

ENGINEERING.

The Canadian government has decided to advise the board of engineers to call for tenders for the new Quebec bridge, to take the place of the ill-fated one which collapsed during construction. The span has been reduced from 1,800 to 1,715 feet, and plans are to be prepared for bridges of both cantilever and suspension type, the style adopted depending upon cost and speed of erection and general usefulness as compared with expenditure.

Two suction dredgers built by Messrs. William Simons & Co. for use in reclamation work by the Bombay Port Trust, which will add a square mile of land to Bombay, have given remarkable results in their acceptance trials. They are equipped with powerful spiral cutters at the end of their suction pipes, and eat their way into solid blue clay at the rate of 2,700 cubic yards an hour, discharging it 4,500 feet away through a pipe line half of which is floating. One of them has made a cut 300 feet wide at the bottom, 21 feet deep, and 1,000 feet long in 85 actual dredging hours.

Bids have been opened on the U. S. battleships "Arkansas" and "Wyoming," and announcement of the letting of the contracts is expected. These will be the largest battleships in the world, the plans calling for 26,000 tons displacement, 545 feet over-all length, 92 feet beam, 29 feet draft, and 33,000 horse-power engines, giving a speed of 21 knots. Since the British "Dreadnought" set the fashion in all-big-gun battleships, the size and gun capacity of each new ship of the U. S. navy have been steadily increased; but these will be the first two ships to exceed all records of foreign navies. The Cramps made the lowest bid of \$4,450,000.

The steamship "Otaki," built by Messrs. Denny of Dumbarton, is the first merchant vessel to be fitted with "combination" engines, consisting of two sets of triple-expansion reciprocating engines driving wing propellers and a low-pressure turbine driven by their exhaust steam driving a central propeller. The act of reversing the reciprocating engines closes their connections with the turbine, which is not reversible, and diverts their exhaust to the condenser. Otherwise the "Otaki" is identical with the sister ships "Orari" and "Opawa" of the same company, fitted with reciprocating engines. On a recent round trip to New Zealand the "Otaki" made the same average speed as her sister vessels with a coal consumption of 11 per cent less than their mean, and a water consumption nearly 20 per cent less, their boilers being identical with hers. She also made a non-stop run of 11,669 miles, probably the longest continuous run yet made by a marine turbine.

Some interesting tests of timber under long-continued loads by Mr. H. D. Tiemann of the Yale Forest School were described by him in a paper read before the American Society for Testing Materials. The test specimens were continuously loaded in some cases for a year or more; and their deflections under load, recovery under partial release of load, and other behavior automatically recorded. As in the case of ductile metals a curious effect due to plasticity is noticed, which, while allowing the timber to be distorted and even to take a set, does not affect its ultimate strength. The deflections or recoveries due to immediate addition or removal of loads are independent of the deflections or recoveries due to time effect of dead loads. A remarkable relation between the moisture absorbed and the strength of the beam was also shown, increase of moisture in the atmosphere causing the test specimens to increase in deflection and decrease in strength to the point of failure.

Engineering and building construction for earthquake countries is discussed in an interesting and authoritative manner by Prof. W. H. Hobbs in the current Engineering Magazine. The article summarizes the results of a number of investigations resulting from the California, Italian, Japanese, and other earthquakes, showing the lessons learned from practice in localities especially subject to earthquakes as well as from laboratory experiments with materials. It has especial interest in reference to the suggested liability to damage by earthquake of the Gatun dam and locks at Panama. Whereas it is shown that alluvial filled and other unconsolidated formations, especially when marshy, afford more dangerous building sites than solid rock near the surface on account of the tendency of the latter to dissipate a shock, it appears that considerable displacement of underlying rock will hardly appear at the surface of overlying loose material if the latter is sufficiently deep. It is further shown that on such loose material rigid buildings, especially when supported upon massive monolithic foundations, are less liable to damage than more elastic structures. It would therefore appear that the deep alluvial deposit in the old river bed under the Gatun dam, much talked of as a danger spot in the construction, represents as safe a foundation as possible in an earthquake country for the massive monolithic structure of the locks and dam.

AERONAUTICS.

On September 21st, Hubert Latham attempted a flight with his "Antoinette" monoplane at Berlin. One wing touched the ground twice with considerable shock; then a wheel collapsed and the propeller was broken. After repairs had been effected, however, he succeeded, on September 24th, in making a splendid flight of 1 hour and 3 minutes' duration.

