SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 lis. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Monthly (Established 1885) ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JANUARY 24, 1903.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

WIRELESS TELEGRAPHY AND THE "ST. LOUIS."

The painful uncertainty attending the belated "St. Louis," of which nothing was heard, from the time she left Cherbourg until she was sighted at Nantucket, a week overdue, suggests that for passenger ships at least, the time will be welcomed when every vessel is equipped with a wireless telegraph outfit. Although none of the vessels so equipped would be capable of repeating Marconi's feat when he communicated from one of the vessels of the American Line over 1,500 miles at sea with the powerful Poldhu station, a range of say 200 miles should be quite within commercial practicability. Considering the crowded condition of the various steamship lanes across the Atlantic, it would be impossible, were all passenger ships so provided, for a vessel to remain unspoken for more than a day or two at the longest; and a liner disabled in mid-Atlantic should be able to communicate from ship to ship with her home port and news of her trouble be made known, long before the day set for her arrival. In this way an enormous amount of anxiety could be spared to relatives and friends on the all-too-frequent occasions when transatlantic vessels are disabled. Indeed, we consider that just as soon as wireless telegraphy has been placed on a thorough commercial basis, it would be quite within reason for a law to be passed requiring all ships to install some one of the wireless telegraph systems which will be on the market.

MAGNITUDE OF COMMERCE ON THE LAKES.

The close of November on the Great Lakes usually marks the end of the season of through navigation; and the government statistics show that for the first eleven months of the past year 77,408 vessels, of over seventy-one millions net tonnage, were reported as arrivals, and 77,899 clearances were reported, of over seventy-two million net tons. There are twenty individual ports on the Great Lakes having a registered tonnage ranging from one million to over five million tons. Cleveland heads the list with 5,037,282 tons; and five other ports, viz., Duluth, West Superior, Milwaukee, Chicago and Buffalo, recorded over four million tons of arrivals. The enormous volume of this movement is only appreciated when it is compared with similar marine operations on the ocean frontage. New York, during the entire year 1902, is credited with 8,982,767 tons of arrivals; London had entrances in 1901 amounting to 9,992,753 tons; and Hong Kong reported 8,626,614 tons entering in the year 1900.

NEW METHODS OF TUNNELING.

It was inevitable that the construction of the Rapid Transit East River tunnel, and the North and East Rivers tunnels of the Pennsylvania Road, should stimulate inventors to devise new and better means of tunneling through silt or other soft material. All the later methods that have been outlined make provision for supporting the weight of the tunnel upon the firm rock bottom underlying the silt. The Chief Engineer of the North River tunnel, Mr. Jacobs, does this by opening the bottom of the tube at stated intervals, and carrying a concrete-filled cylinder pier down to bedrock, the weight of the tube and the trains being carried by two parallel trusses resting upon the piers, and constructed within and on each side of the tube itself.

Another system, which has recently been patented by Mr. Sooysmith, employs the freezing process associated with timber piling. When tunneling by this method, a pile foundation is first driven from the river surface throughout the whole length of the tunnel; the material lying just above the piling is then frozen by driving a small pilot tunnel ahead into the surrounding material; and the tunnel is excavated through the material thus frozen, the steel tube resting upon the pile foundation that has been driven for it.

Yet another method is that of Mr. Reno, who drives the tube by the usual pneumatic shield method, and, as it proceeds, takes out a bottom section of the tunnel lining, excavates a rectangular chamber below the tunnel and fills it with a mass of concrete, thus placing the tunnel tube upon a continuous, deep, concrete bed of sufficient weight to prevent vertical or lateral displacement. The great magnitude of the present tunnel schemes, and the importance of securing the system which will be easiest of construction and most secure against deformation when built, render this problem one of the most important that has come up in the world of civil engineering for many years past.

A DOZEN NEW VESSELS FOR THE SHIPPING TRUST.

