work of this class expanded metal makes an excellent reinforcement, and data for the construction of floors suitable for safe working loads of from ½ cwt. to 6 cwts. per superficial foot can be readily obtained.

A further application of concrete, of special value where old shallow mines have been worked, is in the formation of rafts for the foundations of heavy or valuable buildings. For important work these should be properly designed to avoid unnecessary waste of material, but for small jobs the writer has found old rails interlaced with steel guide rods, or even wire ropes, quite successful. The examples given might be multiplied indefinitely.

Selection and Mixing of Materials.—For the benefit of those who might be inclined to adopt reinforced concrete, Mr. Gregory offered some practical hints on the selection and the mixing of the materials:—

Cement.—For all reinforced work, and particularly for underground application, when some considerable time generally elapses between the mixing of the concrete and its being placed in position, a slow-setting cement should be selected. Considerable variation exists in this respect with different makes, and before adopting any particular brand tests should be carefully made. The selected cement should, in addition, comply with the British standard specification as to fineness, specific gravity and tensile strength.

Sand.—This requires equally careful selection. When examined under the microscope the grains should appear sharp and angular. Many sands are mixed with clay or loam, and this is fatal to the making of sound concrete. Washing is sometimes resorted to with a view to eliminating these impurities, but in this district no difficulty is experienced in obtaining suitable qualities locally.

Aggregate.—For underground work the writer strongly advocates broken granite. In the work described two sizes have been used, namely, ½-in. chippings and 1½-in. screened stone. For many purposes on the surface broken bricks or saggars may be advantageously used, but it must be remembered that the sand and cement simply form a matrix or mortar binding the aggregate together, and the greater the strength of the individual fragments of aggregate, the greater the ultimate strength of the concrete as a whole. The aggregate forms the bulk of the finished concrete, and it is useless to get good cement and sand to bind together material which cannot in itself offer considerable resistance to a crushing load.

Gauging.—The correct proportions of the various classes of aggregate sand and cement vary according to the size and shape of the individual fragments. Theoretically, the intersticies or voids in the large stone should just be filled by the smaller stones, and the voids still remaining should be completely filled up by the mortar of sand and cement. In practice a considerably larger proportion of the smaller material must be used, in order to insure a compact concrete, owing to inequalities in mixing and stowing. The voids in the various grades of aggregate are easily determined by filling a box of known capacity level full with the stone to be tested, and adding a measured quantity of water until it is on the point of overflowing. With the aggregate adopted at Sneyd the following proportions by measure of the material give good results:—

1½ in. broken granite	36% or 9 parts
½ in. granite chippings	32% or 8 parts
Sand	20% or 5 parts
Cement	12% or 3 parts

The proportion of the neat cement to aggregate, including sand, is thus 1 to 7⅓. The aggregate, sand and cement are measured out accurately in the proportions stated above and then mixed well dry, after which a measured quantity of water is added and the whole thoroughly mixed wet.

Owing to the finished concrete forming a homogeneous whole without intersticies, the bulk is considerably reduced in mixing, and forms only 60 per cent. of that of the dry material. For making 1 cubic yard of concrete, therefore, the following table gives the quantity of each ingredient based on the proportions already stated:—

	Cu. ft.
1½ in. broken granite	16.2
½ in. granite chippings	14.4
Sand	9.0
Cement	5.4
	45.0

The mixing can be done by turning the material over with spades, but careful supervision is necessary, and it is difficult to ensure that the whole of the ingredients are thoroughly incorporated first in the dry state, and afterwards when the water is added. When much work is likely to be carried out, the writer strongly advises a machine, the cost of which is speedily recouped by the saving in labor, and absolute uniformity in the quality of the cement is secured.

Cost.—The cost of the application of concrete underground is dependent to a great extent on local conditions. The nature of the ground to be excavated and the facalities for the transport of the materials to the site are factors which it is necessary to take into consideration for each individual job. The following table gives the cost of the raw materials for 1 cubic yard of concrete as used at Sneyd Collieries, and will be some guide in working out an estimate:—

Material	Cubic feet	Weight in lbs. per cubic foot	Total weight in lbs.	Price per ton s. d.	Total s. d.
1½ ins. granite	16.2	84	1,360.8	9 6	5 9
½ in. chippings	14.4	84	12,906	7 6	4 0
Sand	9.0	80	720	6 6	2 1
Cement	5.4	95	513	36 0	8 3
Water	—	—	202.6	—	—
Total per cu. yard	—	—	—	—	20 1

The cost of stowing the concrete in position, including fixing the centering, is approximately 3s. per cubic yard, and mixing with the machine about 2d. per cubic yard. If girder rings are used, their cost has to be added, and as an example the cost per lineal yard of a barrel arch, 11 ft. in diameter, with rings spaced 3-ft. centres, is given:—

	£	s.	d.
1 girder ring 19 cwts. at £10	9	19	0
6.55 cubic yards concrete at £1	6	10	10
Stowing cement 6.55 cu. yds. at 3s		19	8
Fixing girder rings		7	6
	£17	8	0

This, of course, excludes the cost of excavation or of mixing the concrete and conveying it underground to the position required. Where the girder rings can be dis-