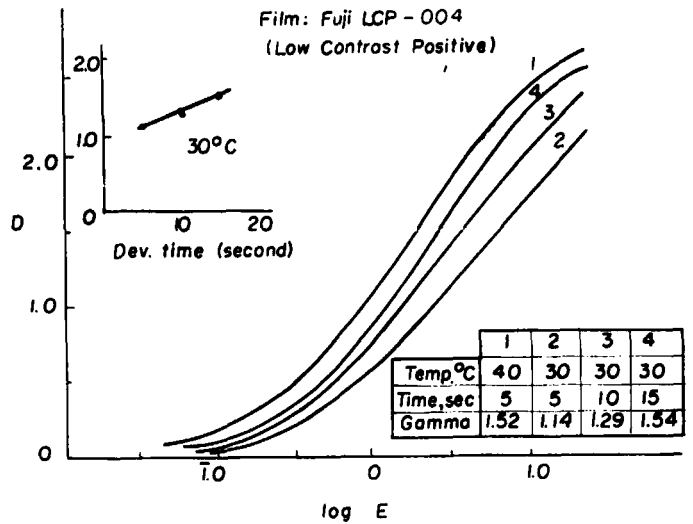


**Table I. Film Processing Solutions.**

Developer	
<i>A Solution</i>	
Metol.....	5 g
Sodium Sulfite, anhydrous..	70 g
Hydroquinone.....	60 g
Potassium Bromide.....	20 g
6-Nitrobenzimidazol.....	0.1 g
Water make to.....	1,000 ml
<i>B Solution</i>	
Caustic soda.....	100 g
Water make to.....	1,000 ml
Add B to A solution before use	
Fixer	
Ammonium	
Thiosulfate..... (1:4)	1,000 ml
Sodium Sulfite, anhydrous....	7 g
Acetic acid, glacial (28%)....	3 ml
Sodium metaborate.....	7 g
Potassium Alum.....	7 g



**Fig. 8. Sensitometric curves of rapid processor.**

system has been adopted, while drying is done with the application of infrared rays. The time required for processing the entire film is about one minute, with 30 sec more for film passage between camera and reproducer (Fig. 7 and Table II). The sensitometric curves from this processing are shown in Fig. 8.

The reproducer is a 2-3 intermittent TV projector with a vidicon-type camera. The overall horizontal limiting resolution is 500 lines.

**Table II. Processing Time, Sec.**

Developing.....	8.0
Fixing.....	15.0
Washing.....	8.0
Drying.....	30.0
Total processing time.....	61.0
From recording to reproducing.....	90.0

**Acknowledgment**

An expression of appreciation is due Hokushin Electric Co., Ltd., which generously consented to design and manufacture the camera and other mechanical parts needed for constructing this equipment. Thanks are also due T. Nomura, Chief of TV Research Section, for his generous advice and guidance.

**Letter to the Editor:**

**Historical Note on Composite Production of Motion Pictures**

Referring to the SMPTE *Journal* for December 1959, the article on "Electronic Composites in Modern Television," does not seem to go back far enough to the source of devices designed to combine "rear-view" projected backgrounds and foreground images, with both in action.

At the end of the article, under the heading of "Reference," the earliest patent listed is June 16, 1936.

May I call your attention to the fact that all inventions of this nature spring from my original patent applied for on April 3, 1925, which was granted on August 18, 1931. (These were non-electronic, but effective.)

Please find herewith excerpts from this patent, to indicate its general nature. It is necessary to refer to the complete patent to grasp all the possibilities that are covered by it.

To the best of my knowledge, my invention is the very first to be successfully used to combine two distinctly separate images, to appear as a single picture with the combination (back-

ground and foreground) in simultaneous action.

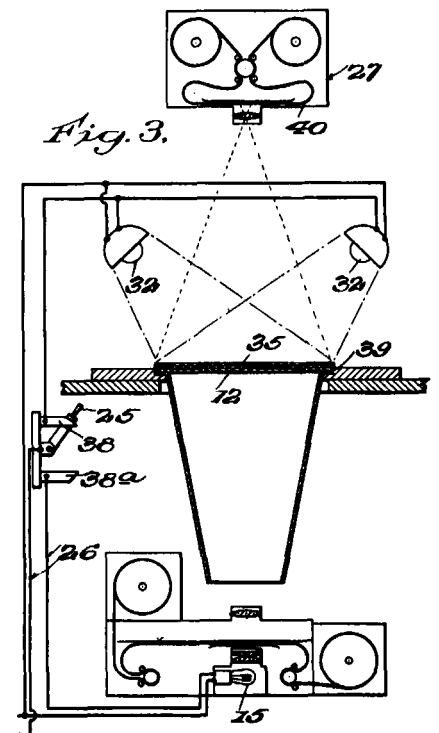
I will greatly appreciate your kindness in publishing this information in the *Journal*.

December 21, 1959      MAX FLEISCHER  
666 West End Ave.,  
New York 25, N. Y.

*Editorial Note:* No editorial position can of course be taken on patent claims. The paper by Messrs. Kennedy and Gaskins purported to cover only electronic processes for television. Mr. Fleischer's material is, however, of possible historical interest.