It will be remembered that when the great steamship merger known as the International Mercantile Marine Company was publicly announced, it was stated that there would be a division of all new steamship construction between American and British yards. The company has just authorized the statement that no less than a dozen Atlantic liners are to be added to their fleets. Of these vessels six will be launched in this country, three of them from the Sparrow's Point yards, Baltimore, and three at the Camden yards, Philadelphia, while the other six will be constructed in British yards. All of these vessels are to be of the mixed freight-and-passenger type which has proved so popular in the "Celtic," although none of the ships will be as large as the latter vessel. Their tonnage will run from 12,000 to 16,000 tons, and the length from about 500 to something over 600 feet. It is significant that not one of these vessels is to be of the high-speed type, the average sea speed varying from 14 to 16 knots. It is well understood that the slower vessels with large cargo-carrying capacity are the most profitable ships afloat, and that their net earning capacity increases rapidly with increasing size.

THE HUMORS OF RAILROADING.

In a recent issue, the Editor, in describing a ride on the locomotive of the Twentieth Century Limited, over the New York Central and Lake Shore Roads, ventured, with many misgivings, to attempt the role of an impressionist. On casually reading over the cold-type result, it has occurred to him that the "impressions" are a little out of balance, inasmuch as he has failed to touch upon the lighter side of the very strenuous life on the footplate; for although the handling of a crack, modern express train on an American railroad is a task calling for the highest qualities of courage, judgment, and eternal vigilance, and although in the background of changing sights, sounds and scenes that go to make up the engineer's life, there is always visible the specter of sudden death or shocking injury, life on the road has still its lighter and humorous phases. One of the "sights" which the privileged guest in the locomotive cab of an express train will be told to watch for, is the taking of water from the trough tanks between the tracks. It is an interesting and even a spectacular sight, particularly if the scoop should be left down a little too long, and the tank should overflow. On the occasion of our ride, when we were making fast time over a stretch of the magnificently-kept roadbed and track of the Lake Shore system, we took water at a trough while we were running at considerably above the regulation speed of 45 miles an hour, to which enginemen, as a rule, are expected to slow down. Now, when a forwardly-projecting scoop is pushed through standing water at a speed of 60 miles an hour, it can be understood that the inrush of water to the tank is in such a volume as to fill it up in an exceedingly short space of time, and hence it requires considerable judgment on the part of the fireman to raise the scoop at the "psychological moment" and avoid an overflow. To provide against rupturing the tank there is a large, square hole cut in the top of the tank at its rear, just opposite the baggage car front platform; and in case of an overflow the water boils out through this opening in a perfect cataract. When the Twentieth Century train was first run over the road, it happened that the tank was overfilled, and the water, rushing out, fell against the front end of the baggage car, burst open the door, rushed through the baggage compartment, poured into the barber's shop, and so scared the tonsorial artist that he stood not on the order of his going, but fled headlong into the smoking compartment, with the foaming flood at his heels. Thereafter, to provide against another accident of the kind, the front door of the baggage car was battened; and the baggage master and barber henceforth pursued their respective callings, dry shod.

The scoop is lifted from the tank by means of an air cylinder. On the occasion when we made the run, the "air failed to act" (at least so said the fireman), with the result that the water continued to rush into the tank long after it was filled, and the writer witnessed a display that was simply magnificent. Tons of water as it boiled over, fell against the front end of the baggage car, and, dividing, rolled off in a splendid cataract at each side of the track. Here, as it struck the gravel ballast, at a velocity of a mile a minute, it acted like water from the nozzle of a gigantic fire hose, and the flying waters spread right and left in a huge cloud of foam and spray that entirely hid the following train from view.

