those previously used; 10 per cent. of water by weight was used in each case, but the briquettes were $1\frac{1}{2}''$ by $1\frac{1}{2}''$ (or $2\frac{1}{4}$ square inches in section,) prepared with the same cement as that previously used (q^2 in table C) and reduced to the square inch strain.

It will be noticed that, notwithstanding these facts, the strains obtained from No. 1, both at 7 and at 28 days, differs from those already recorded at those periods when made with the 1″ by 1″ moulds (*vide* q^2 tests in table C). This appears to point to the fact that the smaller briquettes can be made more dense and uniform in texture than those of larger size, and consequently afford better results in testing.

3 TO 1 TESTS: COMPARATIVE STRENGTH BY WEIGHT AND BY VOLUME.

No.	By weight at		Per-centage of increase from 7 to 28 days.	By volume at		Per centage of increase from 7 to 28 days.	Extent to which strength is decreased when proportions are by volume instead of by weight, at	
	7 days.	28 days.		7 days.	28 days.		7 days.	28 days.
	lbs.	lbs.	per cent.	lbs	lbs.	per cent.	per cent.	per cent.
1	145	182	25.5	131	159	59.0	10.35	12.17
2	127	170	25.2	107	131	87.1	15.20	22.94
3	143	244	41.3	105	172	63.8	26.50	29.50
4	113	214	89.3	82	155	89	27.60	27.50
5	178	245	37.6	119	177	48.7	33.10	27.70
6	221	330	33.0	143	218	34.4	35.20	33.90

An attempt was also made to obtain the relative strengths of concrete made entirely of bluestone aggregates, and that made with river gravel and sand, but with hardly satisfactory results, in consequence of the size of the blocks being too large.

The blocks were made in each instance 6 inches in thickness, 9″ by 9″ on the surface, and were gauged 6 to 1 (by volume) of aggregate and cement, with 6.4 per cent. of water for the bluestone concrete, and 5.06 per cent of water for the gravel and river sand mixture.

The "bluestone" aggregate was composed of equal parts of 1″ and 2″ metal, mixed with 50 per cent. of screening passing through a $\frac{1}{4}''$, but not through an $\frac{1}{8}''$ mesh, and of bluestone dust in the proportion of 1 to 2. The weight of this mixture was 121.5lbs. per cubic foot.

The "gravel and sand" aggregate consisted of gravel ranging from ½ inch to 2 inches in gauge, mixed with Nepean River sand in the proportion of 2½ to 1, and weighed 129lbs. per cubic foot.

The same cement was used for both concretes, and three blocks of each kind were made, and sent to Professor Warren's testing room at the Sydney University, to be tested for compression when the concrete was 21 days old, half of which time was under water. Professor Warren, who kindly undertook the test, reported that they presented too large an area for the machine, which is limited to a pressure of 100,000lbs.

One bluestone block cracked *on one side* at 67,000lbs., but there was no sign of crushing at 100,000lbs.; the second did not crack even at 100,000lbs.; and the third was not attempted.

One Nepean gravel block cracked at 54,000lbs., and crushed at 85,000lbs.; the second cracked at 96,000lbs.; but the third did not even crack at 100,000lbs.

The results appear to be in favour of the bluestone concrete, but are not satisfactory; and further experiments with smaller blocks will be made shortly to settle the point accurately.

Several attempts have been made to manufacture Portland cement in the colonies, and a good deal of money has been spent in experiments without much success; the apparent difficulty being to obtain the class of lime that will produce the necessary chemical change—effected during calcination when the lime is mixed with silica and alumina—whereby the carbonates are transferred into silicates of lime.

