

MODERN ROAD WORK.

IN a paper presented before the Roads Improvement Association of Leicestershire, Eng., Mr. H. P. Boulnois, vice-chairman of the association and a member of the engineering advisory committee of the Road Board, dwelt upon the subject of modern road methods. He laid the revolution which obtains in our preconceived methods of road building to the introduction in large volume of self-propelled traffic, which had thereby raised considerable public and scientific interest in a question which had lain dormant and neglected for many years. The year 1908 brought with it the public outcry against the dust nuisance, and the excessive damage caused to the water-bound carriageways of this and other countries by the new description of traffic. Road makers became naturally much exercised in their minds at the outcry, and at once set to work to ascertain how this great change in the character of the traffic was to be met.

Three International Road Congresses have been held since then, the first at Paris, the second at Brussels, and the third in London. Extraordinary interest in the proceedings was shown at all these congresses, which were attended by delegates from all parts of the civilized world. Many interesting questions were discussed, but no very definite conclusions could be arrived at—beyond generalities—the fact being that there are so many conflicting and disturbing factors which enter into the question as to what should be the form of construction of the modern road surface.

The traffic on the road is the primary factor which governs the selection of the type of construction to be employed. The amount and description of this traffic varies in almost every locality, and the problem is further complicated because this traffic is in a state of transition. We have to deal with the self-propelled traffic of varying speeds and weights, but also with the horse-drawn traffic, and a surface that may be excellent for the one may not be the best for the other.

It has been stated, with some truth, that the bicycle requires a road as smooth as a billiard table, a traction engine, or heavy motor wagon, requires a solid stone causeway, a horse requires a soft and easy foothold, and that a rapid motor car requires a straight track all to itself. In addition to this, the pedestrian requires a foot-path for safety, and there should be little or no dust, a requirement which is shared by the occupiers of adjoining premises; also there should be a minimum of noise. The ratepayer, who pays for the road, naturally requires that the construction and maintenance should cost as little as possible, while all the users of the road require that it shall be amply wide, so that there shall be plenty of unobstructed room for the traffic.

How are these problems to be solved is the question that exercises the minds of the modern road engineer.

The earliest endeavors that were made to meet some of these difficulties consisted in tar-painting or tar-spraying the existing road surfaces, where the road was in good condition. The dust was no doubt greatly diminished, and the surface of the road was in great measure improved and preserved. Since then many hundreds of miles of road surfaces in this country have been thus treated, in most cases satisfactorily, and where there have been failures it has been due to want of proper precautions.

In this connection the Roads Improvement Association has issued a valuable little leaflet, entitled "Notes

upon Tar Treatment of Road Surfaces," in which they point out the precautions that should be taken when dealing with the surface of roads in this manner. Shortly their recommendations are:—

(1) It is absolutely necessary that the crust and foundation of the road, taken together, should be sufficiently strong to carry the traffic.

(2) Before treatment the surface should be thoroughly cleansed from dust, caked mud and dung, in order that the tar may adhere properly, and that the surface of the road should be even and without depressions of potholes, etc., before the tar is applied.

(3) No tar should be applied unless the road is thoroughly dug to at least $\frac{1}{2}$ in. below the surface, and they point out how impossible it is for tar to adhere to a wet, or even a damp, surface.

(4) Great care should be exercised in the selection of the tar; crude tar requires special care, as it may contain many detrimental compounds, and they give valuable hints as to the manner in which this may be avoided with reasonable care.

(5) The methods of tar-spraying by hand or machine are not discussed, but it is stated great care should be taken to apply only that quantity which the road will take, and at the same time amply cover the surface; from one-sixth to a quarter of a gallon of tar per square yard is suggested.

The leaflet contains many other valuable recommendations, and I advise all those who are engaged in this description of work to obtain a copy.

There can be no doubt that very excellent results have followed tar-spraying, and it has the advantage of being an exceedingly economical palliative, but it is only a palliative, and only solves the mere fringe of the problem of modern road methods. Something more is required in numberless cases where the traffic has abnormally increased, and a very large number of special methods of construction have been introduced during the last five or six years.

It would be impossible in a short paper to give a list of these various methods; suffice it to say that mainly all of them are on the lines of the introduction of a bituminous material to bind the stones together which form the road, instead of the now old-fashioned method of binding them with sand, dirt and water.

It has been found that the traffic not only wears the surface or crust of the road, but produces a movement among the stones themselves at some depth below the surface, causing a rocking action of the stones and producing an inter-attrition or rubbing which gradually wears off the angles of the stones until they are of a rounded shape and have no interlocking or power to resist movement among themselves. This is the main cause of the excessive mud on an ordinary water-bound road, and it is also the chief cause of the destruction of roads.

It was to meet this interstitial wear, and to confine it, so far as possible, to the upper surface, that the bituminous-bound road has been introduced. The various methods that have been adopted may be divided into the following groups:—

The ordinary water-bound macadam road with surface tarring, or painting, already referred to, and the introduction of various patented preparations to take the place of ordinary tar for this purpose.

Tar-macadam, which consists of broken stones of various sizes, thoroughly dried, then coated with tar or other bituminous mixture (either by machinery or by hand), and then laid in the road and rolled into place.