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NEW YORK, SATURDAY, MAY 5, 1900.

REVIVAL OF THE AMERICAN MERCHANT MARINE.

At the present time the majority of the shipping trade of the world is in the hands of Great Britain. Less than half a century ago the leading position was held by this country, which not only possessed the largest tonnage, but was acknowledged to produce the fastest, and in every way the best appointed ships that sailed the high seas. To-day, our deep-sea trading fleet is not only insignificant in comparison with that of the leading maritime nations, but it is ridiculously disproportionate to the resources, the skill and the feverish energy of the nation under whose flag it sails.

The decline of American shipping dates from the Civil War, when the depredations of the Confederate privateers drove into the hands of other nations that portion of our carrying trade which it did not destroy on the high seas. The failure to rehabilitate our merchant marine is not to be attributed to lack of enterprise, but to the diversion of capital into fields where there was a more pressing call and a promise of more speedy results. At the close of the war the energy of the American people was so completely devoted to the internal development of the country by the construction of railways and the building up of industrial establishments, that no attempt was made to save the wreck of our splendid merchant marine, which was left to be completely broken up by the storm of competition which beat upon it with steady persistency.

There was another agency which contributed to our decline, working less swiftly, but, perhaps, with even more potent effect; we refer to the change in the materials of construction and in the motive power of modern vessels as exemplified in the steam-propelled iron ship. Great Britain was quick to adapt herself to the new order of things, and shipyards were reorganized, and multiplied with such rapidity that she at once assumed a position so commanding that it has never yet been disputed. Had the United States deferred her internal development for another decade, and put into the construction of rolling mills and shipyards the wealth and labor which she expended so liberally in covering this country with a network of railways, we think it is not unlikely that we would have held to-day the position now occupied by Great Britain.

At the close of the century we have reached a point in our industrial development where, great as is the extent of the country, large as is its population, production has overtaken and far exceeded the demand. We have built enough, and more than sufficient, railroads; our establishments in many lines of manufactures have a capacity considerably in excess of the demands of the home market; and we are now pushing out into a world-wide competition which, brilliantly begun, is full of even brighter promise for the future. Among the fields of national enterprise that excite our interest, we know of none that should appeal more strongly to our national pride than that of resuscitating our merchant marine and striving to regain, if not the leading position in the shipping trade, one that shall be at least fairly commensurate with our national importance. Among the beneficial results of the late war is the stimulus which it has given to the shipping industry. Our over-sea possessions and our ever expanding foreign trade are creating a demand, the reply to which is seen in the fine fleet of vessels, illustrated in this issue, which are now being constructed on the Delaware and the Clyde. While this activity, however, is gratifying, we must not for a moment imagine that it is on a scale that will do much towards placing us as a maritime people where we properly belong. This can only be accomplished by the adoption of some such sweeping measures as have enabled Germany to advance her shipping interests so rapidly that in the matter of speed, accommodation and size, the ships of its leading companies are probably the best in the world. Germany's success is due, very largely, to the fostering influence of a judicious system of subsidies; and there is a growing conviction that similar means would produce similar results in promoting the shipping interest of the United States.

The scheme which is at present before Congress provides that all American vessels shall receive a bounty of 1½ cents per gross ton for every 100 miles sailed up to 1,500 miles, and an additional 1 cent per gross ton for every 100 nautical miles additional. The building of fast vessels is to be encouraged by granting a subsidy of 1 cent per ton to vessels of from 1,500 to 3,000 tons measurement and 14 to 15 knots speed, and granting $\frac{1}{10}$ of a cent more for attaining a speed of 1 knot greater; while a steamer of 8,000 tons is to receive 2 cents per gross ton if she makes 20 knots an hour, and 2·3 cents per gross ton if she exceeds 21 knots per hour. It is provided that in earning these mileage bounties, a ship must carry at least half her full cargo, while the maximum amount to be paid out for speed premiums to vessels of over 20 knots speed is to be limited to $2,000,000 per year. The bill contemplates the admission to the United States register of vessels built in foreign yards, with the reservation that such vessels shall receive bounty rates only half as great as those paid to American-built vessels. They are also to be subjected to a limitation of ten years as the period for which the subsidies shall continue, whereas in the case of American-built ships, subsidies will be continued for a period of twenty years. Taking it as a whole, we think that if the stimulus of government subsidies is necessary, the provision of the bill as thus briefly epitomized are about the best that can be made.

