

Correspondence.

Inflammable Gas from Steam Boilers.

To the Editor of the Scientific American:

In your issue of January 5, I noticed paragraph 87, wherein F. S. W. states that gas forms in his hot water heater, or rather radiator, which burns on opening the air cock, and suggests that steam boilers may be exploded thereby.

We had a hot water heater put in our house last spring, with eight radiators. The upper one in third story has an open pipe leading through the roof, in case the water should boil. The usual tank is attached, which holds about seven gallons. Now, as the water slowly wastes away, we replenish it with two or three gallons, having first to open the air cock to let out the air, or what I supposed to be such, so that the water would rise to take its place; but ever since the fire was started I noticed that the air smelled gassy; so (before the water was put in the tank), in order to guard against a possible explosion, I took a small brass tube, about 8 inches long, and, bending it U-shape, fastened one end to the cock and flattened the other end about a gas jet, and on applying a lighted match quite a little explosion popped up, which, had the match been applied to the large hole in the cock, the flame might have followed in, and, as there was about two gallons of the gas, it seems to me that the radiator itself might have been exploded, and I should have been unable to write the result. JOHN P. NESSLE.

Newark, N. J.

Changes on Saturn.

To the Editor of the Scientific American:

Good views have been secured with the 10 inch equatorial of this observatory of the new "white region" on Saturn's ring announced by Dr. Terby from Europe.

I also have the pleasure to announce the interesting additional discovery, just made by myself, that this "white spot" is variable in brightness. Pulsations of its light at irregular intervals of a few minutes are noticeable with careful scrutiny.

The cause of this new phenomenon is yet unknown, but the fact that telescopically visible changes are going on in this wonderful ring system of Saturn is of the highest scientific interest. The "white region" is situated on the rings, close to the dark shadow cast by the gigantic globe of Saturn upon the rings.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., March 19, 1889.

The Disarmament of Inventors.

Mr. Goschen, member of Parliament, in a recent speech gave the following:

Mr. Morley distinctly says that we shall have to explain what has been done with the millions already voted. That question we ought to answer, and I believe we can. I will tell this meeting and the public one of the reasons why it is always being said that "the millions" have been misspent. The experts, the admirals and the generals, always desire, and naturally desire, to have supplied the last perfected weapon or ship that the ingenuity of the inventor can devise—but invention outstrips manufacture. While we are manufacturing a ship or a weapon that three years ago was the best of its kind, some new invention renders it what, by an abuse of the word, is termed "obsolete," and it is represented that all the money spent on it has been wasted. Thus it is said that our troops are not properly armed. They have certainly not got the newest magazine rifles, because it is only a few months since the experts agreed what was the best type to be adopted; and if we had manufactured magazine rifles one or two years ago, we should now be denounced as having armed our troops with the worst weapon in Europe. (Laughter, and "Hear, hear.")

Similarly the "obsolete" ship of to-day is the perfect ship of three years ago. The obsolete weapon of to-day is the dream of perfection of the experts three years ago. You will therefore see how prudently it is necessary to proceed under such circumstances. We must build more ships, but before they are completed two or three years hence, they will be described as being obsolete as compared with the latest inventions of the time. We sometimes hear of a European convention for disarmament, but if that cannot be attained, it would be a very great gain if there could be a disarmament of inventors. (Laughter.)

If the experts would only agree—but they only agree when it is too late to attempt something which half of them recommended three or four years before. Experts are very hard on politicians sometimes, and especially on the Chancellor of the Exchequer. It is certain that if the inventors were granted a free hand without any restriction, there would be a very considerable waste of public money in regard to ships and guns and arms. Invention outstrips manufacture, and therefore we must always be behindhand, whatever we do, and fail to reach the ideal standard of excellence which is set up.

The Growth of Population in Cities.

The tendency of population in all civilized nations to centralize, and its rate of concentration, has been investigated by Emil Kniehling, C.E., of Rochester, N. Y. He finds that the general law of increase is subject to fluctuations due to local causes, but when tabulated in groups of decennial grades in population, a most remarkable uniformity of decrease in the rate per cent. for each decennial increase in population is noted.

