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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.

INCREASING RAILROAD FATALITIES.

The Interstate Commerce Commission is doing valuable work in collecting and publishing, every quarter, the statistics of railroad accidents for the preceding three months. It was only by the institution of such a commission, equipped with ample authority, that the country could keep itself informed on this most momentous question. The steam railroad enters so thoroughly into our modern life that the question of the safety of travel touches the citizen very closely, and while it is a fact that the killing of passengers is the one thing above all others that an up-to-date railroad management wishes to avoid, it cannot be denied that the publicity given to accidents by these bulletins of the Interstate Commerce Commission is a decided safeguard to the life and limb of the traveling public. On the other hand, it is a most disquieting fact that the statistics of train accidents for the year ending June 30, 1904, show not only the largest record of deaths and injuries, but one that has never been approached in any year covered by the investigations of the Interstate Commerce Commission. Last year 3,787 passengers and employes were killed and 51,343 were injured in train accidents. In the previous year, 3,564 were killed, and 45,977 injured, and in 1902, 2,819 were killed and 39,800 more or less severely injured. This is an increase in two years of nearly one thousand, or 34 per cent, in the number of killed, and over 11,500, or 29 per cent, in the number of injured. Now, just what these figures mean can be understood when we remember that they far exceed in killed and wounded the losses in some of the greatest battles of the present Japanese-Russian war, battles which we are informed will go down to history as among the most bloody on record.

In casting about for an explanation of this appalling list of casualties, various causes have been suggested. Two years ago, the increase in railroad accidents was attributed to the enormous volume of traffic due to an exceptional era of prosperity. This necessitated the employment of a large number of green hands who had to be broken to new duties, and to handle apparatus with which they were not familiar. The past two years have seen a return to normal conditions; and yet the ratio of accidents has greatly increased. Of the causes which may have contributed to this increase, we think one of the most fruitful has been the higher speeds at which trains are now run. Because of the heavier dynamic forces acting on the track, the bridges, and in the rolling stock, there must be a more rapid deterioration; moreover, the higher running speeds render the chances of avoiding collision by sudden application of the brakes smaller than they were, while the greater momentum renders a collision or a derailment proportionately more fatal. These considerations are strengthened by the fact that the weight of engines and cars has gone up enormously in the last few years, and weight is the other important factor with velocity that shortens the life of track and structures, and increases the smashing effects of a collision. It is difficult to explain the apparent increase in carelessness or absent-mindedness among employes, an increase which is very largely responsible for the growing list of fatalities. Orders apparently are read, understood, and by some curious mental aberration are entirely disregarded. This has been particularly true on single-track railroads. Many recent accidents have been due to trainmen failing to wait at the designated station for a train coming in the opposite direction. In one notorious case, the engineer and conductor were old employes who had been running that particular train carefully and successfully for many years. If accidents can happen in a case like this, the obvious lesson is that the single-track road and the train-order method of operation are an extremely perilous combination. The only sure remedy is to double-track such roads and run them under some form of the block signal system. Of course, in many cases this could not be done for the reason the outlay involved would throw the road into immediate bankruptcy; but there are undoubtedly thousands of miles of single track in the United States whose owners could well afford to make the change, and would find that in the long run it was a profitable improvement.

In the presence of this awful fatality list, does it not look as though the time had come when the Interstate Commerce Commission should be authorized by the government to render the installation of a block signal system imperative upon every road that is in a financial condition to warrant the outlay? The Commission was given such power with regard to automatic coupling and the air brake, and much fatality and suffering has been prevented by that most wise provision. If similar powers were conferred with regard to the question of signals, the Interstate Commerce Commission would succeed, we do not doubt, in reducing the annual list of deaths and injuries to a rate less alarming than that which now prevails.

THE VENTILATION OF THE SUBWAY.

It was inevitable that soon after the opening of the Subway, public attention should be directed to the question of its ventilation. When a traveling public that has been accustomed to ride on elevated railroads, where the amount of fresh air is unlimited, commences to travel in a tunnel, it will naturally be apprehensive as to the purity of the air therein; and those who have an instinctive dislike to underground travel, are pretty sure to be seized with an instant conviction that the air is more or less foul and pernicious. In the case of the New York Subway the inevitable has happened, and some very alarming statements have been made as to the small amount of oxygen and large amount of poisonous gases that are to be found there, even at this early stage of its operation.

It is not for the SCIENTIFIC AMERICAN to decry a reasonable agitation of this subject, inasmuch as we have several times during the construction of the road suggested that, when it came to be opened, conditions might result which would necessitate some form of mechanical ventilation in that portion of the Subway lying below 59th Street. What we do protest against is the publication of results of so-called investigations, containing statements as to the bad condition of the Subway atmosphere, which, if they were true, would involve the decimation by disease of the passengers, to say nothing of the operators who spend ten hours a day in Subway service. It is not to be expected that an analysis of the air twenty feet below ground in an inclosed four-track road that carries several hundred thousand people a day, will give as good results as that of air taken at the street level; but that conditions are anything like as bad as has been suggested, is quite out of the question. Even the London tubes, which lie at places some sixty to eighty feet underground, do not show as bad results.