The day is rapidly approaching when we shall be able to build ships upon the banks of the Delaware and upon the shores of the Chesapeake and San Francisco Bays, as cheaply as they are now built upon the Clyde, the Tyne and the Thames. We can already produce ships' plates and general structural material more cheaply than they can be made in England, indeed, we have already made shipments of the kind to the other side. How far our remarkable advancement in the steel and allied industries is due to government assistance, we do not attempt to say, but the fact is incontrovertible that the industries which have been thus encouraged have had a growth that is absolutely without a parallel. As to the policy of ship bounties, we have yet to find any substantial reason advanced to show why government assistance will not prove as great a stimulus to our shipping interest as it has been to the flourishing industries above mentioned.

THE SINGLE-RAIL SUSPENDED RAILWAY.

The most striking feature of the curious railway which is illustrated elsewhere in this issue, is its novelty, for as far as we know this is the first instance of the construction of a standard elevated railway of the true mono-rail type. The other so-called "mono-rail" systems have required, in addition to the main weight-carrying rail, one or more auxiliary rails for the purpose of steadying the cars and preserving them in the vertical position; while in the Decauville system this duty is performed by laborers or draught animals. Whether this system will prove to be superior to the common type of elevated railway with which we are familiar in this country, has yet to be proved. As far as we can understand the chief advantage claimed is that derailment is practically impossible at high speed. It is said that in the early experiments with the Langen suspended railway, hanging cars of the general type now in use were successfully run around curves of 33 feet radius, at a speed of 15½ miles an hour, with the cars swinging outward on the curves to the extent of 25 degrees from the vertical. This would seem to prove that derailment on the curves of a standard line would be a remote possibility, and, no doubt, the designer has produced a system which will be suitable for lines of excessive curvature over which it is desired to run trains at a high rate of speed. At the same time it is a fact that some of the sharpest curves in the world are to be found on our own elevated railways in New York city, and when we consider the enormous traffic that passes over them, it must be admitted that derailment at these curves is an extremely rare occurrence.

As regards the weight of the cars, it is probable that the suspended type has some advantage over the ordinary car running on two four-wheeled trucks. The concentration of the rolling load upon a single rail should reduce lateral and longitudinal vibration, and tend in every way to smoothness of running. The fear has been expressed that the swaying of the cars would produce uncomfortable symptoms of nausea, intensifying the liability to that "train sickness" to which many passengers are liable when traveling over a crooked road. We think, however, that the fact of the center of gravity of the train being hung so far below the point of support will tend to increase the periods of oscillation so greatly that the lateral sway will be scarcely perceptible, especially if care is taken to eliminate all reverse curves by placing a sufficient length of tangent between them.

In point of appearance and general aesthetic effect it must be admitted that the Langen road, at least as built through the Wupper Valley, is decidedly picturesque, and is less obtrusive, whether in city or country, than the ordinary system of rectangular elevated structures with which we are familiar. Architecturally considered the structure is another tribute to the skill of the German engineers, who have proved in many of their later bridges that most pleasing architectural effects may be obtained without violating the structural or commercial limitations which control, and very properly control, the best modern engineering works.

THE SEVENTH ANNUAL RECEPTION AND EXHIBITION OF THE NEW YORK ACADEMY OF SCIENCES.

BY E. O. HOVEY.

The seventh annual reception of the New York Academy of Sciences, with its accompanying exhibition of specimens, preparations and apparatus to illustrate the progress of science during the past year, was held in one of the new halls of the American Museum of Natural History on April 25 and 26. There were about one hundred and twenty exhibitors and the number of articles exhibited ran up into the thousands, classified under twelve sections or departments.

