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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

## FILTRATION AND THE FUTURE WATER SUPPLY FOR NEW YORK CITY.

It is gratifying to know that the Board of Water Supply of this city have laid it down as a *sine qua non*, in any future extension of the water supply, that the plans shall include a system of filtration. One of the earlier commissions that investigated the subject proposed the establishment of pumping stations on the Hudson River, by which the water was to be raised to filtration beds located on the adjacent hills, at a sufficient elevation to insure the delivery of the water by gravity to New York. The latest scheme and that which has been adopted by the Board of Water Supply contemplates using the mountain waters of the Catskill region, which are to be impounded in a large reservoir on Esopus Creek at an elevation of 500 feet above tide level. As finally completed, the water will be delivered at the rate of 500 million gallons daily at an elevation of 300 feet above tide level at the city limits. The scheme is elastic, and provides for an early use of the water, by the delivery of the first supply that is available into the existing Croton Reservoir. This plan also contemplates the filtration of the water as thus delivered.

There is a growing conviction among sanitary engineers and the boards of water supply of our large cities that filtration is the only sure method of providing a water supply free from pollution, and particularly from the germs of typhoid fever. In cities in which filtration plants have been installed the decrease in typhoid fever has been very marked and immediate. How great is the typhoid peril may be judged from figures recently given by the State Commissioner of Health, who announced a few days ago to several hundred sanitary officers of the various counties of the State that since January 1 there has been the enormous number of 60,000 cases of typhoid fever in this State, and that in Greater New York alone there have been 500 deaths from typhoid during the nine months of the present year.

## PRESENT RAILROAD TRACK INEFFICIENT.

It is not often that a form of construction which was used in the early days of an art merely because it was cheap and ready to hand shows such vitality as the present form of track, which, despite the remarkable development of the railroad, is to all intents and purposes the same to-day as it was three-quarters of a century ago. The metal rail spiked to the wood cross-tie early demonstrated that it was the best combination of cheapness and efficiency available at a time when capital was scarce and economy was a prime consideration. In the building of a new railroad, the wooden ties could be cut from the woods adjoining the right-of-way, and the rails brought up over the track already laid and quickly spiked in place. The spikes could be made by any blacksmith, and ballast was readily obtainable from the river bars, or from quarries adjacent to the railroad.

For many a decade the steel and wooden railroad track has proved that, if it be properly maintained, it is not only a simple and cheap form of construction, but one that is well adapted for its work. Of late years, however, and particularly during the last decade, the track has failed to keep pace with the remarkable improvement both in design and construction of the component parts of the railroad. Not only has the weight of locomotives and cars increased by leaps and bounds, but there has been a great acceleration in the speed, with all the increase in the dynamic or pounding effects which an increase in weight and speed must bring. It is the concentration of load on a single wheel, and not so much the total load of the whole engine or car, that batters the track out of shape; and this destructive agency has grown to a point at which the total load on a single axle will amount to between thirty and forty tons. Now, thirty to forty tons was the weight of a fair-sized passenger engine twenty-five

years ago, and it is twice the weight of the engines that were built at the time when the wooden cross-tie track was first introduced.

Our engineers have ever been fully alive to the weakness of our track system, and by designing rails of heavier section, increasing the number of cross-ties to the rail, and providing a greater depth of ballast, they have endeavored to keep the track up to the severe duty which was laid upon it. To within the last ten or a dozen years they succeeded in keeping pace with the demands, but to-day with concentrated loads on a single axle as high as thirty-five tons, and speeds of from sixty to eighty miles an hour, the maintenance-of-way engineer realizes that the present system of track has been developed to the limit of its capacities.

The inefficiency of the track is rendered the more conspicuous when we take note of the great advance that has been made in all the other elements that go to make up a railroad. Wooden culverts have given place to culverts of iron, concrete, or stone; the wooden trestle has been replaced by the solid fill; the Howe truss wooden bridge has given place first to the cast-iron truss, then to the more reliable pin-connected truss, and finally to the massive riveted structure with buckle plate floor and the rock ballast carried continuously across the same. Every detail, in fact, of the railroad has kept pace with the increased weight and speed of the rolling stock except the track—for to-day we are still nailing our two strips of steel down to our frail little cross-sticks of wood, and wondering how much longer we can make them hold up to their work.

We have long believed that the solution of the track problem lay in the adoption of some form of permanent longitudinal bearing for the rails, built either of steel or concrete, or possibly of a combination of the two. Engineers have long realized that the continuous longitudinal bearing, or "sleeper," presented great advantages of strength and stability, if certain difficulties connected with its maintenance could be overcome. Those of our readers who, in years gone by, may have ridden on Brunell's broad-gauge railroad, which was laid upon continuous longitudinal sleepers, will remember the smoothness with which the train ran, and the total absence of violent shocks and lurchings. Although the wooden sleepers that were used proved to be altogether too soft to hold up the rails to their work, we believe that it would well repay our roads to put in a stretch of experimental track in which the rails were carried on deep, broad, continuous steel girders of trough-section, united at intervals with suitable cross-ties. With a heavy rail bolted down upon these girders, a track of enormous vertical and lateral stiffness would be provided; and because of its great depth, ample girder strength would be provided at the rail joints—that weak point in all our present track construction. Another form of track construction that would surely repay investigation would be the building of continuous walls of concrete, one beneath each track, with cross walls thrown in at proper intervals. The problem in this case would be to provide a suitable form of track fastening, and also to find some suitable material to place between the rail and the concrete to prevent the pulverizing of the latter under the action of passing trains.

