12-1-1910

Second Biennial Report of the Territorial Engineer to the Governor of New Mexico including Irrigation, Water Supply, Good Roads, Carey Act, 1909-1910

Vernon L. Sullivan

ERRATA SHEET, BULLETIN [illegible]nial R

Covering Errors in Totals and Runoffs, and Other Main Errors.

Number of this Bulletin should be No. 5 instead of No. 15.

Page 5. Run-off Jan.Sep. inc. 1910 should be 582,200 acre feet.

Page 6. Float discharge measurements made by J. B. Stewart, Sept. 6th, 1909, should have discharges 69,900, 87,700, 111,000 and 141,000 second feet.

Second discharge measurement made by J. B. Stewart, June 18th, 1910, should have a discharge of 540 second feet.

Page 7. Total for Feb. 1909, should be 103.4.

Total for Jan. 1910, should be 24,487.

Page 8. Run-off for 1909 should be 371,499 acre feet.

Page 11. Discharge for measurement made Aug. 26, 1909, by W. W. Mills should be 1.6 sec. ft.

Page 12. Discharge for measurement made June 14th, 1910, by J. B. Stewart, should be 22.5 sec. ft.

Page 13. Date over table at the bottom of page should be 1910.

Page 14. Gage height for measurement made by W. H. Sutton, July 7, 1909, should be —0.18.

Page 15. Total for April, 1909, should be 396.3.

Page 17. Gage height for measurement made May 22, '09, by J. B. Stewart should be 2.05.

Gage height for measurement made June 24, 1909, by J. B. Stewart, should be 1.70.

Gage height for measurement made July 28, 1909, by W. H. Sutton, should be 1.88.

Gage height for measurement made April 24, 1910, by J. B. Stewart, should be 2.20.

Page 18. Total for November, 1908, should be 40.3.

Total for December, 1908, should be 155.

Page 21. Gage height for measurement made June 22, 1910, by W. S. Freeman, should be 5.01.

Page 25. Run-off in acre feet for April, 1910, should be 305000.

Run-off in acre feet for January and September 23, 1910, should be 1,174,600.

Page 27. Run-off in acre feet for June, 1910, should be 3700.

Run-off in acre feet for July, 1910, should be 321.

Run-off in acre feet for Period should be 7013.

Page 28. Gage height for measurement made July 8, 1909, by J. B. Stewart, should be 3.90

Page 30. Run-off Mimbres, July, 1910, should be 296 acre feet.

Page 31. Total for Oct., 1908, should be 364.5.

Total for Dec. 1908, should be 394.0.

Page 32. Run-off Oct. 1908, should be 726 acre feet.

Run-off Nov. 1908, should be 558 acre feet.

Run-off Dec. 1908, should be 781 acre feet.

Run-off Oct.-Dec. [illegible], should be 2065 acre feet.

Page 33. Run-off June, 1910, should be 6310 acre feet.

Run-off Period, 1910, should be 44,960 acre feet.

Page 34. First three run-offs as printed for May, June and July, 1910, should be for April, May and June.

Page 35. Gage height for second measurement made Aug. 19 1910, by W. B. Freeman, should be 2.00.

Total for May, 1910, should be 6625.

Page 36. Run-off for May, 1910, should be 13,118 acre feet.

Run-off for Period, should be 79,248 acre feet.

Page 38. Right hand column in table at bottom of page, Pecos a Dayton, New Mexico, 1908, should be headed Estimated Run-off Acr Feet.

Page 40. Total for Aug. 1910, should be 44,259.

Page 42. Discharge for measurement made Aug. 15, 1910, on th Penasco, at Elk, by W. B. Freeman, should be 29.7 second feet.

Page 45. Discharge measurement made April 7, 1910, on Rio Pueb de Taos, by J. B. Stewart, should have width 14.8—Area 18.0—Ga height,—Discharge 43.0 second feet.

Discharge measurement made July 12, 1910, on Rio Pueblo de Ta by J. B. Stewart, should have width 11.5—Area 12.0—Gage height Discharge 14.0 second feet.

Discharge measurement made September 15, 1910, on Rio Pueb de Taos by C. D. Miller, should have width 11.5—Area 8.9—Ga height—Discharge 7.2 second feet.

Page 46. Date over table at top of page should be 1910.

Page 48. Gage height for measurement made June 14, 1910, b B. Stewart, should be 1.35.

Gage height for measurement made Aug. 12, 1909, by W. H. Su should be 1.37.

Page 52. Discharge for measurement made April 21, 1909, b B. Stewart, should be 214 second feet.

Page 53. Total for May, 1909, should be 847.

Page 54. Run-off for April, 1910, should be 738 acre feet.

Run-off for July, 1910, should be 30.7 acre feet.

Page 56. Total for December, 1908, should be 6095.

Total for September, 1909, should be 181,570.

Page 58. Gage height for measurement made Nov. 17, 1909, B. Stewart, should be 2.90.

Page 62. Total run-off for period of Jan.-Sept., 1910, sho 1745.7 acre feet.

Page 65. Total for July, 1910, should be 26,610.2.

Total for Aug., 1910, should be 3,182.

Total run-off for period Jan.-Sept., 1910, should be 65,722.9 ac

Run-off for Jan., 1910, should be 6210 acre feet.

Run-off for July, 1910, should be 52,800 acre feet.

Run-off for Aug., 1910, should be 6,310 acre feet.

SEE IMPORTANT RAINFALL NOTICE ON LAST PAGE.

Second Biennial Report

OF THE

TERRITORIAL ENGINEER

TO THE

Governor of New Mexico

INCLUDING

IRRIGATION WATER SUPPLY GOOD ROADS
CAREY ACT

1909---1910

SANTA FE, N. M.
NEW MEXICAN PRINTING COMPANY
1910.

LETTER OF TRANSMITTAL.

Santa Fe, New Mexico, November 30th, 1910.

To the Honorable Wm. J. Mills, Governor of New Mexico.

Dear Sir:—In accordance with the provisions of Section 8, Chapter 49, Laws of 1907, I have the honor to submit herewith, a report covering the work of this department during the last two years.

Respectfully,

VERNON L. SULLIVAN,
Territorial Engineer.

ACKNOWLEDGMENTS.

Acknowledgments are due to the United States Reclamation Service for its kindness in lending this Department field instruments, the United States Geological Survey for its assistance in co-operating with this office and the furnishing of money for the work connected with the general hydrographic investigation, also the Santa Fe railroad and various other parties who are co-operating with the Department.

I also wish to acknowledge the energetic interest and efficient help of my assistant, Mr. C. D. Miller, in his untiring efforts to assist in promoting the best interests of this Department as well as Engineers, Messrs. C. H. Neel, John D. Meriwether and John W. Lewis, Hydrographer, James B. Stewart, and Miss Irna Holcomb, Stenographer, to all of whom this Department owes a part of its success.

Second Biennial Report of Territorial Engineer.

INTRODUCTION.

Since submitting my first report two years ago, matters pertaining to this Department have progressed and multiplied extensively along all lines. Irrigation has been assisted by the extension of the Carey Act to the Territory and the adoption of the District Irrigaion Law by the last legislature.

Three years ago the Territorial Engineer was questioned when he made the statement, that New Mexico would ultimately irrigate two million acres of land; today he is criticised for his conservatism. "Within the last two years there have been filed 285 applications for permits to appropriate water covering an intended area to be irrigated of over two million acres of land. This amount is, of course, in excess of what will actually be developed from these filings, as the filings in many cases are larger than the water supply will warrant, also several parties having made duplicate filings on several very large projects, however, within that time there have been 40 irrigation projects that have been completed; 30 projects that have one-fifth or more of their construction work finished and 26 others that have been commenced.

There is an estimated one-half million of "water horse power" that can be generated by waters of the Territory, and in many places the fall is so great in the streams, that a given amount of water will generate enough power to pump several times that amount from the underflow. There have been 27 water power filings made within the last two years which contemplate the development of nearly one hundred thousand horse power.

With the diverting of the natural flow of the various streams, the construction of *storage reservoirs* and the *pumping* of water from the *underflow*, combined with the *economic* and *scientific* use of the water, it is evident, that New Mexico will eventually irrigate an area greater than the combined area of Delaware and Rhode Island.

One of the largest opportunities for the development of water for irrigation will be found in the storing of flood waters from various arroyos all over the Territory, as large volumes of water

come down these arroyos at intervals and if these waters were stored, it would enable the development of a water supply for the irrigation of many thousand acres of land.

The greatest development in irrigation through actual construction work has been in the northern and eastern portions of the Territory, there being very little construction work in the southern and southwestern parts of the Territory, excepting the United States Reclamation Service Projects known as the Carlsbad, Hondo and Rio Grande Projects. The construction work, generally speaking, is being made in a more permanent and substantial manner than in years past. A great catering is being made to reinforced concrete. Nearly all of the headgates on the various projects are of either iron or concrete or both, while the types of dams vary from solid concrete, to reinforced concrete, earth and rock fill. Practically all of the constructed diversion dams are of reinforced concrete, while the majority of the storage dams are either rock fill or earth dams with reinforced concrete cores, the upper face of the dam being paved with either reinforced concrete or rock rip-rap. All the latter type of dams are provided with sufficient spillway capacity at other points.

The major portions of the canals are in earth and unlined, however, there are a number of smaller projects in which the canals are being constructed by having them either lined with concrete or carried in pipe lines. Quite often the laterals are lined with concrete and generally all the canal outlets are of concrete or cast iron. On the whole the construction development is tending toward a much improved character.

The Good Roads Law passed by the last legislature has placed a great deal of extra work on this Department as the Territorial Engineer is the Engineer of the Commission and under whom the supervision of construction work is done. It is a pleasure to note what has been done towards the construction of a system of highways in so short a time and the confidence the people have in our results, wherever we have worked.

The Territorial Engineer has taken great interest in this work and has taken particular care in getting competent men to oversee the construction work, and that proper locations of roads are made, that plans of construction are best suited to each particular case.

The accounts and expenditure of moneys is particularly guarded. No account is paid unless there is a voucher for same which is checked in the office of the Territorial Engineer, the Good Roads Commission and by the Territorial Auditor.

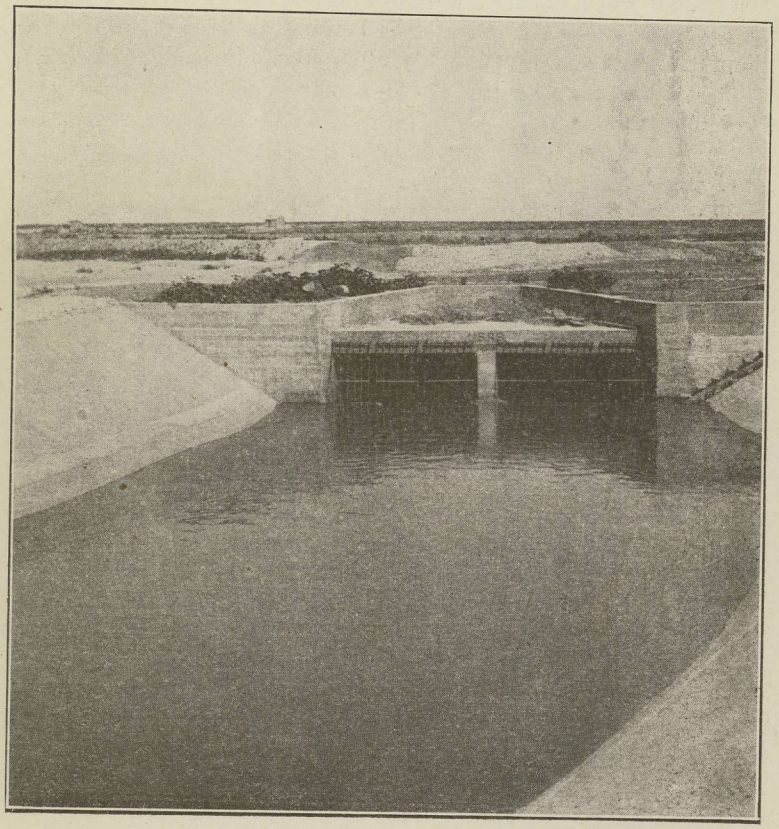
The results accomplished are very gratifying, not only to the Territorial Engineer, but also, we believe, to the public.

In conclusion: With the coming of statehood and the adoption of a short but *effective* Constitutional Provisions, insuring the appropriation of water with *beneficial* use as the basis, measure and limit of a right and priority of appropriation being recognized and supported with one of the best irrigation laws known, together with the Carey Act, which applies to government land; the District Irrigation Law, applying to patented lands; the systematic collection of hydrographic data; the adjudication of water rights; a more *scientific* use of waters and the conservative appropriation of same, together with the advancement of the construction of good roads, there seems to be no reason why New Mexico should not develop very rapidly along these lines.

The following pages will give a more detailed report of our Department.

Cary Act in New Mexico and Its Operation.

The Congressional Act known as the Carey Act has recently been extended to the Territory of New Mexico and the last Territorial Legislature passed an act accepting and carrying it into



Large Concrete Siphon, Carlsbad, U. S. Reclamation Project.

effect, thus giving its benefits to this Territory. This act provides that the United States government shall give to the Territory a

million acres of land, or as much as the Territory will irrigate by settlers who are not allowed to irrigate over one hundred and sixty acres to each male head of a family. This, of course, is only applicable to where there is government land that is susceptible to irrigation by the building of a large irrigation project.

The land under the contemplated Carey Act Project is segregated for this project by the Government, for the Territory, and the Territory then contracts with a construction company to build, colonize and organize an irrigation company for this specific irrigation project.

The cost of doing this work is paid out of the water rights sold to the specified lands, the Territory agreeing to sell any of the lands subject to irrigation under the project for fifty cents per acre to parties who have agreed to purchase a water right from the company at a specified price. The cost of the water right is generally paid by the settler to whom the company has sold a water right, in ten annual payments, the price of same being based upon the actual cost of the construction work, colonization and organization of the irrigation company, plus a reasonable amount for profits and interest on the investments to the construction company, this price being fixed by the Territory and is a prior lien on the land.

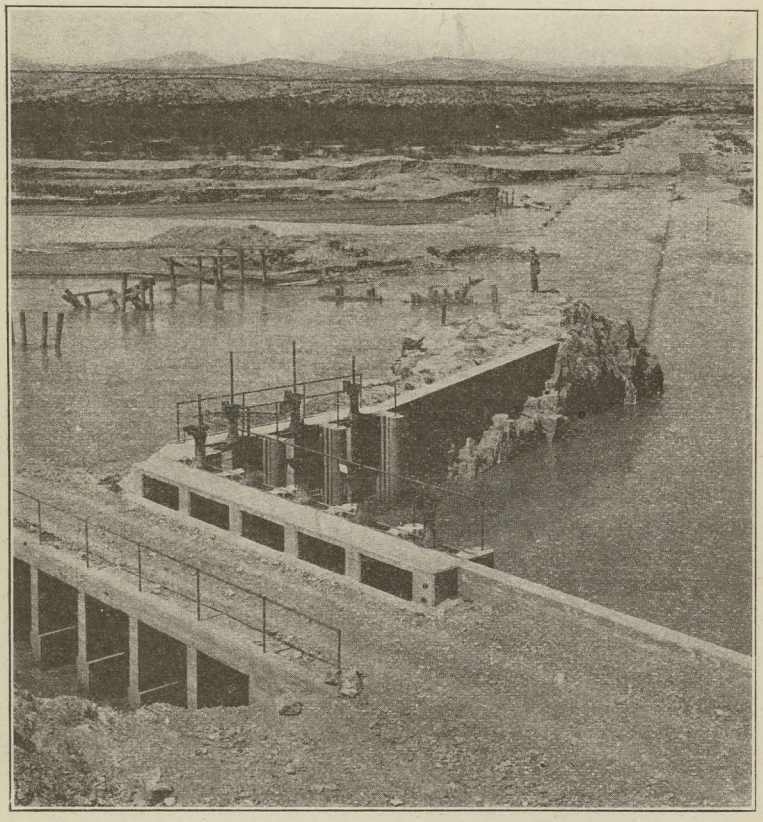
It is provided that these water rights carry with them a proportional interest in the irrigation system and when paid for they have a portional voice in the management of the company, thus, the Carey Act Projects, after a lapse of ten years, become community propositions.

We have already two Carey Act Projects in the Territory, One the Lake Charette Project near Springer, N. M., which contemplates the irrigation of ten thousand acres of choice land from the waters of the Ocate and Sweetwater rivers. The other Carey Act project is the Oasis Development Company of Artesia, N. M., which contemplates the irrigation of ten thousand acres of very fine land in southern Otero County from the flood waters of the Sacramento River.

DISTRICT IRRIGATION PROJECTS.

The Legislature of 1909 passed an Act similar to the Act commonly called the District Irrigation Law which provides that the County Commissioners, can, after certain petitions have been presented to them, organize a district of certain lands that can be irrigated from an irrigation project and that these lands can be bonded as security for obtaining money for the construction of

the irrigation project. So far the Territory has two District Irrigation Projects, one the Orchard District Irrigation Project located in San Juan County which contemplates the diversion of some of the waters of the Animas River for the irrigation lands lying on the west side of that river. The land under this project is exceptionally good and the bonds have been approved. The other



Leasburg Diversion Dam, United States Reclamation Project.

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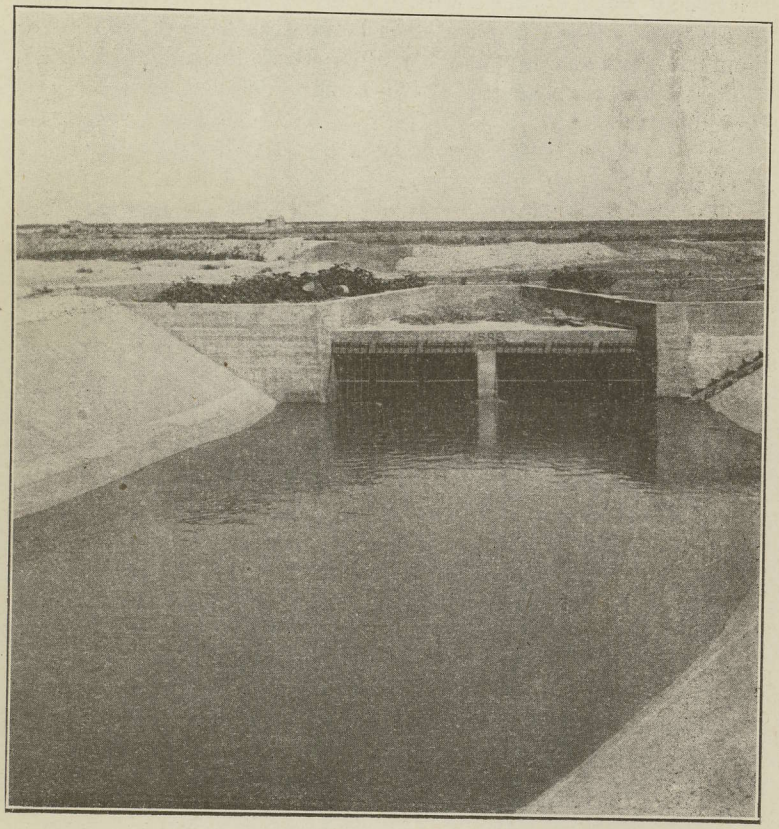

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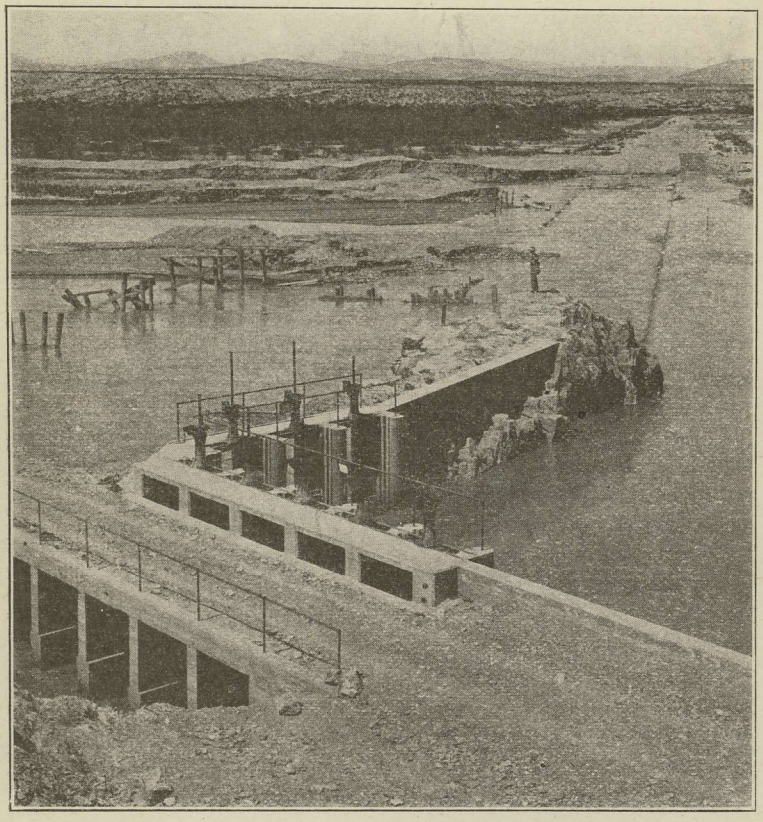

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The passage of the District Irrigation Law will enable the Territory to irrigate tracts of land that are now patented and that would otherwise be hard to finance, as it provides that lands under the District are held as security for the bonds that are sold to build the irrigation works.

With the provisions of the Carey Act, which cover Government land, and the District Irrigation Law, covering patented land, the Territory is now in good position to make rapid progress in the development of its irrigation resources.

BONDS.

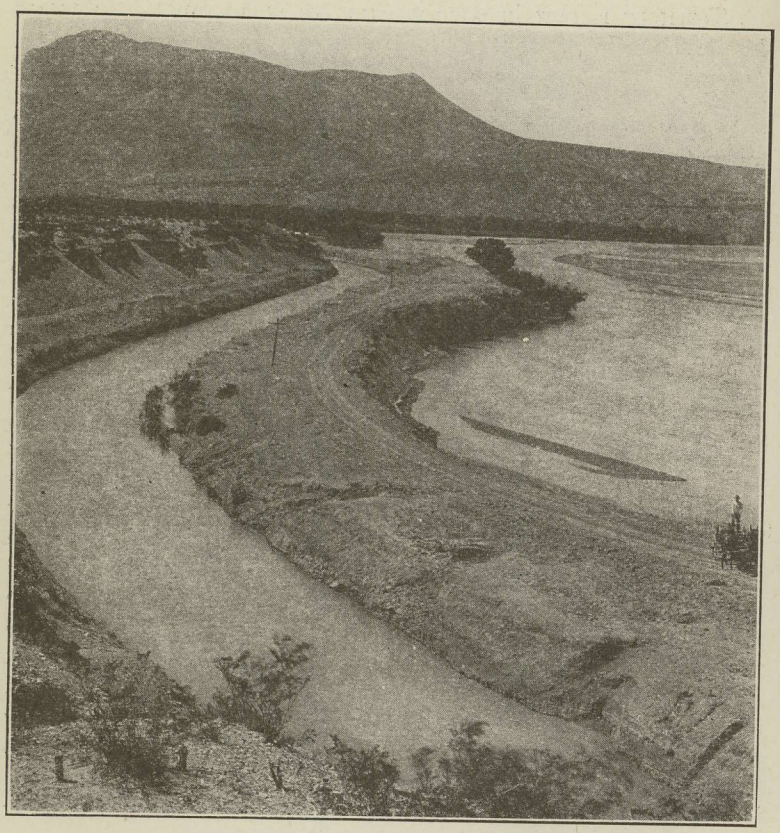
A great need for the proper regulation and restriction of the applications for permits to appropriate water, filed in the office of the Territorial Engineer, has been felt almost from the very creation of this office. Many applications have been filed, and while resulting from actual surveys, the expenditure of some money to comply with the rules and regulations and the law, have no other intention than mere speculation. Applications have been received covering large quantities of water, securing a certain priority, the promoters have rested upon this initiative work until the projects could have been disposed of and in many cases, the promoters have not used diligence in trying to dispose of them to possible constructors as they had little money at stake. It is necessary, in order to give capital protection during the construction of large irrigation projects, to give the priority of water rights under the project the same date as the date of filing the application for a permit to appropriate, for, otherwise, several smaller projects could step in during the construction of the large project and, by the smallness of their projects, be able to grasp enough water so quickly as to leave the larger project without sufficient water when it has been completed and ready for use. Our law fully protects the large project as well as the smaller ones by giving a date of priority the same as the date of filing, provided the project is completed within the required time. Thus, it can be seen that if a project is a worthy one there is a value in the obtaining of a permit to appropriate water.

It is no more than right that when the Territory gives such a permit, that the Territory should be assured that such a project will be built, consequently, the Territorial Engineer adopted a rule requiring a bond proportioned on the amount of water asked to be appropriated, as a guarantee, that the project will be built, thereby, preventing largely the overestimating of the water sup-

ply and the monopolization of the public waters without intent to make beneficial use thereof.

This bond was approved and passed on by the Attorney General and at the meeting of the Board of Water Commissioners of May 3rd, 1910, the action of the Territorial Engineer was approved.

The amount of the bond is so proportioned on the amount of



Leasburg Canal, United States Reclamation Project.

water intended to be appropriated that it is not burdensome on the small projects yet it obtains the results it was intended for.

There was some comment on this step by people who had not considered the results or necessity. Statements were made that this action would stop the development of irrigation projects; but, contrary to this opinion, applications have not only been as

numerous as heretofore but have secured considerable more attention and investigation before same were filed and bond made out guaranteeing construction in event such application is granted.

At present there have been received bonds amounting to $60,250 and are itemized as follows:

Application No.	Applicant.	Amount of bond.
21	Ranchos Orchard and Land Co	1000.00
40	The Eden Land & Canal Co	$5000.00
41	Stag Canon Fuel Co.	1000.00
339	E. H. Fisher	4000.00
456	Hardwich and Highsmith	500.00
449	S. K. Norment	5000.00
462	G. A. Richardson	500.00
463	Columbus Improvement Association	1000.00
464	R. L. Survant	2000.00
465	Baldwin and Gibbany	500.00
467	W. M. Fyffe, et al.	2000.00
468	Thos. L. Loftus	8000.00
457	W. H. Bartlett	500.00
470	E. T. Foster, et al.	5000.00
474	Joe Elek	500.00
475	J. M. Miller	1500.00
477	Beutler and Wiese	250.00
478	Alamogordo Improvement Co.	2000.00
479	Thomas H. Malone	250.00
481	F. M. y Martinez	250.00
482	S. H. Brown	250.00
484	F. W. Lowery	500.00
485	T. P. James	250.00
486	Gila River Power Co.	5000.00
487	Craig and Lund	250.00
493	George Doak	4000.00
501	L. P. Upton	500.00
502	La Joya Land, Irrigation and Dev. Co.	250.00
503	La Joya Land, Irrigation and Dev. Co.	6000.00
505	D. B. Whiteside	3500.00
69	C. W. Thuringer	1000.00
Total		$60,250.00

The following letter, upon the approval of this bond by the Board of Water Commissioners, was sent to the attorneys and irrigation men throughout the Territory:

DEPARTMENT OF TERRITORIAL ENGINEER,
Santa Fe, N. M., May 4, 1910.

To the Attorneys, Civil Engineers, County Surveyors, and General Public:

Gentlemen:—Within the last three years there have been over four hundred applications for permits to appropriate the public water of the Territory of New Mexico and in a great many cases applications have been filed which apparently were not for the purpose of developing the project but for speculative purposes or for the purpose of throwing clouds upon other permits to appropriate water from this same supply.

In view of the intention of the legislature in passing the Irrigation Act of 1907 in which it intended to promote real development and actual construction, this office has deemed it advisable to hereafter require a satisfactory bond as evidence of the ability of the applicant to carry his application to completion.

The bona-fide developer will hail this new rule with approval for he is more protected in his applications as the requiring of this bond will prevent to a large extent the filing of other applications for permits to appropriate water, which might be conflicting with his, for speculative purposes.

This rule has been established after very careful consideration of the great necessity of actual development in irrigation and power matters in this Territory.

The following rule, which has been officially approved by the Board of Water Commissioners, will hereafter be in effect as an appendix to our general printed rules and regulations.

RULE AND REGULATION.

Hereafter the Territorial Engineer will require with every application for a permit to appropriate water under the laws of New Mexico a satisfactory bond, to be approved by him, as evidence of the ability of the applicant to carry the construction to completion and upon failure to complete such project as required by the permit, if granted, the bond will be forfeited and the amount will be paid into the Hydrographic Survey Fund of the Territorial Treasurer.

It is provided that no bond will be required when the application is not for more than two second feet or five hundred acre feet per annum.

The bond required for water filings for irrigation, power, mining and manufacturing purposes will be as follows:

For 2 to 5 second feet (Cubic feet per second of time) or 500 to 1500 acre feet per annum, $250.00; 5 to 10 second feet or 1500 to 3000 acre feet per annum, $500.00; 10 to 20 second feet or 3000 to 6000 acre feet per annum, $1000.00; 20 to 40 second feet or 6000 to 12,000 acre feet per annum, $2000.00; 40 to 75 second feet or 12,000 to 25,000 acre feet per annum, $3500.00; 75 to 150 second feet or 25,000 to 60,000 acre feet per annum, $6000.00; 150 to 300 second feet or 60,000 to 125,000 acre feet per annum, $8000; 300 to 500 second feet or 125,000 to 250,000 acre feet per annum $10,000.00; and all above this last named amount $15,000.00.

Bonds on applications for water for power, mining, or manufacturing purposes only, will be one-half as required for irrigation purposes.

In case satisfactory bond be not filed within thirty days after the receipt of the application at the office of the Territorial Engineer, such application will be rejected.

VERNON L. SULLIVAN,
Territorial Engineer.

The office has received commendation on this step by the leading irrigation men of the United States and in view of the step outlined for the Irrigation Congress against the so-called "wild-catting" in irrigation works we believe the Territory has taken the first step in this direction. The office will furnish blank bonds on application.

MAPS TO ACCOMPANY APPLICATIONS FOR PERMITS TO APPROPRIATE WATER.

There has been some confusion as to the belief, that maps filed with applications for permits to appropriate public water, cover plans and specifications. We require maps to accompany an application as is illustrated by cut, but these maps need not be detail plans and specifications of the construction work. They are to show the controlling features of the project. Our rules, regulations and instructions give the necessary data to be shown upon them together with statements.

Detailed plans and specifications must be filed on or before the date the application comes up for final consideration.

Map of the La Luz and Alamogordo Flood Water Ditch of the Alamogordo Improvement Company Otero County New Mexico

Variation 11°55' East

Scale: 1 inch=1000 ft.

Claimant

The undersigned Alamogordo Improvement Company, Claimant, whose postoffice address is Alamogordo, Otero Co, New Mexico has caused to be located The La Luz and Alamogordo Flood Water Ditch, as herein described, hereby makes these several statements relative thereto and offers this map and statements for filing in compliance with the laws of the Territory of New Mexico

Point of appropriation:

The head gate is located at a point on the south bank of the La Luz River, from which river it will derive its supply of water when said stream is in flood, from said head gate the South ¼ corner of section 25, Township 15 South, Range 10 East, N.M.P.M. bears S 5°50 W. 3325 feet distant. The land on which it is located is the property of the Alamogordo Improvement Co

Lands

The lands to be irrigated consist of 1600 acres located as follows

Subdivision	Sec.	Tp S	R E	Owner	Area
N½	21	15	10	Alamogordo Improvement Co	160 Acres
SE¼ SE¼	22	"	"	"	40 "
S½	25	"	"	"	160 "
NW¼ NW¼	26	"	"	"	40 "
NE¼ NE¼	27	"	"	"	40 "
E½ NE¼	34	"	"	"	80 "
S½ SE¼	8	16	10	"	80 "
E½, SW¼ & S½ NW¼	17	"	"	"	560 "
E½ NE¼ & E½ SE¼	24	16	9	"	160 "
NE¼, N½ SE¼ & SE¼ SE¼	25	"	"	"	200 "

Ditch:

Alignment

Station	Angle	True Course	Station	Angle	True Course	Station	Angle	True Course
0		S 9° 15 W	61+57	29° 0 L	S 34° 05 E	179+05	40° 0 R	S 1° 05 W
5	13° 0 R	S 22° 15 W	63+10	33° 0 R	S 21° 05 E	185	33° 30 L	S 32° 25 E
6+55	19° 0 L	S 3° 15 W	70+25	87° 0 R	S 65° 55 W	181+00	8° 50 L	S 41° 15 E
9+87	37° 0 R	S 40° 15 W	86	12° 30 L	S 53° 25 W	198+34	5° 10 L	S 46° 25 E
11+27	52° 10 L	S 11° 55 E	89+68	13° 0 L	S 40° 25 W	201	4° 45 R	S 41° 40 E
15+50	27° 0 L	S 38° 55 E	100	7° 0 L	S 33° 25 W	213+40	6° 45 L	S 48° 25 E
19	35° 30 R	S 4° 25 E	102	22° 0 L	S 11° 25 W	221	3° 30 L	S 51° 55 E
20+59	26° 0 L	S 30° 25 E	106+44	28° 30 R	S 39° 55 W	226+74	7° 45 L	S 59° 40 E
31+60	16° 0 L	S 46° 25 E	109	11° 30 L	S 28° 25 W	239+50	30° 15 R	S 29° 25 E
34	29° 0 R	S 17° 25 E	112	9° 20 L	S 19° 05 W	257+75	25° 0 R	S 4° 25 E
35+60	22° 0 R	S 4° 35 W	118	15° 40 L	S 3° 25 W	260	17° 0 L	S 21° 25 E
39+80	29° 30 L	S 24° 35 E	126+24	7° 0 L	S 3° 35 E	264	6° 15 R	S 15° 10 E
42	10° 0 L	S 42° 55 E	134+21	10° 45 R	S 7° 10 W	272	6° 30 L	S 21° 40 E
45+50	11° 30 R	S 31° 25 E	141+95	26° 35 L	S 19° 25 E	286+57	25° 30 R	S 3° 50 W
50+73	27° 20 R	S 4° 05 E	163	9° 30 L	S 28° 55 E	290+15	End at main ditch	
56	23° 0 L	S 27° 05 E	170	19° 0 R	S 9° 55 E			
58	18° 0 R	S 9° 05 E	172+50	9° 50 L	S 19° 45 E			
60	16° 0 L	S 25° 05 E	177	19° 10 L	S 38° 55 E			

Grade

The first 400 feet of this ditch will be a two foot pipe line laid with a fall of 2 feet (5 ft per 1000) At station 4+65 this ditch runs into and becomes one and the same ditch as the La Luz and Alamogordo Ditch which was built in 1900 and is owned by the Alamogordo Improvement Co who own the appropriation of all the living waters of the La Luz River. As originally built this ditch was 2 feet deep, 8 feet wide on top and 6 feet wide on the bottom and now has a fall of about 75 feet per mile

Water claimed

The carrying capacity of the new ditch is 12½ cubic feet per second of time for which claim is hereby made to the flood waters of the La Luz River for irrigation purposes

Estimated cost

The estimated cost of the new work is $2000.00

Work began

Work was commenced by survey on the 8th day of August AD 1907

Affidavit

Territory of New Mexico,
County of Otero

I W.R. Eidson being first duly sworn upon my oath state that I am the Vice President of the Alamogordo Improvement Company, a corporation organized under the laws of the Territory of New Mexico that the foregoing map was made under the authority of the board of Directors of said corporation and that I have read and examined the statements and representations there on and that the same are true to the best of my knowledge and belief

The Alamogordo Improvement Company
By W R Eidson
Vice President

Subscribed and sworn to before me this 21st day of August, 1907

R M Jackson
Notary Public

Certificate

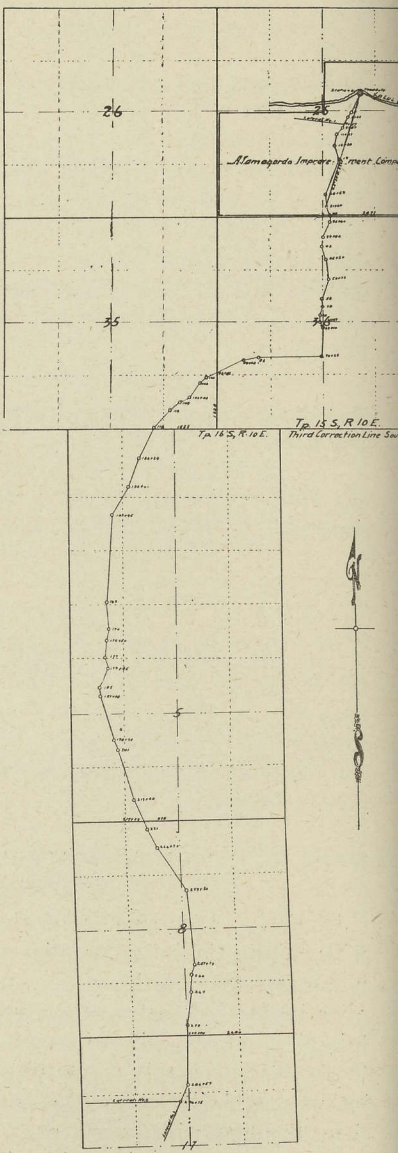
Territorial Engineers Office,
Santa Fe, New Mexico

Territory of New Mexico } ss.
County of Santa Fe

I hereby certify that this map and statement has been examined and approved by me, and was accepted for filing on the 10 day of December A.D. 1907

Vernon L Sullivan
Territorial Engineer

Surveyed & Platted by W A Wilson
Roswell, New Mexico



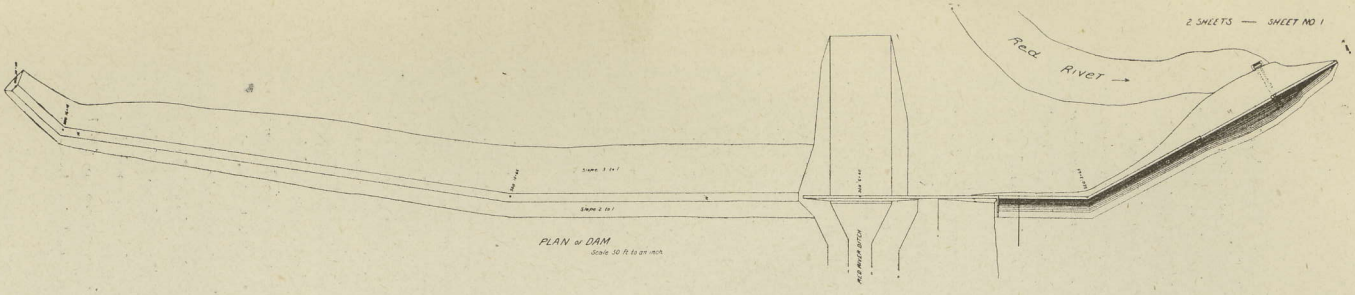
Maps That Should Accompany Applications for Permits to Appropriate Wate

PLANS AND SPECIFICATIONS.

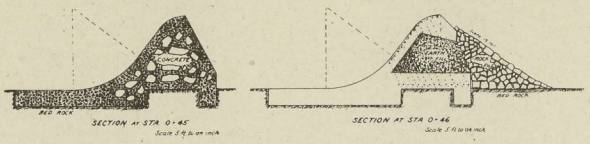
The submission of plans and specifications to the Territorial Engineer is one of the features of the rules and regulations adopted by him and which is strongly enforced by the Irrigation Law of 1907 under which law the office of the Territorial Engineer is administered. Where the project calls for the construction of a dam over six feet in height, either for diversion or storage purposes, a complete set of plans and specifications is required by law to be examined by the Territorial Engineer and modified and otherwise changed as he deems necessary, approved by him and the fees charged by him for such examination, before the application to appropriate public waters can be granted. For canals for fifty second feet or over, specifications of the headgates, flumes, siphons, etc., are also required to be examined.

The necessity for close inspection of elaborate plans by the Territorial Engineer can be readily appreciated by people who are familiar with the conditions and character of the water courses in New Mexico. We have, in the Territory, a condition which is found only in this section of the continent and that is, the extreme fluctuation of the water level, dry streams become raging torrents and carry with the water, immense quantities of silt, owing to the friableness of the soil and the rapid fall of the river channel. To meet the conditions of such large and frequent floods, it is necessary, that plans shall be made in detail, providing a dam of such strength as will withstand the impetus of large bodies of water.

