men can run out about 600 lb. of sausage meat per hour. The sausage is then linked by an operator, giving the stuffed casing a winding movement as it is held in his hands, one or more twists forming the link, the operation being repeated until the whole casing is formed into links. The large casings come from the neck of the bullock, they being about two feet in length. Before smoking sausages, a hot green hickory fire is required, burning at least two hours. This makes an intense smoke, which circulates through the material, the smoking being finished in about thirty minutes. The fat of the hogs is put into what is called a rendering tank. This tank is circular, being funnel-shaped at the bottom. It is made of steel, and is 15 feet in height and 6 feet in diameter. Two or three pails of water are first poured into the manhole at the top of the tank, and 10,500 lb. of hog fat is added; the manhole is then closed and about 50 lb. of steam turned on, which thoroughly melts the fat in about eight hours. The plate is then taken off at the top and the melted lard allowed to run out through a cock about six feet from the top of the tank down through a pipe to a cooler below. After the melted material is run out above the cock the remaining lard is forced up and out by running in water at the bottom of the tank. After the lard has all passed out, the gate at the bottom of the tank is opened, letting out the scrap, which falls down into the water box below. The lard, if any, escapes with the scrap and floats on the surface. This is scooped out and put into the cooler and the fat taken out of the scrap by means of a press. Water is then let into the tank at the top, cleaning it out for another supply of fat. The cooler is made of iron 10 feet by 6 inches in length and 3 feet 6 inches in width and about 3 feet in height. After the lard is run into the cooler, the steam is turned on for one and one-quarter hours, to take out the water that escaped out of the tank with the lard. It is then allowed to cool for twenty-four hours, and then run into 400 lb. barrels for the market. Exported pork products amount to about $37,000,000 yearly; lard amounting to $22,000,000 yearly. Fresh pork consumed in 1880 in the United States amounted to 506.077,052 lb.; salt pork, 859,045,987 lb.; bacon and hams, 1,122,742,816 lb.; lard, 501,471,698 lb. The sketches were taken from the plant of Bush Brothers, Jersey City, N. J.

Ebonizing Wood.

Photographic Work says that the best way to produce the beautiful black so admired in certain articles of furniture, etc., is to moisten the surface with dilute sulphuric acid, and then heat until the desired stain is produced. The rationale is, of course, that the heat drives off the water, and so concentrates the acid that it carbonizes the tissue.

Such dilute acid, to which a little white sugar has been added, makes an excellent "sympathetic ink," the writing being invisible till the paper is heated, when the acid abstracts the water from the sugar, liberating the carbon.

The Cold Bend Test.

At the Brooklyn meeting of the American Association for the Advancement of Science, Mansfield Merriman, in his vice-presidential address on "The Resistance of Materials under Impact," said that during all this development of static testing one impact test has survived and everywhere held its own. This is the cold bend test for wrought iron and steel. In the rolling mill it is used to judge of the purity and quality of the muck bar, in the steel mill it serves to classify and grade the material almost as well as chemical analysis can do, and in the purchase of shape iron it affords a quick and reliable method of estimating toughness, ductility, strength, and resilience. It is true that numerical values of these qualities are not obtained, but the indications are so valuable that if all tests except one were to be abandoned, the simple cold bend test would probably be the one which the majority of engineers would desire to retain.

Preservation of Wines.

The calcium salt of β-naphthol sulphonic acid ($(C_{10}H_7OSO_3)_2Ca + 2H_2O$, previously described under the names of asaprol (Jour. Soc. Chem. Ind., 1892, 772) and abrastol, has been found to exert a remarkable preservative influence on wine, entirely preventing as it does, even under the most trying circumstances, the development of acidity, etc. Moreover, Dujardin-Beaumetz and Stackler have shown that the new antiseptic is perfectly harmless to the consumer, even when used in much larger quantities than necessary for the preservation of wine (ten grms. per hectoliter).

THE NEW CROTON DAM ON THE CORNELL SITE.

Over two years ago, in the SCIENTIFIC AMERICAN of July 9, 1892, we illustrated the new Croton dam and lake to be formed through its agency for supplying the city of New York with water. In 1842 the original and present Croton dam was built, and in connection with the aqueduct of the same period it secured for many years a supply of water for New York. The old aqueduct running from Croton Lake to the city was carried along near the surface of the ground, describing almost a contour line on its serpentine course to the south. Some years ago the new aqueduct was completed. This was built on radically different lines from the old one, taking a far more direct course, and in many places being many feet underground.