The author has himself been present at several of these trials, which have resulted in failure, either from the fact of the materials which were employed not possessing the proper chemical constituents, or from defective manufacture. Under these circumstances it may be supposed that he feels pleasure in stating that he has just had his attention drawn to a sample of cement made in Tasmania from materials obtained within some twelve miles of Hobart, which has been exhibited at the recent exhibition held under the auspices of this Association, and which he is now testing. Although, up to the present, the tests have only reached the seven day period, and the ultimate behaviour of the material has still to be cautiously observed, it will doubtless be of interest to inform the members present that —so far—the prospects of this being a genuine and valuable cement

appear to be very good. The tensile strength of the neat cement at 3 and 7 days was 421 and 693lbs. per square inch respectively; and the test of the 3 to 1 briquette at 7 days gave a result of 213lbs. per square inch, which may be regarded as indicative of considerable initial strength. The pats gave no sign of "blowing" or cracks, and the color, which is light grey, is a good tint.

The small parcel submitted to the author hardly justifies the formation of an opinion of the general fineness and weight of the cement; that which was sieved gave a residue of only 1.58 per cent. on the A sieve (of 2,500 meshes to the square inch) which shows it to have been well ground; in all probability it was put through a Chilian mill.

The chemical analysis, by W. A. Dixon, F.I.C. (which has been submitted to the author for his inspection) is of a rather favorable character, being as follows:—

Lime	66.6
Magnesia	1.2
Alumina	4.7
Silica, free...	1.9
Silica, combined	19.2
Carbon, combined air and traces of carbonic acid ...	3.1
Oxide of Iron	3.1
Traces sulphuric acid and alkalies	0.2

Mr. Dixon also remarks that "the quantity of lime in this "cement is somewhat in excess of that usually found, whilst the "silica and alumina are deficient. The manufacture has, however, "been so carried out that nearly all the silica is in the combined or "active cementing condition; indeed, of all cements which have "come under my notice, this is the highest, by about one-third, in "combined silica. Under these circumstances the cement should be "very hard setting, should stand sand well if finely ground."

A comparison of the above analysis with that given by Henry Reid, in his work on the manufacture and use of Portland cement (page 354) as the composition of a good cement, viz:—

Lime	60.05 per cent.
Magnesia	1.17 ,,
Alumina	10.84 ,,
Silica	24.31 ,,
Alkalies	1.54 ,,

will show a tolerably close resemblance between the two, the chief difference being that the Tasmanian sample is evidently "over-limed," which the maker affirms has been intentionally done, possibly with the idea of increasing the immediate strength.

One peculiarity in this cement is that it took 18 hours to set, a much longer time than any ordinary cement requires.

However, there appears to be sufficient merit in this attempt at the manufacture of a colonial cement to warrant us in wishing the speculators in the venture every success in their praiseworthy undertaking.

In conclusion, the author would apologise for the incomplete character of these notes, as the time at his disposal has been restricted, and the experiments in connection with cement are still being carried on; final results cannot therefore be expected at the present time. He trusts, however, that enough has been shown to prove the necessity that exists in Sydney for a careful and intelligent examination of every shipment of cement that is offered for use on important work, regardless of the utterly misleading recommendation of "brands," or the self-satisfied assurance of the "practical" man who will tell you that he can at once pronounce, by the touch, if a cement be good or bad (a mysterious gift which—if reliable—would be of infinite value, and one before which the most scientific chemists would bow the head!)

There is no doubt that, in conjunction with some excellent cement, a lot of inferior and adulterated material is often shipped to Australia, and offered to the public at a cheap rate. Perhaps this has been already rejected at home, and the manufacturer thinks it will do for the colonial market; perhaps it has been under-burnt; or in all probability it has simply been adulterated with a cheaper ingredient, such as free lime, pulverized slag, or shale; or, if a high initial strength is required, about 2 per cent. of plaster of Paris may have been added.

Danger in such cases is to be apprehended; added to which there is the additional risk of injury through bad packing or wet during the voyage, all of which possibilities conspire to make the selection of cement a very anxious matter, unless it receives the consideration of one who has an intelligent understanding of how to set about the work of judging and determining its merits. That all engineers should endeavour to obtain this knowledge is self-evident;

in support of which it is only necessary to quote the following remarks made by Mr. (now Sir) John Fowler in his presidential address before the Institution of Civil Engineers in the year 1866, when enumerating some of the requirements of a civil engineer:—

"Cement is used, chiefly with sand, in various proportions, accord-
"ing to the nature of the work to be executed; and it is not only
"necessary to possess the requisite knowledge and experience for
"determining the proper proportions of cement and sand for each
"individual case, but it is desirable to have the means of determining
"by direct and repeated experiment the strength and quality of the
"cement which it is intended to use."

