NAME

U. S.
INDIAN
IRRIGATION
SERVICE
DISTRICT
NO. 5

ANNUAL
REPORT
1 9 2 2

H. F. ROBINSON
Supervising
Engineer.

DIST. ENGINEER
RECEIVED
JUL 26 1
U. S. INDIAN SERVICE

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CORNFIELDS.

Some investigations were made at Cornfields near Ganado, on the Navajo Reservation. The investigations were made to determine whether anything could be done to bring these lands under irrigation. Mr. Flitman was detailed and found that there was a large acreage that might be considered irrigable land. 255 acres of this area were being farmed by using flood waters from the Rio Pueblo Colorado.

Mr. Flitman submitted a report as to the possibility of a reservoir in a dry canyon, and also of connecting these lands with the Ganado Project by some eight or ten miles of ditch. Both of these plans were deemed impracticable and so reported to you.

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FORT DEFIANCE, IRRIGATION.

Floods the last year damaged the irrigating system at the Fort Defiance School and Agency, and it was found necessary to build a diversion dam and rebuild the first 3000 feet of ditch. Authority was given for this work, the money appropriated and work was commenced the last of April.

The dam is a solid concrete slab with the head gates built as a portion of same, all fully reinforced, and built substantially as shown in the accompanying drawings. The dam was a little over 100 feet long. A sluiceway and spillway was built at Station 4-65, and 45 feet of ditch below was lined with concrete. In addition to what is included in the plan, a heavy stone wall, 8 feet wide and 8 feet long and 6 feet deep was built at the south end of the dam and a protective apron of grouted rock four feet deep and five feet wide was placed at the downstream side of the dam.

There was also built a storm spillway to prevent the cutting of the road by flood waters coming from the cliffs and sides of the canon. This consisted of a thin slab of concrete reinforced with hog wire, 10 feet long and 8 feet wide, laid on the steep slope of the road, the lower edge resting on an old stone wall five

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feet high, that had previously been built to protect the road from high water in the stream.

A concrete ditch 81 feet long was also built along the school garden where a manhole of the sewer washed out and destroyed the ditch during floods last summer.

All this work was done inside of the money appropriated and authorized for the project. The ditches on the farm were put into shape by the school forces and water was turned in on the 25th of May.

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FORT DEFIANCE PROTECTION WORK.

Unprecedented floods last summer destroyed the protection work which had been done at Fort Defiance to protect the campus and buildings from high water in Bonito Creek, which runs through the grounds.

By direction from the Indian Office I proceeded there, and finding that considerable instrumental work was indicated and having no instruments with me, I wired Mr. Post. On his arrival we made the necessary surveys and prepared plans andestimates for three different plans for controlling the future floods. These thr plans ranged in cost from $10,000 to $30,000. It was thought that perhaps a cheaper method of arriving at the desired result might be devised and Assistant Chief Engineer Olberg visited the grounds in my company in December and we devised a fourth plan, which did away with all masonry substituting loose rock construction. The estimated cost of this was approximately $7,000.

In January funds were made available, and Mr. Post was put in charge of the work. The air compressor and drill from Zuni and some other equipment were taken from Zuni and the Hogback, and some small additional amount purchased. Work commenced the first of February and has been completed.

FORT DEFIANCE PROTECTION WORK.

It consists of building three heavy loose rock groins or jetties, the rock for which was obtained by widening the channel of the stream in the solid rock for a distance of some 500 feet along the stream, and the cutting averaging 40 feet in width. A deep hole in the channel was filled with loose rock, and a protection wall built above the rock channel. As above indicated, no masonry was used, but the points of the groins where they rested on the solid rock, were thoroughly grouted and tied into the rock for a length of at least ten feet from the point, and the protective wall above had the exposed joints completely filled with cement mortar and grout.

While it is believed that this protection work will answer all requirements, and the dead water pockets between the jetties will fill with silt, there has been no high water to test them.

There was no Indian labor donated on this work. Every assistance was given by Superintendent Paquette and steam for the air compressor was taken from the school boilers.

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GANADO.

Heavy rains during July and August of 1921 caused cutting of a number of arroyas crossed by the South Side Ditch and especially at the large arroya crossed by flume 4. The irrigating season was finished without the flume going out, but it was left in such condition that repairs were necessary before water could be turned into ditches for 1922 irrigation. This flume is a truss and the wooden supports at the ends were replaced by concrete piers, using corrugated culverts on end, sunk and concrete filled. Rock filled cribs were built around these piers, being further protected from undermining by sheet piling driven eight feet into the bed of the arroya. This may seem like unnecessary work in a dry wash, but this particular one drains a considerable area and the material is a loose aluvial deposit, largely sand. This is the third flume that has been built here.

