is all the difference between nothing and something—scarcely less than infinity.

In view of certain strongly expressed statements which have obtained currency, the results to be derived from the use of the audiphone in deaf-mutism are likely to prove very disappointing. Repeated tests show that those who are able to hear with the aid of the audiphone hear *their own voices* perfectly without it; while those who are unable to hear their own voices without it can hear no other voice with it.

SOME ELECTRICAL MEASUREMENTS OF ONE OF MR. EDISON'S HORSESHOE LAMPS.

BY HENRY MORTON, PH.D., ALFRED M. MAYER, PH.D., AND B. F. THOMAS, A.M., AT THE STEVENS INSTITUTE OF TECHNOLOGY.

Much has been written and said within the last few months on the subject of Mr. Edison's new horseshoe lamps, and with all the writing and saying there has been wonderfully little produced in the way of precise and reliable statement concerning the simple primary facts, a knowledge of which would give the means of estimating both the scientific and commercial status of this widely discussed invention.

It was, therefore, with great pleasure that the present writers found themselves, through the kindness of the SCIENTIFIC AMERICAN, placed in possession of one of these horseshoe lamps of recent construction.

To satisfy themselves as to the real facts of the case they soon made a series of careful measurements and determinations, and as the results of these are likely to interest others, they now put them in print for general benefit.

A further examination of other lamps would have been made at the same time had opportunity offered; but as a communication on this subject addressed to Mr. Edison did not evoke a reply, they are obliged to content themselves with the one lamp as a subject of experiment.

They would, however, here remark that the behavior of this lamp, under the tests, and the agreement of its results with information otherwise obtained, convince them that it is at least a fair specimen of the lamps of this form so far produced at Menlo Park.

The first object, on receiving the lamp, was to determine roughly what amount and character of electric current would be needed to operate it efficiently. With this view a number of cells of a small Grove's battery were set up, having each an active zinc surface of twenty square inches and a platinum surface of eighteen square inches.

The lamp being placed in the situation usually occupied by the standard burner in a Sugg's photometer, the battery was, cell by cell, thrown into circuit.

When ten cells had been introduced the horseshoe showed a dull red, with fifteen cells a bright red, with thirty-four cells the light of 1 candle was given, with forty cells the light of 4½ candles, and with forty-five cells the light of 9⅕ candles, and with forty-eight cells 16 candles.

Having thus determined what amount of electric current would be required for experiments, arrangements were made to measure accurately the resistance of horseshoe while in actual use and emitting different amounts of light. The resistance of this carbon thread at the ordinary temperature had been already determined as 123 ohms in the usual way, but it was presumed, as had been shown by Matthiessen (*Phil. Mag.*, xvi., 1858, pp. 220, 221), that this resistance would diminish with rise of temperature.

To measure the resistance under these circumstances the apparatus was arranged as follows: The current from the battery was divided into two branches, which traversed, in opposite directions, the two equal coils of a differential galvanometer. One branch then traversed the lamp, while the other passed through a set of adjustable resistances composed of German-silver wires stretched in the free air of the laboratory, to avoid heating. (Careful tests of these resistances showed that no sensible heating occurred under these circumstances.)

Matters being thus arranged, the resistances were adjusted until the galvanometer showed no deflection when the candle power of the lamp was taken repeatedly in the photometer, and the amount of resistance was noted.

These measurements were several times repeated, shifting the coils of the galvanometer and reversing the direction of the current.

The results so obtained were as follows:

Resistances.	Condition of Loop.
123 ohms.....	Cold.
94 "	Orange light.
83·7 "	$\frac{9}{10}$ candle.
79·8 "	5 "
75 "	18 "

The photometric measurement was in all these cases taken with the carbon loop at right angles to the axis of the photometer, which was, of course, much in favor of the electric lamp. On turning the lamp round so as to bring the carbon loop with its plane parallel with the axis of the photometer, *i. e.*, the edge of the loop turned toward the photometer disk, the light was greatly diminished, so that it was reduced to almost one-third of what it was with the loop sideways to the photometer disk.

Having thus determined the resistance of the lamp when in actual use, it was next desirable to measure the quantity of the current flowing under the same conditions.

To do this the current from fifty cells of battery was passed through a tangent galvanometer as a mere check or indicator of variations, and then through a copper voltameter, *i. e.*, a jar containing solution of cupric sulphates with copper electrodes immersed, and then through the lamp, placed in the photometer.

Under these conditions it was found that during an hour the light gradually varied from about 16 candles at the beginning to about 14 candles at the end, making an average of about 15 candles, measured with side loop of toward disk.

