

## THE PROGRESS OF THE PHOTOGRAPHIC SURVEYING METHOD

J. A. Flemer

EDITOR'S NOTE: Mr. Marshall S. Wright, Technical Assistant to the Chief, Office of Plant and Operations, U. S. Department of Agriculture, recently forwarded to me this article with the following comments:

"I recently had occasion to search for an article on a certain photographic procedure initiated many years ago, and in looking through *The International Annual of Anthonys' Photographic Bulletin* for 1900, issued in November, 1899, I ran across an article entitled 'The Progress of the Photographic Surveying Method,' by J. A. Flemer.

"I found the article so interesting that I have had it typed and am enclosing a copy. If you have the space some time I think it will be well worth while to reprint it in *PHOTOGRAMMETRIC ENGINEERING*, for two reasons: (1) its historical value; (2) to show that photogrammetry is not a new science. You will note reference to a 'Photogrammetric Institute' in Berlin in 1888, and that the Prussian Army in 1870 had a complete phototopographic detachment in service.

"The advent of the aeroplane undoubtedly was the major factor in the ascendancy and popularity of this science, and opened a new field in topographic mapping, i.e., aerial photogrammetry."

**T**HE phototopographic surveying method, originally devised and elaborated by Col. A. Laussedat, now Director of the Conservatoire des Arts et Metiers a Paris, is based upon the inverse laws of perspective, which were already known to J. H. Lambert, who refers to them in his work on "Perspective," published in Zurich in 1759.

The first practical application of these principles to map-making is generally ascribed to the French savant and hydrographer Beautemps-Beaupre, when he made a series of freehand sketches of the coastal belts of Tasmania and Santa Cruz while on a scientific expedition (1791-1793). After his return to France he constructed topographic reconnaissance maps of the explored regions which were based upon those outline sketches of the terrene. Beautemps-Beaupre frequently recommended this cartographic method to explorers, still little was accomplished by others until Arago (1839) called attention to the possibilities of photography when utilized in this direction by the topographer.

When Col. A. Laussedat first became interested in the study of iconometric mapping, he used a "camera clara" for obtaining the outline sketches of the terrene, but after 1852 he caused a "camera obscura," modeled after the one used by Niepce, with the addition of special devices for surveying purposes, for the execution of numerous experimental surveys, in which he was subsequently aided by Capt. Javary of the French Genie Corps. In 1859, after having perfected his method, Col. Laussedat announced the successful application of photography to surveying to the Academy of Sciences in Paris. Col. Laussedat's work in this field has been so complete that the guiding principles first enunciated by him still form the foundation of every phototopographic survey made at the present time.

This method was at once preempted by the army engineers of both France and Germany for so-called secret or military surveys. In recent years, however, phototopography has found a wider and more general application in nearly all European countries, in North and South America, in Asia, and more recently still in Africa. Among the principal workers in this field in France, besides the two already mentioned, we may cite Pate, Jouart, Capt. Carrette, Commandant Moessard, Dr. Le Bon, Commandant Legros, Mouchez, Vallot, and others.

The French Ministry of War in recent years has experimented extensively with balloon surveying and so-called "telephotography" (long-distance photography), both being well adapted to military reconnaissance and to locate hostile army corps with or without intrenchments and fortifications, especially since the general introduction of smokeless gunpowder.

Col. Laussedat's photographic surveying methods were soon adopted in Germany and Austria. It is even claimed by some writers that A. Meydenbaur, in 1858, while engaged with the mensuration of the cathedral at Wetzlar for the purpose of its renovation, had, independently of Col. Laussedat's work, conceived the idea of using photographs of the cathedral to construct the plans showing its actual condition at the time of the survey. Dr. A. Meydenbaur has published numerous articles and pamphlets on the subject of photographic surveying, and in 1882 the Prussian Government placed him at the head of the "Photogrammetric Institute" in Berlin.

Count Moltke as chief of the Prussian General Staff early recognized the value of photography applied to military and secret surveys, and the Prussian army, in 1870, had a complete phototopographic detachment in service, under the command of Capt. Bernhardt and Lieut. Doergens. Dr. Meydenbaur, Prof. Jordan. Dr. Doergens, Dr. Stolze, Dr. Finsterwalder, Dr. Pietsch, Dr. Koppe, Dr. Vogel, Dr. Hauck, and others have largely contributed toward the popularization of photographic surveying methods in Germany.

Dr. Koristka, while visiting Paris in 1867, met Messrs. Laussedat and Chevalier, and became interested in the photographic surveying methods. His subsequent photographic survey of the city of Prague is probably the first practical application of Col. Laussedat's method in Austria.

In 1890, a series of experimental phototopographic surveys was made, under the auspices of the Military Geographic Institute of Vienna, which fully demonstrated the superiority of this method for the survey of certain regions, and since then many engineers have applied photography to the surveys of inaccessible mountain districts in Austria. Among the more prominent workers in this branch of surveying in Austria we may mention Lieut. Mikiewicz, Major Bock, Lieut. Hartl, Capt. Hubl, Major Pizzighelli, the engineers, Pollack, Hafferl, and Maurer, Prof. Schiffner, Prof. Schell, Prof. Steiner, Prof. Heller, and others.

The largest area surveyed photographically in Europe may be found in Italy, where excellent results were obtained fully demonstrating the efficiency of phototopographic methods for the surveys of mountain regions of an Alpine character.

Although Prof. Porro's experimental work dates back to 1853, nothing of note was accomplished in Italy until Micheli Manzi, of the Military Geographic Institute, used some photographic views to supplement the topographic details of his plane-table survey of the region about the "Gran Sasso."

In 1878, General Ferrero, Chief of the Geodetic Division of the Italian Military Geographic Institute, detailed L. P. Paganini, Engineer Geographer of the Institute, to make some experimental phototopographic surveys in connection with the new topographic survey of Italy. Paganini's results were so gratifying that the phototopographic method has since been used for the survey of the entire area in Italy situated above the altitude of 2,000 metres, areas below that elevation being surveyed with the plane-table.

Owing to the untiring efforts of Capt. E. Deville, Surveyor General of Dominion Lands, phototopography has been practiced with remarkable success in the Dominion of Canada. The method was first used, in 1888, for surveys in the Rocky Mountains in the vicinity of the route of the Canadian Pacific Railroad; then for the topographic reconnaissance of southeastern Alaska, made for the International Boundary Commission, in connection with the delimitation of the boundary line between Alaska and British Columbia; and more recently for the mapping of the region about Dawson City (Klondike), and for irrigation surveys made in Canada.

The United States Coast and Geodetic Survey Bureau has repeatedly used this method for topographic reconnaissance surveys made in the Territory of Alaska since 1894.