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(Illustrated articles are marked with an asterisk.)

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No. 891.

For the Week Ending January 28, 1893.

Price 10 cents. For sale by all newsdealers.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

The fortieth annual meeting was held January 18 and 19 at the home of the society in New York. The annual reports were made, after which the canvass of votes for officers of the ensuing year was read by the secretary, resulting in the election of Wm. Metcalf, Pittsburg, Pa., president; Charles Macdonald, New York City, and E. L. Corthell, Chicago, vice-presidents; Foster Crowell, Henry G. Prout, Willard S. Pope, F. P. Stearns, J. S. Fanning, and O. H. Landreth, directors; Francis Collingwood, secretary; John Bogert, treasurer.

In the evening an address, with lantern views, was given by Wm. D. Kelley, of Washington, D. C., on his surveys in Ecuador and Peru for the proposed Intercontinental Railway.

On the second day a number of the members visited the improvements on the Harlem River, Macomb's Dam Bridge, and the Viaduct, after which they proceeded to the De la Vergne Refrigerating Machine Co., at Port Morris.

In the evening a reception was held in the rooms of the society, which was largely attended.

PROPOSED ADDITIONS TO THE ELEVATED STEAM STREET RAILWAYS IN NEW YORK.

The legislative commission appointed to consider and establish new and better methods for improving the rapid transit facilities in the city of New York, after many laborious months of study and deliberation, finally settled upon the underground system, and elaborated the general plans for construction and location thereof. The franchise, which was subject to many restrictions, and rendered onerous by the vast amount of capital required, namely fifty millions of dollars, was put up at public auction in December last. No valid bids were offered. Capitalists were unable to see any sure profit in the great work, notwithstanding the fact that almost every other railway within the city limits is a mine of wealth to the owners. All of them, however, run on the ground or above ground.

The fifteen years' experience which New Yorkers have had with the elevated steam railways, and the excellent service they have rendered, seems to have satisfied the people that this is, on the whole, the best method for city rapid transit, although it is attended with many most serious objections, especially for those who live and do business along the railway lines. For them it obstructs the streets, fills them with dirt and dust, produces deafening noise, etc. But these overhead trains are comfortable and satisfactory to the travelers, who constitute a vast host. No railways in the world carry such enormous numbers of passengers as these elevated steam street cars. Their aggregate length is only 34 miles; but they carry nearly 700,000 passengers every day. At the morning and evening hours, when the people go to or retnrn from business, these cars are crowded to excess, and there has been for a long time the most pressing need for relief by the addition of more cars and facilities.

The failure of the commissioners to sell the underground franchise has left them apparently no alternative than to authorize an extension of the elevated system; and this is now under consideration. Several new lines have been laid out, and a number of cross town connections planned, which, when constructed, as they may be within a few months' time, will greatly add to the convenience of the public.

UNCLEAN PAPER MONEY A VEHICLE FOR THE SPREAD OF DISEASE.

A bill has recently been presented in Congress requiring the Secretary of the Treasury to provide for the calling in of all ragged, worn, and soiled paper money, new bills to be furnished in place of the old and unclean notes. It is surprising, when one thinks of it, that some such action has not long ago been taken, for not a little of the paper money daily passing from hand to hand has become extremely repulsive in appearance, and is ever suggestive of disease-spreading power.

In any provision made for the calling in of the old and soiled bills, the banks must, of course, be the principal intermediaries, but they would in most cases be only too glad to substitute new bills for all the old ones which come in over their counters, could sufficient facilities be afforded for obtaining new bills from the Treasury Department. The resolution now before Congress is designed to give a more deserved prominence to this matter, and it is to be hoped the measure will be promptly adopted.

