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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 676.

For the Week Ending December 15, 1888.

Price 10 cents. For sale by all newsdealers.

EXPERIMENTS ON DEATH BY ELECTRICITY.

At Mr. Thomas A. Edison's laboratory in Orange, N. J., the effects of electricity were tried upon larger animals than have hitherto been experimented with, under the charge of Mr. Harold P. Brown. The experiments were witnessed by Mr. Elbridge T. Gerry and others. A calf weighing 124½ pounds was first selected. Its resistance was determined, and was 3,200 ohms. An alternating current of 700 volts E.M.F. was applied and continued for 30 seconds. This was needless, as death was instantaneous. On dissection, its flesh and principal organs were found to be unaffected. The circuit wire was connected to a prepared bare spot on the forehead and to a second spot, also denuded of hair, upon the spine. Sponge-covered electrodes, moistened with sulphate of zinc solution, were employed.

A second calf, weighing 148 pounds, resistance 1,300 ohms, was killed instantly by the same current. The current was only applied for five seconds. Finally, a horse, weighing 1,230 pounds, resistance 11,000 ohms, was killed, the current passing from one fore leg to the other through the body. The demonstration was addressed to the members of the committee who recommended for capital offenses the substitution of death by electricity for the statutory death by hanging. It is also interpreted as illustrating the deadly nature of the alternating current. Proof of this after the number of deaths which have occurred from the direct current in this city seems quite timely. The distinguished inventor in whose laboratory the experiments took place is the principal advocate of the direct system of electric lighting.

THE WEBSTER-HIGGINS PATENT SUIT.

The accounting in a great patent suit has been brought to a close by Commissioner Shields, before whom the proceedings for accounting had been brought. The patent in suit, granted to Wm. Webster in 1872, referred to the placing and withdrawing of the wires used in raising or forming the pile in the manufacture of Brussels carpet. Originally the work was done by hand; then, under the Bigelow patent, a monopoly was held, until 1871, for executing it by machinery. When this expired, many concerns began to use mechanical appliances which seemed to infringe the Webster rights. Shortly after its granting, a company with $200,000 capital was formed, to sue infringers under this patent. The great case now decided was brought against the Messrs. Higgins, and four years, from 1874 to 1878, were consumed in bringing it to the final hearing in the U. S. Circuit Court. The complainants were originally represented by Messrs. Clarence A. Seward and E. N. Dickerson; the defense retained George Gifford, Esq., Judge Hoar, and Senator Evarts. Judge Wheeler, before whom the case finally came, decided in favor of the defendants, and held the patent invalid. This decision after four years had passed was reversed by the U. S. Supreme Court, and an accounting was ordered. It was here that the remarkable features of the case began to appear. Two years were devoted to it. The documents finally produced weighed two tons.

Mr. George Gifford died, and his son Mr. Livingstone Gifford succeeded him in the management of the case, and Roscoe Conkling was also retained by the prosecution. A claim was presented by the representatives of the Webster patent right for over $28,750,000. One witness, the expert bookkeeper and president of the Webster Iron Company, was subjected to a cross examination extending over two years. Nearly 6,300 interrogatories were embraced in his testimony, the record of which covered between two and three thousand printed pages. The great claim was by this examination reduced to $1,500,000, an average of over $4,000 per question asked. The Messrs. Higgins' proofs on the accounting filled 1,200 pages. Eleven days were consumed in the argument, and over a thousand pages of brief were handed the Master. His final decision practically throws out the patent in suit as an element for damages, and the Webster Loom Company are awarded nothing.

The cross examination of Mr. Smith, the president of the prosecuting company alluded to above, is the most remarkable on record. The eminence of the counsel and the visitations of death among them and the other parties also signalize the case. Messrs. George Gifford, Roscoe Conkling, Judge Hoar among the counsel, and the patentee and one of the original defendants, Mr. Nathaniel Higgins, are dead.

Lectures for Workingmen and Women.

