current issue of the SUPPLEMENT, and only a brief description of the principles advocated is possible here.

According to Mr. Haupt, there are other agencies at work in a stream besides the mere volume and velocity, which tend to create and maintain deep channels, as may be seen by a study of the bed of the Mississippi River at the delta. It is found that wherever the course of the river passes from a tangent to a curve, there is an immediate increase in the depth of the channel, which will be found to follow closely the concave bank. Not only is a deep channel formed close to the concave bank of the river, but the silt is thrown over to the convex shore, which shallows gradually from the point of greatest depth to the opposite bank. The sand is continually being washed out from one side of the river, and thrown up on the other. It is claimed by Mr. Haupt that if these natural conditions were reproduced at the Southwest Pass by building a single jetty with a curve of normal radius, the same results would be obtained. The outflowing and inflowing water impinging upon the jetty would maintain a constant depth of water in its proximity, and the surplus water would flow at reduced velocity over the collateral bank, depositing the silt and forming a shoal which would answer the purpose of an artificial jetty. "A single, concave, curved jetty so placed as to encroach gradually upon the path of the stream, produces a compression which causes deflection of the water and deep erosion of the sand, thereby creating a channel parallel to the axis of the jetty, and also building a natural levee by the lateral transportation of displaced material."

The proposed jetty would start from the eastern point of the Southwestern Pass; and would extend nearly two miles in a practically straight line, parallel with the axis of the flow of the river, and at a proper distance from it; thence it would curve to the northwest, with a radius of 4½ miles, for a distance of about 2 miles and end at the 30-foot depth of water on the outside of the bar.

It is estimated that the depth of water which would be attained by a reaction jetty of this type would be 40 feet. Having in view the enormous cost of either of the plans suggested by the Boards which have reported upon this project, there can be no question of the superior economy of Mr. Haupt's single-jetty system. If, after the jetty was completed, it was found that, owing to unexpected conditions outside the river mouth that did not exist in the river itself, the reaction theory did not hold, it would still be possible to obtain all the advantages of the other system by building another jetty parallel, and concentric to the first. It is not likely that if it were found necessary to complete it as a double jetty, the slight curvature would produce any harmful effect upon the structure.

IRRIGATING THE SUGAR PLANTATIONS OF HAWAII.

Sugar is the paramount staple of the Hawaiian Islands. In 1898 the amount produced equaled 2,224,825 short tons, and with the opening of projected new plantations the production will be doubled. With the absorption of the country by the United States, and continuance of the present commercial conditions, the industry is favorably affected. There are now forty-nine incorporated companies, with a paid-up capital of $68,812,000.

The Hawaiian Islands are peculiarly adapted to the cultivation of the cane. The climate is semi-tropical. The soil, volcanic, of exuberant fertility, and the rainfall—an essential feature—copious and fully adequate to the enormous requirements of the plant; the quantity necessary for the cultivation of the sugar cane is prodigious. Upon the Oahu plantation, near Honolulu, there are thirty-six artesian wells, 12 inches in diameter, varying in daily capacity from 1,000,000 to 2,000,000 gallons, all required to supply the plantation of 10,000 acres. Every day 10,000,000 gallons are necessary for each 1,000 acres. Twelve vertical inches of water each month have to be pumped on these thirsty fields, which have to be flooded every ten days. The present yield of this plantation yearly is 18,000 tons, which ultimately will be increased to 40,000 tons.

Though the annual rainfall of the island of Oahu is 70 inches, dependence is placed upon the wells alone. The soil of all the islands has a foundation of porous, volcanic rock, over which has been deposited seven or eight feet of loam, the product of ages of decaying vegetation. It is consequently easily drained and quickly absorbs the heaviest rainfall. A few hundred feet below the surface are inexhaustible supplies of water, and at no time have the wells failed to pour forth their wonted streams or to become reduced in their normal level. Even when the surface rainfall has been less, the wells have never yet been affected in the least.