The section of anthropology, in charge of Prof. Franz Boas, exhibited three cases of objects taken entirely from collections made by the Natural History Museum during the past year, and indicating incidentally, but very graphically, the broad scope of the anthropological investigations now being carried forward by the institution. The material exhibited was brought from Southampton Island in the American Arctic regions, Arizona, California, British Columbia and the banks of the Amoor River in Northeastern Asia. Among the articles exhibited here those which attracted the most attention, perhaps, were a toboggan made by the Eskimo of Southampton Island from the baleen of a whale, and a series of beautifully embroidered garments made from salmon skin by the Golds of the regions along the Amoor River, and collected for the museum by Dr. Laufer of the Jesup North Pacific expedition. The section of astronomy, under the care of Prof. Rees, made its usual fine display of photographs showing the progress made in making negatives and measurements of stars, star-clusters, nebulæ, etc. An interesting photograph was one of a rainbow sent on from Arizona.

The botanical exhibit, in charge of D. T. McDougal, was large and contained much of scientific, or popular interest in more ways than those merely botanical. Prof. Stone showed a set of new apparatus used in measuring the amount of force exerted by a plant in growing and in determining the effect of electricity upon plant growth. A series of remarkable photographs of plants by J. A. Anderson, attracted a measure of the attention it deserved. Some of the subjects were fungi on a tree-stump, cotton bolls, milk weed pods shedding their seed and dandelions gone to seed. The New York Botanical Garden showed, by means of copies of publications, examples of labels, etc., the progress that is being made in that part of Bronx Park, but the most interesting thing in its exhibit from a mechanical point of view, was an exhibition microscope which has been recently devised by Dr. McDougal, and which consists of a simplified microscope inclosed in a small box of plate glass in such a way that visitors cannot throw the instrument out of adjustment, although at the same time the attendant can readily open the case and change the mount on exhibition.

The progress in chemistry the past year seems to have been largely in the line of synthetic work, and a large series of artificial perfumes and artificial indigo, both French and German, gave some hint of the skill being attained in the technical side of the science. On account of the interest excited in smokeless powder, through its extensive use in the South African war, a small exhibit of the explosive was instructive as showing the numerous forms in which it is put up and the widely varying appearance of the finished product. C. E. Pellew had charge of this department.

The electrical exhibit, which was in charge of G. F. Sever, consisted mainly of new and improved Watt volt, and ampere meters exhibited by some of the largest manufacturers of such machinery.

The department of geology and geography, under R. E. Dodge, brought together a considerable exhibit, the geographical features of which consisted of the books and maps issued during the past year by the United States Geological Survey, and the State surveys of New Jersey and Maryland. The geology was represented by some remarkably rich telluride specimens from Cripple Creek, Colorado, quicksilver ores from Southwestern Texas, serpentine verdalite (verde-antique) from Easton, Pa., clays and shales from Michigan and Alabama, complete series of igneous rocks from Magnet Cove, Ark., and the Yellowstone National Park. Mention should not be omitted of a large volcanic bomb, or ejected block, from the island of Vulcano, near Sicily, and of a mass of curiously weathered eolian limestone, from the Bermudas, exhibited by the Geological Department of the Museum.

Alongside this section was that devoted to palæontology, which was in charge of G. van Ingen, and was devoted almost entirely to the collections made by the Department of Vertebrate Palæontology of the American Museum. The explorations of this department in

