Three-Dimensional Photography

By EDWARD W. BAILEY, CH.E. IV

ONE of the most spectacular types of photography is one which gives the illusion of three dimensions on a plain piece of paper; stereoscopic photography. When viewing this type of picture, one obtains the illusion of the whole scene being made up of miniature models beyond a little window through which the observer is looking. The effect is difficut to describe but very real when actually observed. For instance, piping in a picture will stand out in front of machinery and seem to be actually pipe instead of a line on a photograph. All objects can be accurately placed in the picture without having to take relative sizes into account.

When the stereograph is made in natural color, unbelievable reality is obtained. With the development of new processes, stereographs in the future may become a common method of photography.

When a subject is to be reproduced with the stereoscopic effect, it is necessary to have two pictures taken from two different positions. A picture corresponding to the view seen by each eye must be made. The two pictures will appear to be identical, and they will be identical in every part except fine detail and perspective. Only close examination will show up their differences which may be only a change in the highlight or shadow on some item in the picture. It is this minute difference which makes possible the illusion of depth in the final reproduction.

When a picture is viewed which has been made in the normal manner, it is impossible to accurately determine where the object is because it is fixed only in direction. However, when the object is seen from two different directions, it is fixed both as to direction and distance. This is the principle of the stereograph.

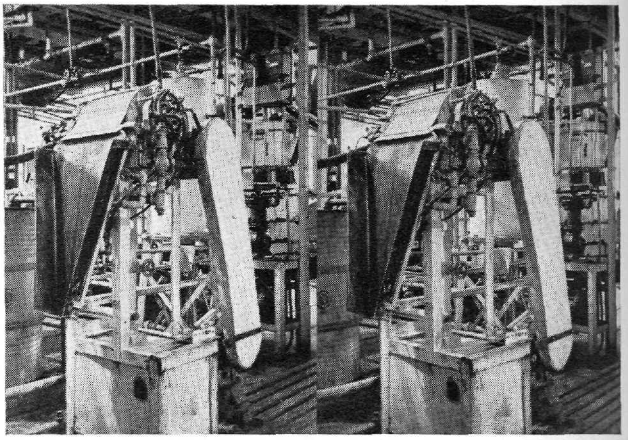
Stereoscopic pictures can be taken of still objects by anyone with a box camera and a ruler. Excellent results will be obtained with a little care. A ruler on a table will provide a guide for moving the camera the correct distance between exposures while keeping it pointed in the right direction. (The distance is variable for different conditions.)

The two pictures must be taken with no motion in the object between the exposures and the length of each exposure must be the same.

If two cameras are arranged side by side, with the shutter triggers attached to some common arm so they will go off at exactly the same time, pictures of objects in motion may be taken. Cameras are made especially for this purpose. They have two complete lens and shutter systems built into the same box and operated by one shutter lever. There are so many still objects which prove interesting, however, that a large enough field is available to keep the average photographer quite busy.

It is very necessary that the camera be moved only sideways during the two exposures. By constructing a simple base for the camera, pictures can be rapidly taken with the assurance that the camera will be in the correct position for each exposure. A slide bar can easily be constructed from a block of wood, two strips of metal and a ¼-inch 20-thread bolt.

The distance over which the camera is moved, the interocular distance, varies with the size and



The Oliver filter can be seen in three-dimensions by holding a card between the two similar pictures and superimposing them

type of equipment used and the distance to the object being photographed. The closer the camera is to the object, the less the required interocular distance. The distance may be as large as a mile for aerial photographs or as small as a fraction of an inch for extreme close-ups. A formula for conveniently finding the interocular distance is:

$$I = \frac{W \times D}{F \times 24}$$

where I is the interocular distance in inches

W is the width of the picture in inches

D is the distance to the object in inches

F is the focal length of the camera lens in inches.

This formula may be reduced to $I = D/30$ for very rough work.

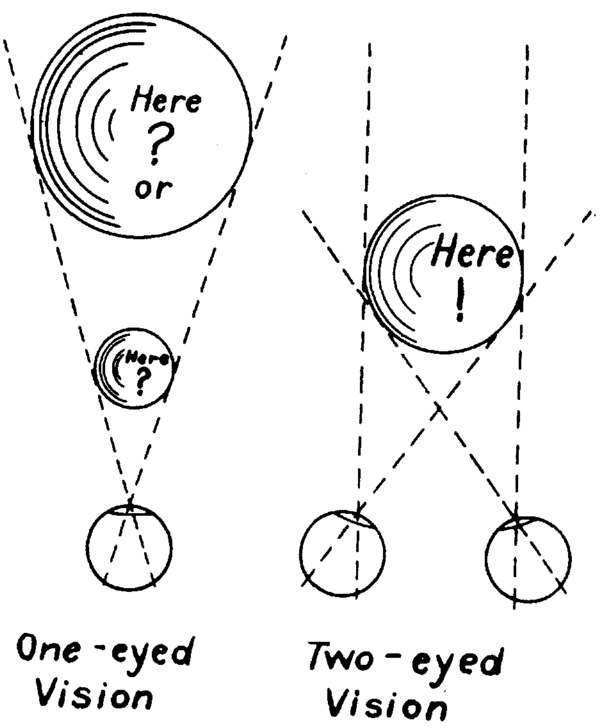
For object distances of 6 to 8 feet an interocular distance of approximately 2¾ inches should be used with most cameras.

