

The New Concentric Lens.

IN answer to inquiries received, regarding the lens spoken of in the following article, we think, as we have not as yet given the new lens a trial, that we cannot answer the inquiry better than by giving the article clipped from that father of journals (and a good father, too), the *British Journal of Photography*, in its entirety, feeling that it will be of interest to all:

Among the innumerable lenses produced daily in the ateliers of the optician one will search in vain for any in which the application of a new principle of construction is involved. Changes have been rung upon pre-existing discoveries, and improvements, in some cases of great value, have been made, but it is long since any novelty in principle has been imported into the art of lens-manufacture. Happily we are now able to record the advent of one in which a new principle of great practical value has been introduced.

We have on previous occasions spoken of a patent new "concentric" lens of Messrs. Ross & Co., which was being constructed from formulæ by Dr. Hugo Schroeder, the mathematician of the house. Although the patent was completed in 1889, the lens could not be commercially produced before, in consequence of the difficulty of always obtaining the exact qualities of special glass required in its construction. This delay, however, has afforded ample time to test the glass, which, after three years, shows no deterioration.

Notwithstanding our having already given an account of the optical principles involved in, and described the construction of, the lens, we think it well to refer briefly to them again. And first we would observe that, in external appearance, it is nearly identical with the well-known "Portable Symmetrical" of this firm; but, if the lenses be critically examined, it will be found that, while each of those forming the symmetricals has its convex surface of a shorter radius of curvature than its concave surface—a condition of things absolutely necessary in all positive combinations of flint and crown glass—in the "concentrics" the reverse condition prevails, for the concave surface is of shorter radius than the convex. Both surfaces have one common radial centre, and are therefore concentric, hence the name.

Physicists are, of course, well aware that such a condition as that above described could not possibly be fulfilled with the ordinary optical glass formerly at our disposal, because of the flint possessing not only greater dispersion, but also greater refraction than its crown partner. The construction of a concentric positive lens was, therefore, impossible until the Abbe-Schott glass of Jena was made available. And among the various classes of this new glass were some corresponding to our crown and flint, but in which the former had a higher index of refraction than

the latter. The construction of the new lens may be stated thus: It is composed of two similar or symmetrical achromatic combinations, each being formed of two simple lenses, a plano-convex of glass of a high refractive and low dispersive power, cemented to a plano-concave of a lower refracting index, but of the same, or preferably of a higher, dispersive power, these being cemented at the two flat surfaces.

On theoretical grounds, we stated, three years since, that a combination thus formed ought to give such an elongation of the oblique pencils as to yield a flat field with good marginal sharpness; and, now that its commercial production is *un fait accompli*, we have witnessed in the new factory of Messrs. Ross & Co. a series of tests to which it has been subjected, by which this hypothetical conclusion has been fully established.

The demonstration established the fact that the new lens, with an aperture of $f/20$, covered an area of large angular magnitude (over 60° on the base line and about 80° on the diagonal) with great sharpness. The subject tested was a watch dial, the image of which, together with those of an adjoining lamp flame and an artificial star, was examined through a powerful eyepiece from positions both central and oblique to the axis of the lens. To enable this to be effectively accomplished, both the dial and the eyepiece were made to move over a considerable distance at a right angle to the axis of the lens, and observations could thus be, and were, made at various successive stages, representing inches on the ground glass of the camera from the centre to the side of the field. The definition was uniformly excellent throughout, establishing the fact that not only was the concentric lens anastigmatic, but that it had a perfectly flat field.

How, it may be asked, does the new lens behave when removed into the field and away from the optician's test room—a comparison some might think similar to that as between a laboratory experiment and a manufacture on a large scale? We can reply: Having placed the lens on our own camera and subjected it to the test of landscape experiment, we found, on applying it practically to the reproduction of familiar outdoor scenes containing numerous objects long used as tests, that when focusing the centre of the plate (a 10×8 one, the focus of the lens being eight inches), and employing a magnifier of great focal power for the purpose, there was absolutely no difference in definition between the centre and the margin, that the illumination was even, the depth of definition great, and the perfection of the image all that could be desired. The exposed and developed plates resulting affirm this in a lasting form.

Not only for landscape and architectural work but to those who have to make sharp copies of maps and similar cartographic subjects we cannot conceive of anything more perfect, as marginal sharpness is secured without the necessity, hitherto existing, of stopping down to a light-destroying aperture.

The "concentric" must prove a great boon