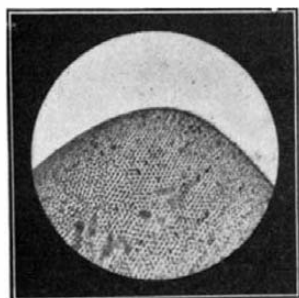
The room must not be too light. If sunlight is used, it is best to have all openings darkened except the one through which you receive your light. If artificial light is used, have all other sources of light cut off. The same room in which the photographing is done can generally be made to serve as the dark room. Do this, if possible, as it will save a great deal of walking as well as time. Having put the apparatus in a fixed position and the room in a proper

essential in obtaining good dense negatives. Fix the plate thoroughly in a strong hypo solution and then wash with plenty of water. A coat of varnish on a good plate will greatly insure its keeping qualities. If the foregoing instructions be carefully followed, there should be no reason for anybody's failing to make good photo-micrographs by using the eyepiece to enlarge the image.

Perhaps the easiest specimen to obtain is a common house fly. This fly contains several good objects, such as the eyes, the tongue, the wings and the legs. Wings may be mounted dry between two pieces of glass. To prepare a fly's leg it must be soaked for a few days in a solution of caustic potash or soda and then mounted in Canada balsam.

One of the accompanying photographs shows a few blood corpuscles. These are best mounted by placing a drop of blood on a slide and then spreading it out over a large area by dragging another slide over it. Do not press or else the delicate corpuscles will be crushed. After the blood is dry a good field may be picked out and photographed.

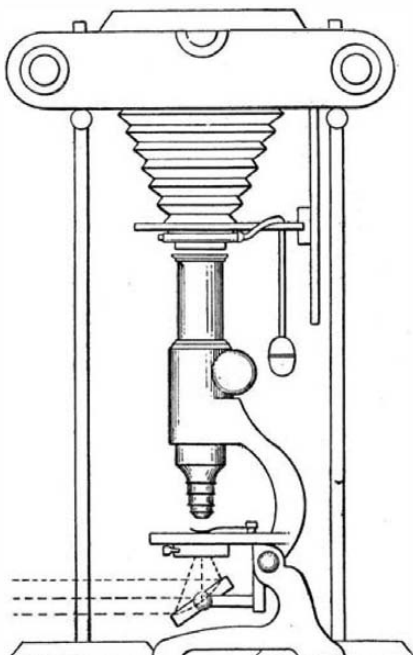
Sections of stems of plants often yield very pretty negatives. The section of the marigold stem, shown herewith, was cut by hand with an ordinary razor blade. The cutting was carried on under water, as very thin slices can be cut in this manner. It is best to mount the sections in water so that the cells will be transparent. Sections of wood may also be made in the same manner. All sections, however, must be cut very thin so that the light can be transmitted through them, unless reflected light is to be used. In conclusion, it may be said that there is an unlimited supply of objects for the photo-micrographer, many of which are beautiful as well as exceedingly interesting.



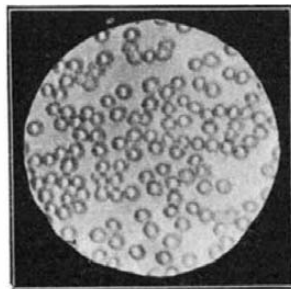
Tip of a fly's wing.



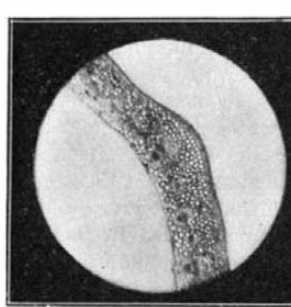
The leg of a fly.



Apparatus for making photo-micrographs.



Corpuscles in a drop of blood.



Section of a marigold stem.

PHOTO-MICROGRAPHY FOR AMATEURS

named method that will be described here in a brief manner. There are many ways in which the arrangement of the apparatus can be modified and, no doubt, many microscopists will modify the arrangement to their benefit. The arrangement of the apparatus described in this article has been successfully used for photographing many microscopic objects, especially transparent objects.

