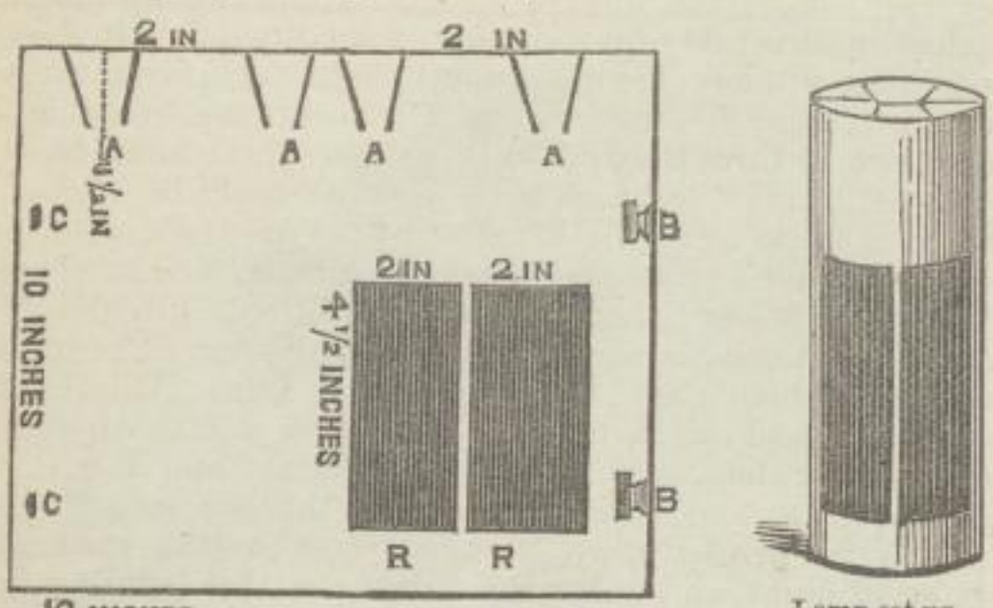
necessary. Procure a piece (12 inches by 10) of the thin sheet brass used for making stencil plates. With the scissors cut out at *one end*, as per sketch, two openings 4½ by 2 inches; the narrow strip between the two openings is for the purpose of preventing the coloured medium from



Lamp set up.

R R, openings for ruby or golden fabric. A A A A, slits for bending over top. B B, hooks. C C, eyes.

tightening across the opening and approaching too near the flame. Round these openings a number of small holes should be pierced; this can easily be done with a sewing-machine and a broken needle sharpened for the occasion. This will enable you to sew on the *outside* the golden fabric, which should be of two thicknesses; if the ruby fabric is preferred, one thickness will be sufficient.

At one end cut the brass as at B, and at the other end as at C, forming hooks and eyes to secure it when set up. The slits at the top are cut in the form of W and two V's; these are for the purpose of bending over, to prevent the light showing at the top; a child's night-light, or short wax candle, is then all that is required. There is no bottom to the lantern, and when standing on a table or shelf no escape of unsafe light; and I do not find it necessary to provide air-holes, the air finding its way in freely somehow. I have made them of Willesden paper and thin cardboard; but the brass is so safe and durable, and can, with a silvering solution, be silvered inside, and thus form a good reflector. The cost is small, and occupies, when flattened out, no more space than a panel mount.

REFLECTING TELESCOPES FOR PHOTOGRAPHY.

BY A. AINSLIE COMMON.*

THE simplest form of the reflecting telescope is that in which only one reflecting surface is used, known as the Herschelian, or, as Sir John Herschel, in his work, "The Telescope," calls it, the "Simple Reflector." The remarks he makes on this form are well worth most careful consideration in connection with the use of the reflecting telescope for photography.