Now, it so happened that once upon a time, subsequent to the closing up of the front door of the baggage car for the reasons above stated, a certain tramp, seeing an opportunity for an unmolested 160-mile ride on one of the fastest trains in the world, stole up on the front platform as the train was starting, and coiled up for the trip. There are two water troughs on this run, at each of which the scoop is used; and whether it was that the firemen accidentally caught sight of the "deadhead," history saith not; but it is a fact that by a curious coincidence, at each trough in succession there was an overflow of the most violent character. At the end of the run, when the engineer was looking over his engine, he was confronted by what he described as the most absolutely washed-out specimen of humanity that he had ever seen, who with the water still in the act of draining itself out of his hair and tattered clothing, placed his hand on the arm of the engineer, with the query: "Say, mister, what was the names of them two rivers we run through back there?"

SUBWAY VENTILATION.

In the present rapid extension of subways and deep tunnels there is a danger of neglecting the all-important question of ventilation. Even in cases where the question has been considered, the means taken to provide for a constant supply of pure air have been more or less inadequate.. Recent tests of air taken from the London tubes at various hours of the day, prove that it becomes vitiated to a degree that is a positive menace to the health of the public. It was found that while samples of air taken at street level outside the stations of the Central London Railway contained an average of 2.83 parts of carbon dioxide per 10,000, tests of air taken at the same time from the interior of the stations, and from the cars within the tubes, showed that on the station platforms the percentage varied from 4.23 to 7.36 parts during the hours of moderate traffic, while during the rush hours the percentage rose from 11.04 parts to 20.46 parts per thousand. Now, when we bear in mind that a percentage of over 6 parts of carbon dioxide in 10,000 is considered to be, to say the least, undesirable, and that in the case of persons of weak constitution this percentage becomes positively harmful, we can understand how very injurious the atmosphere in crowded cars in a subway or tunnel must become, during the rush hours. The SCIENTIFIC AMERICAN has frequently drawn attention to this most important aspect of subway and tunnel construction; and now that the Pennsylvania Road has been granted a franchise for its deep-level tunnels, and the East River and North River tunnels are under construction, the question becomes one of most vital interest to the New York traveling public. We believe that, at present, the subway engineers are trusting to the movement of the trains to produce sufficient ventilation; and, if so, it looks as though they are confusing ventilation and circulation. The movement of trains will produce circulation; but if the air be already vitiated, it will require something more than the mere transfer of the air by the piston-like action of the trains to render it pure. Provision must be made for taking into the tunnels a supply of fresh air and expelling that which has been vitiated, and to secure the best results this action should be constant and not intermittent.

COLONISTS FOR OUR NEW PUBLIC LANDS.

The adoption by Congress of a homestead law for our new insular or colonial possessions will throw open to colonists a new princely domain beyond the seas which will have attractions for tens of thousands of settlers, who will undoubtedly emigrate as soon as adequate laws are enacted to protect them in their rights. The rush for the new homesteads in the Philippine Islands, Porto Rico, Hawaii, Tutuila, and Guam will present one of the most spectacular movements of American population, and will inaugurate an era in our development of lands beyond our own continental border unprecedented in history. The exact effect of this upon the industrial development and expansion of our new colonial possessions can easily be predicted, for similar opening and settlement of public lands have always been attended by rapid growth and improvement of the natural resources of the country.

The public lands in these new islands represent some of the richest and most fertile soils found anywhere in the world, with agricultural, mining, and timber resources scarcely comprehended even by our experts. For centuries these great possibilities for material wealth have remained undeveloped, and they must continue under the control of the people who have always failed to appreciate their opportunities. Under Spanish rule there was little opportunity for ambitious

colonists to take possession of the lands and develop them, and even had their rights and property possessions been respected and encouraged by the authorities, the warlike condition of the native population would have made their wealth somewhat precarious. It was only along the coast and on the outskirts of the few large towns and cities that anything like civilized settlement of the Philippines was undertaken. With the restoration of peace, and adequate laws to protect settlers and Filipinos alike, there should come an industrial awakening which will in a short time transform these fair islands into gardens of wealth and attractiveness.

