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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.

THE SAN FRANCISCO EARTHQUAKE AND THE SENATE CANAL COMMITTEE.

The San Francisco earthquake is responsible for the Senate Committee on the Panama Canal having cast its vote, by a narrow margin of one, in favor of a sea-level canal. To those of us who have followed closely the course of the lengthy hearing before this committee, it was evident that there was a growing conviction that the lock canal was the better type to build, and it looked for a while as though there might be a nearly unanimous vote to this effect. The disaster of April 18, however, was bound to awaken solicitude as to the fate of locks and dams at Panama, in case a similar disturbance should visit the Isthmus after the canal was built; and the Senate Committee, by a vote of six to five, has committed itself to the sea-level canal, its decision being largely due to the imaginary dangers of earthquake.

We say "imaginary"; for as a matter of fact, and we wish to say this with all emphasis, the San Francisco earthquake, so far from shaking our faith in massive monolithic structures of the character that will be used for a lock canal at Panama, has triumphantly vindicated such structures, and proved that they can go through the severest earthquake practically unharmed.

For it so happens that there exist in the line of the main earthquake fault several large earth or cement structures of the same character, or built of the class of materials as it is supposed would be imperiled if the lock canal were subjected to earthquake shock. These structures form part of the extensive scheme of works by which San Francisco is supplied with water, and they include several large dams for the impounding of water. The most important of these, Pilarcitos Dam, is a mound of earth 120 feet in height and similar in construction to, though much lighter in its total mass and ability to resist destruction than, the Gatun Dam at Panama. Another important dam is that by which San Andreas Lake is formed, and this is a structure of earth and clay, approximately 100 feet in height above the natural surface of the ground. A third dam which came directly in the line of the earthquake fault was that at Crystal Spring. This is a concrete structure of unusually massive proportions, which extends to a height of 115 feet above the ground.

Now it is evident that the conditions were such that the passage of the main line of disturbance through the valley in which these structures have been erected afforded a colossal testing laboratory, in which the strength both of earth and concrete structures of great size was put to a full-sized test. What concrete and earth endured at these places under one of the severest earthquake shocks on record, they may be depended upon to endure again, and the lessons taught on that early morning of April 18 are good for all time and any place. The best description of the effect of the earthquake in this region is that given by Mr. Charles Derleth, Associate Professor of Structural Engineering at the University of California, whose observations are recorded in a recent article in the Engineering News. The Pilarcitos reservoir he found to be thoroughly intact and full of water, and its great earthen dam was not injuriously affected. Although the main fault line of the earthquake runs through Crystal Spring Lake, it appears to have in no way affected the imperviousness of its bottom, since the reservoir, two weeks after the earthquake, was found to be full of water. The fault line passes directly through the older dam, which separates the lake into two halves, yet the dam was not seriously affected. Again, it was found that though the line of disturbance touches the eastern edge of the San Andreas earth-and-clay dam, which is nearly 100 feet in height, and there is evidence that it was subjected to a most severe shock, it retains the water just as well as it did before the earthquake, and this in spite of the fact that there are cracks running through the ground against which the dam abuts. So again the concrete dam at Crystal Spring, 115 feet in height, shows not the slightest crack, although it was subjected to a series of thrusts and pulls in vertical planes along its axis.

It is impossible to resist the force of the argument that if these earthen dams in California could pass uninjured through the severe shock and wrenching to which they were subjected, the much more massive Gatun Dam, built in a region where shocks are infrequent and of comparatively moderate intensity, might be considered to be practically earthquake-proof. So again it may fairly well be argued that if a dam of simple concrete, 115 feet in height, endured the ordeal of the earthquake without developing a single crack, the 75-foot walls of the Gatun locks, built as they will be, not of simple concrete but of concrete stiffened, toughened, and thoroughly tied together with steel rods, and with a special eye to resisting earthquake stresses, will present no element of danger to the permanence of the canal.

STRENGTH OF THE JAPANESE NAVY.

An estimate of the strength of the Japanese navy, based upon the published statements of the Japanese themselves, shows that the total strength to-day, or one year after the close of the war, is represented by sixty-two ships of a total displacement of 356,871 tons. The general confidence in the accuracy of Japanese figures and statistics is based upon the veracity with which such information was given out during the operations of the war. Although important statistics were frequently withheld, such facts and figures as were made public proved to be remarkably correct.

The strength of the Japanese navy lies in its battleships and armored cruisers. In the former class the navy is represented by eleven ships of a total displacement of 154,268 tons. Among these are the four battleships the "Fuji," "Shikishima," "Asahi," and "Mikasa," which went through the war; five battleships captured from the enemy, namely, the "Iwami," "Sagami," "Tango," "Suwo," and "Hizen," and the two new battleships recently completed in England, the "Kashima" and "Katori," of 16,350 tons displacement, which are to-day the most powerful fighting ships afloat, carrying as they do, four 12-inch, four 10-inch, and twelve 6-inch guns.

The cruisers are divided into three classes, according to size. In the first class of 7,000 tons and upward, are ten armored cruisers, including the "Aso," captured from Russia, and the 13,000-ton "Tsukuba" built in Japan and approaching completion. In the second class are nine ships of from 3,500 to 7,000 tons, including the "Tsugaru," formerly the "Pallada," and the "Soya," formerly the "Variag"; and the third class contains eight third-class cruisers of less than 3,500 tons, making a total of twenty-eight cruisers, aggregating 249,274 tons.

The coast-defense fleet is made up of twelve ships, aggregating 43,191 tons, and in these are included the "Iki," formerly the "Nicolai I.," the "Okinoshima," formerly "Apraxin," and the "Mishima," formerly the "Seniavin." The balance of the fleet consists of seven gunboats, three dispatch boats, and a torpedo depot ship. Besides these sixty-two ships aggregating over 356,000 tons, the Japanese have thirty-four torpedo-boat destroyers and eighty-five torpedo boats.

