

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. 20 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) \$3.00 a year.
 Scientific American Supplement (Established 1876) 3.00
 Scientific American Building Edition (Established 1885) 2.50
 Scientific American Export Edition (Established 1873) 3.00

The combined subscription rates and rates to foreign countries will be furnished upon application.

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 MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, DECEMBER 16, 1899.

RELATION OF RAINFALL TO BOILER SCALE.

It is probable that if the average steam user were asked to name the various contributory causes of the formation of boiler scale, he would stop short of the rainfall. Yet we have it on the authority of that excellent little monthly, *The Locomotive*, published by the Hartford Steam Boiler Inspection and Insurance Company, that there is a direct relation of cause and effect between the two. The unusually light rainfall of the past season in many parts of the country has been a matter of note, and it seems that the reports turned in by the boiler inspectors in regions so affected show that there has been an unusual amount of trouble from scale.

The reason for this, according to our contemporary, is not hard to find, the unusual deposits of scale being due to the increased hardness of the water after a lengthy spell of dry weather. In times of drought the water is drawn necessarily from the lower levels, in reaching which it has become impregnated with lime, magnesia and other soluble substances contained in the overlying strata. In a season of copious rainfall, on the other hand, the ground, being soaked, cannot absorb the surface water, which rapidly drains off into rivers or reservoirs, as the case may be, before it has had time to dissolve out the scale-forming substances in any quantity. In a season of light rainfall, like the present, the ground can absorb practically all the water that falls, and the proportion of surface water is relatively small. Hence, in dry seasons the water used in the boilers will be largely spring or hard water, and in wet seasons it will consist chiefly of surface or soft water, the deposits of boiler scale being larger or smaller in proportion.

The moral of all this is twofold. In the first place, during a dry season boilers should be more frequently opened, examined and cleaned. Just how much oftener this should be done must depend upon local conditions and the severity of the drought; but it is suggested that, judging from observations made in the State of Connecticut, they should be inspected in such a season as the last about twice as frequently. Another fact to be remembered is that when a heavy rainfall comes, bringing a sudden supply of surface and therefore soft water, the scale that is in the boiler will be suddenly loosened up, and unless precautions are taken it will lodge over the fire-sheet and cause trouble. This is particularly liable to happen during the melting of the snow in the spring, when the water will be particularly free from mineral salts.

OPENING OF THE NEW ST. LAWRENCE CANAL LOCKS.

An event which will be of great importance in the development and expansion of the commerce of the Great Lakes is the opening of the new St. Lawrence canal locks. Our readers will remember that when the United States government wished to bring the revenue cutters "Algonquin," "Gresham," and "Onondaga" from the lakes to the Atlantic, to assist in the Cuban operations, it was found necessary to cut the vessels in two and float them through the St. Lawrence locks in sections. Now, although these little craft are only 205 feet in length, they were about 20 feet too long to be admitted, the old lock being unable to accommodate a vessel over 186 feet in length. The operation was not without its risks, as was proved by an illustration published in the *SCIENTIFIC AMERICAN* of July 2, 1898, showing one of the sections of the "Gresham" capsized in the attempt to make the passage. The new locks are capable of admitting vessels up to 270 feet in length, and the arrival recently of the "Porto Rico," a vessel measuring 250 feet over all, at New York, after making a successful passage from the Great Lakes, indicates that the direct result of the venture will be the shipment of freight direct from the lakes to various points on the Atlantic seaboard.

It has been suggested that these improved facilities, which are entirely under British control, will operate to the naval disadvantage of this country, for the reason that the greater size of the locks will permit a considerable number of the larger gunboats and smaller

cruisers of the British navy to enter the Great Lakes, whereas by the treaty of 1814 the shipbuilding yards on the lakes are prevented from the construction of warships. Although the excellent relations existing and likely to continue between the two governments render it unlikely that this strategic advantage will ever be put to the test, it is probable that, as suggested in the President's message, the restriction to warship construction on the lakes will be removed by mutual agreement. The advantage to shipbuilding interests on the lakes from such a change would be considerable, for there are many smaller vessels, such as the twelve 1,000-ton gunboats, proposed by the Naval Board, which under the new conditions could be built on the lakes and then brought to the seaboard through the new locks.