The ditch leading to and from the flume was lined with concrete for a distance of about 75 feet to prevent any possibility of the ditch breaking and flowing back into the arroya and eroding around the piers. This concrete was reinforced with old rods from flume No. 5 upon its reconstruction.

Flume No. 5, which was a wooden truss, was replaced with a steel one during the year, and during

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its building, on account of heavy rains, the false work was washed out twice, making the cost rather high.

Some protective work was done on the jettys above the diversion dam. A plentiful supply of clear water for the reservoir came down the Rio Pueblo Colorado, making it unnecessary to divert any considerable quantity of the heavily silt laden flood water. Water was furnished for irrigating 110 days during the year.

The Indians are settling up the project more rapidly now, and there is an increasing demand for lands under the North Side Ditch. This ditch has not been quite completed, as there are two or three flumes yet to be built and provision should be made within the next year to give us the necessary funds for this construction. The Indians are settling up the land under the South Side Ditch, but of course they are anxious to get under the North Side Ditch as there will be less work in preparing the land for cultivation, but by holding up the construction another year we will probably be able to get some of them to settle on the other side of the river.

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KIN LE CHEE

This is a small project on the Navajo reservation seven miles east of Ganado where water is being diverted from the Rio Pueblo Colorado.

It was a very small project and it was at first thought that it would scarcely be justified, but the few Indians living there decided that they wanted the project and volunteered to do all of the labor without any pay, provided the Government would furnish the material that had to be purchased and lay out and superintend the work.

The work consists of about 5000 feet of ditch a rock-filled log crib dam and two flumes. With this work about 200 acres can be covered, and by the construction of some laterals at least another hundred may be covered.

The Indians have completed about 1500 feet of the main ditch and practically finished the log dam. The work has gone very slowly as most of the work has been done by six of the Indians most interested, and they have only worked spasmodically, as they could do it without interfering with their vocation. At the rate they are working it will probably be another year before they complete the project.

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KIN LE CHEE CONT'T

Owing to the way they have done the work it is practically impossible to say how many days' labor has been done and the value of the work given this year. At the completion of the project we may be able to estimate what the labor to have done the work would have cost in the open market.

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MARSH PASS.

Upon the completion of the construction of this project several years ago, it was turned over to the Agency employees for operation and maintenance, as it was considered that the project was not of sufficient size to warrant the Irrigation Service keeping a man there all the time.

It would seem, however, that no work of operation and maintenance was done until the last year, when owing to one of the flumes going out, a new short section of ditch was constructed from the reservoir on higher ground than heretofore constructed.

There was considerable damage done to the diversion dam by the high water last year and the river channel above the dam shifted materially and threatened to take a new course entirely, which would leave the dam high and dry.

Mr. Lewy was sent in and made the necessary repairs to the dam and put in brush and rock protective work to keep the river in its proper channel. This work cost approximately $2000.

While there is a considerable area of land and sufficient water for its irrigation, practically nothing has been done on this project since its completion. The silt laden water of this stream fills up the upper section

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of the ditch unless constant vigilence is maintained in keeping it sluiced out. This means that whoever is in charge of this project must look after it every day during the irrigation season. This has not been done in the past and the ditch fills up notwithstanding the fact that we have two spillways for sluicing purposes. For this reason, the Indians seem to think that the project will not work, or if it works, will mean a considerable amount of labor to them, cleaning out the upper ditch, and so have not taken up land under this project. It is suggested that in order to make this project of value that a man be placed there who will act both as a manager of the ditch and as farmer, and if the right man can be found, there will be no trouble in maintaining and operating the ditch and getting the Indians on the land.

It was suggested to the Superintendent in charge of these Indians at the time it was turned over that it would be necessary for him to ask for from $1000 to $2000 each year for the operation and maintenance of this project, and he was told the method that would be needed in keeping the ditch clean and water flowing.

Unless some steps are taken to put a man in there who will look after the project, this service might

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as well decline to do any further maintenance work, as we have gone in there at least four or five times since the project was completed and put it in shape, and there are less than forty acres of land under cultivation at the present time.

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MOENCOPI WASH

The Moencopi Wash which flows through the Western Navajo Reservation a short distance from Tuba, furnishes water through a ditch built many years ago, to about 626 acres of land. 322 acres of this is used for school and agency farms and the balance is used by the Navajo Indians. Some years ago a new heading was made for this ditch some 1800 feet further up stream than the original heading and a concrete dam and headgate were built, and last year a spillway of concrete was placed in the ditch about the location of the old headgate.

It was found necessary to do some protection work on the ditch, as it runs very close to the top of a forty foot bank composed entirely of alluvial deposit. Authority was received from you to build a jetty in the stream to keep the stream from cutting further into this earth bluff and to line the ditch with concrete along the top of the bank. During the year this work was done, which consisted of lining the ditch for a lineal distance of 875 feet and the protection built in the stream was 20 feet high by 16 feet square. In addition to this the ditch between the sluiceway and the headgate was cleaned of mud, which had been de-

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posited by the largest flood known in Moenkopi Wash for twenty years.