*Excerpts from U. S. Patent 1,819,883, August 18, 1931, Method and Means for Producing Films, to Max Fleischer:*

"This invention relates to a process and apparatus for producing novelties in pictures and has for its object the provision of a process for producing motion pictures on films or other media for



projection in which a particular figure may be shown in action or in repose at any point on a background.

"A further object of the invention is the provision of a process for producing moving pictures in which a figure in action is supplied to a definite background which is also in action and so coordinated that the composite pictures will form one continuous medium for projection.

"Other objects include the provision of a device for photographing projected pictures and for photographing

other pictures directly on the same film by reflected light, with means for operating the projecting apparatus at will and also for operating a shutter and an instrumentality for taking the photographs, with clutch mechanism controlling the driving of the film to be projected and the negative carried by the camera.

"*Claim 3* — The method of producing negatives for cinematography which comprises forming a projection film containing a plurality of frames and disclosing a series of pictures of a back-

ground involving moving elements in different poses, projecting frames of the projection film on a screen, masking the background as projected on the screen except the selected poses of the moving element, photographing selected poses on a sufficient number of raw stock frames of a negative for retaining a selected pose in suspended position, masking the selected poses and photographing other frames in succession disclosing the sequence of the frames of the projection films." [See Fig. 3, reproduced here from the patent.]

## Correcting Lenses for Underwater Use

By A. IVANOFF  
and PAUL CHERNEY

**Submarine photographs, generally taken through a plane window in the wall of the box holding the camera, compare unfavorably with those taken on land, even when wide-angle lenses are used, because of difficulties introduced by the flat window. A submarine lens attachment, consisting of lenses properly chosen and mounted to overcome these problems, is described. The proper powers and diameters of the lenses are discussed, together with corrections for chromatic aberration and astigmatism.**

**L**IGHT WAVES TRAVEL relatively badly in the sea, limiting the possibilities of submarine photography. The selective absorption of sunlight by water necessitates the use of large apertures and, especially for color photography, artificial lighting. Good artificial lighting is difficult to realize, and even the best does not carry very far. The scattering of light is still more troublesome; the photographer finds himself in a luminous mist which diminishes the shadows, cuts down the contrasts and veils the more distant surroundings. It is scarcely possible to diminish the effects of this scattering by the use of colored filters, for the scattering of light by sea water is in general very slightly selective. At present the only way to minimize its effects is to take the photograph or films as near the object as possible, using a camera lens of the shortest possible focal length. This not only gives a reasonable depth of field but requires only relatively feeble artificial lighting. The use of wide-field lenses for

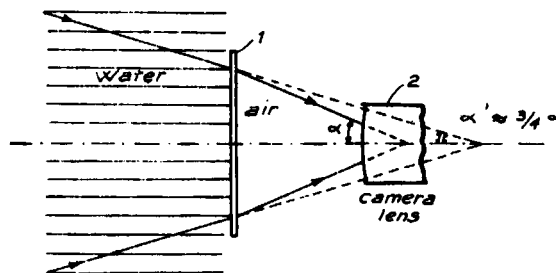
submarine photography or cinematography raises, however, a minor problem of optical instrumentation.

Submarine photographs are generally taken through a plane window in the wall of a watertight box holding the camera (Fig. 1). This window acts as a plane surface of separation between the water outside and the air inside the box. Such a surface of separation makes the immersed objects appear nearer and larger in the ratio of the refractive index of water to that of air, i.e., approximately 4:3. The camera lens has therefore to be focused for 3/4 of the actual distance from the object and, what is much more serious, the field and depth

of view are cut down. In particular, the camera behaves with respect to the field of view as if it had a lens of 4/3 times its actual focal length. To photograph an object of given dimensions, it is necessary therefore to take the photograph at a distance 4/3 times the distance used with the same camera in air, for example, at 4 instead of 3 m (meters). Even in the very clear waters of the Mediterranean, the radiance of the scattered light between object and camera increases about 40% for an increase in distance from 3 to 4 m. Moreover, the difficulties of artificial lighting increase still more rapidly with increase in distance.

It is possible to overcome in some degree the loss of field of view in submarine photography by using wide-angle lenses; these lenses give, through a plane window, only the field of a normal lens in air. Therefore when this method is used, submarine photography, which demands the largest possible field of view, always compares unfavorably with normal photography on land. The aberrations produced by the flat window reduce, moreover, the quality of the image. The

**Fig. 1. A window (1) in a watertight box containing a camera lens (2) is placed in contact with the water.**



This is the system that has been used in the prior art. Such a system comprises a water-to-air plane diopter which diminishes the field, in a ratio equal to the index  $n$  of refraction of the water, and introduces besides considerable aberrations at the periphery of the optical field. The field  $\alpha'$  of such a device is substantially equal to three-fourths of the field  $\alpha$  of the camera lens.

Presented on October 8, 1957, at the Society's Convention in Philadelphia, by A. Ivanoff, Museum of Natural History, Paris, France; and Paul Cherney (who read the paper), Cinefot International Corp., 303 West 42 St., New York 36.

(This paper was first received on October 17, 1957, and in revised form on February 12, 1960.)