"THE WISH IS FATHER TO THE THOUGHT."

A correspondent in Japan writes us that the following paragraph, taken from *The Daily Mail*, has been published with apparent delight by a number of English journals in China and Japan, special prominence being given to it in *The Japan Mail*: "The chairman of the Midland Railway Company was able yesterday to make the highly satisfactory announcement that the American engines which were purchased by that company do not compare at all well with the British-made locomotives. As we have often had to draw attention to the inroads which the United States are making upon our trade, it affords us pleasure to give prominence to this evidence. This is probably the first occasion on which American engines have been fairly tested against British ones upon a high-class road, and the world, we hope, will note the result!" Our correspondent writes that Americans in the East would like to hear the other side of the story, and be assured whether the chairman of the Midland Railway made the unqualified statement that the American engines do not compare at all well with British-made locomotives.

After making careful inquiries both here and in England, we can assure our correspondent that the item referred to is one of those half-truths that are worse than falsehood. Whether the misrepresentation is willful or not, there is no doubt that "the wish is father to the thought." What the chairman of the Midland Company did say was as follows: "With regard to these first ten Baldwin engines, they are at present working on the line, and Mr. Johnson, our locomotive superintendent, says that although they are not by any means up to the finish of locomotives that are made in this country, they are doing their work satisfactorily." We have ourselves italicized the last clause, which was omitted by *The Daily Mail* for the evident purpose of making the chairman seem to condemn, where he actually indorses, the work of the American locomotives.

We are not in the habit of correcting misstatements that occur in the daily press; but the present instance is so purposely misleading, and as our correspondent informs us, the false impression is being so industriously spread abroad in the very countries in which American engines are gaining a secure foothold, as to call for emphatic contradiction. The statement of Mr. Johnson that the new locomotives were doing satisfactory work was made in August. In the intervening three months the whole of the order has been filled by the Baldwin Company and sufficient time has elapsed for a fairly thorough test to be made. The results continue to be strongly in favor of the American locomotive. The engineers who are running the engines report that not only are they hauling the same trains as the English engines upon the same average coal consumption, but they have proved to be capable of drawing much greater trains, and would now be doing so were it not for the fact that the sidings at the English stations are too short to admit longer trains. Hence the American engines cannot be given trains of the maximum weight at which they can show to the best economic advantage, and the fact that they compare favorably with the English engines under conditions that are more favorable to the latter speaks volumes for the American type.

It is urged that the English engine is more durable—a claim that can only be established after a test extending over a lengthy period; but we note that Mr. Ivatt, locomotive superintendent of the Great Northern Railway, for which twenty Baldwin locomotives were recently constructed, says: "I have been examining them, and I cannot find any important part that ought not, with fair usage, to last as long, or nearly so, as those of our own engines." In addition to the ten Baldwins, there were ten engines furnished by the Schenectady Works. Regarding these, we are informed that the company has received "very favorable reports," the operation showing the same satisfactory results as have been achieved by the Baldwin locomotives.

The Midland Company is keeping a careful log of the relative performance of the two types, realizing that they have a valuable opportunity to determine the efficiency of the more roughly finished, less expensive, but harder worked American locomotive as compared

with the more highly finished, supposedly more durable and certainly more expensive and generally easier worked English engine. There is no doubt that the test will be fairly conducted and the results made known without reserve. If, after taking all the questions which determine economy into consideration, such as first cost, hauling capacity, fuel and oil consumption, repairs, and length of useful life, the American machine proves to be more economical, the English locomotive builders will find that the battle for supremacy is on in earnest, and that in their own exclusive territory.

TUNNELS VERSUS BRIDGES FOR RAPID TRANSIT.

