Correspondence.

Waterproof Sand Paper.

To the Editor of the Scientific American:

Can you tell me how to make a waterproof sand paper; something that will stand as much use wet as ordinary sand paper will dry? It need not necessarily be like sand paper, but of any substance that would answer the purpose. The cost of the material would not be of as much importance as the fact of being able to get something to answer the purpose. W. H. T.

Freeport, Ill.

A Well 10,000 or 20,000 Feet Deep.

To the Editor of the Scientific American:

Before the meeting of the present Congress, a statement was made that a proposition would be submitted by some one for the appointment of a committee or commission to have a *well bored into the earth some* 10,000 *or* 20,000 *feet deep.* I have searched through the proceedings of Congress, and so far have failed to find evidence that any action has been taken on the subject. When the matter was first broached, it seemed like a wild scheme and of little importance; but like the introduction of many inventions—the telegraph and telephone for example—it may develop into one of the utmost importance. Who can tell what vast secrets of nature may be discovered? And what great results may come from the experiment? May we not find means by which heat and power, of unlimited extent, can be found? When the best minds of the country are seriously studying how to find means to use the surplus money now in the treasury, may not a portion of it be asked for this purpose to advantage? In conclusion, I would ask you to urge Congress to make an appropriation to the War Department to enable it to have a well bored at least 10,000 or 20,000 feet deep. C. A.

Philadelphia, Pa.

Gas Threads.

To the Editor of the Scientific American:

I notice an answer in your "Notes and Queries" column to C. H. F. about gas threads, and as these threads seem to be a puzzle to all apprentices, a sealed book to most amateurs, and often a bother to the full-blown engineer, I give you here a table of the English threads, along with the diameter. The English threads, be it understood, have very little taper, just sufficient to bite when a coupling or a flange is screwed home, and are cut to an angle of 55°. The table is as follows:

DIAMETER OF GAS TAPS—"WHITWORTH."

Size. In.	Dia.	Dia. at bottom of thread.	No. of threads per in.
1/8	0·3825	0·3367	28
1/4	0·518	0·4506	19
3/8	0·6563	0·5889	19
1/2	0·8257	0·7342	14
5/8	0·9022	0·8107	14
3/4	1·041	0·9495	14
7/8	1·189	1·0975	14
1	1·309	1·1925	11
1 1/8	1·419	1·3755	11
1 1/4	1·65	1·5335	11
1 3/8	1·745	1·6285	11
1 1/2	1·8825	1·766	11
1 5/8	2·021	1·9045	11
1 3/4	2·047	1·9305	11
1 7/8	2·245	2·1285	11
2	2·347	2·2305	11
2 1/4	2·5875	2·471	11
2 1/2	3·0013	2·8848	11
2 3/4	3·247	3·1305	11
3	3·485	3·3685	11
3 1/4	3·6985	3 582	11
3 1/2	3·912	3·7955	11
3 3/4	4·1255	4·009	11
4	4·339	4·2225	11

ERNEST W. NAYLOR.

New York, June 27, 1888.

Scarlet Fever.

To the Editor of the Scientific American:

I notice in your issue of July 7 an article on "Contagious Diseases," in which the writer states that scarlet fever "is produced by a specific poison, which emanates from the person of the patient, and can be caused by no other means."

During a period of 54 years in Baltimore, 1830 to 1883, inclusive, scarlet fever caused 12,197 deaths, equal to a yearly average of 226, 334 having occurred during the latter year; and during that year our city council passed an ordinance regulating plumbing, which took effect January 1, 1884, the result of which, in the reduction of the mortality from scarlet fever, has been remarkable. During 1884, 104; 1885, 68; 1886, 32; 1887, 36—a total for four years of 240, equal to a yearly average of only 60 deaths. Was not the great mortality from scarlet fever during the 54 years prior to our plumbing ordinance caused in a very great measure by defective plumbing? We think so.