How much more that applies at the present day when the use of cement has so wonderfully expanded (especially in its application to concrete work), it is unnecessary to say!

Appendix A.

SPECIFICATION

For the Supply of Cement for the use of the Municipal Council of the City of Sydney during the year 1886.

(Clauses relating to Tests.)

* * * * * * *

"The cement will have to satisfy the following tests, which will
"be conducted in this office, under the supervision of the City Sur-
"veyor or his authorised officer.

"The results of tests made on cement supplied under this
"contract will be made known to the contractor, if desired by him.

"Specific Gravity and tests for adulteration.—The specific
"gravity of all cement supplied under this contract must not be less
"than three and one-tenth (3.10) when carefully tested by approved
"gravimeter; in addition to which—if the City Surveyor deem it
"necessary—further tests by chemical treatment may be made, to
"ascertain if the cement is adulterated by the introduction of any
"foreign matter. Cement of less specific gravity than the minimum
"standard of three and one-tenth (3.10), or which shows any indica-
"tion of having been adulterated, will not be accepted under this
"contract.

"Weight.—The weight of cement will be determined by filling "the standard measure with the cement, allowing it to run in as "gently as possible through a specially prepared hopper, to be struck "off at surface when full. On no account will it be permitted to "press the cement down, or even to allow it to acquire any velocity "in its fall to increase its density.

"The cement to be tested will be weighed as received, unsifted, "and must weigh at least one hundred and five (105) lbs. per "Imperial bushel. It will also be required when sifted, without "rubbing, through a sieve of five thousand eight hundred (5800) "meshes per square inch, to leave a residue not exceeding twenty "(20%) per cent. The sieves used in testing to be those now in use "in the testing-room of this office, and known as Adie's standard "brass wire sieve, or sieves similar in description to them.

"Proportions of cement, water, and sand to be ascertained by "weight and the temperature of the water used, both in the mixing "and in the setting-tank, will be noted.

"The cement to be tested will be made into briquettes, both of "neat cement, and of cement and sand mixed in the proportion of "three (3) parts of sand to one (1) part of cement, with such propor- "tions of water as will be hereafter specified.

"The sand employed in the cement tests to be obtained from "crushed sandstone, sifted through a sieve of (400) four hundred "meshes per square inch; and to be caught on a sieve of (900) "nine hundred meshes per square inch.

"Tensile strength will be acsertained by Adie's testing machine; "strain to be applied at the rate of (200) two hundred lbs. per "minute.

"The neat cement briquettes, after being thoroughly mixed "with from (16) sixteen to (20) twenty per cent. of water, according "to the nature of the cement, will be tested at the expiration of (7) "seven, and of (28) twenty-eight days from date of mixing, and will "be required to stand a strain of not less than (400) four hundred "lbs. and (550) five hundred and fifty lbs. per square inch, respec- "tively.

"The briquettes of one (1) of cement to three (3) of sand, after "being thoroughly mixed with from nine (9) to (10%) per cent. of "water will be tested at (7) seven and (28) twenty-eight days after "being made.

"The minimum standard tensile strain at (7) seven days is "ninety (90) lbs. per square inch; and at (28) twenty-eight days "one hundred and forty-four (144) lbs., provided the neat cement "sets in less than (2) two hours, or is what is known as quick setting; "but should the neat cement take more than two (2) hours to set, or "be what is known as 'slow setting,' the minimum standard is "(200) two hundred lbs. per square inch.

