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CONGRESS AND THE NICARAGUA CANAL.

One of the greatest problems which will confront the next Congress is the Nicaragua Canal. This, if we may believe a recent dispatch from Washington, is to be pushed to the front on the opening day of the session. Representative W. P. Hepburn, who was chairman in the last House of the committee in charge of Nicaragua Canal legislation, is quoted as saying: "I shall introduce a Nicaragua Canal bill on the first day of the session;" and he evidently intends to do this in spite of the fact that the Commission appointed by the President to examine all routes across the Isthmus and decide which is the best will not have had time to present its report.

We doubt if any question of similar magnitude has come before Congress upon which so much general misapprehension exists, both in the country at large and in Congress itself; and the gentlemen who will be called upon to vote upon the subject prematurely (if Mr. Hepburn has been correctly reported) cannot do better, in the intervening time before Congress meets, than acquaint themselves with the true merits of the question. The sources of information are many and voluminous, and are to be found in the reports, official and private, that have been published. We ourselves, during the last session of Congress, published two illustrated articles (SCIENTIFIC AMERICAN, February 4 and 18, 1899) which were written with the object of placing before the public, in concise form, the respective advantages of the Nicaragua and Panama routes, which are the only two that are likely to be seriously considered by Congress.

It will be remembered that the last Congress, after considerable discussion of both routes, decided that it required fuller information, and authorized the President to appoint a committee for the purpose of investigating every possible route and deciding which it was most desirable to build. That committee is still at work and we can readily believe that a year may prove to be all too short a time in which to complete its investigation. If the report is not ready, the obvious thing to do is to wait until it is ready. To vote one million dollars for a committee to investigate and throw light upon the subject and then to ignore the committee by putting the matter to the vote before that committee has reported, is unworthy of the dignity of Congress, and is certainly not the course that will promote the interests of the country.

Before Congress votes away some \$150,000,000 of the nation's money, let it at least know if it is to be wisely spent.

"A GROSS ERROR."

At the recent meeting of the Society of Naval Architects and Marine Engineers, Rear-Admiral Hichborn read a paper on the designs for the "Denver" class of cruisers, in which he referred to the criticisms to which these vessels have been subjected as follows: "One of these publications, for instance, in a prominent scientific paper, contained cuts of the vessels with certain particulars headed respectively: 'The 3,500-ton protected cruiser "New Orleans,"' and 'The proposed 3,500-ton semi-protected cruiser "Denver" and class.' It takes but a glance to discover the first gross error in this comparison, for those familiar with the facts—the "New Orleans" having left the New York yard a short time ago, in ordinary full load condition, displacing over 4,000 tons."

The "prominent scientific paper" referred to will be recognized by our readers as the SCIENTIFIC AMERICAN; but the "gross error" of putting the displacement of the "New Orleans" at 3,500 tons is not chargeable to us, but to the annual report for 1898 of the bureau over which Admiral Hichborn presides, from which our figures were taken. In this report the displacement of the ship, "fully equipped, ready for sea, all stores on board," and with 700 tons of coal in the bunkers, is given as 3,437 tons. To allow for extra coal, due to close stowage, we raised this figure to 3,500 tons, and made our comparison accordingly, having no reason to suppose that in the official statement of the

displacement of a vessel of 3,500 tons there could be a shortage of 500 tons.

We note that in the annual report for 1899, just out, the displacement of the "New Orleans" under similar conditions is set down as 3,769 tons; and now, following closely upon the issue of the report, we have the statement of the chief of the bureau that the displacement is over 4,000 tons!

Surely we may be pardoned if, in taking our figures from such an elastic source, we have fallen unwittingly into "gross error"

THE EXPLOSIVE FEATURES OF ACETYLENE.

