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For the Week Ending December 25, 1897.

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FAMOUS ENGINEERING LANDMARK TO BE REMOVED.

The laying of the new 48 inch water mains on Fifth Avenue, New York, has reached a point where it is possible to dispense with the distributing reservoir at Forty-second Street, and this famous engineering work will now be torn down to make way for the noble pile which is to form the home of the New York Public Library. The reservoir was built over half a century ago to provide a terminal for the Croton Aqueduct, in common with which it forms the most monumental engineering work of the first half of the century in America. The cost of this water supply was more than $12,000,000, and the enterprise with which the city of only a quarter of a million souls faced so great a financial burden was only equaled by the skill and good taste with which the engineers of that day, Jervis, Allen and Davis, carried out the engineering and architectural features of the work.

The reservoir, which crowns the summit of Murray Hill, stood well out in the country at the date of its erection. Fault has been found with its architectural design; though it has always seemed to us that the simple and massive Egyptian style in which it is built is singularly adapted to express the purpose of the inclosing walls of the structure. The reservoir covers four acres and is built entirely above ground. The walls are carried up high enough to give a maximum depth of 36 feet of water and a total capacity of 24,000,000 gallons. The walls are double, with a space between them, varying from 9 feet 9 inches to 14 feet in width, and they are tied together at intervals with cross walls. The outer wall, 4 feet thick throughout, has a batter of 1 in 6. The inner wall varies from 6 to 4 feet in thickness and is vertical. A puddled embankment is laid against the inside of the inner wall and the bottom is covered with 2 feet of puddled earth, above which is 12 inches of concrete.

The work was carried out with that conscientious care which marks the whole of the Croton water scheme, and testifies to the skill of the engineers and the thoroughness of the contractors of an earlier day.

THE POSSIBILITIES OF HIGH SPEED ELECTRIC TRACTION.

In view of the many impossible schemes for air-line electric roads with speeds of from 100 to 200 miles an hour which from time to time find their way into the press, it is a relief to find the subject taken up and discussed in a scientific way by professional men who have no other object than to place the actual possibilities and limitations of high speed electric travel before the reader. In a recent series of articles in the Engineering Magazine the authors discuss the engineering and financial features of an electric road between New York and Philadelphia which would carry passengers between the two cities in thirty-six minutes, or at the rate of one hundred and fifty miles per hour. It is the opinion of the authors that the scheme would present no civil or electrical engineering difficulties which could not be overcome. The cost, however, as figured out, would be $190,000,000. The estimate is made on the basis of a road on the third rail system, with trains running at three-minute intervals. Three-phase 10,000 volt current would be used for transmission lines, and 1,000 volt direct current on feeders. Each station would have an economical capacity of 30,000 horse power and each substation a capacity of 20,000 horse power. The travel, estimated on the basis of several existing elevated and suburban roads, is put down at 187,040 passengers both ways per day. This is more than four times the traffic of all the existing roads between these cities. It is considered, however, that the reduced time and the low fare, assumed at twenty cents, would greatly increase the travel. It is evident that, in the opinion of the authors, Messrs. C. H. Davis and F. S. Williamson, the difficulties would be rather of a financial than electrical nature, and their study of the question of high speed travel shows once more that the limits to engineering performance are set by financial rather than technical considerations.

PROBABLE SOLUTION OF THE ARMOR PLATE QUESTION.

There is some prospect of a settlement of the armor plate controversy between the government and the firms engaged in armor plate manufacture, by the latter offering to supply a much superior plate at the price fixed upon by the Secretary of the Navy. It is well understood in naval circles that the great Krupp factory is turning out nickel plates treated with its new gas process which have shown better ballistic results than the nickel-steel Harvey plates which have won such world-wide celebrity. It now appears that the Carnegie and Bethlehem Companies have acquired the rights to the Krupp process in this country, and two experimental plates are being made which will shortly be tested at the naval proving station at Indian Head. The Krupp plates have shown all the hardness of the Harvey plates, with a remarkable toughness which renders it practically impossible to break them. Extreme toughness and extreme hardness seemed to be incompatible in the same plate, until Harvey combined the two by the use of nickel and face hardening. The hardness, however, is always present in greater degree than the toughness in Harvey plates. The new Krupp process seems to render the plate absolutely proof against fracture.

