two months, and the results grouped accordingly, that is to say, the one week tests, with different per cent. of water, compare between themselves, four weeks and two months likewise. Parallels between the results, at different ages, cannot be drawn on account of some specimens having been prepared under widely different conditions. For instance, the results at two months are exceedingly low as compared with those obtained at one and four weeks. This is due to the fact that these two months specimens were the first prepared of all, and this before the cemented trough in which they were to be immersed was completed. Consequently, they were kept 8 to 10 days longer than the others in the dry air of the laboratory, which seems to have had a disastrous effect on them. But in spite of these slight drawbacks, the annexed table shows that up to 24 per cent., the percentage of water has not a very great effect on the strength. This is an important point, for below 20 per cent. the mortar obtained is rather dry and very difficult to handle.

But beyond this limit of 24 per cent. a greater proportion of water seems to weaken the concrete considerably.

This limit is very sharply defined in the adjoining table, where an additional 2 per cent. of water, from 24 to 26 per cent., weakens the concrete by almost one-half for the one-week tests. It is, however, interesting to notice that strength is almost completely recovered with time, the four-week tests showing the weakening limit to be between 26 and 28 per cent., and the two months' between 28 and 30 per cent. So that if immediate strength be not required of the concrete structure, 28 per cent. of water will not affect the ultimate resistance if allowed to stand two months.

In the parallel sand and cement tests the weak line is not so sharply defined, but yet it is sufficiently so to show that the same statement applies. The tests in this case show a marked weakening between 14 and 16 per cent. of water for the one week, which strength is ultimately recovered, as is shown by the four weeks' and two months' tests.

The low limit of 14 per cent., as compared with 24 for the concrete, is probably due to the fact that the stones of the concrete, on account of their porosity, absorb a part of the water.

The table shows that the greatest density is obtained with 16 and 18 per cent. The weights of the cubes beyond this decrease up to 24 and 26 per cent., where they are again nearly equal in density to the 16 and 18 per cent. of water. Therefore this 24 and 26 per cent. seems to be the point where the best practical results are obtained, because 16 and 18 per cent. make up too dry a concrete to allow of easy handling.

Another point incidentally comes up. Attention has been drawn to the poor results obtained by the same tests and reason of long exposure to dry air given. This shows up a very important point, namely, the necessity of covering up carefully all concrete and cement works exposed for any length of time to dry air and sun. The bad effect of these agents is plainly demonstrated, and it is doubtful whether much strength would ultimately have been recovered.

It is also interesting to notice the results obtained by the concretes made of 1 part of cement, 2 of sand and 5 of stones and 1 cement, 2 sand and 6 of stones. The specimens of these compositions gave results equal to concretes 1, 2, 4, showing that for strength they are as good as the ones containing a less proportion of stones, while being much more economical.

These experiments are as yet very incomplete. But it is hoped that the researches in this subject will be continued and that valuable information for the engineer in practice derived from them.

CONCRETE TESTS—COMPRESSION.

Proportions by weight: 1 part cement, 2 sand, 4 stone.

Per cent. of water by weight of cement and sand.	Crushing strength per square inch. 1 week. comp. tests.	4 weeks.	2 mos.	Average weight of sp. per c.f.
16	792	677	382	141.5
18	653	679	507	143.0
20	746	626	507	139.5
22	620	615	670	139.5
24	679	542	559	141.5
*26	362	545	500	141.2
28	326	340	823	138.0
30	245	331	361	135.5

Proportion by weight. 1 cement, 2 sand, 5 stone.

20	703

1 cement, 2 sand, 6 stone.

20	728

CEMENT AND SAND TESTS.

Proportions: 1 cement, 2 sand.

10	825	800	1822
12	800	1311	1666
14	750	1000	1100
*16	475	1389	1777
18	395	1110	1266
20	400	913	1633
22	330	844	1233
24	388	—	1230
26	—	—	1000

*Line of weakness due to excess of water.

THEO. DEHIS.
CARL REINHARDT,
G. G. HARE.

McGill University, April, 1896.

DR. JAMES P. KIMBALL, of New York, mining engineer and ex-director of the United States mint, has been making a personal inspection of the Trail Creek mines in British Columbia.

POWER FROM THE TIDES.

Dr. Babbage, the well known mathematician, was so struck with the vastness of the power represented in the ocean tides, that he made a calculation of the energy which the tides of the Atlantic could exert in a day. His estimate is that if the tides of this ocean alone were stored up for 24 hours, and converted into mechanical force, the power would be sufficient to drive all the machinery then existing in the world for 175,000,000 years. What a "pull" the moon must have on "this distracted globe!" And if this estimate is exaggerated by one half, still the mechanical force of the tides must be almost beyond comprehension, for this power is in constant exertion. To give one a more concrete notion of this power it may be stated that Professor Sylvanus P. Thompson made the startling assertion that at one English port (Bristol) the displacement of the volume of water up and down each tide was represented by a force of twenty billion foot-pounds of energy each year, or fifty billion foot-pounds at the mouth of the river, which is five miles distant. A tenth part of the tidal energy in the gorge of the Avon, the professor states, would light the city of Bristol, and a tenth part of the tidal energy in the channel of the Severn would light every city in Great Britain, and, in addition, turn every loom, spindle and axle which English manufacturers possess.