Integral Photography

A New Discovery by Professor Lippmann

PROF. LIPPIMANN of Paris is working on a very remarkable new photographic method which he has termed "integral photography." The nature of this is best explained by reference to the accompanying diagram. It should be noted that the process is designed to work without a camera. The sensitized plate is coated with a large number of very small globules of glass or other transparent material. In each of these acts as a miniature eye, with a sensitive plate for its retina. The globules are very small, less than one-hundredth of an inch in diameter. In front each has a little hole which acts as the lens of the miniature eye. Suppose an object to be situated at $M, M'$, as indicated in the diagram. Consider any globule. Rays from the points $M, M'$ will pass through the minute lens, and an image will be formed at the back of the globule upon the sensitized plate at $M, M'$. Thus each globe will contain a minute picture of the objects placed in front of the plate. This picture is brought out by developing the plate and fixing it in the usual way. Of course this yields a negative, which must be reversed by the use of a suitable reversing bath.

The result is a transparency, in which all the minute pictures in the individual globules are combined into one image of the original object. To view it, a good light is placed behind the plate, so that light passes through all the globules. Suppose the eye viewing the transparency to be placed at $O$, the point which when the picture was taken, lay on a line joining one globe with the point $M$ of the object. The process which now occurs will be the opposite of what happened when the picture was taken. In other words, the eye will receive from the globule a view of the image is of the point $M$. Other globules will send images of the point $M'$, etc., at the same time, so that the eye will see the different portions of the image coming from all the different globules. In this way a complete image of the object originally presented to the plate is seen. If the eye is placed at some other point $O'$, or if $O'$ represent the position of the other eye, the object will also be seen, but the light received at the eye will come from somewhat different portions of the globules, and the appearance presented will differ accordingly from that seen at $O$.

The difference is of precisely the same kind as that which distinguished the appearance of the same object when seen from two different points. In other words, when passing from $O$ to $O'$, the observer will receive the same impression, in looking at the transparency, as if he were to move in the laboratory, so that Prof. Lippmann has been forced to abandon his attempts in this direction for the time being. The fact is that the working out of a process of this kind is a technical problem, rather than a scientific problem. There is a good field here for inventors to exercise their ingenuity, for if a Lippmann photographic plate could be made, it would be of great value, inasmuch as in order to take a photograph the plate is simply exposed in a landscape or other object, without any camera at all, and the picture obtained possesses the remarkable properties explained above.

In the meantime Prof. Lippmann has been making interesting experiments with an apparatus which is intended to show some practical results of the principle expressed, and without use of such minute globules he has succeeded in producing some very striking effects. A number of ordinary lenses (even spectacle lenses may be used) are set into squares shape, so that they can be fitted together into a continuous frame. A number of such lenses are put in the front wall of a camera, as shown in our illustration. The more lenses are used, the better is the result obtained, but twelve is found to be a sufficient number. These lenses correspond to the globules spoken of above, each image being formed on a separate portion of the photographic plate at the back of the camera. Each lens makes a picture on the plate, the portions of the plate illuminated by the several lenses being kept separate by an arrangement of black cardboard cells or partitions. One of our views represents the front of the camera and the next of the objects, where we see the pictures of the cells in the plate-holder. This latter carries a large plate of such slits, and a large plate of images, and is placed in the camera as usual. The plate-holder, however, is made with a slide in the back as well as in the front, for a purpose which will appear presently. After the picture is taken, the negative is developed as usual, and is reversed either by means of a reversing bath, or by copying it, so that a transparent positive is obtained. The twelve portraits are not quite alike, for each lens forms its image from a somewhat different point of view. The transparency is put back in the holder, both sides of which are now exposed, while light is sent through from behind. The observer looks in through the lenses with both eyes, when he sees a single view in relief of the object photographed. On moving the head from side to side, or up and down, the same effect is observed as would be under similar circumstances when looking at the real object, that is, objects which cover one another when looked at from one point, are seen to separate when viewed from another. Even with this simple apparatus the effect is very pleasing.

Proposed Aeronautic Map

At a recent meeting of the Academie des Sciences, M. Leclerc, chief of the French Government Survey Department, presented the project which the Aeronautic Commission intends to carry out, establishing an aeronautic map. The proposed map is of special size, and is to be made up after a previous model made by the Aero Club. Each plate of the aeronautic map will be a sheet taking in one degree in latitude and longitude and there will be twenty-four such sheets included in one sheet of the world's map. This latter sheet occupies 6 degrees longitude and 8 degrees latitude, and the whole map will be 36 by 40 inches. The proposed aeronautic map will be a sheet taking in one degree in latitude and longitude, and there will be twenty-four such sheets included in one sheet of the world's map. This latter sheet occupies 6 degrees longitude and 8 degrees latitude, and the whole map will be 36 by 40 inches. The proposed aeronautic map will be a sheet taking in one degree in latitude and longitude, and there will be twenty-four such sheets included in one sheet of the world's map. This latter sheet occupies 6 degrees longitude and 8 degrees latitude, and the whole map will be 36 by 40 inches.