If the two experimental plates show all the good qualities expected of them, the obvious course for the government would be to fix a fair price and close a contract for the supply of the much needed armor for the new battleships.

A YEAR OF PLENTY IN KANSAS.

It is a commonplace truth that the source of the prosperity of this country lies in the soil—that good crops mean good times; but it is only when we have before us such astonishing figures as are furnished this year by the Kansas State Board of Agriculture that we appreciate the supreme importance of agriculture. Omitting the odd thousands, we find that the yield of winter wheat in that State is fifty million bushels, worth thirty-four million dollars, or 160 per cent more than last year. The corn crop totals one hundred and fifty-two million bushels, and the yield of oats is twenty-three million bushels, the two together bringing in thirty-two million dollars. The total value of winter and spring wheat, corn and oats is sixty-six million dollars.

This is the record of a year of plenty. Compare it with the crops of the previous year, when the combined winter and spring wheat, corn and oats brought only fifteen million dollars to the farmers.

The table of the yields and values of the crops and products of all kinds, including, in addition to the cereals already mentioned, potatoes, flax, sorghum, dairy products, etc., is one hundred and thirty-six million dollars. The total value of crops and live stock is two hundred and thirty million dollars, and the total net increase of all agricultural products is over forty million dollars. In the presence of such figures one is prepared to believe there may be more truth than jest in the statement that Kansas will "forward a car load of canceled mortgages" to the forthcoming exposition at Omaha as a token of her returning prosperity.

ECONOMY IN DETAILS.

There is a good story told in a Philadelphia paper of a French officer of engineers who, during a visit to one of the large machine shops in that city, regarded with comparative indifference the massive tools and "show" features of the establishment but paid close attention to a little tool-sharpening machine—a type of those numerous ingenious labor-saving appliances with which an American shop abounds. At the close of his inspection he stated that he had visited all the most notable engineering undertakings and establishments in America, and that he should report to his government that the biggest things in America are the little things. He was struck with the fact that in some establishments which he had visited the profits were mainly realized in the saving of materials and labor by close attention to details which in Europe are unconsidered trifles, and as an instance of this he quoted the little grindstone which he had noticed in the shops.

The criticism of the French engineer went direct to the mark, for while we have engineering works as great as any in the world, it is in our genius for invention of labor-saving appliances that we lead the world, and herein, too, lies the secret of the extraordinary reductions which we have been able to make in the cost of manufacture.

With the ever-growing magnitude of industrial operations and the increasing keenness of competition, the race will be won by the people who have a genius for economy in details, who are untiring in their efforts to save time and labor in the most insignificant trifles of shop and factory management. The rapidity with which the new inventions of one country are patented and bought up in other countries has an equalizing effect which prevents any one nation from enjoying a monopoly of the fruits of its ingenuity, at least in the more important and costly inventions; but as long as the American mechanic continues to devise more rapid and less laborious ways of doing even the most insignificant work, it will continue as easy for us to undersell the European producer as it is puzzling to him to understand how we can do it.

THE LIMITS OF HUMAN SPEED AND ENDURANCE.

The many forms of use and abuse to which the bicycle has been put have served to demonstrate that man is capable of feats of speed and endurance the mere suggestion of which would have been deemed absurd and impossible a generation ago. While it has long been known that the human frame was capable of exertion far beyond the powers of the brute creation, it was reserved for the bicycle to show just what the measure of its endurance was. While we consider that six day races, such as have lately been concluded in New York, are to be condemned on obvious grounds of humanity and common sense, it is undeniable that they possess an interest as showing the amazing feats of strength and endurance of which a well trained athlete is capable.

