THE OVERFLOW OF THE COLORADO RIVER AND THE SALTON SEA.—II.

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In last week's *SCIENTIFIC AMERICAN* it was briefly shown what efforts had been made to close the "temporary expedient" cut of the Colorado bank below Yuma at the point known as the third or lower intake.

Diagrams Showing Location of Intakes.

The accompanying diagram will give the location of the intakes. Intake No. 1 is where the old headgate was placed, which soon became choked up with detritus and was used only during high water, as at low water it was some four or five feet below water level. Intake No. 2 was cut on the Mexican side of the boundary, to conform with a provision of the Mexican charter to the irrigation company. It was practically unused. Intake No. 3 is the "temporary cut" which has caused all the trouble, and which was made because it was cheaper than dredging out intake No. 1. It was the intention of Chief Engineer Rockwood, when this cut was made, to place therein, as speedily as funds would allow, the necessary headgate required, so that this would have become the permanent intake, properly under control, required by the Mexican concession. It was also his intention, constantly expressed, to construct a permanent and sufficient headgate at or near intake No. 1; and, as will be seen shortly, these two are the major propositions upon which the company is now vigorously working.

When work on closing up Intake No. 3 began in May, 1905, the cut was about 100 feet in width. When the water subsided it had grown to 800 feet in width, and was still carrying about 14,000 cubic feet of water per second, with a depth at one point of 24 feet.

On July 18 the Yuma gage showed 121.8 feet, with 18,000 cubic feet flowing through the intake, and only 7,000 passing down the old river channel to the Gulf.

A new attempt was now to be made to control the water. A site was chosen a mile above the former one. By reference to the diagram, it will be seen that an island divides the Colorado River channel opposite intake 3. This island is about 3,000 feet long by 1,200 feet wide. The plan now proposed was to construct a light jetty of piling and brush, beginning at a point on the Mexican side marked A, and continuing to a point on this island marked B. The idea in this effort was to control the river by the formation of a sand bar behind the brush, thereby diverting the main portion of the flow to the Arizona or eastern channel of the island. The experiment failed. In the meantime preparations

were under way for a more ambitious undertaking. In August materials were ordered for the new attempt. This involved the construction of a gate at intake 3 large enough to pass the entire flow of the river at low stage, after building which it was the intention to construct a permanent dam across the rapidly widening "cut." When this dam was secure the gate would have been closed, thus raising the water and throwing it down the old channel. This gate it was proposed to make the one required by the Mexican government. The floor was to be of concrete three feet in thickness on a pile foundation. The superstructure was to be of wood temporarily, but ultimately to be replaced by concrete.

A two-yard dipper dredge was at once set to work excavating a big channel to carry the water around the gate site, as marked E on diagram 2, and the steamer ran around this pass while work on the dam progressed. This consisted of piles driven at the point marked 5 on Diagram 2. These were taken completely across the channel, capped, and a runway built on them from one side to the other. The steamer hauled gravel for a week to make a bottom around the piling, and the cutting of 150 tons of brush for the fascines was rapidly proceeding. All the material was on the ground for the new structure, and it seemed on a fair way to be successful, when orders came from headquarters to stop the work. The water was rising so rapidly at Salton that some other expedient must be tried at once requiring less time, and thereby saving the complete washing away of the railway tracks.

The Southern Pacific engineers proposed the construction of a pile dam across the west channel, near the head of the island at the point marked 6 on Diagram 2 in order to force the water down the east channel. The west channel was here 650 feet wide and about 10 feet in maximum depth. A dam was to be built of woven wire cable mats, filled in with bundles of brush and barbed wire anchored in the river with piling. When completed it would have to withstand a water pressure of 16 feet. Work was begun in the middle of the channel, and with two pile-drivers and a large force of men rushed as much as possible. All progressed favorably until the piling and mats reached within a hundred feet of the shore on both sides. As the work was nearing completion water was raised in the old river channel on the west side fully 14 inches. No matter how much weight was put on the mats to prevent scouring, the water would get under them and cut away the channel. The island, on which all hopes depended, began to wash away. On the 29th of November the severest flood since February,

1891, swept down the river with resistless force, and carried away a portion of the work and much of the equipment. The island was completely flooded, and 240 workmen, 13 wagons, a carload of hay, another of provisions, and 38 head of horses had to be transferred to a barge instantaneously, or they, too, would have been swept away.

This was the last effort prior to the one upon which work is now progressing. The present plan is to construct a permanent headgate at point marked M on Diagram 1. This is four miles up the river from the lower intake, and on the United States side of the boundary. The anchoring foundation is solid rock, and the structure is to be of reinforced concrete. It will be 185 feet wide and 26 feet high above the sill. The floor is to be placed 11 feet below the low-water mark and 4 feet below the river's bed. It will have 154 feet of water openings, and at the lowest water stage of the river can pass 7,000 cubic feet per second.

It will be composed of twelve reinforced concrete cells about 16 feet wide by 14 feet high. These will be filled with rock, gravel, and sand, which will be fully ample to make the structure stable, so that it will withstand the pressure of the heavy floods.