A careful observation of conditions since the opening of the road, seems to prove that the theory of the engineers as to ventilation is to a certain degree correct. It was believed that the moving trains would induce sufficient drafts, and movements of the air as a body, in the Subway to maintain a thorough circulation and renewal. In the course of a trip over the whole length of the line, made with a view to special observation of this feature, a member of our staff noted that on that particular day, with a fresh northwesterly breeze blowing, strong currents of cold air swept through the westerly and northerly entrances and exits at the stations, and that an equally strong current of warm air poured out through the easterly and southerly exits. On the station platforms, it was noted that the local trains carried into the station ahead of them a body of air that moved at a considerable velocity, and that while standing on the local platform twenty feet away from the express tracks, the wave of air carried ahead of the expresses as they swept through the station was distinctly discernible. The air throughout the tunnel on that day was apparently fresh and sweet; though it must be admitted that the conditions were ideal, the trip being taken in the middle of the afternoon, when travel was not heavy, and on a day when a cold northwesterly breeze was blowing. The supreme test of the ventilation occurs, of course, toward the close of the rush hours, and on days when the atmosphere is muggy and there is no breeze blowing to assist in creating drafts at the station exits. Whether the movement of trains and the provision of eight stairway openings at intervals of a quarter of a mile along the road will prove equal to the task of periodically renewing the whole body of air in the Subway, has yet to be proved. It must be borne in mind that it is renewal, and not mere circulation, of the air in the tunnel that is desirable.

The tests which have been ordered by the Board of Health will be made with every refinement known to modern science, and the results can be accepted as absolutely accurate. If it should prove that the percentage of carbonic-acid gas exceeds the safe limit for health, it will be possible to remedy matters by the installation of mechanical ventilation on such sections of the road as may be affected. Should the present official investigation prove that changes are necessary, the public may rest satisfied that the company, which has shown such liberality in equipping the new system, as far as its rolling stock and motive power are concerned, with the very best that the state of the art affords, will do everything that is necessary to render the Subway atmosphere perfectly wholesome.

THE MINING DEBRIS PROBLEM IN CALIFORNIA.

In the early days of gold mining in California, the operations consisted of the washing and concentration of the surface gold-bearing deposits, which were found along the western slopes of the Sierra Mountains and near the headquarters of certain rivers and streams that entered the Sacramento and San Joachin valleys. The process of recovery was the simple one of washing and amalgamating, which was done at first by the simple miner's pan and riffle, and later on a much vaster scale by means of hydraulic mining. Under the latter system the gravel beds were broken up and washed into the sluices by means of streams of water directed at enormous pressure from nozzles which in some cases were as large as nine inches in diameter. Under the terrific impact of the water, whole hillsides were broken up and washed away, the quicksand and gravel being swept into the canyons and small streams in the vicinity, to be ultimately carried farther and farther down into the valleys with each succeeding season's floods. The accumulations of debris at last reached the lower and fertile valleys, where they choked up the streams and caused heavy overflows, during which the sand and gravel were carried out over the adjoining land, and deposited in enormous quantities. The complaints of the owners of the valley property resulted, in 1883, in action by the courts in California, which put a complete stop to hydraulic mining, and about ten years later, Congress appointed the California Debris Commission, consisting of three army officers, who were to permit hydraulic mining under such conditions as would prevent obstruction of the navigable waters of the United States. The commission also was charged to make plans for restoring the channels of rivers in the Sacramento and San Joachin valleys, so as to render them once more navigable.

This important work is now well under way, and the means adopted by the army engineers present one of the most interesting studies in this class of work. In the current issue of the SUPPLEMENT will be found an illustrated article by one of the United States army engineers, describing the extensive work that is being done in reclaiming the Yuba River, which was selected because it had suffered more than any other river in California from the accumulation of mining debris. In 1849 the Yuba was a narrow stream running between lofty banks in its upper portion, and winding through the lowlands to a juncture with the Feather River. At the present time this stream contains over 70,000,000 cubic yards of mining debris. The lower river, once a narrow stream, is now in the neighborhood of three miles in width, and the mining debris varies from 24 feet to about 125 feet in depth. The river during low water winds through this deposit in a narrow stream, and at high stages the entire bed is covered with a rushing flood. The plan of the commission provides for holding in place, and preventing any further movement downstream, of this enormous deposit of waste material. It also aims to prevent any further accumulation, by holding back such debris as may in future be carried down from the upper reaches. These results are to be secured, first, by building barriers across the river to prevent the coarse detritus, consisting largely of heavy bowlders, from being carried down from the upper branches of the river; secondly, the provision of a huge settling basin, six miles below the embankment, for the impounding of flood waters carrying fine material, whereby the suspended matter may be deposited; and thirdly, the confining of the river to a selected channel, by means of training walls. The work that has already been done has been subjected to a heavy flood, and its action gives reason to believe that when the whole plan is completed, the government will succeed in repairing the great damage that has been effected in the Yuba district.

WORK ON THE SIMPLON TUNNEL

It is expected that the two sections of the Simplon tunnel, which are being carried forward on opposite sides, will come together by the end of the year. The work on the tunnel has been greatly hindered by the springs of hot water which were met with on the north end, and special precautions had to be taken to draw off the water as fast as it came, and also to keep the tunnel cool enough for the workmen. As far back as last November a flow of water had been encountered on the north section of the tunnel at 1,000 feet beyond the point of highest level. This made it necessary to stop all the drilling, not on account of the volume