ENGINEERING.

It is said that Russia will give a contract to an American syndicate to develop the Transsiberian Railway and double-track the line throughout.

The third Pennsylvania tube under the East River to Sunnyside yard, Long Island City, has been practically completed.

Five miles of the Panama Canal have been opened to navigation. This includes the channel from the point in the Bay of Panama, where the water is forty-five feet deep at mean tide, to the wharves at Balboa. Steamships are using this part of the canal daily.

The number of railway accidents during the year ending June 30th, 1909, was 66,711, or 2,791 killed, and 63,920 injured. This is a decrease in the total number of 6,042, or 973 killed and 5,069 injured, as compared with the number reported in the previous year. Even the reduced figures do not speak very well for the safety on our railroads.

The great railway bridge across the Sioule gorge in France was opened a short time ago. The height of the bridge is 450 feet above the ground. The bridge consists of a continuous girder 40 feet deep, divided into three spans by two intermediate masonry piers 370 feet high. The main span is 470 feet long, and each of the outer spans has a length of 380 feet.

The Public Service Commission has just issued a synopsis of the report of the Interborough Rapid Transit Company, including both the Subway and Elevated divisions, for the year ended June 30th, 1909. The subway carried 237,451,171 passengers at a total expense of $4,547,620—something less than two cents a passenger. The elevated division carried 275,737,974 passengers. The operating expenses on the subway were $4,457,620, and on the elevated $6,199,823.

Arrangements are being made to consider proposals for a fast passenger and mail steamship and train service from London to Australia and New Zealand by way of Canada, and an 18-knot service on the Pacific. The subsidy aid which would have to be given by British colonial governments would be very heavy. The Australian government demurred at first, but has finally agreed to share in the cost, and a conference will meet in London early in the spring to consider the details and apportion the cost.

A new steamship service will shortly be established between New York and Washington, and freight steamships will be in operation by the first of next year. It is estimated that the journey from New York to Washington will take from thirty-six to thirty-eight hours, including stops. A daily service of passenger steamers is in contemplation. The Potomac River serves an immense territory on either side, which is now largely without modern facilities for traveling or sending goods to market. Wharves are being built, and small steamboats will pick up the freight and carry it to the landings of the large steamships. The country on each side of the Potomac is very fertile; the eastern shore of Maryland produced 4,000,000 barrels of potatoes last year. The great difficulty has been to get the produce to market.

The following notes concerning the storage of California or crude oil in concrete reservoirs were recently given in Concrete. A 1,000,000-barrel reservoir, lined with concrete, has recently been completed at Port Richmond, Cal., and one of 800,000-barrel capacity is under construction near Bakersfield. The practice is to excavate the earth, which in most fields is a sandy loam, porous and very dry, to about one-third the depth of the proposed reservoir. With the material removed, a levee is built round the excavation, having side slopes of 1 : 1½ on both faces. The bottom and sides are then covered with about 3-inch concrete, often reinforced with expanded metal or some equivalent. Small cracks that occur at the junction of the sides and bottom and along the line between the cut and the embankment soon become filled with sediment and are believed to permit the leakage of very little oil. A number of such structures in southern California have recently been examined, and no signs of depreciation in the quality of the concrete were found.

The recent deplorable mine accident at Cherry, Ill., in which there were hundreds of deaths, brings up the question of expert direction in such disasters. Untrained volunteers are entirely useless, as was demonstrated in France a couple of years ago, when about twenty rescuers went down in a mine to their death. The expert life-savers from the Westphalia mines, who were sent by the Kaiser, with their tested ropes and other tackle, came too late, but their work demonstrated that if they had been called in earlier, they might have saved a large number. The cost of expert direction in accidents would not be very great, and it seems as though if we protect our coasts by guards, we might also do something to protect our miners. A few men who are especially fitted could be organized and drilled in each district, and the mine owners themselves might be made to furnish the necessary equipment, which would not be a very great tax on any operators.

SCIENCE.

Dr. Percival Lowell is installing a 12-inch telescope on San Francisco Peak at an altitude of 13,000 feet. Prof. V. M. Slipher will have charge of the task of erecting the big telescope.

