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(Illustrated articles are marked with an asterisk.)

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For the Week Ending May 24, 1890.

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PROFITS OF THE PARIS EXPOSITION.

M. A. Neymarck has recently made an interesting communication to the *Chambre Syndicale des Industries Diverses* of France, on the subject of the profits of the late exposition to France in general. These he considered from the most varied standpoints. A *resume* of his work is of special interest now.

The gold reserve or balance in the Bank of France was enormously increased. On October 25, 1888, it was 1,021,641,845 francs. A year later, as the exposition was on the point of closing, it had increased by 272,640,240 francs. It was calculated that Americans brought over and spent 350 millions of francs in gold. During the exposition one and a half million of foreigners visited France; the greater part were distributed thus: Belgians, 225,400; English, 380,000; Germans, 160,000; Swiss, 52,000; Spaniards, 56,000; Italians, 38,000; Russians, 7,000; Swedes and Norwegians, 2,500; Greeks, Roumanians, and Turks, 5,000; Africa (principally Algerians), 12,000; North Americans, 90,000; South Americans, 25,000; Oceanica, Java, etc., 3,000.

The gold reserve of the Bank of France was not the only gainer; the other banks of Paris showed an increase of 86 millions of francs. The receipts of the railroad companies were 66 millions of francs larger than for the corresponding period of the preceding year. The omnibus company running stages through the streets of Paris reports an increase of receipts over the same period of 1888 of four millions of francs. The cab company transported 29,097,112 people from January 1 to November 1, 1889, instead of 12 millions in the same period of 1888. This brought an increase of revenue of 1,558,000 francs. Four free stages run by the Louvre stores carried 1,320,000 passengers *gratis*. Spring vans were utilized, and as an example of their profits, it is said that the conductor of one of these vehicles acknowledged he had made 33 trips on the day of the closing, carrying eight people at one franc apiece each trip; giving as receipts for one day 264 francs or about fifty dollars. There were about 300 of these vehicles in use.

The tramways from May 6 to October 31 carried 6,342,670 people, giving over a million and a half francs receipts. Sometimes they transported 10,000 people per hour from the Place de la Concorde to the Machinery Hall. The cars running around the city carried 30,000 people a day more than in 1888.

The *octroi* or internal revenue of the city of Paris felt the effects of this increase of visitors. For the first ten months of 1889 it showed an increase of 10,398,721 francs over the estimates, and an excess of 9,946,551 referred to the same period of 1888. The excess of wine drank in 1889 over that drank in 1888 was 3,162,227 gallons; the excess of meat eaten was 3,278,871 lb. The total consumption of wine was 31,586,189 gallons; of meat, 94,680,630 lb.

The theaters showed an excess over 1888 of 10,867,555 francs receipts after payment of the *droit des. pauvres* (poor tax) of 2,045,398 francs in place of 958,643 francs in 1888.

The restaurants on the Champ de Mars (*bouillons Duval*) received six millions of francs, 1,640,000 more than in 1888. A single restaurant toward the close of the exposition served 20,089 meals varying from less than a franc in cost (of which latter 267 were served) upward, only 95 exceeding five francs. The greatest number cost between 2 and 3 francs each.

The Eiffel tower, costing 7,514,095 francs, had a gross income from May 15 to November 5 of 6,459,584 francs.

The exposition proper showed a profit of eight millions of francs against a profit of 4,130,840 francs at the exposition of 1867, and a loss in 1878 of 31,704,890 francs.

Adding together the increase of the bank balance, of the receipts of railroads, of the revenue, etc., a total gain not far short of five hundred millions of francs will appear To this must be added the strictly private receipts. Allowing one million and a half of foreign visitors spending an average of 500 francs each, and six millions from the provinces of France spending an average of about 100 francs each, 1250 millions appear as the private receipts, giving a total of 1750 millions of francs direct monetary gain, or about 350 millions of dollars.

AMERICA'S TESTIMONIAL TO FRANCE.

The National Society of the Sons of the American Revolution has inaugurated a movement intended to give expression in the form of some suitable testimonial of the deep sense of gratitude which the people of the United States cherish toward the people of France for the magnanimous aid, naval, military, and financial, rendered by the French to this country at the critical moment of our revolutionary war.

