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SOME EXPERIENCES WITH LABORATORY CONTROL
OF FIELD WATER SUPPLIES

JACK J. HINMAN, JR.

*PUBLISHED WITH THE PERMISSION OF THE SURGEON
GENERAL, U. S. ARMY*

The Water Analysis Laboratories of the American Expeditionary Forces began their work in January and February, 1918. The personnel consisted of Engineer and Medical Department officers and men. The Medical Department representatives were almost entirely from the Sanitary Corps and were furnished to the Engineer Department under provisions of G. O. 108, War Department, Washington, 1917. The organization formed a part of the Water Supply Service which was built around the 26th Engineers, the Water Supply Regiment, as a nucleus.

The responsibility for the purity of the water supplied to troops, as well as the provision of the water up to the water points in the zone of fighting, was first delegated to the Engineers by G. O. 34, G. H. Q., A. E. F., February 25, 1918. The responsibility was extended to the Service of Supplies by G. O. 131, G. H. Q., A. E. F. August 7, 1918, and the whole service more fully explained and specified by Bulletin 55, G. H. Q., A. E. F., August 8, 1918. The responsibility for the quality of water beyond the water points remained with the Medical Department.

Officers and men of the Water Analysis Laboratories were assigned to the District of Paris, the various Base Sections, the Intermediate Section, the Advance Section, S. O. S., to the Armies and to the companies of the 26th Engineers. The Sanitary Inspectors of Water of the Divisions were not members of the staff of the Water Analysis Laboratories. The Division Sanitary Inspector of Water found his duties accurately defined by Memoranda 5 and 7 (Revised), Office of the Chief Surgeon, Division of Laboratories and Infectious Diseases, A. P. O. 721, August 14, 1918. He worked under the direction of the Division Sanitary Inspector and confined himself chiefly to sanitary surveys of sources of supply and supervision of the treatment of water in Lyster bags. He was directed to refer any extensive chemical and bacteriological laboratory work to the Medical Department

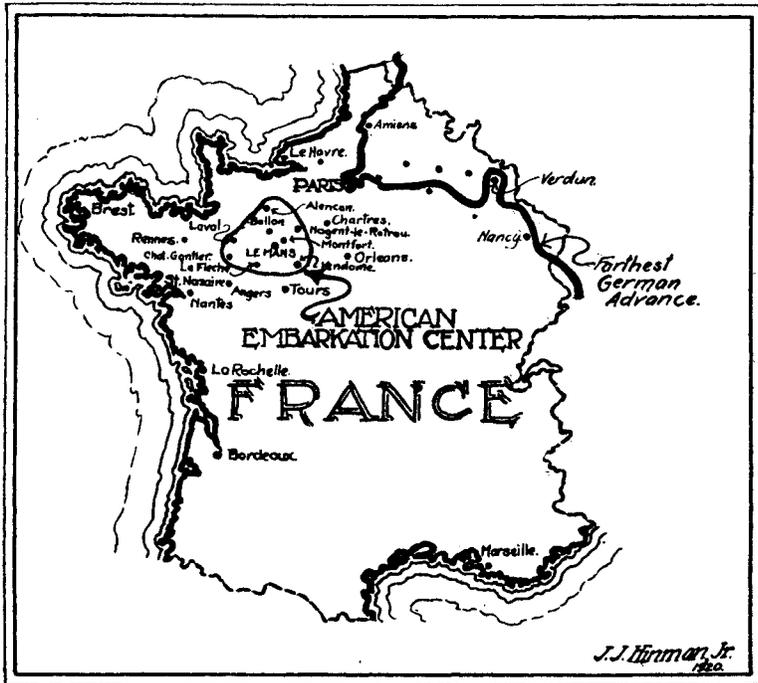


Fig. 48

representative on the staff of the Water Supply Officer for the Army. The laboratories employed for the work of the Water Supply Service were usually operated more or less independently as sections of Medical Department laboratories to which the Water Supply personnel was attached for purpose of administration and supply. Of course, additional water analysis was carried out by the regular Medical Department laboratories, sometimes in cooperation with the Water Supply Laboratories, sometimes independently.

For special work in the advance zones the laboratory work was conducted in mobile laboratories, in the laboratory space of the "sterilab" water purification trucks and with transportable laboratories supplied in chests.