On March 20 the excavations were all completed, and the concrete work actually begun. This gate will carry 7,000 feet of water per second, while the flow of the Colorado at low water is only about 5,000 feet, and sometimes as low as 3,500 feet per second. The building of this gate implies the widening and deepening of the old canal, which is but 80 feet wide, and at low water can carry but two feet in depth. This is to be enlarged to 170 feet wide and 11 feet deep (see dotted line N, Diagram 1.) below low water. This work involves the excavation of 1,800,000 yards of earth.

The permanent work at intake 3 is resumed near the point where it was abandoned last year (Diagram

Cofferdam at the Site of Headgate No. 2.

1, P) with the necessary enlargements and alterations caused by the changes brought about in the interval by the power of the stream. From 300 feet in width it has grown to over 650 feet. (See dotted line in Diagram 1, marked R R). The floor of the new gate will be 200 feet wide and 60 feet long. It will be placed 11 feet below the extreme low-water level in a quicksand formation, and anchored to 533 foundation piles. Aprons 30 feet in length extend from the floor

The Site of the New Concrete Headgate No. 1 at Hanlon's on the California Side of the Boundary.

One Year's Growth of Willows in the Silted-up Canal Bed, Showing the Fertility of the Soil.

to the coffer-dam wall, and wings 100 feet in length extend up and down the stream. Nearly 600,000 feet of lumber, including 1,680 lineal feet of sheet piling wall, 6 inches thick, driven from 12 to 22 feet, will be used in its construction and protective works. Eight

miles southeast of Calexico, is the point of diversion, where the water from the main canal (which, it should be remembered, is the bed of the old river Alamo, dry except in time of flood) is taken, and by means of canals, all of which are controlled by headgates, is

new gate by the cutting back of the channel under the fall. It was necessary therefore to close this gate to save it, and construct an apron to protect the channel below the fall, and, therefore, the abandoned headgate had to be put into commission again. An emer-

Levee Built Parallel with the South Branch of the Alamo River Near Headgate No. 2 to Stem the High Water.

Two-Yard Dipper Dredge at Work at Headgate No. 2.

hundred and fifteen round piles will be used in the foundations, wings, and diversion jetty.

The earthwork in the approaches to the gate involves the moving of 120,000 cubic yards of earth in excavation an average distance of 350 feet, and the fill in the diversion dam and levees contains 59,600 cubic yards of earth, 2,000 cubic yards of brush, and 20,000 grain sacks filled with gravel.

It was decided on the 17th of December, 1905, to resume this work. New material had to be ordered, as all the original supply had been removed to carry on the work which the November flood had destroyed. On the 8th of January, 1906, work on the walls of the coffer-dam began. This is 250 x 120 feet, and contains 740 sheet piles 6 x 12 inches, 22 feet long. It was completed and the earth within excavated on the 15th of February. An 8-inch and a 6-inch centrifugal pump were set to work, and lowered the water as far as was necessary in two days' time. The 8-inch pump now keeps it at a proper level. A force of 160 men is at work here now, day and night. As soon as water can be turned into this gate, a permanent dam will be

supplied to the various sections of the Imperial country. When the flood began to pour down the Alamo,

agency chute was attached to it in February, 1906, with a flume 28 feet wide and 6 feet deep, and through

All That's Left of Salton.

the result was to scour out and deepen the channels around the heading at Sharp's. This scouring still

which 1,300 cubic feet of water is flowing to waste every second. This waste flow is rapidly cutting down the channel to the depth already of some 18 to 20 feet.

Work on the apron on the new waste gate is rapidly progressing, however, when water will be turned therein, the old gate closed, and a restraining jetty built across the old channel, so that the full flow will be under complete control.

Of the Salton Sea it can now definitely be said that its new life will not be long. Not that it will entirely disappear. This is scarcely to be expected. The seepage and drainage from so large an area as the Imperial Valley under irrigation will necessarily be large. This will undoubtedly keep the sea at a certain level. What that will be has not yet been, and scarcely can be determined, though it is certain it must be several feet, probably many, below the present level.

Switzerland is likely to furnish a supply of asbestos for the trade, if we are to believe the most recent reports, which state that important layers of asbestos have been recently found in the Puschlav Valley, which is located in the Canton of Grisons. A syndicate has been formed already in order to work these deposits. At the same time the syndicate proposes to construct a line of electric road which will connect the mine with the railroad station of Tirano and thus give a quick means of transporting the material. One of the principal Swiss firms which are interested in the enterprise is the house of Victor Schneider, of Geneva.

The Salton Salt Works Now Under Water.

constructed across the channel slightly below the point marked 5 on Diagram 2.

It should not be forgotten that fifty miles away from the Colorado the engineers are battling with another problem caused by the overflow. At Sharp's, seven

continues, and will continue, so long as the flood is allowed free course.

The old waste headgate was found insufficient for flood purposes, and a new and large structure was erected. But the unusual flow began to undermine the

A Reminder of the Ruined Salt Industry.

Pile Dam Built Partially Across the Colorado to Force the Water Down the Silted-up Canal.