British Association for the Advancement of Science.—No. 4.

THEORY OF THE AURORA BOREALIS—Admiral Ross read a paper on this subject. He said:

"It having occurred to me that, if my theory was true, namely, 'that the phenomena of the aurora borealis were occasioned by the action of the sun, when below the pole, on the surrounding masses of colored ice, by its rays being reflected from the points of incidence to clouds above the pole which were before invisible,' the phenomena might be artificially produced; to accomplish this, I placed a powerful lamp to represent the sun, having a lens, at the focal distance of which I placed a rectified terrestrial globe, on which bruised glass, of the various colors we have seen in Baffin's Bay, was placed, to represent the colored icebergs we had seen in that locality, while the space between Greenland and Spitzbergen was left blank, to represent the sea. To represent the clouds above the pole, which were to receive the refracted rays, I applied a hot iron to a sponge; and, by giving the globe a regular diurnal motion, I produced the phenomena vulgarly called "The Merry Dancers," and every other appearance, exactly as seen in the natural sky, while it disappeared as the globe turned, as being the part representing the sea to the points of incidence. In corroboration of my theory, I have to remark that, during my last voyage to the Arctic Regions (1850-1) we never, among the numerous icebergs, saw any that were colored, but all were a yellowish white; and, during the following winter, the aurora was exactly the same color; and, when that part of the globe was covered with bruised glass of that color, the phenomena produced in my experiment was the same, as was, also, the Aurora Australis, in the Antarctic regions, where no colored icebergs were ever seen. I regret that it is out of my power to exhibit the experiments I have described, owing to the peculiar manner in which the room must be darkened, even if I had the necessary apparatus with me; but it is an experiment so simple that it can easily be accomplished by any person interested in the beautiful phenomena of the aurora borealis."

ON OCEAN TELEGRAPH CABLES—By Mr Wildman Whitehouse—After referring to the rapid progress in submarine telegraphy which the last four years have witnessed, Mr. Whitehouse said that he regarded it as an established fact that the nautical and engineering difficulties which at first existed had been already overcome, and that the experience gained in submerging the shorter lengths had enabled the projectors to provide for all contingencies affecting the greater. He then drew the attention to a series of experimental observations which he had made upon the Mediterranean and Newfoundland cables, before they sailed for their respective destinations. These cables contained an aggregate of 1,125 miles of insulated electric wire—and the experiments were conducted chiefly with reference to the problem of the practicability of establishing electric communications with India, Australia, and America. The results of all the experiments were recorded by a steel "style" upon electro-chemical paper by the action of the current itself, while the paper was at the same time divided into seconds and fractional parts of a second by the use of a pendulum. This mode of operating admits of great delicacy in the determination of the results, as the seconds can afterwards be divided into hundredths by the use of a "vernier," and the result read off with the same facility as a barometric observation. Enlarged fac-similes of these electric autographs were exhibited. The well-known effects of induction upon the current were accurately displayed. No less than eight currents—four positive and four negative—were transmitted in a single second of time through the same length of wire (1,125 miles) through which a single current required a second and a half to discharge itself *spontaneously* upon the paper. Having stated the precautions adopted to guard against error in the observations, the details of the experiments were then concisely given, including those for "velocity," which howed a much higher rate attainable by the magneto-electric than by the voltaic current. The author stated his conviction that it appeared from these experiments, as well as from trials which he had made with an instrument of the simplest form, actuated by magneto-electric currents, that the working speed attainable in a submarine wire of 1,125 miles was ample for commercial success. And may we not, he added, fairly conclude also that India, Australia, and America are accessible by telegraph without the use of wires larger than those commonly employed in submarine cables?

ON SOLAR REFRACTION—By Prof. Piazzi Smyth—Amongst other interesting and important consequences of the dynamical theory of heat, Prof. W. Thomson having deduced the necessity of a resisting medium, the condensation of this about the sun, and a consequent refraction of the stars seen in that neighborhood, Prof. Piazzi Smyth had endeavored to ascertain by direct astronomical observation whether any such effect was visible to our best instruments. Owing to atmospheric obstructions, only three observations, yielding two results, had been yet obtained; but both these indicated a sensible amount of solar refraction.—Should this effect be confirmed by more numerous observations it must have important bearings on every branch of astronomy; and as the atmosphere at all ordinary observatories presents almost insuperable obstacles, the author pointed out the advantage of stationing a telescope for this purpose on the summit of a high mountain.