The origin of disease germs has been the subject of elaborate investigation and experiment by the ablest biologists, and although our knowledge is still largely speculative, much is known about the way in which such germs are "borne about and deposited in soils suitable for their growth and reproduction. That they are present in the atmosphere of a sick-room, carried on particles of dust, and with them attached to the walls of the room, to carpets, to the clothing of passers-in and passers-out, and, indeed, to every absorbent surface; that they are thereafter dispatched on fatal errands by the housemaid's broom and dusting cloth; that they and their encrusted spores, or seed, are capable of lying in what may be termed a dormant condition, certainly for months, on any surface that catches and detains them, unaffected by excesses of temperature; that, released by a brush or a current of air, and dropped in a substance that affords them nourishment, they multiply with incalculable rapidity." These are facts that have been thoroughly demonstrated. That such germs may, and in thousands of cases doubtless do, become attached to the fibers of worn and soiled bank notes, that they may in fact, in some instances, constitute the very matter which gives them their unclean and repulsive appearance, is a proposition which cannot be denied.

The Hydrotype.

M. Cros has devised a kind of reversed collotype, in which a plate coated with bichromated gelatine is exposed under a transparency until the most exposed portions are so acted upon that they refuse to swell in water. The bichromate is now washed out, and the plate is immersed in an aqueous dye, which is absorbed by those parts of the film which have not been hardened by exposure, and so a very perfect and vigorous transparency results. If a sheet of moistened paper be pressed down on the film, a print in the dye or color results, but M. Cros. deals with the matter rather from the point of view of the transparent reproduction. The plate being dried and slightly rinsed, sufficient coloring matter remains on the film. Old plates will give us plain gelatinized glass, if we remove the bromide by the hyposulphite bath, and wash. If the plates have been developed, the image may be removed by the following bath:

Ferricyanide potassium	3 parts
Sodium hyposulphite	10 "
Water	100 "

This solution must be used while fresh. The plates are now sensitized in a three per cent solution of ammonium bichromate, and, after drying, are exposed in the printing frame for about the time that would be required in the case of an ordinary silver print. Thorough washing is now required, followed by a second desiccation. The plate is now stained with an aqueous solution of the coloring matter. Any aniline or other dye soluble in water may be used. It should be noted, says *Photography*, that plates which have been treated with alum are unsuitable for this process, as alum hardens the whole film.

Soap from Cotton Seed Oil.

The following account, given in a communication to the *American Soap Journal*, of how this oil is employed by a practiced soap maker, centains much information upon this point which is of a useful nature. The question of how much soap a given quantity of tallow will make is often a difficult point to gauge. In the following method one of the advantges claimed is that the yield of soap agrees with calculated yield, 180 pounds of fat giving 535 pounds of clear waxy soap. The formula given below has been successfully used for eighteen months:

	Pounds.
Refined cotton seed oil	164
Tallow	16
Resin "K"	75
Silicate of soda "N"	75
Palm oil	1
Caustic lye, 35 deg. B.	153
Starch	3¾
Sal soda	5
Silex	40
Water	1¼
Perfume	1
	535

The method adopted for working up this formula is as follows: Commencing with cooling frame, the materials are framed, thus avoiding framing the soap. This necessitates the use of a good tight frame in which the cotton seed oil, palm oil, and tallow, carefully weighed or measured, according to the proportions given above, are placed, having first been warmed to a temperature of 115° Fah. The resin, previously warmed and cut with a small amount of weak lye to keep it fluid, is then added.

The frame is now rolled under the mixing machine, which has movable shafts and blades. These mixer shafts are lowered into the foregoing mixture and set in motion. The caustic lye and the sodium silicate are now added, and the mixture stirred for seven to ten minutes, when the starch and sal soda and silex are added, and the whole stirred for another four or five minutes. The mixture should then have a glossy and smooth appearance, indicating that the incorporation is complete. The perfume is added, the mixing blades removed, and the frame set aside to cool. The soap will be quite hard in a resonable length of time. It may be stripped on the second day, and cut upon the third. The difference in cost between tallow and cotton seed oil introduces the element of economy, while there is no loss save the moisture which evaporates during the three days' cooling, no spent lye and no nigres. Lastly the soap is found to do good work in actual use in the wash tub, containing less moisture than there usually is in boiled and settled soaps.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

The World's Columbian Exposition.