It has been readily demonstrated, that builders of irrigation projects do not fully appreciate the magnitude of New Mexico floods by providing ample spillway capacity in connection with their reservoir or dam. The engineer insists forceably that before an application leaves his office that a large spillway be provided and that the dam be bonded with the natural material. In examining plans for earth dams particular attention is paid to the foundation, the up-stream and down-stream slopes of the dam which should not be less than three to one for the up-stream and two to one for the lower side and when the method of outlet for the water is by pipe it should be carefully protected by concrete collars every ten feet along the outlet pipe, to protect the dam from erosion by the water following the outlet pipe to the other side. The up-stream side of the dam should be carefully rip-rapped by carefully laid rock or concrete, the rock rip-rap lying upon a bed of coarse gravel. The earth dam to be thoroughly wetted in layers

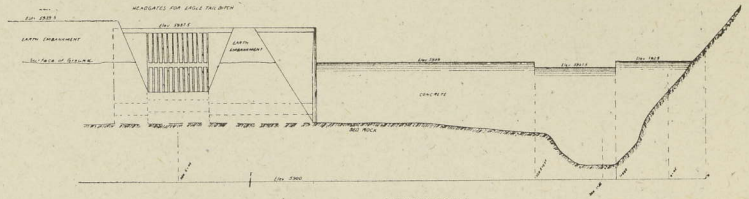


PLAN of DAM
Scale 30 ft. to an inch

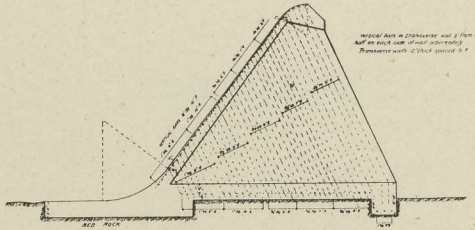


SECTION at STA 0+45
Scale 5 ft. to an inch

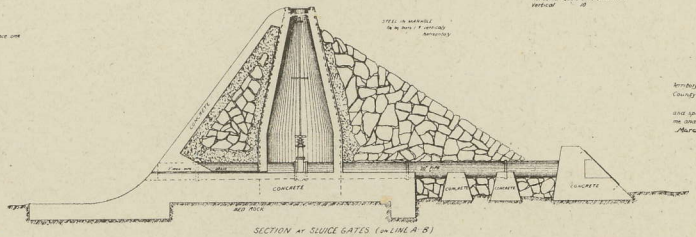
SECTION AT STA 0+46
Scale 5 ft to an inch



ELEVATION of DAM
Horizontal Scale 10 ft to an inch
Vertical " "



SECTION AT STA 1+25 SHOWING STEEL REINFORCEMENT
Scale 1 ft to an inch



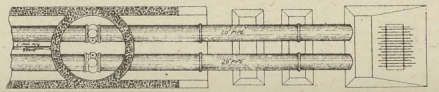
SECTION at SLUICE GATES (on LINE A-B)
Scale 5 ft to an inch

Territorial Engineers Office
Santa Fe, New Mexico

Territory of New Mexico } ss
County of Santa Fe }

I hereby certify that these plans and specifications have been examined and approved by me and were decided for filing on the 27th day of March — A.D. 1910

Vernon L. Sullivan
Territorial Engineer



PLANS & SPECIFICATIONS
DIVERSION DAM FOR
EAGLE TAIL DITCH

not over 10 inches thick and puddled. Concrete construction work is recommended whenever same can be used.

A project of one of the ditches in San Juan County recently gave an example of non-compliance of an irrigation company with the requirements of the Territorial Engineer's office. The Territorial Engineer from time to time endeavored to secure from the constructors of this project plans and specifications of their work but the data submitted was of too meagre a nature be of service and the result has been that some of the work done on this project is the most poorly constructed and inadequate to be found in the Territory. I am not sure what shape their water right will be in when they find that the Territorial Engineer cannot accept such poor construction work. The mere filing and approving of an application is not the final step to the securing of a water right as the work has to be approved by the Territorial Engineer before a certificate of satisfactory construction work can be granted.

COST OF CONSTRUCTION WORK.

It was our intention to give the public as much data as to the cost of construction work on irrigation projects as possible but we find that there are so many varying conditions that there is no hard and fast rule to go by. The cost of work in the same vicinity may vary owing to many influences which come to bear upon that particular piece of work, therefore, in presenting the following data, which are the costs on several projects in the Territory, you should only go on the general average and consider that there are so many conditions that will vary the cost that your calculations will be only approximate.

Concrete in place per cu yd.	Earth excavation for canals per cu. yd.	Earth placed in dams per cu. yd.	Earth in low embankments per cu yd.	Loose rock excavation per cu. yd.	Solid rock excavation per cu. yd.
....	0.15	.....	.....	$ 0.40	$ 0.80
....	0.07 to 0.15	0.25 to 0.35	.....	.....	.60
$ 12.15	0.25	.....	0.20	.50	1.20
8.00	.15	.25	.....	.45	.85
....	.13 to .18	.....	0.16	.....	.....
Aver 10.07	0.15	.28	.18	.45	.86

OVER-ESTIMATED WATER SUPPLY.

The Territorial Engineer is emphasizing more and more strongly the need of conservatism in the promotion of irrigation works. Particular emphasis is made upon the estimated water supply. It has been found that practically 90 per cent of the instances where

water supply has been estimated the estimated run-off for different drainage areas has been greatly in excess of the true supply. Even among men who make the measurement of water a business the estimation of the flow falls very low of the actual results secured by careful study and measurements.

The Territorial Engineer has many times had the pleasure of talking with people of broad experience, while watching a large flood in a river that he had just measured, and their ideas as to the amount of water there was and what it would irrigate if the flood should continue for a certain time, were invariably many times greater than it really was.

A letter on this tendency of over exaggeration is given herewith:

429 Commonwealth Building,
Denver, Colo., April 14, 1910.

Mr. Vernon L. Sullivan,
Territorial Engineer,
Santa Fe, N. M.

My dear Mr. Sullivan:—Sometime ago when I was conversing with you, you made mention of the tendency of promoters and others to exaggerate the water supply available in connection with irrigation schemes. A great many of these men are, no doubt, honest in their beliefs, but have no adequate conception of the amount of run-off water to be expected from a given drainage area. In fact, I have no doubt that they frequently doubt the accuracy of some of the records of stream flow. This is a condition of affairs I have encountered since I came to this office about three years ago. At one time I paid some attention to the protests of the promoters of this type, but I have found that they are chronic. Now I take this stand that there are too many opportunities for legitimate irrigation development in this section to encourage any propositions where the water supply is apt to be inadequate. While our records of stream flow are not complete as they might be, still we have covered the country fairly well in a general way, and it is impossible for anyone to get away from the records which the U. S. Geological Survey has obtained.

Irrigation development in this section is comparatively new, and in most localities engineers and others have not yet learned the rate of run-off to be expected from their streams. In your capacity as Territorial Engineer you have undoubtedly become as conversant with these facts as anyone in the Territory. I think that when it is your opinion that the water supply is not ample, in connection with a certain project, you are justified in turning it down or modify it so as to conform to the water supply. Some

engineers may attempt to talk you out of your opinion, and others to discredit you, but I think that such action on your part will result in the education of the public.

I have recently made a study of the water supply of Colorado, which is very much greater than that of New Mexico. I find that this State, with its splendid water resources, has a total run-off of less than 16,000,000 acre feet per annum, or about 3 inches in depth over the entire surface of the State. There are large areas where the run-off is less than one-half inch in depth per annum. I doubt very much whether the average run-off for the entire Territory of New Mexico is in excess of one inch in depth per annum. At this rate it would require at least 15 square miles of drainage area to furnish water for the irrigation of one square mile. I have no doubt that there are large areas in the Territory where 100 square miles of drainage are would not furnish sufficient run-off for irrigation of one square mile. A study of a few facts of this kind would probably modify the view of various promoters in the Territory.

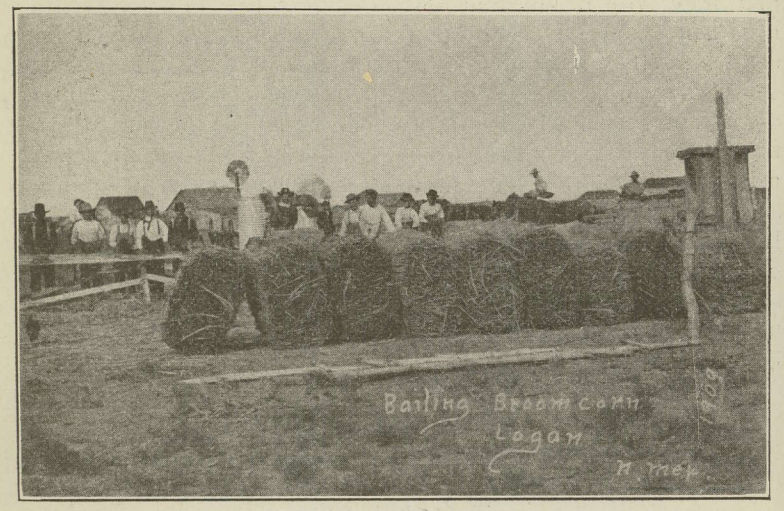
Very respectfully,

(Signed) W. B. FREEMAN,
District Engineer.

DRY FARMING.

The rain fall during the last few years has not fallen as opportunely during the summer months as heretofore, causing more or less shortage in crops among the dry farming section. The preparation of the soil during the winter and early spring months is the key to successful farming by this method. The A., T. & S. F. Ry. Co., realizing that something should be done to assist the dry farmer in the preparation of soil and the cultivation of same in order to "pull through" the dry months of May and June has employed Professor J. D. Tinsley, formerly soil physicist of the New Mexico Agricultural College. Mr. Tinsley while in the employ of that institution spent a portion of his time in lecturing to farmers' institutes but was unable to devote sufficient time to the work to make it systematic and thorough. He is now with the railroad company and with the aid of an assistant does nothing but study the needs and conditions, giving lectures upon same to the dry farmer in the Territory. The work done by the railroad company is of great value. The farmer coming from other portions of the country being unfamiliar with the conditions and requirements of this branch of agriculture has become disheartened by failures of the first one or two years. As with everything else

success is due to the farmer who uses the most thought in this work and follows the advice of those who have had experience along this line. A fence may separate the successful dry farmer from one who fails. The Territory is fortunate in having the



Dry Farming Products Raised Near Tucumcari.

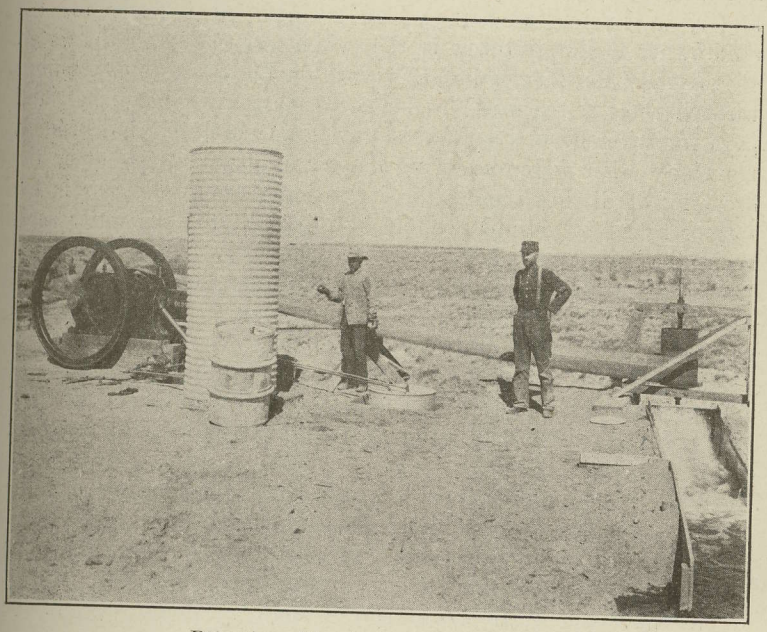
use of experts to teach its citizens proper methods. Experimental farms have been laid out and investigations which are being carried on, will raise this industry to a more scientific plane and secure agriculture where irrigation is impossible either from lack of water or the inaccessibility of the land.

PUMPING FOR IRRIGATION.

The Territorial Engineer has during the past two years strongly advocated and encouraged the development of the underground waters of New Mexico. Such valleys as the Alamogordo, Mimbres, Estancia, Portales and others afford a considerable supply of underground water at various depths. To this end the Department has circulated articles and placed in the hands of interested settlers reports, bulletins, articles, catalogues, etc., giving data and information regarding this method of irrigation. The newspapers of the Territory have published these letters of the Department and by means of editorials and otherwise have followed up the work of this office and aided materially in the distribution of litera-

ture on the subject. Calls for this data have come from outside states and territories.

In the Portales section, the Portales Irrigation Company, consisting of some eighty subscribers, have installed a system of pumping for irrigation and the prospects are exceedingly bright that a large acreage will be brought under cultivation by means of pumping. The construction company doing the work of installing the pumps, wiring, digging of the wells and the placing of the



Pumping Plant, Banks' Project.

motors was the Western Construction Company now located at Estancia where they are endeavoring to put in a similar plant for the Estancia Valley.

The following letter from this company outlines the work done at Portales and what is planned for the Estancia Valley.

"We are pleased to give you such information that we have at hand in reference to the irrigation project proposed for the Estancia Valley, N. M.

"First it might be well to state that the project proposed here is similar to the project we installed and just recently completed in the Portales, N. M., Valley. That plant consists of a

central power station located on the railroad, in the town of Portales. This plant consists of a two 750 horse power, Double Acting Horizontal Tandem Gas Engines, operating at a speed of 150 R. P. M. directly connected to 500 K. W. Generators. These engines use for fuel producer gas which is generated from three 500 bituminous coal gas producers.

"From this central power station we run a pole line out over the valley and when we come to land to be irrigated, the land owner already has his well drilled, we install a pump, a 25 H. P. motor, watt-meter, and the electrical equipment ready for the land owner to simply throw in the switch when he needs the water. In this way the farmer has the plant on his own ground, pumps when he pleases, as much as he needs, just when he wishes, and pays for what he uses. In this way he is absolutely independent from any other water users, no danger of dams going out or the breaking of ditches during the irrigation season. Neither is the farmer asked to get up possibly at midnight to take water as is the case very often under ditch systems.

"The plant above described furnishes power to put 30 inches of water on 11,000 acres, at a cost of less than $1.00 per acre foot, at a 45 foot lift, using coal at $4.50 per ton.

"This current can be used in numerous other ways, such as lighting the farm buildings, houses, etc., operating their feed grinders, wash machines, butter churns, saw wood, sewing machines and many other things.

"With this system of irrigation, the rural mail delivery and the telephone, the farmer can have the city conveniences.

"The above system has been in operation for the past four months and has met every expectation.

"We have put down a number of wells in this valley, in the past few months, and find that the wells will not deliver more than 250 to 500 gallons per minute, while the Portales wells produce from 900 to 1600 gallons per minute. We have 22,000 acres subscribed in this valley which will need two 1,500 H. P. plants, but instead of each well irrigating a 160 acre tract, we cannot expect a well to irrigate more than a 40, or at the most an 80 acre tract, which tends to make the well proposition quite expensive as a depth of from 150 to 300 feet is necessary.

"In a great many instances farmers have no money so that we must buy half their land in order to give them money to put in their well, cultivate the first season, and feed their family, until a crop can be raised.

"While the soil in the Estancia Valley is very rich and fertile

and of considerable depth, the formations differ so widely, and the water bearing stratas differ so materially, that wells within 100 feet of each other may not only find the best water stratas at different depths but in different kinds of formation, so you can see the cost of the wells is very uncertain.

"The above will give you some idea of our system, also as to what is being done in this valley."

In the Mimbres Valley a large underflow is encountered and the people in the vicinity of Deming are succeeding very well in this work. The Mimbres Irrigation Company is installing pumps for irrigation of lands under their project and this method of irrigation will be used until the large storage reservoir and irrigation by gravity system is completed. Some plants have been in operation in this section for a long time and have conclusively proven the facility of this method.

The Alamogordo Valley has the Alamogordo Power Company that is developing the underflow by means of power. The power project is located on the Fresnal in the White Mountains and was formerly the property of Mr. M. H. Fisher, described elsewhere in this report.

TWO TYPICAL PUMPING-PLANTS IN THE MIMBRES VALLEY.

(By R. Bedichek.)

When they first began to talk of pumping water for irrigation in the vicinity of Deming, N. M., there were many Thomases who doubted the feasibility of pumping water anywhere for irrigation, much less onto the desert lands of the lower Mimbres Valley which were never known to produce anything valuable except a little grass during rainy seasons.

Some maintained that there was no water to speak of under this valley, others said that you could not raise anything, even if you had plenty of water, another that the cost of fuel would eat up the profits; and still others based their opposition on the very general grounds that to pump water for irrigation in this country was tinkering with plans of the Almighty, that to irrigate a country that was so manifestly meant to be a desert simply amounted to flying into the face of Omnipotence with ill-smelling, new-fangled machinery, and that such irreverence would be chastised —see if 'taint.

However, a few hardy souls who had the courage of their convictions and money enough to back them, went to work to raise the abundant underflow and convert it into an overflow. The pioneers in this venture in the Mimbres Valley are: R. C. Ely,

B. P. Shull, John Hund, Hugh Ramsey, Chas. E. Hicks and Dr. P. K. Connaway. These men have not only demonstrated the feasibility of pumping water for irrigation in this valley, but have finally convinced a doubting community that water can be pumped here at an enormous profit.

The waters of the Mimbres River sank into sand and gravel strata about twenty miles north of Deming, and it is only under pressure of tremendous floods coming out of the mountains that water is pushed through the usually dry bed of the river as far down stream as Deming. The Mimbres River does not flow at Deming—it *under*flows and sometimes *over*flows. While the flood waters are utilized for irrigation, it is the underflow that the great majority of farmers look for their water.

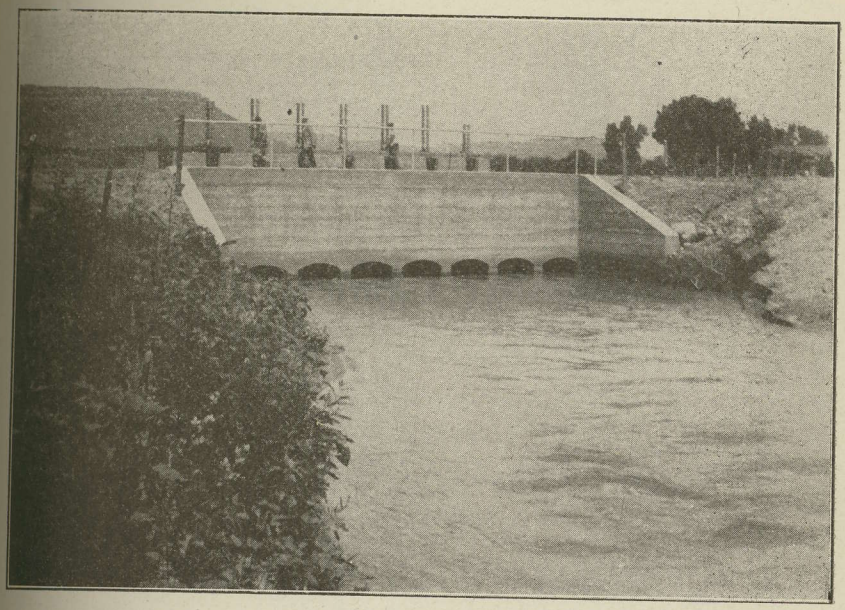
In the vicinity of Deming the first water-bearing stratum occurs at a depth of from ten to seventy feet. The second sand and gravel stratum occurs fifteen or twenty feet below the first, and the third, or main, stratum occurs at a depth of from 120 to 170 feet beneath the surface. When this third stratum is punctured by the well-drill, its waters rise in the well to a point about ten feet above the water level of the first stratum. A pump delivering two thousand gallons of water per minute can pump a twenty foot head off of one of these wells, or a pump delivering 1200 gallons per minute can do it, but when that is done, the water-level cannot be lowered further. Thus, it will be seen that a man's pumping depth is usually ten feet below the point at which he encounters the first water-bearing stratum.

We take as typical of irrigation-plants in the Mimbres Valley, the Schull well three miles east of Deming, and the Hund well two and one-half miles southeast. In drilling the Schull well the first water-bearing stratum was encountered at a depth of thirty-three feet, the second stratum at about eighty feet, and the third at one hundred fifty feet. The aggregate thickness of these three stratas is forty feet.

The well proper is twelve inches in diameter and is cased solidly except where the second and third water-bearing strata occur, and there, in stead of casing, the Layne screen is substituted. A fifty foot steel pit is installed two feet in diameter (perforated where the first stratum occurs) at the bottom of which is set a No. 5 Layn & Bowler pump. It can be seen that the perforation of the pit and the screening of the two lower strata connect these three layers of water-bearing material, so that the well is furnished with water from all of them.

A forty-five H. P. Weber, old style (1895) engine, furnishes

the power to run the pump. The loss in efficiency caused by the altitude (4300 feet above sea-level) is fifteen per cent. A belt from the engine runs the pulley of the pump, and when going at a normal rate, this pump delivers twelve hundred fifty gallons of water per minute, or seventy-five thousand gallons per hour. Engine naptha which costs twelve cents per gallon is used, of which four gallons is consumed per hour.



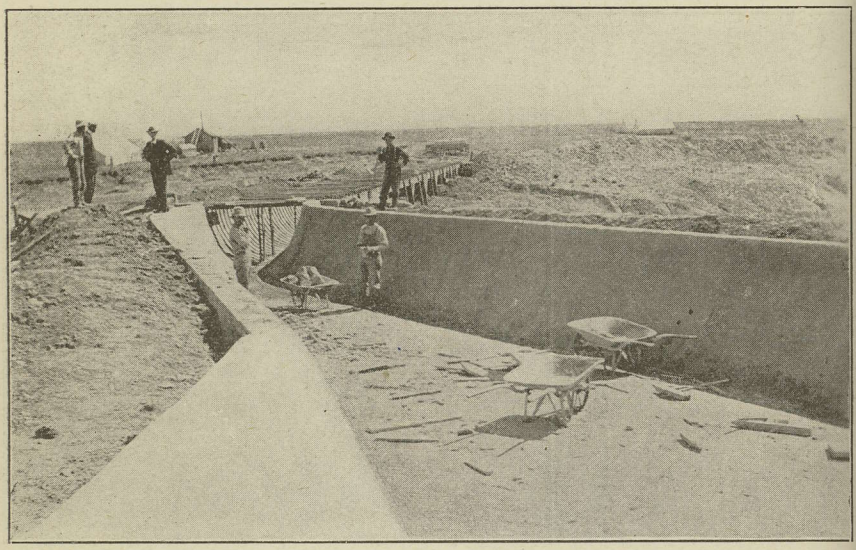
Head-gate. Low Line Vermejo Canal, Maxwell Irrigated Lands Company.

The lift when the pump starts is twenty-seven feet, but a two hour head is pumped off and the water stands permanently at forty-two feet. When pumping at full capacity this plant waters one and one-half acres of Irish potatoes per hour; and this year it is taking care of one hundred seventy acres of potatoes, onions and feed crops.

The cost of the Schull plant including everything, was $3000.00. This well with its present equipment is able to take care of two hundred and fifty acres of ordinary crops.

The Hund plant cost $3200.00. The same strata of water-bearing material were encountered and at about the same depths, but the strata were thicker so that the Hund well was equipped with eighty feet of strainer or screen, as against forty feet in the Schull well. Otherwise the wells are about the same.

The machinery, however, is a little different. The Hund well is equipped with a No. 6 Layne & Bowler pump with nine and five-eighths inch discharge, and with a thirty-five H. P. Western Gas Engine. Engine naptha is used at this plant costing twelve cents per gallon. Thirty-five gallons is consumed in a ten-hour run, and the pump delivers fifteen hundred gallons per minute, or ninety thousand gallons per hour, or nine hundred thousand gallons in ten hours, the fuel cost for this much water being $4.20. This plant waters two acres per hour of ordinary crops, but re-



Flume, Maxwell Irrigated Lands Co.

quires three-fourths of an hour to water one acre of alfalfa. It will take care of one hundred sixty acres of alfalfa, or twice that acreage in beans or ordinary field crops.

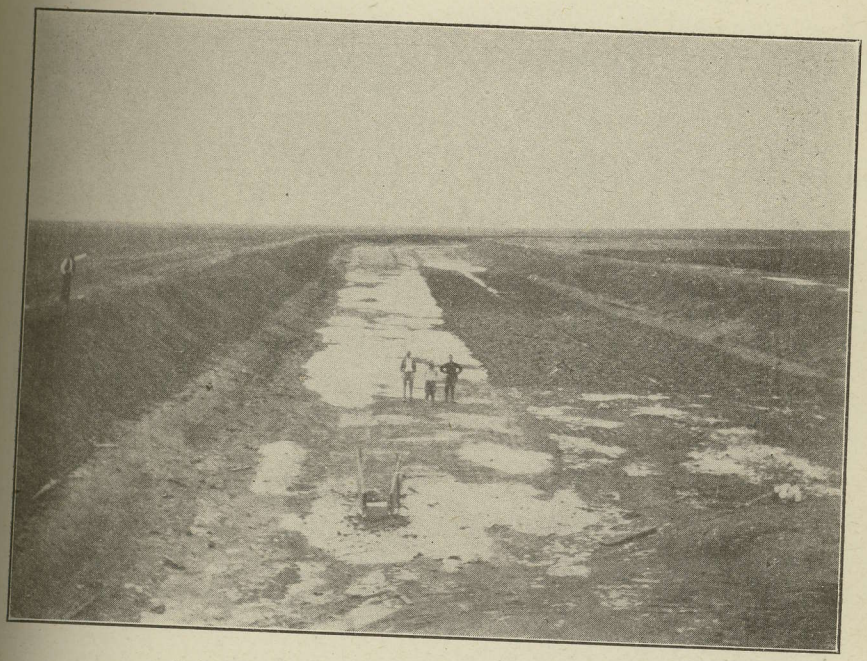
The cost of this plant may be itemized as follows: Engine $1500.00; well and pump $1700.00; engine house $200.00; total $3200.00.

These two plants are typical of the irrigation plants in the lower Mimbres Valley. There are plants larger than either of these, and there are a great many smaller ones. It may be announced as a general rule that the larger the plant, the less the cost of the water.

It will be seen that the fuel cost together with the lubricating oil, which is so small as to be negligible, is about one-half a cent per thousand gallons. To pump water at this price for the irrigation of lands which produce high-priced crops has been proved to be enormously profitable.

IRRIGATION PROJECTS.

In spite of financial depressions, especially in irrigation bonds, there has been a steady development in the construction of irrigation projects. The following more detailed descriptions of some of the irrigation projects will give you a clearer idea of such resources and development.

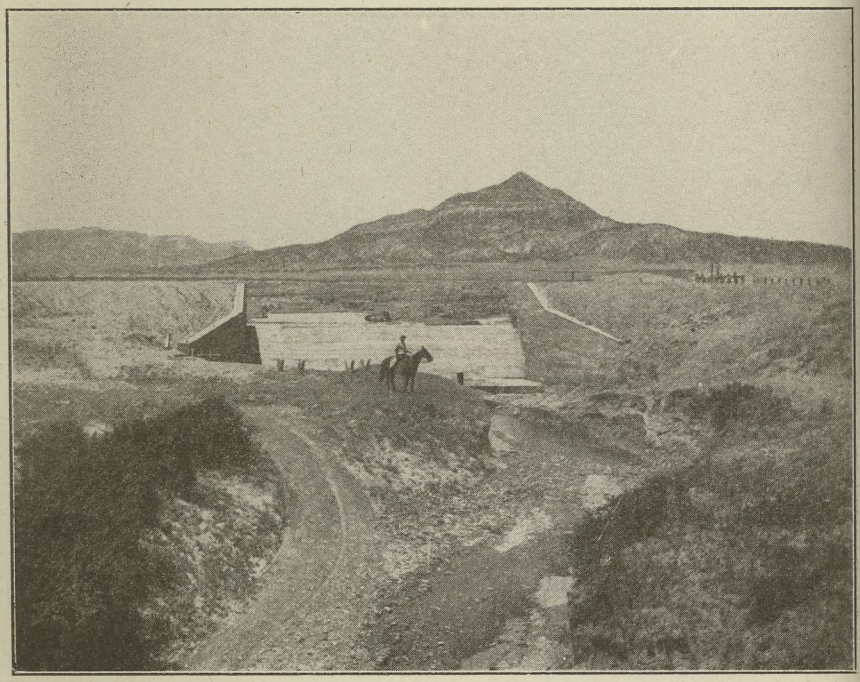


Settling Basin, Maxwell Irrigated Lands Co.

THE MAXWELL IRRIGATED LAND COMPANY'S PROJECTS.

In the beginning of 1908 the Maxwell Irrigated Land Company commenced construction on an irrigation system adjoining Maxwell, N. M., about 27 miles south of Raton. The company owns about 23,000 acres of land, of which 4,500 acres have been sold to settlers, and also the water rights of the Vermejo Ditch Company. The Company has also water rights on Red River and the small tributary streams between the two rivers; and are now constructing the Eagle Tail Ditch therefrom with a capacity of 1000 second feet.

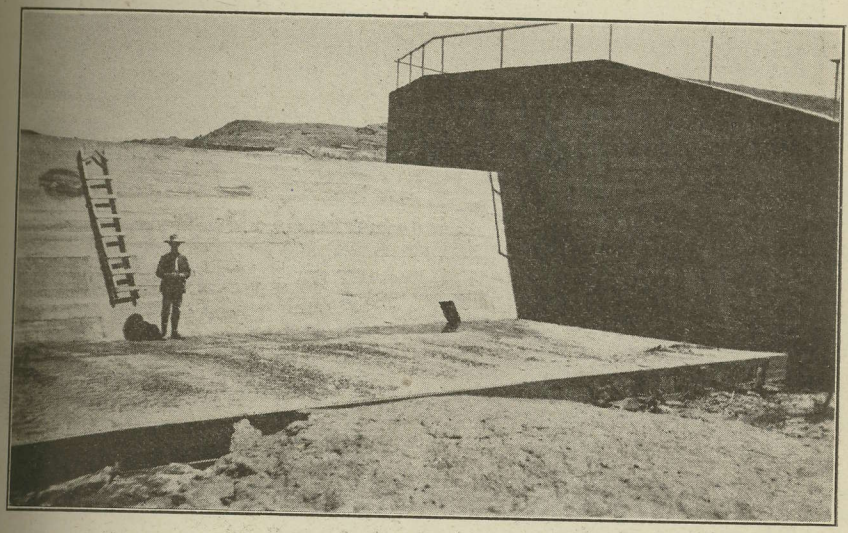
Both the Vermejo and Red River Ditches will discharge into a system of reservoirs also owned by the company, of which Numbers 3, 5, 7 and 8, 11, 12 and 20 have been in operation this year and are practically completed. No. 13, although not built to its capacity, has been in operation during the present year; No. 14 will be constructed before spring. It is possible to increase the capacity of most of the constructed reservoirs. The total available reservoir capacity, as at present outlined, is approximately 30,000 acre feet, of which about half will be in operation before next spring.



Concrete Dam Salt Peter Creek, Maxwell Irrigated Lands Co.

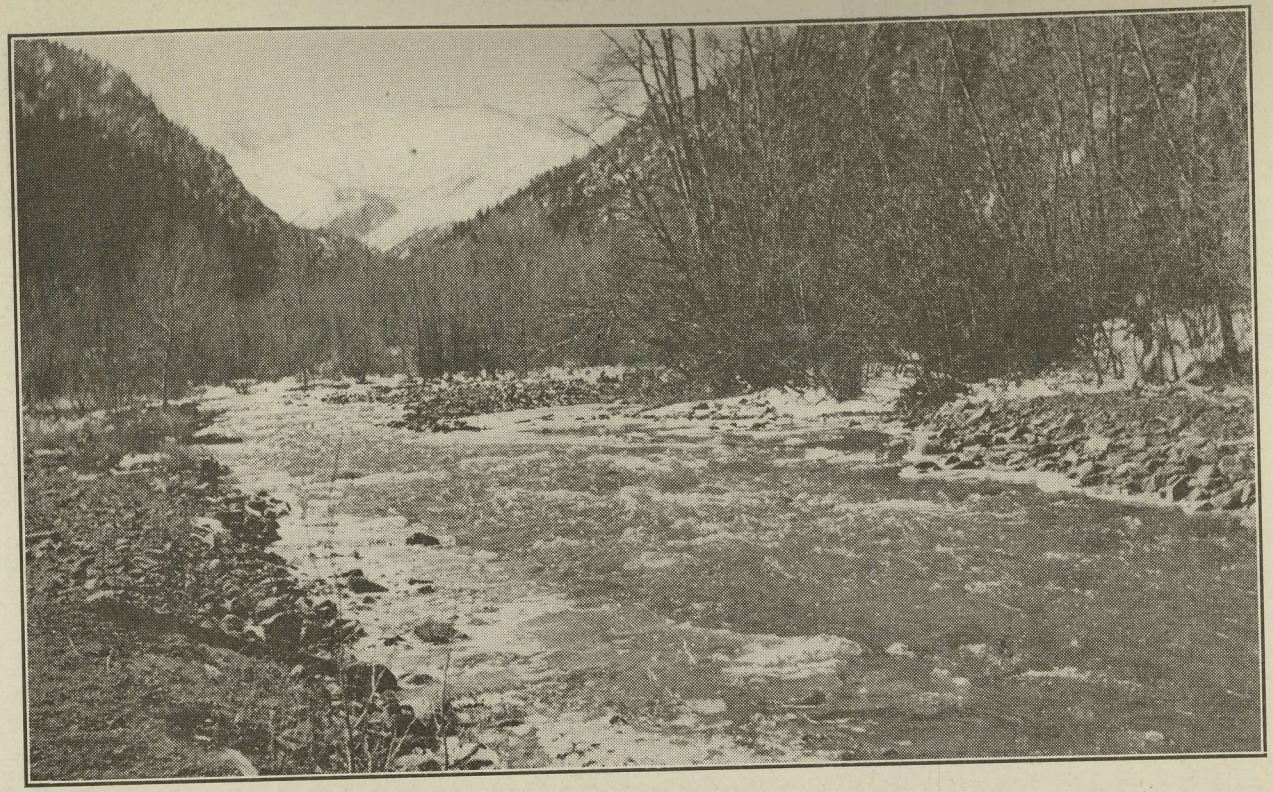
The system from the Vermejo River is practically completed; and the large intake canal was finished and in operation in March, 1909. The old High Line Ditch has been in operation since 1888 and the Low Line, which is the main ditch now in use, since 1891. This latter was enlarged and put into thorough repair by the present Company. From the new concrete head gate to Saltpeter Creek it has a capacity of 1387 second feet. From Saltpeter

Creek to the first lake. No. 5, its capacity is 1517 second feet. At this point the ditch forks, one canal with a capacity of 705 second feet carrying water to reservoir No. 2, which is a distributing point for all the other reservoirs, and a second canal with a capacity of about 500 second feet carrying water to lakes 5, 7, and 8, etc., by another route.



Concrete Dam Salt Peter Creek, Maxwell Irrigated Lands Co.

The main canal is provided below each intake with sand sluices where a large percentage of the sand and silt contained in the flood water can be disposed of. In order to ascertain whether the silt carried in the water could be used for dam building, the sand gates were not operated during last year's flood season; the silt was carried into a settling basin 200 feet wide and 1300 feet long where the water spread out and was thus reduced in velocity before discharging over a spillway into the adjoining reservoir No. 5 causing the deposition of its silt. This result has induced the Company to adopt this method of dam-building. Two parallel banks have been thrown up to replace the old dam of Lake 8 and a large ditch connects this with the above mentioned settling basin of Lake 5. By running the water through this settling basin, thence on to the dam of Lake 8 a double purpose is served, viz: Clear water is discharged into reservoir No. 5, and at the same time much of the silt now in the settling basin, besides that contained



Red River, Above the Intake to the Red River Project.

in the river water is carried on and used to build up the dam of reservoir No. 8. It is expected that the dam at Lake 8 will be constructed in this manner to a height of 10 or 11 feet within the next fourteen months when the two banks will be raised and the operation continued. At the same time a permanent settling basin will thus be formed at Reservoir No. 5 from which the silt can be drawn off, and either put into dams or distributed on the land at will. This method is being successfully carried out by Senator G. W. Swink of Rocky Ford, Colorado, who we believe was the originator of this plan.

The outlet to Reservoirs Numbers 7 and 8 is a double concrete tube, each section having a cross-section of 9 square feet with a capacity of between 150 and 200 second feet when running full, without any additional head. This lake will form a distributing point for all the reservoirs with the exception of 5 and 2.

The dam construction favored by the Maxwell Irrigated Land Company where the extreme height does not exceed 15 feet is an earthern dam with an 8 to 1 slope on the inside and no rip-rap; the latter mainly for the reason that other than concrete rip-rap is not available.

There is very little seepage. The action of the water seems to convert the 8 to 1 slope to about 10 to 1 over the area covered by the wash of water at the average height of the lake.

With the higher dams and where the amount of dirt to be moved consequently become too great, some plan of rip-rap not yet decided upon will probably have to be adopted.

The Company has been measuring the water used for irrigation during the present year with interesting results. The allowance sold with the land so far disposed of is one and one-half acre feet. It has been found, from this year's experience, and it has been unusually dry, that the best farmers are not using nearly the maximum quantity, and it is remarkable that all the best crops have been produced where the smaller quantities of water have been applied. This is in spite of the fact that it is a new country, which always consumes more water during the first year's irrigation than later. In a few cases the full amount due has been used, and in order to test the results the Company has allowed more water to be supplied, but with poor results so far as present data at hand would indicate, and the estimate of Mr. John E. Field, of Fields, Fellows and Hinderlider, that one acre foot would be sufficient for this class of land seems to be fully justified.

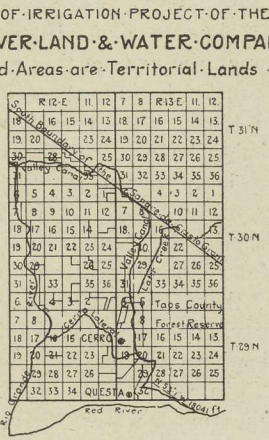
The alfalfa and winter wheat crop at Maxwell this season are remarkable and the product from a small patch of alfalfa left for

seed has been pronounced by an experienced seed grower from Rocky Ford better both in quality and quantity than anything he has ever seen.

The Company also brought in some 35 or 40 Japanese farmers from Garden City, Kansas, last spring who are cultivating about 400 acres of sugar beets. The crop promises exceedingly well, although the best conditions for beet culture, such as planting on old alfalfa land, etc., were not available, and in fact, most of the land planted was that which had been in oats for several years previously, which is exactly reversing the proper and desirable rotation of the crops.

THE RED RIVER LAND AND WATER CO.

The Red River Land and Water Company of Denver, Colorado, is under contract with the Territory of New Mexico for the construction of an irrigation system by diverting the waters of the Red River in Taos County to approximately thirty thousand acres of land belonging to the aforesaid Territory. This approximately 30,000 acres of land was selected by the Territory on July 8, 1902,



Red River Project.

which selection was confirmed by the Secretary of the Interior November 29, 1902, and the lands so selected are known as the Territorial Selection No. 1 and were so selected under the Grant of and Act of Congress of June 21st, 1898, whereby lands were conveyed to the Territory, among other purposes, for the "Establishment of Permanent Reservoirs for Irrigation."

This Company, by its Articles of Incorporation, applied for sufficient waters of the Red River to properly irrigate these lands under the direction of the Territorial Engineer. The right-of-way, being over the public lands in the Carson National Forest, was approved by the Secretary of the Interior September 8, 1908. As this project was initiated by the Territory in 1902 it has prior rights, so far as the waters of Red River are concerned, to the claim of the United States Reclamation Service of the waters of the Rio Grande for the Engle Reservoir and other irrigation projects taking waters of the Rio Grande watershed.

It has been decided under advice of counsel to have the purchasers of water rights from the Company and land from the Territory, organize a municipal irrigation district under the provisions of Chapter 109 of the Territorial Statutes of 1909, which irrigation law is based almost entirely upon the corresponding law in the Statutes of Colorado.