Taking three of the best known plantations of the island of Oahu—Oahu Sugar Company, Ewa Plantation, and Waialua Agricultural Company, aggregating 50,000 acres—the total number of pumping plants are 24; wells, 108; and the daily amount of water required, 196,000,000 gallons, pumped to a height of 550 feet in some instances, and from that down to levels as low as 60 feet. In the island of Oahu there are altogether 209 artesian wells, supplying yearly 44,000,000,000 gallons, and scientific calculations prove that, deducting the natural loss from surface drainage and evaporation from the 600 square miles of the island, at least four-fifths of the yearly surface rainfall passes away without rendering any service to agriculture whatever.

The opening up of the new Olaa plantation, on the island of Hawaii, has demonstrated the existence of huge reservoirs on the slopes of the volcanoes of Mauna Loa and Mauna Kea, from which an immense and inexhaustible flow of water is to be obtained. The plantation embraces 19,500 acres, located on the east side of the island, and encloses a strip 4 × 15 miles in dimensions, at an altitude ranging from sea level to a height of 2,000 feet. The average annual rainfall varies from 160 to 200 inches. Along the slopes are found swampy places, where the interior waters have appeared above the surface, and occasionally flowing springs, suggesting hidden sources of water supplies. Exploration revealed a promising site for tunneling into the side of the mountain, and soon a great increase in the flow was encountered.

The use of dynamite demolished the walls of the reservoirs, and great floods of water resulted. No. 1, tapped May 15 of the present year, has regularly supplied 5,750,000 gallons daily, and No. 2, 4,250,000 gallons. United, these streams will be conducted to the mill of the plantation by a flume and used in transporting cane from the highest portions of the plantation to the site where it is manipulated, a distance of 15 miles.

The enormous rainfall of the island of Hawaii, compared with others of the group, is easily explained. The evaporation is great, and the humid air, driven by the prevailing northeast trades against the lofty range of mountains, of which Mauna Loa, 13,675 feet, is the dominating summit, is condensed by the extreme cold of these high altitudes and falls to the ground. The reservoirs are great bubbles in the earth formed during volcanic eruptions.

The discovery of these water reservoirs has greatly stimulated sugar planting in Hawaii.

NEW FORM OF CELLULOSE.

A new form of cellulose has been recently discovered, which possesses many valuable properties. The chemical designation of this new body is the soda salt of cellulose—xanthogenic acid; it is often designated by the name xanthate of cellulose, or viscose. The discovery of the body is due to the researches of Messrs, Cross, Revan and Beadle, the fundamental action being that of the alkali upon cellulose; these have no action if they are sufficiently diluted with water, and have no other effect than that of bleaching the cellulose; when concentrated, however, they act energetically and give a well-defined compound of cellulose and alkali. In order to obtain the viscose from an alkali-cellulose, the latter must be submitted to the action of carbon disulphide. A combination is formed, and the body at first swells up, being converted by degrees to a gelatinous mass, which gives a homogenous solution in water. The process is thus very simple; the cellulose is triturated in a mortar, while still somewhat wet and in short fibers, with soda lye, which is poured in little by little. The matter is then placed in a closed vessel with a small quantity of carbon disulphide for three or four hours, to obtain the viscose. This body somewhat resembles glue in appearance, being more or less thick, according to the quantity of water it contains; it is remarkable for its viscosity, whence its name. It is strongly colored, but the coloration may be changed by the addition of pigments. The property of viscose which makes i of especial value, is that at the end of a certain time, often but a few hours, it forms an insoluble gelatinous mass, which becomes comparatively hard and washes perfectly. It may be moulded into different forms or spread in a thin layer upon wood, paper, fabrics, etc. The various uses of this product are apparent; the insolubility of the varnish may be increased by dipping it into a concentrated solution of salt, alum, etc. It is probable that viscose will render service in the fabrication of artificial leather or vegetable silk.

INTERNATIONAL MINING CONGRESS.

