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NEW YORK, SATURDAY, FEBRUARY 23, 1901.

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.

EAST RIVER RAPID TRANSIT TUNNEL.

The Rapid Transit Commission, having approved its engineers' plans for the extension of the subway system beneath the East River to Brooklyn, is now seeking the necessary powers to proceed with the construction. We trust that the required authority will be secured, and with the least possible delay. The present Rapid Transit scheme terminates in a four-track loop beneath City Hall Park. The proposed extension, the estimated cost of which is about $8,000,000, will reach from City Hall Park, New York, to the Borough Hall, Flatbush Avenue, and the Long Island Railroad depot in Brooklyn.

The new structure will consist of a two track subway which will extend from the City Hall, beneath Broadway to Pine Street, where it will change into two two-track structures, separated by a partition wall, each of which will contain an up and a down track. At Battery Park one of the two-track structures will swing into a return loop terminal. The other structure will turn to the left, and on a descending grade will connect with two 15-foot parallel cast iron tubes, by which the tracks will be carried beneath the East River. On the New York and Brooklyn sides of the river, the tracks will have an elevation of 66 feet and 68 feet below mean high water. They will descend from either side to a sump below the center of the river, where the elevation will be 91 feet below mean high water, the respective levels being 31, 47 and 32 feet below the bottom of the river. The tubes will be carried on the Brooklyn side beneath Joralemon Street to the Borough Hall, where they will connect with two subways, one of which will swing into a terminal loop encircling the Borough Hall, the other extending below Fulton Street. Above the terminal loop of the tunnel tubes already mentioned as encircling the Borough Hall, there will be another loop which, after making the circuit of the Hall, will also run up Fulton Street, ultimately connecting with the single track from the lower loop, and forming a two-track structure which will extend to Flatbush Avenue, and from there to the Long Island Railroad.

The sum of $8,000,000, which this extension is to cost, might seem, at first thought, to be a heavy addition to the cost of an enterprise for which a sum of over $35,000,000 has already been authorized; but we must remember, first, that the efficiency of the Manhattan Island subway will be vastly increased by this extension; and, secondly, that all provisions for rapid transit in a city which grows as rapidly as New York, must be built with an eye to the enormous traffic requirements of the future.

SIR WILLIAM WHITE AND THE NEW ROYAL YACHT.

A notable instance of the celerity with which a host of detractors will rush into print in the effort to ruin what they consider to be the shaken reputation of a truly great man is seen in the case of Sir William White, the Chief Constructor of the British navy. In all the world there is not to be found a naval architect who is responsible for such a vast amount of work as is carried out under the Chief Naval Constructor of Great Britain, and it must of necessity follow that, in a position which entails so much routine official work, he is unable to do more than lay down the broad features of new designs, and must leave the details to his subordinates. It seems that in the construction of the royal yacht, the distribution of weights was such at the time of her launch that she proved to be unstable. The error was traced to one of the staff, and subsequent reconstruction in the way of cutting down the topmasts, funnels, etc., so far corrected the instability of the vessel that at her recent trials, in which she made about 21 knots an hour, she proved to be an excellent seaboat in all kinds of weather. The attack upon Sir William White was indignantly resented in naval circles, and nowhere more so than in the United States navy. Several of our naval constructors, including Constructor Bowles, the coming Chief Constructor, were at one time students of Sir William White in England, and their strong testimony to his abilities has been indorsed by Charles Cramp, president of the well-known shipbuilding firm of that name. As a matter of fact, the modern navy of Great Britain, dating from the era of the Naval Defense Act, is entirely of his designing, and the correctness of his theories is proved by the fact that the type of ship to which he has clung steadily, with few variations, for the past fifteen years bids fair, at least in its general features, to become general throughout the world.

TESLA'S WIRELESS TELEGRAPHY.

Long distance wireless telegraphy, if we may believe the current story of its latest developments, is about to take an enormous stride both in its reach and its rapidity, for we are shortly to be in possession of a means of wireless telegraphic communication across the Atlantic, by which we can send messages at considerably greater speed than is possible by the present cable. The feat is to be accomplished by the assistance of that "oscillator" with which the name of Nicola Tesla is so well identified. We are, all of us, fairly well familiar with the Marconi system in which Hertzian waves are utilized, the transmission of currents being aerial, or to speak more correctly ethereal. Mr. Tesla, however, manipulates his recently discovered "stationary electrical waves in the earth" by setting up "vibratory currents which can be transmitted through the terrestrial globe, just as through a wire, to the greatest distances."