Diphtheria for seven years prior to our ordinance, 1877 to 1883 inclusive, caused 3,289 deaths, equal to a yearly average of 469. Since the ordinance has been in force the yearly average has been 234, or a total of 934 deaths for four years. We are strong advocates of sanitary plumbing.

A. R. CARTER, Health Department.

City Hall, Baltimore, July 9, 1888.

The Number of Men Engaged in the American Iron Trade.

We may state that at the outstart we have no figures later than those of the census of 1880, although they may be used as the basis of some estimate, as follows. The census figures were:

	Product 1880. Net tons.	Men employed.
Pig iron	3,781,021	41,875
Iron rolling mills, including nail	2,353,248	80,133
Bessemer and open hearth steel works	983,039	10,835
Crucible steel works	75,275	5,196
Forges and bloomeries	72,557	2,939
Total	7,265,140	140,978

For the year 1887 the following estimate may be made covering the same ground:

	Product 1887. Net tons.	Estimate No. of hands same proportion.
Pig iron	7,187,206	80,126
Iron rolling mills	2,588,500	89,000
Bessemer and open hearth steel works	3,433,491	37,840
Crucible steel	84,421	5,820
Forges and bloomeries	43,306	1,750
Total	13,336,924	214,536

From this probably at least 10 per cent must be deducted to allow for the fact that a greater output is being made with less labor in all departments of the iron trade, and notably in blast furnace work. This would leave it roughly 193,000 hands in the iron and steel works themselves.

The quantity of iron ore used in 1880 was as follows:

	Tons.
Blast furnaces	7,256,684
Rolling mills	363,959
Bessemer and open hearth	7,327
Crucible	2,128
Forges	79,610
Total	7,709,708

The number of hands employed in mining 7,064,829 tons of iron ore in the census year was 31,668. The output for 1887 is estimated at 11,300,000 tons, which would indicate a force of 50,600 hands.

In 1880 the consumption of anthracite coal by furnaces and rolling mills was 3,222,498 tons. In 1887 it must have been at least 4,000,000 tons. In 1880, 70,748 hands produced 28,621,371 tons of anthracite, which would indicate 10,000 men for the iron works fuel in 1887. In 1880 the furnaces and rolling mills consumed 5,659,055 tons of bituminous coal. Taking into account the fact that the steel works used relatively little coal, and that natural gas is widely employed, the fuel consumption of 1887 may be roughly estimated at 5,000,000 tons. In 1880, 41,850,054 tons of bituminous coal gave employment to 100,116 men. We would have 12,500 men for the above quantity. Allowing for the introduction of coal cutting machinery, etc., it may be put down at 10,000 men.

In 1880, 3,142 men were employed in producing 5,359,489 tons of coke, of which 2,277,555 tons were consumed in iron works. In 1887 the consumption was probably not short of 6,000,000 tons, which would call for 3,500 men engaged in the labor of converting coal into coke. The number of men employed in mining the coal for the coke may be roughly estimated as follows: Taking 63 per cent as the yield of coal when making coke, 9,500,000 tons of coal would be required, which would call for about 20,000 men. Then there are at least 2,000 men employed in quarrying limestone and over 1,000 in making charcoal. We thus make the following total as a rough estimate:

	Hands.
Furnaces and rolling mills	193,000
Iron ore mining	50,600
Anthracite coal	10,000
Bituminous coal	10,000
Coking coal	3,500
Mining coal for coke	20,000
Quarrying limestone	2,000
Making charcoal	1,000
Total	290,100

It is safe to say that in raising the raw material from the ground and manufacturing into merchantable products the iron trade gives employment to about 290,000 men. This does not include any of the force employed in water or rail transportation. It does not embrace the wire mills, pipe works, foundries, boiler shops, bridge and structural iron shops, etc.—*Iron Age.*

How to Use the Telephone on Submarine Cables.

