DEPARTMENT OF THE INTERIOR

U. S. INDIAN IRRIGATION SERVICE

MONTHLY REPORT

DECEMBER

1914

A. J. Robinson

SUPERINTENDENT OF RR. RIGHT LN.

pipe, until in several cases the pipe was entirely filled up.

RIG. No. 3.

The entire month was spent on on well 343, the well being 120 feet deep. The water stands 10 feet deep in the well, but as the well has not been pumped out nor quite completed, the quantity that will be available is not known, but the driller thinks that a good well will be developed at that point.

RIG No. 4.

During the month well No. 435 was drilled 75 feet deep, and a good well developed, wind mill was erected and 100 gallons per hour was developed. The rig was then moved ten miles north, and at the end of the month 80 feet had been drilled on well 436.

UNDERGROUND WATER DEVELOPMENT. Navajo and Hopi.

During the month Foreman Womack built stone foundations for tanks at wells 321 and 322, setting steel tanks at each place and connecting them with the wells and with a string of troughs. The general repair and upkeep of wells and wind mills on the Hopi Reservations was also done.

PUEBLO WELL DRILLING.

Well drilling outfit No. 5 reports that the hand dug well No. 527 at Ensinal was completed by finishing the excavation of the chamber at the botton of the well, which is 5½ by 8 feet. This chamber was cocred over at 22 feet from surface of the ground, and well casing placed from the surface into the water. The well was then filled up to prevent any filth or animals getting into it. A six foot by seven foot galvanized iron tank was erected on a concrete foundation and a ten foot wind mill on a 40 foot tower set up.

escalero, ..M.,Jan.31,1915.

Mr.H.M.Robinson,

Supt.of Irrigation,

Albuquerque,N.M.,

Dear Sir,

In compliance with your request when here at Escalero,I submit a description of the construction of the diversion dam across the Moencopi Wash, at Tuba,Arizona.

The dam is located about three miles south of the school at Tuba,and the water is carried by a ditch three quatters of a mile in length to the school farm,and about 320 acres of Indian lands below.The farm uses the water for eight hours during the daymand the Indians use it the rest of the time.From what I can find out,it was agreed when the ditch was constructed that the Indians should maintain the ditch in return for the use of the water.I do not think that this has ever been enforced,as the ditch is in a very bad shape.

When I arrived at Tuba in March,1914,the diversion dam consisted of a rectangunar cross section of loose rock, from 12 to 14 feet in width and from 1 to 7 feet in heigth, covered with a capmade of 6 inches of concrete.About 40 feet of this in the centre had been washed out,and there was a temporary brush dam filling the gap.The crest of the old dam was on the same elevation as the floor of the headgate,necessitating an earth dike about 2 feet high to get the water into the ditch.

At the south end there was an abutment of loose

rock extending into the banks of the wash, which were from 10 to 18 feet high here, and at the north end there was a masonry wall extending from the gate openings upstream about 2 feet, and downstream to the lower edge of the dam.

The bedrock at the damsite is a very soft red shale which becomes soft as clay when in contact with water. It was the disintegration of this shale on the downstream side of the dam, under the erosive action of flood waters pouring over the dam that caused the portion of the old dam to wash out.

The new dam was designed to overcome this difficulty of downstream erosion by excavating in front of the old dam and placing a water cushion, 8 feet deep and 16 feet wide with the downstream half sloping upwards to the bed of the wash, to provide a pool where the water from the crest could be somewhat stilled before it came in contact with the rock of the floor of the wash. The crest was raised 2.3' above the floor of the headgate, with the exception of 24' directly in fron of the gates, which was left as a sluiceway, to obviate replacing the old earth dyke after every flood.

The old dam was 135 feet long between abutments, the plan being on the arc of a circle. This length was increased to 150 feet, and it was put in with an angle of about 30 degrees 60 feet from the gates, as it would have increased the cost unnecessarily to have straightened itn outentirely.