A study of the statistics of urban population shows that during the past forty years the rate of increase in the population of the principal cities of Europe and America has been much greater than that of the population of the globe. In this period, nearly every large community which possessed fair natural advantages has increased its population from 100 to 200 per cent, while the total increase of inhabitants is estimated at 40 per cent.

In a large portion of Europe, from one half to two thirds of the population is crowded into cities. In the United States, the older States exhibit similar conditions. Leaving out the towns of less than 4,000 inhabitants, the ratio for Massachusetts is 66 per cent, Connecticut and New York 54 per cent, New Jersey 52 per cent, and Pennsylvania 39 per cent constitute the urban population.

The Western States do not come under the investigation from the same standpoint, from the abnormal increase of population by emigration, which somewhat interferes with the uniformity found in the older States.

The following table of the averages for 196 cities of the U. S., showing the maxima and minima rates and the final average, will be found a most interesting study:

When the population is	No. of cities considered in deriving average rate of increase.	Range of rates of annual increase.		Average annual rate of increase in per cent.	
		Maximum per cent.	Minimum per cent.	Average of all the different values.	Probable average value.
10,000	9	30.50	6.50	14.82	—
20,000	15	24.20	4.10	11.17	—
30,000	19	18.00	2.40	8.34	—
40,000	20	15.50	2.60	6.45	—
50,000	20	13.00	2.35	6.05	6.05
60,000	16	—	—	5.90	—
70,000	15	10.40	1.40	5.52	5.60
80,000	13	9.10	3.00	5.57	5.30
90,000	12	8.30	2.10	4.95	5.03
100,000	11	7.95	1.10	4.80	4.85
110,000	10	7.30	2.35	4.93	4.66
120,000	9	8.25	2.80	5.21	4.52
130,000	7	6.40	3.10	4.38	4.40
140,000	5	6.05	3.10	4.37	4.26
150,000	5	5.75	3.07	4.30	4.15
160,000	4	5.65	3.43	4.62	4.04
170,000	4	6.00	3.40	4.51	3.93

In order to make comparisons with the progress of European cities, the following table exhibits the final averages of American, English, and German cities:

Population.	Probable average annual rate of increase in per cent.			
	American cities.	English cities.	French cities.	German cities.
100,000	4.66	3.16	—	3.57
125,000	4.30	2.99	—	3.33
150,000	4.04	2.83	—	3.10
175,000	3.79	2.67	—	2.87
200,000	3.55	2.52	—	2.66
225,000	3.36	2.38	—	2.46
250,000	3.20	2.26	—	2.26
275,000	3.04	2.13	—	2.09
300,000	2.92	2.00	—	1.93
325,000	2.80	1.92	—	—
350,000	2.70	1.84	1.70	—
375,000	—	1.75	—	—
400,000	—	1.68	—	—

Physiology of Shorthand.

A paper on the "Physiology of Shorthand Writing," by Dr. Gowers, excited considerable interest at the recent Shorthand Congress. Shorthand is only a variety of writing, and the paper was therefore mainly occupied with an account of the cerebral physiology of writing. The chief points in the physiology of the brain relating to the act of writing were first described. It was explained that the arm center of the cortex is merely concerned in producing the movements for the written symbols, and that the word processes are arranged in the motor speech center on the left side, as is shown by the fact that disease of this center abolishes the power of writing as well as of speech. Thus in the work of the reporter, as far as is at present known, there is no direct transfer of the nerve processes from the auditory to the arm center; they must go through the motor speech center. The fact that it is the activity of the latter center which excites the arm center and the movements for the written symbols, affords a strong theoretical justification for the phonetic element in shorthand, in which the written symbols are uniform for the same speech processes.