The rapidly extending use of acetylene and the fact that its widening range of application is putting it increasingly into unskilled hands, render the question of its explosive properties a vital one to the community at large. In the earlier stages of its manufacture and use the new illuminant suffered somewhat in reputation from the recurrence of explosions more or less destructive and fatal, and there was for awhile a danger of its field of usefulness being narrowed by a popular fear as to its safety, out of proportion to the facts. Thanks, however, to exhaustive experimental work in the laboratory, the explosive possibilities of acetylene have been determined with accuracy, and it is now possible to manufacture, transport and use the new illuminant with something of the same immunity from accident that characterizes the familiar coal gas.

Pure acetylene gas, when under atmospheric pressure, is not explosive. This was proved by Berthelot and Vieille before acetylene was looked upon as having commercial value, and as soon as its production on a commercial scale became certain, they took up the question again and confirmed their earlier experiments with the following statement: "Under atmospheric pressure and at a constant pressure, acetylene does not propagate to an appreciable distance decomposition provoked at any point. Neither the electric spark nor the presence of an incandescent wire, not even the detonation of a fulminate primer, exercises any action beyond the vicinity of the region subjected directly to the heating or shock."

As the pressure of the gas rises above that of the atmosphere, it becomes liable to explode, but it is not possible to state the exact critical pressure above which a definite exciting cause will, and below which it will not, render acetylene explosive. Berthelot and Vieille state that when the exciting cause is an incandescent wire in the gas, the maximum allowable pressure is 10.5 pounds gage, and when the cause is the detonation of a fulminate cap, 3.5 pounds is the limit. These two causes of explosion were taken as representing the extreme conditions that could obtain in faulty manufacture and manipulation of the gas, the first representing intense local heating in calcium carbide attacked by a small amount of water, or caused by intense friction due to the rush of gas through a valve. The second case, which would be represented in the formation and detonation of acetylides, is not liable to occur in the commercial production of acetylene, but could only happen under special laboratory conditions.

Liquid acetylene, therefore, on account of its condensed state, is naturally susceptible to explosion, detonation being caused by high temperatures, sparks, or heavy shocks to the liquid itself. Berthelot detonated a steel bomb filled with liquefied acetylene by means of an incandescent wire, the crusher gage showing a pressure of 5.333 atmospheres; but liquefied acetylene contained in cylinders was shown by the same experimentalist to be proof against detonation by shock, a cylinder charged with 300 grammes of the liquid falling repeatedly upon a steel block from a height of 19.5 feet without explosion. A direct blow upon the liquid itself may heat a small portion to a dangerous temperature, whereas the same blow to the cylinder would be only partially transmitted, and what portion did reach the liquid would be absorbed by the whole liquid mass. A real peril exists at the cylinder and reducing valves, due to the sudden arrest of the column of gas at the reducing valve raising its temperature adiabatically to the explosion point.

Acetylene is more dangerous than illuminating gas in forming explosive mixtures with air, for not only is the ignition temperature lower, but the explosive energy is greater, and the range of the explosive proportions of the gas and air is wider. Thus a mixture of one volume of illuminating gas with one or with two volumes of air will not burn; whereas a mixture of similar proportions of acetylene gas and air burns with a sooty flame. In the case of each gas a mixture of one volume of the gas to three of the air is explosive. The strongest explosive in the case of acetylene is one to nine, and in the case of illuminating gas one to six. But whereas the latter ceases to explode at one to twelve, acetylene mixtures do not become non-explosive until the proportion is one to twenty. The temperature of ignition varies but little with the proportions of the mixture, and is placed at 900° F. for acetylene as against 1,100° F. for most combustible gases.

For a more complete discussion of the explosive possibilities of acetylene our readers are referred to an ar-

ticle by Frederick H. McGahie in the current number of the SUPPLEMENT.

THE YACHT "COLUMBIA" IN EUROPEAN WATERS.