THE MOTIVE POWER AND ITS TRANSMISSION.

The industrial world will find an instructive lesson in regard to the generation and transmission of power at the World's Columbian Exposition at Chicago, for the latest improvements in these lines will be elaborately and completely shown. The contrast between this and the Centennial Exposition will be marked, not alone in the direction of radical changes, but in the refinement and improvement of methods then in vogue. The immense Corliss engine at the Centennial was an efficient type of the simple engine as then used in cases where large units of power were demanded. This one engine of 1,400 nominal horse power capacity furnished all the power required at that exposition. The power was transmitted from a fly wheel that was thirty feet in diameter and weighed fifty-six tons to lines of shafting underneath the floor, and was in turn transmitted from these shafts by means of belting to its several uses.

At the World's Columbian Exposition sixteen such immense Corliss engines would not be equal to the demands for power. Or to put it in other words, the industrial condition of the country as represented by the Centennial Exposition has doubled in volume each year since then, with the World's Columbian Exposition taken as the unit of the magnitude of the industries of this country to-day. At the Centennial electricity as a practical useful force was only a dream. At the World's Columbian Exposition it monopolizes things. The engines so far contracted for represent 23,000 nominal horse power. And of this vast amount of power, practically one-half will be utilized to generate electricity to supply the incandescent lighting installation. About 5,000 horse power will be required to operate the arc lighting plant, and the electric motors so far contracted for aggregate something over 4,000 horse power. This leaves only a nominal amount of power to be transmitted by means of shafting.

The Palace of Mechanic Arts will call for a much larger amount of power to operate machinery than any other building, and in cases where this power is transmitted by means of shafting it will be done, as was the case at the Centennial, from mains underneath the floor. The amount thus transmitted will, it is believed, not much exceed a thousand horse power. Electric power will also be used in this building for operating machinery, for running the three electric cranes and for other purposes.

But the great economy and advantage of electric transmission of power is found in supplying it to the other buildings needing it, and yet keep the one great power-generating plant intact. Thus it is about 1,400 feet from the power plant in the Palace of Mechanic Arts to the center of the Electricity Building. Several hundreds of horse power will be required in this building, and it will be supplied wholly by electric motors. The center of the Agricultural Building is a thousand feet from the power plant; the Mining Building is nearly 1,500 feet away, and the Transportation Building some 2,000 or more feet away. In all these cases the only feasible method of transmitting power is by the method adopted—that of electric motors.

A study of the engine plant that is now being installed in the Palace of Mechanic Arts is a lesson in the progress in engine building during the intervening years since the Centennial. As has been said, the immense Corliss engine was at that time a type of the simple engine when large units of power were required. A study of the present exposition plant shows the extent to which the further expansion of steam has been utilized. The largest engine to be installed will weigh only a part of the 700 tons that the big Corliss did, and will yet have greater horse power—2,000—and will be quadruple expansion. This will be the only engine in the plant probably that will utilize this degree of expansion of steam. But there will be four engines that will be triple expansion, three of them being of 1,000 horse power each.

Over fifty engines have already been contracted for; three-fifths of them are compound engines, either tandem compound, double tandem compound, cross compound, or vertical compound. And these engines are of large units compared to engines in general use in the industrial world. Several of them are of 1,000 horse power, and the average for all the compounds is nearly 450 horse power. A dozen simple engines will also be installed.

The generating of electricity has called for the development of the high speed engine. Whether this type of engine has reached the zenith of its popularity is not a question to be discussed, but it will be fully represented in the power plant, there having been perhaps fifteen contracted for. This type of engine is of recent development, and of much more recent perfecting, but nearly all the leading makes will be represented.

One of the latest phases in the use of engines as regards the generating of electricity, which is attracting the attention of builders of engines and electric generators—that of direct connecting instead of belting—will be more fully exploited than was at first understood it would be. Six of the ten-thousand-light incandescent dynamos are to be direct-connected. And in addition to these, there will be two or three other direct-connected sets of smaller capacity.

