When sifting cement through a sieve to obtain the proportion of particles too large to pass through the interstices between the wires, the size or area of the individual holes appears to be the only condition of importance; and it is to be assumed that the intention of the framers of the specification was to ensure this condition being standard.

If a definite number of wires of a definite thickness be *equally* spaced throughout the unit of measurement, the spaces between the wires will be of definite and equal area; but the weaving of wire cloth has not yet attained such a standard of excellence as to ensure that the wires (especially in the finer counts) are spaced equally throughout the piece, or even throughout any individual inch; and I have examined many rolls of cloth which contained the stipulated number of threads, of practically the correct diameter, and yet were hopelessly inaccurate for the purpose of testing cement for fineness.

I submit that the size or area of the holes in a sieve is the real standard, and should be stipulated, the actual diameter of the threads, or their precise number per inch, being of secondary importance.

In the course of my duties it falls to me to examine and to accept or reject numerous pieces of sieving cloth for use in a number of cement works and testing laboratories, and I have formulated a specification for my own use which aims at a standard sieve, while at the same time recognizing and allowing for the great difficulty of weaving cloth of this nature with extreme accuracy.

This specification, for 180^2 sieves, I state as follows:

(1) The standard area of the holes in inches is $.00355^2$.

(2) The equivalent mesh, calculated from the actual average area of the holes, as measured, shall fall between 176^2 and 185^2.

(3) The mean variation from the standard width of holes shall not exceed 10 per cent.

(4) Not more than 10 per cent. of the holes measured shall exceed a variation of 15 per cent. from standard.

It is my practice to measure with a micrometer microscope about 300 to 400 spaces in several different parts of a roll of cloth; and I find it is possible to obtain cloth to conform to the foregoing specification, and that such cloth gives in use very fairly consistent results; whereas sieves which conform to the British specification —as worded—often give, in testing, most erratic results; in one case the difference between two sieves, both of which contained the correct *number* of wires per inch, amounting to 20 per cent. of the total residue.

Another point which appears to be overlooked is the size of the sieve itself. The British specification stipulates that 100 grammes of cement shall be sifted for a period of fifteen minutes, but does not specify the total area of the sieve to be used. I have seen in use sieves varying in size from 4 in. diameter to 9 in. or 10 in. square; and it is obvious that the same weight of cement, sifted for the same period of time, will be more effectively sifted over a larger area than over a smaller one.

The following actual experiments bear this out: A sample of cement was thoroughly mixed, and 100 grammes sifted for fifteen minutes through each of two sieves prepared from the same wire cloth, but differing in sifting area. The larger sieve had a total area of 64 in.^{2}, while the smaller one had a total area of 12 in.^{2}.

The residue on the larger sieve was 16.4 per cent., while on the smaller sieve it was 19.8 per cent., a difference of 17 per cent. of the total.

Another and very finely ground sample, tested in the same was, gave 3.5 per cent. of residue on the larger sieve, and 5.6 per cent. on the smaller one—a difference of 37 per cent. of the total. I admit this is an extreme case, and that nobody in his senses would nowadays use a sieve so small as 4 in. by 3 in. Nevertheless, this sieve was actually in use not so very long ago.

Specific Gravity.—The specific gravity test is now used in place of the old method of taking the weight per striked bushel, which has for some time been discredited, and rightly so.

The weight per bushel had no real bearing upon or relationship to the degree of calcination, but was chiefly influenced by the fineness of grinding. The fallacious character of this test was well known to cement experts long before its abolition from so-called up-to-date specifications, in some of which it appears, even to-day, as the "weight per litre test."

The specific gravity test is still retained in the British standard specification, and is considered by most people to fulfil the functions formerly attributed to the bushel weight test—viz., to detect the degree of burning to which the clinker has been subjected—or, in other words, it is a test for under-burned cement. This, however, is a fallacy. The specific gravity of cement affords no indication of the degree of calcination, and it has long been known that the figure was affected much more by atmospheric influence than by any difference in burning. This is recognized by the standard specification so far that the specific gravity is stipulated to be 3.15 when freshly burned and ground, and 3.10 when the cement has been ground for one month. This difference of .05 is a greater difference than lies between the gravities of good clinker and the lightest under-burned "yellow" respectively, as will be presently pointed out.

The specific gravity of carbonic anhydride and of water being .88 and 1.00 respectively, it will be readily seen that comparatively small proportions of these substances, absorbed from the atmosphere, are sufficient to reduce the gravity of cement to a material extent.

Butler has shown that if the absorbed water and carbonic anhydride be expelled by igniting the cement, the specific gravities of cements of various makes become so nearly identical as to afford no indication of quality.

The conclusions reached by Butler were: (1) That the specific gravity of cement is no indication whatever of proper calcination. (2) That the specific gravity depends upon the age of the cement, and the opportunities it has had of absorbing water and carbonic anhydride from the air.

These conclusions are quite in accord with the experience and the opinion held by myself for some time past.

In 1904 or 1905 F. M. Meyer found, as the result of some hundreds of tests on freshly burned clinker, that the highest specific gravity was obtained when the clinker was burned at a temperature of 1,290 deg. to 1,370 deg. Cent. This clinker gave cement which was expansive and unsound.

As the burning temperature was raised, the specific gravity was decreased, but the clinker became sound.

My own experience is that when taken freshly from the kiln, the specific gravity is practically the same, whether the clinker be well burned or under-burned, provided the carbonic anhydride has been all, or nearly all, expelled from the chalk.

The specific gravity of cement being merely a measure of the degree of aëration which the sample has re-