The masonry wall at the gates was carried 85 feet downstream, anda riprapped wall put in for about 30 feet further, and on the south side a masonry wing wall was built 25 feet downstream and the same distance upstream. Both walls were carried up to the elevation of the top of the gates on

the upstream side, about 7.5 feet above the crest of the dam, and sloped downstream with a drop of 6.5 feet for the first 16 feet, and then carried out XXX horizontal, with a buttress at 45 degrees at thier ends. The dam should pass a flood of over 12000 second feet before the wing walls are overtopped.

The conformation of the bed of the wash downstream from the dam is such that there will always be at least three feet of water in the water cushion when there is no water flowing over the crest of the dam, and the slope of the stream is so slight that during flood there will be a greater depth of backwater. In front of the water cushion is a toe wall extending 4 feet below the bed of the wash, to prevent the wate from cutting back under the water cushion. and there are weep holes in the front wall of the dam to obviate any uplift that might occur from seeping waters.

The sand and gravel used in making the concrete, which was a 1:2½:5 mixture, was obtained on top of a small mesa about one half mile from the damsite. There is no good material in the country, but this was the cleanest to be found and of as good quality as any. The sand was very fine uniform grained, and the gravel was hard sandstone. It made a very good tough concrete for mass work tho, as I found when I attempted to break up several large pieces of it that had been overturned by floods. The rock for the masonry and dry wall was taken from the bed of the wash, where it had washed out of previous dams. It was a very dense limestone or dolomite. I used pieces of about 6 inches in diameteras "fillers" in the concrete where the thickness of the work would warrant it.

Due to the fact thatthere was no place to divert the waters from any flood that happened to come down,all of the sand XXX,gravel and rock had to be stored up on the banks of the wash.This necessitated from one to two extra handlings of all of this material,and increased the costs considerable.Had labor conditions been more certain,it would have been possible to have brot most of the sand and XXXX gravel directly to the mixing board,but the teams and men usually had to be used when the Indians took the notion to work,and could not be depended upon.

The rainfall in the vicinity of Tuba is usually very slight,averaging about 6 inches per year.The rainy season commences the first week in July,and is usually over in the latter part of August.The rains are torrential in character,and consequently the runoff is very large.When the work on the dam was commenced,it was expected that the dam would be completed before the first of July,leaving a small margin of safety in case of floods.

During the first week of June,when I had started pouring the concrete in the floor of the water cushion,we had a storm,and a flood overtopped the cofferdam,and filled the open excavation,which was ready to receive the concrete with silt and mud.The Indians immediately quit work,and it was about three weeks before I had the silt removed,and was pouring concrete again.On the third of July another flood came down,and as usual,most of the Indians quit work,and beofre I could get another crew together,we had a third flood and after this they came down at the rate of two or three a

week during the month of July. They have been keeping records of the rainfall at Tuba for the last eight years, and the precipitation for July, 1914, was over two and one half times the maximum recorded to date.

After installing a sandbox and wasteway in the ditch about 1500 feet below the gates, I left for my annual leave, as there was no possibility of continuing the work on the dam with the wash in flood stage several times a week. Labor was also very hard to get, as the Indians were having their "sings" and it was impossible to get teams, on account of lack of feed.

I returned from my leave the middle of September, and commenced clearing up the work, intending to complete one half of the dam, and then pass any possible flood over it and complete the other half. On October 9th, after a storm, we had the worst flood of the year, the water rising to within two and one half feet of the top of the headgate wall, and refilling the excavation that I had cleared of silt from the previous floods, and was pouring concrete into.

The floods in the Moencopi wash carry from 70 to 80% of silt, and when flood water enters an excavation, it leaves it nearly full of silt, and this silt never becomes hard enough to bear the weight of a team, making it very difficult to remove.

From the analysis of the cost data on the work which I sent in to you a short while ago, you will see that the floods increased the cost of the work about $ 3000, and it is probable that indirectly it amounted to more than this

