

roads in the East with distinctly different operating characteristics. The new basis was then in turn forced upon practically every road in eastern territory. The increases in New England averaged between 20 and 30 per cent., and in some cases exceeded 50 per cent. At the same time long standing differentials between different grades of employees were seriously disturbed. Throughout, the new wage basis and working rules (prescribed partly by governmental mediation) are far from scientific or equitable."

Cost keeping must be systematized with the same care as other operations and be beyond criticism to be effective. The old saying that there are "lies, d— lies and statistics" had its origin, no doubt, in poor cost-keeping. There is a story told of a locomotive standing in the shop waiting for small repairs where costs were carefully (?) kept and everything had to be charged. The old locomotive came in for all doubtful and odd charges until, at the end of three months, it had \$5,000 charged against it.

If time is wasted it should be known as surely as if material is wasted and should be considered a reflection upon the system rather than upon the individual. The trouble is that where standards are lax there is an uncertainty as to where such waste is taking place, and advantage is taken of this to let the matter go.

Cost-keeping as above is becoming necessary to comply with the requirements of the Interstate Commission.

The phase of the situation which is the peculiar problem of to-day—that is, the bringing of the human factor in the machine up to standard—is first and last a matter of men, the production of highly trained men, for however efficient in design an organization may be, its real efficiency is measured largely by the human element. Unfortunately, under present conditions, a man enters railway life at the point of least resistance and gets where he can by force of circumstances and native wit. The result is that thousands of men are struggling to hold positions for which by nature they are largely unfitted. For certain railway positions men are specially selected, the unfitted being rejected. Why should this not be the case for all? For practically every class of material used specifications have to be complied with, and a certain standard attained to be accepted. Why should this not be the case with men? Psychology has made such strides that it is conceivable that a bureau for the purpose could, after some experience, pass upon all applicants, and after deciding upon their general fitness or unfitness for railway work, guide as to the particular class of work for which they are best adapted. Inefficiency under present conditions is often as much a matter of circumstances as any fault of the individual.

When once accepted for railway service a boy or man should have definitely placed before him the necessity for qualifying for the position ahead, and failure to respond should be taken as an indication of unfitness for his particular work or lack of ambition, and the case should be dealt with accordingly. Vocational training has many enthusiastic advocates among railway officers, and is more or less the practice on some of our large systems, so that the material is not wanting for the elaboration of this idea.

The intelligent application of the principles briefly outlined above was the means by which the German army became well nigh invincible, and the nation has in a generation by scientific administration and rational educational training of its people, notwithstanding the poverty

of its natural resources, passed from inefficiency to the front rank among the nations of the world.

The nucleus of the foregoing exists on the railways as operated to-day and all that is needed is that present practice should be brought up to date to meet expanding needs, and more thoroughly understood by all concerned. Speaking generally, what we need is a better understanding between head and hand, the proper blending of theory and practice; the creation of a feeling down to the last man that the railway interests are his and that in furthering its interests he is furthering his own.

THE WATER SUPPLY OF PARIS.

THE city of Paris is supplied with water from many different sources, and the distribution of the supply is under the control of several separate companies, and in part only by a committee of the municipality. Samples of the water from each of the supplies are taken each week and examined chemically and bacteriologically at the municipal laboratory at Montsouris, by Mr. F. Diénert, the official chemist and bacteriologist to the city of Paris. The results are published from time to time in the official municipal bulletin of the city. The bacteriological results, for a period of six months, from September, 1912, to March, 1913, as recently published in *Engineering*, London, are set forth in Table I. from which a comparison of the results obtained by the various systems of water purification may be made.

In the case of the four large service reservoirs at Paris, supplied respectively by aqueducts from the rivers Marne, Loing, Dhuys, and Avre, it will be noted that the bacteriological results are extremely variable, depending to a large extent on the rainfall and consequent state of each river. With regard to the filtered water supplies, the following is a brief summary of the systems employed at the various works.

At Choisy-le-Roi the raw water of the Seine is first passed through Anderson revolving purifiers, by means of which a certain quantity of ferrous oxide of iron is taken out by the water as it flows through. This iron is precipitated as ferric oxide in labyrinth settling-tanks—that is to say, decanting basins—through which the water is made to flow in a continuous stream by means of baffle-walls from inlet to outlet. Recently, however, this system has been partly abandoned, and one-half of the labyrinth settling-tanks have been transformed into roughing-filters, after which the water passes to ordinary sand filters. The roughing filters are scraped by means of the Boistel automatic machine.

At Neuilly the water of the Marne is treated by the ordinary system of decanting-basins and sand filters. At Nogent-sur-Marne decanting-basins, roughing-filters, and slow sand filters are employed. At Ivry Puech "degrossisseurs" were installed some 14 years ago, but the water passes direct from these on to slow filters, instead of being passed through coarse-sand pre-filters in series between the degrossisseurs and sand filters, as in the case of more modern installations on the Puech-Chabal system. At St. Maur, roughing-filters of the ordinary type are employed previous to slow sand filtration, after which the water of the Marne is passed through ozone sterilizers.