From the beginning of the struggle the active sympathy of the French was extended to our countrymen, which found expression in supplies of money, of arms, and of men. In 1778 treaties of amity, alliance, and commerce with us were signed in Paris. In the summer of the same year a large French fleet was sent to our assistance, and from that time until the close of the war and the signing of the final treaty of peace at Paris, September 3, 1783, the French continued to be our faithful allies, assisting us in every possible way, supplying us with arms, munitions, soldiers, and ships of war. Among the practical fruits of this timely and most generous assistance was the capture of Lord Cornwallis with 106 guns and 800 men, the veterans of the British army, at Yorktown, October 19, 1781. On this glorious occasion the French were on hand with a fleet of 37 war vessels and 7,000 men, the American forces under Washington numbering 9,000 men. This practically ended the war, and peace soon followed. The blessings which have ever since ensued to us may be attributed in a high degree to the aid thus given us. We may never hope to repay these benefits, for they are priceless; the most we can do is to ask the acceptance of some souvenir indicative of the obligations which as Americans we owe to the people of France.

In money alone the French expenditures on our behalf are estimated to have been between ten and twenty millions of dollars; say fifteen millions—a sum which if put at interest would probably by this time have amounted to over three thousand millions of dollars.

Coming now to the practical business of the proposed testimonial—the matter is in the hands of a committee of eminent gentlemen resident in different parts of the country, as follows:

Chairman, William Seward Webb, cor. 44th and Vanderbilt Streets, New York City.

Hon. Chauncey M. Depew, New York City.

General W. S. Stryker, Trenton, N. J.

General W. H. F. Lee, Burke's Station, Va.

Governor S. B. Buckner, Frankfort, Ky.

Mr. Goldsmith Bernard West, Jacksonville, Ala.

Judge Lucius P. Deming, New Haven, Conn.

Hon. Clifford Stanley Sims, No. 242 South 3d Street, Philadelphia.

Mr. H. B. Ledyard, Detroit, Mich.

Mr. Wm. O. McDowell, Newark, N. J.

Mr. E. S. Barrett, Concord, Mass.

Rev. Charles Pinckney, Charleston, S. C.

W. H. Brearley, Detroit *Journal*, Detroit, Mich.

Treasurer, Mr. James Otis, No. 22 East 10th Street, New York City.

The committee has suggested that individual subscriptions to the amount of $1 each be solicited by those who take interest in the matter, to be forwarded, with the names of the subscribers, to the treasurer, as above. A large amount has already been received.

We hope every reader of the SCIENTIFIC AMERICAN will do his share in promoting this most noble and patriotic enterprise. Let each one open a subscription list in his own family and extend it, as time permits, among his neighbors. Any further information may be had from members of the committee.

We believe no definite decision has been reached as to the exact nature of the proposed testimonial. For ourselves, we wish it could take shape in something grand and useful, worthily representative and permanently commemorative of the gratitude of a great people toward the greatest of benefactors.

We propose the erection in France, wherever the people of that country shall designate, of a building which in exterior form and dimensions shall be a copy of the Capitol at Washington, with its stately dome and statue of Liberty; the building to be constructed of materials and filled with objects from this country, exemplifying within and without, in the most interesting manner, the richness and variety of our resources; the walls to be adorned with sculptures and paintings by the ablest masters, commemorating the heroes and achievements of the French, both in the early history and settlement of this continent as well as in the later period when they came to our aid in the war. In brief, we would build, endow, and present to the French people a museum of America, great, complete, and substantial, a worthy and perpetual token of the sincere regard and grateful veneration with which the people of France are held in the hearts of the American people.

The idea of an American testimonial to France appears to have originated with Mr. W. H. Brearley, of the Detroit *Journal*, and he made the appointment of the chairman, Dr. Webb.

Electric Welding of Shells.