After defeating decisively the fastest yacht that England could build this year, "Columbia" is to be sent across the water to try her paces in the Mediterranean, and later, during the summer months, over the various English courses. The champion of this year showed such a marked superiority over the "Shamrock" that we think the owners of "Columbia" are fully justified in making this venture. The most formidable yachts that she will have to meet on the other side are the "Shamrock," the German Emperor's "Meteor" (formerly a 90-foot cutter, now rigged as a yawl), the "Valkyrie III.," and a new 90-foot cutter which is being built from plans by Watson, the designer of the "Britannia," "Meteor" and the "Valkyries." The most formidable of these boats will be the "Shamrock" and the new Watson boat. It is possible that alterations will be made in "Shamrock" with a view to improving her qualities on a wind, though we very much doubt if she can be bettered sufficiently to overcome the present 6 to 10 minutes difference in a 15-mile beat to windward between herself and "Columbia." Probably the new Watson boat will be a more formidable competitor, and this for several reasons. In the first place, the later Watson boats have been excellent in windward work. Then again the new boat is an improved "Meteor," and "Meteor," after "Shamrock" had sailed for this side of the water, on several occasions beat "Britannia" by nearly three times as much as "Shamrock" had done, being as much as from 20 to 35 minutes better on a 40 to 50-mile course. Another circumstance which would be in favor of the new Watson boat is the fact that she is being built to race under the new English girth rule, which puts a penalty upon beam and draft, and she should gain thereby some advantage over "Columbia," which was built under a rule that puts no penalty on beam or draft. On the other hand, the Watson boat is sheathed with wood and will be handicapped by some 7 or 8 tons of dead weight. Although the new cutter may prove a troublesome competitor, we do not doubt that "Columbia" will accomplish that wholesale "capture" of English cups which was vainly attempted by "Navahoe" and "Vigilant."

CABLES OF THE NEW EAST RIVER BRIDGE.

The plans and specifications for the cables of the new East River bridge which have just been given out serve incidentally to show what a great stride has been made in the past half century in improving the quality of the materials that enter into a bridge of the suspension type. The great possibilities in the way of length of span and capacity now open to the builders of this type are chiefly due to the use of wire in place of chain cables, and to the extraordinary strength that is possessed by modern cable wire. The iron bars that made up the old chain cables possessed, probably, a tensile strength not exceeding 25 tons to the square inch, and they were open to the suspicion that attached in early days to welded members. The steel wire cables of the East River bridge will have a tensile strength of 100 tons to the square inch, or just four times as much as the old iron chains.

THE NEW NAVAL PROGRAMME.

Secretary Long and the Board of Naval Construction are to be congratulated on the new programme of naval construction, which calls for the construction of eighteen vessels with an aggregate displacement of 75,300 tons, to cost exclusive of armor about \$26,000,000. The most important ships will be three great armored cruisers of 13,500 tons trial displacement, with high speed, unusually large coal supply, and powerful armament. They will differ but little from the armored cruisers "California," "Nebraska," and "West Virginia," vessels of 15,500 tons displacement, authorized by the last Congress. These vessels will combine the offensive and defensive qualities of the battleship with the speed and radius of action of the cruiser. If, as is suggested, they are to carry the 10-inch gun in their main battery, they will mount a more powerful weapon than the latest German battleships, whose largest gun is of 9.45 inches caliber. The programme also provides for three 5,000-ton protected cruisers, which are to be improved "Olympias," the increased displacement being devoted to larger supplies of coal, ammunition, and stores, and a larger crew, all of these additions being necessary to meet the long-distance cruises required by the extension of our foreign possessions. The third class of ships will consist of twelve sea-going, light-draught gunboats of 400 tons, to have the highest speed compatible with good cruising qualities and great radius of action. The presence of these vessels on the programme is due to the recommendation of Admiral Dewey, who considers them necessary for the proper patrol of the Philippines. They are to be patterned broadly after the "Wheeling," but will be of several feet less draft.

The programme is admirably adapted to meet the

necessities of the navy, the new armored cruisers serving to bring this splendid type of ship up to the desired number to match our fleet of battleships.

THE MONUMENT TO ROBERT FULTON.