This work was completed in August 1921.

Fort Defiance
Dam under construction. Looking up canyon.

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UNDERGROUND WATER DEVELOPMENT, NAVAJO AND HOPI.

Two well rigs have been in operation during the year and well rig number 7 has drilled fourteen holes, three of which have been deep wells. The newly discovered artisian belt in First Mesa Wash was developed further and two good flowing wells obtained, one of which flows 2800 gallons per hour. This seemed to cover the limit of this small artisian belt. From there, several other wells were developed in the Hopi country, and later in the year, the rig was moved into the Navajo land, about half way between Keams Canon and Ganado, where there was great need of water supply. As heretofore no water had been developed in this region, it was largely a matter of exploration. Eight holes contained some water, but it was in such fine material that it was impossible to develope it. Finally near the end of the fiscal year, one good well was developed, which will be of great benefit to the Indians in that section, and another well started which we hope will prove equally as good.

Well rig number 6 has been working in the eastern part of the Navajo Country, and upon authority from the Indian Office was loaned to the Crownpoint School to put down a well or wells at the school farm; all ex-

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penses being paid from a separate fund, the money being disbursed by the superintendent. They have been working on a deep artisian well, and at the end of the fiscal year, had practically reached the limit of the rig at a depth of about 1200 feet.

Two wells were drilled on the reservation before commencing at the Crownpoint School farm, both of which were successful wells with an ample supply of water.

Two maintenance outfits have been in the field the entire year, one with headquarters at Chin Lee, and one at Polacca. All windmill maintenance has been kept up, each well being visited at frequent intervals, at least once a month, and all necessary repair work made promptly. Troughs and tanks have been placed at six new wells and several windmills erected. The building of surface reservoirs for storage of water during the rainy season for stock use has been done at various places on the reservation. Foreman Womack has made several exploratory trips into new country and there are new lands that may be opened up to the use of Indians by further well drilling. But most places where water can be secured at shallow depth have been worked out and much of the future work will be in country where the holes will have to be deeper and consequently the work will be slower.

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The development of artisian water near the First Mesa opened up new prospects for the Hopi Indians of that vicinity. The well is down by the wash and about three fourths of a mile from the foot of the Mesa proper.

The main water supply for the Hopi Villages is in what is known as Ishpi Spring, which lies a few hundred yards from the quarters of the field matron, those of the Irrigation Service, and the Church and Mission. When this water was struck, and the quality found so much superior to anything in the entire Hopi Country, both the Agency and the Mission saw that there was a chance for considerable help for these Indians. The Agency had practically no money available for any development at this place, but had some supplies. The Mission had some $2000 that they could use, and it was decided to put a large reservoir at the well, install a pump and run a pipe line to the Agency and Mission buildings on the side of the hill, and place another reservoir at a point above the buildings.

The idea was to get this good water as near the village as possible, with a reasonable amount of pumping, and to have a good quality of water at the Mission and field matron's quarters in order to allow the establishment of a laundry open to all the women of the village.

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and bath houses for the use of all the Indians.

The Indians were interested in the work and agreed to donate a large portion of the labor. The Mission furnished most of the pipe and are installing laundry and bath rooms, and I believe the Agency will do the same. The cement, pump and boiler were furnished from the Agency and the Irrigation Service furnished the plans, the supervision, two old boilers that may be used for water heaters for the laundry and bath houses, and a small amount of incidental material used in construction. The Indians donated labor which if paid at regular rates would have amounted to something over $1700.

A pipe line was also run from the upper reservoir to a point where water will run into barrels carried on wagons, so the Indians may haul water from the top of the mesa in teams, where heretofore it was carried on the backs of women from springs which were inaccessible to wagons.

Plans of the reservoir and pump house accompany this, together with a number of construction photographs which will give a good idea of what has been done.

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WELL RIG NO. 7

No.	Location	Diam.	Depth	Water	Dry Hole?
715	6 Miles N E Polacca	3½	694	Gals.Hr. 2800	
716	16 Miles N E Polacca	3½	570	Artesian 200	
717	Kah ga ta Valley	3½	130		Yes
718	20 Mi.E. of Oraibi	4½	190	400	
719	7 Mi.N of Wepo	3½	213	450	
720	Steamboat Canon	6"	210	(In all of these some (water found in quick- (sand but could not be (developed.	Yes
721	" "	6"	190		Yes
722	" "	6"	150		Yes
723	" "	6"	115		Yes
724	" "	6"	138		Yes
725	" "	6"	137		Yes
726	" "	6"	124		Yes
727	Mouth of Steamboat Canon	6"	107		Yes
728	Toh-gay Wash, New Steamboat Canon	6"	521	200	
			3489		

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