The greatly increased use of electricity, and its special adaptability for power purposes, especially for long transmissions, has materially changed the processes of generating power and of transmitting it since the Centennial Exposition. A well known engineer who was inspecting the power plant as planned for the Palace of Mechanic Arts, remarked to the writer a few days ago, "This may be Machinery Hall, but so far as the power plant is concerned, it is practically an electrical exhibit."

It will be seen that all the progress that has been made since the Centennial Exposition in the direction of the more economic generation and transmission of power will receive the fullest attention at the hands of the World's Columbian Exposition management. And the value of the Exposition, as an instructive factor in the commercial and industrial world, is thus enhanced. Economics have been well studied and recent tendencies in practice fully exemplified, particularly, as has been stated, in the concentration of the power plant into a unit, as it were; the fullest expansion of steam as now utilized, the most efficient transmission of power, particularly for long distances, and the method of direct connecting in electric generating plants.

MISCELLANEOUS NOTES.

The Awards.

After considerable disagreement and much discussion, it has finally been decided that the awards at the Exposition will be made under a straight jury system, the rules adopted providing for a large general jury, to be divided into thirteen departmental juries, which will do the work. Exhibitors entering into competition for prizes will receive a written report, telling why each has or has not been awarded a prize, and from this report an appeal may be taken to an executive committee, which may order a re-examination.

The Great Naval Parade.

The naval parade to take place in New York harbor next April, preliminary to the opening of the Exposition, is now being provided for. Rear-Admiral Gherardi has been appointed to the chief command, and the North and South Atlantic stations are to be temporarily discontinued, Admirals Benham and Walker then serving under Admiral Gherardi with the ships of their respective commands. Besides a full participation in the parade by the vessels of foreign nations, the representatives of our own navy will include the fine 8,150 ton armored cruiser New York, perhaps the best of her class in the world; the Miantonomoh, interesting as a harbor defender of the monitor type; the swift protected cruisers San Francisco, Philadelphia, Baltimore, Charleston, and Newark, of from 18 to 20 knots speed; the heavily armed Chicago and Atlanta; the gunboats Yorktown, Concord, and Bennington: the 2,000 tonners Detroit and Montgomery; the Bath-built gunboats Machias and Castine; the Dolphin and Bancroft, the novel Vesuvius, the torpedo boat Cushing, the Essex, and, finally, the renowned Kearsarge, which sank the Alabama in the closing days of our civil war.

Allotments of Space.

There has been a great deal of fault found with the allotments of space in the fair buildings.

The space in each of the great structures is now practically all assigned, and many have been excluded who counted to a certainty upon being exhibitors, and been to considerable expense to that end, while a far larger number have been allowed so small a space, in comparison with what was asked for, that their disappointment is keen. It is only just to the managers to assume that they have endeavored to do the best possible, and that they have intended to treat all with equal fairness, but it is evident that the vast buildings, great as they are, will be crowded to their utmost, and still be markedly inadequate to hold all the exhibits which should find a place in the fair.

The Receipts and Expenditures.

The receipts and expenditures for the fair, according to the last monthly report of the treasurer, have been as follows:

RECEIPTS.

Balance received from temporary organization.	$4,252 64
Received on current installments of stock subscriptions.	5,402,184 40
Receipts from banks for interest on deposits.	63,400 47
Received from city of Chicago on account of sale of bonds.	5,003,726 06
Received for souvenir coins	734,546 00
Received from premiums on coins	10,022 28
From gate receipts at Jackson Park to Jan. 11	185,076 00
Received account 6 per cent debenture bonds	3,467,000 00
Received on account of interest on 6 per cent debenture bonds	14,824 37
Miscellaneous receipts from sundry sources	374,307 68
Received from various stock subscriptions not yet classified	103 40
Total	$15,259,488 30

DISBURSEMENTS.

Total disbursements on vouchers as per daily report to Auditor	$13,043,612 75
Total available cash on hand	1,315,838 55
Total	$15,259,448 30

The Tax Problem Solved in Sweden.