Adequate steps have already been taken to protect the valuable timber growing on the vast forest domain of the Philippines of some 50,000,000 acres, and indiscriminate destruction of the trees will not be permitted. The forestry department in the islands has been carefully organized, and expert foresters are in charge. Besides protecting the timber from the vandals and lumber speculators, the foresters are making careful surveys of the woods to ascertain their actual resources and value. Much of this timber is too valuable for building purposes, the trees for the most part consisting of the heavy hardwoods of the tropics, and it is intimated that it will pay to ship cheap pine lumber from our Pacific coast for building and bring back the heavy woods for commercial cabinet purposes. If such an exchange of products is desirable, the work should be encouraged at the beginning, and not left until half the valuable timber of the islands has been destroyed. It is the policy of the forestry bureau on the islands to protect the forests, and to encourage their scientific culture. This will insure an annual crop of valuable trees, and at the same time preserve the woods for all time. In the tropical woods of the Philippines the trees grow so rapidly that a thinning out process can be pursued, so that millions of feet of valuable timber can be cut every year. It is possible to go over the same forests year after year and find new available timber ready for harvesting. There should be a steady income from these hardwoods of the islands amounting in the aggregate to millions of dollars. As conducted in the past, the forests have practically yielded the government nothing, and the inhabitants have wasted their resources, so that they have found little actual profit in their great natural possessions.

Scientific experts who have examined the forests of the islands intimate that the greatest calamity which could possibly visit our insular possessions would be the denudation of the forests. The climatic changes that might follow would completely transform the conditions of agriculture. On the other hand, judicious cleaning up of woods and swamps would produce beneficial changes of an agreeable character. There are water courses and streams which might well be reduced in volume and intensity without interfering with the agricultural conditions elsewhere. The final policy of forest culture which the experts will recommend will probably tend toward the climatic and agricultural improvement of all the islands. There will be openings for the new American colonists who will undertake scientific forest culture of the most promising kind. The possession or leasing of these forest lands will be regulated in such a way that denudation will be visited by prompt ejectment and punishment. But it is unlikely that an owner of hardwood timber lands that furnish a good income each year will decide to kill the goose that lays the golden egg. The export trade in valuable hardwoods will increase in proportion to the scientific culture and harvesting of the forests by settlers who have been trained for the work. Expert foresters represent to-day a new profession in this country, but their services in our island possessions will be even in greater demand than at home.

This class of new settlers will be of a higher grade than those who file petitions for the ordinary 160 acres of homestead farming land to secure title by living on and cultivating the same. Expert foresters are not numerous, and their services are needed to develop the forests. It is not possible that others will secure possession of the valuable timber lands of the Philippines, so strict is the forestry department of the islands. On the other hand, there will be urged the necessity of intelligent settlers undertaking the development of forest farms. Under the direction of public foresters it is possible to train a class of practical farmers who will wisely conserve the interests of both the government and the settlers. The small settler is more likely to preserve his possessions of hardwood timber than the lumber speculator, whose chief interests are concerned in robbing the forests of all he can secure in a few years. Forest culture of the hardwoods may thus become an important industry of the new colonists who go to the Philippines under the homestead law.

The time is apparently ripe now for making inducements to attract settlers to the new public domain of the United States, and both the Secretary of War and the Insular Bureau have been urging Congress to enact some homestead legislation. There is little possibility of a great industrial and agricultural development in the islands without some inducement being held forth to American settlers. There are some forty to fifty millions of acres of land in the islands which belong to the Federal government, and much of this is the richest of agricultural and mining land. The disposition of this vast domain must carry with it a great amount of responsibility for those who have the matter in charge. Land records have been very loosely kept in the islands, and a good many of the natives claiming land have no deeds or other titles to show that their possession is a legal one. To determine the legal ownership of great tracts of the land will require years of study and survey, and possibly numerous decisions of the Supreme Court. But outside of the land which is held in dispute there is a vast tract of which the government has unquestionable ownership, and the opening of this public domain to American settlers according to the homestead rights will be sufficient to attract thousands of new colonists to the islands.

