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NEW YORK, SATURDAY, DECEMBER 20, 1902.

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.

THE TRANSPORTATION PROBLEM IN NEW YORK CITY.

The extraordinary congestion of its passenger traffic is the most serious problem confronting the city of New York, and particularly that portion of it that is embraced by Manhattan Island. We had all of us hoped that with the completion of the electrical equipment of the street surface and elevated lines, there would be a marked loosening of this congestion; but in this we have been disappointed. Not only has there been no improvement, but the congestion has appreciably increased; indeed, there has never been a time when the means of travel appeared to be more helpless to meet the demands imposed upon them. Go where you will, north or south, east or west, at street level or on the elevated system, there is to be found, during the rush hours, a congestion that baffles description, and can only be appreciated by those who are subjected to its miseries morning and evening. We are speaking now merely of Manhattan Island itself. The chaos on the Brooklyn Bridge is too well known to call for any description here.

The city is just now reaping the bitter fruits of the want of foresight, or supine indifference (to say nothing of the political corruption) of former municipal administration. As far as the Rapid Transit Subway is concerned, it would have been open four or five years ago had it not been for political influence coupled with the opposition of a few small-minded shopkeepers, who were afraid of a temporary loss of trade during the work of construction. As it is, fully another twelve months must elapse before the system is even partially in operation, and it is due to the splendid energy shown by the contractor that we shall not have to wait nearly two years before the line is declared open. If trains are running by the first of January, 1904, the city will be indebted to Mr. McDonald, the contractor, for having pushed the work to completion nine months before the date named in the contract.

The fact of the matter is, that travel on Manhattan Island has always increased at a much greater rate than was anticipated; and, as a consequence, the provisions, great as they were, made for handling the traffic by opening new lines and improving the rolling stock and methods of operation of existing lines, have always been years behind the necessities of the city.

What are we going to do about it? Judging from the talk of the man on the street, and the more serious discussions of the question in the columns of the daily press, we are looking forward to the opening of the Rapid Transit Subway for a complete solution of the difficulty, and are forgetting that the capacity of the new line, after all, will be but a limited quantity, while the growth of passenger travel is proceeding at an ever-increasing rate. If we are content to sit still, satisfied with our \$35,000,000 effort, it will be but a comparatively short time before the Rapid Transit Subway, like the street surface lines and the electrified elevated lines, will be swamped by the volume of traffic that will roll in upon it. Very few of the citizens of Manhattan Island realize at what an astonishing rate our passenger traffic is growing. Ten years ago, the total number of passengers traveling north and south annually over the lines of the Metropolitan Street Railway Company on Manhattan Island was 175,000,000. In 1896 the total had increased to 255,000,000, and in 1902 to 465,000,000. Ten years ago the Manhattan Elevated Railway carried 216,000,000 passengers in the year. With the opening of, first, the cable railways, and then the electrical railways, by the Manhattan Street Railway Company, there was naturally a transfer of a large number of passengers from the elevated to the surface systems, so that, in 1896, the total elevated travel had fallen to 185,000,000. With the electric equipment of the elevated railroads, however, there was a return of travel to that system, so that, in 1902, the totals had risen to 215,000,000 passengers, or about what it was ten years before, when its only competitors were the miserable horse car surface lines, which

have since been amalgamated to form the admirable properties of the Metropolitan Street Railway Company. The total north and south travel obtained by adding the figures for the Metropolitan to those of the Elevated system are, for 1892, 391,000,000; for 1896, 440,000,000; for 1899, 553,000,000; and for 1902, 627,000,000;—an increase in ten years' time of 62 per cent. In addition to the north and south travel, there are some stupendous totals of east and west travel, which takes place entirely on the Metropolitan Street Railway system. Thus, in 1892, there was a total east and west travel of 61,000,000 passengers; in 1896, there were 80,000,000 passengers east and west; and, in 1902, the total had risen to 121,000,000. Adding the total east and west and north and south travel, we find that the growth during the past decade has been as follows: In 1892, the total number of passengers was 452,000,000; in 1896, the total had risen to 520,000,000; in 1898, it was 605,000,000; in 1900, it was 716,000,000; in 1901, the total was 785,000,000; while last year, it had risen to the vast number of 801,000,000, an increase, during a single decade, of 77 per cent.