An interesting discussion has of late been going on among the officials in New York relative to the best way of collecting taxes. It is shown that an immense amount of personal property escapes taxation and consequently real estate pays the greater share. Some of the most experienced tax officials advocate the abolition of personal taxes, owing to the difficulty of collection, and the placing of all taxes, or nearly all, upon real estate, which is always in view, and can be readily grabbed from the owner in case of non-payment. In an article in the *Forum*, Mr. J. W. Brooks describes the Gothenburg plan, by which the profits on liquor are made to take the place of a large if not the principal part of the public taxes. The New York *Sun* says:

A company was established by the reformers in 1865 to take over the public house licenses as they fell in, reserving the right to decide how many should be made use of, and in which parts of the town. The surplus profits were to be devoted to public uses, but later a reasonable interest was guaranteed by the city on the capital invested, and the whole net proceeds were turned over to the community. The company began operations in 1865, and in its existence of twenty-seven years neither director nor share holder has received a cent of profit, all the gains going into the public treasury. The system has spread over Sweden and Norway, and in the latter country, where in 1875 there were but 15 societies in existence, in 1889 there were 51. Innumerable difficulties, of course, arose from time to time. The modifications and variations in the details of operation have been multitudinous. The chief principle, however, is to deprive individuals of the strongest motive for stimulating the sale of spirits—that of personal gain.

Of profits that have accrued to the communities through the disposition of the profits from the liquor business, Mr. Brooks tells much that is interesting. For example, Bergen, a town of fifty thousand inhabitants, has in thirteen years received nearly four million dollars, which, under the old system, would have gone to the distillers and private liquor dealers. But this fact of the community benefiting so largely from the liquor business constitutes one of the great dangers of the Gothenburg system. It is greatly to the interest of the taxpayers to have the liquor sales as large as possible, because this lightens other taxation. This difficulty has been dealt with in a variety of ways. In Norway the taxpayers' interest is made as slight and indirect as possible. The liquor profits are used as far as possible in public improvements. The establishment of parks, baths, reformatories, technical schools, even improved workmen's dwellings, are a few of the things on which the liquor revenue is spent.

At the same time Mr. Brooks admits the existence of serious objections to the Swedish plan. He does not think the best hope it offers to us lies in the actual lessening of sales. Rather the system as compared with private selling gives a basis for an aggressive and efficient education of public opinion upon the liquor question. He does not think the system could be introduced in any of our large cities. The "alliance of rum and politics" would stifle any effective agitation of the question.

Peculiar Effects of Electric Welding.

Some of the men employed at the Kolomna iron works, in Russia, have lately had some unpleasant experiences. Electric welding is practiced there according to the Bernados process. While engaged on the trying work the artificer's eyes were, of course, protected by tinted glasses, but the skin being exposed, the following symptoms were manifested: Burning sensation on the skin and in the eyes; in from three to four hours, discharges from the nose and the eyes; three to four hours later, a dry cough; four to five hours later, swelling of the skin and development of other symptoms; eight to ten hours from the commencement of the disorder, continuous irritation of the eyes, lasting from four to six hours; and finally, coloring of the skin. Then the various effects ceased, and the skin began to peel. On the third day the cuticle had completely decorticated, and by the sixth all the painful symptoms disappeared. But for weeks afterward the skin remained colored. These effects, it would seem, are exactly the same as those which are induced under scorching by the sun. The best protection which can be afforded the workmen against the evils mentioned, M. Maklahoff, the manager of the works, believes consists in a covering of yellow waxed cloth or red and green veils.

An Amidol Formula.

Mr. W. T. Wilkinson, in *Wilson's Photographic Magazine*, gives the following as a good formula for an amidol developer for ordinary work:

Amidol	120 grains.
Water	20 ounces.
Potassium bromide	10 grains.
Soda sulphite	1 ounce.

Such a mixture gives fine, strong negatives in the studio.