The galvanometer during this time only showed a fall of half a degree in the deflection of the needle.

Carefully drying and weighing the copper electrodes, it was found that one had lost 1·0624 grammes.

Now, it is well known that a current of one weber takes up 0·00326 gramme of copper per second, which would make 1·1736 grammes in an hour; therefore the current in the present case must have been on the average $\frac{1{\cdot}0624}{1.1736} = 0{\cdot}905$ webers, or a little less than one weber.

Having thus obtained the resistance of the lamp when emitting a light of 15 candles, namely, 76 ohms, and the amount of current passing under the same conditions, namely, 0·905 weber, we have all the experimental data required for the determination of the energy transformed or expended in the lamp, expressed in foot pounds. For this we multiply together the square of the current, the resistance, the constant 0·737335 (which expresses the fraction of a foot pound involved in a current of one weber traversing a resistance of one ohm for one second), and the number of seconds in a minute. Thus, in the present case, we have $0{\cdot}905^2 = 0{\cdot}8125$, and $0{\cdot}8125 \times 76 \times 0{\cdot}737335 \times 60 = 2753{\cdot}76$ foot pounds.

Dividing these foot pounds per minute by the number of foot pounds per minute in a horse power, that is, 33,000, we have 0·08, that is, about eight one-hundredths or one-twelfth of a horse power as the energy expended in each lamp.

It would thus appear that with such lamps as this, one horse power of energy in the current would operate 12 lamps of the same resistance with an average candle power of 10 candles each,* or 120 candles in the aggregate.

Assuming that a Siemens or Brush machine were employed to generate the electric current, such a current would be obtained, as has been shown by numerous experiments, with a loss of about 40 per cent of the mechanical energy applied to the driving pulley of the machine. To operate these 12 lamps, therefore, we should have to apply more than one horse power to the pulley of the machine, so that when this loss in transformation had been encountered there should be one horse power of electric energy produced. This would call for 1⅔ horse power applied to the pulley of the dynamo-electric machine, by the steam engine.

To produce one horse power in a steam engine of the best construction about three pounds of coal per hour must be burned, and therefore for 1⅔ horse power 5 lb. of coal must be burned.

On the other hand one pound of gas coal will produce 5 cubic feet of gas, and will leave, besides, a large part of its weight in coke, to say nothing of other "residuals," which will represent practically about the difference in value between "steam making" and "gas making coal," so that it will not be unfair to take 5 lb. of gas coal as the equivalent of 5 lb. of steam coal.

These 5 lb. of gas coal will then yield 25 cubic feet of gas, which, if burned in five gas burners of the best construction, will give from 20 to 22 candles each, or 100 to 110 candles in the aggregate.

We have, then, the twelve Edison lamps producing 120 candles and the five gas burners producing 100 to 110 candles, with an equivalent expenditure of fuel.

If each apparatus and system could be worked with equal facility and economy, this would of course show *something* in favor of the electric light; but when in fact everything in this regard is against the electric light, which demands vastly more machinery, and that of a more delicate kind, requires more skillful management, shows more liability to disarrangement and waste, and presents an utter lack of the storage capacity which secures such a vast efficiency, convenience, and economy in gas, then we see that this relatively trifling economy disappears or ceases to have any controlling importance in the practical relations of the subject.

* The candle power being 15 candles in the best position, and 5 candles at right angles to this, the average or general illuminating power of the lamp is 10 candles.

THE AMERICAN FISH CULTURAL ASSOCIATION.

The ninth annual meeting of the American Fish Cultural Association began in this city March 30. A large number of gentlemen interested in fish and fishing were present. The President, Mr. R. B. Roosevelt, read an interesting paper on hybrids. Mr. Seth Green contributed an account of his experience with California mountain trout, brook trout, and black bass at the State hatchery, with remarks on cray-fish and frogs.

Mr. Hugh D. McGovern submitted a short paper on the discovery made by him of a curious habit of eels. At the Brooklyn waterworks, among the wet moss growing on the crown of an arch over a waterway, 12 inches above the surface of the water, he found thousands of small eels, who seemed to live there, clinging to the moss as flies cling to the ceiling. The fact was important, as showing how this fish could move from water to water. To reach the moss these eels must have climbed up the 12 inches of wet wall above the surface of the water.