As it became manifest that the old Croton Lake was of insufficient size for its purpose, other dams were built back of it, to some extent increasing the water impounded. But nothing definitely final or adequate for the provision of a sufficient reservoir of water had yet been done, and Quaker Bridge dam was proposed; a gigantic structure which would have surpassed anything of its kind which the world had yet seen. This dam it was proposed to erect near the Hudson River, the structure crossing the valley through which the Croton River runs on its way to the Hudson River. Then Mr. M. A. Fteley, chief engineer, proposed instead of this a dam immediately below the present one, much higher and increasing the reservoir capacity enough for the needs of years to come. After much discussion an intermediate site was chosen for the new dam—the Cornell site as it is termed—about 3½ miles below the old Croton dam. The formation of the valley of the Croton is such as to provide excellent sites for dams, its somewhat precipitous sides acting as walls for the reservoir and as abutments for the dam.

Our small cut gives the general view of the new Croton dam as it will appear when completed. The part on the right is to be of earth with a rubble masonry core. Then comes the masonry dam, founded on the bed rock, in some places ninety feet below the surface. All the earth is to be removed and the dam is to be built on the solid rock. Two trenches, each ten feet wide, are to be made in the rock, and into them the masonry of the dam is to descend to prevent the great mass from sliding laterally. Thus a great part of the excavation will be done nearly a hundred feet below the level of the present river. The general relation of the dam to the country is shown in the diagram on this page. Referring to it, the lines of excavation can be traced down to the rock. On the left of the dam is to be its spillway, 1,000 feet long, and delivering its overflow through the 220 foot opening indicated. The shaded portions show the material which is to be excavated.

The excavations are rapidly progressing to a point when the Croton River has to be disposed of, and our large cut shows the present condition of the work. The soil is attacked on several levels, and trains of dump cars are busily traversing the terraces and the bottom, carrying off the earth, the whole making a most impressive scene. Through the excavations the Croton River is seen winding its way toward the Hudson. Cribwork is in process of construction on the right, which is to form the basis of a deflecting dam to carry the water of the Croton River to one side. In the diagram on the front page is shown the plan of the deflecting dam, and the change it is to produce in the river channel is there indicated. In itself this is a remarkable achievement. An approximately semicircular line of cribwork is carried along near the edge of the excavation, and by addition of earth the dam is to be completed and the river is to be turned into the new channel thus provided. This will leave the ground to the south clear for excavation. The work on the deflecting dam is shown more in detail in the lower cut on the front page. On the left the rock rises vertically, while the cribwork determines the general line of the deflecting dam.

A visitor to the Croton region will, in summer, find little or no water passing through the bed of the Croton River below the present dam, the great consumption of water in New York absorbing practically the flow of the river. But at other seasons the great watershed delivers a quantity in great excess of the New York consumption, and it is this excess which the new dam is intended to impound, and which has to be deflected from its course, as the foundations for the new dam in being made upon the bed rock involve the removal of 90 feet of soil underlying the present water course. As engineering achievements advance, the deflection of a river, as in the present case, becomes an incident of the greater work, but it is none the less one of the remarkable things done in the construction of this dam.

When the dam is complete, it will provide a reservoir of some 30,000 millions of gallons capacity in place of the present one of only 2,000 millions capacity. As the water rises, it will submerge the present dam and Muscoot dam far back in the interior. Its peculiar shape is seen in the small view of the completed work, where is shown the spillway, running back nearly at right angles to the main dam, and the overflow being delivered through the new channel at the north end. Over the gap between the dam and the side a bridge is to be erected, and a roadway will run across the valley over the bridge and along the crest of the dam. It is proposed to construct two other roads, one along the north side and the other along the south side of the lake.