The craze for building bridges, and \$15,000,000 bridges at that, which has taken possession of the gentlemen who just now control the expenditures of the city of New York, was forcefully rebuked by the controller at a recent meeting of the Board of Estimate. About a year ago the Board committed itself to the construction of two bridges, between Manhattan Island and Brooklyn, one of which is to cost \$15,000,000 and the other \$13,000,000. A sum of \$50,000 was voted at the time for the preliminary expenses, and at the next meeting of the board a resolution was introduced authorizing a bond issue of \$2,000,000 on which to commence active operations. It was suggested by the controller in a very able address that action should be delayed in issuing bonds for construction, until the question of constructing tunnels in lieu of bridges could be thoroughly investigated. He presented reports upon the relative cost of tunnels and bridges, which had been prepared at his request by the Chief Engineer of the Department of Bridges, and the engineers of the Brooklyn Bridge and the new East River Bridge, which made out a strong case for the tunnels on the question of first cost and cost of maintenance.

It was stated that the tunnel beneath the East River constructed to carry the mains of the East River Gas Company is 10 feet 6 inches in diameter, or several inches larger than the City and South London tunnel, which is daily carrying a heavy passenger traffic. This tunnel according to the report could be duplicated to-day for less than \$500,000, or two such tunnels, one for east and one for west-bound traffic, could be built for about \$900,000.

A report put in by the firm who built the tunnel under the East River used by the New Amsterdam Gas Company stated that a double-track tunnel to carry the same number of passengers as could be carried on the proposed Manhattan Queens Bridge could be built for \$1,900,000, whereas the bridge is to cost \$13,000,000; and another tunnel, to take the place of the Manhattan-Brooklyn Bridge, would cost only \$2,500,000, as against a cost of \$15,000,000 for the bridge.

Another feature named by the controller was the great rapidity with which tunnels can be constructed, the East River gas tunnel having progressed at the rate of 100 feet per week. From this it is concluded, that a tunnel between Brooklyn and New York could be completed in two years from the letting of the contract. It was further pointed out that the great height of the bridges above the river called for costly condemnation of private property to provide for the approaches, whereas tunnels can be kept within the line of the city's streets; and, furthermore, that tunnels are not tied down by consideration of topography to particular locations, but may be located with a sole view to meeting the requirements of traffic.

While there is no disputing the broad truth of these arguments, they somewhat overstate the case in favor of the tunnels, and omit to mention compensating features in the bridges. On the question of cost there cannot be two opinions—the tunnel is cheaper. But it is not so much cheaper as Mr. Coler supposes; for, like the bridge, it must have lengthy approaches, which, in the very nature of things, will require condemnation of property to make room for terminals; unless, indeed, it is proposed to dispense with terminals altogether and connect direct with the underground system. Then, again, it is somewhat misleading to draw a parallel between a two-track tunnel accommodating railway cars only and a vast thoroughfare such as will be the new East River Bridge, with two steam railway tracks, two trolley tracks, two wagon roads, two broad sidewalks for foot passengers, and in all probability two separate tracks for bicycles. It would take at least four two-track tunnels to provide the same traffic capacity as this huge bridge with its clear width of 118 feet, and four such tunnels would cost not less than \$10,000,000, without any allowance being made for the approaches to accommodate trolley, wagon, and foot-passenger traffic. The object of the new East River Bridge, as stated at the time of its commencement, was to provide a broad thoroughfare across the river over which the surface, elevated, wagon, and foot-passenger travel might pass without interference of terminals or grades.

It seems to us that the situation can best be met by the provision of both bridges and tunnels, the former to connect the elevated and surface roads and the latter to unite the new underground system with the various transportation systems of Brooklyn. One of the

two proposed bridges would suffice for the present, and the \$15,000,000 it is proposed to spend for the other could be used to better advantage in the construction of three or more tunnels of the kind suggested.

OUR EXPORTS OF IRON AND STEEL.