Modern Light and Heat says there is another electrical industry about to be established at West Lynn, Mass., for the manufacture of welded shells. The Thomson Electric Welding Company is pressed beyond its capacity in the demand for welding machines, which will be used extensively in the new enterprise. The government has already given an order for 100,000 shells for the Hotchkiss gun and Shrapnel shells as soon as facilities for their manufacture, under the patent of Lieutenant Wood, U. S. N., are ready. By the new process the shells, instead of being made of cast iron and boxed as formerly, are made by welding the chilled point and butt to a section of soft iron pipe, and, in the case of Shrapnel shells, the trouble of graduating the thickness with calipers, after boring and adjusting the delicately poised diaphragm between the powder and the bullets, is greatly diminished.

Recent and Needed Improvements.

The steam hammer has given such perfect results in the cushioning effects of steam that a substitute in the form of compressed air must be employed where other motive power than steam is used.

There is quite a tendency among inventors and mechanics to bring into use the driving effects of hydraulic power whenever a steam plant is to be called upon to operate the machinery, and the mill privilege, with its never-failing steam, must be utilized in compressing air, that the machinery may have some of the expansive benefits that are to be found in the steam engine.

The exhaust from a steam boiler should step right back into the boiler as readily as if the engine was simply an exhaust injector, and the units of heat that pass up the smoke stack should be dispensed with at once by firing up the plant on the principle of the soda engine. It would seem quite easy to construct a boiler with the fire box in the same compartment with the steam room, and the fuel as well as the draught supply pumped in with the feed water, and allow the engines to make use of all the gases, as well as the mechanical unison of heat and water known as steam. If fears are entertained for the air pump when the condenser is in use, a highly hydrogenous fuel should be used, which will leave the greater part of its own product of combustion the same as that obtained by evaporating the feed water.

Where a battery of boilers are kept under fire, the engine must keep a set of pumps at work, that the freight as well as the passenger elevator may be driven by hydraulic power. Speaking of boilers, how an inventor must shake his head when he examines the amount of waste found in a modern steam plant, and what a wonderful chance there is for an improvement! Will some inventor take notice?

We shall expect before long to find in the list of patent improvements a substance or a compound ground up and sold in the form of corn cakes that will disintegrate spontaneously, similar to sky rocket powder, which will only need to be thrown into a soda tank to supply an engine with driving power for ten hours.

A novelty in the manufacture of steam pipes consists in the fact that a core of some kind has been invented which may be thrust through a mass of melted steel after it has been poured into the mould. The utility of such a device goes without saying.

A machine has been devised that separates quartz sand into different grades from 4 to 60 by simply allowing the sand to drop or rain down on to a revolving cylinder. Every grain receives the same velocity when it leaves the cylinder, and the simple resistance of the air effects the separation—so it is claimed.—*Mining and Scientific Press.*

Cost and Productiveness of Labor.

The U. S. Commissioner of Labor is preparing to transmit to Congress his first report on the cost of production. The commissioner has been engaged on the report for several months and has obtained some very interesting and valuable material. The purpose is to ascertain all the elements that enter into the cost of production of a manufactured article, and Congress extended the inquiry to foreign countries, in order to obtain facts bearing upon the tariff question. The commissioner's report will embody data that have never been presented in any official report in any country. It will undertake to give with precision not only the elements of cost in the production of an article, but the efficiency of labor in different countries and in different lines of industry and the relations between efficiency, wages, and manner of living. The labor will be reduced to the hour basis, and it will be possible to determine, by an examination of the tables, the precise relation between the wages in the United States and European countries and the relation between the work performed in each country for those wages. The cost of management, the cost of repairs, the interest on invested capital, will all be set forth with a fullness which will admit of the most searching comparisons. Where a product is composed of more than one material, each of the raw materials will be followed to its source, and the cost of producing it set forth. The report on iron and steel will be sent to Congress within a few weeks, and those on cotton and wool will follow soon after. The other reports upon which the commissioner is at work are on glass, linen, silk, and lumber. These facts will be of use from a theoretical standpoint and in tariff and industrial discussions. They are so full and precise that they are likely to have a still further use for the practical business man. By comparing the statements for different establishments he can learn what others in his line of business are spending for the different elements that enter into their products, and can correct his own methods by the study of those of others. The hours of labor, the wages paid, the cost of raw material, the cost of subsidiary materials, the cost of management, will all be set forth and can be studied by the intelligent business man.—*American Analyst.*

Party Walls.