The world at large, and even many of those who are interested in the history of mechanical engineering, do not know that the body of the great engineer, Robert Fulton, lies in Trinity churchyard in New York city, being interred in the Livingston family vault. There is no mark or inscription to indicate its resting place. In view of the epoch-making character of the work of Fulton, and of his eminence as an engineer, and of his indomitable perseverance in the development of steam navigation in the face of the greatest obstacles, it has been deemed desirable that his tomb should be marked by a suitable monument. The Council of the American Society of Mechanical Engineers had the matter brought to its attention at the Washington meeting last May. The idea was warmly welcomed, and a committee was appointed to investigate the proper method of accomplishing the suitable marking of the grave. The committee has found its efforts heartily met both by the Trinity corporation and by members of the Fulton family. The society has been assured that a suitable place will be provided in Trinity churchyard for such a monument as may be erected, and that the remains of Fulton will be removed to such a place when the monument is ready. The Society possesses a number of memorials of Robert Fulton, including furniture, his portrait by his own hand, drawings, autograph letters, and other personal relics. Indeed, it may be said that the Society is Fulton's literary heir. In view of this fact, the action of the society is most dignified and fitting. A subscription is now being raised by it, and there is little question that sufficient funds will be obtained to erect a most admirable memorial to mark the place where lies the body of one of the earliest and greatest of American engineers.

It is poetic justice that Fulton should continue to rest in the spot where he was interred. At the front of the quaint old burying ground run the cable cars, at the rear the electric cars and the elevated road, and at the foot of Rector Street, the other boundary, two of the fastest vessels on the bay make their landings. Almost across the street is one of the tallest buildings which has ever been erected, and Wall Street commences directly in front of the burying ground. What more fitting spot could be obtained for the resting place of one whose activities contributed in so large a degree to the progress which is so much in evidence immediately around the historic old church?

THE HEAVENS IN DECEMBER.

BY GARRETT P. SERVISS.

Those who watched for the November meteors saw the starry sky at midnight last month wearing nearly the aspect which it has at an earlier hour of the night in the middle of December. Each month sees the heavens advance from east toward west about 30°, equivalent to the length of one of the signs of the zodiac. But the same advance can be beheld in the course of two hours watching on any single night. Thus the observer of the heavens at 10 o'clock P. M. by waiting until midnight can see them as they will appear at 10 P. M. one month later. At 10 o'clock in the middle of December Orion is in the east, dominating all that quarter of the sky, while Sirius flames between him and the horizon. It is worth while to study the appearance of Sirius while the star is yet comparatively low in the east. At such times it possesses a beauty of shifting color which it entirely lacks when seen near the meridian. The rapid play of prismatic hues is indescribably splendid. If the Kohinoor could be hung up against a black background a hundred yards away with an electric light concealed behind it and transfusing it with fire, the appearance might possibly rival that of Sirius rising through an unsteady atmosphere on a clear December night.

While Orion and Taurus rule the east, Eridanus, the great river of the sky, with its curious winding streams of stars, stretches westward from Orion's feet and crosses the meridian. Cetus, broad and formless, hiding the wonderful variable Mira in its folds of dark sky, occupies a large part of the southwestern quarter, with Pisces and Aries high above it near the mid-heaven. At the same time Perseus, with his gorgeous sword hilt, composed of matted stars in one of the thickest parts of the Milky Way, shines north of the zenith, while Andromeda lies stretched along the sky westward, the W of Cassiopeia glittering between her and the pole. In the northeast Leo follows Gemini up the star-sprinkled slope between the horizon and the meridian. The Great Bear, Ursa Major, appears in the northeast standing on his tail. The Milky Way crosses the dome of the sky from southeast to northwest.

THE PLANETS.

Mercury plays a double role in December, being an evening star at the beginning of the month and a morning star at the end. It is not visible, however, in the evening, being too near the sun. It passes behind

the sun on the 5th, and, emerging in the morning sky, reaches its greatest western elongation on the 25th, about which time it will be quite a conspicuous object in the morning twilight. Mercury is in the constellation Ophiuchus.