The most gratifying feature in the growth of the iron and steel trade of this country is the fact that a rapidly increasing proportion of the product of our furnaces and mills is being shipped abroad. In spite of the greatly increased demand at home, due to the present era of prosperity, and despite the steady rise in prices, our exports continue to grow at an increasing rate. The first ten months of the present year show an increase over the corresponding months of 1898 of about \$20,000,000, bar iron exports, for instance, having increased in quantity by 100 per cent, steel rods by 30 per cent, and steel sheets and plates by over 100 per cent; the greatest increase being in wire nails, of which we sold nearly 200 per cent more than in the preceding year. Thus our exports of wire for ten months rose from 135 million pounds in 1898 to 219 million pounds in 1899; steel sheets from 48 to 109 million pounds, and wire nails from 24 to 56 million pounds. The largest increase in value was in the exports of machinery, which rose in value from 12 million to 15 million dollars; builders' hardware coming next, with an increase from over 5 million to over 7 million dollars. The total value of iron and steel exports was for 1898, \$67,290,560; and for 1899, \$86,162,258. The present indications are that we shall sell to the outside world over \$100,000,000 worth of iron and steel and manufactures therefrom for the whole calendar year.

TROPICAL PRODUCTS OF OUR NEW POSSESSIONS.

The commercial possibilities which await the tropical island territories which have come into closer relationship with the United States during the past year in supplying a permanent and growing market in this country are suggested by the figures which the Treasury Bureau of Statistics has obtained of the importation of tropical and sub-tropical products into the United States during the ten months of the present year, compared with that of the corresponding months of the preceding year. They amount to no less than \$280,000,000, or an average of over \$1,000,000 for each business day of the year. The figures include raw silk, tea, rice, and the small portion of sugar which is manufactured from beets; but even if these be omitted, the total which would be clearly entitled to be classed as tropical products would exceed \$250,000,000 annually, including sugar, coffee, India rubber, fibers, tropical fruits and nuts, cacao, tobacco of finer grades, spices, dye woods, cabinet woods, etc. Curiously enough, all these articles can be and are now produced to a greater or less extent in the islands in question, sugar cane being grown in large quantities in Cuba, Porto Rico, Hawaii, and the Philippines. Coffee is successfully grown in all of the islands in question and at one time was a very important crop in Cuba as at present it is in Porto Rico, Hawaii, and the Philippines. Fibers of which the importations in the present year will amount to \$20,000,000 in value can be readily grown in all of the islands. The Philippines are already supplying the most important feature of our fibers, Manila hemp, which alone in the present year will amount to about \$6,000,000 in value.

THE AUTOMOBILE CUP.

The cup which has been recently presented to the Automobile Club, of France, by Mr. James Gordon Bennett is to inaugurate a series of yearly international contests between the different clubs of Europe and America, the winning club to hold the cup until beaten, as in the yacht races. This will form a yearly event which promises some interesting sport, as there is no doubt that the cup will be warmly contested by the different clubs. It is now in possession of the Automobile Club, of France, who will hold it until the first contest decides the winner. A series of rules have been established for the conduct of the races; the following is a résumé of them:

The cup may be competed for by all the clubs now on the official lists, which includes those of Belgium, Austria, Italy, Great Britain, Germany and the United States. Any club not on this list may be accepted by a majority of the clubs above named. To enter the competition, a letter should be addressed to the president of the club holding the cup, in which will be stated the number of vehicles to be entered, and other necessary details. The time fixed for the races is from the 15th of May to the 15th of August. Each club may send from one to three automobiles, these to belong to the class known as "voitures," as specified in the rules of the Automobile Club, of France, for 1899. According to this they should weigh, empty, more than 400 kilogrammes, and carry at least two persons, these placed side by side. A weight of 70 kilogrammes is allowed per person, this being regulated by the addition of ballast, as usual, to make up the 140 kilogrammes total. The 400 kilogrammes, representing the weight of the vehicle empty, is exclusive

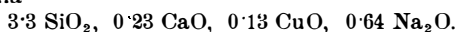
of combustibles, accumulators, water, baggage, etc. One of the rules is that all the automobiles entering the contest should be constructed in the countries represented by the different clubs. They are to be conducted by members of these clubs, the two places being occupied during the whole time of the race.