"To determine its setting properties, the cement, after being "mixed neat and made into pats, will be tested with a weight "equal to one (1) lb. avoirdupois, pressing on an area of cement "under test equal to that of a circle of one-sixteenth ($\frac{1}{16}$) of an inch "in diameter. When the pressure produces no depression or inden- "tation on the surface, the cement is considered to be set. Neat "cement pats kept in air to observe for colour, and others placed in "water after setting for seven (7) days, to ascertain fitness for "immediate use, and ensure the absence of free lime, will also be "applied as may be deemed necessary.

"The above tests are practically similar to those approved by "the Harbours and Rivers Department of this colony, and are "based upon the official requirements of the London Metropolitan "Board of Works, and the rules and regulations for the supply and "testing of Portland cement adopted in Germany, Austria, and "Russia, being actually lower than the standards therein laid down.

"Any cement that will not satisfy the above tests will not be "approved."

* * * * * * *

"The contractor is to state in his tender the rate at which he "will deliver the cement, in accordance with the conditions of this "specification, at per cask, containing a net weight of cement, "exclusive of cask and packing, of not less than three hundred and "eighty (380) lbs. avoirdupois."

A. C. MOUNTAIN, M. Inst. C.E.,
City Surveyor.

Sydney, October 9th, 1885.

TOWN HALL, SYDNEY, N.S.W.

No .....

CITY SURVEYOR'S OFFICE, ... 188
(Date of 28 days' test.)

SAMPLE OF PORTLAND CEMENT supplied by....., Manufactured by....., Brand.....

N.B.—Tested ln accordance with requirements of Specificaeion for supply of Cement to the Municipal Council during the year 1886
The average breaking weight of six briquettes is taken for the test.

NEAT CEMENT set in..... ..... hours.

SPECIFIC GRAVITY.....

Temperature of water used in mixing.....deg. F.

,, ,, in setting tank.....deg. F.

NEAT CEMENT put in water after setting, and observed for 24 hours for immediate use..... .....

NEAT CEMENT kept in air to observe for color.....

Ref. No.	Description of Test.	Results	Standard Results.	Remarks.
1	Weight, as received, per Imperial bushel ...	.....lbs.	Min. 105 lbs.	
2	Weight, sifted through A Sieve	..... ,,	Min. 95 ,,	Condition of Cask tested
3	Residue on A Sieve (2,500 meshes per sq. inch)	.... per cent.	Max. 15 per cent.	
4	,, B ,, (5,800 ,, ,,)	..... ,,	Max. 20 ,,	
5	,, C ,, (14,400 ,, ,,)	..... ,,	Max. 40 ,,	Gross Weight ,, ,, lbs.
	NEAT CEMENT, WITH.....PER CENT. OF WATER			
6	Tensile strength after 3 days	.....lbs. per sq. in.	Min. 250 lbs. per sq. in.	
7	,, ,, 7 ,, ...	..... ,,	Min. 400 ,, ,,	Increase of Tensile Strength from 3 to 7 days per. ct.
8	,, ,, 28 ,, ...	..... ,,	Min. 550 ,, ,,	,, ,, ,, 7 to 28 ,, ,,
9	,, ,, 3 months	..... ,,		,, ,, ,, 28 days to 3 months ,,
10	,, ,, 6 ,, ...	,,		,, ,, ,, 3 mo. to 6 ,, ,,
11	,, ,, 9 ,, ...	..... ,,		,, ,, ,, 6 ,, 9 ,, ,,
12	,, ,, 12 ,, ...	..... ,,		,, ,, ,, 9 ,, 12 ,, ,,
	1 OF CEMENT TO 3 OF SAND, WITH....PER CENT. OF WATER.			
13	Tensile strength after 7 days	.....lbs. per sq. in.	Min. 90 lbs. per sq. in.	
14	,, ,, 28 ,, ...	..... ,,	Min. *144 ,, to 200 lbs.	Increase of Tensile strength from 7 to 28 days per cent., *according to time of setting.
15	,, ,, 3 months	..... ,,		Increase of Tensile strength from 28 days to 3 mo. p. cent.
16	,, ,, 6 ,, ...	..... ,,		,, ,, ,, 3 mo. to 6 mo. ,,
17	,, ,, 9 ,, ...	..... ,,		,, ,, ,, 6 ,, 9 ,, ,,
18	,, ,, 12 ,, ...	..... ,,		,, ,, ,, 9 ,, 12 ,, ,,

....CITY SURVEYOR.