Mr. Livingston Stone, U. S. Assistant Commissioner of Fisheries, followed with an important paper on the transportation of live fish. Mr. James Annin gave an illustration of trout stripping in artificial propagation, using a number of male and female trout from his ponds on Long Island. Mr. Charles Hallock gave a description of Labrador fishing, and Mr G. Lamphear read a short but valuable paper comparing the statistics of Fulton Fish Market for 1878 and 1879. His figures showed that 34,276,666 pounds of fish were sold in Fulton Market during the year 1879–'80, an increase of 646,700 pounds over the previous year. In addition, 1,509,561 mackerel had been sold and 291,845 shad.

The next day Prof. Brooks, of Johns Hopkins University, described the propagation of the oyster; and Prof. Atwater, of Wesleyan College, read a paper on the nutritive qualities of various kinds of fish. Prof. Brooks believes that the oysters of the Chesapeake do not breed in the same way as European oysters do; that the sexes are separate; and that to propagate oysters artificially the males and females should be chopped up together and thrown into the water, so as to thoroughly mix the eggs and milt.

In this way, he thinks, the oyster might be propagated with profit, using for the purpose small ponds. All this learned trifling will be very amusing to the practical oystermen of Connecticut, who, for a score of years, have successfully propagated oysters by the square mile. Their trouble is not to get an abundance of young oysters. At certain easily recognized times the Sound waters swarm with them, ready to attach themselves to any clean "stools" presented to them. The real trouble is to defend the oyster farmer's acres of partially grown oysters from the swarms of star-fish and other marine vermin which prey upon them; for which defensive work steam dredging seems to be the only economical and certain resource.

PHOTO-ENGRAVING.

In general terms the process of producing engravings or types for printing by photography, consists, first, in making a sharp negative of the picture to be engraved; second, in the photographic printing of a sheet of sensitized gelatine by means of the negative; third, the development of the printed lines upon the surface of the gelatine by water; and fourth, the casting of a copy of the developed gelatine sheet in metal, the metal so produced being used for printing on the press in the ordinary manner. All this is very simple, and in the hands of experienced and skilled persons very beautiful examples of printing plates, having all the fineness and artistic effect of superior hand engraved work, may be produced.

Among the earliest and most extensive efforts to introduce this process commercially were those of Mr. John C. Moss, of this city, to whose persevering labors the public is chiefly indebted for the successful establishment of the new industry in this country.

Mr. Moss has finally concluded to give the public the benefits of all his latest improvements in this line, by the organization of a new corporation known as "The Moss Engraving Company," whose first announcement will be found in our advertising columns. Every description of engraving and printing plates is done in a superior manner by the company promptly on very moderate terms. The Moss process has been used on the SCIENTIFIC AMERICAN, especially on our SUPPLEMENT, for several years past, and we therefore speak from experimental knowledge when we say that it is good and reliable. The motto of Mr. Moss's company is "The best work at low prices, always on time." In all our past experience with Mr. Moss, although we have given him many perplexing jobs, we have never known him to fail in carrying out the above motto. The Moss Engraving Company has a large and splendid establishment at 435 Pearl St., New York, which is fitted up in every department with the latest and best appliances for the execution of good work. It deserves and will doubtless command an extensive patronage.

THE NEW YORK EXHIBITION OF 1883.

A bill to provide for celebrating the one hundredth anniversary of the treaty of peace and the recognition of American independence by holding an International Exhibition of arts, manufactnres, etc., in New York, in 1883, passed the Senate March 31. It incorporates the United States International Exhibition, composed of well known New York gentlemen, whose official functions are to continue until the close of the Exhibition. It will be their duty to fix the date of the Exhibition, make the needed preparations for it on a site within the corporate limits of the city of New York, and to superintend the Exhibition during its progress. The bill provides further that the corporation shall cease to exist on or before January 1, 1885. Congress may at any time alter or repeal the act, and the United States are not to be liable for any of the acts or representations of the promoters of the enterprise. Not less than $1,000,000 must be subscribed, and not less than 10 per centum thereof must be paid in before the corporation may do any corporate act other than organize, and no part of the capital stock or assets is to be withdrawn, refunded, or divided among the stockholders until all the debts are fully discharged.

Glucose Manufacture.

There appears to be quite a furor in the West in connection with the manufacture of glucose from corn. A large number of factories are being set up; one at Chicago, it is said, will have a capacity of 20,000 bushels a day. A bushel of corn produces 30 pounds of glucose (grape sugar) or 3 gallons of sirup. The sugar costs 2 cents a pound, the corn selling at 40 cents a bushel.

Artificial Atropine.