Wyoming, Texas and elsewhere, have been wonderfully successful, important finds being made each year. This year the exhibition included a series of fine skeletons of Pleistocene horses and the mammoth, the skull and tusks of a Miocene mastodon and skeletons of the saber-toothed tiger and other carnivorous animals from the Tertiary. In this section the geological department of the museum displayed a portion of the recently acquired Jay Terrell collection of Devonian fishes, showing their heavy construction and the formidable teeth with which they are provided. Passing to the section of zoology, in charge of C. L. Bristol, one of the features of special interest seemed to be the series of anatomical preparations from the morphological museum of Princeton University, including the circulatory systems of several animals, and a series of specimens showing the growth of the young opossums while still in the mother's pouch, Prof. B. Dean showed the last feature for the kangaroo of Australia, also. A fascinating exhibit was that of R. L. Ditmars, and consisted of a number of preparations of the heads of snakes, both venomous and harmless. A series of photographs showed the progress of the Zoological Park in Bronx Park and characteristic poses of many of the animals within the inclosure. The Kny-Scheerer Company made a large exhibit of formaldehyde and other preparations in various branches of natural history, and there was a fine series of corals, sponges, and mollusca which had been collected at Nassau by R. P. Whitfield.

The mineralogical section, with L. Mc.I. Luquer in charge, had about two hundred specimens on exhibition, ranging from the large showy pieces of calcite, fluorite, etc., to the crystallographic treasures of tellurium and other minerals shown by Prof. A. H. Chester. One noteworthy specimen exhibited was a diamond crystal, weighing 4⅓ carats, from North Carolina. The mineralogical department of Columbia University displayed some new apparatus and many rare or new mineral forms.

The department of metallurgy, in charge of H. M. Howe, had models of blast and Bessemer furnaces on exhibition, together with many diagrams and specimens showing the ductility of steel, the evolution of gas by metals during solidification and the effect of aluminium in preventing blowholes, the metallography of steel, etc. A series of specimens showed the alloys made by adding various substances to the molten steel, such as tungsten, manganese, molybdenum and chromium. Special stress was laid on the enduring hardness of tungsten steel. The experimental psychologists have not been idle during the year, as was proven by the exhibit under the care of E. L. Thorndike. The apparatus exhibited showed the improvements which have been recently made in the means for detecting and preserving a record of the various mental phenomena under investigation, and also for projecting the actual records onto the screen for class purposes.

The department of physics and photography, this year in charge of William Hallock, can usually be depended upon for something of interest. P. H. Dudley has continued his work with his stremmatograph, showing graphically the high economy of solid railroad beds, heavy rails, and certain types of locomotives and cars. The assistance which photography can give to physics in certain lines was shown by photographs of manometric flames and of sound waves. The kinetoscope, too, has been called in by R. W. Wood, of Wisconsin State University, to unite in a striking manner successive views of wave motion to produce a harmonious and instructive whole. Apparatus illustrating his diffractive color photography process was also exhibited. Some excessively thin films of metals produced by A. C. Longden, of Columbia University, explained how the colors of certain metals appear by transmitted light. Gold is greenish-blue, silver bluish-gray, and copper yellow in these films.

The officers of the Academy of Sciences for the current year are: President, Robert S. Woodward; first vice-president, Franz Boas; second vice-president, Charles A. Doremus.

FLOATING DRY DOCKS FOR NEW YORK CITY.

In connection with the article which appeared in the SCIENTIFIC AMERICAN, April 21, on the large dry dock accommodation which is to be provided in South Brooklyn, it will be of interest to our readers to learn that the Tietjen & Lang Dry Dock Company have under construction a large sectional dry dock built on the same system as the one illustrated in that issue. The credit for the designing of this type of dock is due to Mr. Frederick C. Lang, whose name has for many years been prominently associated with dry dock construction in New York harbor. The new dock, which is being constructed at the Hoboken yard of the company, is of approximately the same size as the new dock at South Brooklyn. It is being built in 80-foot sections, with a clear opening between the wings of 90 feet. Three sections have been completed and are in place at the yard, and two other sections are well under way. The length of the dock will be 468 feet, and it will be equal to the accommodation of a 500-foot vessel. Another dock of four sections is to be built adjoining the five-section dock, and when it is desired to dock vessels of 700 feet or over, the whole nine sections will be coupled up, making a total over all length of about 800 feet.

THE HEAVENS IN MAY.

BY HENRY NORRIS RUSSELL, A.M.