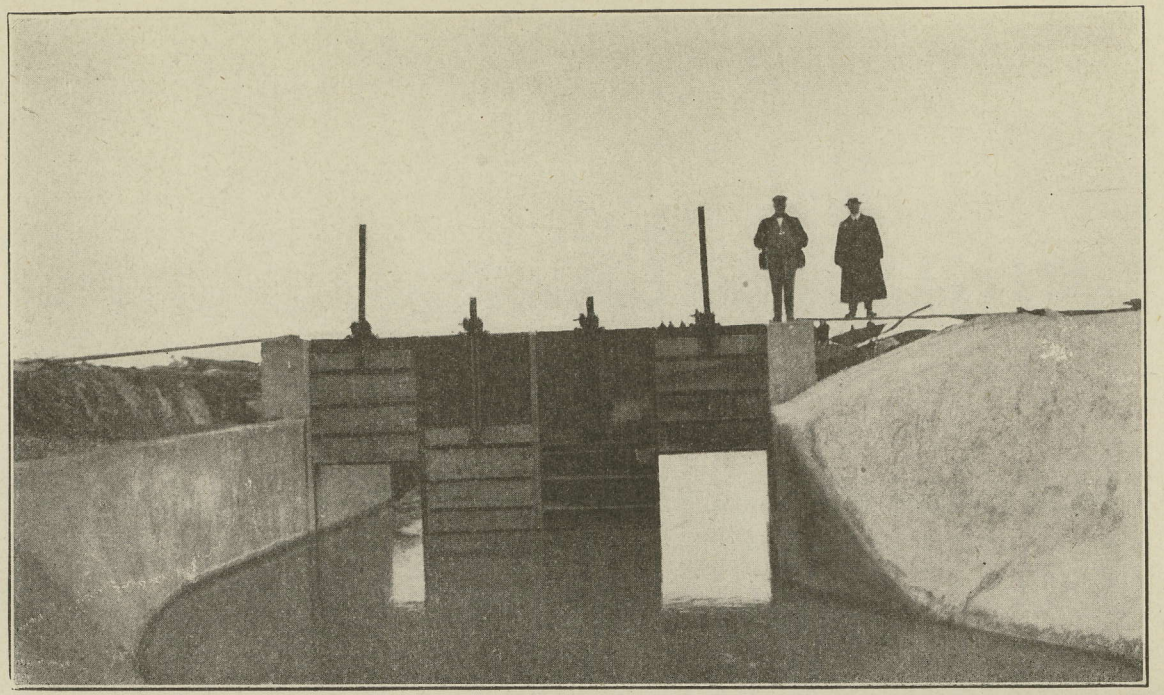
The Company advises us that it has arranged its financial affairs through the medium of issuance of municipal irrigation district bonds as proposed, so that it is assured of funds for the construction of the system, and it is confidently expected that same will be completed prior to January 1, 1912, which is the limit of the time given under the contract with the Territory for the completion of the work. This will insure water being placed upon all the lands by the spring of 1912, and a portion of the lands will be supplied with water next season.

THE FRENCH LAND AND IRRIGATION COMPANY.

The French Land and Irrigation Company's project embraces what is known as the Antelope Valley. This parcel of land is divided into two tracts, known as the South Tract and the North Tract. A trifle over 20,000 acres have been sold on the South Tract and the construction work for the reclamation of this Tract already provided consists of three reservoirs having aggregate storage capacity of 8,000 acre feet; reinforced concrete dams across the Cimarron and Ponil Rivers and Cerrosozo Creek, including a full system of reinforced concrete dams, siphons, flumes, main and subsidiary canals, etc., etc., representing a cost of $500,000.00.

The entire system, as contemplated, will have a completement of seven reservoirs with a total storage capacity of approximately 55,000 acre free of water derived mainly and directly from the following streams: Cimarron, Ponil, Vermejo, Cerrosozo and Van Bremer.

There are approximately 8,000 acres in cultivation this season



Head-gate French Land Irrigation Co.

with crop conditions varying from fair to excellent, depending on the measure of the scientifical soil culture, a selection of seeds and the methods pursued by the farmer in the proper and timely irrigation of crops. The populace of the French Tract, including the town of French, is in the neighborhood of 500 inhabitants. Commercial apple orchards, alfalfa, small grain, Mexican beans, melons, and garden truck are in the main the vegetations our settlers are confining themselves to and all do exceedingly well here.

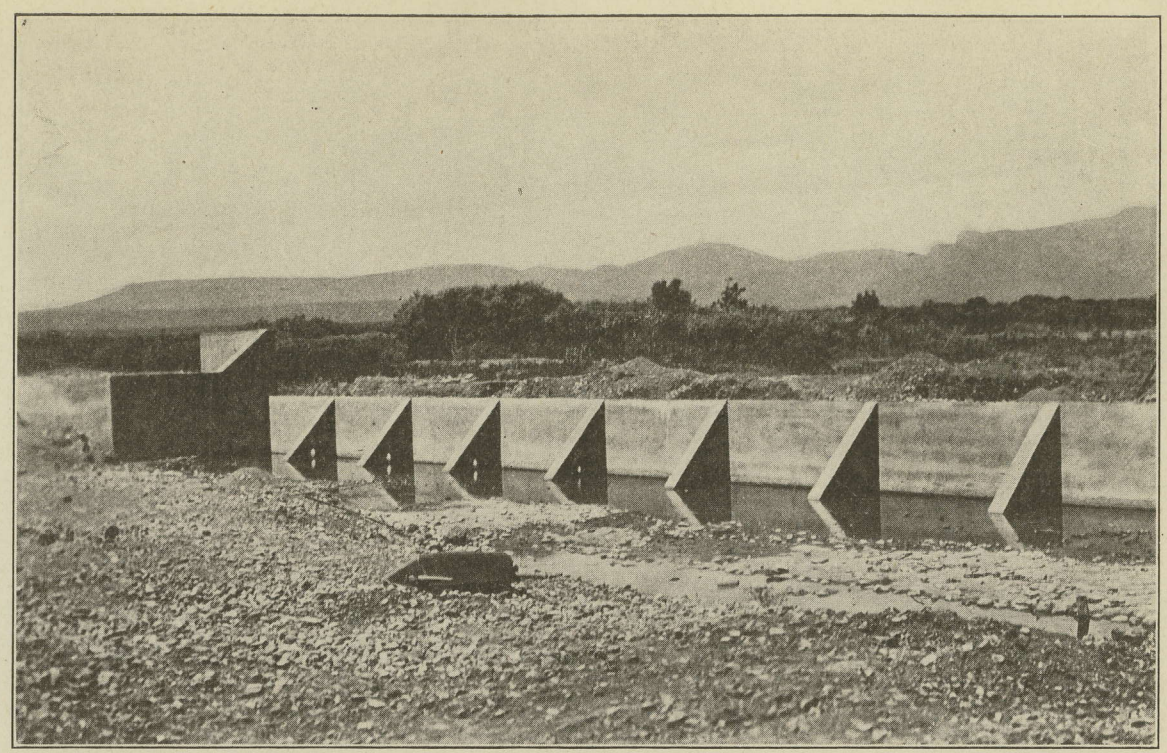
Mention is also made of the excellent shipping facilities this valley affords, in having the main line of the A., T. & S. F. Railroad, E. P. & S. W. Railroad and the St. L. R. M. & R. Railroad. The great fertility of the soil and the climatic conditions are also accompanying elements tending to the merits and success of the Antelope Valley.

LAS VEGAS GRANT BOARD'S PROJECT.

The Irrigation Project of the Las Vegas Grant Board of Las Vegas, N. M., is the second enterprise projected under the irrigation District Law passed by the Legislature of 1909. It comprises at present 16,456 acres of first class land, all the second class lands within the boundaries of the district having been rigidly excluded. The bonded indebtedness of the district is limited to $35.00 per acre, payable in annual installments beginning eleven years from date.

This project was first seriously considered by the U. S. Reclamation Service in 1903 by the admirable location and perfect natural advantages of the Sanguijuela Reservoir site which has been examined and reported on as early as 1898. In 1903 the Engineers of the Reclamation Service made an examination of the reservoir and established gauging stations in the Gallinas and other streams, and made an estimate of the cost of the entire works. In January, 1906, filings were made upon the water rights by the Reclamation Service for an aggregate of 80,000 acre-feet per annum. Owing to the lack of funds and the fact of the private ownership of the lands the work was not carried on further by the Government, but private capital was encouraged to take it up from that point.

About one-half of the lands were in private ownership and the remainder in the control of the Las Vegas Grant Board. On September 1, 1909, Mr. D. A. Camfield of Colorado, acting for the Camfield Development Company, entered into a contract with the Grant Board to construct the entire system, after having had en-



Concrete Dam, French Land & Irrigation Co.

gineers in the field for several months making an exhaustive survey and examination of the engineering features and water supply. This contract provides for the completion of the works by March 2, 1912, in accordance with the plans and specifications which have been approved by the Territorial Engineer.

The reservoir is a natural basin on the plains at the edge of the foothills. Its maximum capacity as shown by the Government reports is 38,500 acre feet. The present plans provide for a storage capacity of 22,000 acre feet capable of being drawn off through the outlet canals.

The dam will be of earth work with reinforced concrete rip-rap topped by a coping wall 5 feet high and 1 foot thick and a curtain wall either of concrete or steel sheet piling. The dam will be 71 feet high and 300 feet in width at its greatest height. The waste way 200 feet in length will be of concrete.

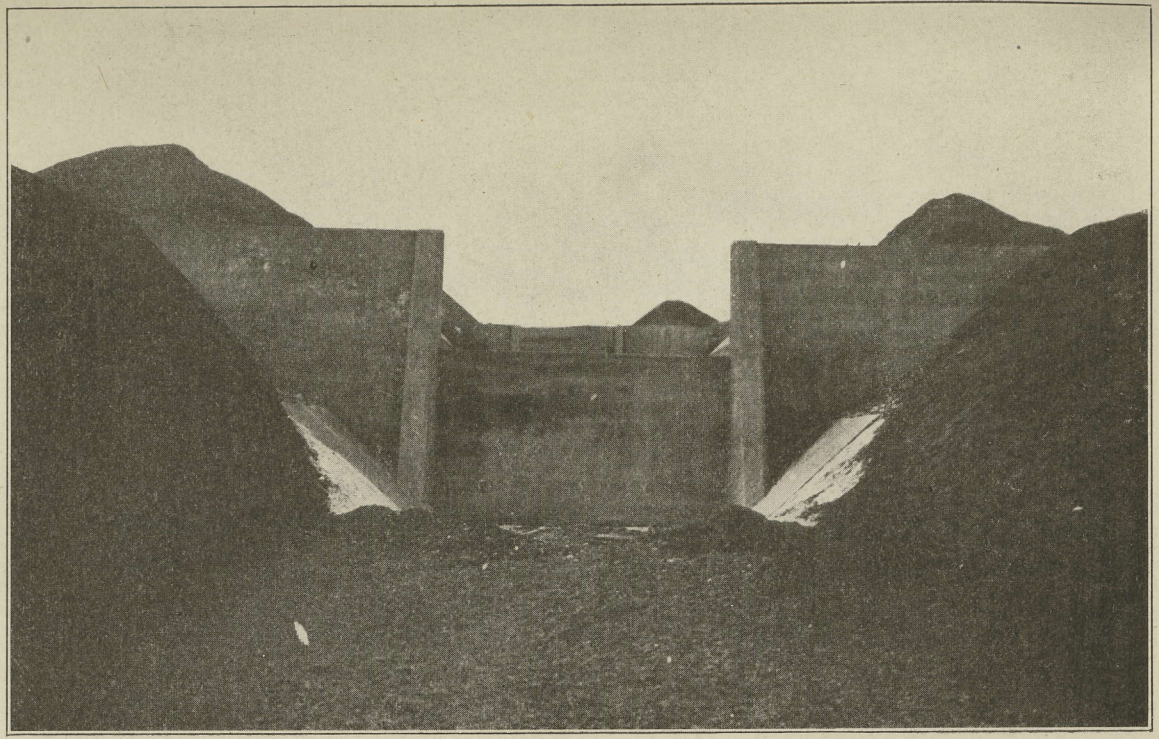
The source of water supply for the system is the Gallinas River and the Pecos and Sanguijuela Arroyos. These streams have a drainage of over 200 square miles mostly in the high mountains. This locality has the largest precipitation of any portion of New Mexico, the average for 21 years, according to the government reports, being 19.23 inches.

THE ORCHARD IRRIGATION DISTRICT OF AZTEC, N. M.

The Orchard Irrigation District of Aztec, N. M., includes an area of 11,800 acres of irrigable land. The District was organized in August, 1909. Its organization has been approved by the District Court for the County and the bond issue authorized and confirmed by the Court for $480,000.00. This bond issue brings the price per acre to the land holders in the District to $40.00.

The chief reason for forming the District is the fact that there is a fair sale of irrigation securities of this character while it is almost impossible to finance a project by selling bonds merely secured by contracts.

A call for bids for the construction of this work is now being published and we are assured of a bid for the construction of the work at a cost to the District of about $400,000.00 in bonds. The balance of the bond issue will be used in acquiring water right and in payment of the expenses of the District outside of construction. Twenty thousand dollars of the bonds are held by the District for the payment to the contractor who constructs the ditch for his services in bringing a half head of water through the ditch and keeping it there for 10 days after the ditch is completed. The final payment is not made until after this is done. Lands adjoining



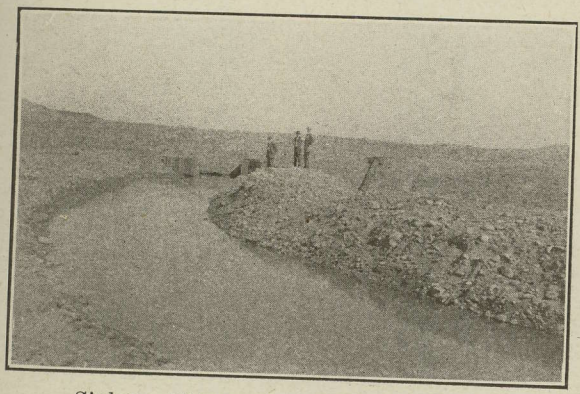
Concrete Drop, French Land & Irrigation Co.

this district are now selling here at prices ranging from $100.00 to $250.00 per acre.

THE CITIZENS DITCH AND IRRIGATING CO.

The canal of the Citizens Ditch and Irrigating Company lies in San Juan County, N. M., the northwest county of the Territory.

This canal is located on the west and north bank of the San Juan River. The headgate being located above Blanco in Section 3, Township 29 North, Range 9 West. There are irrigable lands lying along the entire course of the canal, commencing at the head but the bulk of the lands lie upon what is known locally as the "Bloomfield" and "Salmon" Mesas. Upon these two mesas lie the largest tracts of land covered by any canal so far constructed

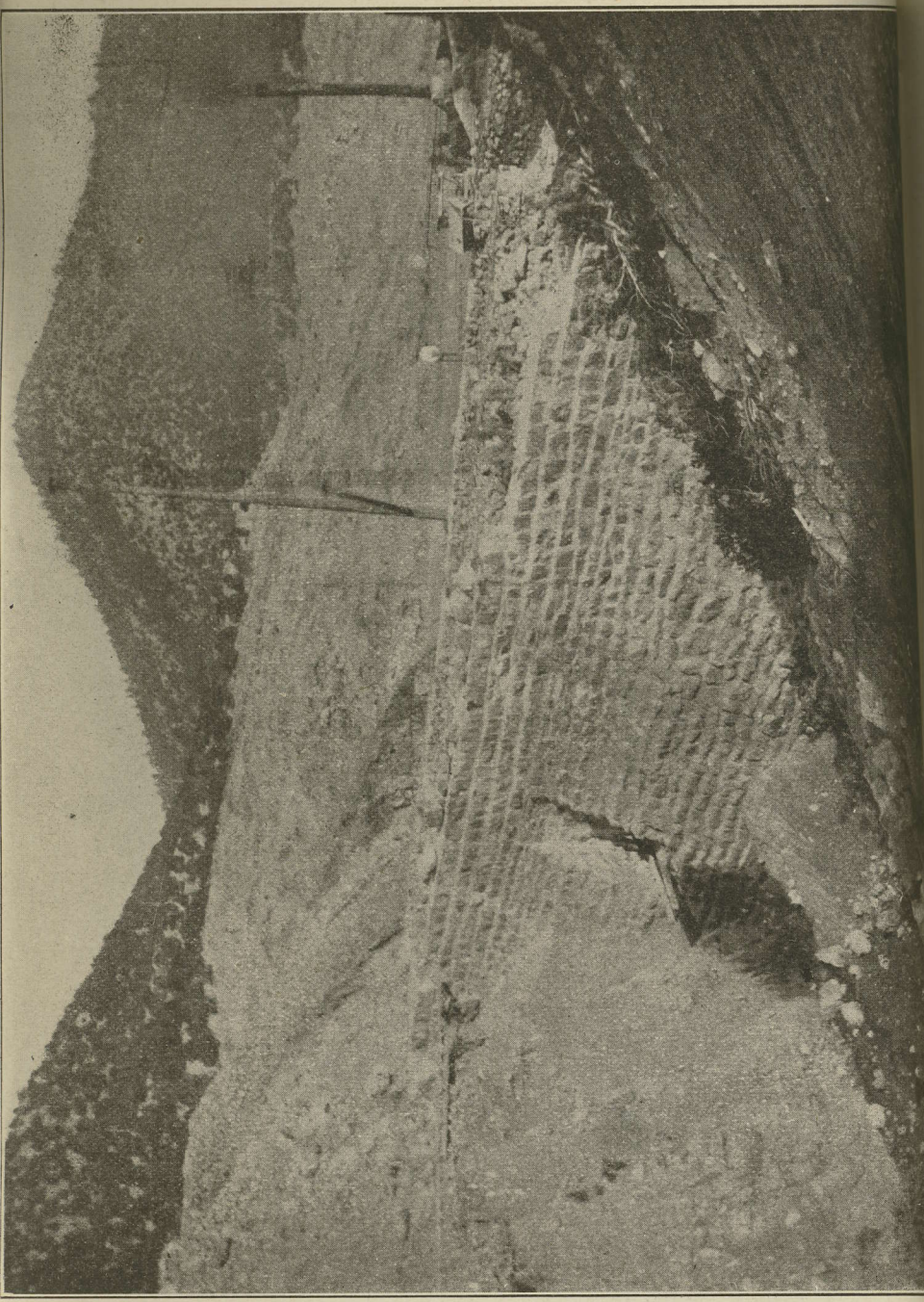


Siphon, Citizens Ditch, San Juan Co.

in San Juan County. The canal was constructed and is now owned by those who own land that can be irrigated by the same, and, although the Company is organized as a corporation under the Territorial Laws, it is operated as a "Community Ditch" for the benefit of the land owners.

The soil runs from a dark red sandy loam on the Salmon Mesa to a lighter sandy loam on the Bloomfield Mesa, there being some adobe land on the latter mesa which experience in this county has shown is especially adapted to fruits, grain and alfalfa.

There is no available Government land under the canal, lands having been heretofore patented and held by homestead and desert land entrymen. San Juan County in recent years attracted national attention on account of the fine grade of fruits grown. While the area is comparatively small in comparison with older fruit



Rubble Dam Under Construction, Santa Fe Improvement Co.

sections it is but a question of a few years until thousands of acres of young orchards will come in bearing. Adjacent to the land of the canal are several old orchards and general farms, and the fruit, vegetables and grain grown thereon shows conclusively that the new lands under the canal will in a few years produce likewise.

Foundation Rock, Santa Fe Improvement Co.

The Bloomfield Orchard Company with headquarters at Aztec, N. M., who own several hundred acres of land under the canal have placed an order for 18,000 apple trees for spring of 1911 delivery and intend to plant all these trees on their tracts upon the Bloomfield mesa. The nearest railroad point adjacent to the lands under the canal is Aztec, the county seat of San Juan County, at which point the headquarters of the Company are located.

THE SANTA FE IRRIGATION AND IMPROVEMENT CO.

The project of the Santa Fe Irrigation and Improvement Company is located on the Arroyo Hondo, about six miles south of the City of Santa Fe and is now under construction.

The construction work consists of two dams, one of course, rubble masonry 80 feet high, and the other reinforced concrete of the buttress type about 140 feet high. A main canal of semi-circular cross section, eight feet in diameter and concrete lined, will lead from this dam to a small reservoir of concrete construction. This reservoir will serve both as a settling and measuring basin and also as a diversion point to the two main lines of the distributing system. Distribution will be through cement tile laid underground, the system being about fifteen miles long.

The land to be irrigated, consists of about 10,000 acres, subdivided into twenty acre tracts, and lies to the south and southwest of the Arroyo Hondo. The land has an even and gradual slope to the southwest. Two railroads, one the Atchison, Topeka and Santa Fe, and the other the New Mexico Central, traverse the land and provision has been made for a townsite on each of the roads.

THE KEYSTONE DITCH.

This project makes use of the permanent and flood waters of the Tenaja Creek in Colfax County, distributing same on about 600 acres. The large portion of this land is of a sandy loam character, partially cultivated and partially grass land. The intention to put considerable acreage in alfalfa. The diversion is made at grade of creek only a sub-dam being used and headgates are of iron placed in concrete wall. All spillways and drops on ditches are of concrete and lateral headgates of iron. Carrying capacity of ditch 115 second feet. Two reservoirs of ten acre feet storage capacity are used in connection. Diversion and distribution made on lands owned by George T. Lambert. The above project has been fully constructed.

THE G. T. L. DITCH AND RESERVOIR OF COLFAX COUNTY.

The diversion works for this project will consist of a concrete dam and four iron headgates 4 ft. by 4 ft. leading into a ditch 20 feet wide on bottom, 32 feet at water line and 6 feet deep with a capacity of 953.1 second feet. The flood waters of the Tenaja Creek (subject to rises of from 500 to 20,000 second feet) will be carried to a reservoir formed by a natural basin and by an earthern

Digging Canal, Lambert Project.

dam (2830 feet long on top and 27 feet high and paved with concrete) with a storage capacity of 2021 acre feet. The land lying under this reservoir consists of 2484 acres of sandy loam well situated for irrigation. Diversion and distribution made on lands owned by George T. Lambert situated on the Atchison, Topeka & Santa Fe Railroad twenty miles south of Raton.

Construction of project commenced July, 1910.

THE SOCORRO COMPANY OF ELMENDORF, N. M.

The Socorro Company of Elmendorf, N. M., owns the Bosque del Apache Grant consisting of 61,117.39 acres lying four miles south of the station of San Antonio on the A., T. & S. F. Railroad and is divided into two nearly equal parts by the Rio Grande which runs through it from north to south. The Santa Fe Railroad also runs through the property and has a station named Elmendorf about four miles south of the north line of the property. Of the 61,117.39 acres about 16,000 acres can be reclaimed

by irrigation and of this 16,000 acres about 7,000 lie on the west side of the Rio Grande and about 9,000 acres on the east side.

The Socorro Company has spent a very considerable amount of money on the west side and has completed sixteen miles of ditches. At Elmendorf the Company has spent about $30,000 in improvements, as follows: A twenty room hotel, adobe and pebble dashed which is a most comfortable building; a very comfortable and complete six room cottage; three pebble dashed cottages of three rooms each; a brick metal roof blacksmith shop very complete; a large store building and and a very complete office.

Construction Work on Ditch, Elmendorf Project.

The Company has about 2,000 acres of land that is ready for the plow and could be put into cultivation in the fall of 1910 or the spring of 1911. All the 16,000 acres have the appearance of being perfectly flat but you will find that when the instrument is put on it that the land has a very gradual fall of about five feet to the mile. On the east side of the river the ditch has been surveyed and the stakes driven and it is the intention of the Company to build this ditch at a very early date. When this ditch is completed it will furnish water to irrigate 9,000 acres. It is the intention of the Company to offer all this land to the actual settler and give to them all the help possible.

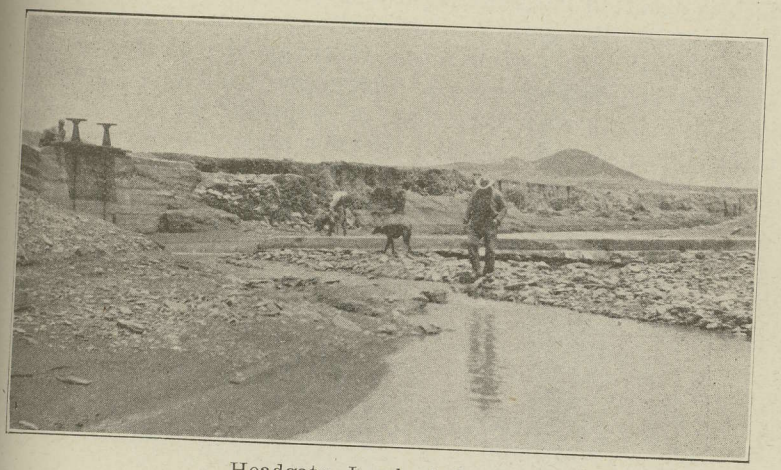
While this Company has been in the receivership for sometime

past, the information that the Territorial Engineer has on hand indicates that the affairs of this Company will soon be adjusted and construction work will be renewed and active work will be carried on until the project is completed.

PALO BLANCO LAND AND IRRIGATION CO.

Upon inquiry regarding the status of the project of the Palo Blanco Land and Irrigation Company of Springer, N. M., they reply as follows:

"Referring to yours of the 19th will say: We are at work on the Palo Blanco and will be able to put in 1,000 acres of grain next year, perhaps as much as 1,500 acres. There are sixty-five settlers under this proposition now, and things look good that



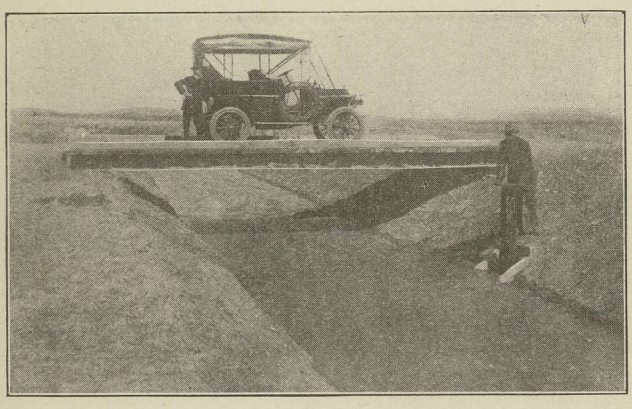
Headgate, Lambert Project.

way. The dam we are working on now will irrigate about 10,000 acres of land. There are two more large projects that we propose to put in that will handle about 7,500 acres each. It will aggregate a cost of about $350,000 when completed. There are no intake ditches of much account and the only cost will be the dams. Everything looks well out this way and people are well satisfied. The new railroad, the M. P. & V. Railroad, goes right through this country and the new cut-off of the Santa Fe goes that way, so we feel that we have an A No. 1 proposition and all the settlers are pleased. There is still Government land out here that could be taken and we would be pleased to have settlers in here."

THE ILLINOIS DITCH.

The Illinois Ditch has water appropriation No. 69 for 66.4 second feet of water in the Animas River. The land to be irrigated lies on the west side of the Animas River in San Juan County, N. M., between the towns of Aztec and Farmington. It is chiefly desirable for the growing of fruit such as apples, pears, peaches, cherries, grapes, apricots, quince, melons, cantaloupes, etc.

Several surveys have been made of the line of the canal and a re-location of the point of diversion. Actual construction was begun in 1908, and in 1909 an irrigation district was formed of the lands located under the survey and known as the Orchard Irrigation District. This district has recently voted a bond issue of forty dollars per acre for the purpose of constructing the canal which is about 40 miles in length and it has entered into a contract with the Standard Construction Company and the Durango Trust Company, both of Durango, Colorado, who are to market the bonds and build the canal. Early construction is promised and if their plans are not interfered with through some, unforseen contingency, they will have the water for next spring's use.



Headgate and Bridge, Farmer's Development Co.

THE FT. SUMNER LAND AND DEVELOPMENT CO.

The Ft. Sumner Land and Development Company of Ft. Sumner, N. M., have a system of irrigation of the capacity to irrigate 16,000 acres. The same Company is now proposing to irrigate nearly 100,000 acres of land on both sides of the river contiguous to Ft. Sumner under what is termed the Alamo Project, to include storage of 200,000 acre feet by reservoirs on the Pecos River.

The success attained by the farmers of the Ft. Sumner district this season has not only proved the adaptability of the soil for alfalfa, vegetables, etc., but that the farmer who embarks on an irrigation farm in this district can calculate in the very beginning, approximately, what crops he will harvest and what revenue he will derive therefrom. This certainty of success is based upon the stability of the ever-flowing Pecos River to furnish an ample supply of water.

The season of 1910 has undoubtedly experienced the worst water famine since 1880 and while many of the ditches in the older districts have gone dry, and even the great rivers reached a very low ebb, the farmers in the Ft. Sumner district have at all times had an adequate supply of water.

On May 1, 1909, there was under actual cultivation under the Ft. Sumner district only 590 acres. On May 1, 1910, there was 4,495 acres in growing crops.

Below is given an itemized acreage of the various crops under cultivation this year, also an estimated valuation of same, the calculations being based upon what has actually been accomplished with the same crops in the older developed portions of the Pecos Valley.

Acreage.	Crops.	Estimated Gross Value.
1096	Alfalfa	$92,064.00
257	Beans	15,420.00
301	Broom Corn	30,100.00
27	Cantaloupes	3,712.00
151	Cane	3,770.00
46	Indian Corn	2,318.00
131	Irish potatoes	19,650.00
64	Kaffir Corn	1,600.00
361	Maize	9,030.00
792	Millett	14,256.00
60	Oats	2,034.00
17	Onions	10,200.00
38	Sweet potatoes	7,600.00
	Celery, tomatoes, Peas, cabbage, pumpkins, peanuts, Pepper, squash, watermelons, etc	5,500.00
	Total	$217,524.00

THE MIAMI PROJECT.

A general outline of the work of the Farmers' Development Company, of Springer, N. M., in the development of the Miami Project has been given in previous reports. Although the complete project comprises the irrigation of only 10,000 acres of land, the success of the farmers under this system is doing much to demonstrate the true value of the lands of Northern New Mexico when they are under a good substantial system of irrigation.

At the time of making our previous report their reservoir No. 2 and intake and outlet canals had been completed. This part of their system is being operated with great success. The canals which are on a two foot grade per mile have kept themselves clean

Irrigating Alfalfa, Farmer's Development Co.

and have not cut so they are in as good condition now as the day they were built. The heavy rock rip-rap on the main dam has withstood the very trying wave action and the dam is in first class condition. The Company is now developing the capacities of the reservoir by heightening the main dam and the dikes. A considerable portion of the works is already completed. Also the Company's system of distributing canals has been greatly extended. This work of construction is largely done by force-account so as to give employment to resident farmers during the fall and winter and early spring months when their time is not required on their farms.

The crops grown the first season are mainly grains, beans, alfalfa and garden vegetables. Winter wheat is proving a very successful crop, yields as high as 50 bushels to the acre from raw sod. Spring

wheat, oats and barley are also producing large yields. Other crops mentioned are being grown with equal success, particularly the alfalfa and the hardier vegetables. A professional fruit man is located on the project and is superintending the planting and care of the orchards and orchard culture is being taken up very extensively, mainly growing of apples in a commercial way.

The settlers upon this project are for the most part people of means and are much above the average in intelligence. They are placing high class improvements on their farms and are establishing a rural telephone system and other modern conveniences.

THE HAND PROJECT.

This is an irrigation project owned by the Placita Ranch Company at Las Alamos, New Mexico, and consists of 50,000 acres of land. A large portion of which will be under irrigation. The land will be put on the market in 5000 acre tracts and sold directly to the farmer in ten acre tracts and up. The first 5000 acres will be on the market January 1, 1911, and will be sold for a small amount. This tract will be ready for the 1911 spring crop. There are seven large lakes on the property which are to be user as storage reservoirs and the intake canal for the largest lake, which takes water from the Sapello River is now being considerably enlarged and will be completed in time for water for this year's crop. When completed it will be 60 feet wide on top and 30 feet on the bottom, 1¾ miles in length and have a carrying capacity of 2000 second feet of water. This reservoir has now available 10,000 acre feet of water and will store 30,000 acre feet during the year of 1911.

Arrangements have been made for the completion of a storage reservoir belonging to this project on the Mora River where a very large amount of water will be stored and put on the land as the farmers require.

The southeast corner of this land begins six miles north of the city of Las Vegas and the main line of the Santa Fe Railroad runs for 10 miles through the property.

THE RIO MIMBRES IRRIGATION COMPANY.

This proposition contemplates the construction of one large storage reservoir on the Rio Mimbres at a point about twenty-four miles northwest of Deming, N. M. This reservoir, when completed, will store approximately 65,000 acre feet of water. At a point about two miles south of the reservoir is to be constructed a diversion dam which will discharge the water into ditches on each side

of the river. The survey for the reservoir as well as for the two main canals has been completed and the character of the construction work has been decided upon.

In addition to the storage system the Company contemplates the sinking of wells throughout the shallow water district controlled by it, for the purpose of increasing the water supply during such dry seasons as might occur.

The lands to be irrigated under this system are finely situated; they are easy of access, most fertile in their natural state, and such as have already been cultivated have proved to be wonderfully productive. The entire body of land is within twenty miles to the north and northwest of the City of Deming. It is crossed by the Atchison, Topeka and Santa Fe Railroad and is all within six miles of some one of the several railroad stations.

The average altitude is about 4,500 feet, the climate the best in the southwest and the entire tract is underlain with water of absolute purity for domestic purposes, which can be easily obtained.

It is the expectation of the Company to commence the construction of this project within the near future but it will probably be from twelve to eighteen months before the lands under it will be offered for sale.

URTON LAKE PROJECT.

This project was originally taken up by the United States Reclamation Service, and the survey of the reservoir and canals was made by engineers of that department. The plan proposed was to construct a low diversion dam of masonry in the Pecos River, some four or five miles north of the town of Ft. Sumner, where a suitable rock bottom could be obtained; the dam to be used for the intake canal of a capacity of fifteen hundred feet to be built for a distance of approximately thirty-eighth miles, for filling the Urton Lake Reservoir, a natural basin which, with but very small cost for embanking the southwest and west sides, will hold approximately two hundred thousand acre feet. The outlet from the reservoir was to be obtained by tunneling through the south wall, thus supplying water to the valley lying immediately south of the outlet, and extending thence in a southerly direction about fifteen miles and in an easterly direction for about six miles.

The Urton Lake Land & Water Company, a New Mexico corporation, organized for the purpose of utilizing the water originally filed upon by the United States Government for this project and irrigating the lands above described and lands contiguous thereto by having them all segregated under the provisions of the Carey

Act, believes it better to modify the above plans in the following particulars.

To build an equalizing reservoir at a point farther up the river where a good rock foundation can be obtained for the dam, the reservoir to hold approximately eighty-two thousand acre feet of water which will back the water in the Pecos River back from the dam approximately ten miles, the dam to be constructed of solid concrete masonry to a height of about one hundred feet.

To then conduct the water through the outlet gate of the equalizing reservoir down the Pecos River to the diversion dam to be placed in the river at the same point as determined by the Reclamation Service, or in lieu thereof to build an intake canal a little higher and take the water from the equalizing reservoir direct.

By constructing the equalizing reservoir above mentioned it will then be necessary to only build an intake canal with a carrying capacity of five hundred second feet, and the amount of water stored in the equalizing reservoir together with the available flow of the river will insure a flow in the intake canal to from one-half to its full capacity during the entire year.

The cost of constructing this canal will therefore not only be much lessened, but it will also permit an increased grade and the construction of flumes across the Tiban and other small streams crossing the canal line and thus reduce its length from three to five miles, all of which will materially decrease the evaporation and seepage and the cost of maintenance.

There are about fifty thousand acres of strictly first class land for this project under the Reclamation Service survey, and an additional six to eight thousand acres between the intake and the Urton Lake Reservoir; and the Company proposes to raise the outlet tunnel approximately ten feet, thus allowing the water to pass through the hill, and thereby water an additional twenty to tweny-five thousand acres of very fine land to the south and east of the outlet tunnel.

The lands are well suited for all kinds of cultivation, and are especially adapted to fruit raising. A line of railroad is now proposed, coming from the south and running through this land in a northerly direction, and, if the Urton Lake Project is built, it will undoubtedly insure its construction.

SMALL IRRIGATION PROJECTS.

It has been very gratifying to the Territorial Engineer to note the number of small individual projects that have been built under the provisions of the Irrigation Law of 1907. One of the great problems in New Mexico irrigation and one which will undoubtedly prove to be very useful and that is, the utilization of small water supplies. A great many opportunities are afforded for the construction of small storage reservoirs in thousands of arroyos in the Territory which in time of rain contain more or less flood water. These projects are good only from one or two hundred acres. It can be done very nicely by the individual himself in the winter months by the use of a team and the necessary fillings in the office of the Territorial Engineer. When considering the cost of construction and the acreage that can be put into cultivation by the appropriation of a small amount of water the cost of a water right is exceedingly small, say from five to ten dollars an acre, while under large irrigation projects the settler had to pay from forty to fifty dollars per acre for his water.

A few of the projects built upon the lines encouraged by the Territorial Engineer are given below. While large irrigation projects are awaiting financial aid, as much depends upon the caprice of the bond market and the financial condition of the country, the small irrigation project is built by the small expenditure of a few hundred dollars and reclaims from one hundred to five hundred acres of land in places where it was thought impossible to secure water.

Under the portion of this report devoted to the recommendations of the building of storage projects on dry streams it will be found that the dry looking arroyos carry a great deal of flood waters and when stored proves a means of sustaining one, two, three, or four irrigators who prove to be successful and crops of alfalfa, orchards, etc., are cultivated where nothing but cactus and sage brush have had sufficient nourishment before.

J. A. COTTINGHAM'S PROJECT.

J. A. Cottingham of Roswell, N. M., has practically completed his project for diverting water from Lake Francis as mentioned in the previous report. He has two main ditches from the lake to his farm and the necessary laterals for the irrigation of his land.

T. C. BRYANT'S PROJECT.

T. C. Bryant of Grants, N. M., states that the Rinconada Ditch has been practically completed and only requires a few changes and strengthening in places. The ditch is eight miles long, following the arroyo bed, the tank shown in the original application has been remodeled for stock purposes. Owing to the dry year the project suffered somewhat for lack of water.

MAY PROJECT.

M. B. May of Nogal, N. M., has practically completed his small project. Mr. May intends to enlarge his works later and reclaim new land. This proposition is a small storage scheme and is an example of what can be done by storing small water supplies for irrigation. The Territorial Engineer is endeavoring to encourage the building of small individual projects for from fifty to two hundred acres of land by the storage of water in small arroyos for this purpose.

COX PROJECT.

Applications granted by this office to S. B. Cox and Geo. W. Cox, both of Hope, N. M., are practically one project, the application of S. B. Cox being an extension and enlargement of the Geo. W. Cox application. The applicants have been getting the ground in cultivation principally in Indian and Kaffir corn and here is another example of the small irrigation project which is constructed at very small cost per acre.

L. E. MARTIN'S APPLICATION.

Owing to the very dry season the settlers under the project of L. E. Martin have not been able to cultivate very much of the land. This project diverts water from the La Luz River and the owners are the residents of the town of La Luz.

DOOLY DITCH.

William Dooley of Artesia, N. M., has diverted a small appropriation from Cottonwood Arroyo. The diversion consists of a concrete dam seven feet high by forty feet long. The land irrigated now amounts to about 350 acres devoted to apple, pear and peach orchard, corn and beans are raised between trees. Seventy-five acres still remain unbroken, but it will be plowed in about two months. Three thousand dollars have so far been expended and when considering the acreage the cost seems an exceedingly low price for water. This application was approved August 1,

1908, and certificate of construction granted May 21, 1910. The growth of the orchard, etc., has been very satisfactory.

THE MULESPREAD IRRIGATION PROJECT.

Settlers along Mulespread Canon near Deming, N. M., formed the Mulespread Irrigating Ditch Co., and constructed a project which now has under cultivation 1,020 acres belonging to eight settlers. This project is principally a large diversion ditch and is used for diverting floods of Mulespread Canon in times of rain, etc., and flooding it over the land. The unusual drouth conditions during the past year have somewhat effected this enterprise.

GALLEGOS PROJECT.

Ventura Gallegos of Trinchera, Colorado, diverts water from Trinchera Creek, has completed his project and in accordance with the provisions for his application, Mr. Gallegos is going back over his construction work and make extensions so as to cover a small patch left while developing his original work.

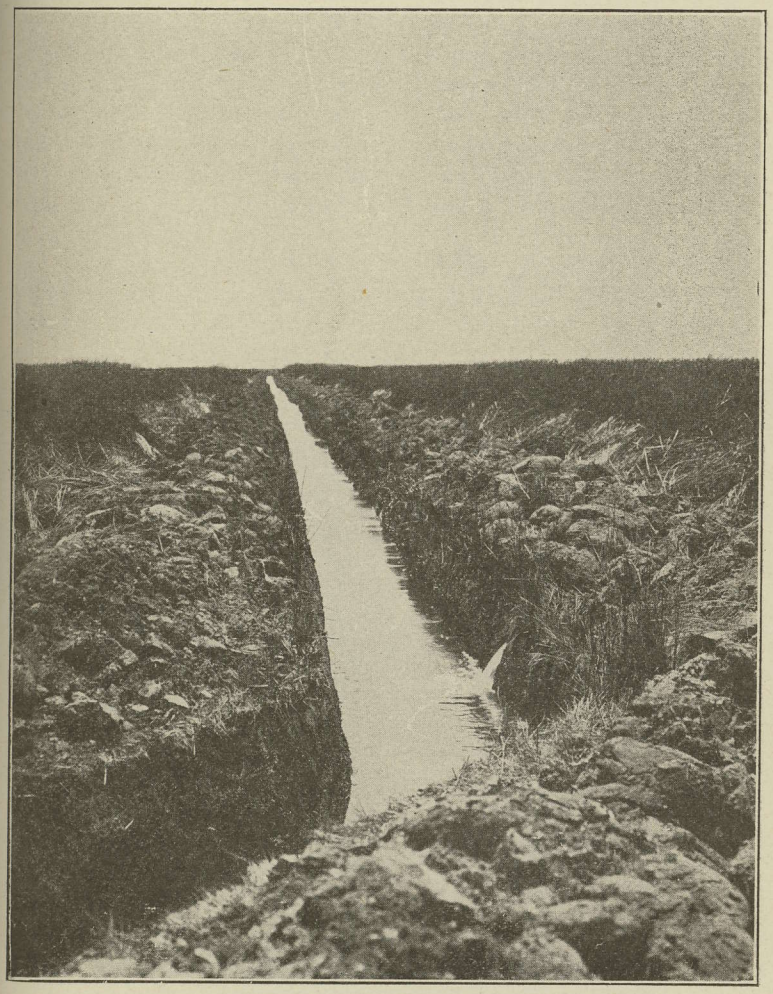
McCUISTION PROJECT.