Now to meet this growing traffic, although several new lines have been constructed, the chief provision has come chiefly from the improvement of existing lines, the small and slow-moving horse cars being replaced by commodious and swiftly-running electric cars; while on the elevated there has been an increase, due to the new electrical equipment, of from 20 to 30 per cent in speed, and of 20 per cent in the capacity of the trains, the latter due to the introduction of six-car in place of five-car trains. Although these improvements and extensions provided a large increase in carrying capacity, it was nothing like so large as the 77 per cent increase in the number of passengers; and hence we predict that by the time the Rapid Transit Subway is in operation, the whole of its four tracks will be taxed to their utmost to relieve the present situation, leaving practically no margin for the future expansion of travel in this city.

Now the lesson that is clearly written upon these statistics is, that we ought at once to make provision, on a far more extensive scale than we have ever done in the past, for the future growth of travel in this city. And since the surface lines have appropriated practically all the streets, and because, on account of their inherent ugliness, the construction of additional elevated roads is out of the question, it is evident that any additional lines constructed in this city must be built underground. Here we have unlimited space and opportunity, and the preliminary steps should be taken at once toward constructing a tunnel on the east side above Forty-second Street, either under Madison or Lexington Avenue; moreover by the time work has been begun on this line, provision should be made for the construction of additional tunnel lines extending the whole length of the island from the Battery to the Bronx, one to the west of the present Subway, and the other to the east of Third Avenue. Of course, we are fully aware that in providing the necessary funds for construction, there is the ever-recurring question of exceeding the city's debt limit, but this difficulty will be met, in part, by the natural increase in the assessed value of property, while the city could well afford to curtail its appropriations for improvements that are less urgently needed, in order to allow of a liberal apportionment for this, the city's greatest want.

A PROPOSED DUODECIMAL SYSTEM OF WEIGHTS AND MEASURES.

The American Society of Mechanical Engineers has apparently not yet given up the idea of combating the introduction of the metric system into the United States. As a kind of compromise between the existing system and the metric, Prof. S. A. Reeve recently proposed before the Society a duodecimal system, which takes as its standard the English yard. Upon the yard a system is to be reared, exactly as a system has been built up upon the meter. The divisions, however, are duodecimal to suit the duodecimal numbers. It is claimed that small units of length will be obtained which are exactly equal to those now in use in machine-shops. A unit of volume will be obtained corresponding with the meter, which unit is practically equal to the existing pint. This new pint, which is a cube measuring 3 inches on each edge, when filled with distilled water weighs within 2½ per cent of the present standard pound.

The standard yard multiplied by 1,000 (which is the duodecimal expression for 1,728 decimal) very closely equals the statute mile. Prof. Reeve believes that this new system of units is as beautifully correlated as are the measurements of the metric system.

So far as the influence of the proposed change on coinage is concerned, Prof. Reeve states that if the arithmetical notation and the standard of weights and measures unite in becoming purely duodecimal in character, the monetary system is bound to follow. The standard of value, the dollar, and all its unit representations would remain unchanged. All bills of five dollars or higher denominations would naturally be called

in, and their equivalent issued in denominations of three, six, dozen, gross dollars, etc. This process could be as gradual as desired. Under duodecimal notation five and ten dollar bills would be inconvenient, but they would be usable. The half dollar and quarter dollar would remain unchanged. The dime, the nickel and the cent would have to be retired. In their place would be issued fractional currency under the following plan:

1 dollar = 10 bits (one dozen bits of 8 1-3 cents value each).

1 bit = 10 groats.

1 groat = 10 grets (for purposes where the mill is now used).

The probable coins would be:

Silver half-dollar (= 50 cents) = 6 bits = 60 groats.

Silver quarter (= 25 cents) = 3 bits = 30 groats.

