granular mass is represented by a solid block of photo-elastic material, suitably shaped and loaded, has previously been used, the stresses being determined by the conventional methods of photo-elastic analysis. Such a technique is of very doubtful validity, since in an unbonded mass of granular material relative motion between the individual particles could well affect the distribution of stress and invalidate the laws of elasticity.

In an effort to meet these objections, we have simulated a mass of granular material by the use of a number of rollers made of a stress-optically active material, the rollers being arranged with their axes parallel and parallel to the optical axis of the bench. While loaded, the model was examined by the use of circularly polarized light, and the stress deduced from the relative brightness of the rollers. The objection to this model is that, if an apparatus of moderate size is to be used, rollers of diameter sufficiently small to simulate correctly the particles in a granular material cannot be obtained ; furthermore, the number of rollers required is prohibitive.

In the model now proposed, the granular mass is simulated by the use of a powdered material. At suitable co-ordinate points in the mass, indicators made of a stress-optically active material of a length sufficient to extend throughout the whole depth of the model are inserted. The directions of the principal stresses in these indicators are determined by the rotation of the polarizer and analyser of the optical bench ; the angular positions of the crossed polarizer and analyser, for extinction, giving these directions.

If these directions, at each co-ordinate point, are inserted on a suitable diagram, and provided that the directions of the stresses in the indicators are the same as those which would be present if the indicator were replaced by granular material, then a diagram showing the directions of the principal stresses in the granular mass may be drawn. Thus a two-dimensional model, in which all the significant characteristics of a granular material would be expected to be operative, is obtained.

As an example of the application of the technique to a practical problem are shown the results of experiments on a model simulating the distribution of stress in a granular material in a tube under plungers of various diameters.

The apparatus shown in Fig. 1 consists of a U-shaped brass plate $\frac{1}{2}$ in. thick, on each side of which is clamped a sheet of 'Perspex', also $\frac{1}{4}$ in. thick. In the slot so formed slides a plunger for the application of the load. The granular material together with the photo-elastic indicators, which are 'Perspex' cylinders $\frac{3}{32}$ in. diameter, are loaded into the cavity under the plunger.

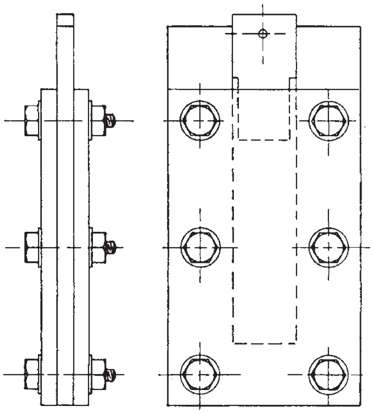
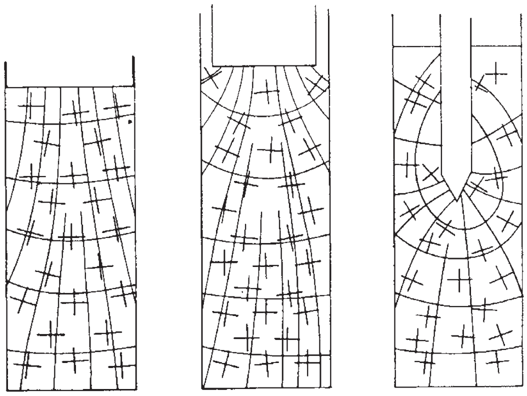


Fig. 1



(a) (b) (c)

Fig. 2

In Fig. 2 are shown the stress-distributions as obtained by this method ; in Fig. 2*a* is shown that under a plunger the same diameter as that of the tube, in Fig. 2*b* that under a plunger of diameter 0·8 of that of the tube, and in Fig. 2*c* that under a plunger of diameter 0·25 of that of the tube.

It is interesting to note that in the latter case the stress pattern begins to show features normally associated with the stress-distribution around a pile even though, in the present case, considerable wall-effect is operative.

While we do not consider the method to be free from objections, it is felt that it may prove to be a valuable tool and may be of interest to workers in allied fields.

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Passage of Organic Vapours through Orifices

THE object of this note is to direct attention to a peculiar phenomenon discovered during an investigation on the passage of organic vapours through orifices.

In one of a number of experiments, *para*-nitrophenol vapour at a temperature of 130° C. and a pressure of 0·02 mm. of mercury was allowed to flow along a capillary tube (internal diameter 0·61 mm., length 10 cm.), into a chamber where it was condensed on an ice-cooled brass surface placed 3 mm. from the end of the capillary. The *para*-nitrophenol was deposited on the surface in a diffraction-like pattern consisting of a central disk (radius 0·2 mm.), an inner ring (radius 1 mm.) and an outer ring (radius 4 mm.). It has also been found[1] that with a straight slit, two symmetrically placed deposits with a minimum at the centre are produced.

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[1] Mishra, B., *Ind. J. Phys.*, **30**, 273 (1956).