

THE WEST VIRGINIA FLOOD OF AUGUST 9, 1916, AND THE HEALTH RELIEF MEASURES.

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ON THE morning of August 9, 1916, Cabin Creek, Coal River, Paint Creek and Mud River Districts of West Virginia, an area of some 400 square miles, were visited with a disastrous flood. Newspaper reports stated that the flood was caused by a cloud-burst, but investigation shows that the storm was an exceedingly heavy downpour of several hours' duration. It traveled in a southeasterly direction, the center passing through Griffithsville on Mud River, Horse Creek and Nelson on Coal River, and Kayford on Cabin Creek. The greatest damage was wrought at Kayford, where, from the best data available it appears that the storm lasted from 4.30 a. m. to 9 a. m. There are no rain gauges in the flood district, and all estimates of the rainfall are probably much in error. The most accurate record of which I could learn was that obtained by a retired mine fire boss at Kayford who stated that 5.82 inches fell during the storm. His measurement was made in an ice cream can.

The flood reached a much greater depth on Coal River than on Cabin Creek. At Seth, on the former stream, 54 feet 2 inches were read on a privately maintained gauge, while the greatest depth encountered on Cabin Creek was about thirty-two feet. The damage, however, was far greater on the latter stream, as it was closely built up with mining towns, whereas on Coal River there are but comparatively few mines opened, and the nar-

row river bottoms are given over to small farms.

It is estimated that seventy-one lives were lost in the flood and that over nine hundred houses were entirely wrecked, with a total property damage in excess of \$2,000,000. The Chesapeake & Ohio Railroad had the greater portion of its road bed for eighteen miles obliterated. Not a single railroad bridge in the entire distance was left in position. At only two points was it possible to tell where the county road had been previous to the flood.

On the morning of the flood Dr. S. L. Jepson, the Health Commissioner of West Virginia, sent one of the assistant engineers up Cabin Creek to ascertain the extent of the disaster. The writer was in Pittsburgh at the time, but realizing the grave danger of serious outbreaks of typhoid due to contamination of wells which constituted the only source of drinking water for a population of over 10,000 in the flood area, he returned to Charleston immediately, after first having telegraphed to Baltimore for a large supply of anti-typhoid vaccine. All the chloride of lime in Charleston and Huntington, West Virginia, and Columbus, Ohio, was obtained by telegraph and an order placed for several hundred pounds in addition. A local chemical manufacturing company was instructed to hold several carloads of agricultural lime ready for immediate shipment; also instructions were telegraphed to the state printer to have

several hundred posters 18 by 24 inches struck off with the statement "This Well Probably Safe for Drinking."

As there were a number of cases of typhoid fever on Cabin Creek and Coal River previous to the flood, the chance that the wells, a great majority of which were flooded by the sudden rise of water, had become dangerously contaminated, was the chief problem that faced the Division of Sanitary Engineering.

To lessen this danger as far as possible the writer with his two assistant

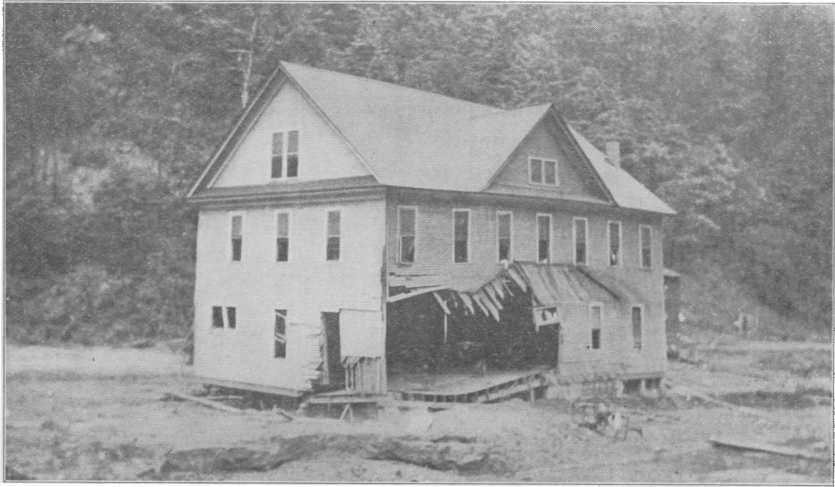
engineers, Mr. Ellis S. Tisdale and Mr. Andrew N. Wardle, both graduates of the Massachusetts Institute of Technology, entered the district prepared to disinfect all wells that had not been filled with mud and silt and to administer the anti-typhoid vaccine to all who would take it. As the roads were washed away and the valley strewn with wreckage, it was impossible to get even a pack animal through, and we were obliged to carry all our provisions, blankets, vaccine and chloride of lime, on our backs.

The writer deemed it wise to make a hurried trip through the entire valley, disinfecting at least one well in each community that safe water might be obtained at all points as quickly as possible, and then after this establish headquarters at some central point and from this place to direct the disinfection of the other wells as fast as they could be cleaned. The first day some thirty wells, scattered over a distance of ten miles, were each treated with from a quarter to half a pound of chloride of lime. As each well was treated it was posted with a sign, "This Well Probably Safe for Drinking."