Silver bit (= 8 1-3 cents) = 1 bit = 10 groats.

Nickel half-bit (= 4 1-6 cents) = 6 groats.

Copper quarter-bit piece (= 2½ cents) = 3 groats.

Copper groat (= 0.7083 cent).

Change for a quarter could ordinarily be had in a single convenient denomination, that is, in three silver bits, whereas now it requires two denominations, dimes and nickels, to make it. The practical objections to relying upon nickels alone for changing quarters are obvious. The progress of business toward finer margins and lower prices is steadily making the cent too large for many retail transactions. The smaller value of the groat meets this need.

The duodecimal system, as proposed by Prof. Reeve, necessitates the introduction of two new numbers. They are inserted by him between the 9 and the 10. The first is a peculiar-looking combination of the figure 1 and the 0, and is called the dek; the second is like an inverted 3, and is called an eln. Thus when our decimal 10 is reached it signifies a dozen. Prof. Reeve has compiled some interesting new names for his duodecimal numbers, such as "dozone" (thirteen) "fitze" (five dozen), "twodz-nine" (two dozen and nine), etc. This, of course, brings in the use of the dek and eln, and he has "dedz" (dek dozen), etc.

RETURN OF THE JESUP SIBERIAN EXPEDITION.

After a two years exploration of northern Siberia, a part of the Jesup North Pacific exploring expedition has returned to New York. The expedition was headed by Mr. Waldemar Jochelson, a Russian scientist of great repute. The expedition visited regions never before reached by a white man, and found races of people of whom the civilized world knows as yet nothing. Mr. Jochelson and his party collected 15,000 specimens. The collection will be installed in the American Museum of Natural History, and will probably excel that of any other museum in the world. In one of the New Siberian Islands in the Arctic Ocean the tusk of a mammoth was unearthed which is without doubt the largest yet found. It weighs 220 pounds. Other tusks and bones of mammoths were brought from the Anadyra River. About 2,000 bone carvings, executed in a manner that would do credit to an artist of civilization, were gathered. Eight complete sets of iron armor, similar to that made by the early Japanese, are also included in the collection.

Mr. Jochelson states that the tribes which he studied in Siberia all possessed characteristics in common with the Indians of North America. That these tribes were not found before was due to the fact that they inhabited a remote region, and that they have nearly been wiped out by disease and starvation. Some of the tribes had legends, language, and customs almost identical with those of the American Indians. One great tribe, the Yukoghirs, has been reduced by starvation and smallpox from many thousands to seven hundred persons. It occupies the Kolyma district, which contains 14,000 square miles. The tribe has no reindeer, but uses dogs to a limited extent. Having nothing to ride, they walk. Women drag the sledges in winter. In summer the men and women dwell in tents of skins and boughs. In winter they live in wooden huts. The Yukoghirs are the remnant of a Paleo-Asiatic race, and are one of the small tribes which do not belong to the main stock of the Asiatics. Their physical traits are different from those of the Mongolians. They are a small, slender people, well shaped, with small round faces. Some of the women have fair, almost white, skin. Their religion is Shamonism. Natives of the coast tribes are often armed with rifles. They have plenty to eat and are independent. Old men and women when they become infirm are killed by their children, in response to imperative demands supposed to come from spirits.

A NEW TYPE OF AUXILIARY VESSEL FOR THE BRITISH NAVY.

One of the latest and newest acquisitions to the British navy was recently launched at Southampton. This is an ordnance vessel of very stout construction, specially built for the conveyance of heavy guns in reserve, and other ordnance stores. The hatch is of sufficient dimensions to accommodate the largest of

naval guns, being 52 feet long, while the hold is 80 feet in length. The vessel is 165 feet in length between perpendiculars, its beam is 26 feet, and its molded depth, 13 feet 8 inches. The engines and boilers are placed aft and are protected by wing bunkers. The ship is provided with a long, raised quarter-deck 70 feet in length, and a forecastle deck 26 feet in length. The engines are of the triple-expansion type, with cylinders 13½ inches, 20½ inches, and 31 inches in diameter by 24-inch stroke, indicating 500 horse power. Steam is supplied by one large single-ended boiler, constructed for 155 pounds working pressure.

