If 3.8 cu. ft. weigh 376 lbs., then 100 c.c. will weigh 5 19-32 oz., so if it is assumed that 1 bag of Portland cement, 94 lbs., is a cu. ft., then 100 c.c. would = 5 5-16 oz.

Using the calculated voids as per the water test above referred to, and the proportion of cement accordingly, using as a unit of measurement 94 lbs. as assumed to be equivalent to 1 cu. ft., or 100 c.c. as equivalent to 6 5-16 oz., it was found that the volume of mortar was entirely dense, economical and in every instance greater than the volume of sand used to the extent of from 10 to 15%; therefore irregularities in mixing and placing are automatically cared for.

To arrive at correct proportions obtain the voids in sand by means of the graduated glass tube water test described above. Use Table 2.

Apply preceding table, No. 3, using the proportions as shown in last column opposite the % of voids as ascertained above.

Proportions of cement and sand resulting in maximum density for water-tight mortar.

(Voids to be determined by method described above). Proportions figured on 4 bags = 3.8 cu. ft. Proportions stated, 1 bag = 1 cu. ft.

To ascertain the percentage of voids in the larger aggregates, the following table will be a simple means of furnishing this information.

Make a box of such dimensions as will contain 3 cu. ft., box to be 1' x 1½' x 2'. Dry the stone or gravel, heating to over 212° F. Throw the stone into the box loose, level off the top with a straight edge, and having first weighed the box, weigh the box when full. Deduct the weight of the empty box from the gross weight and divide the net weight by 3, which will give the actual weight of 1 cu. ft. Apply Table 4.

Table 5.

Voids in Stone	Proportions of Stone expressed in cubic feet											
	PROPORTIONS OF MORTAR											
%	1:1	1:1¾	1:2	1:2¼	1:2½	1:2¾	1:3	1:3¼	1;3½	1:3¾	1:4	1:4½
25	4	7	8	9	10	11	12	13	14	15	16	18
26	3¾	6¾	7¾	8½	9½	10½	11½	12½	13½	14½	15½	17¼
27	3½	6½	7½	8¼	9¼	10	11	12	13	14	14¾	16¾
28	3½	6¼	7¼	8	9	9¾	10¾	11½	12½	13½	14¼	16
29	3½	6	7	7¾	8½	9½	10½	11¼	12	13	13¾	15½
30	3¼	5¾	6¾	7½	8¼	9¼	10	10¾	11¾	12½	13¼	15
31	3¼	5¾	6½	7¼	8	9	9¾	10½	11¼	12	13	14½
32	3	5½	6¼	7	7¾	8½	9¼	10	11	11¾	12½	14
33	3	5¼	6	6¾	7½	8¼	9	9¾	10¾	11½	12	13¾
34	3	5¼	6	6½	7¼	8	8¾	9½	10¼	11	11¾	13¼
35	2¾	5	5¾	6½	7¼	7¾	8½	9¼	10	10¾	11½	12¾
36	2¾	5	5½	6¼	7	7¾	8	9	9¾	10½	11	12½
37	2¾	4¾	5¼	6	6¾	7½	8	8¾	9½	10¼	10¾	12¼
38	2¾	4¾	5¼	6	6½	7¼	8¼	8½	9¼	10	10½	11¾
39	2½	4½	5	5¾	6¼	7	7¾	8¼	9	9¾	10¼	11½
40	2½	4½	5	5¾	6¼	7	7½	8	8¾	9½	10	11¼
41	2½	4¼	4¾	5½	6	6¾	7¼	8	8½	9¼	9¾	11
42	2¼	4¼	4¾	5½	6	6½	7¼	7¾	8¼	9	9¼	10¾
43	2¼	4	4¾	5¼	5¾	6½	7	7½	8¼	8¾	9¼	10½
44	2¼	4	4½	5¼	5¾	6¼	6¾	7½	8	8½	9	10¼
45	2¼	4	4½	5	5½	6	6¾	7¼	7¾	8¼	8¾	10
46	2¼	3¾	4¼	5	5½	6	6½	7	7¾	8¼	8¾	9¾
47	2¼	3¾	4¼	4¾	5¼	5¾	6¼	7	7½	8	8½	9½
48	2	3¾	4	4¾	5¼	5¾	6¼	6¾	7¼	7¾	8¼	9¼
49	2	3½	4	4½	5	5½	6¼	6¾	7	7¾	8¼	9¼
50	2	3½	4	4½	5	5½	6	6½	7	7½	8	9
51	2	3½	3¾	4½	5	5½	6	6½	6¾	7¼	7¾	8¾
52	2	3¼	3¾	4¼	4¾	5¼	5¾	6¼	6¾	7¼	7¾	8¾
53	2	3¼	3¾	4¼	4¾	5¼	5¾	6¼	6¾	7	7½	8½
54	2	3¼	3¾	4¼	4¾	5	5½	6	6½	7	7¼	8½