O. W. McQuistion of Valley, N. M., has cultivated a small project of two hundred and eighty acres in Bluestem and expects his third cutting of alfalfa. As the water supply for this is principally flood water it speaks well for the cultivation and the proper use of water when available.

HARDWICH PROJECT.

Hardwich and Highsmith of Artesia, N. M., have availed themselves of water collected in bogs of the Pecos Valley. This is rather an unusual source of appropriation but ultimately a very important one as a great deal of seepage appears in places and sometimes amounts to a considerable flow. This project is created by digging a trench through the bogs and allowing the water to collect and which is conducted off on to the land to be irrigated. The cut on the opposite page shows very nicely the ditch constructed by the applicants, and, while the season has been very dry, water for five hundred acres has been secured and it is believed that in course of the year water for double that amount can be obtained. A drainage system of this kind has a double beneficial result for by draining the bogs land is reclaimed and the use of water upon other lands for irrigation adds to the irrigable area of the Territory and adds to the valuable property of the county. It is unfortunate that the Supreme Court decision ren-

dered upon water of this nature, was to the effect that such waters could not be appropriated under the Territorial Irrigation Law. The project of Mr. Hardwich, et al., was, however, approved before the question was decided. In another portion of the report the Territorial Engineer makes mention of the value of being allowed to appropriate this water.



Hardwich Ditch Collecting Seepage Water for Irrigation.

T. BANKS' PROJECT.

This Department always strongly advocated the use of pumps in irrigation either from the surface or underground flow and as an example of the efficiency of such a plant mentioned is here made of the project of T. Banks of Hagerman, N. M., and is represented by the figure opposite. Mr. Banks has a 25 horse-power Olds gasoline engine with an eight inch centrifugal pump and a lift of twenty feet. The water pumped is from the Felix River. The application of Mr. Banks originally called for the diversion of water for 100 acres and a permit was granted to him allowing the pumping of four second feet during one-fourth of the irrigation season. Mr. Banks has been very successful in his work and to quote from a letter he says: "I would not exchange my water system for a water right under the canal here, which is a good system, as I have tried a water right under it."

CITIZENS' DITCH.

The Citizens' Ditch Company of Questa, N. M., have irrigated approximately four hundred acres from the Red River by means of three ditches. The land under this system is held by a number of settlers in small holdings. This project was constructed some years ago and should not properly have been applied for in this office.

CABRESTO LAKE PROJECT.

The Cabresto Lake Irrigation Company was also constructed by settlers a number of years ago but as the system is prospering mention is here made of same. The land irrigated amounts to about twelve hundred acres. This project takes its water from the Cabresto Creek, tributary of the Red River, and the company has a small storage reservoir located in the mountains. The Red River Valley is very beautiful and is in Northern Taos County. Being located very closely to the mountains, the water supply is from snows and is generally very permanent.

CERRO DITCH PROJECT.

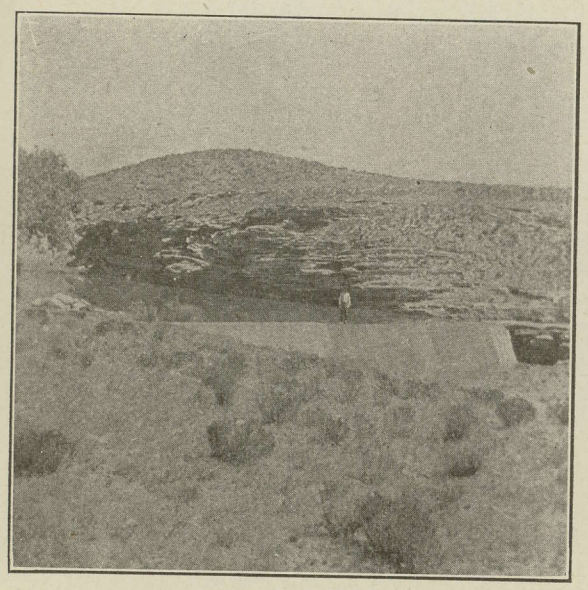
Under Application No. 86 the Cerro Ditch Company of Cerro, N. M., claim water from the Rio Latir for the irrigation of three thousand acres. A portion of this project was constructed sometime ago and some portions have been completed under the present law. They have about 2500 acres under cultivation.

THE RITO DE LA LAMA IRRIGATION COMPANY'S PROJECT.

The Rito de la Lama Irrigation Company's Project about eight miles south of Questa was constructed under permit No. 75 by this office. The settlers under this project have laid out small tracts in oats, and wheat princcipally. A certificate of construction and a license to appropriate have been granted.

RANDALL PROJECT.

Benjamin G. Randall of Taos, N. M., has a small and attractive project near Taos. Water is diverted during times of flood and stored in a small reservoir and is used for irrigating the land by Mr. Randall in a very economical manner. The water allowed originally in the permit granted by the Territorial Engineer has, by a system of ditches, water from one draining into another, been made to extend over more land than was originally stated in the application. A use of water similar to that made by Mr. Randall is the highest use and the careful and intelligent manner of getting the most out of the water has been encouraged by this Department. By study and attention to the features of this project Mr. Randall has secured excellent results. It is another example of the small individual project of a hundred or two acres being built very cheaply and satisfactorily.



Dam. Bond & Martin Project.

DeSmet PROJECT.

L. DeSmet has a small irrigation project at Taylor, N. M., and cultivated about one hundred acres under it. Floods washed out the dam and preparation is now being made for the re-construction of same.

BOND & MARTIN PROJECT.

Messrs. Bond and Martin of Pasamonte, New Mexico, has a small projects of 140 acres and have a small concrete dam in Ute creek, which diverts water for acreage devoted to alfalfa, maize, etc.

URRACA RANCH PROJECT.

This irrigation system is one of the best small projects in the Territory and exemplifies what can be done on the small stream and arroyos in this Territory. The project diverts the flood waters of the Cimarroncito into a reservoir where the flood waters are stored until needed for irrigation when they are allowed to flow through a system of canals.

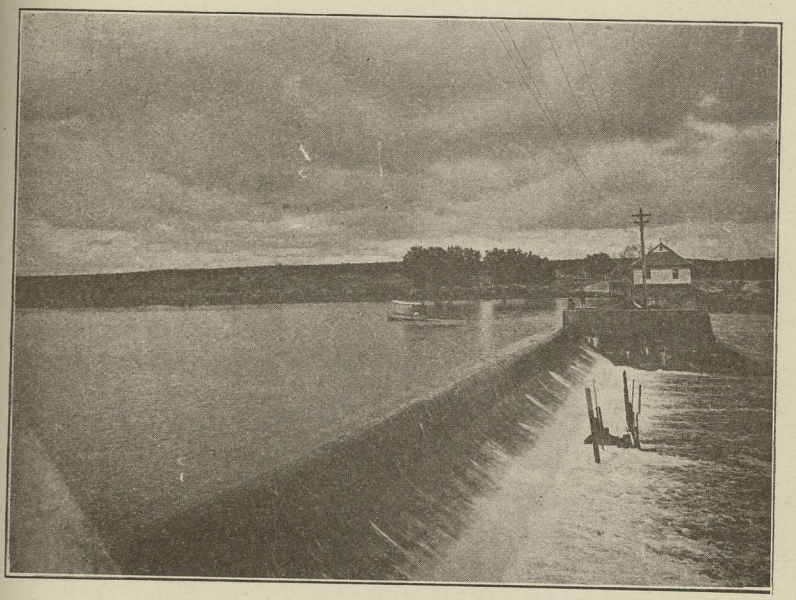
The project is giving excellent success and over a thousand acres will be put in cultivation this year. The project will irrigate about 2000 acres of fine soil in the Cimarron Valley.

POWER PROJECTS.

There has been a large activity in the development of water power projects within the last two years. A more detailed description of a few of the water power projects will give an idea of what will eventually be done in development along this line.

THE BENSON PROJECT.

One of the largest power projects that has so far been filed on is the Benson filing on the Penasco. This project contemplates the diversion of the waters of the Penasco and the conveying of same in pipe lines and ditches until a sufficient head is obtained through the fall of the river. We believe this to be one of the best power projects in the Territory.



Tansill Power Dam, Carlsbad, New Mexico.

L. T. HARDY POWER PROJECT.

The power project of L. T. Hardy of Espanola, N. M., has secured the sanction of this office and arrangements are now in progress for the financing of the works. This project is located

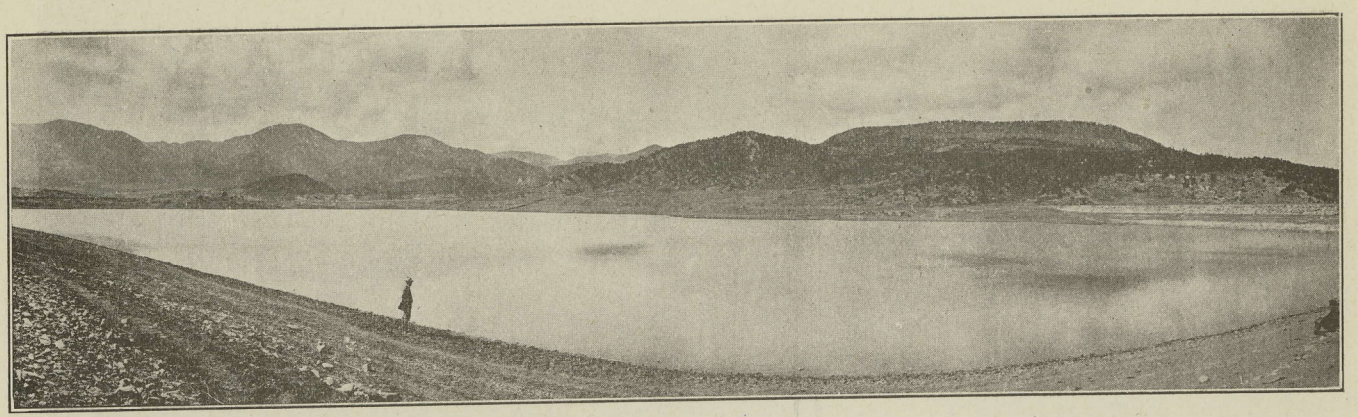
on the Rio del Medio and is considered a neat proposition for the purpose intended. It is planned to convey the power from point of generation eighteen miles to the town of Espanola where same will be used in running an elevator of the Espanola Milling and Elevator Company. The development of power to be used for making flour will help that section considerably in agricultural lines.

BOULWARE AND JOHNSON PROJECT.

Boulware and Johnson of Silver City, N. M., are the applicants for power site on the upper Gila River. The permit for this application has been given by the Territorial Engineer and arrangements are being made for the construction of this project by the owners. Owing to the large development of mining recently brought about in the Mogollon Mining District the use of this power is greatly needed and will prove of considerable value both to the applicants and to that section of the Territory. The project consists of a reinforced concrete dam 29 and 80 feet wide, pipe line from 52 down to 44 inches, 12 miles long. The original survey was 20 2-3 miles long but by a tunnel of 3000 feet it has been reduced to the length above mentioned. The applicants claim 580 feet effective head and 3951 cubic feet per minute, giving 3689 horse power at the wheel, selling at seventy-five dollars per year per horse power. Probable cost will be about one million two hundred thousand dollars.

M. H. FISHER PROJECT.

The power project of Merrill H. Fisher on the Fresnal, after considerable construction work, has been sold to the Alamogordo Water Power Company of Alamogordo, New Mexico, and the installation of a power plant proper will be done in a few months. Besides using the power for municipal lighting, etc., it is planned to extend the lines down the valley and the power used for pumping for irrigation. As Alamogordo Valley has no natural outlet the water coming from the streams of the White Mountains flows out on the sands and disappears and the indication is that there is a considerable underflow. It has been demonstrated that there are three stratas of water in this district 25 feet, 75 feet and 125 feet respectively. The water of the third stratum, upon analysis, has proven to be the best being practically free from alkali. The water from this depth rises from twenty to forty feet of the surface where it is pumped to the surface. The valley lands in the vicinity of Alamogordo are exceptionally fertile and with the utili-



Reservoir, Urraca Ranch Project.

zation of water power the project will prove very attractive doubtless in a financial way and bring under cultivation some very excellent land. On the Fresnal Creek 5000 feet of excavation three by three and one-half feet out of the 8100 feet required has been completed as has a cut of 385 feet long by 15 feet deep.

E. H. FISHER POWER PROJECT.

The E. H. Fisher Power Project is located on the Pecos River below the junction of Mora Creek about 18 miles east of Santa Fe and is owned by E. H. Fisher of Albuquerque, N. M. Application No. 194 by John P. Connor was supplemented by an application by Mr. Fisher No. 339. The original application by Mr. Connor was sold to Mr. Fisher and the project is being developed under the latter application. This power project intends to supply power for electric lighting to the cities of Santa Fe, and Albuquerque and to pump water in the Estancia Valley to cover several thousand acres of land. It is claimed that seven thousand horse power will be generated. Records are now being collected by the Territorial Engineer on the water supply by means of an automatic gage established at Cowles, New Mexico. The cut opposite shows the location of the power project. This project is being financed and will probably be started within a year.

LIST OF CONSTRUCTION WORK DONE UNDER APPLICATIONS DURING 1909 AND 1910.

No. of Application.	Applicant	Work Commenced	One-fifth Completed	Whole Completed
2	Socorro Company	started		
3	Socorro Company		1-5 completed	
6	U. S. R. S. Carlsbad			completed
8	U. S. R. S. Engle	started		
12	E. P. & R. I. R. R. Co.			completed
13	E. P. & R. I. R. R. Co.			completed
16	T. E. Mitchell			Oct. 25, 1909
17	Farmers Del Co.			Oct. 23, 1909
18	G. H. Howard	started		
19	Taos Land Co.	started		
23	N. M. Irrigated L. Co.	started		
34	Monte Alto Irrigation Co.			Sept. 25, 1909
35	Bluewater Del. Co.	Dec. 3, 1909		
38	J. J. May			completed
39	Oasis Del. Co.	Jan. 22, 1909.		

No. of Application.	Applicant	Work Commenced	One-fifth Completed	Whole Completed
40	Eden Canal Co.	started		
48	E. O. Brown			Sept. 15, 1909
49	M. H. Fisher		Jan. 1, 1909	
50	Citizens Ditch & Irrigation Co.		Sept. 30, 1909	
53	Palo Blanco Land & Irrigation Co.,	Sept. 20, 1909.		
60	G. H. Webster, Jr.		Sept. 24, 1909	
63	T. Banks			Apr. 4, 1910
65	O. W. McCuistion			Sept. 27, 1909
69	C. W. Thuringer		Oct. 12, 1909	
74	J. C. Dunn, et al.		Jan. 1, 1910	
75	Rito Lama Irri. Co.			Sept. 29, 1909
76	Cabresto Lake Irrigation Co.			completed
81	French Land & Irrigation Co.		Sept. 22, 1909	
82	French Land & Irrigation Co.		Sept. 22, 1909	
83	French Land & Irrigation Co.		Sept. 22, 1909	
86	Cerro Ditch Co.			completed
89	W. H. Lambert			Sept. 18, 1909
90	J. D. Hand		Jan. 3, 1910	
102	C. E. Wiltse			Nov. 19, 1909
109	French Land & Irrigation Co.		Sept. 22, 1909	
110	French Land & Irrigation Co.		Sept. 22, 1909	
111	J. A. Cottingham			Oct. 2, 1909
112	J. A. Gregory			completed
117	L. E. Martin	commenced		
119	Citizens Ditch Co.			Sept. 21, 1909
122	C. E. Blattman		Sept. 22, 1909	
123	J. J. Gross			completed
125	Taos Land Co.,	Jan. 27, 1910,		
128	F. J. Lukens	commenced		
130	W. E. Rogers	Oct. 2, 1909		
131	E. T. Baird		Sept. 16, 1909	
132	W. A. Coe		Oct. 21, 1909	

No. of Application.	Applicant	Work Commenced	One-fifth Completed	Whole Completed
134	W. H. Lambert			Sept. 18, 1909
139	D. N. Hartley, Jan. 15, 1910			
151	Krause & Fletcher, commenced			
153	F. J. McDonald			completed
154	F. Vanderwork, Feb. 8, 1910			
156	Vermejo Ditch Co.			Sept. 21, 1909
158	M. B. May		Sept. 23, 1909	
160	Wm. Dooley			Sept. 30, 1909
161	M. H. Fisher			Sept. 21, 1909
162	G. W. Cox			Completed
163	J. P. Crutsinger			Sept. 23, 1909
173	S. R. Edwards		Sept. 13, 1909	
175	W. E. Sperry,	commenced		
176	Bond & Martin			Sept. 16, 1909
178	D. J. Splane, Oct. 6, 1909.			
182	M. S. Lee		Sept. 30, 1909	
183	Ventura Gallegos			completed
186	Hagerman Irri. Co.			Sept. 24, 1909
191	W. H. Harris	commenced		
197	W. T. Wells	commenced		
198	W. W. Jernigan		Sept. 27, 1909	
199	A. T. & S. F.			completed
200	Cat Claw Canal Co.		Dec. 30, 1909	
201	L. DeSmet		Sept. 15, 1909	
202	D. & R. G. R. R. Co.		Oct. 27, 1909	
205	Ute Creek Ranch Co., commenced			
206	F. M. Quinn		Mar. 12, 1909	
208	T. McMurdo			Oct. 28, 1909
209	J. I. Cowan,	Dec. 23, 1909		
210	J. H. Potter,			Mar. 23, 1910
214	Dell J. Holson and F. H. Wing		Sept. 9, 1909	
215	B. G. Randall			Sept. 13, 1909
220	Aubrey & Crozier, Feb. 2, 1910.			
221	Spader & Sullivan			completed
233	Osborn & Rinker, commenced			
234	Frank Walker, Jan. 25, 1910			
236	J. W. Lewis, Mar. 31, 1910			
251	E. F. Hardwich			completed
258	W. P. Riley		Sept. 30, 1909	

259	T. C. Bryan	Feb. 5, 1910
267	S. B. Cox	Feb. 3, 1910
272	G. T. Lambert	July, 14, 1910
275	J. W. Russey	Feb. 14, 1910
284	L. T. Hardy, Dec. 28, 1909	
286	Lenox & Slack	Feb. 28, 1910
299	Ole O. Strand	May 20, 1910
311	Cresencio Salazar	May 23, 1910
314	J. T. Potter	Feb. 28, 1910
369	L. R. Lamay	May 20, 1910
296	Mulespread Irri. Co.	July 5, 1910

Tabulated List of Proposed Irrigation and Power Projects in New Mexico—Compiled from applications for permits to appropriate public water—given herewith.

OLD APPROPRIATIONS.

The question as to the status of irrigation ditches, or rights in such ditches, where the construction work and application of water to beneficial use has been done prior to the passage of the law of 1907, is a very important question relating to irrigation work in New Mexico. The Department of the Territorial Engineer, realizing that some questions might be raised along this line and being very desirous of protecting the old rights, if such needed protection, upon coming into the office, the Engineer asked for an opinion of the Attorney General on this point.

The Attorney General in his opinion, which is given in full herewith, outlines the doctrine of prior appropriation and use as the fundamental basis to the right to the use of water. This spirit prevades our own irrigation code, which had in mind the protection of these old rights.

The filing of old notices: These the office will receive in affidavit form, stating the owner, address, name of source of supply and point of diversion by course and distance, date of construction, acres irrigated, quantity of water used for irrigation in second feet or acre feet; but is not required of old settlers to protect their rights and, although, these statements are generally vague and indefinite and giving no exact classification of the rights claimed, the office has received a number of these statements and upon filing become a part of the records of this Department, however, giving no right other than that which the Courts shall adjudicate to the ditch, as the amount of water which has been secured by beneficial application.

Recapitulating this subject, the Engineer would state, that

TABULATED LIST OF PROPOSED IRRIGATION AND POWER PROJECTS IN NEW MEXICO—COMPILED FROM APPLICATIONS FOR PERMITS TO APPROPRIATE PUBLIC WATERS.

No	Name of Applicant.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated.	Horse Power Generated	Approved or Rejected.	Approximate cost.
1	Rio Mimbres Irrigation Co	Faywood. N. M.	Rio Mimbras	All surplus	S. 16 T. 20 R 10 W	All that water will supply		Approved Sept. 16, 1905	
2	Socorro Company	Elmendorf, N. M.	Rio Grande	97 cu ft.	S. 5 T. 5 S. R 1 E	6780		" Jan. 4, 1906	
3	Socorro Company	" " "	" "	286 sec. ft.	¼ Cor. Bet. S. 8 & 17 T. 3 S R 1 E	20000		" Jan. 12, 1906	
4	J. H. Sloan	Santa Fe. N. M.	" "	Surplus	White Rock Canon			" Jan. 29, 1906	
5	U. S. of America	Carlsbad, N. M	Gallinas, et al	80,000 ac. ft.		10000		"	
6	" " " "	" " "	Pecos	300,000 " "	6 Mi. above Carlsbad	20000		"	
7	" " " "	" " "	"	300,000 " "	12 " " Ft. Sumner	60000		"	
8	U. S. of America	" " "	Rio Grande	2000,000 " "	9 " West of Engle	210000		"	
9	" " " "	" " "	Hondo	80.000 " "	12 " Southwest of Roswell	13000		"	
10	Charles Springer	Cimarron, N. M.	Cimarron, et al	Surplus	S. 24 T. 27 N R. 16 E.	42000		"	
11	Jaritas Ditc & Res. Co	Springer, N. M.	Chico & Jaritas	"	S. 23 T. 25 N. R. 24 E.			"	
12	El Paso & R I. R R Co	El Paso, Texas	Pintado Res	688.59 ac. ft.	S. 19 T. 18 N. R. 21 E	R. R. Uses		"	
13	" " " "	" " "	Gallinas "	313 " "	S. 7 T. 2 S. R 13 E.	" " "		"	
14	Ralph C Ely	Deming, N. M	Mimbres		4 Mi. Northwest of Deming			"	
15	Santa Rosa Company Ditch	Santa Rosa, N. M.	Agua Negra Chiquita						
16	T. E Mitchell	Santa Fe, N. M.	Tequesquite	45 sec. ft.	S 28 T. 20 N. R. 29 E.	1600		Lapsed	
17	Farmers Development Co	Springer, N. M.	Rayado	70 sec. ft.		4080		Approved May 7, 1908	
				15,000 ac. ft.	S. 34 T. 25 N. R. 19 E.	10000			
18	G Hill Howard	Española, N. M.	Arroyo Seco		S. 8 T. 25 N. R. 7 E.			" Aug 31, 1907	$ 50,000.
19	Hugh F. DuVal	Santa Fe, N. M.	Hondo	20 to 200 sec ft.				" Dec. 15, 1908	30,000.
20	" " "	" " "	Rio Colorado	All waters	4 Mi. East of Questa	15000		" Nov. 30, 1906	70,000.
21	" " "	" " "	Rio Grande	Surplus waters	Above Los Ranchos			" Nov. 30, 1906	300,000.
22	Springer Land & Irrigation Co	Springer, N. M.	Ocate Creek		S. Cor. 14, 15, 22, 23, T 23 N. R. 21 East.			" Nov. 30, 1906	100,000.
23	N. M Irrigated Land Co	El Rito, N. M.	El Rito	Surplus				"	
24	Chas H. Colgrove	Raton, N. M.	Crystal Res	32.63 ac. ft.				" Dec 15, 1906	
25	" " "	" " "	Echo "	117.84 " "				" April 15, 1907	
26	" " "	" " "	Wind Cap Res.	37.44 " "				" April 15, 1907	5,500.
27	" " "	" " "	Cascade "	58.48 " "				" April 15, 1907	2,500.
28	" " "	" " "	Dear Park "	72.50 " "				" April 15. 1907	3,760.
29	" " "	" " "	Regulating "	156.73 " "				" Apri. 15, 1907	6,000.
30	" " "	" " "	Snow Bound "	190.00 " "				" April 15, 1907	5,250.
31	" " "	" " "	Greatheart "	143.87 " "				" April 15, 1907	2,000.
32	Wendell V. Hall	Santa Fe, N. M.	Pecos	Surplus	S 32 T. 16 N. R 12 E.			" April 13, 1907	
33	Bluewater Development Co	Albuquerque, N. M.							
					FILINGS UNDER LAW OF 1907.				
34	Monte Alto Irrigation Co	Corrumps, N. M.	Dickey Canon	348.41 ac. ft.	S 18 T. 30 N R 33 E.	1090		" Dec. 9, 1907	5,000.
35	Bluewater Development Co								
36	Frederic Whitney	Cimarron, N. M.	Cimarronetto	2044 " "				Withdrawn	
37	Rayado Land and Irrigation Co	Rayado. N. M.	Rayado et al			7500			
38	Jesse J May	Hillsboro, N. M.	Trujillo Cr.	3 sec ft.	S. 31 T 16 S. R 7 W.	200		Approved Aug. 23, 1907	400.
39	J C Gage & J. B Enfield	Artesia, N. M.	Sacramento	1500 " "					
				10345.0 ac. ft.	S. 35 T. 20 S. R. 13 E.	30000		" Jan. 10. 1908	76,000.
40	Eden Canal Land & P. Co	Aztec, N. M.	Animas	750 sec ft.	S. 1 T. 33 N. R. 10 W.	60000		" Dec. 12, 1907	500.000.
41	Charles Springer	Cimarron, N. M.	Vermejo	6270 ac. ft.	S 21 T. 29 N. R. 20 E.	6000		" Sept. 4, 1908	150,000.
42	G W. Rogers	Hope, N. M.	Peñasco	2 sec. ft.	S. 36 T. 17 S. R. 21 E.	160		Rejected	500.
43	Charles Springer	Cimarron, N. M.	S. Pofil	Surplus	S. 16 T. 27 N R 19 E.	2800		Approved Sept 24, 1908	2,500.
44	Taos Valley Land Co	Taos, N. M.	Rio Lucero	1040 ac ft.	Mouth of Lucero Cañon	1040		Rejected	
45	" " " "	" " "	Rio Hondo	1000 " "	Above Mouth of Houdo Cañon	1000		"	
46	" " " "	" " "	Arroyo Seco	1000 " "	At Mouth of Seco Cañon	1000		"	
47	Sacramento Valley Irrigation Co	Alamogordo, N. M.	Sacramento	Flood waters	T. 19 S R. 12 East.			"	
48	E. O Brown & Dovie Brown	Springer, N. M.	Rito de la Plano	14 sec. ft	Secs 20, 29 T. 26 N. R. 34 E.	1000		Approved Sept. 9, 1907	2,000.
47	Merril H. Fischer	Alamogordo, N. M.	Fresnal Creek	15 sec. ft.	S. 5 T. 16 R. 11.			" Jan. 9, 1908	35.000.
50	Citizens Ditch & Irrigation Co	Aztec, N. M.	San Juan	100 " "	S 3 T 29 N. R 9 W.	7000		" Aug. 13, 1907	77,000.
51	J. L. Lawson	Alamogordo, N. M.						Rejected	
52	George Irving	Chicago, Illinois	Animas	200 sec ft.	S. 15 T. 32 N. R. 10 W.	25000	250	"	2,500.
53	Palo Blanco Land & Irrigation Co	Springer, N. M.	Palo Blanco	38800 ac ft.	Township 26 North	18400		Approved Feb. 14, 1908	175,000.
54	Emilio Valdez	Springer, N. M.	Sweetwater Cr.		S 35 T 24 R. 19 E.	1000		" April 17, 1908	
55	D R Hartley & C. R Brice	Carlsbad. N. M	Blueriver S	Surplus	S. 19 T. 24 R. 27 E.	640			
56	Alamogordo Improvement Co	Alamogordo, N. M.	Cabellero S	5 cu. ft.	S. 22 T. 16 S. R. 11 E.				2,800.
57	Tusas Peak Gold and C. Co	Tusas, N. M.	Vallecitos	33 sec ft.					
				1050 ac. ft.	Tp 28 N. R. 7 East		500	Rejected Feb. 26, 1910	100,000.
58	Albert B Fall	Otero County	Three Rivers	Flood waters	Secs. 22, 33, 33, 26, 27, Tp. 11 S. R. 9 East.			"	
59	Alamogordo Improvement Co	Alamogordo, N M	La Luz and Fresnal	12½ sec ft.	SW¼ NE¼ S 25 T. 15 S. R. 10...	1600		Approved Dec. 10, 1907	2,000.
60	George H. Webster, Jr.	Cimarron, N. M.	Cimarroncito	2 sec ft.					
				2744.4 ac. ft.	568-22' E a distanee of 4292 ft. from corner	1646		Approved Sept 19, 1907	
61	Jno W. Glidden	Raton, N. M.							
62	St. Louis R. M. P. Ry Co	Raton, N M.	Red River	400 cu ft. per min.	S 14 T 30 N R 23 E.			Approved March 17. 1908	3,000.
63	T. Banks	H german N. M.	Felix River	1-½ sec. ft.	S. 2 T 14 S. R. 28 E.	100		" Jan. 13, 1908	
64	Chas. Springer & Co	Cimarron, N. M.	Springs	5000 ac ft	Tp 25 E R 20 East	5000			
65	Oscar W. McQuistion	Valley, N. M.	Dry Cimarron	5 7 sec. ft	S 36 T 32 N. R 33 E	400		Approved Feb. 14. 1908	
66	Farmers Development Co	Springer, N. M.	Rayado River	10,000 ac. ft.	T. 24 N R 17 E.	10000			
67	" " "	" " "	"	10,000 " "	S. 3 & 4 T N. R 19 E.	10000			
68	Oscar W. McQuistion	Valley, N. M.	Dry Cimarron	49.75 sec. ft.	S 36 T 32 N. R 33 East.	400			1.800.
69	Charles W. Thuringer	Denver, Colorado	Animas	66.4 sec. ft.	S. 13 T. 31 N. R 11 W.	5280		Approved April 28, 1908	20,000.

TABULATED LIST OF PROPOSED IRRIGATION AND POWER PROJECTS IN NEW MEXICO—COMPILED FROM APPLICATIONS FOR PERMITS TO APPROPRIATE PUBLIC WATERS.—*Con'd.*

No.	Name of Applicant.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated	Horse Power Generated.	Approved or Rejected.	Approximate cost.
70	Merrill H. Fisher	Alamogordo, N M	Alamo Cr	10 sec. ft.	S. 4 & 5 T. 17 S. R. 11 E		600	Witndrawn Sept. 12, 1907	$ 30,000.
71	Charles Springer	Cimarron, N M	Cimarron et al	Surplus & flood		65000	All	Approved July 3, 1908	100,000.
72	Frank Springer, et al	Raton, N. M	Cimarrom River	400 sec. ft. 8000 ac. ft		16000		Rejected March 20, 1908	
73	J. J. Laubach, et al	East Las Vegas, N. M	Head Waters	All water	In the Pecos Forest Res		All		10,000.
74	J. A Dunn, et al	Alamogordo, N. M	Dry Cañon	11 sec. ft.	S. 36 T. 15 S. R 10 E	8000		Approved Oct. 29, 1907	500.
75	Rito de la Laina I Co	Questa, N. M	Rito de la Laina	7 sec. ft.	About 4 Mi. South of Questa	680		" March 16, 1908	
76	Cabresto Lake Irrigation Co	" " "	Cabrestro Lake	22 sec. ft.	S 13 T. 29 N. R 13 E	1504		" April 18, 1908	
77	Harvie DuVal	Santa Fe, N M	De Las Mulas	8000 ac. ft.	All on unsurveyed land	3000			
78	Rio Puerco Irrigation Co	Albuquerque, N. M	Rio Puerco	12 sec. ft. 24,0 0 ac. ft.	Bears N. 62 00' W. 100 ft. dist. from N. W. Cor. Grant	19200		Approved July 21, 1908	200,000.
79	Chas. Springer & Co	Cimarron, N. M	Springs	30! ac ft		2000	All		2,000.
80	P H. Bailey, et al	Chamberino, N. M	Rio Grande	95 sec. ft.	Point on S. Bank of R. Grande	7000			3,000.
81	The French Land & Irrigation Co	Springer, N. M	Poñil	50 " "	S. 15 T 26 N. R. 20 E	21000		Approved March 17, 1908	
82	" " " "	" " "	Cimarron	100 " "	S. 23 T. 26 N. R 20 E			" March 17, 1908	95,000.
83	" " " "	" " "	Carrizozo	150 " "	S. 21 T 27 N. R. 20 E	21,000		" March 17, 1908	95,000.
84	Merill H Fisher	Alamogordo, N. M	Alamo	15 " "	Unsurveyed Goverment Land		20000		140,000.
85	D. N. Hartley	Barney, N. M	Pinabetes	Flood water	NE Cor. S. 28 T. 23 R 32	2.000			5,000
86	Cerro la Associacion de Mutuo Beneficio Protecto	Cerro, N. M	Rito Latir	43 sec. ft.	SW. Cor. S. 28 T. 30 N. R. 13 E	3000		Approved Feb. 18, 1908	2,000
87	William T. Lambert	Philadelphia, Pa.	Tinaja Cr	12 " "	Secs. 24 & 25 T. 28 N R 23 E	6000		" Feb. 25, 1908	3,645.
88	Jay Turley	Turley, N. M	Florida	2150 " "	S 11 T. 32 N. R. 10 W	130,000		" July 21, 1908	1,500,000.
89	William H. Lambert	Philadelphia, Pa	Eagle Tail Mesa	3.3 " "					
90	James D. Hand	Los Alamos. N M	Mora	4 ac. ft.	NW Cor. of SW¼ of SW¼ of S. 24 T. 28 N. R. 23 E	250		" Feb. 25, 1908	300.
91	Piacita Ranch Company 7	" "	Sapelio	115 sec. ft.	S. 33 T 19 R. 18 East	1500		" Feb 26, 1909	10,000.
92	M O. Hinderlider	Denver City. Colo	La Plata		S. 26 T. 18 N. R. 16 E	8000		Rejected Feb. 12, 1910	5,0 0.
93	Cha . Springer & Co	Cimarron, N M	Cimarron	200 sec. ft.	S. 15 T 32 N. R 13 W	14000		Approved March 3, 1909	50,000.
94	Chas. Carter et al	La Plata, N. M	La Plata et al	3350 ac. ft.	S. 23 T. 26 N. R. 19 E	2660			3.000.
95	Red River Land & Water Co	Denver, Co o	Red River	21½ sec. ft.	S. 15 T. 32 N. R. 13 W	1520		Approved May 3, 1908	3,500.
96	Jay Turley	Turley, N. M	La Plata	629 " "	S. 2 T 29 N. R. 13 E	43000			
97	Charles Springer	Cimarron, N. M	Moreno	All	SE¼ of S 27 T. 32 N. R. 13 W	30000		Approved July 21, 1908	500,000.
98	Charles Springer	Cimarron, N. M	Moreno	90.6 ac. ft.	NE¼ of S. 6 T 27 N. R. 11 E	400	All		
99	Wm. Meader	Raton, N. M	Sugarite	54. " "	S½ of S. 31 T 28 N. R 16 E	200	All		
100	Wm. Meader	Raton, N M	Sugarite	32.98 " "	SW¼ of S. 2 T 30 N. R 24 E	320		Approved March 26, 1909	1,394.
101	C. L. Hortenstain et al	Springer, N. M	Sugarite	33.73 " "	W½ S. 2 T. 29 N. R. 24 E	320		" March 25, 1909	
102	Clyde E Wiltse	Farmington, N M	Ocate	18000 " "	S. 45-31 E¼ Cor of S's. 11 & 12 Tp. 22 S. R. 19 E. N.M P M.	10000		" Feb. 4, 1908	51,400.
103	J. P. Annon	Alamogordo, N. M	La Plata	2½ sec. ft.	S. 32 T. 30 N. R. 13 W	55		" May 2, 1908	475.
104	John W. Glidden	Raton, N. M	Dog Cañon S	3.7 " "	S. 8 T. 18 S. R. 11 E		800	" April 7, 1908	22,000.
105	George Carl	Alamogordo, N. M	Coppis Cr	5000 ac. ft	S 14 T. 29 N. R. 24 E	1060		" July 1, 1908	5,000.
106	Chas A. Wheelon	Santa Fe, N. M	Merooche S	2.08 sec. ft.	Secs. 23 & 26 T. 15 S. R. 11 E		Power	" May 29, 1908	10.000.
107	Young & Norton	Fruitland, N. M	Vallecitos	40,000 ac. ft	About 3 Mi. below Ojo Caliente Springs	1000		Rejected	
			La Plata	113 sec. ft.					
108	W. A. Williams	Kennedy, N. M		101149.3 ac. ft.	S 15 T. 32 R. 13 W	5000		Approved July 20, 1908	57,410.67
109	The French Land & Irrigation Co	French, N. M	Galieteo	1.8 sec ft.	NW¼ of S 2 T. 13 N. R. 9 E	320		" May 20, 1908	
110	" " " " "	" " "	Van Bremmer C.	10335 ac ft	Secs. 11 and 12 T. 27 N. R. 20 E	30100		" July 21, 1908	300,000.
111	James A. Cottingham et al	Roswell, N. M	Vermejo	20665 " "	S. 1 Tp. 27 N R 20 E	30100		" July 21, 1908	300,000
112	James A. Gregory	Currumps, N M	Lake Francis	5 sec. ft	SE¼ NE¼ bf S. 32 T. 9 S. R. 25 E	640		" March 20, 1908	200.
113	Seferina de Sanchez	Barney, N. M	Alamosita	3-2.7 " "	S. 8 T. 28 N R. 34 E	220		" Aug. 1, 1908	
114	Luis A. Sanchez	Barney, N. M	Two Unnamed A	1-6.7 " "	Secs. 3 and 4 T. 23 N. R. 32 E	265		Rejected	
115	John J Brophy	Clayton, N M	Unnamed Arroyo	1½ " "	S. 25 T 24 N. R 32 E	105		Approved Sept. 24, 1908	
116	T A Ezell	Carlsbad, N. M	Sloan Cañon	2 " "	S. 24 T 31 N R 34 E	140		" July 22, 1908	
117	L. E. Martin et al	Alamogordo, N. M	Pecos & Delawere	190 " "	S. 28 T. 26 S. R 29 E	15000	40	Lost by default	40,000.
118	Blanche I. Major	Artesia, N. M	La Luz Cr	12 " "	NW¼ of NW¼ S. 26 T. 15 S. R. 10 E	980		Approved Oct. 19, 1908	
119	Citizens Ditch Co	Questa, N. M	Spring Lake	1 " "	NE¼ S. 3 T. 18 S. R 26 E	120		" March 21, 1908	100.
120	Eugene Van Patten	Las Cruces, N. M	Rio Colorado	11-3.7 " "	Secs. 31 and 32 T 29 R. 13 E	800		" Jan. 22, 1908	2,000.
121	John H. Culley	Wagon Mound, N M	Maple Grove C	Entire flow	S. 7 T. 23 S R 4 East	25		Application lost	2,000.
122	Chas. E. Blattman	Ocate, N M	Rain Water	.14 sec. ft.	S. 15 T. 19 N. R 21 E			Approved March 16, 1908	
123	J. & Mollie Gross	Kenton. N M	Ocate River	Floow waters	Secs 5 and 8 T 22 N. R. 19 E	Watering stock		" April 28, 1908	1,400.
124	Taos Valley Land Co	Taos, N M	Unnamed Arroyo	3.2 sec. ft	SW¼ NW. S. 23 T 32 N. R. 34 E	200		" May 20, 1908	1,500.
125	" " " "	" " "	Rio Lucero	5½ " "	E. Boundary Antonio M. Grant	5000 ac.	50	Application Rejected	7,000.
126	" " " "	" " "	Rio Hondo	2½ " "	N. Boundary Antoine Leroux Grant	10,000	50	Approved April 8, 1908	10,000.
127	John G. Stewart	Alamogordo, N. M	Arroyo Seco	2½ " "	S Bank Arroyo Seco	5,000	50	" April 21, 1908	7,000.
128	Fred J Lukins	Artesia, N M	Marble & Stewart	6.7 " "	S. 27 T. 16 S. R 10 East	60		" March 16, 1908	1.500.
129	Price & Bower	Alnmogordo. N. M	Draw Ditch	2 sec ft	S. 26 T. S. 26 E	140		" April 28, 1908	200.
130	William E. Rogers	Lake Arthur. N M	La Luz Creek	4½ " "	SE¼ NE¼ S 29 T 15 S. R. 10 E	320		" July 24, 1908	1,200.
131	Edward T. Baird	La Luz, N. M	Cottonwood	2.57 " "	Lot 11 S 4 T 16 S. R. 26 E	180		" April 28, 1908	100
132	W. A. Coe	Alamogordo, N M	La Preson	½ " "	SW¼ NW¼ S 13 T 15 S. R 10 E	60		" Sept. 4, 1908	300.
133	H. B. Jones	Santa Rosa, N. M	La Luz Cr	13-5.7 " "	Tp 15 S R 10 East	960		" July 23, 1908	700.
134	William H. Lambert	Philadelphia, Pa	Agua Negra Chiquita	62 " "	SW¼ SW¼ S. 11 T 8 N R. 21 E	1300	147.8		15,000.
135	Antonio J Ortiz	Ortiz, Colorado	Tenaja Cr	12 " "	Secs. 24. 25 T. 28 N. R. 23 E	840		Approved Feb. 25, 1908	5,705.
136	F D & W O. Albright	Camp. N. M	San Antonio	2½ " "	S. 11 T 30 N. R 7 E	200		Rejected Jan. 10, 1910	5,000.
137	H H. Letts	Koehler. N M	San Andres	1.5 " "	Tp. 18 S R 10 East		130	Approved Aug. 1, 1908	16,500.
138	S C Hawthorne	Santa Fe, N. M	Crow Creek	4000 ac. ft.	S. 28 T. 29 N R 22 E	5000		Withdrawn May 4, 1908	12,000.
139	D N Hartley	Barney, N. M	Arroyo Hondo	10 sec. ft.	In the De Vargas Grant	5000		" July 9. 1908	35,000.
			Pinabetas	4195.1 ac. ft	SW¼ SW¼ S. 18 T. 23 N. R. 33 E	3320		Approved March 23, 1908	15,000.