## THE NEED FOR FEDERAL QUARANTINE CONTROL.

The people of the Southern States will, some time this fall, appeal to the country to support a policy of federal control of quarantine—certainly of interstate quarantine—and of federal aid and assistance in sanitary matters so far as they relate to contagious or epidemic diseases. A canvass of the Southern press shows 90 per cent in favor of such action.

An attempt was made to secure some action on this line after the last yellow fever epidemic of 1897, and quarantine conventions were held at Mobile and Memphis with only negative results. The popular demand then made—that control of quarantine be transferred from the local or State authorities to the federal government—was based on dissatisfaction with the former and recognition that they were not equal to the emergencies arising in an epidemic. Whether the federal government was equal to the occasion was as yet unknown or not sufficiently proved. A change was desired and it was felt that it could not be for the worse. In the present agitation, there is a strong feeling in favor of federal control of quarantine, of federal assistance in case of epidemic and even of federal aid in sanitary education and the extension of sanitary measures, on much the same line as was followed in Cuba during the military occupation of the island.

The United States Marine Hospital Service has been able to place only a few of its representatives in the yellow fever section—less than fifty in all—and the expenses of the campaign have been less than the State quarantine dues at a single southern port—New Orleans. There have been to date about 3,600 cases of fever throughout the Southwest, and 452 deaths from that disease—fewer deaths than occurred from yellow fever in New Orleans alone in two days of 1853, when

that city had one-third the population it has to-day.

But the lives saved, and the suffering avoided, is but one feature of the improvement brought about by placing the control of affairs in the infected towns and districts in charge of a body of skilled sanitary officers, acting upon a fixed policy, unaffected by political or financial interest, and dealing equally with all, rich and the poor alike. The results of the sanitary campaign inaugurated by the United States Marine Hospital Service in the South, the interest aroused in sanitation, and the sanitary overhauling and improvement secured, have been productive of far more good than the war on the yellow fever itself.

No one who has not been in the fever section can appreciate the great sanitary advance made there in the last two months. A study of the vital statistics will shed some light on this question. The New Orleans papers have called attention to the fact that the mortality of that city was lower in August and September, in spite of the presence of the yellow fever, than during the other months of the year when the city was free of the disease. This does not mean that the yellow fever drives out other maladies, but simply that the encouragement given to sanitary work under the stimulation of the Marine Hospital Service, as shown in the draining of ponds, the cleaning of gutters, the fumigation of the houses, the removal of trash and debris of all kinds, has put the city in a much better sanitary condition than it has ever been before. Hence its general health has improved and there has been a decline in deaths from pneumonia, malarial fever, and other diseases due to bad drainage, bad water, or filth, more than sufficient to make good the twenty-one deaths claimed weekly by yellow fever.

Perhaps this is most strikingly illustrated in the negro quarters of the city. These, as in all other Southern cities, are public scandals. The simplest laws of hygiene are openly violated through the ignorance of the negroes, and the local health authorities, finding the task of cleaning these districts greater than that facing Hercules at the Augean stables, have usually done little or nothing to improve the situation. As a consequence the mortality from disease among the negroes of the Southern cities continues from year to year at epidemic figures, reaching 46.7 per thousand a year at Charleston, S. C., and 56.6 per thousand at Shreveport, La. Taking the South as a whole, the negro mortality is nearly twice that of the whites, and more than twice what it ought to be.

Under the educational methods now being pursued, directed by the Marine Hospital Service and with the encouragement of the whites, a marked impression has been made on the negroes. The decline in the negro death rate from 42.4 per thousand (census year) to 27.2 per thousand in the midst of an epidemic is not accident, but a natural sequence of sanitary education. It means the saving of several hundred lives a year, the avoidance of several thousand cases of illness, and a great increase in the productive capacity of the negro as a worker.

In the single task of educating the people to the mosquito theory of the origin of yellow fever, and thereby inducing them to take the precautions necessary to protect themselves against the disease, the best possible results have been accomplished. Governor Blanchard, of Louisiana, and Vardaman, of Mississippi, announced themselves as disbelieving in the mosquito theory and unwilling to base their quarantines on it; but both have been converted. Probably not one per cent of the people of Mississippi accepted that scientific discovery at the beginning of the campaign. A lecture delivered on the subject at Jackson, the State capital, by a physician of the United States Marine Hospital Service was received at first with surprise, but through the teachings and practices of the federal physicians the doctrine spread over the State and has been the means of holding the fever well in check.

Perhaps no better instance of the good work accomplished in a sanitary and educational way could be shown than in the case of the Italians. These people, among whom the fever started, and who have been its worst victims, were the bane of the local health officers at the beginning of the epidemic; so much so that most of the towns prohibited the incoming of any Italians and some even ejected them. Yet the Italians, who constituted nine-tenths of the cases and deaths at the beginning of the epidemic, constitute only a small fraction to-day; the Italian quarter is nearly free from fever and is cleaner than it has ever been or any one believed it could be. Those who thought it impossible to teach the lower class of Sicilians the value of cleanliness find themselves mistaken.

The excellent results obtained in the South have been rendered possible only through a body organized and controlled by the federal government, superior to local prejudices and influence and able to act equally and justly to all. The comparatively small experience had in the matter this year has satisfied the great majority of the Southern people on this point and will bring about a practically unanimous attitude in the matter of future legislation.