The very first thing to take into consideration is the source of light. Either gas or sunlight may be used. The writer advises the use of light from a gas mantle. The reason for this is because the light does not vary, and once a correct exposure is found it will apply always. But with sunlight it is different. There are a great many variations to contend with, and besides, exposures can not be made at night; while when using gas light, exposures can be made at any time. The light from an ordinary lamp or an electric light may also be used. Having determined from what source you are to receive your light, the fixtures and apparatus should next be taken into consideration.

A low table which rests solid upon the floor is best to work upon. If gaslight is to be used, place the burner at one end of the table. If sunlight is to be used, place the table close to a window facing north. Never use the sunlight direct, but prefer the light reflected from light and fluffy clouds. After the table and gas burner have been put in position, place the microscope upon the table in such a position that the reflector will receive rays from the brightest portion of the light. The best distance from the gas burner will be about two feet. Now, since the optical axis of the microscope is in a vertical position, it will be necessary to put the optical axis of the camera in a

condition, the photo-micrographer is ready for making photo-micrographs.

Focusing an object which is being photographed through the eyepiece requires a very fine movement of the microscope tube. Place the object on the stage, get a rough focus upon it. Now place the object in the center of the field. Then get a fine focus upon it and regulate the intensity of the light by means of the diaphragm beneath the stage. Try to secure an illumination which best brings out the details wanted. If reflections from the inner surface of the tube of the microscope are found, put in a cylinder of dead black paper. Care must be taken to have every lens clean and dry. When the object has been placed in the center of the field, the light regulated, and a good focus has been obtained, everything is ready for the exposure.

There are no rules that can be laid down in regard to the length of exposure. The amateur must learn to judge this by the brightness of the image. The length of exposure also depends upon the kind of light used—sunlight or artificial; the power and angle of the objective and the distance of the plate from the eyepiece of the microscope. A good thing for an amateur to do is to keep the distance between the plate and the eyepiece constant throughout all of his exposures, until he knows the correct time for exposing that distance. Use one kind of light and do not try first sunlight and then artificial. Keep a complete record of every plate. It will greatly help in finding the correct time for photographing other objects.

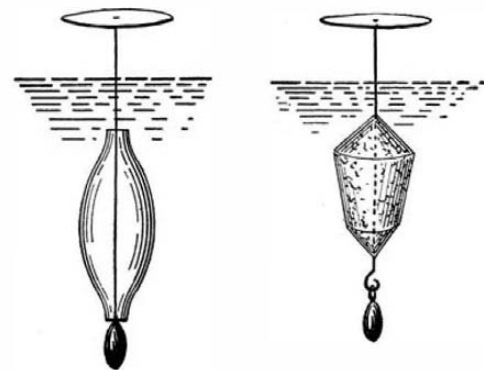
After the plate is exposed, develop it in any good developer and develop until the outlines of the image are clearly seen from the back of the plate. This is

Simple Hydro-comparators

By Frederick William Salmon

I WAS very pleased to see upon page 524 of the SCIENTIFIC AMERICAN for December 31st, 1910, a description of a very simple hydro-comparator of weights.

I have on various occasions used a very similar de-



Two simple hydro-comparators.

vice, except that I have made mine in other ways that I believe have advantages over the style that you describe.

I have made some out of very light glass tubing, heating it and blowing in it and so producing a kind of a bottle, shaped about like a fishing float, passing a fine wire through it, and sealing this wire in it with paraffine, and to the lower end of the wire securing a small fishing sinker, and to the upper end a small circle of thin celluloid. I have also made them of cork, very much like the one you described, except that I have always been very careful to make the upper and lower ends of the cork conical, and fit a fishing sinker to the bottom end of the wire, and then paraffine the whole instrument up to the celluloid pan at the top, and afterward scrape the paraffine off the upper wire for very accurate comparisons. Another good way to make one is to use a hook on the lower end of the wire passing through the float, then sinkers of various weights may be used with one float, and thus a much larger variety of work done with one instrument.

From practical experience I know that in many cases small air bubbles will cling to parts of a hydro-comparator made like the one described in your late issue, and these will lead to erroneous work, or cause other troubles and delays, while one made as I describe is very little subject to such trouble. I always paraffine them, and much prefer distilled water to any other medium.

Importation of Moth Parasites

THE Bureau of Entomology has been largely aided in its campaign against the moth family by the importation from abroad of moth parasites. The results from their importation have not been entirely satisfactory, yet they are sufficiently so to justify further work along these lines.