According to public reports, Mr. Tesla during the past year or so has been devoting his time chiefly to the improvement of his generator and receiver. He claims to have so far perfected the system that by means of proper "tuning" he can direct his messages infallibly to any particular receiver. It seems that the primary purpose of his recent Pike's Peak experiments was a series of elaborate tests, the result of which satisfied Mr. Tesla that when a suitable plant is built, he can establish wireless electrical communication between the old and the new world. The system, as described in interviews with the author, involves the production of electrical vibrations of enormous frequency, a transmitter which receives the current, intensifies it, and sends it to the earth, through which it flows in every direction. A receiver which is adjusted so that its vibrations are in tune with those of the transmitter is set up, say in London, Paris or Berlin, picks up the vibrations, and intensifies them so that they become decipherable at the receiving station. These electrical vibrations are recoverable at any spot on the surface of the globe, provided that the Tesla receiver be at hand to pick them up, and intensify them to a point at which they may be read.

HIGH-SPEED PASSENGER STEAMERS ON THE HUDSON

It is somewhat surprising, in view of the excellent facilities for a rapid steamer service afforded by the Hudson River, and the inducement which is offered by the existence of many populous residential suburbs along the shores of the river, that there has been no attempt as yet to manipulate such a line for the benefit of suburban residents. It was only at the close of last year that preliminary steps were taken looking to the provision of a service of this kind, and the scheme has now reached a stage of its development at which some facts regarding the vessels which are to be employed will be of interest. There will be three twin-screw vessels, built from designs by Mosher upon the lines of the remarkable type of craft with which his name is identified. They will be 130 feet in length, 15 feet in beam, with a depth of 7 feet, and an extreme draft of 4½ feet. They will have two twin-screw, quadruple-expansion engines of 4,000 horse power, and the displacement, with an average load on board, will be about 100 tons. There will be a large general saloon, and a smoking saloon, and a seating capacity for 250 passengers. The lines of the boats will be similar to those of the "Ellide," which is credited with a speed of 34¾ knots an hour on the measured mile; and while these steamers will be capable, when the engines are run at their full power, of making an equal or even greater speed than this, the present arrangements are to run them at a speed which under normal circumstances will enable them to make the trip from Nyack to 22d Street, New York, in one hour. A steamer will leave every hour from six o'clock in the morning to eleven o'clock at night, and calls will be made at Rector Street, 22d Street, Yonkers, Dobbs Ferry, Tarrytown and Nyack. The landings will be made at the ends of the piers and there will be special provision made to allow a clear course for the steamers in approaching and leaving the docks. We think it is more than likely that such a service will prove extremely popular during at least six months of the year, and its successful maintenance will mark a very important step in the development of high speed travel by water.

SMOKELESS POWDER AND GUN EROSION.

The Board of Ordnance of the navy is to be congratulated on the excellent results obtained with the multi-perforated smokeless powder, the perfecting of which has involved a great amount of investigation and experiment. The advantages of smokeless powder are well known to the public; but it is not so well understood, perhaps, that these advantages, in the case of some of the best-known smokeless powders, are largely offset by certain serious defects, chief among which is their destructive action upon the interior surface of the gun, which is shown in a pitting or eating away of the bore. The direct result of this erosion is that, the obturation being imperfect, the gases escape past the shell, and there is a consequent falling off of the muzzle velocity below that which theoretically should be produced by a given charge of powder. This erosion is most marked in the case of smokeless powders that contain a large percentage of nitroglycerine, the well-known cordite which contains over 58 per cent of this explosive being, perhaps, the chief offender in this respect. The temptation to include a large percentage of nitroglycerine is due to its enormous energy; but it has always been recognized that if a powder could be produced that contained a minimum of nitroglycerine, and still possessed high ballistic qualities, it would be an ideal powder. It is satisfactory to know that the ordnance officers both of the United States army and navy have developed powders which are so far superior to cordite, that the army smokeless powder contains only 25 per cent of nitroglycerine, and the navy powder none at all, the latter being an all-gun-cotton product.

It is with this powder that the Board of Ordnance has secured the remarkable ballistic results which, from time to time, have been chronicled in the SCIENTIFIC AMERICAN. Thus, the new 12-inch naval rifle has shown a velocity of 2,854 feet per second, while velocities of 3,000 foot seconds and over have been obtained with the 6-inch, 4-inch and 3-inch 50 caliber guns, and in every case these high velocities have been obtained without exceeding the designed chamber pressure of 17 tons to the square inch, and, what is equaly important, without any sacrifice of the mass of the projectile.