All other astronomical events of May are incomparably surpassed in importance by the total eclipse of the sun on the 28th, which is of additional interest to us because it is visible in the United States. Though such eclipses occur at some part of the earth's surface rather oftener than once in two years, on the average, the path of the moon's shadow is so narrow that it passes much more rarely through any given region. Only three other total eclipses have been visible in the Eastern States during the present century—in 1806, 1834 and 1869.

The path of totality in the present eclipse begins in the Pacific Ocean, crosses Mexico and the extreme southern corner of Texas, passes out into the Gulf, and enters the United States again near New Orleans, whence it passes in an almost straight line to Norfolk, Va., and out to sea, as may be observed in the map published in the SCIENTIFIC AMERICAN of April 21, 1900.

Crossing the Atlantic almost on the track of the Mediterranean steamers, it transverses the Spanish peninsula, crosses to Algiers, and follows the north coast of Africa into the Tibyan desert.

The shadow-path in the United States is about 50 miles wide. Its central line passes about 10 miles north of New Orleans, 25 miles north of Mobile, Ala., 10 miles north of Columbus, Ga., 5 miles south of Greensboro, Ga., Newberry, S. C., and Wadesboro, N. C., and 15 miles south of Raleigh, N.C., and Norfolk, Va.

These details are given in order to enable the approximate construction of the eclipse track on any convenient map. The duration of totality in the United States varies from 1 minute 10 seconds at New Orleans to 1 minute 40 seconds at Norfolk.

Numerous astronomical expeditions will, of course, be sent to observe the eclipse, and the chances of fair weather at different stations have been carefully considered, and the most favorable ones chosen. The principal work will consist of photographs and drawings of the corona and prominences, and observations of the spectra of the corona and the lower layers of the solar atmosphere.

For those to whom the eclipse is a magnificent spectacle, rather than an occasion for scientific work, the most striking phenomena will be the onrush of the moon's shadow with the tremendous velocity of 2,000 miles an hour, the sudden darkness, and the appearance of the corona surrounding the black disc of the moon.

At the time of eclipse Mercury is about 2° west of the sun, and Aldebaran about 6° S.S.E. Both should be visible during totality. Venus will be too near the eastern horizon, as seen from stations in this country, to be conspicuous.

For those outside the track of the shadow, the partial phase of the eclipse will still be well worth looking at. Along the coast near New York about nine-tenths of the sun will be hidden, and the decrease of light will be conspicuous, the sun appearing through smoked glass as a narrow crescent.

However, since even one-tenth of sunlight is some 60,000 times as bright as the strongest moonlight, day will by no means be turned into night for New York, even at the time of greatest eclipse.

THE HEAVENS.

At 10 P. M., in the middle of May, the splendid constellations which make the evening sky of April the most brilliant of the year have all set except Gemini in the west and Auriga in the northwest. Before the brightest star, Capella, of the latter constellation, is lost from the evening skies, it is worth while to note that it has recently been shown by spectroscopic evidence to be double, consisting of two components of almost equal brightness which revolve about one another in an orbit comparable in size with the earth's in a period of about 100 days.

This "spectroscopic binary" is unusually interesting since on account of its relative nearness to the earth there is reason to hope that its components may be separated visually with the aid of the greatest of present-day telescopes, thus giving us an accurate knowledge of its mass and distance.

Leo is high in the west, and the Great Bear between him and the pole. Almost overhead shines Arcturus, and on the east is the semicircle of the Northern Crown, while further south, and near the meridian is Virgo, marked by the white star Spica.

The Milky Way lies low along the eastern horizon, with several fine constellations near its course.

In the northeast is the cross of Cygnus, now prone upon its side, and above is the blue-white Vega. Just rising in the east is Altair and in the southeast Scorpio lifts his claws well above the horizon, and the red Antares blazing in his heart, though his long curving tail is still out of sight.

THE PLANETS.