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No.	Name of Applicaut.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated.	Horse Power Generated.	Approved or Rejected.	Approximate cost.
140	Oliver M Lee	Alamogordo, N M	Kid Bluff S	3 sec. ft	Tps 18 and 19 Range 11 E	160		Approved Aug. 10, 1908	$ 20,000.
141	" " "	" " "	Sacramento	20 " "	S. 30 T. 18 S. R. 12 East		644	" Aug. 10, 1908	30,000.
142	" " "	" " "	Sacramento	24 " "	Headgate on Grapevine Cañon		2894	" Aug. 10, 1908	80,000.
143	J. C. Roseborough	Deming, N. M	Mimbres	484.6 " "					
				203,520 ac. ft.	Tp. 24 S R. 8 W.	33920			10,000.
144	Julia F. Morgan	Alamogordo, N M	Andreas Cañon	2 sec. ft.	SE Cor T 17 S. R 9 E	320		Approved Dec. 26, 1908	4,000.
145	Wylie Farm & Live Stock Co	Roswell, N. M	Pecos River	10 " "	W½ of SW¼ S. 10 T 3 S. R 25 E	717		" May 29, 1908	
146	Mulespread Irrigation Co	Deming, N. M	Mulespread C	20 " "	Bears S. 80 15 W. to W½ Cor. S. 31 T. 20 S. R. 7W.				
				628 ac. ft	1995 ft	5440		Rejected March 24, 1909	
147	O. M. Lee et al	Alamogordo, N M	Ruidoso et al	50 sec. ft.	E line of Mescalero Indian Reserve		est 15,000	Approved July 9, 1909	200,000.
148	John N. Bland et al	Gallup, N M.	Rio Puerco	80 " "	S. 15 Tp. 15 N. R 19 West	19000		Rejected Jan 30, 1909	77,000.
149	Herbert W Walcott	Kansas City, Mo.	Sacramento	100 " "	SW. Cor. S. 19 T. 19 S. R. 12 E		10,000	" June 30, 1908	500,000.
150	Turner & Burke	Farmington, N M	Animas River	750 " "					
				200,000 ac. ft.	SW¼ S. 22 T 32 N R. 10 W	80000			1,000,000.
151	Krause & Fletcher	El Paso, Texas	Peñasco	40 sec. ft.	S. 2 T. 17 S R 13 E		2000	Approved Aug. 10, 1908	100,000.
152	James M Gaar	Deming, N M	Mimbres	200 " "	S. 6 T. 24 S. R 7 W	9880			25,000.
153	Frances J McDonald	Carrizozo, N. M	Carrizozo Cr	4 " "	NW¼ of SE¼ S 27 T. 7 S. R 10 E	320		Approved Aug. 4, 1908	1,200.
154	Fred Vanderwork	Lakewood, N M	No name	2.049 sec ft	SE Cor NE¼ of SW¼ of S. 14 T 19 S R 26 E	163		" Aug. 5, 1908	437.
155	Miera & Akers	Santa Fe, N M	Rio Puerco	7.15 " "	NE¼ of SW¼ S 6 T. 19 N R 1 W	500		" Sept. 4, 1908	3,000.
156	Vermejo Ditch Co	Maxwell City, N. M	Salt Peter Cr	260 " "	NE¼ NE¼ S 6 T. 27 N. R. 21 E	22,000		" Dec. 22, 1908	1,500.
				22,000 ac. ft.	(Rejected by Board of Water Commissioners)				
157	Lyman H McNett	White Water, N. M	Apache Tejo S	2 sec. ft.	S 6 T 20 S R. 18 E	240		" March 31, 1908	600.
158	M. B. May	Nogal, N. M	Torolita Cr	6 " "	S. 36 T. 8 S R 12 E	160		" March 29, 1909	350.
159	H. M. Letts	Koehler, N. M	Crow Creek	800 " "	S. 28 T 29 N. R 22 E	15,000		" Sept. 4, 1908	26,000.
160	Wm Dooley & D Dooley	Artesia, N M	Cottonwood D	3.4 " "	S. 3 T. 16 S R. 25 E	240		" Aug. 1, 1908	250.
161	Merrill H Fisher	Alamogordo, N. M	Ruidoso	50 " "	If surveyed: S. 7 T 11 S. R. 12 E		450		12,000.
162	George W. Cox	Hope, N M	Robbinsons Sp	1½ " "	SE¼ S 33 T. 17 S. R. 16 E	80		Approved Aug 1, 1908	400.
163	J. P. Cruisinger et al	Alamogordo, N. M	Waste waters	14 " "	S 36 T. 16 S. R 9 E	1,680		" Aug. 1, 1908	1,500.
164	H. P. Cameron	Alamogordo, N. M	La Luz Creek	1 sec. ft 9.8 ac. ft.	S. 28 T. 15 S R. 10 E	80		" July 23, 1908	299
165	Emma S. Kilburn	Silver City, N. M	Mimbres	3 sec. ft	Lot 1, S. 30 T 20 S. R 10 W	210		Rejected	300.
166	Jay Turley	Turley, N. M	San Juan	15,000 " "	S 30, 81. T 30 N R 9 W	1,225,100	5000	Withdrawn	8,000,000.
167	J E. Edgington	Alamogordo, N. M	Rio Peñasco	100 " "	S 85 W 628 ft. S. 24 T. 16 S. R 14 E		3720	Rejected	15,000.
168	Damian Duran	Los Pinos, N. M	Cañada de Montoya	½ " "	S. 10 T 30 N R 8 East	Stock purposes		Supplemented No. 169	
169	Damian Duran	Los Pinos, N. M	Cañada de Montoya	2 " "	S 10 T. 30 N R 8 East	" "		Approved April 21, 1909	500.
170	Ft Sumner and Pecos L Co	E. Las Vegas, N. M	Pecos River	9.42 " "	Lot 10 S. 19 T. 3 N. R. 26 E	659			4,165.
171	F. D. Crandall	Aztec N M.	Animas River	23 " "	S. 26 T. 31 N. R 11 W	1700		Approved Oct. 15, 1908	15,000.
172	R. L. and J W. Porter	Estancia, N. M	Torrance Arroyo	2.5 " "	S 4 T. 5 N. R 7 E	178.6		" Sept. 24, 1908	350.
173	Sam B Edwards	Eureka, Kansas	Manzano Creek	2.5 " "	On Manzano Grant	360		" Sept. 4, 1908	400.
174	D. R Britt	Roswell, N M	Chain Lakes	3.4 " "	SW¼ of SE¼ S 3 T. 11 S R 25 E	240		Rejected Nov. 29, 1909	500.
175	W. Elmer Sperry	Raton, N M	Holkeo Cr	8 " "	NW¼ of NW¼ S. 15 T 25 N R. 27 E	200		Approved Sept. 24, 1908	400.
176	Bond and Martin	Alrolom, N. M	Ute Creek	2 " "	SW¼ of NE¼ S. 8 T. 23 E R. 29 E	140		" Sept. 25, 1908	2,000.
177	W. E. Washington	Lake Arthur, N M	Grapevine Cr	5 " "	Cor S. W¼ S 26 T. 26 S R 23 E	540			10,000.
178	Daniel J. Splane	Chicago, Illinois	Arroyo Hondo	20 " "	SW¼ S 12 T. 16 N R. 9 East	5000		Approved Oct. 12, 1908	60,000.
179	Willie Martin and Co	Farmington, N. M	Animas River	91 " "	NW Cor S. 14 T 29 N R. 15 W		100	" Feb 24, 1909	1,500.
180	The Aztec Dicth	Aztec, N M	Animas River	36.95 " "	W¼ Stone S. 8 T 31 N R 10 W	2200		" Sept 24, 1908	8,000.
181	Lewis Clausing	Raton, N. M	Tenaja Cr	8.5 sec. ft.	NE¼ S. 27 T 28 N R. 23 E	200		Approved Dec 29, 1908	10,463.
182	M S. Lee	Artesia, N. M	Eagle Draw	3.1 sec. ft.	SE¼ NE¼ S. 22 T. 17 R 25 E	220		" Dec. 29, 1908	200.
183	Ventura Gallegos	Trinchera, N M	Gallegos	1 sec. ft.	NW¼ NE¼ S 31 T. 32 N. R 27 E	70		" Dec. 22, 1908	150.
184	Wolcott & Lawson	Alamogordo, N. M	Grapevine	20000 ac. ft	Secs 28-29 T. 19 S. R 11 E	2000	5000		100,000.
185	Wolcott & Lawson	Alamogordo, N. M	Sacramento	60 sec. ft	SE of NW¼ S. 10 T. 19 S R. 12 E		5000		200,000.
186	Hagerman Irrigation Co	Hagerman, N M	Miller Drain	Drain water	SW¼ NE¼ S. 17 T 11 S R 25 E	85000		Approved July 6, 1909	
187	L D Pointer et al	Liberty, N M	San Juan	17 sec. ft	NW¼ NW¼ S 14 T. 29 N. R. 14 W	1200			15,000.
188	Fred H. Miller	Roswell, N. M	Pecos	10 " "	S. 7 T. 15 S. R. 27 East	800			4,000.
189	John W. Glidden	DeKalt, Illinois	Red River	3.5 sec. ft.	S 7 T. 27 N. R 23 East	259.5		Approved Dec. 22, 1908	3,500.
190	Ft Sumner & Pecos L Co	East Las Vegas, N. M	Pecos	17.42 sec. ft.	S. 4 T. 2 R. 26 East	1312.			4,000.
191	Wm. H Harris	Gladstone, N M	Palo Blanco	452 sec ft	S. 18 T. 25 R 28	13000		Approved March 17, 1909	22,000.
192	Hugh F. Duval	Santa Fe, N M	Santa Fe	1.87 sec. ft.	Secs. 28, 33 T 17 N. R. 8 E	600		" March 11, 1909	15,000.
193	A. M. Jackley et al	Alamogordo, N M	Dog Cañon	300 " "	Unsurveyed lands	500		Rejected	5,000.
194	John P. Conner	Santa Fe, N M	Pecos	400 " "	S. 29 T 17 N. R. 12 E		5000	Approved Oct. 19, 1908	withdrawn
195	Wolcott & Lawson	Alamogordo, N M	Sacramento	60,000 ac. ft.	Secs 9, 10, 3, 4, T 19 S R 12 E	20000	5000		150,000.
196	Baca Development Co	Albuquergue, N M	San Mateo	50 sec ft.	S. 1 T 12 N R 10 West	6000		Approved April 5, 1909	100,000.
197	W. T Wells	Alamogordo, N M	San Andres	8 " "	Near mouth of San Mateo	640		" Dec 22, 1908	800.
198	W. W. Jernigan	Weed, N. M	Cuervo Cañon	1.5 " "	SW¼ SW¼ S 34 T 17 S R 16 E	105		" Dec 22, 1908	500.
199	Atchison T. & S. F. Ry Co	East Las Vegas, N. M	Indian Cr	804 " "	SE Cor. of S. 36 T. 16 N. R 10 E	Railroad purposes		" Nov. 24, 1908	25,000.
200	Cat-Claw Canal Oo	Artesia, N. M	Cat Claw Draw	Flood waters	S 27 T 17 S. R. 24 E	4000		" Jan. 4, 1909	40,000.
201	L. & M DeSmet	Taylor, N M	Chico Cr	42 sec ft	S 19 T. 24 N. R 24 E	480		" Dec. 22, 1908	
202	D. & R. G Ry Co	Denver, Colorado	Las Animas	1.3 " "	S. 15 T 29 R. 13 W	Railroad purposes		" Dec. 28, 1908	4,000.
203	Sacramento Valley Irrigation Co	Alamogordo, N M	Sacramento	1430 " "	S 10 T 19 S R 12 E	100000	5000		300,000.
204	Prichard and Raynolds	Santa Fe, N M	Santa Fe Cr	7000 ac ft	S. 12 E 34 Ch Dist	18000		Approved Feb. 15, 1909	150,000.
205	Ute Creek Ranch Co	Raton, N M	Ute Creek	15 sec ft.	SE Cor. of S. 10 T 27 N R. 17 E	940		" Dec. 17, 1908	3,000.
206	Frank M. Quinn	Farmington, N. M	Las Animas	32.5 " "	S 18 T. 30 N R 11 W	640		" Dec. 31, 1908	10,000.
207	Jay Turley	Turley, N M	San Juan	15.000 " "	S. 1 T 29 N R 9 W	1,225,100.	15000		8,000,000.
208	Thomas McMurdo	Abbott, N M	Salado Ar	19½ " "	S 8 T. 22 N R. 25 E	320		Approved Jan. 15, 1909	500.
209	James I. Cowan	Colorado Springs, Colo	Red River	125 " "	S. 35 T. 59 N. R 23 E.	25,000		" Jan 25, 1909	40,000.

TABULATED LIST OF PROPOSED IRRIGATION AND POWER PROJECTS IN NEW MEXICO—COMPILED FROM APPLICATIONS FOR PERMITS TO APPROPRIATE PUBLIC WATERS.—*Con'd.*

No.	Name of Applicant.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated	Horse Power Generated.	Approved or Rejected.	Approximate cost.
210	J. T. Potter	Corona, M. M	Bonito Cañon	10 ac. ft.	S. 18 T 1 S. R. 13 E	Stock purposes		Approved Jan. 25, 1909	
211	Roscoe Rogers et al.	Silver City, N M	Cameron Cr	1 sec. ft.	S. 27 T. 18 S¼ R. 13 W	120		Rejected Jan. 29, 1909	$ 500.
212	James D. Hand	Los Alamos, N. M	Mora River	1400 ac. ft.	S. 11 T. 18 N. R. 16 E			Approved Feb. 26, 1909	1,500.
213	Appel and Winburn	Springer, N. M	Cimarron	8.6 sec. ft.	S. 33 T. 25 N. R 22 E	600		" March 31, 1909	3,000.
214	Holson and Wing	Silver City, N. M	Whiskey Cr	1¼ " "	S. 21 T 18 S R 13 W	100		" Jan. 25, 1909	550.
215	B. G. Randall	Taos, N. M	Fernando de Taos	1.4 " "	Fernando de Taos Grant	142		" Feb. 11, 1909	1,500.
216	Socorro Mines	Mogollon, N. M	Whitewater Cr	30 " "	S. 11 T. 11 S R 19 W		975	" Jan. 25, 1909	135,000.
217	J. W. Lewis	Carlsbad, N. M	Cass Draw	3 " "	Secs 6 and 5 T 24 S R. 28 E	400		Withdrawn Feb. 1, 1909	1,500.
218	Merrill H. Fisher	Alamogordo, N. M	Fresnal Cr	6000 ac. ft.	S 5 T 16 S. R 11 E	2000	1500	Approved Feb. 26, 1909	150,000.
219	Frank W Beach	Orogrande, N. M	El Paso Cañon	60000 " "	T. 20 S R. 12 and 13 E	30000		Rejected Dec. 22, 1909	500,000.
220	Aubrey and Crozier	Duncan, Arizona	Gila River	185 sec. ft.	S. 13 T. 19 S. R 20 W	10000		Approved March 26, 1909	31,400.
221	Spader and Sullivan	Placitas, N. M	Las Huertas	7 " "	S. 20 T 13 N. R 5 E	480		" Feb. 24, 1909	500.
222	Gila Farm Co	Gila, N. M	Gila River	726.7 " "	S 18 T. 18 S. R. 17 W	256600	35,011		15,000,000.
223	Gila Farm Co	Gila, N. M	Duck Creek	1 sec. ft. 449.8 ac. ft.	S. 11 S 15 S. R 18 W	Watering stock		Approved Oct. 6, 1909	
224	Ernest H Fisher	Cimarron, N. M	Pecos River	150 sec. ft.	S Cor. 4, 5, 8, 8, T. 17 N. R. 12 E		4800	Withdrawn Oct.-29, 1909	459,000.
225	N V. Cook	Lakewood N. M	Seven River	3 " "	S. 8 T. 20 S R. 26 E	200	15	" Jan. 11, 1909	3,000.
226	Thomas Jackson	Cimarron, N. M	Hewitt Cr	6 " "	S. 25 T. 26 N. R. 15 E	360			200.
227	Geo. H. Webster, Jr	Cimarron, N. M	Rayado River	15 " "	Urraeca Ranch S. Boundary		2208.8	Approved Feb. 27, 1909	45,000.
228	Ute Creek Ranch Co	Raton, N. M	Cieneguilla Cr	2 " "	S. 6 T. 23 N R. 19 E	120		Rejected Dec. 17, 1909	75.
229	James N. Cook	Raton, N. M	Raton Cr	102 " "	S. 31 T. 31 N R 24 E	325		Approved June 7, 1909	2,100.
230	Ute Creek Ranch Co	Raton, N. M	Nine Mile Cr	7 " "	S. 35 T. 26 N. R 15 E	330		Rejected Dec. 17, 1909	200.
231	Joseph W. Thurman	Carlsbad, N. M	Grapevine Cr	2-1.3 " "	S 19 T. 26 S. R. 24 E	200			500.
232	Benjamin Rambo, et al	Silver City, N. M	Cameron Cr	1½ " "	S. 27 T. 18 S. R. 13 W	120		Approved April 27, 1909	500.
233	Osborn and Rinker	Tres Piedras, N M	Aguage de la Petaca	1000 ac. ft.	S. 36 T. 28 N. R. 9 E	5120		" April 22, 1909	6,000.
234	Frank Walker	Raton, N. M	Uña de Gato	18½ sec. ft.	SE NE¼ S. 11 T. 29 R. 24	580		" April 21, 1909	600.
235	Christian F Harra	Buckner, Mo	Seven Rivers	3 " "	SE¼ NE¼ S. 7 T. 20 S R 26 E	395		" April 27, 1909	1,000.
236	J. W Lewis	Carlsbad, N. M	Cass Draw	8 " "	S 1 T 23 S. R 28 E	8103¼		" May 1, 1909	1,500.
237	Gila Farm Co	Gila, N. M	Gila River	36233.0 ac. ft.			35011		7,000,000.
238	Ernest H. Fisher	Cimarron, N. M	Rayado River	20 sec. ft.	S 25 N. R 17 E		2000		175,000.
239	Cesarine A. Lewis	Carlsbad, N. M	East Side Canal	1-1.7 " "	SE¼ SE¼ S 33 T. 21 S. R 27 E	80		Rejected Nov. 29, 1909	250.
240	Jay Turley	Turley, N. M	San Juan	640 " "	S 2 T. 29 N. R. 9 W	25000	1023	Approved Dec. 29, 1909	150,000.
241	Clarence J. Roberts	Raton, N. M	San Juan	200 " "	S. 8 S. 29 N R. 9 W	10000	802		50,000.
242	Farmers Development Co	Springer, N. M	See page from F. D. Res. No. 2					Approved June 8, 1909	
243	Frederic Whitney	Cimarron, N. M	Red River	150 sec. ft.	T. 29 N R. 14 E		8000	" May 4, 1909	450,000.
244	Placita Ranch Co	Los Alamos, N. M	Sapello	78.5 " "	S. 30 T. 18 N. R 16 E	5000		" Feb. 12, 1910	6,000.
245	James D. Hand	Los Alamos, N. M	Mora River	100 " "	S. 11 T. 18 N. R 16 E	7000		" May 4, 1909	8,000.
246	J M Freeman et al	Santa Fe, N. M	Rio Grande	500 " "	Secs 23, 24, 25, 26, T 23 N. R. 9 E	2000	500	Withdrawn	150,000.
247	Ernest H Fisher	Cimarron, N. M	Nambe River	30 " "	S. 26 T 19 N R 10 E		2000	Approved May 4, 1909	250,000.
248	Talpa Water Users and Irrigation Association	Talpa, N. M	Rio Chiquito	3.37 " "	E B. C istobal de la Serna	4075		" May 4, 1909	35 498.
249	Ary C. Clark	Carlsbad, N. M	Delaware	13.7 " "	S 33 T. 26 S. R. 28 E	960		" July 16, 1909	4,000.
250	Charles Springer	Cimarron, N. M	Rio Hondo	95 " "	S 79-40' W. 1900 ft. of S. Fork of Rio Hondo		5000	" Oct. 6, 1909	200,000.
251	Eugene F. Hardwich	Roswell, N. M	Bogs	7.5 " "	SE¼ NE¼ S. 12 T. 18 S. R. 26 E	520		" July 13, 1906	1,000.
253	C H. McLenathen	Carlsbad, N. M	E Side Canal	4¼ " "	S. 4 T. 22 S. R. 27 E	300		Rejected Nov. 29, 1909	500.
253	Hortenstein and Hartley	Springer, N. M	Ocate River	7000 " "	NW Cor. S. 8 T. 22 N. R 19 E	49000	5000	Approved Oct. 1, 1909	500,000.
254	H F. Robinson	Albuquerque, N. M	Rio Lucero	30 " "	Lot 37, 36 T. 26 N. R. 13 E	2000		Rejected May 9. 1910	3,500.
255	John O. Bland et al	Mal up, N. M	Rio Puerco et al	80 " "	S W SE¼ S 15 T 15 N. R 9 W	19000		May 20, 1909	77,000.
256	John W. Glidden	Maxwell, City	Tenaja Cr	11 " "	Secs 27, 28, 33, 34 T. 28 N. R 24 E	1989		Approved July 20, 1909	40,000.
257	Bert Mackey	Dayton, N. M	Springs on Peñasco	2.8 " "	Secs. 18 and 13, T. 18 S R 27 E	200		" April 8, 1910	500.
258	Willis P. Riley	Hope, N. M	Eagle Draw	2 3 " "	SE¼ SW¼ S. 4 T 17 S. R. 24 E	160		" June 7, 1909	100.
259	T C. & D K. Bryan	Grant, N M	Rinconada	8 " "	S W Cor. of S. 28 T 12 N. R. 8 W	800		" June 8, 1909	1,000.
260	Arrington and Crane	Farmington, N. M	La Plata	2½ " "	S. 32 T. 30 N R 13 W	175			850.
261	Geo. W Irving	Chicago, Illinois	San Juan	62.8 " "	S. 8 T 29 N R 9 W	4910			30,000.
262	Lucas Bros. and Raynolds	Carlsbad, N. M	Black River	2-6.7 " "	S. 35 T 25 S. R. 24 E	200			250.
263	Malaquias Martinez et al	Taos, N. M	Rio Puerco	3 " "	T 26 N. R. 13 East	800		Rejected May 6, 1910	800.
264	George H. Webster, Jr	Cimarron, N. M	Rayado	62 " "	N. 60-30' W. 16085 ft. dist		2000		80,000.
265	A. M. Patten	Denver, Colorado	Bull Gap Arroyo	9000 ac. ft.	T. 9, 10 S. R. 8 E	5000		Approved Oct. 8, 1909	110,000.
266	G N. Wynkoop	New York City	Rio San Jose	32000 " "	W. B Antonio Sedillo Grant	25,200	All		375,000.
267	Samuel B Cox	Hope, N. M	Robbinsons Springs	1½ sec. ft.	SE¼ S. 33 T. 17 S. R. 16 E	160		Approved July 13, 1909	400.
268	W. S. Hopewell	Albuquerque, N. M	San Pedro Cr	0.589 " "	S. 4 T. 12 N. R. 6 E			" April 9, 1910	3,876.
269	W S. Hopewell	Albuquerque, N. M	Spring	All water	S. 15 T. 10 N R. 5 E	80		" July 8, 1909	300.
270	Geo. W Stith	Tularosa, N. M	Sanchería A	10 sec. ft.	Secs. 28 and 30 T 14 S. R. 10 E	160		Ju y 24, 1909	1,565.
271	J. W. Thomason	Mountain Park, N. M	S Fresnal Cr	400 ac. ft.	E½ S W¼ S. 15 T 13 S. R. 11 E	160			4,200.
272	Geo. T. Lambert	Dorsey. N. M	Tenaja Cr	115.6 sec. ft.	SE¼ S 30 T 18 N R 24 E	595		Approved Feb. 26, 1910	4,585.
273	Womans Home Missionary Society Me. Church	Farmington, N. M	San Juan	1 " "	S. 18 T. 29 N. R. 13 W	35			700.
274	Jack M. Potter	Clayton, N. M	Cimarron et al	8-3.7 " "	S 26 T. 32 N R 35 E	500		Approved July 24, 1909	2,500.
275	J. W. Russey	Carlsbad, N. M	Pecos River	1-8.100 " "	SE¼ SE¼ T. 22 S. R. 27 E	76		" July 10, 1909	1,200.
276	E A. Clayton	Artesia, N. M	Runyan Springs	All unappropriated	S. 3 T. 18 S. R 26 E	100			100.
277	Joseph E Wheeler	Liberty, N. M	Westwater Arroyo	Under flow and flood	S. 8 T 30 N R. 15 W	200		Approved Jan. 10, 1910	1,000.
278	F. E. & F. Fullen	Abbott, N. M	Salado Arroyo	20 sec. ft.	S 7 S T. 23 N. R 25 E	110		" July 13, 1909	1,300.
279	Gusdorf and Montoya	Taos, N. M	Rio Grande del Ranchos	9 " "	Cristobal de la Serna Grant	1700			31,930.
280	Wingfield et al	Tularosa, N M	Ruidoso	108 " "	Unsurveyed land		2745.18		166.840.
281	M. Marcellino	Liberty, N. M	Westwater Arroyo	250 ac. ft.	NE NE Cor. S 29 T 30 R. 15	75		Approved Apr 130. 1910	2,000.
282	Martin Yates, Jr	Artesia, N. M	Drain Ditch	2-6.7 sec. ft.	SW¼ NE¼ S. 26 T. 17 S. R. 26 E	220		" Aug. 17, 1909	200
283	James B. Neatherlin	Artesia, N. M	Jennings Springs	2-1.14 " "	NW¼ NW¼ S. 28 T. 17 S. R. 27 E	145		" Oct. 6, 1909	100.

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No.	Name of Applicant.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated.	Horse Power Generated.	Approved or Rejected.	Approximate cost.
284	L. T. Hardy	Española, N. M.	Rio del Medio	40 sec. ft.	SW¼ S. 8 T. 20 N. R. 10 E.		2000	Approved July 10, 1909	$ 15,000.
285	L. F. Hutchins	Fruitland, N. M.	Unnamed Arroyo	All waters	S. 24 T. 30 N. R. 15 W.	320		" April 30, 1910	
286	Lenox and Slack	Roswell, N. M.	Four Mile Draw	2 sec. ft.	Lot 4 S. 1 T. 12 S. R. 25 E.	156		" July 13, 1909	200.
287	B. B. Ownby	Lordsburg, N. M.	Ownby Reservoir	6 " "	Secs. 28, 29, 32, 33, T. 22 S. R. 18 W.	467		" Oct. 11, 1909	800.
288	J. E. Edgington	Alamogordo, N. M.	Cuervo Cañon	8 " "	SW¼ SW¼ S. 3 T. 17 S. R. 16 E.	80		" Jan. 10, 1910	500.
289	N. & B. A. Rodriguez	Arboles, N. M.	Rio San Juan	2 " "	S. 27 Tp. 32 N. R. 6 W.	160		" Dec. 1, 1909	1,000.
290	Martin Graney	Elizabethtown, N. M.	Moreno	4.4 " "	S. 17 T. 27 N. R. 16 E.	150			720.
291	Gusdorf and Black	Taos, N. M.	Miranda Arroyo	3.8 " "	E. B. Cristobal de la Serna Grant	700		Approved Dec. 17, 1909	19,400.
292	W. J. Preston	Santa Fe, N. M.	Arroyo Hondo	All unappropriated	S. 17 T. 16 N. R. 10 E.			" Jan. 20, 1910	
293	W. J. Preston	Santa Fe, N. M.	Arroyo Hondo	All unappro. water	S. 18 T. 16 N. R. 10 E.			" Jan. 20, 1910	
294	Love and Smith	Socorro, N. M.	Ojo Chico	All water of spring	S. 16 T. 3 S. R. 1 W.	1000		Rejected Feb. 26, 1910	
295	Socorro Mines	Mogollon, N. M.	Spring	All water of spring	In Spring Cañon	Milling purposes			45,000.
296	Mule-pread Irrigation Co.	Deming, N. M.	Mule Springs Cañon	77 sec. ft.	S. 1 T. 20 S. R. 7 W.	5440		Approved Aug. 21, 1909	1,500.
297	E. A. Clayton	Artesia, N. M.	Runyan Springs	2¼ " "	SW¼ NW¼ S. 3 T. 18 S. R. 26 E.	160		" Jan. 29, 1910	250.
298	L. R. Host	Nogal, N. M.	N. Nogal Cañon	.25 " "	S½ of NW¼ Sec. 17	17		" Oct. 6, 1909	200.
299	Ole O. Strand	Lake Arthur, N. M.	Cottonwood A	2.35 " "	Lot 9 T. 16 S. R. 26 E. S. 4	100		" Dec. 1, 19 9	223.
300	Geo. T. Lambert	Dorsey, N. M.	Tenaja Arroyo	953.1 " "	Secs. In Range 23 East	2484		" Jan. 29, 1910	45,000.
301	Alexander Gusdorf	Taos, N. M.	Cañada de Los Alamos	4 " "	Cristobal de la Serna	820		" Dec. 17, 1909	10,000.
302	Pecos Irrigation Co.	Carlsbad, N. M.	Pecos	125 " "	NW¼ SE¼ S. 11 T. 23 S. R. 28 E.	8150		" Oct. 22, 1909	30,000.
303	Frank E. Downs	Carlsbad, N. M.	Pecos	40 " "	S. 24 T. 22 S. R. 7 E.	2280		" Nov. 23, 1909	9,000.
304	Chas. A. Spiess	East Las Vegas, N. M.	Rio Grande del Ranchos	6.9 " "	T. 24 and 25 R. 11 and 12 E.	1280			26,000.
305	E. G. Kindred	Denver, Colorado	Six Mile D. and Rio Puerco	12.732 " "	S. 15 T. 15 N. R. 19 W.	16640		Rejected	162,813.50
306	Hughes and Raynolds	Santa Fe, N. M.	Rio Grande	500 " "	Caja del Rio Grant	12000		" Feb. 26, 1910	25,000.
307	J. D. Young	Fruitland, N. M.	East Arroyo	320 ac. ft.	S. 12 T. 30 N. R. 15 W.	160		" Oct. 6, 1909	150.
308	J. D. Young	Fruitland, N. M.	Coolidge Arroyo	320 " "	S. 27 T. 30 N. R. 14 W.	160		Approved Oct. 6, 1909	150.00
309	H. H. Kellogg et al	Alamogordo, N. M.	Springs	10 sec. ft.	T. 16 S. R. 18 East		500		25,000.00
310	A. A. and G. W. Kaiser	Dayton, N. M.	Bogs	7.4 " "	S. 12 T. 18 S. R. 26 E.	520			900.00
311	Crensencio Salazar	Coyote, N. M.	Ojito de la Alameda	½ " "	S. 36 T. 23 R. 3 East	80		Approved Dec. 1, 1909	75.00
312	E. A. Clayton	Artesia, N. M.	Spring Lake	6-6/7 " "	SE¼ NE¼ S. 3 T. 18 S. R. 26 E.	480		" Feb. 26, 1910	
313	J. J. Baumgardner	Santa Fe, N. M.	Aguage de la Petaca	2.6 " "	Cerro Taoses	1600		" Sept. 13, 1909	18,000.00
314	J. T. Potter	Weed, N. M.	Aguachiquita	5 " "	Secs. 25 and 27 T. 17 S. R. 14 E.	200		" Sept. 13, 1909	500.
315	E. P. Bujac	Carlsbad, N. M.	Pecos	1-2/7 " "	S. 5 T. 22 S. R. 27 E.	80½		Returned Nov 12, 1909	2,000.00
316	Louis E. Lamb	Bluewater, N. M.	Ashcroft Cañon	560 ac. ft.	S. 30 T. 12 N. R. 10 W.	490		Rejected Jan. 28, 1910	685.00
317	Homer W. Schofield	Alamogordo, N. M.	Rio Tularosa	42 sec. ft.	S. 11 T. 14 S. R. 10 E.	400		Approved April 28, 1909	15,000.00
318	Arch Latham	Lake Valley, N. M.	Berenda Creek	Underflow	S. 10 T. 18 S. R. 8 West	640		Rejected Feb. 26, 1910	2,500.00
319	T. A. Ezel	Carlsbad, N. M.	Pecos River	475 sec. ft.	S. 19 T. 26 S. R. 29 E.	1066	1300	Approved Oct. 6, 1909	700,000.00
320	A. A. Jones	East Las Vegas, N. M.	Gallinas and Tecolotito	430 " "	Where Tecolotito empties into Pecos	100,000		Rejected Feb. 12, 1910	400,000.00
321	Jackley and Kimpe	Alamogordo, N. M.	Dog Cañon	200 " "	Tps. 18 and 19 S. R. 10 and 11 E.	540		Approved Dec. 1, 1909	5,000.00
322	Martinez and Black	Taos, N. M.	Rio Lucero	20 " "	T. 26 N. R. 13 East		288	" Dec. 20, 1909	13,000.00
323	Amargo Ditch and Land Co.	Lumberton, N. M.	Big Navajo	60 " "	S. 8 T. 32 N. R. 1 E.	7,500		" Oct. 6, 1909	40,000.00
324	J. L. Torres	Alamogordo, N. M.	Preston and Barro C	78 " "	S. 34 T. 14 S. R. 10 E.	640		" Dec. 1, 1909	1,500.00
325	La Joya Land I. & D. Co.	Santa Fe, N. M.	Rio Embudo	250 " "	S. 28 T. 23 N. R. 10 E.	12000	600		250,000.00
326	Henry Tipton	Carlsbad, N. M.	Pecos river	6 " "	S. 21 T. 22 S. R. 27 E.	400			2,500.00
327	F. Sanchez y Medina	Roy, N. M.	Unnamed Arroyo	2.3520 " "	S. 19 T. 20 N. R. 25 E.	50		Rejected Dec. 14, 1909	500.00
328	Will R. Gray	Carlsbad, N. M.	Pecos River	3 " "	Secs. 31, 32, T. 21 S. R. 29 E.	240			1,200.00
329	Thos. Shaw	Raton, N. M.	Unnamed Arroyo	4.44 " "	S. 11 T. 30 N. R. 24 E.	180		Approved Dec. 20, 1909	350.00
330	Red River Ditch Co.	Maxwell, N. M.	Loco Arroyo	1620 ac. ft.	Secs. 3, 4, 33, 34, T. 27 N. R. 23 E.	1400		Rejected Jan. 10, 1910	12,000.00
331	James D. Hand	Los Alamos, N. M.	Mora and Coyote	200 sec. ft.	S. 28 T. 20 N. R. 16 East	14000			25,000.00
332	Frank H. Carter	Abbott, N. M.	Unnamed Arroyo	6 " "	S. 35 T. 24 N. R. 25 E.	50		Approved Jan. 10, 1910	550.00
333	L. A. Hughes	Santa Fe, N. M.	Santa Fe Creek	220 " "	Secs. 1, 6 T. 15 N. R. 7, 8 E.	18000		" Jan. 29, 1910	150,000.00
334	French Land and Irrigation Co.	French, N. M.	Cimarron River	730 " "	See other applications	51100			
335	H. A. Jastro	Bakersfield, Cal.	Rio Pueroo	112 " "	Bernardo Montaño Grant	8,800			
336	G. R. L. White	Lakewood, N. M.	S. Seven Rivers	4 " "	S. 7 8 T. 20 S. R. 26 E.	360		Assigned	1,500.00
337	Taos Valley Land Co.	Taos, N. M.	Rio Pueblo	100 " "	S 67° E. 3435 ft. dist.	50,000	50		55,000.00
338	J. W. Russey	Carlsbad, N. M.	Pecos River	3 " "	S. 14 T. 22 S. R. 27 E.	210		Rejected Feb. 26, 1910	2,500.00
339	Ernest H. Fisher	Cimarron, N. M.	Pecos and Mora	150 " "	S. 22 T. 18 N. R. 12 E.		7000	Approved Feb. 15, 1910	750,000.
340	Watt Gilmore	Tularosa, N. M.	Waste waters	1 cu. ft.	S. 21 T. 14 S. R. 10 E.	50			200.00
341	The Board of Trustees of the Town of Las Vegas	Las Vegas, N. M.	Sanguijuela Gallinas, Sapello Pecos	Entire flow				Approved Feb. 12, 1910	750.000.
342	Forest S. Cartwright	Albuquerque, N. M.	Tijeras Springs	12 sec. ft.	S. 1 T. 9 N. R. 3 E.	1280		" March 23, 1910	53,672.
343	James D. Hand	Los Alamos, N. M.	Gallinas River	42.86 " "	San Miguel Ct. House	3000			4,000.
344	James I. Cowan	Colorado Springs, Colo.	Red River	125 " "	S. 35 T. 29 N. R. 23 E.	25000		Approved March 25, 1910	125,000.
345	Ben Totten	Malaga, N. M.	Pecos River	3 " "	S. 24 T. 24 S. R. 28 E.	210			2,000.
346	A. A. Jones	East Las Vegas, N. M.	Pecos, Gallinas, Tecolotito, and Bernal	1,400,000 ac. ft.		200,000	25,000		1,500,000.
347	Cat-Claw Canal Co.	Artesia, N. M.	Eagle Draw	3.0 sec. ft.	S. 35 T. 16 S. R. 21 E.	5,600		Approved April 8, 1910	10,000.
348	Meloche and Thomson	Raton, N. M.	Uña de Gato	30 " "	S. 13 T. 30 N. R. 23 E.	2,160		" March 23, 1910	80,000.
349	D. R. Bentson	Albuquerque, N. M.	Tijeras Cr	.05 " "	S. 26 T. 10 N. R. 4 E.	100		Withdrawn	3,000.
350	E. M. Teel	Hope, N. M.	Peñasco	1 " "	R. 14 T. 17 S. R. 20 E.	100		Approved April 8, 1910	600.
351	Farmers Development Co.	Springer, N. M.	Rayado and Trib.	70 s. ft. 15000 ac. ft.	SE Cor. S. 34 T. 25 N. R. 19 E.	10000			25,000.
352	Farmers Mutual Ditch Co.	Farming on, N. M.	San Juan	170 " "	SW¼ NW¼ S. 7 T. 29 N. R. 13 W.	12000			50,000.
353	J. R. George et al	Liberty, N. M.	Little Water Arroyo	1000 ac. ft.	E¼ Cor. of S. 9 T. 30 N. R. 15 W.	960		Approved April 30, 1910	6.000.
354	W. P. Turner et al	Roswell, N. M.	Peñasco	100 sec. ft.	NW¼ NW¼ S. 18 T. 16 S. R. 17 E.		1,000	" April 9, 1910	25.000.
355	R. E. Rupard	Camp, N. M.	Unnamed Arroyo	All waters	S. 15 T. 18 S. R. 10 E.	4		Withdrawn March 11, 1910	50.