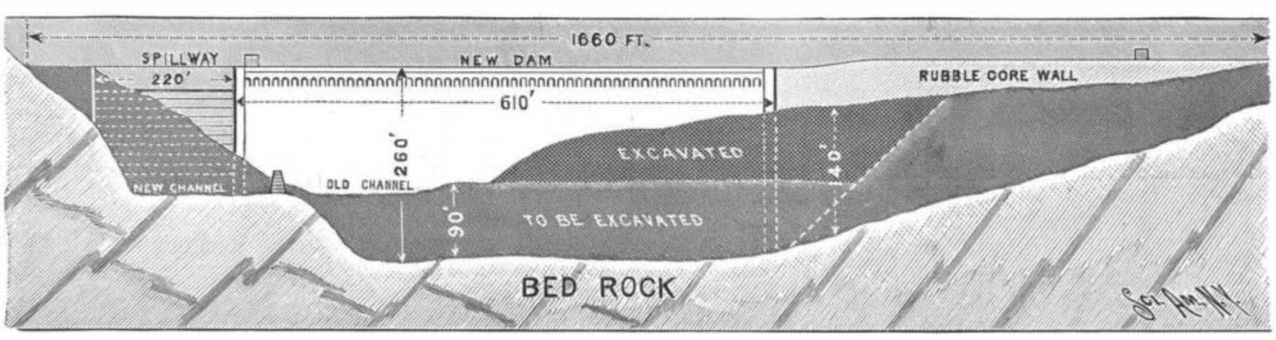
The general dimensions of the dam are as follows. It will be understood that owing to the nature of the work they will be departed from a little in practice. The earthwork dam has a maximum height of 245 feet from the bed rock, where its base is 550 feet wide. The crest is 30 feet wide. The slope of the sides is 1 foot vertical on 2 feet horizontal. A rubble core 225 feet high, 18 feet thick at the base and 6 feet thick at the top, runs through its center.

The masonry dam is to be 610 feet long, 238 feet high from the bed rock, 188 feet thick at the base, and $21\frac{26}{100}$ feet thick at the crest. It is to rise 150 feet above the restored surface or bottom of the lake, at which level it will be $109\frac{79}{100}$ feet thick.

By running the spillway off nearly at right angles an immense overflow capacity is secured. This is one of the most remarkable and original features of the work. The maximum section of the spillway gives it a height of 142 ± feet and a bottom width of $119\frac{16}{100}$ feet. The outside face is made up of a series of steps in general of 8 feet rise and 4 feet horizontal plane. Its crest is 14 feet below the crest of the dam.

The gap left between the spillway and bank is crossed by the bridge already mentioned, and the total width of the gap closed by the dam and bridge is put at 1,660 feet.

The great Johnstown disaster was due to the carrying away of a dam whose spillway was of insufficient capacity. By providing so large a spillway, one with a crest 1,000 feet long, and in removing all the overflow off to one side of the base of the dam, a most remarkable improvement upon the usual plan has been effected. No conceivable freshet could maintain a cascade of water over the 1,000 feet crest of sufficient depth to involve the overtopping of the top of the dam 14 feet above it. The removal also of the overflow to one side of the main structure removes all possible danger of the scouring of the earth from its base, and the disposition leaves the main dam intact in its work of supporting the hydraulic pressure of the water without its having to supply an overflow. The spillway and dam are separate and distinct elements of the structure.



GENERAL PLAN OF THE NEW CROTON DAM, SPILLWAY, AND DEFLECTING DAM.

Removing Old Bolts.

One of the most difficult operations in the repairing or rebuilding of locomotives is the removing of old bolts from the frames of engines. These bolts are originally machine fitted, which alone would make their removal difficult, but as they are always badly rusted the process is doubly tedious. The method always in use is to force them out by upward blows from heavy hammers, but frequently the drill has to be used. The Boston Journal of Commerce says: A workman in the Erie railway shops, at Hornellsville, N. Y., conceived the idea that these bolts could be quickly and effectively removed by a projectile fired from a cannon. The master mechanic resolved to test the idea, and a steel mortar-shaped piece of ordnance was made for the purpose, with a two inch bore, seven inches deep. This is fitted with a steel projectile the same length as the bore. The first test of this novel tool was made recently. The mortar was loaded and the drill projectile placed beneath a bolt in an engine frame. At the first discharge the bolt, a particularly obstinate one, was driven from its hold. The entire frame was dispossessed of its numerous bolts by the projectile in a much shorter time than a single bolt was ever taken out before. The success of the ordnance tool will mark an important revolution in the work of locomotive repairing.