A case which recently came up in Washington, according to the *American Architect and Building News*, suggests a question in regard to party walls which is of very great importance as a matter of construction, although it has, so far as we know, never been mentioned in a court. It seems that the regulation in regard to party walls in the District of Columbia was composed, or perhaps copied, from some regulations existing in Philadelphia by no less a person than President Washington, and his rule has been the law ever since. Under this, if a person puts part of the foundation of his wall on his neighbor's land, that neighbor is entitled to use the wall above ground as a party wall, even though the wall above the foundation may be wholly on the land of the one first building. To architects, this view of the matter will seem very reasonable, and it would certainly be of advantage to the art of construction to go still farther, and to say that, at least in certain localities, every wall built within two feet of the boundary line between two adjacent properties should be built with its center on the boundary line and made a party wall. The reason for this is, of course, that no wall is properly built, the center of which does not stand over the center of its foundation; and that, where two independent walls are built on adjoining properties, close to the boundary line, both of them must, under the most favorable conditions, stand on the extreme edge of their foundations, at the imminent risk of causing the footings to tilt, or "roll," producing settlements and cracks, and bringing about ultimately the destruction of the wall.

In practice, however, the first comer always gets his footing stone a little over his neighbor's line, and, when the latter builds, he is obliged to have either the first footings cut off, endangering the old wall, or to set his own footings back, and build his wall overhanging them, at the great peril of his own construction. The matter is particularly serious with pile foundations. In this case the first to build always drives a row of piles tangent to the boundary line, and his wall above ground rests vertically over this row of piles, the second and third row of piles, driven parallel with the first, helping to carry the load, but in an indefinite degree, depending on the bonding of the footings and other circumstances. When the second proprietor comes to build, however, and finds the first piles driven close to the line, he is prevented from following a similar course on his own side. Not only does the form of the pile-driving machine render it impossible to get it near enough to the existing wall to drive piles vertically within six or eight inches of the line, but it is difficult and dangerous to drive even so near as this, and, in practice, the nearest row of new piles is often driven a foot or more back from the boundary line. When the remaining rows are driven, the footing courses laid, and the superstructure begun, the new wall, if it is built close to the line, as it usually is, stands over nothing, the nearest row of piles of the three which are supposed to support it being some distance back from the line of the wall. It is marvelous that walls constructed in this way, of which there are hundreds, stand at all, and they would probably not do so, except the support which the second wall gets from leaning against the first; yet the only alternative is to drive the piles for the second wall obliquely so as to crowd them in among those intended for the first wall. This method, although often followed, is, in most cases, even worse than the other, as it brings the new wall on an inclined support.

The best course in all such cases, and the one which should be required by law, is to arrange the piles and the footings as if for a party wall, building the wall above ground on the party line or not, as circumstances may require. The last comer, in case he wishes to erect a heavy building on his side of the line, can drive additional piles, and, by the arrangement of the footings, utilize them, as well as those already there, to support his wall, which will thus rest nearly on the middle of the foundation, and be under conditions favorable for stability.

Securing Immediate Suction in Dentures.

Some years ago, somewhere in dental literature, I came across a suggestion for securing immediate suction in a new dental plate or a newly repaired one. It has been of so much use to me that I herewith submit it, and advise its trial. The plate is moistened, and then simply sprinkled with fine powder of gum tragacanth. The plate is then pressed in place, and no matter how good or bad a fit, it will hold firmly for a day under almost any use or abuse. The advantage of this will be apparent to any one; for the first half hour or few minutes after a plate is put in for the first time makes or mars the reputation of the dentist, for the time being, in the estimation of the inexperienced patient, whose efforts to "suck up" a plate, if not immediately successful, are at once discontinued, the plate is taken out, and the invariable remark is, "It don't fit."

A patient will bring a rickety, ill-fitting plate, and after being without it the few hours necessary to repair it, will insist that the plate fitted perfectly before it was confidingly submitted to our care, but now it feels as though it had been made for another party. A thin coating of tragacanth will even up all irregularities, soothe the wounded sensibilities of the patient, and prevent the plate wounding the sensitive membrane of the mouth.

