4. Pestrecov, Dr. Konstantin, Resolving Power of Photographic Lenses. PHOTOGRAMMETRIC ENGINEERING, Volume 13, Number 1, Pages 64 to 85, March, 1947.
5. Selwyn, E. W. H. and Tearle, J. L., The Performance of Aircraft Lenses. The Proceedings of the Physical Society, Volume 58, Part 5, Number 329, Pages 493–525, September, 1946.
6. Howlett, L. E., Photographic Resolving Power. C. J. R. A, 24: 15–40, July, 1946.
7. Gardner, Irvine C. and Case, Frank A., Precision Camera for Testing Lenses. Journal of Research of the National Bureau of Standards, Volume 18, Pages 449–460, April, 1937.
8. Field, R. H., A Determination of the Distortion in a Number of Air Camera Lenses, C. J. R., Volume 10: 239–243, February, 1934.
9. Washer, Francis E., Locating the Principal Point of Precision Aeroplane Mapping. Journal of Research of the National Bureau of Standards, Volume 27, Number 4, Pages 405–412, 1941.
10. Ingalls, A. L. and Pestrecov, K., Centering of Optical Systems. Journal of the Optical Society of America, Volume 38, Number 4, Pages 343–349, 1948.
11. Calhoun, J. M., The Physical Properties and Dimensional Stability of Safety Aerographic Film. Photogrammetric Engineering, Volume XIII, Number 2, Pages 163–221, June, 1947.
12. Carman, P. D., Dimensional Changes in Safety Topographic Aero Film Under Service Conditions. C. J. R. F, 24: 509–517, 1946.
13. Nodwell, R. A., and Burstow, R. C., An Accurate Mount for Tri Metrogon Photography. C. J. R. F, 24: 501–508, 1946.

FILM PROCESSING UNIT

New Zealand Aerial Mapping Ltd., Hastings, New Zealand

MENTION the words "film differential" to the photogrammetrist and he will immediately take up the subject with eloquence in pointing out the evils of films being stretched and distorted during development.

Uneven development and pressure bands associated with the manual development, causing poor matching of prints, particularly in mosaic work, caused us in New Zealand to design our own processor.

Essentially, with minimum tension on the film (not more than 10 ft. between driving points) the unit develops, fixes, washes and dries the entire length of film in one continuous mechanical operation.

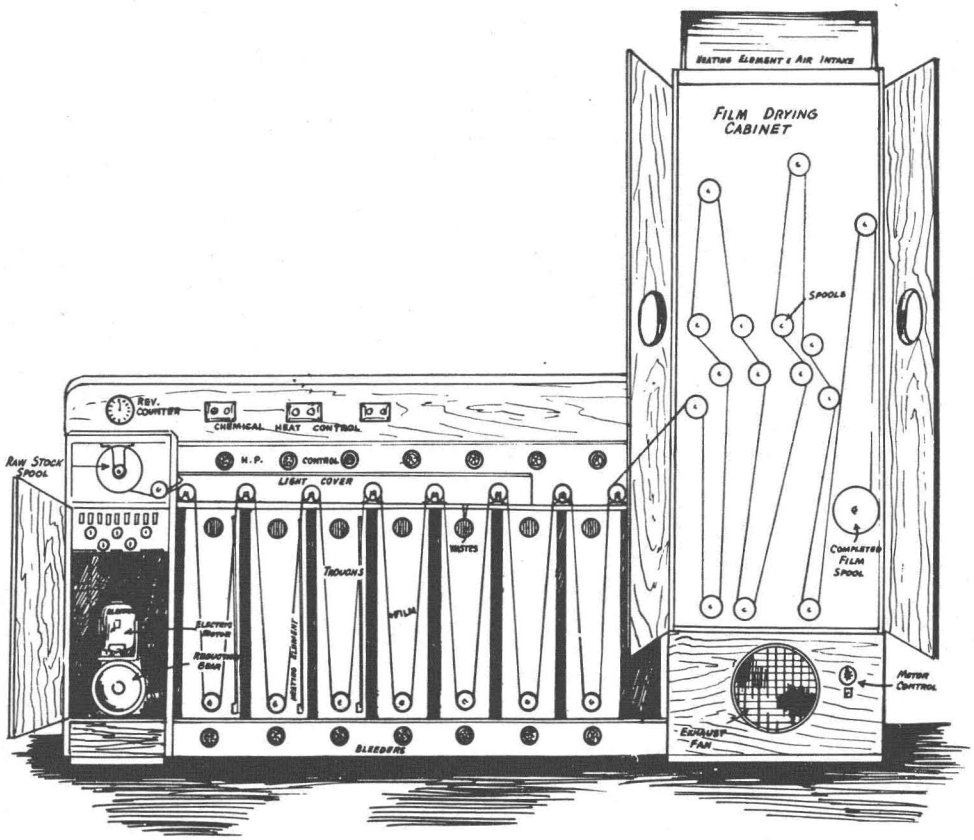
On reference to the sketch, you will observe how we have constructed our unit. On the left, a rheostatically-controlled motor is mounted vertically onto a reduction drive, the final shaft from which protrudes through the rear to drive all the many rollers by sprocket and chain at the same speed. Actually, we used a separator crank case for it contained the large initial reduction gears and oil bath.