To take a stereoscopic picture using only a box camera and a ruler, place the camera on a table aimed at the object to be photographed. When the object is centered in the finder of the camera, place the ruler in front and against the camera so that it is parallel to the front of the camera; this gives measured distances through which the camera can be moved. Now take the first picture.

Without moving the camera, wind the film to the next picture. Move the camera sideways to the right or left depending on which picture was chosen to be taken first. It is very important that the camera be moved in only the one direction, keeping the front of it parallel to the ruler. When everything is ready, take the second picture.

The presentation of the completed pictures is the most difficult problem. The picture corresponding to that seen by the right eye must go only to the right eye and the left eye must see only the image meant for it.

The simplest method of presentation is to paste both pictures to a card, the right eye picture on the left and the left eye picture on the right.



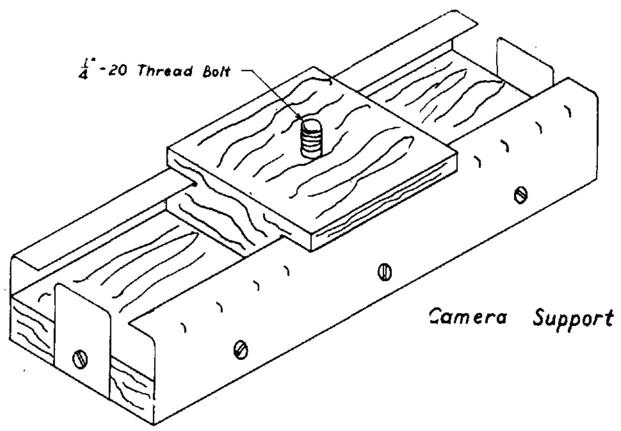
—*Courtesy Polaroid Corp.*

This diagram illustrates the principle of two-eyed vision and shows why three-dimensional photography is possible

Then by holding one end of a card about a foot long between the two pictures and putting the other end between the eyes, each eye will see only the picture meant for it. However, two pictures will still be seen. By looking lazily through the pictures and completely relaxing the eyes, the two pictures can be superimposed, giving the desired effect.

After some practice has been made in this method with success, the card can be taken away. By allowing the eyes to relax in the same dreamy manner, three pictures will be seen instead of two. The middle picture is the one with depth and reality. Both of these methods require much patience to see the picture for the first time, but once the picture is seen in three dimensions, it becomes ever easier to quickly repeat the method. After some practice, only a fraction of a second is necessary to see the pictures as they should be seen.

The first method described has been developed into the stereoscope, the device which has been in use for so many years.



A simple support such as this will hold the camera steady and permit the correct movement between exposures

A new and improved method of three-dimensional presentation known as vectography has come with the development of polarizing film. Handled as ordinary prints, vectographs may be viewed by more than one person at a time, a great advantage over other methods. When viewed through special spectacles made of polarizing film, vectographs take on the three-dimensional appearance.

In vectography, the customary two images are printed from wash-off relief film onto vectograph film which resembles clear acetate sheeting. The printing is accomplished by an imbibition-transfer process similar to the one used in making three-color prints. Each image is printed on a different side of the vectograph film. The polarizing element in the vectograph film in conjunction with the polarizing spectacles permit each eye to see only its own separate image, thus creating the illusion of depth.