Venus is beginning to assume her place as the evening star, which, when she occupies it, admits no rival. She can be seen in the flood of sunset light at the opening of December, but she will appear more beautiful at the close of the month, when she will linger above the horizon more than two hours after the sun has set. She is moving swiftly eastward among the stars, passing during the month from Sagittarius into Capricornus.

Mars, almost lost in the solar rays at the beginning of the month, and entirely so before the end, plays an unnoticed part as an evening star. In fact, Mars may almost be said to have lost his popularity of late. During the last opposition comparatively little was seen of the puzzling system of streaks called canals, which have given birth to so many fancies concerning Mars, and almost nothing new seems to have been learned. It is true that the planet was not well situated for observations, but at the same time disappointment has been felt over the meager results obtained. Mars is in the constellation Ophiuchus, from which he passes into Sagittarius.

Jupiter is a morning star in Libra, rapidly increasing its distance from the sun, and sufficient by its sole presence to give an air of occupation and planetary distinction to the before-sunrise sky. At the end of the month it will be about two moon-breadths from the well-known double star Beta in the constellation Scorpio. Jupiter continues to hold the attention of observers by the wonderful evidences which its ever-shifting belts and spots furnish of the grand scale on which its ceaseless changes are taking place. This emergence of a planet from chaos, for that much the phenomena of Jupiter may be regarded as indicating, is certainly a fascinating spectacle. The markings on Jupiter, with their often beautiful colors, are so easy to see that the great planet offers a rich field for amateur telescopists, and with a good four or five inch glass any industrious observer, watching Jupiter, can learn for himself, through the testimony of his own eyes, things which will, at the same time, widen his view of the origin and growth of worlds and stimulate his appetite for science. With Jupiter brightening in the morning and Venus in the evening sky, there is enough of promise to awaken the enthusiasm of all lovers of astronomy, and later in the winter, when these two leaders of the starry host have really begun their reign, there will be a carnival of telescopes.

Saturn, concealing its pageantry of rings and satellites in the glare of sunlight, passes from the evening into the morning sky on December 17. Like Mars, it remains during the entire month too near the solar orb to be seen. It is in Ophiuchus and moves thence into Sagittarius.

Uranus is also a morning star in the constellation Ophiuchus, a few degrees north of the bright red star Antares in Scorpio.

Neptune in Taurus, close to the border of Gemini, and above the head of Orion, is in opposition to the sun on December 17, the same date on which Saturn is in conjunction with the sun.

THE MOON.

New moon in December occurs on the morning of the 3d, first quarter on the morning of the 10th, full moon on the morning of the 17th, and last quarter on evening of the 24th. The moon is nearest the earth on the 7th and farthest off on the 22d.

There are two eclipses in December, an annular eclipse of the sun, visible only around the south pole, on the 2d, and a nearly total eclipse of the sun, visible generally in this country on the evening of the 16th.

COMPRESSED CORK AND ITS USES.

Cork, as everyone knows, is one of the best non-conductors of heat or sound. That it has not been more widely used in building is due chiefly to the difficulty of obtaining it in an unadulterated form. A product called cork tiling has recently been placed upon the market which is made of what is known to the trade as "virgin cork," ground, compressed, and otherwise treated by a patented process, and which is free from the cement and glue usually employed to hold the particles together. We are informed that tiles made of this pure, compressed cork form an admirable flooring, which, besides being noiseless, water-proof, warm, and germ-proof, is capable of withstanding hard usage. By varying the degree of compression and modifying the manufacturing process slightly, sheets of cork different in color and density are obtained, which, when sawed and finished in the form of panels, can be used for wainscoting alone, or in connection with cork-tile floors. Cork compressed into sheets and sawed to the size and thickness desired constitutes a very efficient pulley covering. It is said that a pulley covered or lagged with compressed cork will transmit from 50 to 60 per cent more power with the same tension of belt than one having only a smooth iron surface.

AMERICAN FRUITS AT THE PARIS EXPOSITION.