So much for proving ground results. Can they be sustained in regular service; or will there be, as in the case of the naval guns of at least one foreign power, a gradual falling off in velocity, due to erosion and enlargement of the bore? It is with considerable satisfaction that the Ordnance Bureau is able to certify that no such deterioration will result from the prolonged use of its new powder, since a 4-inch rapid fire gun at the Indian Head Proving Ground has been fired 661 times, and a 5-inch gun 636 times with the smokeless powder, without causing sufficient wear to be detected by micrometer measurement.

Another defect to which smokeless powders are liable is that when they are in storage, or in the magazine, for a considerable length of time, they are liable to undergo a chemical action which results in a great falling off of energy. Powders that depreciate with age give unreliable results in service, since it can never be determined just exactly how the gun sights should be adjusted. Should they be adjusted to suit the full velocity of the powder when that velocity is actually one or two hundred feet per second below the designed velocity, the shell will fall proportionately short of the object. Hence, stability is a feature which is second only in importance to that of erosion, and it is gratifying to learn from the Department that our navy powder has proved to be thoroughly stable, a sample of powder which had been in the magazine for two years having shown at a recent test that there had not been the least loss of its ballistic qualities, nor any evidence of chemical alteration.

PRIZES FOR INVENTIONS A LEGITIMATE ENCOURAGEMENT

The closing year of the nineteenth century was a remarkable one in the field of invention, not only as regards the number of patents issued, but for the remarkable inventive ability displayed. It is gratifying to note the increase in the esteem in which inventors are being held, and the substantial rewards which crowned many of their efforts. They can reap not only the full benefits to be derived from their inventions, but they can also compete for the remarkable series of prizes which have been offered by associations and individuals in the hope of improving our economic condition. The great prizes of 1900 were the Pollak prize for life-saving devices, which was $20,000; the prize offered for labor-saving machinery for the sugar business, made by the Hawaiian Planters' Association, the amount being $6,500, and a number of prizes of smaller value. There is every indication that the year 1901 will be even more fruitful in liberal offers for inventions than the year which preceded it. Only $2,000 of

the Pollak prize has been adjudged to those who exhibited their devices; consequently there is a large sum to be awarded in September, 1901. It has not been decided as yet to whom the prize of $6,500 for improved sugar machinery will be given. During 1901 the Nobel prizes will be awarded, and in three of them the inventor may find his opportunity. One prize will be for the invention or discovery made in the domain of physical science, another prize in chemistry, and a third in physiology and medicine. The value of each of these prizes is very large, being $80,400. It should be remembered that in none of these cases does the inventor part with any of his rights, and his receiving a prize does not interfere in any way with the material reward of the inventor. The recent success of Prof. Pupin in selling an invention for nearly $500,000 is fresh in the memory of all.

It is becoming quite customary for societies and associations to offer prizes for what might be termed minor discoveries. For instance, the chief topics of discussion of the Chemical Congress, at the recent meeting held at Hanover, was a substitute for benzine, and last autumn the subject came up once more at the meeting at Cassel, and it was decided to offer a premium of $250 for an effective substitute for benzine, or for means for rendering it less dangerous, the objectionable points about benzine being its inflammability and volatility and the danger of poisoning the atmosphere.

At first sight it might seem as though this was a very small prize for a society to offer, but, as it has already been stated, the inventor does not, by accepting a prize of this nature, cede any of his rights, which, in the case of a substitute for benzine, would undoubtedly bring the inventor large wealth. The Bressa prize of $1,920 is offered by the Académie Royale des Sciences de Turin, and the competition is open to savants and inventors of all nations for the most important discovery in the arts and sciences during the period 1897-1900. The aggregate of prizes offered is by no means inconsiderable, and tends to stimulate invention in a healthy manner.

ARE YOU ABOUT TO BUILD?

The Building Edition of the SCIENTIFIC AMERICAN occupies in its field the same important position held by the parent paper in its own sphere of activity. The scope of the Building Edition has been enlarged by the introduction of many new and valuable features. No periodical in the United States can claim more distinction as regards its mechanical execution than this beautiful monthly magazine, with its fine views of exteriors and attractive interiors. The policy of showing only executed work is strictly adhered to, thus differentiating it from many of its contemporaries. The illustrations show how the house actually looks, the plans show how it is arranged, the description of the plates tell how it is built, who owns it, who is the architect, and who are the contractors, and when attainable, its cost. This information is all valuable to those about to build, as well as those who are interested in the subject from a professional and financial point of view. There are many interiors and examples of home decoration, showing what can be accomplished on various scales of expenditure. Other plates are devoted to interesting subjects at home and abroad, such as public buildings, churches, libraries, fine iron-work, stables, etc. Groups of cozy corners, doors, windows and other similar features will be published throughout the year.