The non-phonetic systems, in so far as they do not adopt the phonetic principle, proceed on a resymbolizing of the ordinary longhand signs. There are two steps to the process, whereas in the phonetic systems

the symbols replace the longhand signs, and are placed at once on their permanent footing in direct relation to the speech processes. No doubt, however, the practical difference is less than appears from theoretical considerations, because in all systems the shorthand symbols ultimately stand in very close relation to the word processes, and are produced without any consciousness of intermediate steps. It was pointed out that the term "phonography," applied to the "phonetic shorthand," is not strictly accurate, since it is the speech process, and not the auditory impression, that immediately excites, and is symbolized by, the written sign. It is really "speech writing," not "sound writing." The error is not great, however, because the speech process and the auditory process are in perfect correspondence. The curious fact was mentioned that many persons, perhaps all persons, read by means of the motor speech center, so that if this is destroyed the power of reading is lost, and illiterate persons actually move the lips in reading. This affords another justification for the phonetic principle—i. e., for the uniformity of relation between the written symbols and the motor processes. The paper concluded with some remarks on the muscular mechanism of writing.—*Lancet.*

Spanish Torpedo Boats.

The report on the maneuvers and experiments with first class torpedo boats, carried out by order of the Spanish government last summer, has been published. The programme laid down was a comprehensive one, and occupied seven clear weeks: Launching torpedoes at targets fixed or moving from boats at various speeds, making circles and performing other evolutions, attacks by night and reconnaissances under varied conditions, and, to finish up with, during the sixth and seventh weeks, comparative trials of speed among the torpedo boats. The course was from Carthagena to Alicante, a distance of 68 nautical miles. Six boats only competed, and they arrived in the following order:

	Hs.	Ms.	Speed in knots.	Original speed.	Maker.
Barcelo	3	27	19.7	19.5	Normand.
Halcon	3	30	19.6	23	Yarrow.
Rayo	3	32	19.5	23.6	Thornycroft.
Ariete	3	57	17.2	26.3	"
Ordenez	4	14	18.1	20.2	"
Acebedo	4	20	15.8	20.2	"

*Le Yacht* declares that this experience in Spain is exactly a duplicate of what happened during similar trials in Russia. The boat built by M. Normand, of Havre, was the only one that maintained the original speed on active service.

It will be seen from the foregoing that trial trip tests as ordinarily conducted give a false idea of the real speed value of the boat.

The Gatling Gun.

This weapon, the first of quick-firing artillery, has an interesting history. In the *New York Commercial Advertiser* Dr. Gatling tells an instructive story of the development and introduction of his machine gun. The idea of it originated in a conversation Dr. Gatling had in Indianapolis in 1861 with a friend of his, Benjamin Harrison, now President. One of the new guns was shown to General Ripley, then Chief of Army Ordnance, who refused to have anything to do with it, and said the flint lock was the surest and best weapon any way, as his successor in office practically declares the Springfield breech-loader to be better than the magazine guns with which the rest of the world is arming itself. General Butler gave orders for the eleven guns which had been manufactured, and later Mr. Stanton ordered a trial of them. Dr. Gatling says:

"I went to Fortress Monroe and tested them, and made a great success. The young officers at the fort tried to play a trick on me. At their old howitzers they had trained artillerists. To me they assigned three old negroes. I saw through the game, and asked Col. Baylor, who was in command, to give me an hour in which to instruct my men how to use the gun. This he readily assented to, and I began drilling my 'recruits.' They learned very quickly, and in the hour I was ready. The firing was a competitive examination, and with my three old negroes I fired and made about three hits to one on the target to those made by the old guns. Mr. Stanton then gave me an order for \$175,000 worth of the guns. Since I have sold a great many in this country and every country almost on earth. England has them, and so have Turkey, Austria, France, Russia, and Italy."

THE following is given as Bill Nye's obituary of Mr. Weeks: "Mr. Weeks was a self-made man, and even in his most prosperous days would not allow finger bowls in his house. His education was mostly in the line of the business he had adopted, and though he did not know that evolution was a gradual change from an indefinite and incoherent heterogeneity to a definite and coherent homogeneity, through constant differentiations and integrations, a flat wheel would wake him out of a sound sleep before it had made two revolutions."