A committee of supervision is to be formed, and for this each club will be represented by a delegate; the donor of the cup is an honorary member of this committee. The necessary officers will be appointed, and also the starters, judges, timekeepers, etc.; these latter are not necessarily chosen from among the members. The races will be run over a route of 550 to 650 kilometers, with stages of not less than 150; they are to take place in the country whose club holds the cup for the year in question; if desired by this club, the races may be held in France, starting presumably from Paris. This will no doubt be carried out in a number of cases, on account of the fine roads in that country and from the fact that Paris, besides being a local center, has all the facilities for the care of automobiles.

Among other rules the most important is naturally that which concerns the winning of the cup; this is decided by the automobile which first crosses the line, and the club it represents will be declared victor. All communications in regard to these contests may be addressed to the secretary of the Automobile Club, of France, Place de la Concorde, Paris.

ANCIENT EGYPTIAN PORCELAIN.

It has often been a subject of question as to whether a veritable porcelain has ever been made by the Egyptians, the term including products which shall be compact and translucent. The French savant Brogniart, in his treatise on ceramics, concludes that all the samples of porcelain found in Egypt are of Chinese fabrication. M. Le Chatelier has lately made some interesting researches in this direction and has presented his results to the Academie des Sciences. Among the samples given him by an archæologist he has found a fragment of a funerary statuette coming from Sagarah, which he pronounces to be undoubtedly of porcelain; its hieroglyphics leave no doubt as to its fabrication in Egypt. The paste is translucent and of a pale blue color; in composition it presents marked differences from that of china. It is a veritable soft porcelain, its blue color being due to the addition of a small amount of copper. The experimenter has been able to reproduce a substance which resembles this very closely by making a paste of ground sand, 55 parts; white clay, 5 parts; and a special blue glass, 40 parts. This latter was made up according to the formula—



This paste when baked at a temperature of 1,050° C. yields a pale blue mass which turns to green when the temperature is raised above 1,200°. It is to be remarked that by reason of the feeble proportion of clay in the composition, the wet paste is plastic only in a feeble degree and for this reason could not be used for molding objects except those which took a compact form, such as the statuettes referred to.

RAILWAY SAFETY APPLIANCES.

The Interstate Commerce Commission, on December 6, gave a hearing to the representatives of the several railway companies, asking for a further extension of the time allowed them to equip their lines with safety appliances, under the act of March 2, 1893. Two years ago the Commission granted an extension until January 1, 1900, and the present extension desired is one year. Representatives of a hundred railways were in attendance, as were also representatives of labor organizations. The President of the Baltimore & Ohio Road, acting as chairman, representing eighty-eight other roads, having 80,000 miles of line, made the opening argument. He said that on June 1, 1899, 211,268 freight cars out of a total of 2,268,000 engaged in interstate commerce were not equipped with safety appliances, but since that time the number has been reduced to between 150,000 and 175,000. He stated that the railroads had done as well as could be expected, and some of the cars not equipped were so old that they would go out of service within the coming year, and the present withdrawal of 175,000 unequipped cars would practically paralyze interstate commerce. Other railroad officials also spoke, advocating an extension of time.

"ADVANCE SHEETS" OF THE GERMAN CONSULAR REPORTS.

To satisfy the numerous demands from German manufacturers, exporters and Chambers of Commerce, for an improvement in the information service of the German Consular Bureau, the Imperial Government has recently begun to publish pamphlets containing extracts from Consular Reports and other interesting matter. It is entitled "Advices for Commerce and Industry," and is something between the daily "Advance Sheets" issued by our Department of State and the monthly "Consular Reports." It is very gratifying to know that our Consular Reports and methods are considered abroad to be worthy of emulation.

NEW YORK'S TRADE IN WILD ANIMALS.