Up to the present time the artificial preparation of an alkaloid has not been successfully carried out. Vanilline and other organic products formed in plants have been made, and a substance isomeric with coniine was also made some years since. Ladenburg has recently taken an important step in the matter of making artificial atropine. He has, in fact, prepared the alkaloid, but the materials employed in its preparation, namely, tropine and tropic acid, have not yet been obtained from any other source than from atropine. When atropine is acted upon by baryta or hydrochloric acid, it breaks up into tropic acid and tropine. To be able to unite these two bodies again, so as to form the true atropine, may seem a small affair, and yet it is often very difficult. Every one knows how grape sugar splits up into alcohol and carbonic acid, if yeast is present, yet no one has ever been able to convert alcohol into sugar by acting upon it with carbonic acid. The conversion of cane sugar into glucose is easy enough, and yet the opposite is impossible. The destruction of complex organic compounds is always easier than their production, and whenever we succeed in rebuilding a body from simpler ones we have made an important step in the direction of its synthesis. To decompose the tropic acid into simpler bodies, perhaps into substances that have already been prepared, and then to reverse the operation, will be the next duty of Dr. Ladenburg.

Atropine is the active constituent of belladonna, and possesses, with other properties, the remarkable power of dilating the pupil of the eye, whether introduced into the eye, taken into the stomach, or injected beneath the skin.

The artificial atropine prepared by Ladenburg has the same effect upon the eye. Both the natural and the artificial alkaloids possess the power of neutralizing the action of muscarine upon the heart. Physically they have the same melting points, and both crystallize in brilliant needles. The precipitates formed by tannin, mercurio-potassic iodide, picric acid, chloride of gold, etc., have the same properties whether the natural or artificial atropine is employed. When heated with sulphuric acid and bichromate of potassium they each evolve an odor of benzoin. These remarkable physical and chemical coincidences leave no reasonable doubt of their identity.

The Effect of Coffee Again.

Dr. Richardson, the eminent English scientist, in respect to the popular notion that coffee is an unhealthy beverage, that it keeps up a constant irritation of the stomach, and brings on depression of spirits, etc. There was a great deal of truth in that statement, says the doctor, as coffee cannot be taken in excess without producing dyspepsia and irritation, *but moderately used it is an invigorating, healthful, and wholesome drink, bringing a man's best energies into play.* The quantity taken, however, must not be large, and should be good.

Dr. Bock, of Leipsic, another celebrated scientist, says: "The nervousness and peevishness of our times are chiefly attributable to tea and coffee: the digestive organs of confirmed coffee drinkers are in a state of chronic derangement, which reacts on the brain, producing fretful and lachrymose moods. Fine ladies addicted to strong coffee have a characteristic temper, which I might describe as a mania for acting the persecuted saint. Cocoa and chocolate is neutral in its psychic effects, and is really the most harmless of our fashionable drinks."

Nerve Stretching in Obstinate Sciatica.

At a recent meeting of the Harveian Society, London, Mr. Pye read a paper on nerve stretching. A patient had suffered for many years with severe sciatica, for the treatment of which huge doses of morphia had been used. The patient was in severe pain when not under the influence of morphia. The nerve having been laid bare, it was pulled backward and forward, forcibly, with from eight to ten pounds pressure. The wound healed well, the pain was lost, and some paresis followed. The paresis wore off, and some pain was felt in the lower leg, but there was no return of the sciatica. The patient was able to resume work. The sciatica was probably rheumatic. The list of cases of nerve stretching yet performed is not large enough to settle the question of the justifiableness of the operation. Mr. Pye then reviewed very carefully the history of the operation. It has been less successful in the treatment of tetanus than neuralgia. When the nerve was compressed by an inflammatory area the operation promised well. In cases where the skin had become altered a change toward the normal condition followed, as well as the relief of pain.

Petroleum in Russia.

From an official report addressed by Colonel Romanowsky to the Russian Minister of Finance, it appears that the principal petroleum depots in the Russian Empire are to be found in the southeastern and northeastern districts of the Caucasus, that is to say, in the province of Bakou, on the shores of the Caspian Sea, and in the province of Kouban, in the vicinity of the Black Sea. According to the statements of some Russian engineers, there are no less than 250 localities within these provinces where enormous quantities of petroleum can be found. It is said that 100 of these depots, if properly worked, could be made to yield 660,000,000 gallons per annum. The Bakou oil is thick and heavy, suitable for heating and for rough purposes in general; the Kouban oil is of better quality for refining and for burning in lamps.

IMPROVED HAND AND POWER PRESSES.