The school commissioners of the city of New York authorized at their meeting on Wednesday, December 5, lectures for workingmen and workingwomen, to be delivered twice a week, at night, in schools in the Tenth, Twelfth, Thirteenth, Nineteenth, and Twenty-second Wards. These lecturers have been selected: Prof. L. J. B. Lincoln, Prof. Henry A. Mott, Dr. T. O'Conor Sloane, Charles S. Allen, M.D., Henry G. Hanchett, M.D., Edward H. Boyer, Stephen Helm, Francis G. Caldwell, Nathan S. Roberts, M.D., H. M. Leipziger, Prof. J. C. Zachos, Geo. A. Clement, Prof. Bickmore, and J. Oscroft Tansley, M.D. This is an innovation in the line of public education from which much is to be hoped and whose results will be watched with much interest.

Bursting of the New Steel Gun.

The hopes which were entertained of producing cast steel guns of sufficient strength to stand the requirements of actual service have met with a serious check if not final disappointment.

The new steel gun which was carefully cast by the Pittsburg Cast Steel Co., after being finished and rifled, was taken to the government proving grounds at Annapolis, Md., and subjected to trial on December 5. The gun was 193 inches in length, and was to be tested with 38 pounds of powder on the first charge, and 48 pounds for ten consecutive shots following. It carried a 100 pound conical shot, which was to be fired into the earth bank 200 yards away. All the visitors were supplied with bomb-proof stations, some with glasses and others with peep holes, giving a view of the gun at the discharge.

The first discharge was made with 36 pounds of powder, at the request of the makers, "to warm up the gun," they said. The gun stood this test, a pressure of 11 tons to the square inch. The second load contained 48 pounds of powder, the regulation charge. With a tremendous roar the second discharge came, startling the auditors and spectators. It had done its work. The great gun lay dismantled under the huge timbers of the platform that had been utterly demolished, heavy timbers of 12 by 12 inches having been splintered into fragments. The government lost $5,000 by the destruction of property in the explosion. Ensign Robert R. Dashiell said that the experiment proves that the Bessemer cast steel will not do for great guns. The gun exploded under a pressure of 14·1 tons to the inch. It was broken from the trunnions to the butt in over twenty pieces. From the trunnions to the muzzle it remained in one piece. The ball deflected about 20 feet above where it was aimed. The gun showed weakness in the breech, where it ought to have had strength. The fragments of the gun all flew backward.

An investigation is to be made, with a view to discover, if possible, the exact causes of the disaster.

A Volatile Alkaloid in Pepper.

BY WILLIAM JOHNSTONE, PH.D., F.I.C., ETC.

The subject of this short note is to announce the existence or discovery of a volatile alkaloid in pepper possessing strong alkaline properties. The analysis of its platinum salt gave the following results:

		Found.	Calculated.
C	120·0	20·02	20·60
H	24·0	4·32	4·15
N	28·0	5·01	4·80
Pt	197·4	33·93	33·89
Cl	213·0	36·62	36·56
$2(C_5H_{11}N.HCl)PtCl_4$	582·4	99·90	100·00

These results so closely agree with the formula of piperidine that I think I am justified in announcing the existence of piperidine in pepper.

I have made several estimations of this volatile alkaloid in various peppers, and find that nine samples of black pepper gave an average of 0·56 per cent, with a minimum of 0·39 per cent and maximum of 0·77 per cent calculated as piperidine.

Long pepper contains 0·34 per cent, and pepper refuse, composed principally of the husks, 0·74 per cent.

Three samples of white pepper gave respectively 0·34, 0·21, and 0·42 per cent, showing that the alkaloid is contained principally in the husk, and which naturally accounts for the greater pungency of black pepper over that of white pepper.

The same samples of black pepper were examined for piperine and the amount estimated, giving a maximum of 13·03 per cent, a minimum of 5·21 per cent, and a mean of 8·25 per cent.—*Chemical News.*

The Proposed Quaker Dam.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. A. Marichal discussed the plans of the Quaker Bridge Dam, as proposed by the board of experts appointed by the New York Aqueduct Commission, and made comparisons between them and the plans presented by himself to the commission at the beginning of this year.

Mr. Marichal says that the report of the board of experts contains certain errors of such a nature as to make it almost worthless; that this report represents his plans as to be built on a straight line, while four pages out of seven of the pamphlet accompanying his plan are devoted to demonstrating that the dam should be built on a curve. He, moreover, says that he was one of the first to criticise the straight line in plan (see *Proceedings*, January 14 last).

