Let us consider the various qualities given in their tabular order.

(*a*) *Specific Gravity.*

The average of Canadian Portlands = 3·11.

The average of English Portlands = 3·10.

The average of Belgian Portlands = 3·055.

The average of all Portlands (16) = 3·09.

It would seem advisable, therefore, to specify a minimum for Portlands of 3·10.

The samples were not dried or prepared in any way; if they were dried for 15 minutes, according to English practice, it is probable they would go somewhat higher.

It will be noticed that the only two Portlands (?) whose specific gravity was low (Belgians Nos. 16 and 17) were both poor cements; one, No. 16, sets slowly, and the briquettes made for 4 week tests, and immersed in water after 24 hours, were found sloughed down in the tanks, and had evidently run and set over again! They would not give any test to speak of. Evidently the hydraulic property, in 24 hours, was not enough to hold them together, while the other one (No. 17) failed in the blowing test. Altogether, it is doubtful whether these cements are Portland or naturals, although sold as the former, owing to their color being gray.

It will be noticed, with satisfaction, that Canadian Portlands stand at the top in specific gravity, judging by the samples tested, which were, however, all received from manufacturers.

The specific gravity of natural cements might be placed at 2·95, although it is not so likely to be underrun, owing to the ease with which this can be obtained.

(*b*) *Water required for standard consistency.*

This is considered, by many, to be very important; but many tests have demonstrated to the writer that what is especially needed is that there shall be sufficient to make good briquettes; to err, say, 1 per cent. in adding water is fatal, if too little, while if too much, it does not seem to affect the strength of briquettes at one week, certainly not at four weeks. This is contrary to statements often made regarding the increased strength given by a minimum amount of water; but probably what is referred to is an excess of water sufficient to make a thin batter or soup. Undoubtedly such an amount not only makes the briquettes shrink and crack in drying, but will seriously affect the early strength.

A very peculiar effect was met with in two Canadian and one English Portlands. They were evidently fresh, and when mixed with a normal amount of water would work into a good plastic mass, but in about one to two minutes after the water was added, they would suddenly set, so hard that it was useless to attempt to put them in the moulds.

By increasing the per cent. of water to about 30, a thin batter was made, which could be got into the moulds before this action took place; of course this amount of water made the set very slow, and deadened the indurating action in one week tests.

When tests were made, several weeks later, on these cements, this effect had disappeared; perhaps some one connected with this industry can explain the cause of this action.

(*c*) *Residues or Fineness.*

The variation is enormous, as the following statement shows:—

	Residue on No. 50 Sieve. Per cent.	Residue on No. 80 Sieve. Per cent.	Residue on No. 120 Sieve. Per cent.
Coarsest	31·4	52·2	61·2
Finest	0·25	2·7	6·7

The English Portlands are generally very coarse, as will be seen, and the selected Canadian ones fine.

It is not putting it too severely to say that specifying a certain residue on No. 50 Sieve is a direct premium on coarse grinding, and so, in fact, are neat tensile tests.

For instance, English brands, No. 10, No. 11, No. 12, No. 13 and Nos. 14 A, 14 B, are all evidently ground to pass a specification of 5 per cent. residue on No. 50 Sieve, and are all very coarse when sifted on finer ones, thus plainly showing the failure of the specification to obtain as good a product as possible.

The author would urge the severest requirements for fineness.

Various papers read and the statements of manufacturers themselves go to show that the increased cost is very slight, not more than 10c. per bbl. between ordinary and fine grinding.

10 per cent. residue on No. 80 Sieve
20 per cent. residue on No. 120 Sieve } as maximums are not too high for present facilities for fine grinding; this would let in 3 out of 4 Canadian Portlands tested, 1 out of 10 English Portlands tested, 2 out of 4 Belgian Portlands tested, or in all 6 out of 18 brands. There are signs, however, that the English manufacturers are waking up to finer grinding, and will soon fall into line; there is no reason why educating influences should not bring grinding down much finer still for ordinary brands, but for the present, too much severity would defeat the object in view.

(*d*) The time of incipient and final set, as found by Gilmore's needles, does not seem to affect the strength, except for very short tests. When the slow settings are generally stronger, good cements may be either the one or the other; but ordinarily, unless for tidal work, a slow setting one has the desirable feature of allowing masons to mix and use good sized batches of mortar, without constant tempering, which is the practice with quick setting ones, much to their own hurt.

(*e*) The blowing test advised by Faija, has detected a "blowey" tendency in several instances; but much late evidence seem to throw some discredit on blowing tests, whether made with hot or boiling water, on the ground that manufacturers can, by the addition of sulphate of lime, cause the cement to be so slow setting and set so strongly as to resist the blowing tendency of so much as 3 per cent. of free lime added after the cement had been burnt. If this is a fact, chemical analysis will need to be resorted to more frequently, to detect this dangerous adulteration which is fatal in seawater, and bad in any case, as the great strength which it gives to cements at early dates is apt to decrease at longer periods. Belgian No. 19 cement tested gave higher results at 1 week than at 4 weeks; this looks a little suspicious.

Cements have been tested usually neat; the Germans have reached the stage of 3 to 1 mixtures as the deciding test, and this would seem to be the only rational way of testing a cement, *i. e.*, in the same condition as it is used.

The difficulty, however—and it is a very serious one—has been to get anything like uniform results in sand tests. The variation in putting the mortar in the moulds has been so much more than the variation in the cementing value of the cement that the tests were valueless, so that the most testers have clung to neat tests as being simple and a fair index of cementing qualities. That this view is in fault, and misleading,