We give on this page engravings of several varieties of presses made by the Boomer & Boschert Press Company of Syracuse, N. Y. These presses are adapted to a great range of work, such as baling cloth, pressing paper, expressing lard or tallow, making cider, wine, etc., and are built in different sizes to be operated by hand or power.

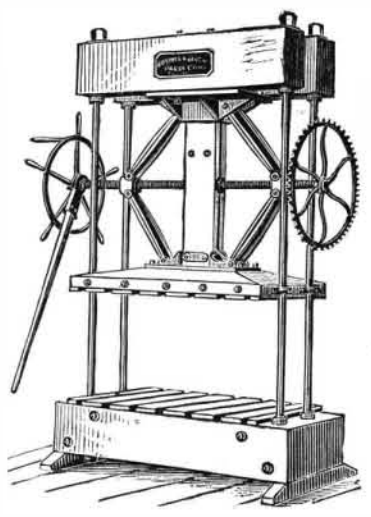

Fig. 1.—CLOTH BALING PRESS.

An almost endless number of devices have been used for obtaining pressure, the most prominent being the screw, the lever, and the hydraulic press, but these without exception give the same power at the beginning and end of the work.

In expressing lard and tallow or the different oils, as well as most other substances, but little power is required in the early part of the operation, and the constantly increasing resistance requires a corresponding increase of power. The construction of the Boomer & Boschert press is such as to insure a regular increase of power with every turn of the screw which tends to straighten the toggles, while the movement of the follower is proportionately less. The development of pressure and increase of resistance are so nearly equal that the same power that is applied at the beginning of the pressing operation is competent to finish. For example: one man with a hand power press can easily perform the task from beginning to end. This "progressive power," as the manufacturers term it, is perfectly adapted to the work, and by very simple means accomplishes wonderful results.

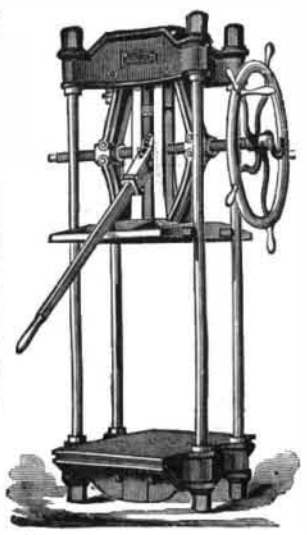

Fig. 2.—PAPER PRESS.

Fig. 1 shows a cloth baling press embodying this principle. The platen is guided by the rods which bind the upper cross beams to the bed and take the strain of the press. The frame and platen of this press are wood, and may be varied in size within certain limits without materially affecting the cost.

The paper press shown in Fig. 2 is made of iron in different sizes. The length of the rods controls the distance between the base and follower and the capacity of the regular sizes of this press may be varied by using longer or shorter rods.

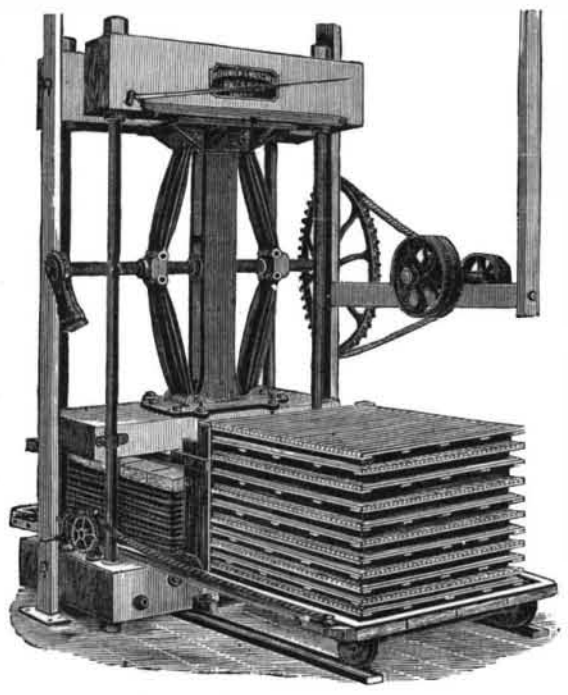

Fig. 3. POWER CIDER PRESS

The power cider press represented in Fig. 3 has a double platform, which is mounted on a truck, movable on a track on the floor. The shifting gear is worked by a crank, and is arranged to move the platform across the bed of the press easily and quickly. By means of this arrangement one cheese may be pressed while another is being made ready.

