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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.

THE WASTE OF OUR NATURAL RESOURCES.

The present awakening of the national conscience on the subject of the waste of our natural resources is one of the most encouraging signs of the times; but in this, as in all other great national awakenings, there is the danger that the movement may never progress beyond the stage of discussion to that of practical effort. Until the necessary legislation is secured, it is well for us to take an occasional review of the present conditions of waste, and point to the ultimate absolute depletion of our resources which must inevitably ensue unless the strong arm of the law be called in to enforce remedial and preventive measures. We have before us a succinct review of the question by Dr. George F. Swain in a paper presented at the recent annual meeting of the National Association of Cotton Manufacturers, in which the subject is treated under the four heads of Forests, Water, Lands, and Minerals.

At the present time the people of the United States use annually forty cubic feet of wood per acre, as an offset to which there is a natural growth of only twelve cubic feet per acre. In answer to the question, whether it is necessary for us to use three times what we produce, attention is invited to the fact that, while in the United States we use 262 cubic feet per capita, Germany uses only 37, France 25, and Great Britain 14 cubic feet per capita. Forest fires, most of which are entirely preventable, have consumed since 1870 an average of 50,000,000 acres of standing timber per year. There is much unnecessary waste due to careless methods of logging and sawing. For each 1,000 feet of standing timber that are cut down, only 320 feet are put to use. Tanning establishments bark the trees and leave them to die. The turpentine industry, also, results in a large annual destruction of timber. It is not to be wondered at that in the last nine years the price of yellow pine at the mill has increased 65 per cent.

Natural gas is allowed to waste in many localities without restraint, and it is estimated that a sufficient amount is lost to light all the cities of the United States having a population of over 100,000. At the present rate of use and waste all the known supplies of natural gas will be exhausted in 25 years. As for oil, it is sufficient to state that at the present rate of increase the supply will be exhausted before the year 1950. Although there has been an improvement of about 50 per cent in our methods of coal mining in recent years, the present system is uneconomical. We extract the high grade coal and allow the mine to cave in, thereby wasting a large percentage of the available supply. By the middle of the next century, the easily accessible and available coal in this country will have been exhausted.

The situation with respect to our supplies of iron ore is even more serious; for it is estimated that, if the present rate of increase of consumption continues, the known supply of high grade ore will be gone by the middle of the present century. Twenty-five years is also the limit set for the exhaustion of another important mineral—phosphate rock. Taking all our mineral products together, it is estimated that the total waste approximates \$1,000,000 per day or over one-sixth of the value of the total production.

As to public lands, or lands in general, it is undeniable that we are failing to secure as large crops as we should, chiefly because we neglect some fundamental principles, such as the development of rotating crops, and so plowing on sloping grounds as to prevent washing away of the soil. Although we have some of the richest soil in the world, the average yield per acre from 1897 to 1906 was 13.8 bushels of wheat in the United States as against 28 in Germany and 32.2 in the United Kingdom.

The facts as above set forth relating to the exhaustion of our fuel supplies indicate that in the future years the value of water power as a national asset will become increasingly evident. To utilize the full hydraulic power of the rivers it will be of the greatest importance to reduce the extremes of flow so that the waste of water through floods may be made a minimum. Statistics show, moreover, that the annual damage done by floods is increasing and has risen from \$45,000,000 in 1900 to \$118,000,000 in 1907. The Merrimac River discharges at its period of highest flood seventy times as much water per second as it does at its lowest stage, and ten times as much as its average flow throughout the year. The regularity of the flow may be increased by the preservation of the forest, whose presence tends to retard the run-off of the rainfall, and by the construction of reservoirs, which will hold back the floods and allow the surplus waters to be drawn off as needed, thereby increasing the average flow throughout the year. Particularly necessary is it to protect the forests on steep mountain slopes, with a view to the prevention of floods and the resulting destruction of the arable lands in the lower valleys. In the Tenth Congress on International Navigation held in Milan in 1905, the engineers were unanimous upon this point. M. Lafosse, the French delegate, describes the evil effect of stripping the mountain sides as follows:

"The soil, swept bare of its forests, exhausted by the abuses of grazing, loses quickly its vegetable stratum. Washed periodically, and carried away by melting snow and summer storms, it is soon disaggregated. The waters run toward the low points, rolling before them gravel and boulders, and even tearing out loose sections of rock. A thousand rivulets cut out beds, and the torrent is formed. Scours begin, the banks are broken down, and a mass of mud, stones and rocks invades the valley, destroying everything as it passes."

Most of the countries of Europe have learned the lesson and taken steps for the careful preservation of their forests; and this has been done not merely with a view to increasing the timber supply, but in the interests of navigation. Over half a century ago, the French government entered upon a policy of forest protection and reforestation, and up to the 1st of January, 1900, they had acquired no less than 620 square miles for these purposes. The efforts of our own government to solve this question on a scale commensurate with its importance should receive the hearty co-operation of every State of the Union.

FEWER BROKEN RAILS.