Under the supervision of the Division of Pomology of the Department of Agriculture, arrangements are being perfected whereby the exhibition of fresh fruits from this country to the Paris Exposition next year will be the most effective and elaborate ever attempted. Mr. W. T. Taylor, Assistant Chief of the Division, recently had this to say of the preparations already made

"At Paris there will be 250 barrels of choice American apples in cold storage, small lots being taken from the supply from time to time as needed to keep up a continuous fresh fruit exhibit. Oranges will be treated in the same manner. Apples we are making the leader, as being the most widely grown and most valuable fruit for export trade. More perishable fresh fruit will be shipped regularly, affording, also, a continuous exhibit. California, for instance, has arranged to send over every week a supply of fresh perishable fruit, such as grapes, plums, apricots, figs, peaches, etc. We wish to show not only that America can produce the finest fruit in the world, but that foreigners will not assume much risk from plant disease or insects in importing our fruits for general use."

A prominent feature of the Department's exhibit will be its photographs, those in practical horticulture and agriculture being especially striking. The miracles wrought in our arid lands of the West by the large irrigation systems now so successfully in operation there, with views of the mammoth crops and orchards growing on irrigated land, while the immediately surrounding and unwatered land is seen to be only sparsely covered with scrub and sage brush, will be among the most interesting of these photographic evidences of the activity and worth of the Department's work. The ornamental tree, shrubbery and horticultural systems of some of our great railroads, at their suburban and village stations, as well as the results of the competitive prize offerings of the large factories for cultivations in their own and operatives' grounds, in some of our more modern co-operative towns, will also be prime features.

The canned and dried fruit and nut exhibits will also be under the care of the Division of Pomology, and everything is to be done to prove to Europeans how very little they yet realize of the possibilities of procuring from America, as articles of every-day consumption, what are now regarded by them as only luxuries for the wealthy.

CAN WHITE MEN LIVE IN THE TROPICS?

Benjamin Kidd, who is well known for his writings on social subjects in the tropics, has recently published a series of articles which attempt to show that it is impossible for white men to become acclimatized in the tropics. He goes on to say that all of the attempts to reverse by any effort within human range the long, slow process of evolution which has produced such a profound dividing line between the inhabitants of the tropics and those of temperate regions will end in failure. Dr. Sanborn, on the other hand, has shown that the causes of disease, deterioration and death in the tropics are due to pathogenic germs which have their limited and peculiar geographic areas, and differ greatly in the various tropical regions. Of course, if heat were the difficulty in the way, acclimatization would be altogether hopeless. There appears to be good reason, however, to believe that the real difficulty is the microbe; and if so, we may hope to fight against it in the tropics as successfully as has already been done in the temperate zones by sanitation and the gradual acquisition of immunity. The Medical News quotes Dr. Manson, who has written a book on this subject, and Dr. Rho, of the Italian navy, who also believes in the possibility of tropical acclimatization. The death rate of European troops in the tropics, which used to be from 100 to 129 per thousand, is now as low as 12 per thousand in India. The death rate of Spaniards in Cuba is less than in Spain.

DEATH OF SIR WILLIAM DAWSON.

Sir William Dawson, the late principal of McGill College, Montreal, Canada, and one of the most celebrated geologists of modern times, died November 19. He was born in Nova Scotia in 1820, and after studying at the University of Edinburgh returned home and devoted himself to the natural history and geology of Nova Scotia and New Brunswick. He embodied these investigations in his "Acadian Geology." In 1842 and 1852 he accompanied Sir Charles Lyell in his explorations. His title to fame rests perhaps more upon the discovery of the Eozoon Canadense of the Laurentian limestone, the oldest form of animal life, than upon any other discoveries or researches which he made. He was a very prolific writer upon geological subjects, and he has appeared as a scientific lecturer in the U. S. He was a Companion of the Order of St. Michael and St. George and was appointed president of the Royal Society of Canada, and in 1884 he was knighted. In 1886 he was president of the British Association. The Montreal meeting was the first ever held out of the British Isles.