Appendix B—**ENGLISH CEMENTS.**

Reference Nos.	Neat Cement Briquettes—Tensile Strain at						3 to 1 Briquettes—Tensile Strain at					Weight per bushel.		Residue on Sieves.			Hours in setting.	Tests for	
	3 days.	7 days.	28 days.	3 mos.	6 mos.	12 mos.	7 days.	28 days.	3 mos.	6 mos.	12 mos.	As recd.	Sifted.	A.	B	C		Expansion.	Colour.
A 1	372	475	605	...	...	601	155	129	...	...	...	100.62	87¼	17.13	...	...	9	puffing at edges	dull brown
B 1	496	604	762	746	809	820	107	178	207	263	269	107¼	100½	11.81	20.59	36.62	8	no change	grey tints
„ 2	350	422	526	854	...	...	135	205	269	...	...	109	97½	13. 2	21. 3	35. 4	¾	do.	do.
„ 3	619	656	786	..	...	...	151	218	...	...	...	107½	96⅝	13. 6	21. 4	36.40	¼	do.	grey and buff tints
„ 4	513	642	712	...	...	...	124	170	...	...	...	106⅝	95¾	16. 3	24. 5	36.90	½	do.	do.
„ 5	413	462	578	...	...	...	79	140	...	...	...	106½	97	13. 6	21. 8	35.80	¼	do.	do.
„ 6	571	629	720	...	...	...	119	186	...	...	...	107¾	98½	14. 2	21. 9	35.20	¼	do.	do.
„ 7	405	546	598	...	...	...	100	183	...	...	...	109	102¾	8. 8	19. 0	33.80	¼	do.	do.
„ 8	546	608	677	...	..	...	106	201	...	...	...	103¾	93	15.37	21.87	32.86	½	do.	do.
„ 9	474	529	678	...	...	...	97	189	...	...	...	111¼	110.2	12.71	21.12	33.70	¾	slight cracks	do.
„ 10	506	553	621	...	...	...	73	155	...	..	...	109	98.15	13. 9	21.41	34.35	¾	no change	do.
„ 11	303	379	472	...	...	...	99	171	..	...	...	115	104.92	13. 8	22.43	33. 9	¼	do.	do.
„ 12	372	536	621	...	..	...	82	142	...	...	...	107¼	97¾	11. 5	21.20	33.36	¼	do.	do.
C 1	462	572	628	808	866	850	135	178	275	302	320	110	101⅓	14.96	25.17	41. 7	4	no change	light grey
„ 2	560	609	828	...	...	...	218	262	...	...	...	109¾	107½	3. 0	9. 9	27. 6	1½	do.	do.
D 1	333	437	551	695	743	689	98	167	230	261	310	104½	90	18.64	28.14	40.91	1	no change	brown
E 1	388	417	540	720	662	764	103	162	270	306	377	102½	97½	7.67	16.52	34.54	4¼	fine cracks	brown
„ 2	532	603	686	731	744	735	168	217	321	289	369	103½	98⅜	7.07	15. 3	31. 8	5	slight puffing	buff and grey tints
„ 3	388	477	585	809	838	846	139	200	238	302	332	105	97½	9. 9	19. 4	34. 3	6½	no change	equal buff and grey
F 1	381	509	617	773	841	838	102	156	299	363	403	109¾	102¾	12.20	17.90	33.00	5¼	no change	equal buff and grey
„ 2	426	512	624	770	...	...	80	155	243	...	...	108	99¾	8.09	14. 8	28. 4	½	do	do.
G 1	354	459	610	674	805	922	93	163	308	331	424	112	105½	9. 2	19.00	38.10	6	no change	buff and grey tints
H 1	487	522	549	745	756	755	156	218	340	420	469	105	98¾	5. 9	12. 5	28. 9	¼	no change	equal buff and grey
I 1	367	472	556	767	782	798	92	149	299	372	412	102¾	95.27	8. 2	17. 3	32. 4	¼	no change	buff and grey tints
J 1	415	515	594	666	780	823	77	165	266	336	420	104½	99	9. 9	18. 7	33. 7	4¼	cracks	buff and grey tints
„ 2	255	292	350	560	...	...	51	125	285	...	...	103¼	96½	9. 5	18. 4	34.05	¼	no change	buff
K 1	221	325	391	531	...	...	44	96	236	...	...	106¼	96¾	13. 4	21. 4	35. 6	¼	no change	buff
„ 2	273	345	438	752	...	...	88	183	250	...	..	105	97	10. 4	20. 1	34. 8	½	do.	buff and grey tints
„ 3	234	324	402	748	...	...	116	189	252	...	...	102¾	94	12. 8	18. 9	35. 0	½	do.	do.
„ 4	261	364	401	602	...	...	84	189	243	...	...	105⅜	96¼	12. 5	19. 1	32. 6	½	do.	do.
L 1	541	673	676	...	...	...	153	225	...	...	...	102¾	92	13. 9	21. 9	32. 3	1	do.	equal grey and buff