The past year has been fruitful in record-breaking

performances on the bicycle, and the array of records is full of startling figures. The distinction most coveted by the racing wheelman is that of having ridden the mile in fastest time. This has been done first in England and a month or two later in America in 1 minute 35⅘ seconds, which is equal to a speed of over 38 miles an hour. The rider who first rode a mile in this time has also covered a distance of 32⅘ miles in one hour—an even more remarkable performance.

This, however, was eclipsed by the feat of another speedy rider who wheeled off over 616 miles in one day at an average speed of 25⅔ miles an hour. A study of the details of this ride reveals the remarkable fact that the rider was as strong at the finish as at the start, the average speed for the twenty-fourth hour being as high as for the first hour, and the 610th mile being covered in 1 minute 56 seconds, or at a speed of more than 30 miles an hour.

The latest and, in respect of mere endurance, the most difficult feat was the ride of 1,983 miles in six days made in this city. The average speed from Monday morning to Saturday afternoon, when the rider practically left the track for good, was 14·7 miles per hour, and the average actual speed, exclusive of rests, was 15·8 miles per hour. The rider was off the track only 9¾ hours, 4½ hours of which were given to sleep. From a medical point of view the remarkable fact was that his pulse and temperature were about normal after this tremendous exertion, and that he showed no discernible physical injury as the result of it. It is noteworthy that the rider's diet consisted almost entirely of boiled rice and milk and that no stimulants of any kind were taken.

In the presence of such performances as have been outlined above, the stories of ancient prowess become more credible, and it is certain at least that our race shows no signs of physical degeneration in the present day.

COPYRIGHT INJUSTICE.

An interesting example of the obliquity of vision with which men seem to be afflicted in regard to property rights in literature is given in the pending proposal for amendment of the copyright law. It is proposed to require authors obtaining copyright protection to supply at their own cost copies of their books to public libraries throughout the country. At first only a few libraries are to be designated as recipients of such gifts, four or five in all. But there is no reason why the number should not be indefinitely extended. If the public library in one city is to be thus favored, why not that in another city? The chances are that if the principle is once established, the application of it will be extended until the author is compelled to give a copy of his book to every city, town, village and public school library in the land, or else forfeit his copyright. Or, if not, it would be uncommonly interesting for the authors of the proposal to explain why not.

The system, it is said, will result in the building up of a number of national libraries throughout the country. Yes. If every farmer who wants to have his ownership of his wheat crop protected were required to give a bushel to some government depository in each large city throughout the country, the system would result in the building up of a number of national granaries. If every man who wants his right to his wages maintained were required to pay $1 a week to a government collector in each large city of the Union, the result would be the accumulation of a magnificent surplus in the national treasury. If every man who wants to secure patent rights on a machine he has invented were required to give one of the machines to every city in the land, to be loaned out to the inhabitants for free use, it would be a mighty nice thing for those who want to get something for nothing. And assuredly there is no conceivable argument in favor of the one scheme that does not apply with equal force to all the others. There is no more reason why the producer of literature should be thus mulcted than the producer of any other commodity.

The scheme may have been suggested by contemplation of the Library of Congress, which is thus enriched with copies of all new works, and a desire to create duplicates of it in other cities, and the question may be unthinkingly asked why the author may not properly be required to deposit copies of his book elsewhere, as well as at Washington. To such question the answer is obvious. The book is deposited at Washington, not for the sake of building up a library, but as a matter of record, to complete the act of securing copyright, as an inventor was formerly required to place a model of his machine in the Patent Office, or the owner of real estate has to record his title deeds at the office of the county clerk or register. The process of securing copyright is completed at Washington for the whole country, and does not have to be repeated in half a dozen other cities. There is no justification, therefore, for requiring one of its conditions to be repeated elsewhere. Nor would the scheme have any such result as its projectors seem to suppose. It would build up libraries, but they would not be good libraries. The essential nucleus of every library that is worth housing room must consist of a mass of standard and classic works which are not daily being produced and copyrighted. Libraries secured by the proposed method would be altogether one sided. They would contain plenty of current literature, but no standard works; a host of ephemeral novels and minor poets, but no classics and no encyclopedias. Such a library would be a delusion and a snare. The government would have committed an act of gross injustice and spoliation, and have got no real benefit in return. The plan is a mischievous one from every point of view, and should be heard of only as a "horrible example" of freak legislation which never can be seriously considered.—New York Tribune.