THE INDIA RUBBER TREE AND ITS FRUIT—Chevalier D. Claussen, inventor of the flax cotton, read a paper on the above subject. He stated, that in the course of his travels in South America, he had occasion to examine the different trees which produce the india rubber, and of which the *Hancornia speciosa* is one.—It grows on the high plateaux of South America, between the tenth and twentieth degrees of latitude south, at a hight from three to five thousand feet above the level of the sea. It is of the family of the *Sapotaceæ*, the same to which belongs the tree which produces gutta percha It bears a fruit, in form, not unlike a bergamot pear, and full of a milky juice, which is liquid india rubber. To be eatable, the fruit must be kept two or three weeks after being gathered, in which time all the india rubber disappears, or is converted into sugar, and is then in taste one of the most delicious fruits known, and regarded by the Brazilians (who call it Mangava) as superior to all other fruits of their country. The change of india rubber into sugar, led him to suppose that gutta percha, india rubber, and similar compounds contained starch. He therefore tried to mix it with resinous or oily subtances, in combination with tannin, and succeeded in making compounds which can be mixed in all proportions with gutta percha or india rubber without altering their characters. By the foregoing it will be understood that a great number of compounds of the gutta percha and india rubber class may be formed by mixing starch, gluten, or flour with tannin and resinous or oily substances. By mixing some of these compounds with gutta percha or india rubber, he canso increase its hardness that it will be like horn, and may be used as shields to protect the soldiers from the effect of the Minie balls, and some of these compounds in combination with iron, may be useful in floating batteries and many other purposes, such as the covering the electric telegraph wires, imitation of wood, ship-building, &c.

SOAP PLANTS—The Chevalier also read a paper on this subject. When he was experimenting on several plants for the purpose of discovering fibers for paper pulp, he accidentally treated some common sea weeds with alkalies, and found they were entirely dissolved, and formed a soapy compound which could be employed in the manufacture of soap. The making of soaps directly from sea-weeds must be more advantageous than burning them for the purpose of making kelp, because the fucusoid and glutinous matter they contain are saved and converted into soap. The Brazilians use a malvaceous plant (Sida) for washing instead of soap, and the Chinese use flour of beans in the scouring of their silk; and he had found that not alone sea weed, but also many other glutinous plants, and gluten, may be used in the manufacture of soap.

[This concludes our extracts from some of the papers read before the last meeting of the above-named Association.

Pure and Impure City Water.

MESSRS. EDITORS—In the SCIENTIFIC AMERICAN of the 24th of Nov., I noticed an aticle entitled "Impure City Water," which, without further elucidation, is calculated to detract from the popularity of the gravitation system for supplying towns with water.

As a Commissioner under the English Drainage Acts; as one of the parties conferred with by the Government on the public Health Act; as having taken an active part in the promotion of these important measures; and, moreover, from a tolerably extensive experience, having a practical acquaintance with the most approved modern plans of sanatary works, which have been my special study and professional occupation for some years past, I feel more than an ordinary interest in impressing on the public mind a right appreciation of those more perfect and efficient plans which, after a long and costly probation, have, in England, attained a degree of completeness that it is my object to introduce on this continent.—Wherever it is attainable, even by going many miles for the purpose, there can be no question but that the gravitation system is the one to be adopted for a water supply. It has everything to commend it to public favor—cheapness of first cost, simplicity, durability, uniformity of supply, with the annual charge for repairs and management reduced to the lowest possible point. As compared with a pumping system, in almost every instance, it will save the entire first cost of the work in twenty years—the period over which it is usual to spread the outlay.

With reference to Boston and Albany, where the water is said to have acquired a fishy taste, it seems to me that the several circumstances have been too superficially examined. In the common course of nature it is simply impossible that opposite causes should produce similar effects; and hence the true reason must be looked for in the existence of the same defect in both places. And I am inclined to think that this will be found in an imperfect circulation in the distributing pipes, or technically speaking, in an excess of dead ends, which invariably produce a deleterious effect on the water. I have also known instances in which a fish has, by some means or other, got into the supply pipe, and being killed therein, has impregnated the water for some time. But, supposing the cause to be what is assumed, by the water being impregnated at its source either by animalculæ or weeds, there is a simple and effectual remedy by means of a properly constructed and adjusted screen filter filled with charcoal, &c., at the mouth of the supply pipe.

The low standard of public health, confirmed by the sad experience of daily reality, shows the pressing necessity which exists on this continent for a more stringent attention to sanatary matters; and that would be a wise and beneficent measure which should oblige (if need were) all municipalites to take prompt and efficient steps for the improvement of the public health.