The literary contents comprise a number of new features which will enhance the value of the magazine many fold. "Monthly Comment" is devoted to current events. The editorials deal in a practical manner with the problems which confront the architect, contractor or owner in the design, execution or improvement of the house. As wide a range of the subjects as possible is given. "Interviews With Architects" forms a new feature of the year, and gives the ripe experience of men standing high in their profession in a most interesting manner. "New Books" will deal with the latest publications, and the reviews will be discriminating. The Correspondence column will tend to keep the Editor and reader in close touch. Any question relating to subjects of architecture, building, sanitary science, etc., will be answered and a cordial interchange of views between readers encouraged. "New Building Patents" will contain a digest of patents relating to building and sanitary science. Each month a considerable space is devoted to a summary of current articles within the purview of the paper. This digest will consist of condensations of long articles relating to building and also shorter notes, and the field covered will be a wide one. On the whole, the Building Edition merits the warm support of every one directly or indirectly interested in architecture or building.

ZENOBE T GRAMME.

Zénobe T. Gramme died near Paris on January 20, and in his death electrical science has suffered a great loss, as he was the inventor of the Gramme ring, which made the modern dynamo possible. He was born in 1836 in Belgium and in early life was a carpenter. He became interested in electrical construction, and in 1870 he improved on the toothed-ring armature of Pacinotti and devised the uniformly wound ring armature machine with which his name has ever since been connected. His dynamo, which was exhibited at the Centennial Exposition, 1876, attracted great attention. The commercial success of the machine was rapid. It was the first practical machine in which were combined the features of continuity of commutation, the self-exciting arrangement, good lamination in the armature core, and reasonably good proportions in the magnetic circuit.

OUR BUSINESS AND PERSONAL WANT COLUMN.

We would call the attention of our readers to our Business and Personal Want Column, which will be found on page 108 of our issue of February 16 and page 123 of the present issue. We have taken a new departure in connection with this column, which we think will be fully appreciated by manufacturers throughout the world and by all of our readers who are in search of information which they could not otherwise acquire.

The SCIENTIFIC AMERICAN has now become a center of information for thousands of readers, who apply for information regarding the particular line of manufactured goods in which they are interested—information which they are unable to obtain through the ordinary channels at their command. Our daily mail is flooded with letters inquiring as to who is the manufacturer of this and that article, or of some improvement on a certain machine, which the correspondent would like to buy if he could get into touch with the manufacturer.

We could, of course, give the person inquiring the name and address of one or two manufacturers in the line requested, but it occurred to us that it was only fair to our readers and enterprising manufacturers that we should endeavor to ascertain for the party inquiring the name and address of every manufacturer that we possibly could in the line desired, thus giving him a wide field for choice, and opening the way for pushing manufacturers to compete with some chance of success.

It will be seen at a glance that this column will open up a new and important field to manufacturers of all kinds. If they refer weekly to the inquiries in this column they may at any time find therein an inquiry for just the class of goods they deal in or manufacture. A letter to us, preferably accompanied by their catalogue and giving in brief as much information as is necessary, together with the number of the inquiry, will, in a short while, put them in immediate touch with the party who desires to buy the goods in question. We, in fact, act as a clearing house between the persons desiring information and the manufacturers ready to fill their wants.

We hope that our efforts will be appreciated to the extent that all manufacturers in the lines inquired for will assist us by weekly replying to these inquiries, as it may be the means of opening a greater field of trade than is now possible.

ZODIACAL LIGHT.

