natural spill to join the Chenab. That would account for the reach being so straight. About the Missouri, the Author should have written " straighter ", not straight. The reason for that was given by him as the clay terrain through which the river passed. Now, clay, when eroded, broke up into very fine particles and those had small deflective power. The straighter course would, therefore, follow as a corollary.

In conclusion, the Author wished to note the effect of a flood in the typical reach shown in Fig. 1, Plate 1. The side creeks would open out or flow more strongly, and the " bars " would begin to silt up. The flow, in fact, would generally be much straighter. During the rise in water-level the creeks and great empty spaces over the higher ground of the basin would be filled and in consequence the velocity would diminish. With a falling river the water would return from off this larger area to its narrower section. Velocity would in consequence increase and action would be severe, especially as the newly forming channels would be scoured out before they were set. Mr. Lacey had probably had that in mind in his remark that the aggregate caving resulted at low and medium river. It would be more correct to say " during a falling river." It should, however, not be forgotten that the flood had brought about the conditions that gave that result.

CORRESPONDENCE
ON PAPER PUBLISHED IN FEBRUARY 1943 JOURNAL

Paper No. 5335.

" The Development of Emergency Sources of Water Supply."†

By A MEMBER OF THE INSTITUTION.

Mr. A. N. Burgess observed that, although in the scheme described the total delivery capacity of the selected installations amounted to 3 million gallons per 24 hours, it would appear that the estimated quantity to meet bare essential requirements was considerably lower than that total capacity. The Author had, therefore, been able to dispense with the use of storage tanks, other than a few comparatively small static tank installations, and to limit the working of the pumps accordingly.

Other water undertakings might be less fortunately placed as regards

† Journal Inst. C.E., vol. 19 (1942–43) p. 275 (Feb. 1943).

the relation between total delivery capacity of emergency sources and bare essential requirements, and in such cases they would be well advised to avail themselves of existing storage facilities, any risk of pollution from that source being counteracted by a sufficient chlorine dose, or by preliminary scouring of the tanks. Frequently the storage provided in connexion with an industrial installation was sufficient to accommodate the whole of the night yield of the pump, thereby making continuous operation practicable.

Other advantages resulting from the use of large capacity storage tanks included :—(*a*) avoidance of intermittent working of the pumps resulting from temporary lack of demand for water ; (*b*) simplification of sterilization, the water being treated at the inlet to the storage tank, making possible the use of simple automatic dosing apparatus ; (*c*) ability to meet peak demands for water ; (*d*) economy in the use of vehicles resulting from more rapid refilling of mobile tanks ; (*e*) the possibility, under certain conditions, of gravitating the supply from the storage tank through portions of the ordinary trunk main system, which might be used to feed hydrant standposts or static tank installations.

Mr. Burgess's experience of the distribution of water by mobile tanks touring allotted areas had been that it was slow, and therefore wasteful of tanks and transport. He suggested that economy could be effected by (*a*) mobile tanks proceeding to allotted distribution points and there standing until emptied by the public, or (*b*) bulk delivery from mobile tanks into static tank installations.

The Author, in reply, observed that, as stated by Mr. Burgess, the total delivering capacity of the pumping installations was considerably in excess of the quantity stated to be required to meet the bare essential requirements of the public ; indeed the quantity available was six times greater than that provided to be distributed in the scheme. The Author considered such a factor of safety to be necessary to allow for interruption of the working of the installations owing to enemy action.

In case of necessity arrangements had been made to use the storage provided at certain of the less vulnerable installations. As the storage tanks were in most cases located in the highest parts of the industrial buildings, and with their pipe connexions, as also the distribution mains in the roadway, were more subject to damage from enemy action than were the pumping plants frequently located below ground-level, the scheme was primarily designed to limit the use of all ancillary plant at each installation to the minimum. The object of that was to ensure, as far as possible, that each water point could be brought into operation after damage to the industrial establishment to which it normally furnished a supply, either after effecting repairs to the installation or bringing into operation alternative mobile pumping plant on the site of the borehole.

For reasons of simplicity of operation it was decided to adopt a system of field chlorination that could easily be applied by trained labourers using

such equipment as could readily be renewed, rather than more refined chlorination equipment requiring a higher degree of skill to operate and possible supervision by technical members of the staff, who during the continuance of the conditions requiring the operation of the emergency water-supply scheme would be engaged on other urgent works in connexion with the restoration of the normal piped supply.

With regard to the distribution of water by mobile tanks provided for in the scheme, censorship arising from war conditions rendered it impracticable to append to the Paper a plan showing the location of the several selected water points and the many others, in reserve but as yet undeveloped to a complete stage, and their relation to the whole of the area to be supplied, as also the many Food and Rest Centres distributed over the area with their individual static storage tanks located in the adjoining public roadways. If necessary those static storage tanks could be filled more frequently than once a day to enable consumers in the vicinity of the Food and Rest Centres to draw supplies. Further, as a considerable number of standard mobile tanks were provided in the scheme, it would be possible to erect one or more of those tanks, interconnected, on any site where experience proved that the provision of static storage tanks would be beneficial and thus assist in the dispersal of mobile tanks.

Sufficient static tank installations as shown on *Fig. 4* had been installed to provide the supply to more than one-quarter of the population.

CORRESPONDENCE
ON PAPERS PUBLISHED IN MARCH 1943 JOURNAL

Paper No. 5316.

"Results of Experiments on Metallic Beams Bent Beyond the Elastic Limit." †

By Enrico Volterra, Ph.D.

Professor J. F. Baker observed that though considerable attention had been given in recent years to the development of a theory to explain the behaviour of structures in the plastic range it was still incomplete and speculative. Nevertheless the information already available, to which

† Journal Inst. C.E., vol. 20 (1942–43), p. 1 (Mar. 1943).