The coöperation of the hospital corps of the West Virginia National Guard, which had been ordered into the flood district, and of the local mine doctors in the giving of the anti-typhoid vaccine, was solicited and obtained. A campaign of publicity to overcome the prejudice that the miners entertain toward all forms of vaccine was inaugurated at the suggestion of one of the doctors. Small boys were paid 25 cents apiece to carry



All wells that were in any way fit for use were disinfected with chloride of lime and posted as shown.



The ruined Y. M. C. A. at Eskdale. Headquarters of the Division of Sanitary Engineering.

posters up and down the valley stating that the anti-typhoid treatment would be given free at certain places at certain times. Other posters had skulls and cross-bones with "Beware of Typhoid. Be vaccinated before it is too late." At each town visited, some small boy who looked brave would be singled out and given the treatment. Then he was told to jolly his chums about being cowards, with the result that some fifteen or twenty small boys would take the treatment. These would be divided up in squads of four and sent marching through the town with their left sleeve rolled up, calling out "It doesn't hurt to get vaccinated." The results of this system of advertising surpassed our best expectations. One doctor vaccinated over 400 the first afternoon. We slowly waked up the interests of the people to such an extent that the usual salutation in passing the time of day when two friends met was, "Been vaccinated yet, Bill?" "Yep, took it half an hour ago.

Don't see why I ever swore I'd never take it. Didn't bother me as much as a pin scratch."

Each doctor in the flood district was visited in person by one of the engineers and given the amount of typhoid vaccine that he felt he could probably use. Nearly every doctor told us that he wouldn't need many treatments, as the miners could not be made to take it; yet before two days were up nearly all had sent messengers to our headquarters in the ruined Y. M. C. A. building at Eskdale, asking for more. The final returns giving the name, address, etc., of each person vaccinated have not as yet been received from the doctors, but the writer has returns on his desk showing that at least 4,467 civilians were vaccinated. It is estimated that 90 per cent. of this number will take the full three doses, and that the total number of those receiving one dose will pass the 5,000 mark.

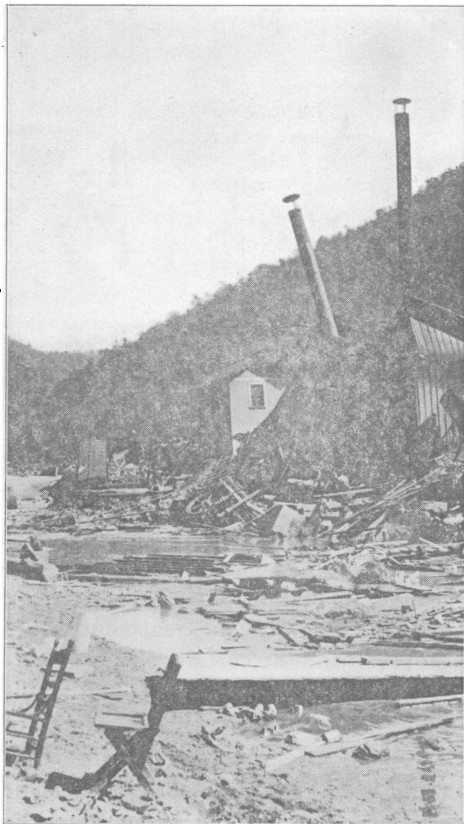
As yet no word had reached the

writer's office of any infected arms, which is remarkable when it is considered that some of the doctors would vaccinate as many as ten people without resterilizing the needle. Whenever possible we attempted to prevent such practice and supplied the doctors with grain alcohol that they might at least rinse the needles.

It should be noted that the engineers took charge of the disposal of the bodies of dead animals, as mules, dogs, hogs, etc., which were found in numbers in the piles of *débris*. As fast as the railroad was rebuilt into the district, lime was shipped in for use in sweetening the ground about the houses, many of which had two or three feet of mud on the floors. Lime was also freely used about the privies.

The results obtained from the wholesale anti-typhoid vaccination on Cabin Creek, Coal River and Mud River should prove of great interest to health officers throughout the entire country as, so far as the writer is aware, it is the largest number of civilians ever vaccinated at one time. Larger numbers have received the treatment in the army and in large labor camps, but in these places living conditions are highly specialized, the food, water, housing conditions and health being carefully looked after at all times, whereas in the work done in the flood district of West Virginia we now have an opportunity to study the effectiveness of the treatment under ordinary living conditions in all stations of life, from the mine superintendent to the most illiterate miner and his family.

The work of the Division of Sanitary Engineering should prove of great value. The West Virginia miner



Ruins of power plant of Chesapeake and Ohio R. R. at Eskdale.

is nomadic in his habits, as he seldom lives more than a few months at one place. The flood has caused a general exodus of miners from the creek, 60 per cent. having left, and unless every precaution against an outbreak of typhoid had been taken, the disease would probably have been carried to all parts of West Virginia, and to Ohio and Kentucky as well.

In closing it should be noted that the work could not have been accomplished without the aid of the local doctors who everywhere gave valuable assistance.