In addition to the World's \$10,000 prize for the quickest flight by an aeroplane or dirigible from New York to Albany, the American has offered a prize of \$1,000 for a circuit of Manhattan Island by an aeroplane. Three airships are ready to start in the first-mentioned contest, these being the dirigibles of Capt. Baldwin, John Roeder, and George L. Tomlinson. The start will be made from 119th Street and the Hudson River.

The flights of Wilbur Wright and Glenn H. Curtiss above New York Bay and the Hudson River during the present week are to be the leading feature of the Hudson-Fulton Celebration. The flights will be announced by flag signals displayed from the Singer and Metropolitan towers, and by bombs, as follows: White flag with red center—weather favorable, flight will probably take place in the afternoon. Black flag with white center—weather unfavorable; no flight to-day. White flag with red center over red flag with white center—flight will probably take place within the hour. Red flag with white center over white flag with red center—flight will take place within 15 minutes. The same with black flag with white center below both—flight has started.

At Morris Park late in the afternoon of September 23rd, Charles Crout made a short flight of 60 feet at an elevation of about eight feet with a new biplane built by François Raiche, a member of the Aeronautic Society. This is the first aeroplane built by a member to succeed in getting off the ground. It was run along the track at a speed of 15 to 18 miles an hour against a 12 to 15-mile wind when the flight was accomplished. The balancing planes were not operative, and the aeroplane tipped in alighting and damaged one end of the lower plane. Exhibition flights will be made soon with this machine throughout the country. The aeroplane has been acquired by the Scientific Aeroplane and Airship Company, which will conduct the exhibitions with it and also with several monoplanes which the company has produced.

In the course of his exhibition flights recently at Berlin, Orville Wright made several new records. On September 18th, with Capt. Englehardt as passenger, he flew 1 hour, 35 minutes, and 47 seconds, thus beating by 23 minutes and 11 seconds his previous record with a passenger. During this flight he sent his machine beyond the limits of the Tempelhof parade ground and soared over the railroad tracks and houses in the vicinity. In a subsequent attempt during the same day to beat the speed record, the water circulation of the motor gave out, and he was obliged to descend after a flight of 1 hour and 24 minutes. A few days before Orville Wright flew at an estimated height of 50 meters above a balloon anchored at a height of 175 meters, thus making the altitude he reached probably over 750 feet. Rougier, on the 20th ultimo, attempted to break this record at Brescia, Italy, with his Voisin biplane. He succeeded in making an official record of over 198 meters (650 feet). Mr. Wright will probably fly at the aviation meeting at Berlin during the present week, after which he will go to England, in order to test the first Wright aeroplanes built there for the British government.

The day following his arrival from Europe, Glenn H. Curtiss, the winner of the Bennett aviation trophy and the present holder of the SCIENTIFIC AMERICAN Trophy as well, was given a luncheon at the Lawyers' Club by the Aero Club of America. Among the distinguished guests present were William Marconi, the inventor of wireless telegraphy, and St. Clair McKelway, editor of the Brooklyn Eagle. The latter told of a trip to Goshen, N. Y., back in 1867 in Andrew's dirigible, an account of which was subsequently published in the SCIENTIFIC AMERICAN. This airship (which was made to travel in any desired direction by means of long inclined planes between the triple, parallel, cigar-shaped gas bags, the planes causing the balloon, as it rose from the buoyancy of the gas, to ascend upon a long incline) on this occasion traveled as far as Goshen, N. Y. (50 miles), whence it was blown back by the wind across Long Island Sound to the eastern end of Long Island, where a successful landing was accomplished. In view of his exploit 42 years ago in this, the first dirigible balloon, Mr. McKelway believed himself to be the oldest aeronaut present. The mayor of Baltimore, Md., read a telegram announcing the flight of Lincoln Beachy from that city to a point in the Blue Ridge Mountains, 125 miles away—a flight which is probably the longest ever made in America with a dirigible balloon. The aeroplane with which Mr. Curtiss won the Bennett trophy will be exhibited at Wanamaker's store in New York this and the coming week.

SCIENCE.