A. C. MOUNTAIN, M. Inst. C.E.

Appendix C—GERMAN AND OTHER EUROPEAN CEMENTS.

Reference Nos.	Neat Cement Briquettes—Tensile Strain						3 to 1 Briquettes—Tensile Strain at					Weight per bushel.		Residue on Sieves.			Hours in setting.	Tests for	
	3 days.	7 days.	28 days.	3 mos.	6 mos.	12 mos.	7 days.	28 days.	3 mos.	6 mos.	12 mos.	As recd.	Sifted.	A.	B.	C.		Expansion.	Colour.
A 1	187	280	356	455	488	551	61	85	160	188	262	91½	91¼	.17	2. 5	18.21	10	cracks	grey
,, 2	204	324	480	610	691	730	105	179	229	337	390	94	93⅛	.08	1. 6	12. 2	6¼	no change	grey and buff
,, 3	306	414	516	638	651	729	116	172	234	331	345	93¾	93½	.21	1. 5	16. 6	7¼	slight cracking	grey
B 1	714	811	707	910	714	861	219	302	319	363	426	102¼	93½	2.24	11. 9	35. 6	6	no change	dark grey
,, 2	579	600	629	830	879	887	143	265	326	394	...	102	101¼	1. 5	6. 3	25. 6	½	do.	grey and buff tints
,, 3	645	710	833	815	...	...	163	268	350	...	...	106¼	104.1	1. 9	8. 9	31. 0	½	do.	light grey
,, 4	663	735	771	998	...	...	195	321	315	...	...	106	102½	2. 3	11. 4	33. 4	2	slight cracks	grey and buff tints
C 1	492	521	662	682	789	840	124	195	252	316	400	96¾	92	4.26	9.74	25.	7½	no change	dark grey
,, 2	488	573	578	753	776	821	144	203	304	319	408	99¼	93½	4. 2	9. 8	22. 5	7	do.	do.
,, 3	418	473	572	722	829	816	116	185	269	317	382	98¾	93½	5. 8	12.05	27.24	7½	do.	do.
,, 4	429	500	634	745	778	792	139	206	231	296	339	95¼	89½	3. 6	8. 2	22.	6½	do.	do.
,, 5	409	538	694	758	775	876	104	149	356	428	509	99	93.6	1. 4	4. 2	16. 6	1	do.	buff and grey tints
,, 6	488	705	726	839	853	848	196	280	405	470	506	102	98.5	.28	2. 1	14. 9	5½	cracks	do.
,, 7	491	770	853	...		...	148	257	...	...	...	100	97.9	1.18	8.02	22. 5	4¼	do.	light grey
D 1	240	322	402	490	547	607	64	126	244	291	354	96¾	95¾	1. 9	8.18	22.98	10	cracks and puffing at edges	brown
,, 2	285	388	430	527	640	679	87	134	220	290	405	96½	94⅛	3. 2	10.	24. 8	8½	no change	buff and grey tints
E 1	573	575	712	746	760	882	185	182	267	328	317	103¼	103	.9	7.81	32. 5	5	no change	brownish grey
F 1	402	435	599	744	770	820	99	157	331	360	427	97¼	92¾	.82	7. 4	23. 2	¾	no change	grey and buff