Tragacanth is a white gum like arabic, but has special advantages for this use, as it swells when wet by the fluids of the mouth, becomes sticky and of the consistency of jelly, but does not dissolve or wash out for hours. It should be kept in a salt or flour shaker with fine perforations in the top, and should be sprinkled on the surface of the plate, shaking off all the free powder after a moment. Having no odor and little taste, it is in no way objectionable. It might be put up in suitable perforated boxes and flavored with wintergreen, or otherwise made more elegant, mysterious, and costly. If the dentist is of the opinion that time and use will improve the general adaptation of the plate, a small box of tragacanth should be presented to the patient with directions for use when there is a varying atmospheric pressure which may possibly affect the suction of the plate! Its use will also obviate the necessity for labored explanations as to the cause of certain plates only resting on certain prominences of the maxillary and certain other tender places on the mucous membrane. It will also be a relief to the patient, for the mental effort necessary to the intellectual digestion of these scientific dissertations, and to retain a credulous expression of countenance, is often evidently as painful as the sharp edges of the plate.—*L. C. Bryan, Dental Cosmos.*

Electricity as a Manufactured Article.

At Harrisburg, Pa., Judge Simonton handed down two opinions recently in the Commonwealth of Pennsylvania cases against the Philadelphia Electric Lighting Company and the Brush Electric Light Company, of the same city. Both of these companies claim to be manufacturing concerns, and, as such, exempt from taxation under the recent act taking the tax off from manufacturing companies. The opinions discuss at great length the means by which electricity and electric light are produced, and quote extensively from the testimony of Professor Henry Morton, President of the Stevens Institute of Technology, whose testimony as an electrical expert was taken in these cases.

But Judge Simonton adheres to his opinion, reached in a similar case about a year ago, that producing electric light is not a species of manufacture. He held that neither electricity nor electric light was a material substance; that there could be no manufacture unless some material substance was produced. It is expected that these cases will be argued in the Supreme Court on appeal at its meeting in June. In these cases a great deal of evidence was taken to show the unequal operation of the present tax laws upon different corporations. The lack of uniformity, it was claimed, made the tax unconstitutional. Judge Simonton, however, sustains the constitutionality of the tax, except as to the amount involved on patent rights granted by the United States, which he holds are not subject to taxation. Upon this point the Attorney-General may possibly appeal. The full amount of the Commonwealth's claim against the Philadelphia Electric Lighting Company is allowed, with interests and cost; but in the case of the Brush Company the amount is largely reduced by the decision as to the invalidity of the tax on patent rights.—*The Electrical Engineer.*

The Nadria Aqueduct.

The great Nadria Aqueduct in India carries a canal 150 feet wide or thereabout across fifteen arches of 60 feet span. In an account by the correspondent of *Engineering*, it is stated that the foundations, which are on circular wells, all go down some 55 feet below the bed of the river which the aqueduct crosses. The fifteen arches are divided by abutment piers into groups of five spans each, the abutment piers have each two rows of wells, and the single piers one row. Thanks to the simple expedient of building the work in a pit dug out of dry land through which the river was subsequently diverted, the work of sinking the 268 wells went on without interruption throughout the year. It is probable that no other well-sinking job has been so systematically worked out—and, indeed, in the beds of active rivers there is no such chance of careful administration; for as the river rises and falls, the conditions to be dealt with change completely. The aqueduct carries the Lower Ganges Canal across what is known locally as a nuddee, *i. e.*, a watercourse that draws its water supply from the plains of Hindostan, and not like what are here known as the rivers proper from the mountains. The canal that goes over the top draws, in ordinary years, a revenue from the land it waters of some £50,000 sterling a year, and a work that secures that revenue at a cost of £300,000 sterling has much need to be pushed on with the utmost expedition. Fortunately, owing to favorable rainfall during the four years that the aqueduct was under reconstruction, the loss of revenue actually experienced was but a tenth of the total. Had the case been the other way, the loss of food crops in even one year would have far overtopped the price of the work.