If any evidence were needed beyond what almost every man's individual feelings can bear testimony to of the comfort, and even monetary benefit to be derived from perfect sewerage, and an ample water supply, it can be found in truthful abundance in the periodical reports of the English Registrar General, which, in recording the health of London, distinctly mark, step by step, the progressive advance in the duration of life exactly proportioned to the progress made in the sewerage of the metropolis, and its more perfect supply of water, and consequent general cleanliness.

JOHN H. CHARNOCK.

Drainage and Sanatory Engineer, Hamilton, Canada West, Dec. 4, 1855.

A Fact for Farmers.

Every inch of rain that falls on a roof yields two barrels to every space ten feet square; and seventy-two barrels are yielded by the annual rain in this climate on a similar surface. A barn thirty by forty feet yields annually 864 barrels; this is enough for more than two barrels a day for every day in the year. Many have, however, at least five times that amount of roofing on their dwellings and other buildings, yielding annually more than four thousand barrels of rain water or about twelve barrel sor one hundred and fifty ordinary pails-ful daily.—[Ger. Telegraph.

Artificial Manures.

At a meeting of the National Institute, held in Washington, Dec. 3rd, Dr. Gale in the chair, a verbal communication was made by Dr. Breed, of the Patent Office, respecting the poisonous effluvia arising from the decomposition of night soil, &c., and the remedies for the same. These effluvia are a producing cause of disease, and, but for their diffusion, would generate pestilence in all cities. The remedies are simple and of easy application. Paris illustrates this fact; its former condition being such as to attract the attention of the scientific, their labors had resulted in an entire reform of the evil. The need of this reform in American cities and towns was presented, and the products of the process of putrefaction stated with their deleterious effects upon the air and upon walls. Not only does public health require the immediate abolition of this nuisance, but the wants of agriculture second the demand, as thereby an excellent fertilizer might be abundantly and cheaply supplied. It would be necessary so to treat the mass as to retain its most valuable constituent, nitrogen. The modes of so doing were given in detail—showing how to effect the last-mentioned object and likewise complete deodorization and disinfection. The present process of making poudrette in Paris was then described; and, in conclusion, it was shown that the nitrogen of the annual night soil of London and New York is about equal to the nitrogen of the 180,000 tuns of guano annually imported into Great Britain and the United States, and that, if estimated by the cost of nitrogen in guano, it would amount to nearly ten millions of dollars per annum.

Arithmetical Improvement.

MESSRS. EDITORS—Knowing you to be advocates of improvements, whether mechanical or otherwise, I herewith present an improved plan of multiplying mixed numbers, by which one-half of the usual amount of figuring is saved.

Let us take for an example 866 1-8 × 422 2-3,

866 1-8
422 2-3

1-3 of 866 1-8 = 288 17-24

2-3 of 866 1-8 = 577 10-24

866 × 422 = 1732 / 1732 / 3464

1-8 of 422 = 52 6-8

Total amount 366082 4-24

By the old method the two numbers would be reduced to improper fractions, multiplied, and the numerator divided by the denominator, producing the same result, but involving double the figures.

This I consider of great importance, as the multiplication of long mixed numbers by the old process is excessively tedious. Mr. E. Robbins, a practical mathematician of New Haven, Ct., is, I believe, the discoverer of this improvement. WM. Y. BEACH.

Wallingford, Ct., Dec., 1855.

New Shoal near New York Harbor.

Professor A. D. Bache, the able Superintendent of the U. S. Coast Survey, in a letter to the Secretary of the Treasury, dated the 21st ult., says that in the progress of the hydrographic work of the present season, in the vicinity of the Narrows' entrance to New York harbor, by the Coast Survey party, headed by Lieut. Com. T. A. Craven, U. S. N., a shoal spot has been discovered, existing in the main ship channel, located 2,067 yards S. 30 degrees E. from the lighthouse on Staten Island, lying north and south, with a length of 503 yards in that direction, and a breadth of 164 yards from east to west. The soundings show a depth of eighteen feet, at low water. The shoal is composed of sand and shells, or more strictly is a shell bank. The steamer *Baltic* struck on it a few months since, and it was reported that she had struck upon a wreck. Some of the pilots claim to have had a knowledge of the existenc of the shoal, though none of them could give the ranges for it. The Lieutenant and the Superintendent both recommend that a buoy be placed upon it.