THE HALL-MARKING OF GOLD AND SILVER IN ENGLAND.

There are probably few countries where the gold and silver manufacturers and the public are so protected, and all possibility of fraud rendered abortive, as in Great Britain. In England, no plate manufacturer is permitted to sell, and no member would even attempt to purchase a piece of silver or gold plate, that had not received the "hall-mark." This symbol is stamped upon every section of plate, and is an absolute guarantee of the purity of the metal. "Hall-marking" is protected by the legislature. Fraudulent hall-marking is so heavily-punishable an offense, that attempts to deceive the public by means of spurious hall-marks are practically unknown. Probably few articles can be so easily adulterated as silver and gold, and were there no such protection as hall-marking in vogue, the public would be extensively defrauded, as the purity of the metals cannot be determined by cursory examination, but only by elaborate testing.

Hall-marking gold and silver plate in England is an exceedingly ancient custom. In the whole of the United Kingdom there are only seven government assay offices—four in England, two in Scotland, and one in Ireland. Although the principal office is the Royal Mint, London, the most important and busiest assay office is that at Birmingham, the center of the jewelry industry of England, where enormous quantities of articles are stamped every day. The first statute passed authorizing the stamping of gold and silver with its carat purity, was enacted over five hundred years ago, and the main principles then laid down, are still in vogue to-day. The wording of the original law was as follows: "Because gold and silver, which is wrought by goldsmiths in England, is oftentimes less fine than it ought to be; because the goldsmiths are their own judges, be it ordained that henceforth every goldsmith put his mark upon his work, and the assay of the Touch belongs to the mayor and governors of the cities and boroughs, with the aid of the Master of the Mint, if there be such, putting the mark of the city or borough where the assay is." During the course of years, owing to the mayors of cities having become more deeply engrossed in more urgent municipal affairs, the task of testing plate originally assigned to them, has devolved upon the Goldsmiths' Company.

The standard of purity is governed by the legislature. Pure metal is estimated at 24 carats. But pure gold articles, owing to the softness of the pure metal, would be of practically no use for commercial purposes, so a certain percentage of alloy is permitted, the carat value being reduced correspondingly. Formerly there was only one standard in existence, and all articles which were not equal to this standard were destroyed. But in view of the demand for plate articles containing various proportions of metal, five standards of gold and two of silver have been authorized by the government. The five old standards for gold are 22, 18, 15, 12, and 9 carats respectively, in an alloy of 24 carats. Every article submitted to the Assay Office must correspond with one of these standards; otherwise it is not stamped, but is broken to fragments and rendered unsalable.

The Birmingham Assay Office employs 190 hands, a large majority of whom are women. The amount of jewelry stamped is considerable, and the work is carried out with remarkable thoroughness. For instance, in the case of gold and silver chains, every link is assayed and stamped, yet the fee is only 10 cents in the case of a gold chain, and 3 cents for a silver chain. Owing to the heavy business transacted at this office, the fees levied for hall-marking are only approximately one-third of those authorized by the legislature. No hollow plate ware less than .0076 inch thick is stamped, this being the minimum thickness stipulated by the office. Thin wares need not be stamped, nevertheless the retailer, if required by his customer, must get his goods stamped.

The plate is brought to the institution in a practically completed state. The manufacturer stamps each article with his own initials, and indicates upon a statement what the gold or silver carat value of the articles deposited is supposed to be. The goods are deposited at the office in the early morning and are fetched in the evening.

The plate is then taken in hand by the assayers. The maker's initials are first compared with those registered at the offices, the articles are examined to see if they are quite complete, and also to ascertain if the

amount of solder required to effect the necessary joints is not excessive. If these investigations prove satisfactory, a small portion of the metal is cut or scraped away, and this, which is called the "diet," is sealed up and reserved for the Master of the Mint, who periodically tests the metal and checks the work of the assayers. The article is then passed on to the testing room, where exactly five grains of it are weighed out with delicate scales, and wrapped in a thin sheet of lead ready for the assay.