G. E. W.

MORSE'S OLD DIARY AND ITS PROPHECY.

In the Electrical Review there appears a portion of the diary kept by Samuel F. B. Morse during his earliest work on the Baltimore and Washington telegraph line in 1843. The book was discovered in the library of Thomas A. Edison, at Orange, N. J., and contains what are evidently the first records.

The first entry in this diary is dated March 14, 1843, and consists of a copy of the letter from the Secretary of the Treasury, J. C. Spencer, giving instructions as to the handling of the appropriation made by Congress for this experiment. The reply of Morse and other correspondence in the diary give a striking idea of the troubles which beset the pioneer's work, as well as of the untiring energy with which the inventor developed his great ideas. He never seemed to lose heart over the failures of others, which he had to overcome constantly. Under date of August 10, 1843, Mr. Morse describes certain tests he had made, and makes the following interesting prophecy:

"The practical inference from this law is that a telegraphic communication on my plan may with certainty be established across the Atlantic. Startling as this may seem now, the time will come when this project will be realized."

Commenting on this prophecy and old-time record, which is virtually the story of the beginning of the vast electrical industry of to-day, the Electrical Review says:

"How well this prophecy has been fulfilled! To-day there is no ocean unspanned by a telegraphic cable. This old record of the first work in telegraphy takes added interest from our latest accomplishments. We have completed the first Pacific cable and have made a good start on the second, and Marconi has established communication across the Atlantic without wires. It is difficult to realize that this diary was written less than sixty years ago. Who will venture to predict the electrical developments of the next sixty years?"

WIRELESS MESSAGES TO A MOVING TRAIN.

On the occasion of the recent Forty-seventh Annual Convention of the American Association of General Passenger and Ticket Agents, the Grand Trunk Railway gave a demonstration of wireless telegraphy on a moving train. The experiment was entirely successful.

The demonstration was made by Dr. E. Rutherford, F. R. S. C., and Dr. Howard T. Barnes, F. R. S. C., both of the Macdonald Physical Laboratory of the McGill University, Montreal. Signals were exchanged between a station and a train (which was running at the rate of 50 miles an hour). No attempt was made to cover distances comparable in length with those attained by Marconi and others, but with comparatively simple laboratory apparatus it was possible to keep the train in touch with the station for from 8 to 10 miles. St. Dominique was selected as the transmitting station, where two large metal plate vibrators 10 x 12 feet, connected with an induction coil of the usual pattern, were situated. On the train itself the waves were received by collecting wires connected to a coherer of nickel and silver powder. The relay operated electric bells in three cars. The collecting wires were run through the guides for the train signal cord, and extended on both sides of the coherer for about one car length. To obtain the maximum effect it would have been better to have had a long vertical wire, but since such was impossible, the horizontal wire was used. Although these were placed *inside* the steel frame cars, strong and definite signals were obtained over the distance named. Another difficulty militated against obtaining the maximum sensitiveness, as owing to the natural vibration of the train resulting from its great speed, it was impossible to have the relay adjusted to its most sensitive point. In spite of these difficulties the distance to which signals could be sent to the train was eminently satisfactory, and with more refined apparatus greater distances could without doubt be covered. The success of this form of wireless telegraphy, of which this was but a pioneer experiment, opens up yet another method of providing for the safety of the traveling public.

SCIENCE NOTES.

It is rumored that A. Lawrence Rotch, of Boston, is to lend his aid in solving the meteorological problem concerning the permanent circulation of the atmosphere at altitudes greater than 15,000 feet. It is said that the German government is to furnish Mr. Rotch with a ship equipped for a three months' voyage in the tropics. The necessary apparatus and expenses are to be paid for by American scientific men.