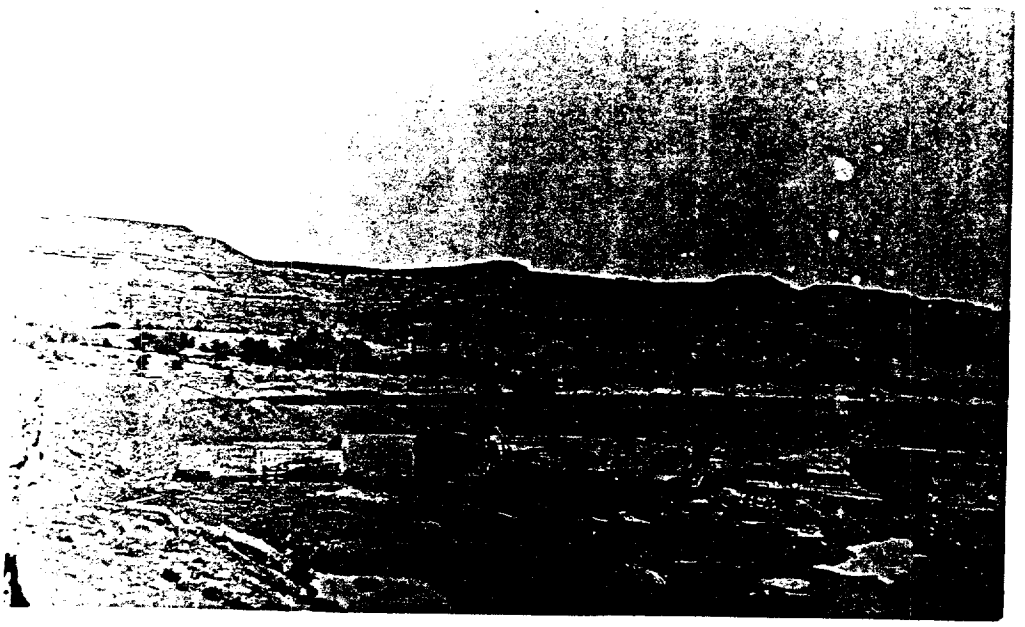
on account of the disorganizing effect upon the whole work.

It was very unfortunate that we undertook to construct the dam in an unusual year, for, from the rainfall records and local information, there would have been ono trouble from floods in an average year before the middle of July and after the first of September.

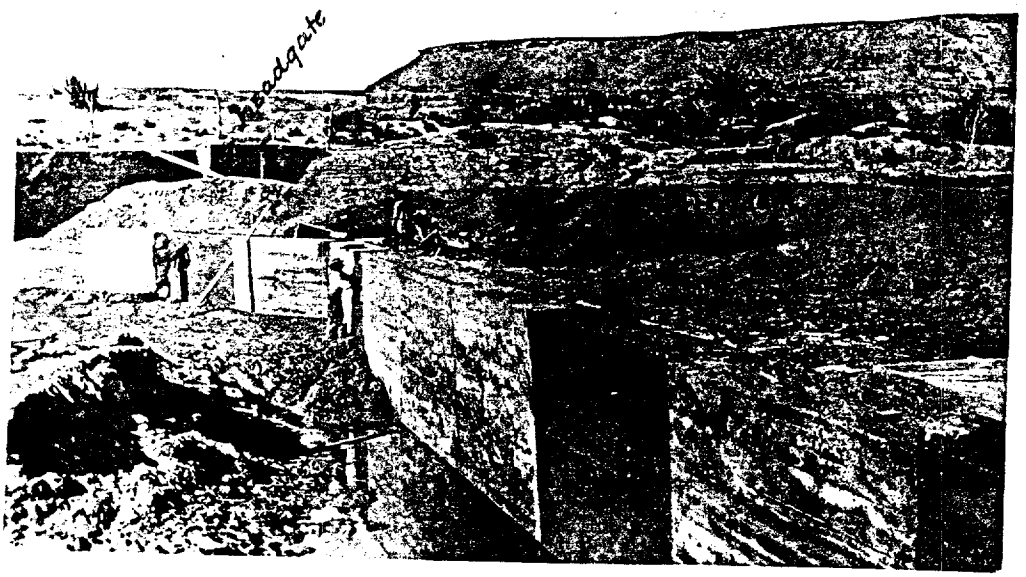
Respectfully yours,

Duncan M. Baker.