The author of the paper went into a mathematical demonstration, having for its object to prove that the calculations made by the board of experts to ascertain the leverage, the frictional and the granular stability of the profile were based on wrong theory; and that his profile, built on a curve of 900 feet radius, would make a much stronger dam than the one proposed by the board of experts, and that the cost would be less by half a million dollars.

The French Sheep Farm.

M. Gustave Heuze contributes to the *Journal d'Agriculture Pratique* an interesting account of the national sheep breeding farm (*bergerie*) at Rambouillet, which has now been in existence for more than a century, King Louis XVI. having purchased the palace and forest of Rambouillet in 1784, and having created an experimental farm on the estate, at a cost of about £1,600 in the money of that day, now representing, of course, a much larger sum. The manager of the farm, one Tessier, then obtained the king's permission to spend more than double the sum in the purchase of Fribourg cattle, Angora goats, implements, and the cultivation of different varieties of wheat, clover, etc. But the great service which Tessier did was the introduction of the merino sheep which have since made Rambouillet so well known. These sheep had originally been brought from Spain some few years before, on account of the excellence of their wool, and Tessier, having seen them at various places in France, induced the king to order the French ambassador at Madrid to purchase a flock of 364 sheep, which were selected from among the choicest flocks in Spain, at a cost of £650. The sheep, on their arrival at Rambouillet, were placed under the charge of a man named Delorme, who was still shepherd when Napoleon came to Rambouillet in 1804, and complimented him by calling him the "first shepherd in France."

The flock was re-enforced two or three times by fresh importations from Spain, and it was the custom to hold an annual ram sale from 1794 to 1853, but in the latter year this was given up, and since then the sales have been private. The change was a beneficial one, for while the highest prices at public auction were £17 for rams and £5 for ewes, the average price for the twenty years from 1853 to 1872 was £34 for the rams and £16 for the ewes. The total value of the sheep sold out of the Rambouillet flock from 1797 to 1872 was £139,000, represented by 4,309 rams, 4,301 ewes, 3,025 wethers, and 131 tons of wool. Although the value of the stock increased considerably during this period, the wool dropped from 1s. 9d. per pound to just half that price. There is a great diversity of opinion as to the origin of the merino sheep, some people saying that the breed was introduced into Spain by the Moors, and that it originally came from Asia; but there does not seem to be any special reason for believing such to be the case, and it is, of course, equally impossible to identify it, as some others have endeavored to do, with any of the Roman breeds spoken of by Pliny. There can be no doubt, however, in M. Heuze's opinion, that the merino sheep brought from Spain have been much improved, both as regards the development of the frame and the growth of wool, since their importation to Rambouillet, and the rams are much sought after by breeders in Australia, New Zealand, and South America, as it is found that the climates of these countries suit them very well. A very favorite cross in France is that of the merinos with the Leicesters, and the animals bred in this way, which are known as "Anglo-merinos," are generally notable for their early maturity, good conformation, and fine clip of wool.

New Westminster Southern Railway.

This new enterprise in the province of British Columbia is of more than local importance, and running from the Fraser River to Seattle in Washington Territory completes, says *Engineering*, the Pacific Coast Railway from Mexico to Canada. New Westminster on the Fraser River was formerly the capital of British Columbia, when the island of Vancouver was a separate province, but when the two were merged into the one province, it lost this distinction in favor of Victoria, the more important city of the two, and formerly the island capital.

When the Canadian Pacific Railway was diverted from the Fraser River Valley (by which it passes through British Columbia), and carried across the Pitt Marshes to Port Moody for a terminus, New Westminster was again left out, and lost the terminal advantage that seemed to belong to it as the best situation near the mouth of the Fraser; while when the Canadian Pacific syndicate extended their line from Port Moody to the new city of Vancouver, and exerted all their influence to make this the great city of the West, New Westminster got a third set-back, from which it will have some difficulty to recover.