TABULATED LIST OF PROPOSED IRRIGATION AND POWER PROJECTS IN NEW MEXICO—COMPILED FROM APPLICATIONS FOR PERMITS TO APPROPRIATE PUBLIC WATERS.—*Con'd.*

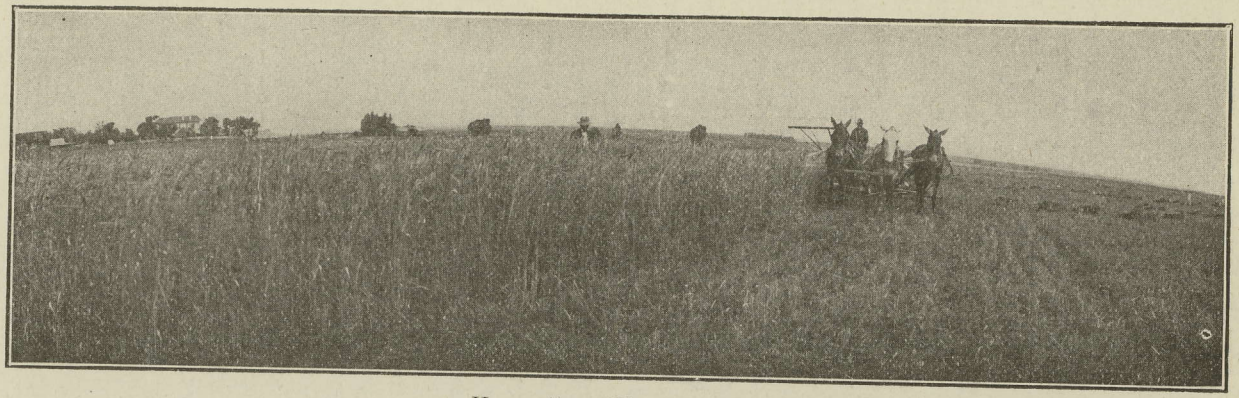
No	Name of Applicant.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated.	Horse Power Generated.	Approved or Rejected.	Approximate cost.
356	Ranchos Orchard and Land Co	Denver, Colorado	Drainage	40 sec. ft.	Gijosa Grant	8,000.			$ 1,250.
357	D. & R. G. Ry Co	Denver, Colorado	Arroyo de la Petaca	14.54 " "	S. 22 T. 28 N. R. 9 E	Railroad purposes			2,265.
358	Sandia Land and Improvement Co	Al uquerque. N. M.	Tijeras Stream	1.26 " "	S. 2a T. 10 N R. 4 E	960		Approved April 9, 1310	20,000.
359	Will Benson	Artesia, N. M.	Peñasco River	90 " "	SE¼ SE¼ S. 12 T. 16 S. R. 16 E		1080	" April 9, 1910	150,000.
360	A. A. Jones	East Las Vegas, N. M.	Sapello, Cebolla, Coyote	All	Secs 3, 4, T. 20 N. R. 16 E	200000			25,000.
361	Placita Ranch Co	Los Alamos, N. M.	Coyote and Cebolla	2000 " "	S. 15 T. 20 N. R. 16 E	50,000			50,000.
362	D. A. Camfield	Greeley, Colorado	Mora and Coyote	25 " "	Cerrito de Ojo Feliz	100000			500.000.
363	Hand Mule Company	Watrous, N. M.	Wolf Creek	187 " "	NE¼ S. 15 T. 19 N. 18 E	1,800			2,400.
364	Sammons and Pitrat	Farmington, N. M.	Las animas	2.28 " "	Secs. 15, 16, T. 29 N. R. 13 W		400	Approved April 8, 1910	6,000.
365	James E. Bloom	Roswell, N. M.	Hondo River	100 " "	NE¼ SE¼ S. 21 T. 11 S. R 21 E	160			300.
366	Thomas C. Tillotson	Roswell, N. M.	Peñasco River	4 " "	SE. Cor of S. 11 T. 16 S. R. 16 E		3000		450,000.
367	Joe Doherty	Folsom, N. M.	Gallegos	300,000 ac. ft.	Secs. 9, 16 T. 27 T. R. 29 E	400		Approved April 13, 1910	2,000.
368	Carey Act Land Board	Santa Fe, N. M.	Pecos River	10 sec. ft.	S. 1 T. 3 N. R 25 East	60,000000			1,000,000.
369	L. R. Lamy	Nogal, N. M.	Spring	200 " "	N½ NE¼ S 32 T 9 E. 13 E			Approved April 12, 1910	200.
370	W. Goff Black	Aztec, N. M.	Animas River	50 " "	SE¼ NW¼ S 9 T. 30 N. R. 11 W		340		1,000.
371	Black and Ponsford	Denver. Colorado	San Juan	30 cu. ft.	S. 13 T. 30 N. R. 8 W	10,000	42		50,000.
372	DuVal and Norment	Santa Fe, N. M.	Nambe		Secs. 30, 31. T 19 N. R 10 E		1000		4,500.
373	C. E. Hartley	Springer, N. M.	Gallegos	All water	S 22 T. 27 N. R. 29 E	8,960			59,633.43
374	Jessie Underdown	Raton, N. M.	Uña de Gato	6.9 sec. ft.	S. 11 T. 29 N. R. 24 E	235		Approved April 30, 1910	685.00
375	S. A. Wiseman	Raton, N. M.	Chico Rico, Raton	70 " "	Secs. 27, 34, T. 31 N R 24 E	5,000			75,000.00
376	W. W. Conklin	Colmor. N. M.	Sweetwater	22 " "	S. 12 T 23 N. R 20 E	305		Approved April 30, 1910	850.00
377	Eugene F. Hardwick	Roswell, N. M.	Bogs	18.8 " "	S 35 T. 17 S. R 26 E	1,316.92			2,000.00
378	Huch Mackey	Denver. Colorado	White Water C	All water	S. 8 T. 11 S R. 19 W		Mining		7,500.00
379	L. T. Hardy	Española, N. M.	Rio Medio	40 sec. ft.	Secs. 20, 21 N R. 9 and 10 E		150	Approved June 3, 1910	7,000.00
380	M. L. Lunge	Colmer, N. M.	Ocate River	2 " "	Secs. 19, 20, 29, 30 T 21 N R 21 E	275			500.00
381	G. A. Beeman	Artesia, N. M.	Main Seven Rivers	2 " "	S 7 T. 20 S R 26 E	142		Approved May 27, 1910	1,500.00
382	R. E. Rupard	Camp, N. M.	Unnamed	5 cu. ft. or all	South of Dog Cañon	40			150.00
383	L. P. Glasscock	Hope, N. M.	Felix	4 sec. ft.	S. 16 T. 15 S. R 18 E	480			1,000.00
384	Alfred P. Hyland	Raton, N. M.	Dry Arroyo	12.75 " "	S 12 T. 30 N. R. 24 E	880		Approved June 3, 1910	400.00
385	D. R. Know	Holland, N. M.	Tramperos Cr	10.45 " "	S. 35 T 22 N. R 32 E	80			700.00
386	Madison and Stark	Alamogordo, N. M.	Dog Cañon	20 " "	T. 18 S. R. 10 East	320		Ap. June 3, 1910, cut to 3 s. f.	200.00
387	Sammons and Pitrat	Farmington, N. M.	San Juan	20 " "	S. 16 T. 29 N R. 13 W	1,500		Appro. June 20, 1910, 15 s. f.	6,000.00
388	Tommie Bowman	Artesia, N. M.	Flood water	6.6 " "	S. 18 T. 17 S, R. 24 E				250.00
389	D. A. Camfield	Greely, Colorado	Mora River	186 " "	Unsurveyed lands	100,000			200,000.00
390	Chas. M. Grover	Santa Fe, N. M.	Flood water	80 ac. ft.	S. 28 T. 10 N R. 10 W	160			700.00
391	Tusas Peak G. & C. Mg. Co	Clayton, N. M.	Rio Vallecitos	20 sec. ft.	Below the mouth of Rock Ck		180		20,000.00
392	Alonso C. Loveless	Clayton, N. M.	Currumpa	5 " "	Secs. 7, 18 T 28 N. R. 37 E	350			2,000.00
393	Leck Burk	Pasamonte, N. M.	Unnamed	4.7 " "	S. 15 T. 27 N. R. 35 E	40			400.00
394	John J. Heringa	Santa Fe, N. M.	Buffalo	4.6 " "	S. 22 T. 24 N. R. 30 E	322			700.00
395	Urton Lake Land & W. Co	East Las Vegas, N. M	Pecos	1500 " "	S. 1 T. 3 N R. 25 E	80,000			1,770,350.00
396	J. J. Laubach et al	Springer, N. M.	Rio La Casa Falls	108 " "	Ft. of Rio La Casa Falls		2745		100,000.00
397	Palo Blanco L & I. Co	Springer, N. M.	Hoikeo	All water	S 6 T. 25 N R. 27 E	47,980			166,793.25
398	Palo Blanco L. & I. Co	Alamogordo, N. M.	Palo Blanco	All water	S. 6 T. 25 N. R. 28 E	25,000			205,316.31
399	J. B. Neff et al	Cuchillo, N. M.	Cottonwood	5 sec. ft.	S. 16 T. 15 S. R. 11 E	640			1,500.00
400	Amado Gonzales et al		Palomas Cr	26.4 " "	S. 14 T 13 S. R. 7 W	600			1,000.00
401	H. F. Robinson for the U. S. Indian Irrigations		San Juan	275 " "	T 12 N. R 1 W				
402	Maxwell Irrigation Land Co	Maxwell, N. M.	Willow A	25000 ac. ft.	Indian Reservation				3,000.00
403	Taos Land Company	Taos, N. M.	Arroyo Hondo	150 sec. ft.	S 4 T. 28 N. R 23 E	25,000			4,500.00
404	Taos Land Company	Taos, N. M.	Rio Pueblo	100 " "	Boundary Antonio Martinez Grant	50000			210,000.00
405	J. D. McCanne	Ft. Sumner, N. M.	Pecos, Alamogordo	1800 " "	Right Bank Rio Pueblo	50,000			375,000.00
406	D. J. McCanne	Ft. Sumner, N. M.	Pecos River	500 " "	Secs 18, 19 T. 5 N. R. East	35,000			350,000.00
407	D. J. McCanne	Ft. Sumner, N. M.	Pecos River	1800 " "	S. 33 T 4 N. R 25 E	50.000			350,000.00
408	Apolonio Santistevan	Clayt n, N. M.	Unnamed A	1 " "	Secs. 18, 19 T. 5 N R 24 E	35,000			350,000.00
409	Kinsell and Reeves	Stanley, N. M.	Armijo A	42.92 " "	S. 27 T. 29 N. R. 36 E	120			350.00
410	Ft. Sumner and Pecos L. Co	East Las Vegas, N. M.	Pecos River	9.42 " "	S. 27 T 11 N. R 10 E	13,000			110,000.00
411	Ft. Sumner and Pecos Land Co	East Las Vegas, N. M.	Pecos River	17.42 " "	S. 19 S 3 N R 26 E	659			4,165.00
412	J. P. Van Houten	Shoemaker, N. M.	Mora River	725 " "	S 6 T 2 N. R. 26 E	1,342			4.000.00
413	Cherry Valley Ditch Co	Shoemaker, N. M.	Mora River	9.8 " "	S 34 T. 18 W. R. 19 E	7,000			135,000.00
414	McLaughlin and Stoffel	Watrous, N. M	Coyote River	3 " "	S. 3 T. 18 N. R. 19 E	1,087			100.00
415	P. S. & T. E. Young	Hope, N. M.	Eagle Draw	8 cu. ft.	Buz Cap	190			1,865.00
416	W. S. Hopewell	Albuquerque, N. M.	Tijeras Cañon	1.78 sec. ft.	NW¼ S 22 T 16 S R. 20 E	640			1,000.00
417	J. C. Taylor et al	Alamogordo, N. M.	Cottonwood	24 " "	Cañon de Cornue Grant	125			
418	Chino Copper Co	Santa Rita, N. M.	Whitewater	3 " "	SE¼ S. 24 T. 15 S. R. 11 E	800			400.00
419	Chino Copper Co	Santa Rita, N. M.	Apache Tejo	Spg. development	S. 31 T. 18 S. R 12 W		Mining purposes		250,000.00
420	Chino Copper Co	Santa Rita, N. M.	Whiskey Cr	2½ sec. ft.	S. 19 T 19 S R 12 W		Mining purposes		250,000.00
421	Ft. Sumner and Pecos Land Co	East Las Vegas, N M	Pecos	17.42 " "	S. 21 T. S R 12 W		Mining purposes		250,000.00
422	St. Sumner and Pecos Land Co	East Las Vegas, N. M.	Pecos River	9.42 " "	S. 4 T 2 E. 26 E	1,342			4,000.00
423	Boulware and Johnson	Silver City, N. M.	Gila River	100 " "	S. 19 T 3 N R 26 E	659			4,165.00
424	A. A. Jones	East Las Vegas, N. M.	Pecos, Gallinas	1400000 ac. ft.	S. 30 T. 13 S R 13 W		4000		200,000.00
425	Placita Ranch Co	Los Alamos, N. M.	Sapello	78.5 sec. ft.	Bernal Hill	200,000			1,500,000.00
426	A. W. Henry	Dayton, N. M.	Henry Springs	½ " "	S. 30 T 18 N R 16 E	5,000			6,000.00
427	Jas. W. Norment	Santa Fe, N. M.	Santa Fe River	12 " "	S 22 T 18 26 E	40			755.00
428	E. & M. Rouse	Hillsboro, N. M.	Las Animas	6½ " "	On Santa Fe Grant	2,000			100.00
429	Carter and Phelps	Raton, N. M.	Raton Cr.	102 " "	S. 30 T 18 S. R 5 W	32			100.00
					S 31 T. N. R 24 E	1,000			22,900.00

TABULATED LIST OF PROPOSED IRRIGATION AND POWER PROJECTS IN NEW MEXICO—COMPILED FROM APPLICATIONS FOR PERMITS TO APPROPRIATE PUBLIC WATERS.—*Con'd.*

No.	Name of Applicant.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated.	Horse Power Generated.	Approved or Rejected.	Approximate cost.
430	Las Bocas Irrigation Co	Albuquerque, N. M.	Flood Waters	200 sec. ft.	S 30 T. 4 N. R. 4 E.	20,000			$ 150,000.00
431	M. B. May	Nogal, N. M.	Tortolita Cr.	1½ " "	S. 3 T. 8 S R 12 E.	20			1,000.00
432	Day and Chase	Meek, N. M.				20			
433	Neal Jenson	Estancia, N. M.	Cieneguita Cr.	1 sec. ft.	S. 10 T 7 N. R. 8 E.	70			500.00
434	Henry Cady	Lower Peñasco, N. M.	Rio Peñasco	6.7 " "	SE Cor. S 12 T. 17 S. R 17 E.	62 6			500.00
435	Las Bocas Irrigation Co	Albuquerque, N. M.	Rain and Cañon Water	20000 ac. ft.	S. 31 T. 8 N R. 5 E.	200.0			175,000.00
436	D. J. N. Canne	Ft. Summer, N. M.	Alamogordo, Pecos	1225 sec. ft.	S. 36 T. 7 N. R 22 E.	120000			2,600,000.00
437	Hughes and Prichard	Santa Fe, N. M.	Rio Grande	500 " "	Caja del Rio Grant		1200		25,000.00
438	Jay Turley	Aztec, N. M.	San Juan	200 " "	S. 35 T. 30 N R 9 W.	2500	440		50,000.00
439	T. A. Ezell	Carlsbad, N. M.	Pecos	337 " "	S. 19 T. 26 S R 29 E.	1060	807		65,000.00
440	Rudolph Miller	Maxwell, N. M	Capps and Road A	450 " "	Secs 10, 11 T. 27 N. R. 24 E.	670			8,900.00
441	Maxwell Irrigation Land Co	Maxwell, N. M.	Salt Peter Cr	22000 ac. ft.	NE¼ NE¼ S 6 T 27 N R 21 E.	22000			9,000.00
442	Will Benson	Artesia, N. M.	Peñasco	50 sec. ft.	Secs 1, 2 T. 17 S R. 13 E.	4640	5700		150,000.00
443	Red River Cattle Co	Springer, N. M.	Ocate Creek	3½ " "	S 9 T 24 N R 22 E.	244			4,913.00
444	McGibbon and Bishop	Santa Fe, N. M.	Santa Cruz Cr.	1000 ac. ft.	SW Cor. of S 31 T 21 N. R 9 E.	3000			10,000.00
445	La Cueva Ranch Co	La Cueva, N. M.	Coyote River	48 sec. ft.	Mora Grant	3360			16,790 00
446	Henry Buchoiz	Raton, N. M.	Salt Lake	1.65 " "	NW¼ NW¼ S. 21 T. 29 N. R 27 E.	65			1,000.00
447	George Curry	Tularosa, N. M.	Rio Rinconada	32 " "	S. 18 T. 13 S R 10 E.	15000			308,175.00
448	Benito Seller	Kennedy, N. M.	Gallsteo Arroyo	1 " "	NW¼ S. 4 T 13 N. R 9 E	90			
449	E. K. Norment	Santa Fe, N. M.	Rio Grande	600 " "	SE¼ S. 21 T 17 N. R 8 E.		11,000		900,000.00
450	Floyd Thomas	Weed, N. M.	Cottonwood	4 7 " "	NE Cor. S. 6 T 16 S. R 26 E.	40			750.00
451	Ben. T. Cox	Fairview, N. M.	Cañada de Alamosa	20 " "	N½ SE¼ S. 31 T. 8 S R 7 W.		200		35,000.00
452	Isabella A. Thompson	Silver City, N. M.	Stone Corra	334 ac. ft.	Tp 21 S R 14 W.	330			2,000.00
453	San Luis Power and Water Co.	Costilla, N. M.	Valle Vidal	44.08 sec. ft.	Tp 31 S R. 70 W.	3360			225,000.00
454	Edwin G. McDermith	Glenwood, N. M.	Whitewater Cr.			Mining purposes			9,000.00
455	Henry J. Overton	Lake Arthur, N. M.	Cottonwood Draw	4.7 sec. ft.	S. 6 T. 16 S. R 26 E.	40			750.00
456	Hardwich and Highsmith	Roswell, N. M.	Bogs	14-24.70 " "	Secs. 11, 12 T. 18 S. R 26 E.	96½			500.00
457	Wm. H. Bartlett, Sr.	Vermejo Park, N. M.	Vermejo River	8½ " "	S. 22 T. 31 N R 18 E.	600			1,200.00
458	Henry Emerson	Nogal, N. M.	Nogal Cañon	1 " "	S. 8 T 9 S R 13 E	25			350 00
459	D. N. Hartley	Springer, N. M.	Pinabetes Cr.	6292.4 ac. ft.	S. 17 T. 23 N. R. 33 E.	6000			93,207.00
460	L. L. Cahill	Springer, N. M.	No Name	.95 sec. ft.	S. 29 T 25 N. R. 25 E.	29.1			8,700.00
461	Mountainair Mining Co	Mountainair, N. M.	2 Springs	17 gal. per min.	S. 36 T 4 N R 5 E.	Mining purposes			2,400.00
462	G. A. Richardson	Roswell, N. M.	Deep Lake and Spring	10 sec. ft.	SE¼ NW¼ S 22 T. 8 S R 25 E.	1040			25,000.00
463	Columbus Imp. Association	Columbus, N. M.	Hackberry Gulch	5000 ac. ft.	NW¼ NW¼ S 20 T 28 S. R. 8 W.	1920			1,500.00
464	R. L. Survant	Trinchera, N. M.	Trinchera Cr.	20 sec. ft.	S. 30 T. 32 N R. 27 E	2800			10,000.00
465	W. P. Sanders	Magdalena, N. M.	La Jencia	1 tenth sec. ft.	S. 12 T. 1 S R 3 W.	10			500.00
466	Baldwin and Gibanny	Roswell, N. M.	Pecos River	10 sec. ft.	S. 29 T. 7 S R. 26 E	600			3,000.00
467	Wm. M. Fyffe et al.	Roswell, N. M.	Spring and Salt Cr.	20.50 " "	NE¼ SW¼ S. 25 T 8 S. R 24 E.	1440			5,000.00
468	Thos. L. Loftus	Durango, Colorado	Animas River	185 " "	S. 4 T 31 N R 10 W.	18,500			650,000.00
469	James H. Backham, Jr	Artesia, N. M.	Bogs	1-5.7 " "	SE¼ NW¼ S 12 T 18 S. R 26 E.	120			500.00
470	Edgar T. Foster et al.	Aztec, N. M.	Animas River	220 " "	S. 8 T 30 N R. 11 W.	2000	1450		75,000.00
471	Claude Stockton	Raton, N. M.	Unnamed Arroyo	11.68 " "	S. 25 T. 30 N R 21 E.	40			300.00
472	Farmers Development Co	Springer, N. M.	See Page F D. Res. No. 2	600 ac. ft.	Outlet Gate Reser No. 5.	10000			4,500.00
473	C. F. Leng	Cooney, N. M.		750 cu. ft. per min.	Bed of Mineral Cr.		200		75,000.00
474	Joe Elek	Abbott, N. M.							
475	J. M. Miller	Roswell, N. M.	Unnamed Arroyo	15 sec. ft.	S. 14 T. 23 N. R. 25 E.	400			
475	J. M. Miller	Roswell, N. M.	Swamps and See Page	17.5 " "	S 15 Tp. 11 S R 25 E.		2240	Rejected Nov. 8, 1910.	700.00
476	Schuler Smith	Fruitland, N. M.	West Water Arroyo	8 " "	1 Mi N W. of Hill.		1520		2,000.00
477	Beutler and Wiese	Taos, N. M.	El Rito del Lama	2 " "	S. 22 T. 28 N R 12 E.		320		12,000.00
478	Alamogordo Imp. Co	Alamogordo, N. M.	La Luz Creek	30 " "	S 25 T 16 S R 10 E.		2000		732.50
479	Thos. H. Malone	Hagerman, N. M.	Felix River	4 " "	S 3 T 14 S. R. 26 E.		140		3,000.00
480	James G. Kerr	Deming, N. M.	Ft. Cummins Springs	½ water	S 23 T. 21 S. R. 8 W.		40	Approved Nov. 8, 1910.	1,800.00
481	F. M. Y. Martinez	Virsylvia, N. M.	El Ojo Salto del Agua	2 sec. ft.	S. 21 T. 30 N R. 13 E.		150	" Nov. 23, 1910.	1,500.00
482	S. H. Brown	Raton, N. M.	Uña de Gato Ck.	21 " "	S. 5 T. 29 N R 25 E.		480		2,390.00
483	E. G. McDermith	Denver, Colorado	Whitewater Ck.	All water	S. T. R.	Not stated.			6,500.00
484	F. W. Lowery	Denver, Colo	Whitewater Ck.	All water	Not stated.	Not stated.			
485	Thos. P. James	Des Moines, N. M.	Carrumba Arroyo	4.1 sec. ft.	S 30 T 29 N R. 31 E.		287		
486	Gila River Power Co	Silver City, N. M.	Gila River	600 " "	S. 33 T. 17 S. R 17 W.	15000			3,279,670.00
487	Craig and Laud	Taos, N. M.	Arroyo Hondo Cañon	4 " "	S. 24 T 24 N R. 11 E.		980	Approved Nov. 21, 1910	3,000.00
488	C. T. Adams	Carlsbad, N. M.	Sitting Bull Cr.	2.7 " "	S 3 T 24 S R 22 E		20		5,000.00
489	Elton Smith	Rosa, N. M.	Rex Draw	0.3 " "	T. 29 N R 6 W.				5,000.00
490	W. B. Chockley	Rosa, N. M.	Frances Draw	480 ac. ft.	S. 17 T. 29 N. R 6 W.				10,000.00
491	G. W. Smith	Rosa, N. M.	Frances Draw	490 " "	S. 33 T 30 N R 6 W.				10 000.00
492	Wm. A. Barber	New York City, N. Y.	Dry and Spruce Crs.	75 sec. ft.	S. 9 T. 12 S. R 18 W.	1000			300,000.00
493	Geo. Doak	Farmington, N. M.	Animas	187 " "	S. 6 T 29 N. R 12 W.	400			6,000.00
494	R. L. Survant	Trinchera, Colo.	Springs	1.9 " "	S. 6 T. 31 N. R 27 E.		80		10,000.00
495	John DuBeau	Fruitland, N. M.	Dry Arroyo	2 " "	S. 13 T 30 N. 15		1000		200.00
496	Crump and Shannon	Wynnewood, Okla.	Pecos River	146 " "	S. 34 T 26 S R 29 E.	500			8,000.00
497	Edgar Corkins	Farmington, N. M.	Animas	12 " "	S. 6 T. 29 N R 12 W.		1000		600.00
498	Simon Bibo	Grants, N. M.	San Mateo Cr.	10 " "	S. 31 T 13 R. 9.		720		500.00
499	Joseph Doggett	Raton, N. M.	Unnamed Arroyo	11.5 " "	S. 36 T 31 N R 23 E.		50		50 00
500	Homer W. Schofield	Alamogordo, N. M.	Rio Tularosa	22 " "	S. 11 T. 11 S R 10 E.	362	303		15,000.00
501	Upton Brothers	Solano, N. M.	Burro and La Canta	40 " "	S. 19 T. 18 N. R. 27 E.		640		1,000.00
502	La Joya L. I. & D. Co	Santa Fe, N. M.	Rio Grande	1000 ac. ft.	S. 27 T. 23 N. R. 29 E.		750		19,000.00

TABULATED LIST OF PROPOSED IRRIGATION AND POWER PROJECTS IN NEW MEXICO—COMPILED FROM APPLICATIONS FOR PERMITS TO APPROPRIATE PUBLIC WATERS.—*Con'd.*

No.	Name of Applicant.	Address.	Stream.	Amount of water to be Appropriated.	Point of Diversion.	No. of acres to be Irrigated	Horse Power Generated.	Approved or Rejected.	Approximate cost.
503	La Joya L. I. & D. Co.	Santa Fe, N. M.	Rio Grande	100 sec. ft.	S. 27 T. 23 N R 29 E.		10,000		50,000.00
504	H. S. Arnold	Pecos. N. M.	Soldier Creek	10 " "	S 6 T 2 N R 13 E.		960		4,000.00
505	D. B. Whiteside	Joplin, Mo.	Rio Quemado	2500 ac. ft.	S 25 T 2 N R 17 W.		14,000		127,000.00
506	Cleaveland and Weatherhead	Mogollon. N. M.	S. Fk. Silver Cr.	½ sec. ft.	S 2 T 11 S. R 19 W.				2,500.00
507	Henry J. Thompson	Springerville, Arizona	Arroyo Carrizo	3333 ac. ft.	S. 8 T 3 N. R 19 W.		1,080		1,500.00
508	Jno. D. Thomas	Des Moines, N. M.	Tranassier Arroyo	2½ sec. ft.	S. 56 T. 31 N R 32 E.		160		600.00
509	Lucas Gallegos	Vallecitos, N. M.	Valle de los Cabolla	1 " "	S. 15 T. 26 N. R. 7 E.		20		250.00
510	Carl W. Gage	Farmington, N. M.	Animas	187 " "	S 32 T. 30 N. R 12 W.	1000			85,000.00
511	J. M. Miller	Roswell, N. M.	S. Spg. Branch	1½ " "	S. 9 T. 11 S. R. 25 E.		180		1,500.00
512	Geo. K. Williams.	Oklahoma City, Oklahoma	Four Mile Draw	8 " "	S. 14 T. 19 S. R. 25 E.		560		750.00



Harvesting, Hand Project.

the old rights are fully protected by the law of 1907, as well as by the decisions of the Court, to the extent that the water has been beneficially used, and although no legal filing has ever been made, it is not necessary to procure a record of same in this office in order to protect the ditches as against subsequent appropriators until the stream is adjudicated and then each water right owner should see that he is made a party to such suit.

August 1, 1907.

Hon. Vernon L. Sullivan,

Territorial Engineer, Santa Fe, N. M.

Sir:—I have your favor of the 15th ultimo, asking this office for an opinion on the following points:

1. What steps are persons to take to preserve their rights in irrigation ditches taken out by them, but who have failed to have same recorded?

2. That such parties desire to have their ditches recorded but are afraid to make appropriations under the new law as it might affect subsisting rights.

3. Could such parties record their ditches without waiving any rights that might be acquired, under the irrigation laws of 1907?

In order to determine what steps should be taken by persons to preserve their rights in irrigation ditches taken out by them, but who have failed to have same recorded, it is first necessary to ascertain what those rights are.

The first statutory provisions with reference to the appropriation of water in New Mexico, are found in Section 21, Compiled Laws of 1897, as follows:

"Sec. 21. All acequias, public or private, when completed shall be the property of the persons who may have completed such acequias or ditches, and no person or persons who may desire to use the waters of such acequias or ditches shall be allowed so to do without the consent of a majority of the owners of such acequias or ditches, and upon payment of a share proportionate to the primary cost of such acequia or ditch to the amount of the land proposed to be irrigated, or the quantity of water proposed to be used: *Provided,* That the provisions of this section shall not apply to any acequias or ditches, public or private, that may pass from the limits of any one county to within the lines of any other county."

Under this section, private ditches are made the property of those who constructed them, or those who may acquire their interest by purchase, and so long as the ditches are kept up and maintained the right of the owner or owners therein cannot be dis-

turbed. This section of the law was enacted in 1882, and under its provisions the rights of an appropriator of water do not become absolute until the appropriation is completed by the actual application of the water to the use designed.

The doctrine of appropriation, although recognized and confirmed by constitutional provisions, or by statutes, state and federal, existed prior to and independently of these provisions, and had its origin in the absolute necessity for irrigation in the arid region, and the right of water by priority of appropriation, and the duty of the state and natonal government to protect such right, existed prior to any legislation on the subject.

Cofflin v. Left Hand Ditch Co., 6 Col. 442.

Thomas v. Guiraud, 6 Col. 530.

It is the fundamental principle of the doctrine of appropriation that, among several appropriators of water, he whose appropriation is first in time acquires, as against subsequent appropriators, a better right to the water appropriated to the extent of such appropriation; or, in other words, priority of appropriation confers supriority of right to water appropriated. This doctrine of priority has been repeatedly upheld by the courts, whether there were any constitutiontl or statutory provisions upon the subject or not. Hence, under Section 21 of the Compiled Laws of 1897, where an appropriator has pursued the work of appropriation with due diligence, and brought it to completion within a reasonable time, as against other appropriators, although his rights do not become absolute until the appropriation is completed by the application of the water to the use designed, his right will relate back to the time of the commencement of the work. Thus as between two appropriators diverting water at the same time, prosecuting the work with reasonable diligence to completion, the one who first began work had the prior right, although the other may have completed his work first.

Questions of priority under this provision for the appropriation of water, would and did necessarily depend chiefly on oral testimony, and confusion and insecurity of rights resulted.

Subsequent to 1882, and up until 1891, no further legislation was had on the appropriation of water by individuals. At said time, however, the legislature passed the following act:

"An act to provide a method for establishing the rights of appropriation of water for ditches, canals or feeders or reservoirs, and requiring registration of all such hereafter made, changed or enlarged. H. B. 113; Approved February 26, 1891.

Be it enacted by the Legislative Assembly of the Territory of New Mexico:

Section 1. That every person, association or corporation hereafter constructing or enlarging any ditch, canal or feeder for any reservoir, and taking water from any natural stream, shall within ninety days after the commencement of such construction, change or enlargement, file and cause to be recorded in the office of probate clerk of the county in which such ditch, canal or feeder be situated, a sworn statement in writing, showing the name of such ditch, canal, or of the reservoir supplied by such feeder, the point at which the headgate thereof is situated, the size of the ditch, canal or feeder, both in width and depth, the carrying capacity in inches, the description of the line thereof, the time when the work was commenced, the name or names of the owners thereof, together with a map showing the route thereof, the legal subdivisions of the land, if on surveyed lands, with proper corners and distances, and in case of an enlargement or change, the depth and width, also the carrying capacity of the ditch so enlarged or changed, and the increased capacity of the same thereby occasioned, and the time when such change or enlargement was commenced, and no priority of right for any purpose shall attach to any such construction, change or enlargement until such record is made.

Sec. 2. A copy of such sworn statement duly certified by the probate clerk of the county where such record is made shall be admitted as prima facie evidence of such appropriation of water in all the courts of this Territory; *Provided,* That the provisions of this act shall not affect any existing vested rights or any public acequia or ditch used for the public, and the canals, ditches or acequias authorized by this act to be constructed shall be completed within five years from the time work shall be commenced on the same,

Sec. 3. All acts and parts of acts in conflict with this act are hereby repealed, and this act shall take effect and be in force from and after its passage."

It will be seen by Section 1 of the foregoing act (Sec. 493 C. L. 1897), that ninety days are given to the appropriator in which to file with the probate clerk of the county wherein the ditch is situated, a sworn statement descriptive of the ditch consructed, changed or enlarged after the passage of the act. The law does not seem to apply to ditches constructed and owned prior to the passage of the act, unless such ditches are subsequently changed or enlarged, and its effect would seem to be that, by a compliance with the requirements as to filing sworn statement in writing, and

actually diverting and using the water, the right of the appropriator or claimant to the use thereof shall relate back to the time of commencement of such construction, change or enlargement, but that a failure to comply with such requirements deprives the appropriator or claimant of the right to the use of the water as against a subsequent appropriator or claimant, who does comply with them. As to how far this principle applies depends upon the purpose of the legislature in enacting the statute. Was it the purpose of the legislature in the enactment of these requirements, to obviate the confusion and insecurity of vested rights that formerly obtained, to apprise others who contemplated the acquisition of water rights from the same source that the appropriator filing such statement had taken the initial step in making his appropriation, and to preserve reliable evidence of the appropriator's right? Or, was it the purpose of the legislature that an appropriator, who failed to comply with the requirements, but who, in the absence of any conflicting adverse right, had actually diverted the water and put it to a beneficial use, should acquire no right or title thereby? As to those ditches constructed subsequent to the passage of the act, it only applies in so far as priority of right is concerned, and does not tend to in any manner affect whatever vested right the proprietor or owner may have therein, the only penalty for non-compliance with the statutory requirements being, "no priority of right for any purpose shall attach to any such construction, change or enlargement until such record is made." In the title of the act the purpose of the legislature is stated as being, "to provide a method for establishing the rights of appropriation of water." This language clearly and necessarily implies that there is a right to the use of water, acknowledged by the legislature and cognizable by the courts, which is good against all the world except a claimant who has complied with the requirements prescribed in Section 1. Now, what is this right? What can it be, except the right of one who has fully completed the diversion of water, and applied it to a beneficial use, before the initiation of an adverse right of appropriation under the law, or the acquisition of an adverse right in the land to be affected by the diversion? And why should not such a right be recognized and enforced? As stated, the legislature acknowledges the right of appropriation; it has attempted to provide a method for establishing that right by requiring registration of all such appropriations made subsequent to the passage of the act, and as a penalty for failure to comply with the requirements prescribed, says to the appropriator, "no priority of right for any

purpose shall attach to any such construction, change or enlargement until such record is made."

Section 2 of this act (Sec. 494 C. L. 1897) provides that the sworn statement prescribed by Section 1, required to be filed by an appropriator of water, can only be admitted as prima facie evidence of such appropriation, and that none of the provisions of the act shall affect any existing vested rights. This act does not repeal Section 21, Compiled Laws of 1897, and the rights of an appropriator of water do not become absolute until the appropriation is completed by the application of the water to the use designed, which must be a beneficial use. Hence, the custom or rule as to what constitutes an appropriation has not been changed, and the performance of these requirements is not strictly a part of the act of appropriation, but is rather a means of fixing and holding the rights already acquired by the commencement of construction work, and the object of the legislature was simply to preserve evidence of the appropriator's right, and provide a better means of determining or establishing such right.

In accordance with these principles, it is held that one who fails to comply with statutory requirements, but who actually diverts water and applies it to a beneficial use, in the absence of any conflicting adverse claim, acquires a valid title thereto, which cannot be divested by another appropriator, who complies with the terms of the statute after the former has completed his appropriation.

De Necochea v. Curtis, 80 Cal. 397, 20 Pac. 563, 22 Pac. 198.
Burrows, v. Burrows, 82 Cal. 564, 23 Pac. 146.
Wells v. Mantes, 99 Cal. 583, 34 Pac. 324.
Watterson v. Saldunbeher, 101 Cal. 107, 35 Pac. 332.
Senior v. Anderson, 115 Cal. 496, 47 Pac. 454.
Murray v. Tingley, 20 Mont. 260, 50 Pac. 723.

In such cases, however, the completion, and not the commencement, of the work of appropriation determines the time when the right of the appropriator becomes vested; and as between two appropriators, neither of whom has complied with the statute, the one who first completes his ditch and uses the water has the superior right, although the other may have commenced work first.

Murray v. Tingley, 20 Mont. 260, 50 Pac. 723.

As to the effect of the statutes then it would seem that, where the requirements have been complied with, the law as to priority of rights remains the same as it was prior to the enactment of the statutes, but the statutes provide for the preservation of evidence of the appropriator's right. Where the statutory require-

ments have not been complied with, the rights of the appropriator, which, but for the statutes, would relate back to the commencement of the work of appropriation, relate back only to the compltieon of the work and the application of the water appropriated to a beneficial use, and the want of the required record cannot be invoked to justify the destruction of a ditch owned by and in the actual occupation and use of another.

The foregoing principles are recognized by subsequent acts of the legislature of New Mexico; the 36th legislative assembly providing, by Sections 1 and 2, Chapter 102, Laws of 1905, that all natural waters within the Territory of New Mexico shall belong to the public, that no person shall be denied the right to appropriate said waters for beneficial use, that beneficial use shall be the basis of the right to use water, that beneficial use shall be the limit of the right to use water, that priority in time of use shall give the better right, and that works heretofore constructed, by means of which any waters have been applied to a beneficial use, must be taken to have secured the right to use the water claimed, to the extent of the quantity, which said works are capable of utilizing: *Provided,* That nothing in this act must be so construed as to in any manner interfere with the vested rights of individuals, companies or corporations, or the appropriation of waters, which said individual, association or corporation may be applying to a beneficial use. By these provisions the intent and purpose of the legislature to recognize, protect and confirm all rights previously acquired by appropriators of water, in the application thereof to a beneficial use, without regard to the acquirement of such rights in accordance with prior statutes on the subject, is couched in such language as to permit of but one construction; and by this language, every person who, subsequent to the passage of the act in question, diverted and applied water to a beneficial use, before the initiation of an adverse right of appropriation under the law, or the acquisition of an adverse right in the land to be affected by the diversion, without regard to how such diversion and application was accomplished, is declared to have a vested right, the right of appropriation, the right to use waters claimed to the extent of the quantity which said works are capable of utilizing, and a right which must not be interfered with in any manner whatsoever.

Again, we are satisfied that the legislature of 1907, while repealing the laws of 1905, did not intend that one who failed to comply with the statute, but who had nevertheless diverted water and applied it to a beneficial use, could be deprived of it by an-

other who complies with the statute at a time subsequent to the former's completed diversion, for the reason that, prior to the passage of Chapter 49, Laws of 1907, the legislature had recognized that a person acquired a right by diverting water and applying it to a beneficial use, which, in the absence of any conflicting adverse right of appropriation under the law, constituted a valid appropriation of water and must not in any manner be interfered with, and it is specifically provided in Section 2 of said Chapter 49 of the Laws of 1907, that:

"In all cases of claims to the use of water initiated prior to the passage of this act, the right shall relate back to the initiation of the claim, upon the diligent prosecution to completion of the necessary surveys and construction for the application of water to a beneficial use."

As to the effect of the lost mentioned section then we observe that, the right to the use of water appropriated prior to its passage depends upon the application of such water to a beneficial use, and not upon the recording with the probate clerk of a sworn statement in writing, descriptive of the ditch constructed, changed or enlarged, as required by Section 493 of the Compiled Laws of 1897.

By Sections 21, 26, 27 and 28 of said Chapter 49, the vested rights of those who, subsequent to the passage thereof, have appropriated water and applied it to beneficial uses, are further safeguarded by requiring of the Territorial Engineer that he, in passing upon an application to appropriate water, determine from evidence presented by the parties interested, from such surveys of the water supply as may be available, and from the records, whether there is unappropriated water available for the benefit of the applicant; and by also requiring that, in any suit for the determination of a right to the use of waters of any stream system, all those whose claim to the use of such waters are of record, *and all other claimants,* so far as they can be ascertained, with reasonable diligence, shall be made parties.

Section 2, Chapter 49, Laws of 1907, further provides that:

"All claims to the use of water initiated after the passage of this act shall relate back to the date of the receipt of an application therefor in the office of the Territorial Engineer, subject to compliance with the provisions of this act, and the rules and regulations established thereunder."

But nowhere in said Chapter 49 is it required that appropriators of water, prior to its passage, shall make any filings either with the probate clerk or the Territorial Engineer declaratory of the water rights claimed by them. Hence, those rights, when called

into dispute, must be established before the Territorial Engineer, and in the courts, if found necessary, in accordance with the provisions above referred to, regardless of whether the appropriator has complied with the statutory provisions as to the filing of a sworn statement in writing, prescribed by Section 493 of the Compiled Laws of 1897, or whether he failed to comply with such requirement and obtained his right to the use of water, solely upon the application thereof to a beneficial use.