One of the most interesting of the international congresses held at Paris has been that relating to mines and metallurgy; its president was M. Haton de la Goupillière, Inspector-General of Mines. The opening and closing sessions were held in the Palais des Congrès of the Exposition, and the remainder at the rooms of the Société d'Encouragement de l'Industrie Nationale. A large number of delegates from the different nations were present, and from an industrial point of view the results of the congress have been considered of great importance. In the opening address the president referred to the great progress realized in the metallurgy of iron and steel, and co-operation of the different sciences in the final results, of which the expression was to be found in the numerous reports which had been prepared to serve as a base for the discussions. Among the papers of especial interest may be mentioned that of Prof. Weddind, of Berlin, who treated the magnetic separation of ores. M. Hubert, Chief Engineer of the Belgian railroads, gave the results of the progress accomplished in the direct use of blast furnace gases in the production of motive power. M. Babu, Professor at the Paris School of Mines, showed what had been realized in the manufacture of special steels with manganese, chromium, nickel, etc. A remarkable study was presented by M. Hartmann, Chief of the Artillery Works near Paris, relating to the phenomena which accompany the deformation of metals when worked. The different studies of coke furnaces are worthy of note, and those on the mechanical installation of metallurgical works, transportation of slag, methods of charging and discharging raw material and products, the use of electricity in mines, and others. M. Bousquet, a prominent engineer of the South African region, made a communication of great interest on the progress of the metallurgy of gold and the cyanuration of ores in the Transvaal. In order to handle the large amount of material which was presented, the congress was divided into special sub-sections for the study of the various mining and metallurgical questions; the reports on the different subjects were prepared in advance, in order to give an exact basis for the discussions and to limit them to the essential points. The resumé of the reports and discussions of the congress will give an exact account of the present state of these industries.

DEATH OF DE WITT CLINTON HASKIN.

DeWitt Clinton Haskin died July 17, 1900, at Buffalo, N. Y. He was born in 1824 and after varied adventures in his early career, he started to build the California Pacific Railroad line, connecting the city of Marysville with San Francisco; a short line connected Sacramento with the main line. He then built the California Pacific Railroad line, which was completed in 1869, after which he became engaged in mining in Utah. In 1872 he came to New York and while crossing the Hudson River during a fog he realized the advantages of a tunnel under the Hudson. He immediately began operations for the construction of such a tunnel, the nature of the material being a fine quicksand silt. He found that methods different from those adopted at that time would have to be used. He conceived the idea of utilizing compressed air to balance the weight of the water and silt until masonry could be put in. He then took out patents covering the pneumatic process. His idea at that time met with great opposition by those familiar with tunnel construction. After years of persistent effort Mr. Haskin demonstrated that his plan was practicable, although the work was never completed, owing to financial complications.

CAVIAR.

Two distinct varieties of caviar are manufactured in Russia, the granulated and pressed forms. The granulated form is obtained by passing under pressure through a fine-meshed sieve; the small eggs pass intact, but the envelops are retained in the sieve. To these pure salt is added in the proportion of $\frac{1}{20}$ or $\frac{1}{40}$; it is intimately mixed with the eggs by means of a kind of wooden spoon. The caviar is then ready for consumption; it is packed in round metallic boxes of 1½ to 5 pounds, enveloped in parchment for transportation. The pressed caviar keeps better than the granulated form. To obtain it the fresh caviar is treated with a solution of salt at 25° Baumé until the eggs have acquired a certain degree of hardness. This operation requires considerable skill and experience; if allowed to stay in the solution too long, the caviar will be too salty, and if not long enough, the eggs cannot be preserved. The caviar is then put into small sacks, which are pressed under a screw-press to drive out the excess of salt. It is packed in barrels containing up to 1,000 pounds, or left in the original sacks, which measure 8 by 20 inches. The average export of pressed caviar for the three years, 1896 to 1898, has been more than 3,000 tons, representing a value of $1,400,000.

TELEGRAPH LINE IN GERMANY.

In Germany the establishment of a new telegraph line between that country and England has been considered, and an addition of $500,000 to the budget has been demanded for this purpose. Since the laying of the fourth cable in 1896 the number of telegrams has continued to increase, this number being 1,867,868 in 1895 and 2,465,613 in 1899. As a result, the crowding of the lines has been prejudicial to the commercial interests, and accordingly the establishment of a fifth line was found necessary. The new cable, of four conductors, will start from Borkum and end at Bacton, Norfolk; it will be constructed and laid in concert with the British telegraph administration, and will unite all the most recent improvements in the technique of submarine cables. The expense will be supported in common, except for the junction lines proceeding from the terminal stations, which will be borne by the respective governments.