Aroused to the necessity of making every exertion to save the remains of their business from being diverted either to Victoria or Vancouver, the old community have taken hold of this new railway scheme, and as they have lost the Fraser River trade and the terminal advantages of the transcontinental railway, are taking the best means to secure the southern outlet from the province. They have accordingly liberally bonused the new scheme. They gave the company $150,000 for the road, $75,000 for a ferry across the Fraser, and $75,000 for their locomotive and car shops, which must be built within or in the vicinity of the city on the north side of the Fraser River. Considering that the ratable property of New Westminster by the last assessment was only $862,511, this bonus equals more than one-third of the total valuation, and seems exceedingly, perhaps imprudently, liberal, but it is looked upon as a necessary investment, and the only means by which the city can retain its position. It is intended ultimately to bridge the Fraser, and for this a further bonus is promised, but as the river is 90 feet deep and very wide, this for the present is postponed, and the trains are to be crossed by a ferry.

The New Westminster Southern will be 126 miles long from the Fraser River to Seattle, of which about 30 miles is in British Columbia and the remainder in the United States. The line runs through a wonderfully rich country. It is heavily timbered, 12,000 million feet of lumber being, it is estimated, within the two and a half miles belt of land donated to the railway. The company has also secured some valuable coal lands, with two known workable seams of coal, each three feet six inches in thickness, and they have immense beds of iron ore, said to be 156 feet in thickness and assaying 56 per cent of iron, practically inexhaustible, on their freehold. The agreement with the city of New Westminster was signed September 5, and provides that work shall be commenced within thirty days, be completed to the boundary in twelve months, and to Seattle within four years. At the end of the month the whole distance to the boundary was cleared of its timber, and the right of way had been secured, the contract for the grading was let, and the contractor expects to have the rails laid on this section by the end of March next. The whole of this is much against the interest of the Canadian Pacific Railway, who are now surveying a parallel route to start from Vancouver, and missing New Westminster to cross the Fraser at Sea Island, about five miles further up the river.

The Marriage of Near Kin.

There is a widespread idea that consanguineous unions produce either defective offspring or none at all. When a marriage between cousins is spoken of, sterility or a deaf-mute, idiotic, or deformed progeny is predicted, and examples are always athand to cite in support of the prophecy.

Does this opinion rest upon positive and well authenticated facts, or is it erroneous? This is a question that was examined a few years ago by Mr. G. H. Darwin, who, after a profound study of the subject, came to the conclusion that, in the present state of science, there is nothing to justify the common prejudice that exists against the marriage of near kin. More recently, the subject has been further examined by Mr. A. H. Huth, who has just published an exhaustive work upon it, in which he arrives at the same conclusions that Mr. Darwin did.

Mr. Huth thinks that consanguinity of itself plays no particular role in the union of individuals of the same stock. In the descendants, it increases the tendencies common to the two progenitors. By reason of their relationship, the closer this is and the closer the relationship of the ancestors, the greater is the tendency of the descendants to exhibit the same dispositions. If these are good, consanguineous unions will be advantageous, in that they will fortify and intensify them. If, on the contrary, they are bad, such unions should be avoided, in order to prevent a re-enforcement of unfavorable tendencies, which should be suppressed. But the case is identical where it is a question of unrelated persons. No reasonable person would urge two neuropathic individuals of different family to unite, because he knows that the neurosis has every chance to become intense in the descendants. On the contrary, a union between consanguineous individuals, equally healthy and well favored, ought to be encouraged. What may be urged against marriages of near kin is the facility with which unfavorable tendencies are transmitted, and the relative rarity of the circumstances in which such marriages can really be advised. But, this admitted and explained, consanguinity of itself presents no inconvenience, especially if we consider how remote, by reason of the existing laws upon marriage, is the degree of consanguinity between individuals capable of uniting legitimately.

Upon the whole, consanguinity accumulates and intensifies tendencies. If these are bad, the marriage of near kin should be avoided; if good, it may be favored. But as, unfortunately, the unfavorable tendencies are more easily and frequently transmitted, because they are the ones that are established with the most facility, there is oftener more reason for avoiding than seeking such unions. Upon the whole, Mr. Huth concludes that the accusations directed against marriages of near kin are not justified in the present state of science.

Explosion of Dust.

At Saginaw City, Mich., November 29, a terrific explosion, at a quarter to one P.M., shook the city, and was closely followed by an alarm of fire from the direction of the Steglein furniture factory, standing nearly in the center of the city. When the firemen reached the scene, the factory was demolished and enveloped in flames—the wreck was complete. The cause of the explosion was an accumulation of dust. The men had just left for dinner, or the loss of life would have been frightful.