There are two consecutive methods of testing gold, and two alternative processes for assaying silver. Formerly the metals were tested by simply rubbing the plate with a piece of hard, black, smooth stone, and then wetting the "touched" pieces with the tongue, which operation divulged the various tints that distinguish one rare metal from another. But this process is far too primitive nowadays, when metals can be so easily and closely adulterated, while too much also depends upon the judgment of the operator, for any reliable estimation of the purity of the metal to be gained, though it is still employed for certain purposes.

The testing process for gold, recognized by law, is that known as the "dry" process, but there is also another method known as the "wet," which is more efficacious and quicker than the former, and is indeed rapidly superseding it. The dry process is utilized in the testing of both gold and silver. The five grains of metal obtained from the article is rolled up in the small sheet of lead, and placed in a small cupel containing calcined bone. The vessel is then heated over a gas fire in an air furnace, the result of which operation is that the base metals alloyed with the gold or silver oxidize, and are absorbed by the calcined bone. The small pill of gold left in the cupel is then weighed, and by deducting its present weight from the five grains which it weighed before cupellation, the proportion of gold or silver in the plate can be ascertained. For testing silver by this dry method, nothing more is necessary, but as silver is alloyed with gold, a further operation is necessary to extract the silver from the rarer metal. The second operation is technically called "the parting," and consists of boiling the small pill of gold, which by the way has been treated with a quantity of silver to facilitate the dissolving of silver alloyed with the gold, in a platinum vessel containing nitric acid. This solution rapidly dissolves the silver, but exercises no effect upon the gold. When all the silver has been extracted from the gold, the latter metal is so brittle that it cannot be handled, and therefore has to pass through an annealing process, after which it is weighed, and, by comparing its present weight with the original five grains, a correct estimate of the quantity of gold in the assayed article is obtained.

In the "wet" testing process, so far only utilized for silver, the latter metal is plunged in nitric acid and dissolved, and solutions of iron and salt are added by means of graduated pipettes. Common salt may be employed, but better results are gained with sulpho cyanide. This test is based upon the principle that a certain quantity of salt solution will precipitate a certain quantity of silver before acting on the iron. Therefore, if the liquid in the glass vessel is not discolored by the iron, the vessel contains at least the standard quantity of silver. Then it is necessary only to compare the sample with one prepared for standard silver, and the assayer can immediately ascertain whether the sample is equal or below the standard.

After passing through the tests, the articles are stamped, or "hall-marked," as it is called. This process is simultaneous with the assaying. For gold articles, the standard marks are a crown and the carat number for the two highest carat standards—22 and 18 carats respectively—this number being followed by decimals representing the proportion of gold in the alloy for the 15, 12, and 9-carat quantities. The number is followed by the symbol or mark of the assaying office, which in the case of Birmingham is an anchor, while the year in which the assay was made is represented by a letter. At last come the manufacturers' initials. Although the hall-marks are stamped boldly upon the article, some makers are agitating for them to be imprinted with still bolder marks, and also for the addition of further marks, as customers are always guided in the choice of wares by the hall-mark, knowing full well that the article is as represented, and that no fraud is being practised. By the foregoing series of marks it is possible to ascertain by reference to the hall-mark, the manufacturer, the year of assay, quality of gold, and the office in which the article was assayed. Last year 407,698 ounces of gold, and 3,272,950 ounces of silver were hall-marked at Birmingham.

Every article submitted to the Assay Office is returned marked. If it does not correspond to the manufacturer's statement of the carat value, it is smashed to pieces, and returned to the manufacturer, in fragments to be remade. Under no circumstances whatever is gold or silver plate delivered from the Assay Office without the hall-mark. If a private person wishes to ascertain the carat value of a piece of gold or silver plate, procured abroad, and submits it to the Assay

Office to be tested, it is duly assayed, and the owner informed of its carat value, but if it does not correspond to one of the standards, no matter what its value may be, it is smashed and returned to the owner in pieces. Last year 2995 ounces of gold plate, and 3804 ounces of silver plate were destroyed for being under the manufacturers' statement values.