Before ascertaining the voids in stone containing screenings or gravel containing sand, dry by heating, screen out all particles which will pass through a ¼ inch mesh sieve; such particles should be figured as a portion of the mortar. Having obtained the percentage of voids in the larger aggregates, the proportion of mortar necessary to fill these voids is thus known.

You are now in possession of the proportions of cement to sand or stone screenings in forming the mortar and the number of voids in the larger aggregates which will be filled with this mortar. The preceding table, No. 5, will be a ready means for obtaining the proportions for concrete.

ELECTRIC POWER FROM WIND.

By H. E. M. Kensit, M.I.E.E.

The Canadian Engineer of November 2nd contains a note on "Electric Power from Wind," which suggests considerable possibilities in the way of isolated wind driven electric plants.

The convenience, advantages, and economy of such installations for electric light and power to ranchers and others all over Canada are too obvious to need comment. The point is, are they practical and reasonable in cost?

As a matter of fact they are. Very practical results have been obtained for some time past in this direction in European countries, and a few examples of actual instances showing the amount of power developed and the cost, may be of general interest.

The main difficulty is, of course, the irregularity of the wind, but this has been efficiently overcome by several different methods as shown below.

Considerable attention has been given to this subject by the Danish government, and at the beginning of 1906 there were some 40 windmills driving generators in operation in Denmark.

The experiments are mainly carried out for the government by Prof. La Cour, and their success led to the formation of the Danish Wind Electricity Co., who put in most of the above mentioned installations.

The La Cour method of obtaining approximately regular voltage is as follows: The main pulley actuated by the windmill shaft drives a pulley whose shaft is mounted on a weighted and adjustable lever. A larger pully on this same shaft drives the dynamo by belt. The difference of tension between the tight and slack sides of the main belt can be regulated by adjusting the weight on the lever, and when the speed exceeds a pre-determined rate the belt slips proportionately and the apparatus becomes self-regulating. An automatic switch prevents the battery discharging through the dynamo when the battery voltage is higher than that of the dynamo.

It has been found that for the particular type of windmill used a blade area of 514 square feet gives 8 h.p. with a wind velocity of 13.4 miles per hour and 16 h.p. with a wind velocity of 17.8 miles per hour.

At Askov a windmill drives two dynamos of 12 h.p. each Part of the power is used to charge a battery supplying 705 incandescent lamps, 4 arc lamps, and 8 motors, a total of 21 h.p., the balance being used for electrolytic purposes.

At another installation at Valle Kilde the area of the blades is 240 square feet, and this gives 8.6 h.p. at 24 r.p.m. with a wind velocity of 15.6 miles per hour. The capacity of the dynamo is 8 kw. and of the battery 600 ampere hours. The plant drives a grinding mill, circular saw and other machines. In this case a petrol motor was put in as a standby. The total cost of the installation, including this petrol motor and buildings, was $3,600.

A fairly complete description of these plants, with diagrams, is given in the Electrical Review, (Eng.) No. 5162, Vol. 61.