All other forms have the second or third mirror only for the purpose of bringing the image formed by the large mirror where it can be more conveniently used. Of these, the Newtonian is the simplest and perhaps the best, as here the second reflection does not alter the size of the image, but only diverts it to the side of the tube. In the Cassegrain or Gregorian form the use of the convex or concave mirror enlarges the primary image more or less. Modifications of the Cassegrain form can be made by replacing the small convex mirror by a flat or very slightly curved mirror, in which case, although there is much loss of light, the image is kept nearly the same size as in the Newtonian. There is also the "Brachy" form, where the Cassegrain is used obliquely, but this is practically a Cassegrain. In all these telescopes, except the first and last-mentioned, the second mirror requires support of a kind that acts most injuriously on the image, causing rays to come from stars which, in the case of stars as faint as eight magnitude, show quite distinctly with such long exposures as are needed in photographing the nebulæ or clusters of very faint stars. In addition to these well-known forms of the reflecting telescope, there is the arrangement of three reflectors as a telescope indicated by me in the May number of the *Monthly Notices* of the Royal Astronomical Society, and also the application of the Coudé principle, treated of at length by M. Lœwy in the June number of the *Bulletin Astronomique* (1884). As far as I know, there has not been any practical application of the Coudé principle to the reflector. The need of three reflections would involve great loss of light, and for this reason alone would render it unsuitable for photography, where so much depends on the power of the telescope to bring together, as much light as possible on the surface of the sensitive plate. Apart from this great loss of light there would be enormous difficulties in making such a telescope of even three-foot aperture, indeed, I am very doubtful if it could be done; there is the difficulty of keeping the different mirrors free from flexure and in proper adjustment; there is the fact that the form of mounting that must be used to carry the ponderous mirrors would be that most unfavourable to the good performance of the whole as a telescope in regard to the atmospheric disturbance due to the mounting; and last, though not least, the position of the external plane mirror would be so exposed that it would not stand many nights' work. With the flat mirrors of a Newtonian telescope one has much difficulty, as a slight rise in temperature will dew them at once, and under ordinary circumstances they become very soon so dull that they require re-silvering many times more frequently than the large mirror. Certainly the large plane mirror would conserve its heat better than the small flat of a Newtonian; but from the exposed position it would occupy, it would certainly be a source of continual trouble. There is only one good thing in such arrangements, and that is that the observer has not to follow the eye-piece, which only rotates, and does not change its position. For general observational work this becomes of importance. For comet-seeking, for which I believe this telescope was first used, it is difficult to imagine a more suitable arrangement than that brought again to the notice of astronomers by M. Hermite in *L'Astronomie*, October, 1884, though his proposition to dispense with a tube or to use a fixed one, would make a difficulty at the eye-end, where the image would rotate, as it would in the case of a fixed telescope with a mirror moving in front, after the manner of a siderostat. For photography, all these latter forms of telescope are not admissable; even for large fields, when a refractor specially made was used, it would be better to use it as a simple equatorial than to lose the light by two additional reflections. Considering carefully the different reflecting telescopes enumerated above, there does not appear to be anything that can be more simple than the Herschelian, and nothing more suitable, judging from what has been done, than the Newtonian; nor does there seem anything in any other form that offers greater advantages than these, either on the grounds of simplicity, easy manipulation, possible increase of size, and, what is of vital importance, smallness of first cost. It is on one or or the other that I should entirely rely as the photographic telescope of the future. Whether the Herschelian form would be better in practical use than the Newtonian, or, rather, whether the reflecting surface could be made as good in this case, would only be shown by actual trial; if it could then, for the reason already mentioned, the image would be the best, and the best kind of telescope for the purpose of photography would be found.

(To be continued.)

* *Nature.*

Correspondence.

LENSES FOR PORTRAITURE.

SIR,—In connection with the remarks of yourself, Mr. Debenham, Mr. Wheeler, and Mr. Burton, on this subject, I should like to quote what Sir David Brewster said regarding this matter in 1856. The quotation is from a paper read before the Photographic Society of Scotland, and reported in "Sutton's Photographic Notes," Vol. I., page ix. (second edition).

"For taking buildings and landscapes, large lenses are not necessary; but they have been introduced for the purpose of taking portraits quickly when the light is faint, or when the sitter cannot sit steadily for a sufficient time. The effect of these large lenses is to give hideous representations of the sitter; and it is doubtless from this cause, principally, that photographic portraiture is so extremely defective, exaggerating every feature, and producing pic-