In addition to the navy as given above, the Japanese have an aggregate of 97,000 tons of new ships either now under construction or to be immediately laid down. This includes two 19-000-ton first-class battleships, the "Aki" and "Satsuma," the former being built at Kure, and the latter at Yokosuka. The armored cruiser class is to be increased by four vessels, each of 13,000 tons, two of which have been launched, while the other two are under construction. Three third-class cruisers are also being constructed, each of which will be of 2,500 tons displacement and high speed. A significant fact in connection with the future development of this navy is that the Japanese now consider themselves to be independent of foreign shipyards, all of the new construction being built in Japanese yards.

DENATURIZED ALCOHOL.

The recent passage by Congress of the bill to remove the tax on alcohol for technical uses, is expected to prove of enormous value to almost all the industries of the country. To render unfit for drinking or other purposes alcohol which is intended for commercial or industrial utilization, the liquid must be "denaturized" by the addition of various substances which make it impossible of consumption in beverages.

Consul-General Thackara, of Berlin, writing on the use of denaturized alcohol in Germany for technical purposes, says that the subject was ably and exhaustively treated by his predecessor, Consul-General Mason, in various reports on the subject. He gives the following extract from one of Consul-General Mason's reports regarding the methods in use in Germany for the denaturization of alcohol:

For most industrial purposes alcohol is used in Germany duty free, after having been "denaturized" or rendered unfit for drinking purposes by admixture, in presence of a government official, with a prescribed percentage or proportion of one or more of several different substances prescribed in the very elaborate statue which governs the complicated subject in Germany. There are two general classes or degrees of denaturizing, viz., the "complete" and the "incomplete," according to the purposes for which the alcohol so denaturized is to be ultimately used.

Complete denaturization of alcohol by the German system is accomplished by the addition to every 100 liters (26½ gallons) of spirits: (*a*) Two and one-half liters of the "standard denaturizer," made of 4 parts of wood alcohol, 1 part of pyridin (a nitrogenous base obtained by distilling bone oil or coal tar), with the addition to each liter of 50 grammes of oil of lavender or rosemary; (*b*) one and one-fourth liters of the above "standard" and 2 liters of benzol, with every 100 liters of alcohol.

Of alcohol thus completely denaturized there was used in Germany during the campaign year 1903—4,931,406 hectoliters denaturized by process (*a*), as described above, and 52,764 hectoliters which had been denaturized by process (*b*). This made a total of 26,080,505 gallons of wholly denaturized spirits used during the year for heating, lighting, and various processes of manufacture.

Incomplete denaturization, i. e., sufficient to prevent alcohol from being drunk, but not to disqualify it from use for various special purposes, for which the wholly denaturized spirits would be unavailable, is accomplished by several methods, as follows, the quantity and nature of each substance given being the prescribed dose for each 100 liters (26½ gallons) of spirits: (*c*) Five liters of wood alcohol or one-half liter of pyridin; (*d*) 20 liters of solution of shellac, containing 1 part gum to 2 parts alcohol of 90 per cent purity (alcohol for the manufacture of celluloid and pegamoid is denaturized); (*e*) by the addition of 1 kilogramme camphor or 2 liters oil of turpentine, or one-half liter benzol to each 100 liters of spirits.

Alcohol to be used in the manufacture of ethers, aldehyde, agarcin, white lead, silver bromide gelatins, photographic papers and plates, electrode plates, collodion, salicylic acid and salts, aniline chemicals, and for a number of other purposes, is denaturized by the addition of (*f*) 10 liters sulphuric ether, or 1 liter of benzol, or one-half liter oil of turpentine, or 0.025 liter of animal oil.

For the manufacture of varnishes and inks alcohol is denaturized by the addition of oil of turpentine or animal oil, and, for the production of soda soaps, by the addition of 1 kilogramme of castor oil. Alcohol for the production of lanolin is prepared by adding 5 liters of benzine to each hectoliter of spirits.

The price of denaturized alcohol varies in the different States and provinces of the Empire in accordance with the yield and consequent market price of potatoes, grain, and other materials. At the present time alcohol of 95 per cent purity, which is the quality ordinarily used in Germany for burning, sells at wholesale from 28 to 29 pfennigs (6.67 to 6.9 cents) per liter (1.06 quarts), and at retail for 33 pfennigs (7.85 cents) per liter.

SOME FACTS ABOUT PORTLAND CEMENT.

The use of cement runs back to antiquity. There is no exact known date when mankind first used calcined limestone in connection with masonry. It is known to have been used anciently by the Chaldeans, Egyptians, Greeks, and Romans. The most ancient form of cement was simply burnt limestone, more or less pure, used very much as we use ordinary lime at the present time. The Romans were the first to adulterate lime by adding certain clay soils and slate for the purpose of making a cement of a hydraulic nature, i. e., one which would set or harden under water. Pliny, who lived in the first century B. C., describes the method of modifying ordinary burnt limestone and converting it into a form of hydraulic cement.

It was anciently believed that the best cement was made from the hardest rock, and this opinion was not modified from the time of the Romans down to the eighteenth century. However, John Smeaton, the man who built the second Eddystone lighthouse, in the course of examining the various hydraulic cements for use in the foundation and masonry, made the important discovery that the quality of hydraulic cement depends upon the amount of clay in the limestone. This is conceded as the most important discovery in the art in nearly twenty centuries.

On the island of Portland in the south of England there are certain quarries of limestone which have been worked for many years, anciently producing building stone. In 1824 an Englishman named Joseph Aspdin, of Leeds, patented a process for mixing and burning lime and clay. The product looked so much