The record of altitude in aeronautics has been attained by Sig. Placenza and Lieut. Mina, in an ascension made from Milan on August 10th, 1909. Their great spherical balloon, the "Albatross," carried 2,600 pounds of ballast at the start and reached an elevation of 38,700 feet, or more than 7 miles. The aeronauts experienced a temperature of -25.6 deg. F. and landed near Milan $3\frac{1}{2}$ hours after they started.

The great tidal waves observed at Marseilles on June 15th, 1909, appear to have been caused by the unusually high electric charge of the atmosphere which is known to have existed during the period of the earthquakes which devastated the south of France. The powerful attraction exerted on the surface of the earth by this electric charge caused earthquakes on land and tidal waves in the Mediterranean.

Prof. Percival Lowell has noted at his Flagstaff Observatory that the antarctic canals of Mars are disappearing. This waning of the much-discussed canals seems to be a well-recognized phenomenon. Long ago Prof. Pickering suggested that we see not really the canals, but rather the vegetation which fringes their banks. The waxing of the canals in spring and summer and their waning in autumn and winter is not unreasonably attributed to the growth and decay of this vegetation.

In accordance with the resolutions of the last International Congress of Mining and Metallurgy, Applied Mechanics, and Practical Geology held at Liège in 1905, it has been arranged that the next Congress shall meet at Düsseldorf during the last week of June, 1910, under the auspices of the Rhenish-Westphalian Mining Industry. An influential committee of organization has been formed, which is charged with the making of the arrangements for the reading and discussion of papers, visits to places of technical interest, and social entertainments.

A letter has been received at Harvard Observatory from Prof. E. B. Frost, director of the Yerkes Observatory, stating that Halley's comet was observed visually by Prof. S. W. Burnham with the 40-inch telescope, on September 15th, 21 h. 39 m. G. M. T., in app. R. A. 6 h. 18 m. 51.1 s. and app. Dec. $+17$ deg. 9 min. 44 sec. The comet followed B. D. $+17$ deg. 1232 by 12.7 min., north 4 min. 12.1 sec. The comet was also photographed with the 2-foot reflector on September 15th and 16th by Mr. Oliver J. Lee. A second letter received at this observatory from Prof. Frost states that the comet was also observed visually by Prof. E. E. Barnard on September 17 d. 21 h. 1 m. 30 s. G. M. T., in app. R. A. 6 h. 19 m. 0.9 s. and app. Dec. $+17$ deg. 9 min. 0.8 sec. The comet followed A. G. 2122 ($= +17$ deg. 1232) by 0 min. 22.55 s., north 3 min. 28.9 s. Description: $15\frac{1}{2}$ mag. 12 s. diameter, with possibly a faint nucleus or indefinite fleck of light in it. The comet was also photographed by Mr. Lee at the same time.

The astronomers of Lick Observatory have been making some spectroscopic studies of Mars from the top of Mount Whitney. This peak is the highest in the United States, its altitude being 14,501 feet above sea level. The instrument taken by the observers was a 16-inch horizontal reflecting telescope, to which a suitable spectroscope was attached. Of the seven nights spent by the men on the summit, only two were clear enough for observation. The spectrum of Mars was compared with the spectrum of the moon. It is known that there is no water vapor on the moon, certainly in no appreciable quantity. If no difference can be detected between the spectrum of Mars and the spectrum of the moon under these most favorable conditions, it can be said with safety that water exists on Mars in negligibly small quantities. The results of this expedition have not as yet been published. Readers of this column of science notes will doubtless remember that Mr. Slipher of Prof. Lowell's staff claims to have obtained spectroscopic evidence of the existence of water vapor on Mars.

On July 26th, 1909, the Singles coal mine, in the French district of Puy de Dome, was the scene of an accident similar to that which occurred some time ago in the Gard mines. At the Singles mine an interior shaft was being sunk for the purpose of determining the depth of the deposit. This shaft was sunk from a horizontal gallery which led from the foot of a shaft, 1,000 feet deep. The explosion of a powerful blast shattered the rock and caused the disengagement of great volumes of carbon dioxide, which filled the gallery and both shafts before all the miners could take refuge in the safety chamber. This mine possessed no oxygen life-saving apparatus and the manager was absent at the time of the accident. The life-saving corps of several mines in the vicinity responded promptly to appeals by telephone, but no effective work could be accomplished until several hours had elapsed. Of twelve miners who had been entrapped, seven had passed the day in terror in the safety shelter, but the remaining five were found suffocated in the gallery.