With the approach of cold weather all wild animals move into their winter quarters, and following the custom of their class the animals held in captivity in museums and circuses take up their abode in warm, steam-heated cages prepared for them. During the summer months many of them have been traveling about the country on exhibition, and others have been browsing in the numerous parks and private summer menageries just outside of large cities. The demand for wild animals for small parks in summer is quite general, and dealers in wild creatures make quite a fair profit in renting them out during the dull season. But as winter approaches, most of the animals return to the cities for exhibition in their regular quarters, where an eager public is always willing to pay a small fee to gaze at them.

The trade in wild animals has been unusually brisk for several years now, and the importations have steadily increased. In spite of this, however, prices instead of advancing for most of the animals have fallen; the reason for this is attributed to the fact that expeditions for capturing wild animals in their natural homes are more numerous than ever before, and they are better equipped for their work than in the past. Consequently more wild animals of nearly every description come to the civilized countries in captivity than in the days of Nero, when imperial Rome boasted of thousands of wild animals caged in its confines. While it is generally reported that many of our wild beasts are rapidly being exterminated, it is nevertheless true that they will never become extinct so long as their kind can be bred in captivity. This is now an accomplished fact with nearly all of the birds and animals.

This success of breeding in captivity is noticeable among lions in particular, and from present indications there is little danger of these felines becoming extinct. The importation of lions has almost ceased because it is cheaper and easier to breed them in captivity. Formerly an importer of fine lions could calculate upon getting \$5,000 for a good specimen, but to-day young lions bred in captivity are almost a drug in the market. The only demand for imported lions is to keep up the stock of the breeding ones, or for very large, powerful creatures, for it is noticeable that the tendency in cage-breeding is for the animals to degenerate in size and ferocity. Tigers do not take as kindly to cage life as the lions, and they do not breed so satisfactorily in captivity, and considerable numbers are imported every year. Elephants do not breed well in captivity, not more than two or three ever having been bred in this country, but the importations of these animals is so large that the prices obtained for them have dropped from \$10,000 to \$1,500 to \$2,500 each.

Numerous as monkeys are in this country, they are not bred here, as they do not breed well in captivity. They are so easily obtained in the country south of us, however, that prices obtained for them are merely nominal, and there is little danger of their immediate extinction. In their native countries they multiply so rapidly that the supply always keeps well up to the demand. Among the highest priced animals of to-day are the rhinoceros. There are quite scarce, and they do not breed in captivity. There are probably not more than half a dozen in number in this country; all were bought years ago at good round sums. Thus the full grown one in Central Park cost the department \$7,000, and a similar sum was paid for the fine African specimen in the Philadelphia Zoo. The most recent purchase of a rhinoceros was the full grown one for Barnum's circus, which cost the proprietors \$7,250.

The hippopotamus is another extremely rare and expensive creature, and sales of these African products are so few that it is difficult to quote a price for them. It is seldom that dealers have a good specimen to sell, and few private circuses could afford to give the prices that would be demanded. The hippopotamus born in Central Park is the only instance of these animals breeding in this country. Had this baby hippopotamus belonged to a private show, it would have made a fortune for its owners.

Snakes and birds form a large part of the animal importer's business. These creatures come in great numbers from India, Africa, and South America. The public is peculiarly fascinated by snakes, and they are among the most popular creatures exhibited. The best specimens of reptiles come from India, and a snake twenty feet or more in length is worth considerable money. In a cage it is the size of the snake more than its venomous qualities that attract, and a large boa constrictor or python is worth more than a rattlesnake of smaller size.

Exporting wild animals was formerly quite an extensive feature of the trade in these creatures, but owing to the scarcity of our large animals this feature of the business has fallen off. A young American bison can now be exported and sold for \$1,000, and American elk, moose, and caribou have good market demands in Europe. Our Florida diamond-back rattlesnake and the alligator have a fair market demand abroad, and good specimens are occasionally shipped to foreign dealers to fill orders. G. E. W.