Extreme precautions are observed to prevent fraudulent hall-marking, or the stamping of articles with a higher carat mark than they actually are; and to prevent ruthless breaking owing to deficiency in carat value. One assay master and two warders are compelled by law to be present when any plate is being marked or broken. To prevent tampering with the hall-marking dies, they are always kept in a strong box, whenever they are not in use, fitted with three different locks, the key of each lock being retained by one of the trio. These precautions are absolutely necessary because the manufacturer is entirely at the mercy of the assayers. The manufacturer suffers no loss from the abstraction of the "diet" for the master of the mint, but the amount is voluntarily surrendered by the office.

SCIENCE NOTES.

Through the liberality of George W. Perkins, of New York, an expedition was sent by the New York Botanical Garden to Nova Scotia and Newfoundland. The expedition has secured 12,000 specimens of over 2,000 species of plants. A third of the specimens are marine plants.

The recent expedition sent to north Montana by the New York Botanical Garden has done much in the interest of scientific botany. Many Alpine forms of plants were discovered. Ample statistics were secured establishing the variation of plant life caused by temperature and latitude, and of the general vertical distribution of flora.

Recently at an auction sale in London which was judiciously advertised, an egg of the great auk was put up which after some lively bidding was knocked down for \$1,260. That is said to be a very good price. But auk eggs have been sold in London for as much as \$1,500. The reason for these enormous prices is naturally to be found in the scarcity of the eggs. The bird is extinct, and not over seventy of its eggs are in existence.

Charles Rothschild has, perhaps, the most curious museum of any collector in Europe. At Tring Park he keeps thousands and thousands of fleas. The museum is in charge of Dr. Jordan. Every animal and bird has its particular kind of flea. Very many have several different kinds. It clearly follows that the gathering of fleas affords diverse material for the collector. In the Rothschild collection is one mole flea (*Hystrichopsylla talpæ*) a fifth of an inch in length.

Charles Gilmore, of Laramie, and E. B. Cavell, who have been at work all summer in the fossil fields at Medicine Bow for the Carnegie Institute at Pittsburg, have dropped their work for the winter. The summer netted them about a carload of fossils, which will be shipped to Pittsburg. The finds were numerous and valuable, though no astonishing results followed their labors. Walter Grainger, who is at work in the Medicine Bow field for the American Museum of Natural History of New York, also has a carload of fossils to go forward, but he will remain in the field for time being. He reports a large number of curious and valuable finds, and expects to return to this field next summer.

Hungarian dentists and chemists claim to have discovered a valuable local anæsthetic, an alkaloid, nervocidine, the hydrochloride of which is stated to have similar properties to cocaine, but to produce a much more lasting anæsthesia. The base is obtained from an Indian plant, "Gasu Basu," the properties of the leaves of which were first discovered by D. Dalma, who successfully employed them in painful pulpitis with such good results that he reported that the drug might displace arsenic for dental purposes. B. von Fenyvessy has investigated the properties of the alkaloidal hydrochloride, as prepared by Dalma, which is a yellow, amorphous, hygroscopic powder, readily soluble in water. It produces marked anæsthesia of the cornea in 0.1 or 0.2 per cent solution, which is very persistent, and a 0.1 per cent solution brushed on the mucous membrane of the cheek also gives marked anæsthesia. Stronger solutions, exceeding 0.5 per cent, produce irritation of the cornea, and a 2 per cent solution causes ulcerative keratitis in dogs and rabbits, which lasts ten days, during which period the anæsthesia also lasts. It does not appear to produce anæsthesia by subcutaneous injection. Its general effect is that of a paralyzing poison. Although its anæsthetic effect is much more prolonged than that of cocaine, the length of time necessary before this effect supervenes, the irritation caused by the drug, and the toxic symptoms it produces, do not point to the probability of its being of general service, except perhaps in dental practice.—Lancet.