

ardizing other elements or substances used in road construction. This is the special province of trained geologists and chemists who ought to be put in charge of a department constantly engaged on this vital work of investigation and research.

At the present day we have very little practical experimental data to go on, and even the far-seeing pioneers—such as Mr. Lovegrove and others—who have undertaken such work on a necessarily limited scale have been handicapped by the absence of actual tests on roads bearing different classes of traffic as shown by a scientifically planned traffic census.

This last method is, the writer suggests, the only sure test of a road stone; but the help of such experts as are suggested will become increasingly necessary as the work of road construction becomes more complex and bituminous and other products play a larger part in our work than hitherto. But even our present-day knowledge would—were it only applied—prevent firms advertising as “granite” numerous classes of road stone as distinct from granite as well-defined classes of rocks can be, both from a geological and a business or commonsense point of view.

Such “annexationists’” material is generally vastly inferior to the best-known granites used on our roads. One instance the writer can give, for he condemned some hundreds of tons of defective material from certain particular quarries, which at the best turn out a second-rate road stone (a quartzite) quite suitable for local district roads, but which lasted less than one-third the life of a good granite stone from quarries in an adjoining county, but equally near at hand. And yet to-day we have millions of tons of stone sold as granite and described as such on their letter paper and literature by firms who do not hesitate to try any means to “down” any surveyor who has the temerity to point out that they cannot produce one single ton of granite from their quarries, or to crush between fingers and thumb quantities of “top-stuff” sold as granite with a crushing strain of — thousands of lbs. pressure per square inch!

Verily our institution has a future, if only in battling against such real corruption—a work which, coupled with our defence fund, is worthy of our best efforts—another battle in which the writer is determined to again “do his d—ndst.” And he would venture to pass on to his colleagues in the defence of our rights that time-worn maxim of war, “The best defence lies in attack.”

Wanted—“Business Methods”—and an Organizer

And as constructive, rather than carping criticism is the *motif* for these remarks, I venture to throw out the suggestion that a really able and tactful inspector of contracts (annual and other) should, with the assistance of a small expert staff, be able to save the country possibly £100,000 yearly on that half of the total road expenditure (say, £10,000,000) which is expended on material, etc., and which could thus be brought under review for the purpose of a “business” or “quality” audit, as distinct from that mere checking of figures usually subject to those really infantile “deductions” of the Local Government Board. How? (1) By backing up every surveyor, especially at those meetings of his authority when the large annual contracts are let; (2) by inspecting materials on the roads—before, during, and after use thereon—by organizing and checking transport and haulage, and generally by applying those business principles and that wholesome supervision upon which every really successful business organization is built up, extended, or modified as is necessary to meet the complex difficulties every worthy

contractor, no less than each surveyor, has to battle against almost every day.

One result of such appointments would be to increase the output of practically every single class of usable road material, and, though insisting upon uniformity and excellence of material would naturally result in increased business to the firms producing such materials, the only people who would be “ousted” would be those retailers of local dumps of materials which experience proves to be worthless for use even on adjoining roads. On the other hand, a good local material should “oust” material from a distance which is no better for the required purpose. Again, the organization of methods of delivery and of transport should result in enormous economies being effected; and in this connection why not prepare to use some thousands of our war-time motor vehicles—in helping to balance “supply” and “demand” in this public service after the war? All this—and more—should be the task allotted to a really “live” man trained in the severe school of experience to distinguish real organization from its shadow.

Road Rollers

Having regard to the necessity for true downward pressing together of present-day bituminous road materials rather than the uneven tangential stresses of wheeled rollers, the writer has designed both steam and motor-engined road rollers on the “Tank” principle, but as he does not consider he has yet fully mastered all these lessons, the less teaching of half-truths the better.

Bridges

As regards new points *re* bridges and bridge construction brought out by the war, many pages could be written from the military point of view, but were it permissible to publish even a résumé of all the facts interesting to us as road engineers, this phase of our common interests would alone provide the subject-matter for several papers more technical than this “summary of lessons” is intended to be.

The first essential of a bridge which has to carry modern traffic is width, and this point has been already emphasized to the best of my ability. And whether for extending lengthwise those countless culverts and small-span arches, or for filling up behind the haunches of those “hog-back” bridges, which alike seriously detract from the utility of our highways, there is, I consider, no one material to compare with ferro-concrete. In fact, the one outstanding lesson as to materials of construction taught by the war is, in my opinion, the all-round excellence from all points of view of concrete, and more especially ferro-concrete construction.

Ferro-concrete bridges are practically indestructible, as the war has well proved. Not only do they bear the downward stresses they were built for, but they stand the lateral and upward stresses from explosions and floods better than bridges of masonry, etc. Even in England we have had the parapet walls of narrow bridges pushed off by ordinary traffic, whereas ferro-concrete will stand up against almost anything.

In the forthcoming directory of the American Association of Engineers, there will be an innovation in the way of a classified list separated into the several branches and specialties of engineers. For instance, under the electrical engineering division will be sub-heads of members who have had experience in the design, inspection, test or sale of batteries. In the base or main list, which will be alphabetical regardless of grade, the full service record will be given, so that the directory becomes a guide to the employer of engineers and a silent salesman for the individual.