The discovery of a new Alhambra at Ronda, south Spain, by Lawrence Perin of Baltimore is reported. Mr. Perin recently purchased the well-known Casa del Rey Moro, and proceeded to make excavations. He found large numbers of Roman and Arabian gold coins and revealed vast galleries.

The Italian Parliament will soon be called upon to provide for a special department to unroll and decipher papyri discovered at Herculaneum. It is trusted that this action may be taken immediately. Some previous documents have been damaged irrevocably because of legislative delay and neglect.

The American Museum of Natural History is to use designs of the famous Mitla ruins of Mexico for the new restaurant which is now being planned. The Mitla ruins were built of adobe and stone ornamented with mural painting and mosaic work produced by stones set in cement. The restaurant will therefore serve the purpose of an exhibition hall.

Some time ago it was ascertained that radium emanations were absorbed by the surface of lungs and intestines, but not by the skin, at least under ordinary conditfons. The greater part of the absorbed emanation is quickly eliminated by the lungs; a small part passes away with fecal matter; and finally some has been found in the liver and the bile, but none is ejected with the urine or perspiration.

An international conference is proposed for the preservation of the fur seal and all marine mammals, including whales, walruses, sea lions, and sea elephants. Some of these animals are now all but extinct, and the government considers it time to formulate an international law for their preservation. The Japanese seem to be the chief offenders, for they have even ventured within the three-mile limit to carry on their work of destruction.

In a new process of keeping eggs in cold storage, 500 eggs are packed in a tin box, and a little calcium cbloride is added, to insure dryness. A lid, having a hole 1/5-inch diameter, is then soldered on and the box, with a number of others, is placed in a large iron cylinder, from which the air is then exhausted. By this operation the air and carbon dioxide dissolved in the albumen are removed, as well as the air which surrounds the eggs and fills their voids. The cylinder is next filled with pure carbon dioxide, and a pressure slightly above that of the atmosphere is maintained until the constancy of the manometer indicates that the eggs are saturated with the gas. But as eggs do not keep well in pure carbon dioxide, a certain quantity of this gas is next withdrawn from the cylinder and replaced by nitrogen, obtained either from the cylinders in which it is sold in a compressed state or by passing air over red-hot copper. When the eggs have become saturated with the mixture of gases, the boxes are removed from the cylinder, sealed, and placed in rooms where the temperature is kept between 32 and 36 deg. F. By this process the eggs are kept in an atmosphere which contains no free oxygen, and in which the proportions of carbon dioxide and nitrogen are the same as exist in the albumen of fresh-laid eggs.

Whether or not there is a planet beyond Neptune is a problem which has long concerned mathematical astronomers. Among those who have taken the trouble mathematically to settle the problem of such a planet's existence is Prof. W. H. Pickering, who used the method of Leverrier, the discoverer of Uranus. Prof. Pickering believes in the existence of at least one such planet, which he has designated by the letter *O*. A search for this planet was recently undertaken by the Rev. J. H. Metcalf with his 12-inch doublet, but without success. The reasons adduced in Science by Prof. Pickering for this failure are the following: (*a*) The planet may be unexpectedly faint, or reddish in color. Its computed magnitude is 13.5. (*b*) The orbit may be highly eccentric, the computation being based on an approximately circular orbit. (*c*) The orbit may be highly inclined to the ecliptic, and the planet at present situated far from its node. For various reasons the first two causes are not thought sufficiently effective to interfere with the discovery of the planet. We might, by analogy, compare planet *O*, on account of its relative size and position with regard to the other planets, to the sixth or seventh satellite of Jupiter. The inclinations of the orbits of these two bodies are 28 deg. and 26 deg., respectively. The region already covered in the photographic search extends along the ecliptic for 25 deg., and reaches to a maximum distance of 10 deg. to the north and south of it. It is expected therefore to make an examination of the higher latitudes next year. The number of stars already examined in the search is estimated at about 300,000.

AERONAUTICS.