LIEUT. PEARY RECEIVES A SHIP.

The following cablegram, relating to Lieut. Peary's Arctic trip, has been received by the New York Sun:

"A. C. Harmsworth, England's patron of Arctic exploration, has presented his Arctic ship 'Windward' to Mr. Peary and will have her overhauled and sent to America for use in his coming expedition.

"This generous act of Mr. Harmsworth is the latest incident in a series that has shown that England and America are bound in the strongest brotherly ties in their mutual interest in Arctic work. Grinnell fitted out the first and second Grinnell expeditions to assist England in the search for Franklin and his brave companions. America sent the recovered 'Resolute' back to England as a gift. England sent the 'Alert' to America to assist in the search for Greely and his companions. Now Mr. Harmsworth gives Mr. Peary a ship which has been engaged for the last three years in exploring Franz Josef Land."

The princely gift of Mr. Alfred Charles Harmsworth will materially assist Mr. Peary in carrying out his plans of Arctic discovery. The "Windward" is admirably adapted to the purpose of exploration in northern seas. This act of the London newspaper magnate will be another tie which, like the log of the "Mayflower," will tend to still more unite the people of Great Britain and the United States.

In 1894 Mr. Harmsworth equipped the Jackson-Harmsworth expedition at a cost of $125,000. This expedition, after spending three winters in Franz Josef Land, returned to England in September last. As the result of their labors almost the whole of Franz Josef Land has been carefully mapped, and has been shown to consist, not, as was supposed, of large land masses, but of a number of islands. Gillies Land, as to which there had been much controversy, he found to be conspicuous for its absence in the place usually assigned to it on Arctic maps.

THE LASSO.

The lasso is of great antiquity. It is said to be depicted in the ruins of Nineveh. An early Persian manuscript, preserved in the Escorial, shows a sportsman (whom I suppose royal by his Olympian expression and careless seat) in the act of catching a wild ass with a nicely plaited lasso. The monarch bestrides a rather "stocky" looking, dark colored horse, with four white feet and a white face. A bow, quivers and a saber are hung from his saddle, and a sort of housing half covers the horse. How the wild ass is to be restrained, even by the hand of a monarch, is not at first sight evident, for the lasso is neither fixed to the saddle after the fashion of the gauchos, nor is a half turn taken round the pommel, in the style adopted by vaqueros in Mexico and Texas. Apart from this detail, all is as realistically set forth as it would be to-day in a photograph. The horse bears away from the beast lassoed, and the king sits a little to one side, exactly as a Texan cowboy or an Argentine gaucho sits under similar circumstances. Irises and Narcissi spring up under the horse's feet, and an applauding group of angels peep out of a cloud, while in the middle distance another Persian gaucho shoots an antelope with an arrow while galloping at full speed.

The Laplanders are said to lasso their reindeer, and the Tartars and modern Australians use a rudimentary lasso fixed to a long pole in order to catch wild or refractory horses. The Poles, Croatians and Wallachians, with the Hungarians, seem to have used the lasso till about the beginning of the present century. A picture by the German artist Richter shows Polish remounts for the German cavalry being lassoed in the Zwinger, at Dresden. The horses look as wild as a Texan "broncho" or an Argentine "gagual," and the attitude of men and animals, and the way the ropes are coiled and thrown, are identical with those adopted in Spanish America to-day. The lasso appears to run through a ring in the pommel of the saddle. It is, however, in Spanish America where the art has been most developed. This is on account of the open country and the vast numbers of wild and semi-wild horses which, up to the middle of the present century, overspread its plains.—Badminton Magazine.

THE Boston Pneumatic Transit Company opened their pneumatic tube system at the general post office, Boston, on Friday, December 17, 1897, at 12 o'clock.