,, 2	338	520	608	801	824	792	128	188	256	381	451	94¾	90½	. 2	3. 8	21. 8	1	do.	grey
G 1	165	237	335	370	541	621	49	88	185	275	351	98½	97½	.28	1. 9	16. 1	7	cracks	buff and grey
H 1	307	491	606	702	729	686	127	202	271	356	473	101	96¼	2. 1	5. 9	18. 3	7¼	no change	light grey
I 1	427	557	648	764	822	826	125	207	371	426	468	101¼	95½	.07	2.	19. 9	¾	no change	grey and buff
J 1	363	613	775	804	909	904	114	170	292	351	374	111.25	101.19	13.12	24.26	42. 8	6½	no change	grey and buff
K 1	307	491	606	702	729	765	127	202	271	356	457	101	96¼	2. 1	5. 9	18. 3	7¼	no change	light grey
L 1	305	469	572	694	754	772	104	166	259	354	384	101⅓	101¼	1.02	4.42	19. 6	7¼	no change	buff and grey
,, 2	377	456	613	...	...	...	100	144	...	...	...	103¼	102⅓	.42	3. 9	23. 7	6¼	do.	do.
,, 3	401	460	614	...	...	...	142	189	...	...	...	109¼	109¼	.24	2. 4	20. 5	4½	do.	do.
,, 4	318	427	576	...		...	89	151	...	...	...	110	107¾	.28	3. 3	23. 7	6	do.	light grey
M 1	116	270	388	590	675	729	38	96	185	269	321	101	93¾	4.05	12. 1	26. 9	3¼	no change	grey and buff
,, 2	326	457	566	748	827	837	97	172	273	325	387	102	99¼	2. 8	11. 1	28. 4	1¼	do.	light grey
,, 3	370	465	516	636	...	...	77	131	278	...	...	101½	97½	4.25	14. 5	29. 4	1¼	do.	dark grey
N 1	352	398	463	656	710	830	50	106	196	265	...	109⅜	101¼	12. 9	23. 3	37. 7	2	no change	buff and grey
,, 2	258	306	431	582	695	...	57	115	217	276	...	107	97½	12. 1	19. 8	33. 9	1¼	slight cracks	buff
O 1	468	514	609	699		...	185	225	313	...	...	98½	96½	3. 2	8. 5	20. 9	1¼	no change	grey
P 1	525	565	672	813	...	...	187	308	338	...	...	104½	100¼	2. 2	9. 8	31. 5	¾	bad cracks	buff and grey
,, 2	489	592	675	...	...	...	178	226	...	...		105¼	103¾	2. 1	10. 3	31. 5	4	no change	do.
Q 1	419	530	620	799	863	806	142	235	287	335	392	107¼	105½	1. 9	8. 2	27. 2	2	no change	light grey
,, 2	423	532	738	...	...	...	181	268	...	...	...	105¼	102½	2. 5	9. 5	26. 3	4	do.	grey, buff tints
,, 3	406	470	572	...	...	...	172	262	...	...	...	97¼	95¾	2.39	7. 4	23. 3	3½	do.	light grey
R 1	410	472	578	...	...	...	131	199	...	...	...	108¼	106	3. 5	13. 0	37. 3	4	cracks	buff and grey

A. C. MOUNTAIN, M. Inst. C.E.