Seven stainless steel troughs, welded together, make up the central portion. The first three, containing the wetting agent, the developer and the first fixer respectively, are lagged and are kept at constant temperature by immersion heaters and separate thermostatic controls. Then follows the second fixer, two running washers and the final wetting agent. Each trough has an overflow, a bleeder waste and H. P. inlet at the bottom.

Rubber rollers, carefully cut to the same diameter, slip into key sprockets at the rear, each time, to carry the film from one trough to the next at the same rate. Similar rollers, mounted on stainless steel rods but not driven, guide the film near the bottom of each trough.

On the right, a tall drying cupboard containing numerous reels, accommodates approximately 80 ft. of film which is dried by air passing through an element at the top of the cupboard and drawn off by a fan at the bottom. A slipping clutch on the large take-up reel and a cord passing over a groove in most of the smaller guiding reels within the drying cupboard, satisfactorily take care of the film tension during the last stages of processing.

Going into more detail in regard to the operation and working of the machine, let us visualise the sequence of events following the arrival of a number of exposed films: The leader is threaded back from the drying cupboard, under the bottom trough rollers which are actually lowered into place on top of the film; the exposed three films are joined together into one length on a splicing bench and are wound onto a larger spool sufficient in size to take 650 ft.; this spool is



"N.Z. Aerial Mapping Ltd's Film Processing Unit."

then mounted onto a lightly adjusted slip-clutch above the power unit and its end, protruding through a slot in the side of the box, is connected to the leader.

The unit is set in operation, the film given a little slack at the bottom of each trough and a lid covering the first six troughs is put in place, permitting the machine to run in daylight and allowing continuous inspection of the developed film as it passes from the seventh trough into the drying cupboard.

The majority of films in New Zealand are taken during the moderate conditions of Spring and Autumn. After having processed some 200 odd films in this unit, we find that we require a temperature of only slightly over 70°F. to satisfactorily dry the emulsion at a relative humidity of 65%.

To avoid risk of scratches on the film, particularly in the latter stages while it is drying, use is made of its inherent buckle in such a way that the emulsion side never comes into contact with the central portions of the spools in the drying cupboard at any time.

The time of development is controlled by altering the speed of the motor and, under ordinary circumstances, we are able to process three full-length films of 150 ft. each in one working day with an actual development time of approximately six minutes. Variation in line voltage is somewhat of a problem in New Zealand but we maintain constant speed by watching an aircraft revolution counter which is mounted on the top panel.

It is not economical to process less than three films in the unit on account of the quantity of chemicals involved to fill the troughs, but the quality of the negative produced is certainly worth the time involved in holding the odd film over until the next period of good weather and further flying.

DEVELOPMENT OF BAUSCH & LOMB AUTOFOCUS RECTIFIER

O. W. Boughton and J. V. Sharp
Bausch & Lomb Optical Company

BASED on the comments of several members of the American Society of Photogrammetry at its annual meeting in January 1946, the need for development of a fully automatic Autofocus Rectifier was investigated by Bausch & Lomb. This investigation revealed that the primary need for this instrument is to produce, in quantity, controlled mosaics from low-tilt aerial photographs. A second need is for changing map projections from one type of projection to another. Furthermore it appeared desirable to include military applications for such an instrument; these require use of aerial photographs taken with aerial cameras tilted to at least 20°.

In June 1946, based on preliminary investigation, a development project was instituted and operational specifications and preliminary designs of such an instrument were established. Several organizations were contacted and four types of European Autofocus Rectifiers were observed, two of which were in productive operation. Operating requirements were discussed with various individuals in both administrative and operating divisions of these organizations. Their concurrence with these preliminary specifications was obtained.

In development of such an instrument, our purpose was to simplify the mechanical principles of rectification as much as practical, and yet to obtain an exact mechanical solution of rectification in the design for manufacture of a fully automatic Autofocus Rectifier having operating speed and convenience. Thus, the operating cost per rectified print or map projections where the volume of prints is large could be kept at an operational minimum. This is in line with our development policy. As in the Multiplex Mapping System, the effort is to develop optical solutions of photogrammetric problems which, in mechanical design are as simplified and maintenance free as possible, and at the same time will meet the exact theoretical and practical operational specifications of photogrammetric instruments and of mapping organizations.

A comprehensive investigation of the autofocus rectification of aerial photographs was instituted to study past developments, using among others the following references in literature which are readily available to photogrammetrists.

"Rectification of Tilted Photographs," J. H. Dickson-Photographic Journal, Section B: March–April 1945.

"Essays on Photogrammetry," O. VonGruber 1932, Chapman & Hall Ltd.