Again, Section 59 of said Chapter 49, Laws of 1907, in part, reads as follows.

"Nothing contained in this act shall be construed to impair existing vested rights * * *"

And considering this provision, in conjunction with those heretofore quoted, the effect would seem to be clear that, where an appropriation of water was made and applied to beneficial use, prior to the passage of these statutory provisions, and the appropriator failed to file the sworn statement in writing, required by Section 493 of the Compiled Laws of 1897, his vested rights therein are recognized and confirmed, subject only to final determination and adjudication by the courts.

I am therefore of the opinion:

1. That it is not incumbent upon such persons as have, prior to the enactment of Chapter 49, Laws of 1907, appropriated water and applied it to beneficial use, but who have failed to file with the probate clerk of the proper county a sworn statement in writing, descriptive of the ditch constructed, changed or enlarged, as required by Section 493 of the Compiled Laws of 1897, to take any steps whatever to preserve their rights, further than to submit to you, upon taking up for consideration an application for the appropriation of water which might affect such rights, such evidence as they may have as is necessary to a determination thereof, under Section 21 of said Chapter 49; and in case of a suit, under Section 21, for the determination of water rights by the courts, to see to it that they are made parties, and establish their rights therein.

2. That there is no law now in force authorizing or providing for the recording of such rights.

3. Should such parties voluntarily file with you a sworn statement in writing, descriptive of the ditch, declaratory of the appropriation and claim of water, setting forth the time of consruction, the appropriation of the water and its application to beneficial use, and its continuous use, such descriptive and declaratory statement would not, in my opinion, in any wise affect whatever vested rights might have been acquired prior to the enactment of

Chapter 49, Laws of 1907, in a judicial determination of such rights by the courts, but would merely serve as a notice to the Territorial Engineer, and to the courts, of the rights claimed, and be admissible as evidence tending to show the intention of such appropriators, as to quantity and time, of the appropriation.

Very respectfully,

G. W. PRICHARD,
Attorney General.

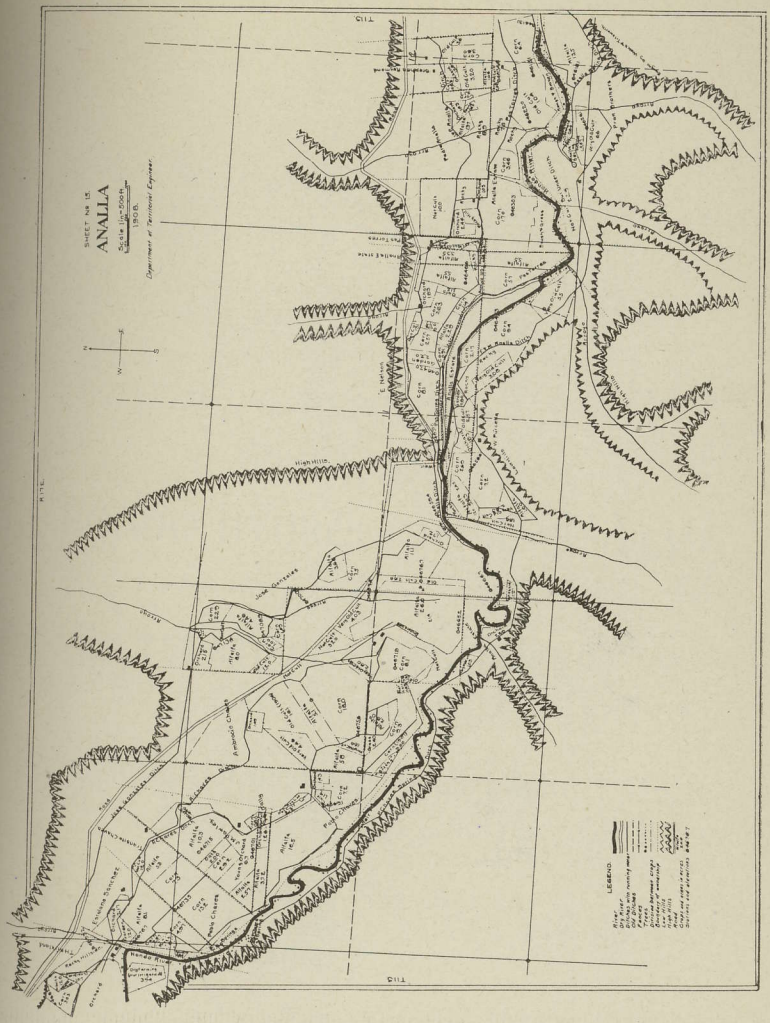
HYDROGRAPHIC SURVEYS.

Three hydrographic surveys have been made by this office in accordance with the provisions of the Irrigation Law of 1907. The first, on Black River, was completed and mentioned in the first Biennial Report.

In order that the court may have sufficient data to adjust all the rights equitably, the law provides that the courts shall order the Territorial Engineer to make or furnish a complete hydrographic survey of the stream system under litigation. These surveys include a survey of the land as well as the water thus the court is advised of every acre that is at present irrigated—of the kind of crop grown, of the land that has been irrigated in the past, the acreage of such land, the alignment of all ditches and canals and the amount of water carried in each ditch, the number of fields, size and shape of same, location of buildings, flow of water in the river at various places, etc.

The question of beneficial use and the duty of water on different areas of irrigated land under a stream system are important factors necessary in determining the amount of rights to the use of water for the specified areas, thus the data included in the hydrographic surveys and reports as to size and condition of ditches, the amount of water used and wasted, the conditions and kind of soil, upon which the water is applied, results gained and crops raised, etc., upon all lands irrigated in the entire stream system are of inestimable value in obtaining a just adjudication."

The Hondo Survey was the second and the Rayado was the third completed by this Department. The number of people interested in these surveys, especially in the Hondo, makes it advisable to embody in this report, the report of the Territorial Engineer on each survey complete and to show the effectiveness, accuracy, methods used, facts determined, results, etc., to the people who have petitioned the courts to have these surveys made.



Hydrographic Survey Map, Copy From Original Survey on the Hondo Hydrographic Survey.

REPORT

ON THE

HONDO HYDROGRAPHIC SURVEY

BY THE

TERRITORIAL ENGINEER

TO THE

Court of the Sixth Judicial District

OF THE

Territory of New Mexico.

TABLE OF CONTENTS OF REPORT.

LIST OF TABLES ACCOMPANYING REPORT:

MAPS ACCOMPANYING REPORT.

One General Map.

Forty-seven Topographic sheets showing alignment of all ditches and rivers, location of all gages and weirs, houses, etc., alignment of all roads, fences, field divisions, etc., and elevation.

Five discharge sheets of ditches giving amount of water used through each ditch.

Eight discharge sheets showing amount of water flowing by each gauging station.

Three sheets showing tabulated list of irrigated land and owners.

Honorable Alford W. Cooley,

Judge of the Sixth Judicial District, Alamogordo, N. M.

Dear Sir:—In compliance with an order, of your court under date of December 5, 1907, in the matter of the El Paso & Rock Island Railway Company et al.—Plaintiffs vs. the United States of America et al.—Defendants, No. 1730, for the Territorial Engineer to make or furnish a Hydrographic Survey of the Hondo Stream System, I herewith have the pleasure of forwarding same.

Yours very truly,

VERNON L. SULLIVAN,

Territorial Engineer.

INTRODUCTION.

In preparing this report we have tried to make it as brief as possible yet covering all important points. In order to do this we have arranged a great deal of the data in tabulated form, thus covering it concisely and in such shape as to be easily understood.

The data is presented exactly as found when the survey was made.

Opinions and suggestions gathered from an engineering standpoint regarding causes and effects are also given, but no suggestions as to priority of water rights are given or on legal questions.

HONDO AND TRIBUTARIES.

The Hondo stream system is situated in the South central part of the Territory of New Mexico and at an altitude varying from about 4000 feet at the Inlet into the Hondo Reclamation Service Irrigation Project to about 11,900 feet at the highest point in the White Mountains.

The Hondo itself is formed by the junction of the Bonito and Ruidoso Rivers which rise in the White and Capitan Mountains and flows to their junction in either canons or through deep narrow valleys. Practically all of the available area in the narrow valleys is now irrigated. The drainage area being very rough and precipituous.

At the junction of these two rivers or at the head of the Hondo

the valleys begin to widen out a little and the mountains are a little less precipitous until the topography flattens out into a rolling plains country below the Hondo Project.

The drainage area above the Hondo Inlet Canal contains about 1075 square miles of which about 900 is very rough and rugged. The upper portions of said area are covered with timber running from small pinon and pine to large pines suitable for lumber. The lower portions are rolling and rocky with no timber.

The formation is broken and vertable and many dikes appear on the surface, on the Upper Bonito a rather low grade granite rock exists extending down to a point near the Fort Stanton Reservation when the formation changes to a stratified limestone apparently dipping to the northwest as it appears on the surface. The limestone formation apparently covers the lower portions of the Bonito and Ruidoso and the upper portions of the Hondo while further down the Hondo gypsum begins to appear.

It is while in this stratified limestone that most of the normal water supply of these rivers is brought to the surface.

The waters of both the Ruidoso and the Bonito are very clear and pure excepting at times of flood when they carry considerable amounts of silt which increases rapidly as it approaches the flatter country.

METHODS OF COLLECTING DATA.

A topographic land survey was made of the entire stream system showing alignment of all ditches and rivers, location of all gages and weirs, houses, etc., alignment of all roads, fences, field divisions and elevations and general topographic conditions, this work was under the direct charge of Mr. J. W. Lewis.

The hydrographic work was under the direct charge of Mr. C. H. Neel, which covers the flow of water in the various rivers and ditches. Mr. Lewis and Mr. Neel are each well fitted for the work under their charge, having had a large experience in each line of work as well as technically qualified.

The topographic work was commenced April, 1908, and continued until the last of October, 1908. This work was largely done with plaintable excepting such portions that had no irrigable area which was done with a transit. Distances between plaintable and transit stations were chained while all other measurements were statia, areas were measured with planimeter and all work was thoroughly checked.

No especial time was taken to tie up outside public corners but all surveyed corners that could be found were located and the

section lines were platted on the sheets from these corners, approximate elevations were carried either with plaintable or transit no especial level line being run. The survey covered a distance of about one hundred and fifty miles and is represented on forty-seven sheets.

The topographic work was commenced in April, 1908, and continued until September, 1909. Price Current Meters and Rectangler weirs were used in this work. Measurements of water made either by current meter or weir was carried to a hundredth part of a cubic foot per second while calculated measurements from curve on discharges for gaging stations are only carried a tenth of a cubic foot per second.

There were six gaging stations located on the Hondo, eleven on the Bonito and three on the Ruidoso and about one hundred and forty weirs on the various ditches.

All weir depths were read either by Mr. Neel or special assistants hired for such work while readings on gaging stations were made by parties living in the locality of the stations, such readings, however, were checked up by Mr. Neel or his assistants. This work is represented on eleven discharge sheets.

CAUSES FOR SURVEY.

This survey was largely made necessary through a suit filed to adjudicate all of the water rights of this stream system largely brought about through the El Paso and Rock Island Railway Company who had bought up nearly all of the lands with water rights in the Bonito Valley above Fort Stanton for the purpose of changing the use of such water from the irrigation of these lands to that of domestic and steam purposes on the line of their railroad.

Protests were made against the granting of same on the grounds that if such application was granted it would result in damage to their claimed prior rights, while on the other hand it was claimed by the Company that they owned prior valid rights to this water and the changing of the use from that of irrigation to that of running a transcontinental railroad, carrying mails, people and freight would result in a higher beneficial use of water and at the same time preventing innumerable tieups of trains which resulted on account of not having pure water for boiler uses, and farther that they claimed that this water sunk and did not reappear to the benefit of rights below.

It was thought best by the Territorial Engineer for all concerned under the circumstances to grant a provisional permit to

make such a change of use, provided same could be done without detriment to prior valid rights and limited to that amount of water they owned or controlled, this, of course, made it necessary to have these rights adjudicated in order to know if same could be done without detriment to prior valid rights and also to determine how much water rights they had owned or controlled and the priority of same.

Since this survey has been in progress the United States Reclamation Service and the water users under the Hondo Irrigation Project have asked me to include in this report the facts concerning the conditions of the Hondo River, regarding the loss of water in the Hondo River Bed and whether same could be conserved for the Hondo Project.

IRRIGATED LANDS.

The topographic features of the irrigated lands under this stream system vary from clear level lands under the Hondo Project to extremely sloping and rough lands up in the mountains. The lands and topographic features are represented on the forty-seven topographic sheets filed as a part of this report as hereinbefore mentioned.

There has been in cultivation and irrigation in this stream system above the Inlet Canal of the Hondo Reservoir 5786 acres divided upon the following crops at the time such survey was made:

Alfalfa 2211.59; orchard 450.13; garden 148.92; corn 1317.95; oats 378.26; wheat 89.01; pasture 181.95; old cultivation 658.77; plowed 20.27; cane 12.25; cultivated 46.74; beans 72.43; corn and garden 10.45; corn and wheat 14.4; corn and beans 35.75; barley and alfalfa 10.9; barley 15.27; barley and oats 10.4; vineyard 1.57; grass 11.47; strawberries 0.40; sweet clover 12.58; garden, oats and wheat 3.49; forest nursery 0.46; millet 0.40; timothy 45.18; potatoes 0.94; blackberries 0.23; timber culture 1.54; clover 2.00; rye 20.16; meadow 0.91; berry patch 0.11.

In addition to the above there are several garden and truck patches irrigated on some of the tributaries which are included in the tabulated list of ditches and acres irrigated.

This irrigated area was watered through one hundred and forty different ditches, the land being owned or under the control of two hundred and ninety-two different individuals as is shown on three sheets marked tabulated list of "IRRIGATED LAND AND OWNERS.' This makes on an average of less than three individuals to a ditch, of course, some ditches irrigate a great deal more land than others as well as being owned or under the control of

a greater number of individuals. The above areas only cover the exact acreage irrigated or cultivated, no allowance being made for either farmyards, roads or fences.

In addition to the above amount of land irrigated there was used through the Hondo Project 1753 acre-feet in irrigating 1406 acres in 1908 while in 1909 there was 731 acre-feet used for the irrigation of 1300 acres, as shown on topographic sheet No. O. The amount of land intended to be irrigated through this project was ten thousand acres but owing to the lack of water only the above results were obtained.

In the tabulated list of "IRRIGATED LAND AND OWNERS" each owner's total number of acres ever irrigated as well as the number of acres of each variety of crop raised is given, this was done in order to give the court at first glance the total acreage the individual owned or controlled as well as the giving of the variety of crops that he raised.

It will be impracticle for me to discuss in this report any varying natural conditions that may exist between individuals and various ditches as the conditions are so general that it would be an injustice to speak of one without taking up every individual, however, the water as applied to soils will be taken up under another subject.

The soils under the Hondo Project vary from a sandy loam to an almost adobe texture, with plenty of humus to make them produce well, when properly airated by cultivation, as you proceed up the stream system there is a change in the soil to a sandy loam for the first twenty miles, when the texture begins to gradually grow coarser the further you go up until it becomes almost rocky in the mountains.

The upper portions of the mountains are covered with a vegetable or leafy mold.

The soils have been formed by an erosion of the mountains, the finer texture being carried farther away from the points of erosion.

WATER SUPPLY.

Practically all of the normal flow of the Hondo comes from the Ruidoso and the Bonito and springs along its course, however, there are several large arroyos that discharge large quantities of flood waters into the Hondo after excessive rains.

The Bonito is largely formed by the junction of the North and South Fork and Krout Canon. In addition to these tributaries there are several large arroyos that carry considerable flood waters but practically these tributaries carry no normal flow excepting

small amounts that are used before reaching the Bonito. The North Fork of the Bonito has a little larger drainage area and carries more flood water than the South Fork, however, the South Fork carries more normal flow and less flood waters than the North.

The principal tributaries of the Ruidoso are the Eagle. Cedar and Carrizozo Creeks and Cherokee Bill and Gavaland Canons. There is practically no irrigation on any of these tributaries excepting a little on the Eagle which is very small as there is very little water in said creek excepting at times of floods.

The largest portion of normal water supply of the Bonito and the Ruidoso is spring water caused from the melting of snows and rains in the mountains which sink and seep through coming out or appearing in springs lower down. This portion of the normal flow is fairly permanent in character, however, there is considerable runoff from excessive rains which is comparatively short and quick and thereby causing many short and quick floods.

The greatest discharge of the Hondo is at or near Picachco, the average flow of said river at that place for the months of May, June, July and August, September, October, November, and December, 1908, was 49 second-feet. At Border station 27 second-feet and Diamond "A" station 25 second feet. The average discharge from January to August of 1909, at that place, (Picacho) was 30 second-feet. The maximum discharge at any one time during this period was a little over 2000 second-feet which was in July 18, 1908.

WATER LOSSES.

The natural formation through which the Hondo and its tributaries flow varies from a broken granite on the Upper Bonito to a stratified lime on the Lower Bonito and the Upper Hondo to stratas of gypsum on the Lower Hondo. There are apparently losses of water in the granite, increased waters in the stratified lime and large losses on the Lower Hondo. The discharge of the river at various places is shown in acre-feet in the tables entitled "DISCHARGE IN ACRE FEET BY MONTH AT GAGING STATIONS ON HONDO RIVER AND TRIBUTARIES."

The maximum point of discharge of the Bonito above Government Springs is at Angus, the discharge in acre-feet at that place from November, 1908 to August, 1909 inclusive was 3022 acre-feet.

The discharge for the same period at gaging station Stanton No. 3, located above Government Springs was 792 acre-feet. There is a loss of water between Stanton station No. 3 and Angus

of 2030 acre feet, less the amount of water that was used by Fort Stanton and A. C. Austin and Parker for domestic purposes and irrigation of 262 acres. Measurements made upon this river, when in a normal condition, by current meter show a loss between Angus and the Intake at Fort Stanton Upper Ditch of about one second foot. The loss of one second foot during the period of November, 1908, to August, 1909, inclusive would amount to 600 acre-feet leaving a balance of 1430 acre-feet used by Fort Stanton, A. C. Austin and Parker which corresponds to the amount of water which our records show that was used by those parties.

The amount of water diverted from the South Fork through the railroad pipe line for the same period was 1468 acre-feet.

A special investigation was made to endeavor to determine whether the water now diverted through the railroad pipe line had anything to do with the discharge of the Government Springs and on August 7, 1908, the waters of said pipe line were turned back into the river, the amount of water then flowing in the pipe line being 2.85 second feet, this water being turned back into the river took six days before it reached the road about 1200 feet above the junction with the North Fork and in eight days it reached the junction a distance of less than one mile. Then it is evident that before the water would effect the Government Springs it would take considerable time as it took eight days for it to flow over three-quarters of a mile in the main stream. The record of the flow of the Government Springs shows a steady decrease after August of that year. The variation of the flow of the Government Springs corresponds to the rainfall and melting of snows.

An endeavor was made also to determine the losses of water in the Bonito River during this month but owing to the fact that there was excessive rains, the Weather Bureau showing that during the months of July and August that there occurred over 65 per cent of the rainfall for the year. These special measurements taken on the river during that investigation showed a gradual increase, however, these measurements were effected by water seeping into the said river along its course from the excessive rains, which occurred at this time, therefore, we could not conclude that there was no loss on account of these measurements indicating an increase.

We concluded after turning the water of the Bonito pipe line into the river for nearly a month that before the end of that time the Government Springs began to decrease and to gradually decrease for the next four months, that there is no relationship between the waters of the South Fork of the Bonito and the waters

of the Government Springs. We also concluded from measurements taken in the Bonito (See table entitled "LOSS OF WATER IN SECOND FEET ON THE BONITO") at its minimum flow or natural flow that there is a loss of about one second foot of water between Angus and the Intake of the Upper Fort Stanton ditches which check with the total discharge in acre feet at Angus and Stanton Station No. 3. That such loss is conclusive is without question but where said loss goes to we were unable to determine.

From the Government Springs east to Picacho the formation is in stratified lime rock and there is a large increase in the waters which come up in this stratified lime rock in the springs along said river bed.

The discharge of the Hondo in acre-feet (see table entitled "DISCHARGE IN ACRE FEET BY MONTH AT GAGING STATIONS HONDO RIVER AND TRIBUTARIES") for May, June, July, August, September, October, November, and December, 1908, at Picacho was 23,792; for the same period at the Border Ranch 17,878, and for the same period at the Diamond "A" Ranch 12,206, while at the Intake into the Hondo reservoir the discharge was 5458, there being an actual loss between the Diamond "A" station and the Intake into the Hondo Reservoir of 6748 acre-feet during that period, there being no water used for irrigation between the Diamond "A" station and the Inlet Canal. The difference of water in acre-feet between the Diamond "A" and Border Stations for this same period was 5672 acre feet of which approximately 2822 acre-feet was used for irrigation, leaving a loss through seepage of 2850 acre-feet.

During the period from January 1st, 1909, to August 31st, 1909, the total discharge in acre feet at the Inlet to the Hondo reservoir was 1037, the discharge at Diamond "A" station for that same period was 6074 acre feet leaving a total loss of 5037 acre feet.

The difference in the discharge between the Diamond "A" and the Border station for this period was 5522 acre feet of which approximately 2707 acre feet was used in irrigation between these two places, leaving a loss by seepage of approximately 2815 acre feet.

There is no question that there is as much loss between these two places as indicated for there might have been local floods coming in between these two points which if there had been would increase the loss more or to the amount of the discharge of such floods.

The loss of water between the Diamond "A" station and Inlet

Canal by actual measurement of running water indicates that there is from 22 to 33 second feet loss which is shown on the table entitled "LOSS OF WATER IN SECOND FEET," this table gives the losses of water in second feet between the various places along the Hondo.

The loss by actual measurement between the Diamond "A" station and the Border station is seven second feet or more.

It is, therefore, evident if there had been running water down to the Inlet Canal all the year that the loss in acre feet would be much more than it is owing to the fact that there are times when there is no water to be lost.

It is evident that if there was an impervious canal constructed with a capacity of sixty second feet from the Inlet Canal on the Hondo Project to the Diamond "A" Station that practically all of the waters lost between these two points excepting such water as would be lost in evaporation would have been saved, which would have been considerable as the total loss between these two points from May, 1908, to August, 1909, inclusive was 12,622 acre feet.

By constructing a ditch of eighty second feet capacity to above the Border Station considerable more water could be saved but the amount saved would not be as much compared with the extra cost of construction as the plan of constructing the ditch to above the Diamond "A" Station, however, it would be worth considering.

DUTY OF WATER.

The highest duty of water in irrigation as far as natural conditions are concerned should be found where the ground has only a gentle slope and a surface soil of a sandy loam underlaid with a soil of finer texture of a considerable depth. This finer texture underlying the sandy loam will absorb the moisture slowly and through its thickness will prevent any loss through seepage. Thus holding the moisture until the upper surface becomes dry when it is brought back to the surface through capiliary attraction. The sandy loam surface soils absorbs and allows the moisture to sink quickly after irrigation, thereby allowing soil mulches to be made by cultivation soon after irrigation which prevents the moisture from escaping back into the air.

Where soils are underlaid with a coarse and gravelly strata it allows the water to seep away underneath and, therefore, handicaps the conservation of moisture, however, the climate and soil conditions are not the controlling features regarding the duty of water as one individual will cover a great deal more area with a given

quantity of water and oftimes irrigate a less number of times than another individual, just because one individual has properly handled his water and tried to conserve the moisture after irrigation and it is, therefore, here through the individual efforts where the conservation of moisture and higher beneficial use of same can be obtained.

In irrigating where the soil is underlaid by a gravelly strata the irrigation must be more frequent and a great deal less of quantity should be applied at one irrigation as the over-irrigation of such soils, the surplus water is practically lost into the underground seepage.

From an engineering standpoint we question whether one individual should have the right to use several times more water for a given area than another party when the natural conditions are similar simply because the one individual does not try and conserve the moisture by proper handling of the water and the cultivation of the soils.

As the largest percentage of water lost in irrigation under normal conditions is from evaporation we will quote experiments taken from the United States Agricultural Department on the conservation of moisture by the preventing of this evaporation. These tests showed an evaporation in 14 days of 23 per cent of the water applied to the soil where the soil was not cultivated at all, where cultivated four inches deep forming a soil mulch, the loss by evaporation was 6.6 per cent and where cultivated 10 inches deep there was less than 1 per cent.

The scientific farmers in the semi-arid districts have been successfully growing crops where the rainfall is less than 20 inches without the aid of any irrigation water whatever. It is, therefore, not a theory but a demonstrated fact that by proper handling of the water and the cultivation of soils moisture can be conserved.

Referring to tables headed "NUMBER OF ACRES AND AVERAGE USE AND DUTY IN EACH DITCH," I have arranged these tables so that they will show the average duty of the water by the various ditches under this stream system during May, June, July and August, 1909, as this period is at the time of year when there is more water used than the average during the year. I have placed another column showing what the probable duty of water would be if considered the year round and it will be seen from going over these records that the duty of water under the various ditches varies enormously. The highest duty of water is through the Kline Ditch which irrigated 77.02 acres on an average of less than .32 second feet while the lowest duty of

water was under the Nicanora Ditch which used nearly a second foot for a little over 18 acres of land and which would have covered that area during that year, if there was no loss through seepage and evaporation, nearly 34 feet deep. It is apparent that the people in these valleys would have made lakes out of their farms if it had not been for the natural drainage conditions underlying the soils, there being no question but what in a great many instances that the soils have been so leached out by the pouring of water through them and the washing away of the fertile substances of the soil that they can not raise as good crops now as they should.

The duty of water under the best irrigation system of the Territory is under the Hagerman Canal. Under this canal there are greater results obtained from irrigation than any other large canal system in the Territory and at the same time they use less water. The average duty under this canal system during the irrigation season of 1909 was 216 acres for one acre's foot of water.

The duty of water for the farms under this stream system would probably not average as high as that of the Hagerman even though the soil and water was as carefully cared for as under the Hagerman for while the rainfall is considerable higher in the Hondo stream system yet the under stratas are so porous and gravelly, especially the further you go up in the mountains that it is more difficult to conserve the moisture properly, therefore, the duty should naturally be lower. I am, therefore, of the opinion that the duty of water under the Hondo Project should at least reach the present duty of water under the Hagerman Canal but that it should steadily decrease as you advance up the mountains.

ADJUDICATION OF WATER RIGHTS.

The natural conditions under this stream system which would effect the duty of water on the amount of water the individual should be entitled to, varies so evenly as you proceed up the stream system that it would hardly be necessary for me to discuss any peculiarities regarding each individuals' ditch and land, however, some of the ditches lose more water than others, yet they could be made by proper construction to carry the water with less loss and as that is the duty of the owner of the ditch to keep the ditch up properly I should no think that the party who neglects his ditch and allows the water to loose in conveyance should be entitled to more water on account of his carelessness for we certainly do not want to put a premium on shiftlessness. All ditches when in proper shape and of sufficient capacity to irrigate all of the land under them.

As I have outlined "UNDER DUTY OF WATER" that same should equal the duty as found under the Hagerman Canal System, under the lower portions of the Hondo or at least under the Hondo Project, however, as you proceed up the stream system the slope becomes greater and the soil, especially the under strata, more gravelly which makes it a little more difficult to economize in the use of water, however, this is partially overcome by the heavier rainfall. The mean annual rainfall for Fort Stanton being a couple of inches greater than at Roswell.

After careful consideration of the natural conditions we are of the opinion that the duty of water should decrease as you proceed further up the mountains as heretofore stated, but the duty of water should be even at its minimum at least 100 acres to every second foot of water. The amount of water entitled to each individual or ditch should be gradually and evenly decreased by commencing with a duty at the Hondo Project of at least 200 acres per one second foot when you have reached the mountainous regions.

The time will come when the duty of water will not vary so much when the people learn to properly handle the water and soil, for by such methods all of the lands under this project should eventually reach a very high duty of water.

In order to facilitate the Courts in arranging its adjudication we have placed in our tables under the head of "NUMBER OF ACRES AND AVERAGE USE AND DUTY OF EACH DITCH," the following data; under the name of each ditch the total number of acres that have been irrigated, the number of acres of the total amount which was not irrigated the season the survey was made, the average discharge of water that was used in that ditch during May, June, July and August, 1908, the duty of water for those months and the duty of water would have been at that same rate if considered for the entire year. It must be remembered that the period of measurement of water in the various ditches was at a season of the year when a maximum use of water was necessary and to determine what the same duty of water would have been for the year I have calculated from the following formula which was tabulated from the actual use of water for the period of several years under the Pecos Irrigation System located about 100 miles South of this stream system. The average per cent of water used in the various months being as follows: January 1 per cent, February 11 per cent, March 8 per cent, April 10 per cent, May 15 per cent, June 14 per cent, July 13 per cent, August 15 per cent, September 12 per cent, October 6 per cent, November 3 per cent,

December 2 per cent. It will readily be seen from this that during May, June, July and August the actual use of water for these months would be 67 per cent of the total amount of water for the full season of the use of 67 per cent of water in one-third of the time allowing the period of the entire year as the irrigation season.

It will be noticed that the amount of water used by the various ditches as compared with the number of acres irrigated that the duty of water varied during our measurements excessively, this was due to the fact that the water was not properly handled and cared for in many, many instances. The natural human instinct to get all you can if it does not cost anything more is probably predominant in the use of water for irrigation.

We again reiterate from an engineering standpoint and the development of our country with fairness to all that unless water for irrigation purposes is properly handled, taken care of at night and after irrigation, proper methods be used for the conserving of the moisture that same would not be, at least, a high beneficial use of water and we would question whether that an excess of water would be termed a beneficial use at all. We appreciate the fact that there are so many small ditches that the duty of water can not be so high as if this land was irrigated from a few or less number of ditches.

In view of the above we have given our opinion of what the duty of water should be and in event the court should agree, the adjudication as far as the amounts of water are concerned can be calculated from each ditch from the tabulated list entitled "NUMBER OF ACRES AND AVERAGE USE AND DUTY OF WATER IN EACH DITCH."

If the Court should find that all land that has been irrigated should be entitled to their proportion of water then the total number of acres in column No. 2 could be taken as a basis to determine the amount of water each ditch is entitled to and if the court should desire to go further and adjudicate water to each individual the list of "IRRIGATED LAND AND OWNERS" could be taken as a basis as this list corresponds to the same lands as the above table of lands under ditches.

The place of use can be determined by referring to the proper topographic sheet, the number of the sheet upon which will be found the location of the land where water is applied is also given in the list.

In the determination of the proper periods of the use of water it must be remembered that the principal growing period of crops

is during May, June, July and August. However, there are crops such as alfalfa, winter oats, wheat and fruit trees that grow some or at least are alive during the other months of the year.

The average use of water during various periods of the year is duly described above which was calculated by the actual use by the farmers for a number of years under the Pecos Irrigation System.

All of the water used in this stream system was for irrigation of land, domestic and stock purposes excepting a small mill upon the upper Ruidoso which we think has been abandoned through non-use for over ten years.

WATER RECORDS OR FILINGS.

The record of water filings on this stream system in the office of the Territorial Engineer at the time this suit was brought consisted of the United States Reclamation Service filing for the Hondo Project and the application by the Rock Island and El Paso Railway Company for the change of the use of the water as herebefore mentioned and the action taken by the Territorial Engineer in the matter. From this action of the Territorial Engineer an appeal was made and upon appeal the action of the Territorial Engineer was sustained.

Records of the above will be forwarded to the courts. In addition to the above there has probably been filings made in the County Clerk's office on a great many of the old ditches.

Since this suit was brought the following filings for permits to appropriate water have been made: No. 147, filed by O. M. Lee, et al., on April 10, 1908, on the Ruidoso for power purposes, which was approved provided the water was returned above the intake of all irrigation ditches and that suitable means be provided for the watering of stock, etc. No. 161, by Merrill H. Fisher, on May 11, 1908, for power on the Ruidoso, not approved by the Engineer, same being conflicting and subsequent to the Lee filing.

No. 280 by C. W. Wingfield, et al., filed May 3rd, 1909, on the Ruidoso for power purposes, not approved by the Engineer same being conflicting and subsequent to Lee filing.

No. 365 by James E. Bloom, filed December 18, 1909, on the Hondo for Irrigation. Same held up pending adjudication.

TABLE I.

Number of Acres and Average Use and Duty of Water in Each Ditch.

(1) NAME OF DITCH	(2) Total No. of acres irrigated under ditch	(3) No. of acres not irrigated that season	(4) Average discharge of water in ditch for May, June, July and August, 1898, in sec. ft	(5) Duty of water for those four months	(6) Duty of water same would be if considered by the year
Diamond "A"	312.77	18.31	7.2	43.49	73.9
Bar "H"	52.08		1.25	41.	70.
Border	100.20		2.84	35.	60.
Montano	95.72	1.14	3.67	26.	44.2
Michaelis	120.93	2.46	2.55	47.	79.
Circle Diamond	37.80		.15	252.	428.4
Kline	77.82	3.45	.131	252.	428.4
Picacho	128.30	2.20	7.89	53.4	107.8
Buckguys	217.69	19.43	3.98	46.7	79.4
Chene (old)	207.26	93.25			
Serrano	118.72	6.89	.98	121.13	205.9
Casey & R. Vijil	11.3	11.3			
F. & M. Analla	28.12	15.18	.145	194.	329.8
Analla Springs	25.28	6.35	1.93		
Pas Torres	70.31	10.4	.64	109.8	186.7
J. & P. Analla	82.03	14.63	.99	82.8	140.8
P. Chaves Springs	26.58	6.23	.87	30.5	51.9
J. Gonzales	60.03	7.89	1.15	48.	81.6
Kirkland (Bonito)	75.18		1.03	73.	124.1
Bradstreet & Vorwerk	48.08		.72	66.7	114.4
H. Fritz & G. Gonzales	37.18	4.34	.23	161.6	274.7
H. Fritz Spring	55.25	1.17	10.9		
Vijil	52.25	1.35	.67	80.07	136.1
Old Ditch	40.70	40.70			
Los Chosas	104.71	12.65	2.6	41.6	70.7
E. Fritz Spring	20.25	10.40	.17		
E. Fritz	62.56	.57	7.4	84.5	111.7

TABLE II.

Number of Acres and Average Use and Duty of Water in Each Ditch.

(1)	(2)	(3)	(4)	(5)	(6)
NAME OF DITCH	Total No. of acres irrigated under ditch	No. of acres not irrigated that season	Average discharge of water in ditch for May, June, July ond August, 1903, in sec. ft.	Duty of water for those four months	Duty of water same would be if considered by the year
Dow	22.79	8.51	0.0	22.79	38.7
F. Chaves	23.59	7.50	1.08	21.8	37.1
Hulbert No. 3	7.06		.49	14.4	24.5
Hulbert No. 2	12.04		.33	36.5	62.1
Hulbert No. 1	95.33	18.35	1.71	57.	96.9
Laws No. 2	28.07		.53	53.	90.1
Laws No. 1	19.45		.62	31.4	53.4
Lincoln	83.49	15.38	1.00	82.5	140.3
Titsworth	49.89	11.38	.41	12.3	20.9
Protectora	108.47	23.58	1.04	102.	173.4
Providentio	176.22	12.39	2.37	74.	125.8
Sedillo	78.31	8.86	.42	181.7	308.9
Cruz de Jara	49.84	5.13	.84	59.3	109.8
Nicanora	18.70		.897	2.8	4.8
Govt. Springs	45.39		1.6	28.5	48.5
Lutz	52.29	15.33	9.1	5.72	9.7
Old Salado	6.62	4.34			
Stanton No. 3	125.61	11.61	1.38	91.	154.7
Stanton No. 1	82.36		1.27	65.	110.5
Parker	18.12	1.03			
E. P. & S. W. No. 12	1.17				
E. P. & S. W. No. 11	5.75				
E. P. & S. W. No. 10	11.15				
E. P. & S. W. No. 9	3.03				
Barrett No. 2	9.92	0.26			
Barrett No. 1	20.62	3.14			

TABLE III.

Number of Acres and Average Use and Duty of Water in Each Ditch.

(1)	(2)	(3)	(4)	(5)	(6)
NAME OF DITCH	Total No. of acres irrigated under ditch.	Total of acres not irrigated that season.	Average discharge of water in ditch for May, June, July and August, 1908. In sec. feet.	Duty of water for those four months.	Duty of water same would be if considered by the year.
E. P. & S. W. No. 8 and A. C. Austin	10.55	1.46	.595	17.7	30.1
E. P. & S. W. No. 7...	19.13	1.40			
E. P. & S. W. No. 7 A..	5.68				
E. P. & S. W. No. 6....	68.59	5.28			
E. P. & S. W. No. 5....	1.03				
Crockett	12.56				
E. P. & S. W. No. 4....	18.59	.66			
E. P. & S. W. No. 3....	2.92				
E. P. & S. W. No. 2....	19.38	1.03			
E. P. & S. W. No. 1....	7.26	2.52			
W. I. Robinson No. 1...	20.62	17.14	.83	24.8	42.16
W. I. Robinson No. 2...	4.29	4.29			
Greer No. 2.....	3.09		.68	4.5	8.7
Greer No. 1.....	5.09		.41	12.0	20.4
D. R. Robinson No. 2..	3.63				
D. R. Robinson No. 1..	7.95	.66	.34	22.9	38.93
Stephens and Wells....	16.30				

SMALL DITCHES ON THE UPPER BONITO THAT SELDOM HAD WATER IN THEM.

ON BONITO.

Dugger	.60		.25
Bonito	1.89		.21
F. Braune	1.94		.20
H. Consbruch	9.42	7.95	.20
Reed	.50 appx		.20
Rice No. 2	.50 "		.20
Rice No. 1	.50 "		.20

ON BEAR CANON.		
C. A. Stephens		.25
Grafton No. 2	.97	.13
Grafton No. 1	5.22	.41
Staten		.20 est
ON TANBARK CANON.		
Jennings	5.55	.20
Greer No. 3.....	1.77	.00

Number of Acres and Average Use and Duty of Water in Each Ditch.

(1)	(2)	(3)	(4)	(5)	(6)
NAME OF DITCH	Total No. of acres irrigated under ditch.	No. of acres not irrigated that season.	Average discharge of water for May, June, July, and August, 1908. In sec. feet.	Duty of water for those four months.	Duty of water same would be considered by the year.
Kirkland (Ruidoso) ..	6.20				
P. Chaves	132.24	1.66	2.54	51.	87.9
A. Chaves No. 2.....	66.38	18.62			
Storm	104.29	1.20	3.42	27.5	46.8
C. Hilburn	40.76	2.43	.36	109.	185.3
F. Hilburn	74.29	1.72	1.37	54.	91.8
A. Lucero	11.02	.14	.31	31.	52.7
Mes	37.68	6.78	.41	92.	156.4
San Patriocio	162.69	12.88	2.01	81.1	137.9
D. Gallegos	9.83		.23	37.8	46.8
N. Silva	39.01				
F. Sanchez	65.50	6.79	.93	70.4	119.7
Chosas N.	51.37	4.06	1.22	42.	71.4
Chosas S.	15.70	.40	1.64	9.6	16.32
L. Gonzales	25.19		.66	38.	64.6
A. Chaves No. 1.....	51.18	6.97	1.42	36.	61.2
Analla and Barragan..	40.56	3.29	1.13	36.4	61.9
Narragan and West...	82.13	5.35	.29	282.	479.4
L. Gallegas	26.29		.45	58.	98.6
F. Coe	85.15	.23	.42	202.7	344.6
F. Coe (Eagle Creek)..	6.80				
R. Coe	53.79	2.06	2.2	24.5	41.7

Number of Acres and Advance Use and Duty of Water in Each Ditch.

(1)	(2)	(3)	(4)	(5)	(6)
NAME OF DITCH	Total No of acres irrigated under ditch.	No. of acres not irrigated that season.	Average discharge of water in ditch for May, June, July, and August, 1908. In sec. feet.	Duty of water for those four months.	Duty of water would be if considered by the year.
G. Coe	28.92	.63	.88	35.7	60.7
Tully	24.90		1.52	16.3	27.71
P. Gonzales	45.15		1.75	23.5	53.95
A. Sanches	60.62	5.09	1.44	40.4	68.7
F. Silva	14.14		.47	30.08	51.14
Meraval & Norman	7.90	1.20	.53	15.	25.5
J. M. Sanchez	17.45		.33	53.	90.1
F. Sanchez S.	11.67	.40	.41	28.4	48.3
S. Sanchez N.	3.63	.23	.63	5.7	9.7
Allison	32.96	3.76	.66	48.	81.6
Pope	27.49	3.23	.31	88.6	149.6
Hewitt	24.65	1.66	.43	55.	93.5
Maxwell	70.02		1.17	59.8	101.7
Bracken	65.86	12.04	.77	85.4	145.2
Avent	76.61		1.67	44.7	75.99
A. Herrera					
Hale, North,	36.58	7.50	.27	135.5	230.4
Hale-South,	130.32	22.51	1.05	83.6	142.12
F. Herrera N.	36.74	3.54	.35	105.	178.5
F. Herrera S.	43.34	28.33	.46	94.	159.8
Wingfield	29.18	5.95	.59	49.4	83.98

The Following Ditches on Little Eagle Creek Were Dry Almost All Summer.

