service, no artificial light can be produced which will quite take the place of the great luminary; but for the many, some other means must be sought.

When the promised days arrive that are to place in every man's house electric lights, cheaper than gas and as easily controlled, the problem will be satisfactorily solved; but at present we must content ourselves with prosaic paraffin (or kerosene), seeking only for the most practical method of utilizing its brilliant light.

After many experiments I have settled upon a flat, broad-based, lamp of good oil-holding capacity, which is attached to a heavy retort stand with movable arm, enabling it to be carried to any desired height. A duplex burner, and tall chimney, producing perfect combustion, afford a light of thirty candle-power, rendering possible the following average exposures with the plates I am now using; the variations in time being caused by differing densities and actinism of the tissues or substances to be photographed.

1½	inch objective	...	... 3 to 45 seconds
⅔	,,	...	... 7 to 90 ,,
4/10	,,	...	... ½ to 3 minutes
¼	,,	...	... 2 to 7 ,,
1/10	,,	...	... 4 to 10 ,,

This lamp produces sufficient light for use with the highest powers, requiring the employment of a diaphragm to reduce its intensity. Too brilliant an illumination, flooding the field with diffused rays, will almost certainly produce a blurred and indistinct image.

Microscope, camera, and lamp being ready for use, it becomes necessary to provide a suitable support for each, in order to form a complete working outfit. Some writers have described and illustrated their apparatus as being carried upon two or more separate tables or trestles. This I have found to be a most objectionable method in our city houses, since the vibration produced by passing vehicles is unevenly communicated to camera and microscope, producing inevitably a distorted or blurred image, especially when high powers are employed. By adopting, however, a long, solid platform, carrying all of the separate parts of the apparatus, this objectionable feature is removed, any vibration is communicated to camera and microscope alike, and there is no blurring of the resulting image whatever. In my apparatus this platform is about five feet in length, with a raised portion at one end, upon which the camera is firmly clamped by a milled head operated from beneath. The cone-front extends towards the platform upon which the microscope (inclined horizontally) is secured at such a height that its tube precisely enters the middle of the cone. Thus a straight line drawn from the object upon the stage through the microscope tube and camera should fall upon the focussing screen in the centre of the latter; and if all the parts are properly put together this will be the result, and the whole field will be equally illuminated when the lamp is placed in position. The stand of the latter is not secured to the platform, but is left free to be moved about and placed nearer to or farther from the microscope, as may be found necessary to secure the best results. A bull's-eye condenser upon movable stand, placed between the lamp and stage of the microscope, is necessary to concentrate the light upon the object, or upon the achromatic condenser when the latter is used, and to aid in the equal illumination of the field. The latter is of great importance, since the result of an uneven illumination will be a negative of differing densities in different parts, marring its beauty, and at times rendering it utterly worthless. Too much stress cannot be placed upon the necessity of securing an even, brilliant light of proper intensity for the object under examination.

Having sketched the various portions of the apparatus, and brought the whole together in its complete form, a few random extracts from my note-book may not prove uninteresting or valueless to some who are working in this direction.

Gelatine Plates.—For photo-micrography, the requisites of a perfect plate are great sensitiveness, combined with extreme latitude in length of exposure and density in development. It should be of a fine texture, showing clearly the most delicate lines and markings, evenly coated, and free from spots or blemishes of any sort. It is most provoking to have an otherwise perfect negative marred or ruined by opaque or transparent spots appearing in its most important portions.

Development.—Ferrous oxalate, or alkaline pyro, are equally useful, and either may be employed, as suits the fancy or convenience of the operator. My own preference is for the latter, and I always use it with ammonia, well restrained, having had no success with either soda or potash in this class of work. For all objects possessing much colour, it is best to continue the development until full density is obtained; but for very thin or transparent subjects, such as diatoms, or unstained vegetable tissues, it is far better to stop the development as soon as all details are out, and resort to after intensification; for which purpose, bleaching with mercury, followed by a 10 per cent. bath of sulphite of soda, will be found eminently satisfactory. I always use the alum bath, and invariably secure a clean negative of a cool grey colour, resembling iron development.

Printing.—The best ready-sensitized paper can be depended upon for producing satisfactory prints, showing the most delicate lines and markings of diatoms, and toning to any desired shade. Avoid over-printing; wash but slightly in two changes of water, the last slightly acidulated with acetic acid, and use an acetate-of-soda bath. Undesirable portions of the negative may be stopped out with a mat of suitable shape. An ordinary cabinet card makes a neat mount of convenient size, upon which may be written the name of the object or specimen, objective and magnification employed, and any other matter referring to print or negative which it may be necessary to note.

A carefully kept note-book is a most important aid to the worker in photo-micrography, and it should contain a record of his failures and successes alike. Notes should be made of the specimen, objective, magnification, exposure, plate and developer, which, carefully studied, will almost certainly enable him to make a success of each exposure.

Lantern Slides.—It is well to make the negative as far as possible of a suitable size for producing the positive by contact printing, which is convenient and satisfactory, though there can be no doubt that reproduction in the camera affords better results. Slow gelatino-bromide plates, such as Carbutt makes for this purpose, produce very satisfactory work, but the chlorides are so far superior that there can be little doubt of their being exclusively employed for positives in future. There is a richness of tone combined with great transparency in the shadows, and clear glass in the high lights, quite unattainable with bromide emulsions, and rivalling the best wet work. I shall show to-night slides made by both processes, and think there can be no doubt as to your verdict upon the question which is the better. Though neither may be what we should like, the chlorides most certainly have the advantage in all particulars.

Opaque Objects.—These may be photographed by the light from a lamp quite as well as transparent ones through which the light is thrown, a matter of which I have thus far spoken only. A strong illumination must be obtained by the employment of a suitable bull's-eye condenser, or a silvered reflector. The most satisfactory method, however, is by sunlight, allowing its direct rays to fall upon the object without the intervention of any condenser whatever. Very short exposures suffice for such illumination, varied only by the reflecting capacities of the object itself. A successfully-exposed plate of this class of subjects will give a print of the object standing out most brilliantly upon a black ground.

To secure the best results, most objects should be specially mounted for photographing. Some are best in a resinous medium such as Canada balsam, but most delicate tissues are obscured or entirely obliterated in this medium. So far as possible all preparations should be mounted in a fluid of some description that will distinctly render visible many tissues and markings which would be lost in balsam. This subject, however, is one of so great extent that it would require a special paper, and I merely refer to it now because of its importance, hoping at some future time to enlarge more fully upon it.

You will notice that my remarks have been confined to work that may be done with objectives of low or only moderately high powers, in no case exceeding one thousand diameters, having preferred to speak only of that which I have demonstrated by actual work as being practical. From recent experiments, I am fully convinced that the lamp-light, such as I have described, is capable of producing satisfactory work with very much higher powers, and shall hope at no distant day to show prints made from magnifications of not less than two thousand diameters, that will be satisfactory in all respects.

AN ATTEMPT TO PHOTOGRAPH THE SOLAR CORONA.

BY W. H. PICKERING.*

Judging by the tone of Dr. Huggins's communication in *Science* for May 15, I think he fails to understand a point I particularly

* Communicated by the Author.