At a recent meeting of the Paris Academie des Sciences, a note of M. Ader on the use of the telephone as a receiving instrument for submarine cables was read. If a telephone is placed at the extremity of such a cable while signals are being transmitted, these signals cause absolutely no sound in the telephone, because, though the diaphragm is put in motion by each signal, the vibrations are too slow to be perceived by the ear, which only recognizes a sound when the vibrations exceed about twenty per second. If, however, the telephone is connected to the cable through a vibrator, the number of vibrations may be increased to any extent and the signals through the line be easily distinguished. With the dot and dash system there is no difficulty in reading by the telephone, the differing durations of the sound being easily perceived; but for the rapid working of cables it is found advisable to work with alternating currents, and in this case some method of distinguishing in the telephone between positive and negative currents must be adopted. This is done by making use of two instruments, one applied to the left and the other to the right ear, the natural tones of the two telephones being different. Both these instruments are connected to the vibrator, and through it to the cable. Each separate telephone circuit is, however, traversed by another current from a local battery, which passes through one circuit in a positive direction and through the other in a negative, the vibration being included in both circuits. The strength of this current is adjusted to be equal to that from the cable, and hence when, say, positive currents are being sent, the local current in one telephone is annulled, while in the other it is increased, and that telephone alone sounds, and when negative currents are sent the reverse takes place, the other telephone sounding, and in this way the signals can easily be distinguished.

Char in Sugar Refining.

At a recent meeting of the Society of Chemical Industry, London, a paper by Messrs. B. and J. Newlands was read upon "The Mode of Using Char in Sugar Refining." The paper set forth that the charcoal used in experimenting was not new, but had been used for some time in sugar refining. New charcoal would not get rid of the color in the sugar solution. Dried blood and horns give a charcoal of great decolorizing power for oils and fats, but not suitable for sugar refining. For the latter, a charcoal is required which is both hard and porous, and one which adheres strongly to the tongue; when the charcoal is not sufficiently hard, it causes inconvenience by the production of dust. The following table shows the amount of dust produced after each sample of charcoal had been revolved 672,000 times, and then sifted:

	Size of sieve.	Dust produced per cent.
English charcoal (No. 1)	10 to 20	2·560
" " "	20 to 30	2 560
" " "	40 to 50	3·220
" " (No. 2)	20 to 30	1·414
" " "	30 to 40	3·694
" " "	40 to 50	8·720
Russian charcoal	8 to 10	3·878

Most refiners like a "small grist" char, since it is most efficacious in decolorizing sugar, and the following table gives the results of experiments on that point. The amount of reduction of color in each case was determined by means of a photometer:

Size of sieve.	Proportion of color remaining.
Char 10 to 20	5
" 20 to 30	4
" 30 to 40	3·5

Original color, 23·0.

The higher the temperature within certain limits, the better are the decolorizing results:

Temperature, Fahr.	Proportion of color remaining.
100	64
125	58
150	46
175	32
200	32

Original color, 420.

Time is a matter of importance, and six hours gives the best results in the case of cane sugar. Beet sugar is better with longer contact. The authors had obtained the following results in time experiments with three descriptions of sugar:

	Jamaica.	Natal.	88 Nat. beet.
Original color	660	420	23

Proportion of Color Left.

Hours.	Jamaica.	Natal.	88 Nat. beet.
2	102	60	6
4	92	37	5 1/2
6	60	28	5
8	64	29	4 1/2
10	—	30	—

The coloring matter which char abstracts from sugar can be dissolved out of the char again by alkaline solutions; consequently, the char does not act by destroying the coloring matter by peroxide of hydrogen or any other oxidizing agent.

The absorption of air by freshly burnt bone charcoal goes on for a considerable time; for if some freshly burnt charcoal be put in a bottle, and turned out of it a few days afterward, a thermometer then put in the mass will rise 20° or 30° F., showing that absorption is going on. In sugar refineries the char after use is washed with once or twice its weight of water, and then recalcined in closed cylinders. At first steam is driven off from it, and this steam is utilized for the drying of wet charcoal. "Buchanan's Improved" kiln is one of the best forms of pipe kilns for revivifying charcoal.