The image for the right eye is apparent through

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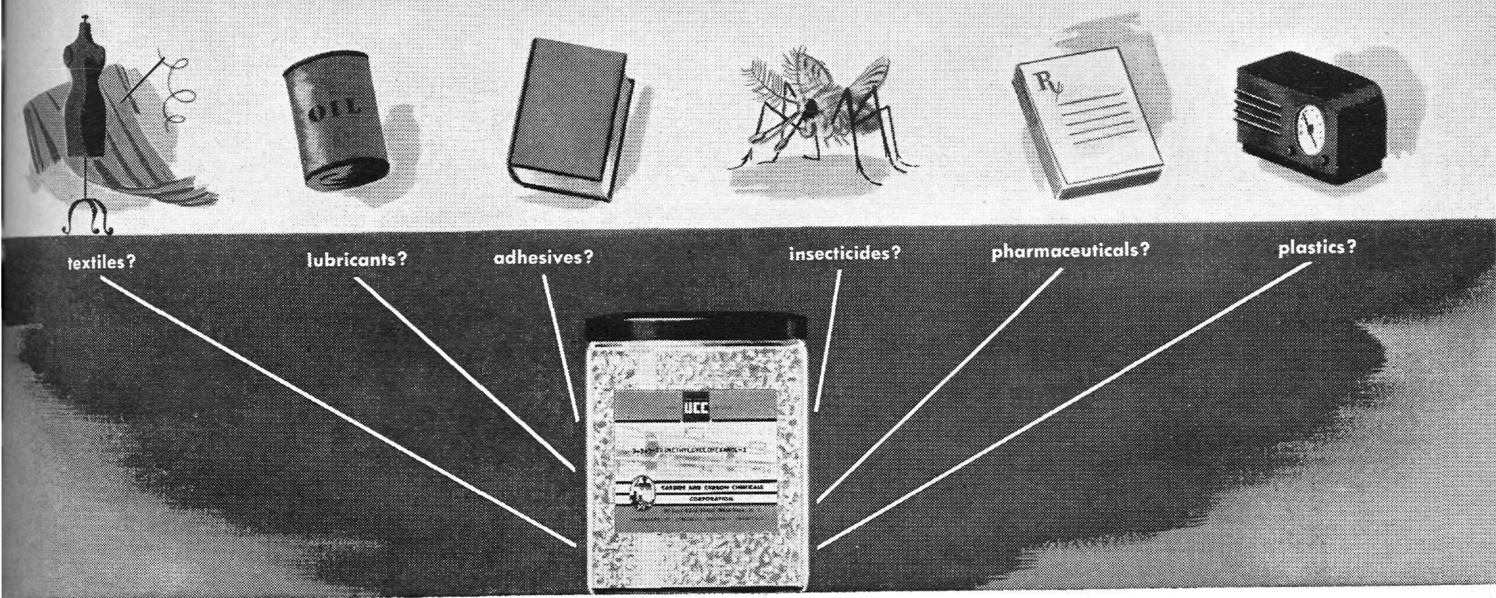
the polarizer in front of the right eye but is invisible through the left eye polarizer, due to the fact that the left eye polarizer has been set in the spectacle frame with its axis of polarization at right angles to the right eye polarizer. The same principle applies to the image for the left eye.

At the close of the war when polarized film will not be entirely taken by the armed forces and war industry, "vectographs" will become common and three dimensional movies will probably be produced on a large scale.

What would you do with some 3,3,5-trimethylcyclohexanol-1?



EVEN *we* know only a little of what you might do with it... yet. Trimethylcyclohexanol (you pronounce it try'-meth'-il-sy'-klo-hex'-an-ohl) is a new industrial chemical by CARBIDE AND CARBON CHEMICALS CORPORATION... made with atoms obtained from common substances, rearranged into molecules that are not known to exist in nature.

What's this new synthetic organic chemical good for? No one yet knows all of the useful things it might be made to do. If you are technically minded you'll find some of the facts so far discovered in the italicized paragraph at the right. Whatever your interest, you will be glad to know that this new chemical has potential uses in the making of such things as medicines, plastics, lubricating oils, and adhesives.

In their service to industry as incubators for raw materials, the laboratories of this Unit of UCC are continually developing such new chemicals. An almost predictable percentage of them prove to be extremely valuable. Out of hundreds already developed have come scores from which scientists in industry have developed useful products of many kinds.

Some of the chemicals are used to make superior anti-freezes. Others are raw materials for quantity production of vitamins and life-saving drugs. Still others make possible improved cosmetics, plastics, textiles, photofilm, insect repellents, anesthetics... and hundreds of things of benefit to you in your daily life.

Through continuing research which is developing new materials out of common substances, CARBIDE AND CARBON CHEMICALS CORPORATION is helping to make many things more plentiful or more useful. And the research of this one Unit... in that field which often must appear to the layman as "unknown chemicals"... gives you an idea of what the combined research of all UCC Units in many basic fields means to you.

▼

As Trimethylcyclohexanol is one of the newest additions to this family of synthetic organic chemicals, its story is still incomplete. It is an alcohol with a high boiling point (388° Fahrenheit). At room temperature, it is a white solid with an odor like menthol. It dissolves in other alcohols, gasoline, benzene, ethers, and vegetable oils like linseed oil, but does not dissolve in water. It can be supplied in carload quantities if and when the need arises.

Technically minded men and women can obtain information on the properties and uses of more than 160 other products of Carbide and Carbon Chemicals Corporation by writing for Booklet P-5, "Synthetic Organic Chemicals."

Model of Molecule of Trimethylcyclohexanol

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