Mercury is morning star during the earlier part of the month, but too near the sun to be well seen. It passes superior conjunction on the 29th, and changes from morning to evening star. During the eclipse of the 28th it will be conspicuous some 2° west of the sun. Observations of its brightness at this time are planned by some observers, who will take advantage of the eclipse to observe it much nearer the full phase than has ever been done before.

Venus is evening star in Gemini, setting nearly four hours after the sun on the 1st, and about two and a half hours after sunset on the 31st. It is apparently approaching the sun, and is in reality rushing forward to come almost between the earth and sun next July.

Its greatest brightness occurs on the 31st, when it is fully one hundred times as bright as an average first magnitude star. Toward the end of the month its crescent phase will be visible in a good field-glass, especially during twilight, when the glare of the planet is diminished.

Mars is morning star in Pisces and Aries, rising about an hour and a half before sunrise, and very unfavorably placed for observation.

Jupiter is in Ophiuchus, north of Antares, and moves westward about 5° during the month. It comes into opposition on the 27th, rising about 7 P. M., but is in an unfavorable position on account of its great south declination.

The same statement applies with even greater force to Saturn, which is in Sagittarius, some 30° east of Jupiter, and about as far south as it can possibly get. It rises about 11 P. M. at the beginning of the month, and 9 P. M. at the close.

Uranus is in the Scorpio, about 2½° east and 1° south of Jupiter on the 1st. It is in opposition with the sun on the 31st, and may be distinctly seen with the naked eye on a clear moonless night, but is hard to distinguish from faint stars. By making two or three sketches, at intervals of a few days, of the stars visible with an opera-glass southeast of Jupiter, the planet may be identified by its slow westward motion. Its greenish color, visible in a field-glass, aids the search. Neptune is in Taurus, too near the sun to be observed.

THE MOON.

First quarter occurs on the afternoon of the 6th, full moon on that of the 14th, last quarter on the evening of the 21st, and new moon (accompanied by the solar eclipse) on the 28th. The moon is farthest from the earth on the night of the 8th, and nearest on the afternoon of the 24th.

The moon is in conjunction with Venus, though not closely, near noon on the 2d, with both Jupiter and Uranus on the afternoon of the 15th, with Saturn on that of the 17th, Mars on the morning of the 27th, Mercury on that of the 28th, a few hours before the eclipse, and finally with Venus again on the afternoon of the 31st.

Princeton University Observatory, April 21, 1900.

PARIS EXPOSITION NOTES.

The portion of the Paris Exposition at Vincennes is even more backward than the sections in Paris proper. Some of the buildings were only recently begun. The "Pauillac" accident interfered greatly with the American Machinery Hall.

The new hotels which have been built near the Trocadero have metamorphosed the entire quarter of Paris, and have very much improved it. One group of hotels has 1,800 rooms, and at least three times that number of guests can be accommodated.

The gates of the Paris Exposition are now closed at six o'clock in the evening. Then freight cars and wagons loaded with exhibits enter the grounds. Work is not interrupted during the time that visitors are on the grounds. The moving sidewalk is now in good working order and is crowded all day long. It makes a complete tour of the Exposition and will take the place of the Eiffel Tower, and of the Ferris Wheel of our own last Exposition.

We have already referred to a unique map of France made of precious stones which illustrates the enormous mineral wealth of the Ural district. The 106 chief towns of France are represented by precious stones set in gold. Thus, Paris is indicated by a rubellite of pink color. Other places are represented by such stones as emeralds, sapphires, tourmalines, chrysolite, beryls, aquamarines, amethysts, and chrysoberyls. The names of the towns are in gold and the rivers are made of platinum.

DEATH OF THE DUKE OF ARGYLL.

George Douglas Campbell, Duke of Argyll, died on April 24, after a long and active life as statesman and scientist. He was born in 1823, and succeeded to his father's titles in 1847. He took an active part in politics, and was well known as a theologian and public speaker. His works of a scientific nature dealt to a certain extent with theology. They include: "The Reign of Law," "Primeval Man," "The Unity of Nature," a work on religion and a sequel to "The Reign of Law;" "What is Science?" "Organic Evolution Cross-Examined."