The alarming increase in the number of broken rails in the State of New York induced the Legislature, some three years ago, to make an investigation of the subject. The conditions were found to be so serious as fully to justify the complaints of the engineers of the railroads, that they were receiving from the manufacturers rails which were faulty both in composition and manufacture. The official investigation showed that the number of rails broken during the winter months in New York State alone ran up into the thousands. The subject was given that healthy publicity, which of late years has resulted in so many improvements affecting the welfare of the general public, and ultimately the manufacturers and the representatives of the railroads met for a thorough discussion of the subject, the outcome of which was a revision of the methods of manufacture and the adoption of specifications which were acceptable both to the rail makers and the engineers. Although it is too early as yet to judge how nearly the rails rolled under the new specifications approach the ideal standard, it is certain that there has been a great reduction in the number of breakages. Many of the recent failures have occurred, of course, in rails which had been rolled under the old system and were already in the tracks when the agitation for better material took place. As time progresses, and the place of the old rails is taken by those of a better quality, we may look for a still further decrease in the number of breakages.

With a view to determining what progress is being made, the Public Service Commission of this State has made a comparison of the returns furnished by the railroads for the four months of December, 1907, and January, February, and March, 1908, with those of the corresponding four months of the past winter. The information required for the earlier period included the rail specifications adopted since June 1st, 1907. The reports, which are practically complete, show that whereas during the winter of 1907 to 1908 there was a total number of rail failures of 3,917, the number for the winter of 1908 to 1909 was only 1,829, relatively a most satisfactory condition. Taking some of the larger roads, we find that there is a reduction on the Erie from 473 failures to 202; on the Delaware & Hudson, from 500 to 162; on the Lake Shore, from 354 to 93; on the New York Central, from 1,601 to 537; and on the Pennsylvania Railroad, from 228 to 139. Of the 54 steam roads included in the report, there is an average reduction of 50 per cent

in the failures, and 22 roads report that they had no cases of broken rails. It is encouraging to learn that only four of the failures resulted in accidents, and that all of these occurred to freight trains.

A NEW FIRE-ALARM SYSTEM FOR NEW YORK.

The recent decision of the Board of Estimate and Apportionment of New York city to appropriate the sum of \$100,000 for the preparation of plans for a new fire-alarm service, and the expressed willingness of these custodians of the city's funds to vote in the near future an outlay of about two millions of dollars for this purpose, will mark, it is hoped, the passing of one of the most serious dangers that menaces New York. At the very root of all fire protection lies the prompt and correct announcement of a fire by suitable mechanical and electrical devices. New York's fire department has been hampered by an obsolete and inefficient system, largely of a makeshift character and with little or no protection against damage or breakdown. Only the skill and ingenuity of the men of the telegraph bureau have made possible even a satisfactory working under normal conditions. Despite the pleas of fire commissioners and chiefs, not to mention the warnings of the insurance companies most pointedly expressed in high rates, the city authorities have for years refused to take notice of this condition and to appropriate funds for the installation of a new system to take the place of one in so scandalous a condition that it is beyond hope of repair. The Merchants' Association, the fire insurance underwriters, and large business interests have at last succeeded in driving home the needs of the fire department. The central office of the fire alarm system is at present housed in a building which in itself is not a first-class fire risk, surrounded as it is by much inflammable material used as kindling for the engines and forage for the horses of the engine company that it also shelters. Signals are sent to the fire houses throughout the borough of Manhattan along main circuits comprising cables attached in little more than temporary position to the Third and Ninth Avenue elevated railway structures in close proximity to the third rail and to high-tension feeders. Fire-alarm boxes are frequently to be found so poorly placed that two simultaneous alarms would interfere with each other and render both signals impossible of interpretation. In fact, the situation is even now considered so critical, that this winter a makeshift protection in the form of a duplicate telephone switchboard for fire department purposes was installed in a nearby telephone central exchange, so that in the event of the destruction of fire headquarters, telephone communication with the various engine and other fire houses could be maintained.

To ascertain the reasons for this sorry condition of affairs in the largest American city means a study of New York's municipal growth, for the original fire-alarm telegraph plant was installed about 1865, when the "paid system" supplanted the volunteer fire department. The plant was located in the old central station in Mercer Street until removed uptown in 1887 to fire headquarters in Sixty-seventh Street. To accommodate the growth of the city, various extensions have been made both of circuits and apparatus, but without removing it from the sixth floor of fire headquarters. Particularly objectionable is the method of leading the cables into the building. Cables, boxes, and connections are all in a hopeless state of more or less inefficiency. Instead of a non-fireproof fire headquarters containing inflammable materials, it is proposed to erect either in Central Park or some equally isolated place, a central fire-alarm telegraph station in a building absolutely fireproof and devoted to no other purpose, a building which neither fire nor flood can damage. The telegraph and telephone wires of the system are to be laid in underground ducts or subways, carefully protected throughout their course from high-tension current or from possible contact with power circuits. The distribution of circuits is to be systematically planned as regards the territory served, while the boxes themselves are to be of the non-interfering type, so that every signal will be recorded clearly, whether sent in alone or simultaneously with other alarms.

The estimated cost of this system is placed at about two millions of dollars, for which, when the plans are prepared, bonds will be issued. Large as this sum may seem, it is a small price to pay for an essential improvement so long postponed. In fact, just as the high-pressure service has proved an excellent investment for the city, and has been the means of giving vastly increased protection at reduced expense, so a modern and adequate fire-alarm telegraph system will doubtless be the means of effecting a further reduction in insurance rates.

According to the report of the Interstate Commerce Commission, many railroads are beginning to use telephony instead of telegraphy for train dispatching. During the year 1908 the telephone was adopted on 2,357 miles of railroad.