DUSTLESS BUILDINGS.*

BY C. J. WOODBURY, BOSTON, MASS., MEMBER OF THE SOCIETY.

The increased height of office buildings rendered possible by what Otis Tufts patented as the vertical railway, while bringing to their occupants relief from the noise of the streets, and affording comfort by extending above the fly belt, which is as well defined as the snow line on a high mountain, also exposes the occupants to the fine dust which pervades the whole structure and which the other salutary conditions of the building render more prominent.

The modern method of heating and ventilating such a building is by means of a blast of air drawn down a flue, warmed and forced through the building in such quantities that four times the volume of the building is frequently circulated through the rooms each hour.

This method of heating, although a more efficient application of radiating surface for heating the air than by direct radiation in rooms, and can be managed with far less expense for attendance, repairs and fuel, and provides the sanitary requisite of ventilation without cold draughts, yet this apparatus distributes large amounts of dust through such a building; and in a city using bituminous coal under the average conditions there is a fine carbon dust which is especially obnoxious, impairing drawings, books, delicate mechanism, and whatever may be injured by the shower of fine, impalpable dust, which produces black, indelible smutches whenever touched. This carbon dust is always an annoyance and at times a serious matter.

The writer undertook to abate the difficulty of dust in a building of nearly 500,000 cubic feet capacity, through which 26,000 cubic feet per minute was usually blown, for heating and ventilation. The outside air used for this purpose was drawn down a flue 37 square feet in cross section, and reached a velocity of 700 feet per minute.

The means taken to remove the foreign substances from the air were by use of cotton cloth filters so arranged that the air should approach the fabric at an acute angle by which the momentum would carry these particles beyond a point where the element of air under consideration would pass through the filter, and the particles of dust would be carried by the place, and, striking the cloth at a lesser angle, tend to glance off and be carried to the bottom of the filter, rather than to clog the interstices in the fabric. The area of the filters being larger than that of the flue, the rate of filtration was inversely slower than the velocity of the air down the flue.

The means by which this was accomplished were very simple. A timber frame, divided by partitions into fine rectangular openings, was placed at the top of the flue, and under each opening was placed a bag whose top was attached to a light wood frame slightly larger than the opening, making a tight fit, so that the air entering the flue must pass downward into these bags, which were over thirty feet in height. An arrangement of guides, ropes and pulleys enabled the bags to be raised and lowered by a person at the bottom of the flue. The bottoms of the bags were made open, and closed with a drawing string, and hoops kept the lower portion distended. An arrangement of lines extending along the sides from end to end facilitated turning inside out and back again when they were being cleaned.

The whole of the mechanical arrangement is fully described in United States patent No. 589,772.

These bags were square at the top, where their combined area equaled that of the flue, but soon diminished to a cylindrical section, occupying about 40 per cent of the space, thus affording ample clearance for the exit of the air passing through the fabric.

The area of the flue was 3¾ per cent of that of the bags, and while the air passed down the flue at a velocity of 700 feet per minute, it passed through the fabric at 26 feet per minute.

From half a peck to a peck per month of fine dust was gathered from the bags.

The efficiency of the device was tested by placing freshly painted boards at the bottom of the flue before the installation of the apparatus, and then giving another coat of paint after the apparatus was in service.

In the first instance the fresh paint collected fine dust until it resembled fine sandpaper, and in the second the paint dried with a smooth surface.

In several of the offices split laps of absorbent cotton were placed in various parts of the building before and after the bags were in service, and one set was covered with fine particles and the other was free. The change was not a notable one at first, owing to the large amount of dust in the flues, but much of this was removed by running the blower at a very high rate of speed, and afterward removing the registers and washing them and the flues as far as could be reached.

The device has been solely under the care and management of the men employed on the engine and boilers, and has served its purpose in rendering a building free from dust caused by the ventilating system.

*Presented at the New York meeting (December, 1897) of the American Society of Mechanical Engineers, and forming part of volume xix of the Transactions.