The methods of water analysis were based chiefly upon the Standard Methods of Water Analysis of the American Public Health Association, 1917, and Medical War Manual No. 6, Laboratory Methods of the U. S. Army, 1918. The standard of purity adopted was the 1914 standard of the United States Treasury Department for drinking water supplied by common

carriers in interstate traffic. This standard requires that the number of bacteria growing at 37° C. on agar shall be less than 100 per c.c. of water and that not more than one out of five 10 c.c. portions shall show the colon bacillus when tested for gas formation in lactose broth and confirmed by litmus lactose or Endo agar plates. Eosin methylene blue lactose agar plates also were used in the confirmatory tests. A bulletin on Water Analysis giving the methods was published for the A. E. F. by the Bureau of Medical Publications of the American Red Cross Society.

Bacteriological water work was not the only laboratory work undertaken. At least one of the laboratories undertook work on boiler waters for locomotives and cranes, another did work on laundry waters, another on cooling water for airplane motors and so on. Operation of filter plants and chlorinators, supervision of Lyster bag chlorination, sanitary surveys and other investigations fell to the lot of practically all officers of the service.

The writer's first A. E. F. assignment was to the Water Analysis Laboratory, Paris. This assignment, however, was merely temporary and orders came to proceed to the headquarters of Base Section 3, at London, where further orders were received designating him as Water Supply Officer with station at Winchester and laboratory in the Base Laboratory located there. The Water Laboratory was in a small room adjacent to the Base Laboratory which had at one time been occupied as a tea room. The equipment was adequate and work was undertaken promptly. All of the inspections, collections, analytical work and typing was done by the writer. The typing was quite a big part of the work as nine copies of every report had to be made in order to have enough for the various officers to whom reports were to be sent. A specially qualified sergeant and private were about to leave Paris for England to assist in the work when the armistice was signed and they were retained in France. At the time of the armistice there were nearly one hundred hospitals and camps in Base Section 3 in which American detachments were stationed. Many of these were Air Service troops who were rapidly assembled in larger camps. On the termination of hostilities the writer's instructions had been to finish first the work in the Southern district and then proceed to the work in the north in Scotland and Ireland. The armistice found the work in the southern district unfinished, so that aside from a thorough survey of the water supply of Liverpool, the work done was confined

to the counties of Hampshire, Wiltshire, Devonshire and Sussex.

About the middle of January, 1919, the laboratory was closed and the writer ordered back to Paris. Here he was engaged in office work for a time, then sent into the Department of the Marne to work on evaluation of war damages to water plants and sewage systems for the Peace Commission. On the abrupt termination of this work, he attended the University of Rennes for a month and was then ordered to duty as officer in charge of the Water Analysis Laboratory, American Embarkation Center at Le Mans.

At this time the troops were going home and Le Mans with its eight outlying divisional areas was a busy place. The Water Laboratory was housed in an old French garage. It had two rooms, one of which was used as an office. The personnel consisted of the writer, three second lieutenants, two first class sergeants, a wagoner and five privates. There were two motorcycles with side-cars assigned to the laboratory and two Fords from the transportation pool were used in addition. The laboratory opened a "sterilab" purification truck, controlled the operation of the United States Filter Plant at Pontlieu and supervised the chlorination of water by six chlorinating machines at other places. Close watch was kept on the quality of the water produced by the Le Mans City Water Plant at L'Epau. Much effort was expended in the attempt to check up the chlorination of water in Lyster bags by the various transient organizations. This checking consisted largely of tests for free chlorine by means of potassium iodide and starch or orthotolidine. Samples showing no free chlorine were bacteriologically examined. Experience showed the utility of the rule to consider all water contaminated and therefore unsafe for use without chlorination. There was one small typhoid outbreak believed to be due to the drinking of spring water contaminated by use as a lavoir.

The Water Analysis Section at Le Mans had in addition to the laboratory facilities in the French garage, both a mobile laboratory truck and a sterilab. The equipment of both of these mobile units was quite complete for the work they were designed to do. They had incubators, hot air sterilizers, Arnold sterilizers and autoclaves in addition to an ample stock of glassware and chemicals well packed in partitioned drawers lined with canton flannel. The mobile laboratory was mounted on a White-truck chassis, while the sterilab was mounted on a Pierce-Arrow truck chassis.

In addition to the laboratory equipment the sterilab carried

a Gould pump, a pressure filter with alum pot and a solution-feed chlorinator with siphon- or bubble-meter. It successfully purified an impure river water and was an excellent piece of equipment. The laboratory space of the sterilab was not used as such but used as sleeping quarters for the men in charge owing to the ease of taking samples to the stationary laboratory in Le Mans.

LABORATORIES FOR THE STATE BOARD OF HEALTH,
STATE UNIVERSITY OF IOWA.