Dr. Henry B. Sands.

By the death of Dr. Sands, which occurred on the afternoon of November 18, America lost her surgeon of greatest reputation. He was fifty-eight years of age. He graduated in 1854 at the College of Physicians and Surgeons in this city. He prosecuted his studies after this for several years abroad, and then, returning, commenced the active work of his profession. He was of the aggressive type, adopting and utilizing the latest surgical discoveries. His achievements in laparotomy have lately attracted much attention. He attended General Grant and Roscoe Conkling in their last illnesses. In the case of Mr. Conkling, he raised a portion of the skull with mallet and chisel to relieve the sac of pus that had formed. His skill as a surgeon was devoted principally to the active work of his profession, and it is a matter of regret that he left no more permanent literary monument of his life's work. It is said that he intended to do so. He lectured in various colleges, and his connections with them and with hospitals and scientific societies were very extensive. His death was sudden, occurring while he was riding in a carriage with a friend.

Artesian Wells in Memphis.

The cities of the Mississippi valley have never been noted for the purity of their water supply, as they have depended largely on river water. Recently, the city of Memphis has been experimenting with artesian wells, and has found an inexhaustible supply of the best water directly under its site. A true artesian basin covered by a perfectly impervious stratum has been discovered, which is now fast displacing the unsatisfactory Wolf River as a source for water. Hitherto this river has supplied the city's wants. Thirty-two artesian wells have been driven over an area 2,000 by 300 feet. They are driven to a depth of about 450 feet. They first pass through 20 feet of bluff loam, then through 24 feet of sand and gravel, and finally through 150 feet of hard, impervious clay. The water-bearing stratum is then reached, which consists of perfectly clean sand seven hundred feet deep. The water rises far above the level of the Mississippi River. Permanent works are now in progress. A large well is to be sunk 80 feet below the surface. From this a horizontal tunnel 2,000 feet long will be carried through the hard clay. This tunnel will be five feet in diameter, and the wells will be connected with it. The water will be pumped from the large well. The tunnel can be extended indefinitely, and more wells can be bored as the supply may need extension. The temperature of the water is practically uniform, and averages about 62° Fah. It is impossible to overestimate the importance of this development as far as Memphis alone is concerned. But the same basin includes many other cities, and eventually a large area may be benefited by the discovery so happily made at Memphis. Mr. R. C. Graves, manager of a local ice company of that city, had used artesian water for making ice, and to him is largely due the credit for the new Memphis water supply.

Short Smoke Boxes and Open Stacks.

A locomotive engineer, writing to the *Railroad Gazette*, says:

Most of our engines are still run with a diamond stack and short smoke box with the petticoat pipe for leading the steam into the stack. The thing is all right except that the cone inclines to scatter the sparks all over the first cars of the train, and it trails the smoke and gases so they fill the cars. It is well known that the open stack lets everything go straight up into the air. That, in my eyes, is the advantage of having an extended front.

It is not the three feet of extra smoke box that keeps an engine clean. It is the open stack that gives a long smoke box its popularity. The putting on of the addition to a smoke box is costly, and the extra weight makes the truck run hot. I am in favor of the open stack, but I favor democratic simplicity and keeping to first principles even in building locomotives. The ordinary smoke box, with the nozzles level with the third row of flues from the bottom, and a plain petticoat, pipe, has been found all right.

Nothing better has been tried since George Stephenson gave to posterity a perfect locomotive. I could write for an hour stating objections to the extended smoke box. Then why not use the smoke box as we find it, with an open stack, and have all the good things working together? The right place for the nozzles is at the bottom of the smoke box. That has been proved. Now, here is my plan. Throw aside your stack with the cone and netting to suppress the draught, and put on an open stack as long as it could be set to clear, and prevent spark-throwing by putting a netting across from the flue sheet to the smoke box casting. This would be the extreme of simplicity, and I would like any one to show what there is to prevent it working to perfection. The contrivance is cheap and simple. By its use no sparks would be pattering on the front cars all the time, ruining the paint. The passengers would not be suffocated with smoke and dust, and the front end of the train would have a modern appearance.