In this connection we give an engraving of Messrs. Boomer & Boschert's apple grater, which is very efficient and well adapted to the work it is required to perform.

The frame of the grater is made of iron, giving a security, strength, and stability which no wood frame, however well made, possesses. The cylinder is of iron, turned and carefully balanced. It has planed grooves to receive the knives—eight in number—which are adjustable by set screws, above and below at each end, and held firmly in their places by a heavy wrought iron band shrunk on each end of the cylinder

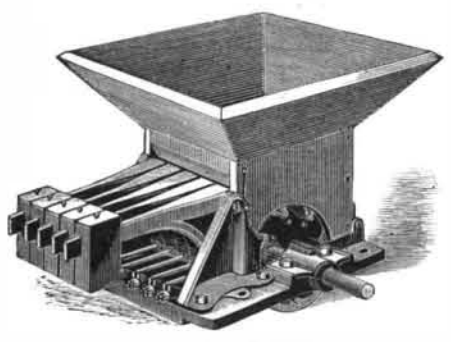

Fig. 4.—APPLE GRATER.

The concaves consist of five iron levers with movable weights, allowing stones or any other hard substances to pass through without injury to the knives.

Fig. 5 shows a press made on the same principle as the others and especially designed for kettle rendered scrap. It is provided with an improved hoop consisting of a cast iron section or post, which forms about one sixth of the hoop, is firmly bolted to the bed of the press, and arranged with hinges upon which swing two doors that complete the circle when fastened together. These doors are constructed of wrought iron hoops and staves, with steel fastenings.

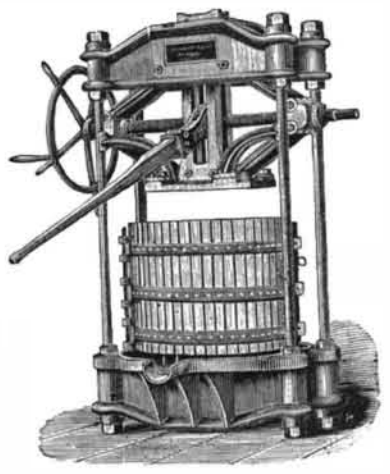

Fig. 5.—LARD PRESS.

When the pressing is completed, the doors are unfastened and swung open, the cake is removed, the doors are swung together and again fastened, thus avoiding much of the heavy lifting attending the use of other kinds of hoops.

These presses have been extensively introduced in the principal cities of this country—as well as Europe, South America, Mexico, and to some extent in Asia, and are deserving of the success they have attained.

Floating Island.

Among the many natural curiosities of Tuolumne county it is not generally known that there is a "floating island." Up in the "Siskiyous," lying like a pearl in the great mountain chain, is Squaw lake, a beautiful sheet of water, now utilized by a mining company as a reservoir. For many years the lake has been a favorite and delightful resort for fishing parties, and contained nearly in its center an island, comprising about an acre of ground, covered with luxuriant grass and a growth of willow and alder. It was never dreamed that the pretty little island was not terra firma, but when the bulkhead across the outlet of the lake dammed up its waters, the island rose slowly until it had been elevated fully 16 feet above its original level. It would be a question for the naturalist rather than the geologist to determine the age of this floating island, as it is evidently made up entirely of decayed vegetation. Perhaps at some remote period the roots of a tree, uptorn by the mountain storm, drifting out in the lake, formed the nucleus from which the island has grown, but it seems singular that it should have remained anchored and unchangeable in its position. The locality is much frequented by pleasure seekers who will hereafter notice the increased elevation.—*Jacksonville Sentinel.*

Home Made Soda Water.

The artificial seltzer water, made with a carbonic acid generator, is already an imitation, far from perfect, of the natural water. A receipt to make it on the small scale for family use, as it were, can only give a product differing still more from that of the spring. Yet the following would fairly imitate the taste and properties of the natural water:

Fused chloride of calcium	4 grains.
Chloride of magnesium	12 "
Chloride of sodium	15 "
Citrate of iron	½ "
Tartaric acid	2 drachms.
Bicarbonate of soda	2½ "
Water sufficient.	

Dissolve all the salts, excepting the tartaric acid and the bicarbonate, in about one pint of water, and introduce the solution into a champagne bottle. Then, having completed the requisite quantity of liquid so as to leave an empty space of about two fluid ounces, add the tartaric acid, and, immediately after, the bicarbonate of soda. Cork the bottle tightly, secure the cork with stout cord, and set the bottle aside for about six hours before it is opened. It is then ready for use.