E. Tardy has studied the oil of Chinese anise, the oil of Japanese anise and the oil of fennel. He finds that Chinese anise oil contains pinene, phellandrene, estragol, a dextrogyrate terpilenol, anethol, a levogyrate sesquiterpene, anisic aldehyde and acid, together with traces of a crystalline body of the formula $C_{20}H_{22}O_3$, and of the ethyl ether of hydroquinone. The author attaches some importance to the presence of the terpilenol, to which he considers the particular odor of Chinese anise is due. The result of his study of Japanese anise (*Illicium religiosum*) shows that the oil has a low rotation.

Princeton University recently received from John M. Clarke, New York State palæontologist, the body of an octopus-like creature, from Onondaga Lake. Dr. Ortmann examined the specimen and found it to be a cold-water, short-armed squid, a species of devil-fish prevalent along the Atlantic coast from Cape Cod to Newfoundland. The fish was a salt-water specimen, and how it came to be found in fresh water is not easily explained. To be sure, the specimen examined by Dr. Ortmann differs from the ocean-bred squid in that it has not the delicate membranous folds on the arms that stretch out from its body. It may be that these folds constitute a real variation, but Dr. Ortmann is inclined to believe that the membranes have been lost through abrasions or imperfect preservation. In every other respect the New York squid resembles the ocean kind.

The Stanford University has received curios gathered by Mrs. Stanford during her long sojourn in Egypt. The collection is interesting, not because it contains many specimens of ancient Egyptian art, but because of its modern historic value. One of the most precious *trouvailles* of the collection is a set of volumes recounting the history of the occupation of the Nile country by the French, and producing in colors the discoveries and conquests of Napoleon. The volumes were compiled by Napoleon's orders in 1812. A set of fine reprints in from twelve to eighteen colors of originals dealing with recent discoveries in the ruins of Karnak, also constitute an important part of the collection. Besides these there are cases of gold embroideries, the work of the women of a great harem in Cairo; large numbers of ancient coins, vases and lamps, statuettes, and bas-reliefs of pottery.

The appetite of a whale is phenomenal. His chief diet consists of jellyfish. He has simply to open his mouth and paddle along leisurely in order to take in jellyfish by the wagon-load. Such is the method adopted by the whalebone whale. The sperm whale, on the contrary, captures huge squids weighing often several tons. Like his brother the whalebone whale, he must be constantly on the lookout for food. Otherwise he would starve. As many as fourteen seals have been taken from a thirty-foot "killer." Other fishes of enormous appetites are not uncommon. The bluefish, for example, thrives on sardines and other small fish. Assuming that one bluefish eats ten small fish a day, it has been figured that it requires ten thousand million sardines to feed the one thousand billion bluefish on our coasts every summer. Most curious of all eaters is the hydra—a strange creature that can be turned inside out without impairing its appetite or its power to eat.

THE CURRENT SUPPLEMENT.

The current SUPPLEMENT, No. 1412, opens with an elaborately-illustrated article on the steam yacht "Aztec." Dr. Marcus Benjamin has made an abstract of some of the more important scientific papers presented before the Washington meeting of the American Association for the Advancement of Science. The English correspondent of the SCIENTIFIC AMERICAN discusses, in the fifth installment of his series on water-tube boilers, the well-known and widely used Niclausse boiler. John Joseph Flather sets forth modern tendencies in the utilization of power. An account of the diversity of the uses of cold storage, by Day Allen Willey, should be read with interest. To exporters, Consul T. H. Norton's admirable summary of commercial conditions in Asiatic Turkey will be of value. The well-known manufacturing chemist W. J. Schieffelin discusses the advances made in pharmaceutical machinery and methods in the last half century. Fred T. Jane presents another installment on the naval war game. His present article tells how hits are determined. Automobilists will read with interest an account of the autochronograph, a new electric timing device for automobiles. The usual Consular Notes and Selected Formulæ will be found in their accustomed places.