M. Leo Brenner has lately given an account of the observations on the zodiacal light which he has made at the Observatory of Manora (Austria). Very few persons have seen this phenomenon; in the northern part of the Continent it is usually quite masked by the lighting of the cities. In the south and in the tropical regions the phenomenon is more striking, but the writer has known many ship captains who have sailed around the globe for many years without having seen the zodiacal light. This phenomenon seems to have been observed only for the last 300 years, and the ancient writers make no mention of it; some have concluded from this fact that the light has only been visible in modern time, but this opinion is difficult to admit. It is generally supposed that the zodiacal light constitutes a clear and distinct phenomenon only in the tropical regions, and Humboldt says that at the Equator, at points of 9,000 to 12,000 feet altitude, it often exceeds in brightness the lightest part of the milky way. However, the author observes that at Lussin, from which he writes, at the sea level, the zodiacal light is generally from four to six times as intense as the milky way and often eight or ten times as bright; this can only be explained in two ways, either that the light is more intense in that region or that the milky way is less brilliant. There the zodiacal light appears at the most favorable times for its visibility, namely from January to March and also in September and October, as a pyramid of light whose base is at the point where the sun has set, while the point traverses the zodiac; at the summit the light is scarcely apparent, but it increases afterward and at a point opposite gives a second cone of light which is called "antizodiacal." This last phenomenon has been the object of observations since 1854, at which time it was examined by Brorsen; however, it was seen in 1803 by Humboldt. The author states that the brightness of the zodiacal light as he saw it was such that often in the main part and up to 40 deg. in height he could not see any of the stars with the naked eye; as to the antizodiacal light, which few observers on the Continent have seen, it appears three times as bright as the milky way, and thus his region seems to be especially favored in this respect. The spectroscope shows that the zodiacal light is reflected solar light, and the polariscope, by which the polarized light is separated from the ordinary rays, confirms this supposition. The green lines of the aurora borealis, sometimes seen in its spectrum, have been shown by Wright to belong not to the zodiacal light, but to aurores which are only observed by the spectroscope. Various theories have been proposed as to the formation of the zodiacal light, but none of these are conclusive.

SCIENCE NOTES.

Michael G. Mulhall, a noted statistician, died recently in London. He forecasted the twelfth American census within 95,000, showing how very precise and accurate statistical science can be in skillful hands.

The United States Weather Bureau was awarded a Grand Prix at the Paris Exposition. Gold medals were also awarded to Prof. C. F. Marvin for instruments, apparatus and appliances, and to Prof. A. J. Henry for cloud photographs. The Weather Bureau will make an extensive exhibit at the Pan-American Exposition.

Major Serpa Pinto, the fourth explorer to cross tropical Africa from sea to sea, died in Portugal a short time ago, his predecessors in the trans-African journey being Livingstone, Cameron, and Stanley. Pinto's journey lasted from November, 1877, when he started from Benguela, to March, 1879, when he arrived at Durban. His book entitled "How I Crossed Africa" is a record of original discovery and of fierce battling with the natives, of hair-breadth escapes, of perils from wild beasts and the depletion of supplies. He was a scientific explorer, which is more than can be said of many pioneers in geographical research.

The American Physical Society met during the holidays in Columbia University. At the morning business meeting the following names of officers for the ensuing year were chosen to be balloted for by the members, the results to be announced at the next meeting: President, Henry A. Rowland, of Johns Hopkins University; Vice-President, A. A. Michelson, of Chicago University; Secretary, Ernest Merritt, of Cornell University; and Treasurer, William Hallock, of Columbia University. The Councilors are Henry Crew, of the Northwestern University, and Edward B. Rosa, of Wesleyan University. After the business meeting six papers bearing on problems in physics were read by as many university professors.

A new species of mountain sheep has been sent from Dawson City to Director Hornaday, of the New York Zoological Society. This species is absolutely new to science, and is so strikingly different as to render its title to independent specific rank beyond question. Director Hornaday has named it the Ovis Fannini, in honor of Curator Fannin, of the Provincial Museum of British Columbia. In the Klondike region it is known as a "saddlebacked" or "piebald" sheep. Its head, neck, breast, and abdomen and inside of the forelegs are of a snow white. The other portions of the body are a brownish gray, giving the animal the appearance of being covered with a gray blanket. There are now 945 members of the society, an increase of 271 during the year. It is desired to increase the membership to 3,000. The total attendance of the year was 525,938, the largest daily attendance being on Decoration Day, 20,134. A motor road will soon be completed in the park, on which the society will operate its own motor carriages for the convenience of the public.

Macaroni is made of hard red wheat from the Black Sea, mixed with Italian wheat grown mainly in the plains around Foggia. This is ground into a coarse flour. The bran and husks are removed, and it is kneaded in hot water until it has the appearance and consistency of dough. It is then placed in a vertical brass cylinder eight or nine inches in diameter, the bottom of which is perforated with holes of various sizes, according to the product desired. The dough is placed in the top of the cylinder and is driven down by hydraulic pressure through the perforated plate, and is cut off by hand in lengths. It is then hung up on canes in the sun to dry. In the case of tubular macaroni and spaghetti, a conical blade is fixed in the middle of the dough to form the tube. This cuts through the dough, and the macaroni issues from the blade with a slit all along its length. This, however, shrinks together at once, and a perfect tube is made. Almost no macaroni is now made by the laborious hand process. There was for a long time a prejudice against machinery, but this has been overcome. The best macaroni comes from Torre dell' Annunziata. Nearly half a million boxes are sent annually to the United States.