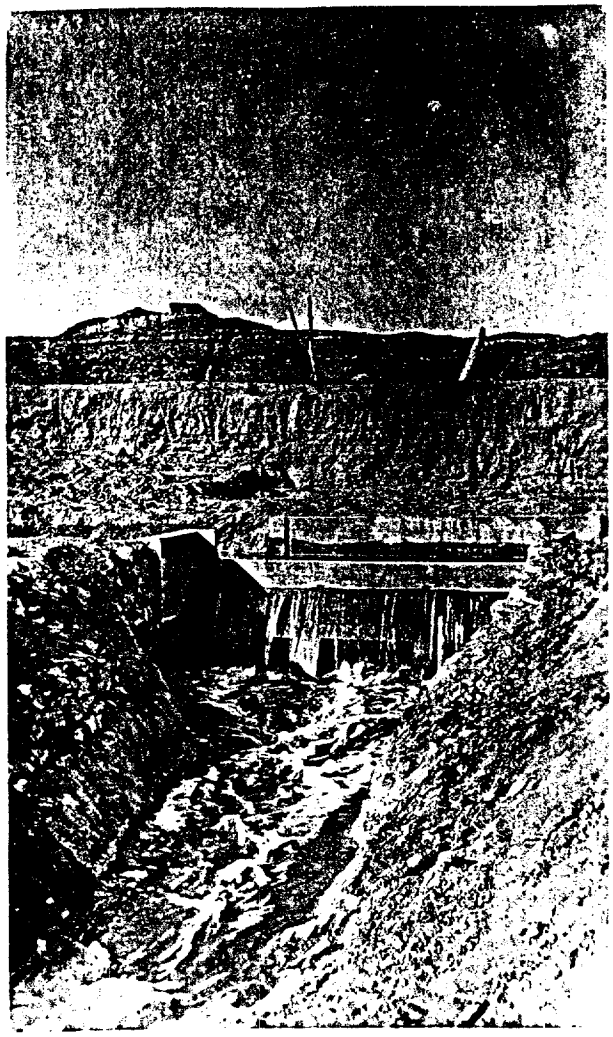
Assistant Engineer.



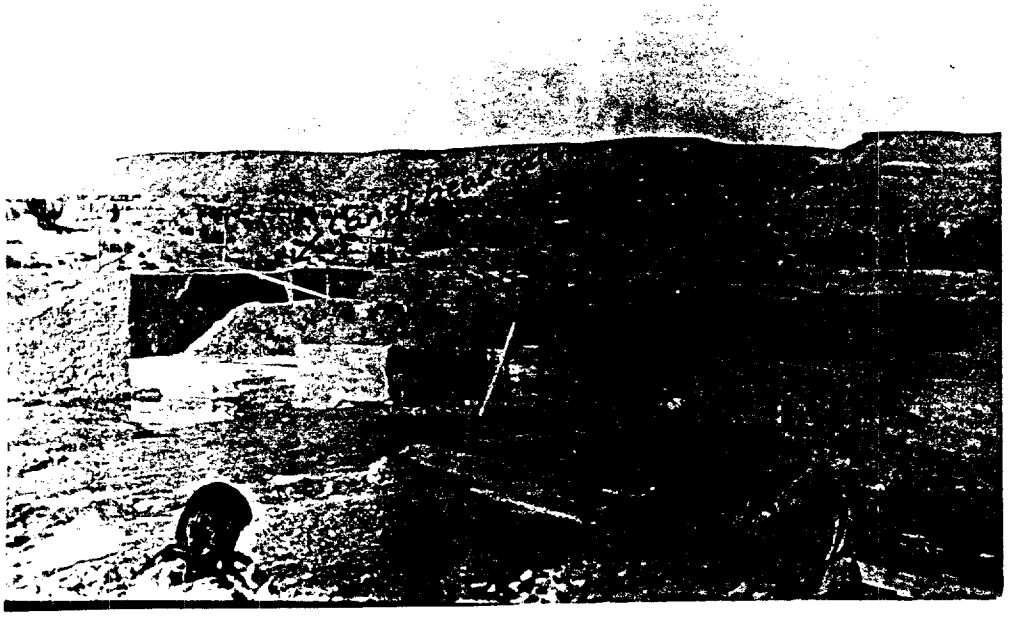
Dam from down Stream.



Face of dam - unfinished.



Spillway in Ditch.



Dam from east wing.