Recognizing that all the leading European nations are rapidly developing aerial fleets of both lighter-than-air and heavier-than-air machines, Gen. James Allen, the chief signal officer of our army, made an especial plea in his annual report to the Secretary of War last week for a definite plan of aeronautical development in the army. It is to be hoped this will be given the attention it deserves. Our War Department was the first to order an aeroplane, and it should not fall behind now in aviation or aerostatics.

The second week in December is noteworthy from the fact that Maurice Farman, a brother of Henry Farman, started to make the first cross-country tour ever attempted by aeroplane. Leaving Buc, near Versailles (France), at 2:52 P. M. December 9th, he arrived at Chatres (42 miles distant) in 53 minutes, flying over Trappes and Rambouillet *en route*. His biplane, which resembles that of his brother, averaged 47 miles an hour in making this flight. The weather was fine, there being scarcely any wind. The flight formed the first stage of a trip to Bourdeaux, which M. Farman hoped to complete in four or five additional flights.

The Wright Company has recently been incorporated in New York for the manufacture of the Wright aeroplane in the United States. The company is capitalized at $1,000,000, Wilbur Wright being president and Orville Wright vice-president. Among the directors are such men as Cornelius Vanderbilt, Howard Gould, and August Belmont. The company will erect a factory at Dayton, Ohio—the home of the Wright brothers—and will also have an aviation field where purchasers can be taught the operation of the machines. It is expected that many American sportsmen will soon become interested in aviation and own aeroplanes.

On the 8th instant Earl Gray, Governor General of Canada, Lord Lacelle, and several other prominent Canadians visited Dr. A. G. Bell's laboratory at Beinn Behreagh, near Baddeck, N. S., and, in the absence of Dr. Bell, were shown about by Messrs. Baldwin and McCurdy, who are still associated with him in his experimental work. A demonstration was given of a new hydroplane boat, which rose completely out of the water in a short run of a few hundred feet. It is expected to use this boat beneath an aeroplane, so as to make possible the ascent from water. Despite a hail storm and a soggy field, Mr. McCurdy treated the visitors to a flight of a mile in the "Baddeck No. 2," the second biplane that he and Mr. F. W. Baldwin have constructed this year, and the one with which a considerable number of successful flights have been accomplished. Altogether, there are a half dozen different heavier-than-air machines ready to be tried out on the ice of the Bras d'Or lakes at Baddeck this winter.

The first tests in the United States of firing at balloons were carried out at the Sandy Hook proving grounds on November 27th, when a small 3-man captive balloon was anchored at a height of 300 feet and fired at from a distance of 2,000 yards. Fifteen shots were fired from a special 1-pounder having a range of movement from horizontal to vertical, without hitting the balloon. A larger field gun that could be elevated to about 40 degrees was also tried with smoke-producing shells, several of which passed over and several below the balloon. A third kind of shot was a shrapnel which exploded at a certain set distance, and discharged backward a score or more of balls in a widely expanding cone. The balloon was brought to earth by one of these shot. Before the completion of the tests, which lasted several days, 90 shots were fired with but 3 hits. Two of these were without effect. As a result of the tests, army officers believe it will be almost as difficult to hit and destroy a dirigible balloon as an aeroplane.

At the meeting of the Aeronautic Society on December 2nd, Dr. Spratt of Coatesville, Pa., an intimate friend of Mr. Octave Chanute and an aeronautic experimenter of many years' standing, gave a brief talk upon his work in connection with the aeroplane. After calling attention to the fact that all animals walk or move over the ground irrespective of the number or length of their legs, just the same as all flying creatures navigate the air no matter what the size or shape of their wings, Dr. Spratt said he believed flight depended upon a general principle as simple as that of the lever, which governs walking, but that man had difficulty in discovering this principle since he was not making use of it universally, as in the latter case. Of late years he has devoted himself to finding this principle, in which quest he believes he has met with success. As a result, he has lately applied for a patent upon an aeroplane in which it is embodied. He spoke of having discovered in his early experiments the curve now used on the Wright biplane surfaces. At the suggestion of Mr. Chanute the Wrights made quantitative tests of surfaces having this curve and, finding it satisfactory, adopted it. Dr. Spratt was with the two brothers three seasons at Kitty Hawk, and was an interested witness of their first flights with a motor.