(1) NAME OF DITCH	(2) Total No. of acres irrigated under ditch.	(3) No. of acres not irrigated that season.	(4) Average discharge of water in ditch for May, June, July, and Augut, 1908. In sec. feet.	(5) Duty of water for those four months.	(6) Duty of water would be if considered by the year.
Gilmore	4.00				
Brooks	6.94				
Lane	4.00				
Peoples	2.14				
Hages	1.91				
West	2.23				
Humphrey	1.94				
SMALL DITCHES ON EAGLE CREEK.					
Philips	20.07	.14			
W. C. N. Hightower	3.42				
Stephenson No. 1	6.41	1.11			
Stephenson No. 2	14.38	1.69			
J. C. Hightower, Jr.	8.76				
J. C. Hightower, Sr.	7.15	3.03			
Stewart	18.06				
Burrell	3.22				
Gilmore	1.20				

TABLE II.

DISCHARGE IN ACRE FEET BY MONTH AT GAGING STATIONS, HONDO RIVER AND TRIBUTARIES.

HONDO RIVER

Date.	Picacho	Border	Diamond "A"	Inlet Hondo Reservoir	River below inlet.
1908.					
May	2073.	1410.	1196.	.0	400.
June	1146.	796.	13.	.0	....
July	4908.	3537.	2188.	588.	528.
Aug.	5616.	3744. Appx.	3834. Appx.	1572. Appx.	423 Appx
Sept.	3082.	2542.	2084.	873.	0.
Oct.	2458.	1578.	648.	0.0	0.0
Nov.	2263.	1895.	1603.	100.	534.
Dec.	2246.	2377.	1740.	380.	0.
Total	23,792.	17,874.	12,206.	3513.	1945.
1909.					
Jan.	2333.	2202.	1316.	37.4	0.
Feb.	1628.	1578.	653.	0.	0.
Mar.	817.	677.	143.	0.	0.
Apr.	1035.	439.	13.	0.	0.
May	992.	343.	0.	0.	0.
June	974.	273.	100.	0.	0.
July	2745.	1404.	917.	187.	324.
Aug.	5000.	4680.	2932.	443.	156.2
Total	15,524.	11,596.	6074.	657.4	480.2

BONITO RIVER.

Date.	Bonito Pipe Line.	Augus.	Stanton.	Government Springs.
1908.				
May	....	....	....	....
June	....	....	....	....
July	....	243.	....	....
Aug.	....	430.	351.	....
Sept.	....	350.	291.	....
Oct.	....	187.	7.	187.
Nov.	73.	124.	0.	190.
Dec.	86.	137.	0.	212.
Total	159.	1471.	647.	589.

Date.	Bonito Pipe Line.	Augus.	Stanton.	Government Springs.
1909.				
Jan.	67.	112.	0.	187.2
Feb.	71.	105.	2.	171.
Mar.	158.	287.	143.	218.
Apr.	309.	599.	249.	ice.
May	270.	305.	0.	180.
June	83.	243.	0.	231.
July	141.	349.	193.	....
Aug.	209.	561.	205.	....
Total	1309.	2561.	792.	987.2

RUIDOSO RIVER.

Date.	Coe.
May	----
June	----
July	2102
August	2071.
September	1966.
October	2059.
November	1287.
December	ice.
Total	11.485

Date.	Coe.
1909	
January	ice.
February	ice.
March	599.
April	1372.
May	331.
June	392.
July	324.
August	....
Total	3018.

TABLE III.

LOSS OF WATER IN SECOND FEET ON HONDO RIVER. BETWEEN DIAMOND "A" RANCH AND RESERVOIR.

Date.	At Diamond "A"	At Reservoir.	Loss.
1908.			
May 18	55.04	21.92	33.12
May 27	28.74	0.0	28.74*
July 28	49.55	July 29, 22.84	26.81
Dec. 8.	27.80	6.79	21.01†
1909.			
Jan. 19.	21.89	0.0	
July 28	36.70	14.66	22.04

*Water stopped running at Reservoir evening of May 27th.

† After heavy snow.

Date.	At Border Ranch.	At Diamond "A".	Water used.	Loss Between.
1909.				
March 1	13.16	0.0	6.33	6.83*
April 30	12.90	0.0	6.05	6.85
May 27	5.77	0.0	3.85	1.92
June 24	5.00	0.0	3.20	1.80

*More loss than is indicated as the water never reached Diamond

BETWEEN DIAMOND "A" DAM AND DIAMOND "A" RANCH.

Date.	At dam.	At Ranch.	Loss
1909.			
March 1	3.41	0.0 (Feb. 28, 1 sec. ft. at ranch)	3.41
March 2	1.78	0.0	1.78
April 30	2.05	0.0	2.05
June 24	2.70	0.0	2.70

BETWEEN BAR "H" DAM AND DIAMOND "A" DAM.

Date.	Above Bar "H" Dam.	Above Diamond "A" Dam.	Loss.
1909.			
March 1	12.53	8.36	4.17
April 30	11.36	8.10	3.06
May 27	5.00	H. Ditch 0.0	0.0
June 24	4.63	0.50 2.70	1.43

BETWEEN BORDER RANCH AND BAR "H" DAM.

Date.	At Border Ranch.	Above Bar "H" Dam.	Loss.	
1909.				
Sept. 28	33.15	31.20	1.95	No water in Border ditch
Mar. 1	13.16	12.53	.63	Water in Border ditch
Apr. 30	12.00	11.16	1.74	No water in Border ditch
May 27	5.77	5.00	0.77	Water in Border ditch
June 24	5.00	4.63	0.37	Water in Border ditch

TABLE IV.

LOSS OF WATER IN SECOND FEET BONITO RIVER.

Date.	North Fork.	Bonito.	Angus.	Parker.	Stanton No. 1	Stanton No. 2.
1908.						
August 6	——	2.81	3.90	4.90	4.64	4.94
August 11	2.4	3.27	3.2	3.65	3.03	2.22
August 16	2.38	5.47	4.52	5.6	——	4.8
August 19	2.79	8.82	10.08	7.6	——	9.6
September 8	2.6	4.7	6.4	6.45	6.50	5.5
November 20.	0.88	1.34	1.67	1.33	2.08	1.61
1909.						
March 10	——	——	2.73	2.09	1.59	1.11
June 12	0.68	1.20	1.36	0.78	0.96	0.72
July 15	1.94	3.32	4.27	4.18	3.60	3.41
December 14	——	——	1.60	1.00	0.63	——

ITEMIZED COST OF HONDO HYDROGRAPHIC SURVEY.

Warr. No.	In favor of	Amount
14440	J. W. Lewis	$ 173.25
14439	J. W. Lewis	335.25
14461	C. H. Neel	145.35
14516	J. W. Lewis	242.85
14515	J. W. Lewis	225.67
14544	C. H. Neel	202.15
14644	J. W. Lewis	449.80
14681	C. H. Neel	349.55
14750	J. W. Lewis	474.50
14748	C. H. Neel	267.15
14809	J. W. Lewis	457.17
14808	C. H. Neel	254.70
14906	C. H. Neel	130.25
15031	C. H. Neel	85.05
15042	J. W. Lewis	689.85
15194	C. H. Neel	187.75
15269	C. H. Neel	115.20
15323	C. H. Neel	162.45
15465	C. H. Neel	130.35
15716	C. H. Neel	186.20
15741	C. H. Neel	151.10
15909	C. H. Neel	125.25
16039	C. H. Neel	161.35
16272	C. H. Neel	140.40
16382	C. H. Neel	83.50
16558	V. L. Sullivan	25.00
16799	V. L. Sullivan	30.00
16800	C. H. Neel	45.25
16987	C. D. Miller	26.75
17044	V. L. Sullivan	60.00
17241	Meade Neel	3.25
17242	C. H. Neel	20.00
		6136.34
	Sale of horses, etc.	55.00
Total cost of Survey		$6081.34

REPORT

ON THE

RAYADO HYDROGRAPHIC SURVEY

BY THE

TERRITORIAL ENGINEER

TO THE

Court of the Fourth Judicial District

OF THE

Territory of New Mexico.

TABLE OF CONTENTS OF REPORT.

COPIES OF WATER FILINGS.

MAPS ACCOMPANYING REPORT.

To the Judge of the Fourth Judicial District, Raton, New Mexico.

Dear Sir:—In compliance with an order of your Court under date of March 24, 1908, in the matter of the Farmer's Development Company, Plaintiffs, vs. The Rayado Land and Irrigation Company, et al., Defendants, for the Territorial Engineer to make or furnish a hydrographic survey of the Rayado River and stream system thereof, I herewith have the pleasure of forwarding same.

Yours very truly,

VERNON L. SULLIVAN,
Territorial Engineer.

INTRODUCTION.

In preparing this report we have tried to make it as brief as possible yet covering all important points. In order to do this we have arranged a great deal of the data in tabulated form, thus covering it concisely and in such shape as to be easily understood. The data is presented exactly as found when the survey was made.

Opinions and suggestions gathered from an engineering standpoint regarding causes and effects are also given, but no suggestions as to priority water rights are given or on legal questions.

RAYADO RIVER AND TRIBUTARIES.

The general map of the Rayado River and tributaries is shown on Sheet No. O.

The Rayado River rises in the Sangre de Cristo Mountains in western Colfax County. The Rayado proper is made by the junction of the Agua Fria or Beaver or South Fork, names by which it is variously known, the North Fork and the Bonito Creek. These streams rise in the mountains, owing their supply greatly to the melting of snows and the discharge from springs. The upper portion of this stream flows through narrow valleys, canons and heavily timbered mountain country, coming out of the mountains about two miles above the Abreu Ranch or some twenty-three miles of Springer, N. M. Located as it is, the Rayado River has a good drainage area among the mountains, the rains and snows being very heavy among the mountains and in that section as compared

with similar elevations in a great many other portions of the Territory. The section of the River as covered by the topographic sheets, which accompany this report, lies in township 25 north, ranges 18, 19, 20 and 21 east in Colfax County. The river is directly a tributary of the Cimarron and later becomes a part of the Canadian or Red River System.

The lands comprising the irrigable area of this valley are exceptionally good. The character of the soil is a black or very dark loam and sufficiently sandy to make it light and susceptible to cultivation soon after irrigation. The lands slope toward the river at a grade which is adapted to drainage although near the intake of the Valdez Ditch some marsh land is to be found.

The survey of the river was brought about by the petition of the Farmers' Development Company of Springer, N. M., to have the old vested water rights along this river adjudicated by the Court in order to determine the amount of water available for their application to appropriate water of the Rayado River filed with Territorial Irrigation Engineer October 7, 1906. The Court of the Fourth Judicial District ordered on March 4, 1908, that this office make a hydrographic survey and furnish it with a report upon same whereby it might make from the data thus received an adjudication of this water in accordance with the laws of the Territory.

As a supplement to this report we are attaching for your information a copy of the filings made for waters of this river in the office of Territorial Irrigation Engineer as well as Territorial Engineer. These applications or filings give the date the application was received, whether or not it was approved, amount of water claimed, land to be irrigated, amount of power to be developed, in fact, they are exact copies of these filings and the action taken on each.

Before taking up the body of this report, which deals with ditches and lands irrigated, it might be well to outline briefly the legend of characters used. The location of various weirs and gaging stations upon the ditches and river is represented by a star, the acreage and crops produced are designated by figures, the comparitive elevation of the plaintable stations by a circle and elevation. Denomination used when specifying amounts of water is in second-feet, the rainfall in inches. In case of floods or unusually high water lasting for only a short period for an hour or more the discharge is not included in the average flow, mention, however, is made of same as information as to storage possibilities.

CAUSES FOR SURVEY.

This survey was largely made necessary through the Farmers' Development Company, which Company themselves, and their predecessors had filed notice of intended appropriation of all regular and flood waters of the Rayado River under the Law of 1905 for the purpose of irrigating ten thousand acres of land, thus, it was necessary for this concern to know what amount of irrigation rights there was upon this stream in order that they would know the amount of water their rights would entitle them to so they could determine the amount of water that was left for their project.

This project is the first project of any size contemplated for the use of flood waters from this stream, they having already constructed one of their reservoirs and the question of the construction of the second depends largely on whether there is sufficient water for the construction of the second reservoir.

ABREU SOUTH SIDE DITCH.

In covering this survey I am taking up the ditches and disposing of them in turn, according to the location upon the river. Upon sheets one and two are shown the alignment of ditches, fences field divisions, roads and the rivers and creeks; the location of buildings, weirs, hills and gaging stations and the approximate elevation in large figures of the land as compared with station one, east boundary of H. M. Porter Ranch which is an assumed elevation of one hundred feet, and the kind of crops and the area of same.

The Abreu South Side Ditch is the first taking water from the Rayado River. The head-gate is located about one-half mile above the Abreu Residence. This ditch carried a mean flow from June, 1908, to June, 1909, of 2.47 second feet, and from June to September, 1909, its flow was 3.20 second feet. I might state here that the following averages are based upon a year and an additional period of three months which gives us the period covered by the survey and also the mean for the year and the mean for the irrigating season. The acreage under this ditch in 1908 when the survey was made amounted to 253.80 acres and the duty of water for the first mentioned period was 199. acres per second foot for the second period the duty was 79. plus acres. The crops raised under this ditch consisted principally of alfalfa, corn, oats, etc., as outlined on sheet twelve of the maps attached hereto and made a part of this report. There are 162.37 acres under the alignment

of this ditch which are not but could be irrigated. The lands are all owned by Mrs. P. B. Abreu.

The handling of the water is done in the average manner and the duty as outlined above could, with proper supervision in its distribution, be made to reach as high as three or four hundred acres to a second foot. This statement applies to the other ditches as well, the principal trouble being that the water has not always been at the disposal of the irrigators when it was needed. With a storage system above this land and the business of distribution placed in the hands of a water master the duty could be made very high provided the water was economically applied and the soils were properly cultivated and cared for so as to conserve the moisture and still be without hardship to the farmers. The water not used from this ditch during various periods of the season is wasted back into the river by what is known as the Abreu Waste Ditch. The amount of water thus returned to the river has been recorded and we find that the average return for the first year was 1.20 second feet and for the other three months a flow of .37 second feet. In computing the amount of water in the South Side Ditch, the amount wasted into the river has been deducted from the total flowing in this ditch at its intake. The crops, under this ditch, did not appear to have suffered at any time for the lack of water. At the point of the intake of this ditch the record of the flow of the river for the first year was a mean of 8.12 and for the three months 7.91 and for the remainder of the year 1909 the average flow was 10.21.

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The Farmer's Development Company has done a great deal of development work by the construction of the Intake Canal and Reservoir No. 2 into which it runs and also the main outlet canal from the Reservoir to the lands irrigated about two miles lower in the valley. Certificate of construction of same having been issued by the Territorial Engineer. The intake canal is very well built and has a capacity as set forth in their application of 260 or more second feet. This canal runs for about a mile to the Reservoir. Considerable difficulty has been experienced by this Company owing to the seepage from the Reservoir. This great obstacle has recently been overcome. The lands irrigated from this reservoir consists of between fifteen to eighteen hundred acres of land sown mostly to oats although a number of the families who have settled on this tract have done considerable gardening work. The soil produces abundantly and some twenty new families have or are building new homes and preparing to farm under this project. This project was retarded somewhat owing to the passage of the act of 1907 just at the period when they were making their filings under the act of 1905. This intermediate position entailed considerable time to adjust owing to the different forms, etc., as required by the Territorial Engineer.

The average amount of water taken through the Intake canal was 4.14 from June, 1908, to June, 1909, and 2.23 second feet from June, July and August, 1909. The description and capacity for Reservoir No. 2 of this Company will be found under their application attached hereto. The Company did not have as much water as they desired for their use, however, they now have from about fifteen to eighteen hundred acres under cultivation lying under this Reservoir. Quite a little seepage from Heck Arroyo originating from the reservoir has been taken through the Valdez Ditch by the Company to use on their old ranch. The location of the lands irrigated from Reservoir No. 2 by the Farmer's Development Company is shown on the blue print attached to the maps in this report.

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Morris Arroyo is a swale or draw carrying water only in times of heavy rains. Such flood water is carried out and used for the irrigation of 82.36 acres of vega land. No record was kept of the flow

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VALDEZ DITCH.

(See Sheets Nos. 2, 3, 7.)

The Valdez Ditch is the fifth ditch taking water from he Rayado. Its head-gate is possibly one-half mile below the Farmer's Development Company's Intake Canal. This ditch had an average flow of .91 for the year June, 1908, to June, 1909 giving an average of five hundred and five acres per second foot. The number of acres irrigated was four hundred sixty and twenty-six hundredths. This ditch covers land owned by the Farmer's Development Company, J. M. Valdez, L. Chandler, and Manuel Valdez. The acreage under this ditch is in excess of what should be irrigated from the water used as the lands of Manuel Valdez' ranch were very poorly irrigated. In this case the lack of water is due to a great portion of the water leaving the Chandler Ranch is dropped into a long arroyo and necessarily a goodly portion lost. This ditch is a long one and very steep along its upper course passing through a very loose soil and a great deal of water is lost by seepage.

CLOUTHIER DITCH.

(See Sheet No. 4.)

The Clouthier Ditch is another of the ditches taking water near the lower portion of the Rayado and is located a considerable distance below the Valdez Ditch. The average flow of water was .77 from June, 1908, to June, 1909, and irrigating about 182.39 acres having a duty of 236.72.

While this duty appears high it must be remembered that the Clouthier Ditch terminates in a reservoir and considerable water is stored during floods and times when water is not immediately

used for irrigation. The crops under this ditch appear to be in fairly good condition.

VALDEZ-PORTER DITCH.

(See Sheet 5 and 6.)

The Valdez Ditch is the fifth ditch taking water from the Rayado. gating 431.13 acres with an average flow for the year of 1.20 second feet and giving a duty or use of 259.2. The lands under this ditch are owned by Emilio Valdez and Elena Valdez, H. M. Porter and Charles Springer. The toal amount of non-irrigated land is 212.85 acres that lies unde rthe alignment of these ditches, some additional water for this ditch is obtained from the Uracca Creek.

RAINFALL.

We have given on sheet No. 11 the rainfall during the various months occupied by this survey. It will be seen that a great portion of the rainfall comes in the summer season and was very good for this section, June having a precipitation of 1.83 and July 3.7 and August 4.23. It is well to bear these facts in mind when considering the water duty under the different ditches. I am of the opinion that the duty of water under these ditches should range from 200 to 250 acres per second foot. Generally with a little spring irrigation together with the rainfall good crops should be grown if the soil, crops and water are properly cared for and conserved.

There is another question I believe should be considered and that is whether the application of water to vega lands is an application to beneficial use. A number of court decisions hold that it is not. Water from many of these ditches has been wasted upon these lands. By waste I mean turned out when not needed for irrigation and flooding the vega lands.

METHODS OF COLLECTING DATA.

The topographical survey was made by J. W. Lewis, C. E., during the month of November, 1908. The installation of the weirs and gaging stations was done by Robert L. Cooper, C. E., and the weir and gage readings were made by R. L. Cooper, A. J. Senseman, W. H. Sutton, C. E. The discharge measurements upon the river for computing discharge curves were made by W. B. Freeman, District Engineer, United States Geological Survey, J. B. Stewart, Hydrographer, U. S. Geological Survey; R. L. Cooper, U. S. Geological Survey; and W. H. Sutton. All records were closely checked by C. D. Miller.

The computation of weir and area discharges was done in this

TABLE OF CONTENTS OF REPORT.

COPIES OF WATER FILINGS.

MAPS ACCOMPANYING REPORT.

To the Judge of the Fourth Judicial District, Raton, New Mexico.

Dear Sir:—In compliance with an order of your Court under date of March 24, 1908, in the matter of the Farmer's Development Company, Plaintiffs, vs. The Rayado Land and Irrigation Company, et al., Defendants, for the Territorial Engineer to make or furnish a hydrographic survey of the Rayado River and stream system thereof, I herewith have the pleasure of forwarding same.

Yours very truly,

VERNON L. SULLIVAN,
Territorial Engineer.

INTRODUCTION.

In preparing this report we have tried to make it as brief as possible yet covering all important points. In order to do this we have arranged a great deal of the data in tabulated form, thus covering it concisely and in such shape as to be easily understood. The data is presented exactly as found when the survey was made.

Opinions and suggestions gathered from an engineering standpoint regarding causes and effects are also given, but no suggestions as to priority water rights are given or on legal questions.

RAYADO RIVER AND TRIBUTARIES.

The general map of the Rayado River and tributaries is shown on Sheet No. O.

The Rayado River rises in the Sangre de Cristo Mountains in western Colfax County. The Rayado proper is made by the junction of the Agua Fria or Beaver or South Fork, names by which it is variously known, the North Fork and the Bonito Creek. These streams rise in the mountains, owing their supply greatly to the melting of snows and the discharge from springs. The upper portion of this stream flows through narrow valleys, canons and heavily timbered mountain country, coming out of the mountains about two miles above the Abreu Ranch or some twenty-three miles of Springer, N. M. Located as it is, the Rayado River has a good drainage area among the mountains, the rains and snows being very heavy among the mountains and in that section as compared

with similar elevations in a great many other portions of the Territory. The section of the River as covered by the topographic sheets, which accompany this report, lies in township 25 north, ranges 18, 19, 20 and 21 east in Colfax County. The river is directly a tributary of the Cimarron and later becomes a part of the Canadian or Red River System.

The lands comprising the irrigable area of this valley are exceptionally good. The character of the soil is a black or very dark loam and sufficiently sandy to make it light and susceptible to cultivation soon after irrigation. The lands slope toward the river at a grade which is adapted to drainage although near the intake of the Valdez Ditch some marsh land is to be found.

The survey of the river was brought about by the petition of the Farmers' Development Company of Springer, N. M., to have the old vested water rights along this river adjudicated by the Court in order to determine the amount of water available for their application to appropriate water of the Rayado River filed with Territorial Irrigation Engineer October 7, 1906. The Court of the Fourth Judicial District ordered on March 4, 1908, that this office make a hydrographic survey and furnish it with a report upon same whereby it might make from the data thus received an adjudication of this water in accordance with the laws of the Territory.

As a supplement to this report we are attaching for your information a copy of the filings made for waters of this river in the office of Territorial Irrigation Engineer as well as Territorial Engineer. These applications or filings give the date the application was received, whether or not it was approved, amount of water claimed, land to be irrigated, amount of power to be developed, in fact, they are exact copies of these filings and the action taken on each.

Before taking up the body of this report, which deals with ditches and lands irrigated, it might be well to outline briefly the legend of characters used. The location of various weirs and gaging stations upon the ditches and river is represented by a star, the acreage and crops produced are designated by figures, the comparitive elevation of the plaintable stations by a circle and elevation. Denomination used when specifying amounts of water is in second-feet, the rainfall in inches. In case of floods or unusually high water lasting for only a short period for an hour or more the discharge is not included in the average flow, mention, however, is made of same as information as to storage possibilities.

CAUSES FOR SURVEY.

This survey was largely made necessary through the Farmers' Development Company, which Company themselves, and their predecessors had filed notice of intended appropriation of all regular and flood waters of the Rayado River under the Law of 1905 for the purpose of irrigating ten thousand acres of land, thus, it was necessary for this concern to know what amount of irrigation rights there was upon this stream in order that they would know the amount of water their rights would entitle them to so they could determine the amount of water that was left for their project.

This project is the first project of any size contemplated for the use of flood waters from this stream, they having already constructed one of their reservoirs and the question of the construction of the second depends largely on whether there is sufficient water for the construction of the second reservoir.

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The computation of weir and area discharges was done in this

office. The areas were obtained by planimeter and all checked twice and as many as six times where the check was not within the prescribed per cent.

During a good portion of the season most of the water is taken out by the upper ditches and the lower ditches depends largely upon the rains and floods. Very little water if any, is used in the various ditches during January, February, March and the water flowing in the river during this period is stored in the Farmer's Development Company's Reservoir No. 2.

BRIEF DESCRIPTION OF WATER FILINGS.

In order to set forth clearly in this report the status of the water right filings, we will briefly recite in abstract form the filings, as recorded in the Territorial Irrigation Engineer's as well as the Territorial Engineer's office, made upon the Rayado River.

On October 7, 1906, M. N. Mikesell filed in the office of the Territorial Irrigation Engineer, as required by Chapter 102, Section 19 of the Laws of 1905, a notice that he intended to appropriate all of the normal flow and flood waters of the Rayado River heretofore unappropriated and he filed with the Territorial Irrigation Engineer, as required by said section, on the 25th day of January, 1907, maps and surveys covering Reservoir No. 1 and ditch, same was approved by David M. White, Territorial Irrigation Engineer.

On January 14th, 1907, he filed an additional notice in behalf of the Farmer's Development Company, a Company which had been organized to develop his project, setting forth the fact that they desired to appropriate for irrigation purposes a site for their Reservoir No. 2 and before he was able to file his maps of the reservoir, ditches and plans and specifications as required by Chapter 102, Section 19 of the Laws of 1905, the Irrigation Act of 1907 was passed, thus, making it necessary for him to complete his filings under the Irrigation Law of 1907.

It was thought best by the Territorial Engineer, that for the other works connected with this irrigation project, notice of appropriation of said waters being made by M. N. Mikesell in the office of the Territorial Irrigation Engineer on January 14, 1907, should be supplementary filed on in accordance with the irrigation law of 1907 (See Chapter 58, Sec. 49, Laws of 1907) and on the 10th day of June, 1907, the Farmer's Development Company filed an application for a permit to appropriate water in connection with notice filed with Territorial Irrigation Engineer on October 7, 1906, and supplementary notice of January 14th, 1907. This

application calls for water sufficient to irrigate ten thousand acres of land by the diversion of seventy second feet and storage of 15,000 acre feet. This application was approved on the 31st day of August, 1907. Certificate of construction issued on the 16th day of February, 1910.

On March 31, 1908, he filed in the office of the Territorial Irrigation Engineer a notice that the water filings on the Rayado River acquired by him had been transferred by him to the Farmer's Development Company that was organized for the purpose of developing this project.

On May 27, 1907, the Rayado Land and Irrigation Company filed an application for a permit to appropriate the waters heretofore covered in the notice and project of the Farmer's Development Company. This application has not been acted upon by the Territorial Engineer on account of these prior filings.

On July 23, 1907, the Farmer's Development Company filed applications numbers 66 and 67 as supplements to their notice dated October 5th and filed in the office of the Territorial Irrigation Engineer on October 7th, 1906. These applications covered reservoir sites for additional storage in the mountains and were designated as Reservoirs 3 and 4. These applications have not been acted upon on account of prior filings.

On August 5, 1907, an application was filed for a permit to appropriate water for irrigation and domestic purposes by Charles Springer and Company, said application has not been acted upon on account of prior filings.

On August 29, 1907, Charles Springer and Company filed in the office of the Territorial Engineer an application for a permit to appropriate the waters of springs on land belonging to applicant in Agua Fria Park for irrigation of 2000 acres of land and for power. This application has not been acted upon on account of prior filings.

An application No. 227 by George H. Webster, Jr., for waters of the Rayado River for power purposes, filed on January 19, 1909, has been approved by this office, there being no conflict with the use for power and irrigation. The rights under this application have been assigned to the Rayado River Power Company of Cimarron, New Mexico. Same has also secured an extension of time.

No. 238 by Ernest H. Fisher, was filed February 10, 1909, for practically the same proposition as application No. 227, but as sa mewas subsequent in time, it has not been approved owing to the prior filing of Mr. Webster.

Application No. 242 by the Farmer's Development Company for seepage from their Reservoir No. 2 and Heck Arroyo upon

which the reservoir has been located has been approved by this office, in accordance with Chapter 49, Section 53, Laws of 1907, where owners of an irrigation work has the first right to file upon water appearing as seepage from the works which they have constructed.

Application No. 264 by George H. Webster for power filed on April 7, 1909, has not been approved owing to prior filings on the same reservoir site, however, the construction of this reservoir would increase the amount of power that could be generated through permit No. 227 and without detriment to the irrigation rights below. Whether the prior filings upon a reservoir for appropriation of water for irrigation purposes when there is no water available for such purposes would prevent a subsequent filing and approval of same reservoir for power purposes.

Application No. 351 by the Farmer's Development Company to enlarge the capacity of their reservoir No. 2 in order to store the waters approved for Reservoir No. 1 by the Territorial Irrigation Engineer, was filed November 18, 1909, and publication of notice has recently been ordered. As this application is for no additional water, merely being a place of change of storage of water heretofore acquired, it will probably be approved by this office.

CONCLUSION

It seems to be the consensus of opinion among the farmers of the Rayado Valley that the flow of the river for a number of years past has been more intermittent, that the floods have been more frequent and that the average flow has been less uniform in quantity. Up to a few years ago there had been a number of beaver dams across the river and tributaries in the mountains and these have all been destroyed in recent years. These dams served in a small way the capacity of equalizing reservoirs. If this water could be stored in the mountains, the flow of the river would be equalized and controlled to the needs of the water users.

There is an application in this office by the Farmer's Development Company, a copy of which is appended hereto, for reservoir sites in Agua Fria Park which they have designated as reservoirs Nos. 3 and 4. If these reservoirs sites could be utilized the water supply of the Rayado River would be amply sufficient for the needs and the uses of the farmers along the valley, allowing considerable quantities to be stored during the winter months and flood times and used in the spring and summer for the irrigation of the already irrigated lands and also allow for the cultivation of new lands.

The runoff from the South Fork or Agua Fria Creek is much

slower and uniform than that of the North Fork owing to the heavily timbered character of the former. Along the South Fork are a number of springs which are formed by the seepage from Agua Fria Peak and other mountains surrounding. Some evaporation is caused by the cattle trampling these springs.

Another source of loss by evaporation is the stretch of sixteen miles from the junction of the North and South Forks to the opening of the river into the valley at Abreu's Ranch. On July 9, 1908, a measurement was made of the water flowing at the junction of these forks and found to be 17.1 second feet and on June 28, a few days previous the river was measured above the intake of all ditches or about sixteen miles below the junction and found to be 12.32 second feet. As the weather conditions were the same when these two measurements were taken the loss was 4.78 second feet between the two points measured. This loss was due to evaporation and seepage at the lower end. We are of the opinion that the greatest loss is by seepage between the intake to the Farmer's Development Company and where the river leaves the canon. This could be helped by the construction of a ditch up to the mouth of the canon.

The storing of this water at the head of the river would reduce very greatly the loss of 4.78 second feet or 35 per cent of the flow at the junction. When the water was needed for irrigation it could be let down in such large quantities as to allow a loss of from 15 to 25 per cent only.

Below the Abreu Lower Ditch there is a spring in the river bottom and seeps also appear in this section from Morris Arroyo and Reservoir No. 2 of the Farmer's Development Company which add a slight flow to the river. The seepage is represented by the results of the gage reading on the river at Miami Ranch. This small amount of water, however, does not materially enter into the water supply of this river for irrigation purposes. However, the irrigation under the Farmer's Development Company will increase the flow in the long arroyo through which Manuel Valdez' receives his supply of water.

By adding the discharge of all the ditches and intake canal and and deducting for the water wasted back into the river above Abreu's we find that there is a loss of from 1 to 2 second feet in the river from seepage, this does not take into consideration that there is some water seepage into the river from the sides caused from the irrigation of lands along the edge of the river.

The application of George H. Webster or that of E. H. Fisher for the use of water from Agua Fria for power purposes will be

a factor in conserving the waters at the head of this river owing to the intended use of iron or stave pipe through a course of three or four miles.

In this Territory we are limited on water and our development along the lines of irrigation farming will of course be limited to the extent we are able to conserve our water supply and in this connection it must be remembered that the conserving of water not only means the construction of reservoirs but also the conserving of the moisture after applying it to the soil. Thus it is apparent that great care should be used in the conserving of the moisture after irrigation in order to get the greatest beneficial results. To illustrate how water is wasted on the land where it is not properly cared for I will copy some of the experiments made by the U. S. Agricultural Department on the evaporation of moisture from soil, these tests showed an evaporation in fourteen days of 23 per cent of the water applied on the bare soil that was not cultivated; 6.6 per cent where the soil was thoroughly cultivated four inches deep; and only 1 per cent where the soil was cultivated 10 inches. Therefore, too much care can not be taken in the proper handling of the soil after irrigation and the amount of water adjudicated to the specified land should not be more than necessary when the soil and water have been properly cared for.

The Hagerman Canal below Roswell, N. M., is irrigating over two hundred acres for each second foot of water used and they are getting greater results than where more water is used. The altitude is lower and farther south where the evaporation is greater and the rainfall less so that the duty of water in Colfax County should be much higher than there.

As heretofore mentioned where the rainfall is as heavy as during the period of our investigation it appears that the greatest need of irrigation water occurs in the beginning of the season and with proper care of the moisture by cultivation the duty of water under this stream system should nearly reach that of California which ranges from several hundred to a thousand acres per second foot.

The cost of this survey was $1535.04, which should be assessed to those securing water and returned back to the Territory.

Yours very truly,

VERNON L. SULLIVAN,

Territorial Engineer.

ITEMIZED COST OF RAYADO HYDROGRAPHIC SURVEY.

Warr. No.	In favor of	Amount.
14680	R. L. Cooper	$ 231.05
14749	A. J. Senseman	84.66
15354	J. W. Lewis	99.45
15565	V. L. Sullivan	102.00
15717	V. L. Sullivan	50.00
15864	V. L. Sullivan	55.78
15922	A. J. Senseman	50.00
16015	V. L. Sullivan	28.00
16048	A. J. Senseman	50.00
16153	V. L. Sullivan	57.65
16381	C. D. Miller	111.00
16380	W. H. Sutton	12.70
16557	V. L. Sullivan	25.70
16798	V. L. Sullivan	5.00
17041	V. L. Sullivan	5.00
17430	V. L. Sullivan	260.00
17430	V. L. Sullivan	242.05
17041	V. L. Sullivan	65.00
	Total cost of Survey	$1535.04

APPEALS FROM DECISION OF THE TERRITORIAL ENGINEER.

It is very gratifying to the Territorial Engineer, in spite of the fact that the Engineer's powers are most safeguarded, for appeals can be taken not only from any action but any non-action that he may take or fail to take, without the cost of any bond, to the Board of Water Commissioners, where there is no cost connected with the hearing; that of all the appeals taken from the Territorial Engineer's decision, with the exception of four, are pending before the Board of Water Commissioners, District Court or have gone to the Supreme Court. Three of the above four, the Farmer's Development Company, the Rock Island Railroad Company and the Aubrey-Crozier Cases were settled by the Board of Water Commissioners by practically sustaining the Territorial Engineer. The other, the Lyman H. McNett case, the Board of Water Commissioners reversed the Territorial Engineer on the ground that spring water was not subject to appropriation and an appeal was taken to the District Court, but later a settlement was made by the buying off of Mr. McNett's rights, which the Board had rejected through their reversal, by having a third party pay him eight thousand dollars for his water rights, homestead, and desert claims as is of

record in applications Nos. 418, 419 and 420. The argument that "The most important results of storing and utilizing the waters (spring waters) for irrigation upon the uppermost lands first and in turn for the next lower lands, etc.," does not harmonize with the decision of the Supreme Court that seepage or return waters are not subject to appropriation. The Territorial Engineer being of the opinion that spring waters *are subject to appropriation* where they flow off the land of the owner and form a part of a supply of natural streams, any other version would destroy the right to appropriate the normal flow of the rivers of the Territory as the normal flow of all rivers is largely made up of spring waters.

The Territorial Engineer was very sorry that this case was not carried to the Supreme Court for we believe that the Engineer's action would have been sustained. Some claim there would be a large portion of the waters return. This is true when an excess amount of water is used, but when economically and scientifically used, very little returns.

The only case in which the Territorial Engineer has been reversed by the Supreme Court was the Vanderwork case where the applicant asked to appropriate seepage water or percolating waters. The Court held that such waters are not subject to appropriation. The *law should* be *changed* in this regard, for, in *equity* and in the *interest* of *development,* such waters should be subject to appropriation. When the above decision was made we received numerous letters from the Pecos Valley setting forth how seriously the decision effected them as this office had approved several such applications where no protests had been made and a large amount of land is now being reclaimed and irrigated from such source. An example of such development is described and illustrated in the "Hardwich application" under small irrigation projects. *Two results* are obtained in the appropriation of such waters. First, water to *irrigate other lands,* second, the *reclamation of the land* upon which the water rises through the drainage of same.

We take the liberty of quoting a statement made by a well known irrigation attorney of Colorado regarding the appropriation of such waters.

"Referring to the rulings made by some of the Courts that an appropriation cannot be made of waters running in an arroyo or depression in the land caused presumably by irrigation on higher ground or water derived from that source, it appears to us that such a rule would be very illogical and also a very harmful one for the reason, if carried to its logical conclusion it would mean that no water could ever be appropriated except from those streams

which have existed from the beginning, practically, or at least, from the time of the present formation of the lands in the arid states.

"It is a well known fact that not only lakes are appearing and disappearing, regardless of artificial irrigation, but that whole rivers and streams are disappearing and new ones are being formed in other places, and in reason, there should be no difference as to the results whether these streams are formed from natural causes like changes of the rain-fall, precipitation, snow or earth slides, drifting of sands or other reasons which cause the streams to disappear or begin in new places and, for this reason, it appears to us that those in control of irrigation matters should recognize a formation of any new streams and lakes and endow them with the same possibilities and with the same rights as other streams."

The fundamental principles of the irrigation law, we believe, is the *protection* of *valid rights* and the *furtherance* of the *greatest development* of our water resources. Any law that would tend to allow people to hold the right to water without their putting same to a beneficial use is contrary to our statutes; contrary to the later court decisions and *absolutely contrary* to the development of our water resources.

We are fully in accord with the argument of the Supreme Court in remanding to the District Court for further consideration the Hinderlider vs. Norton, et al. case.

There have been filed, even within the last four years, applications for permits to appropriate public water covering an intended area several times greater than the entire water supply of the whole Territory would irrigate.

The following is the decision in full:

OPINION.

Abbott, A. J. We think the decision of the District Court was justified and probably required by the statements of facs on which it was heard, but we find that statement very incomplete and unsatisfactory as the basis of a decision in such a cause. If it were a matter of private interest alone, a question simply between two rival applicants for the right to use the waters in question, we should content ourselves with affirming the decision of the District Court. But the question is much broader than that, and includes the public interests as well, by the terms of the statute under which the Territorial Engineer, the Water Commissioners and the Courts have jurisdiction of the subject matter.

The view apparently adopted by the Water Commissioners in

their decision that the power of the Territorial Engineer to reject an application, "if in his opinion the approval thereof would be contrary to the public interests," Sec. 29, is limited to cases in which the project would be a menace to the public health or safety, is, we think, not broad enough.

There is no such limitation expressed in terms in the statute and we think not by implication. The declaration in the first section of the statute that the waters therein described are "public waters" and the fact that the entire statute is designed to secure the greatest possible benefit from them for the public, should be borne in mind.

It is, for instance, obviously for the public interest that investors should be protected against making worthless investments in New Mexico, and especially that they should not be led to make them through official approval of unsound enterprises. If there is available, unappropriated water of the La Plata River for only five or six thousand acres of land, it would be contrary to the public interest that a project for irrigating fourteen thousand acres with that water should receive an official approval which would, perhaps, enable the promoters of it to market their scheme, to sell stock reasonably sure to become worthless, and land which could not be irrigated, at the price of irrigated land. Such a proceeding would in the end result only in warning capital away from the Territory. The failure of any irrigation project carries with it not only disastrous consequences to its owners and to the farmers who are depending on it, but besides tends to destroy faith in irrigation enterprises generally.

It may be said that the Territorial Engineer could have approved the Hinderlider project for the number of acres which could be irrigated from it. He makes it clear, however, from his report, that the cost of the works for that project would be much greater than for works fit to irrigate the land which could really be irrigated from the available water there.

While that element is not conclusive on the question of public interest, we think it should be taken into account. It may be that, of the five or six thousand acres there which it is claimed can be irrigated at an expense of ten or twelve dollars per acre under the Young-Norton project, a thousand acres could be irrigated at five dollars per acre because of its being at a lower level or nearer the water than the other land. But that would not justify refusing to the owners of the other four or five thousand acres the privilege of irrigating their lands, under a plan which would increase the cost of irrigation to the owners of the thousand acres. And the

same may be said of the Hinderlider project as compared with the Young-Norton project. The mere fact that irrigation under the former project would cost more per acre than under the latter is not conclusive that the former project should be rejected.

But the attempt to cover too much land may have gone so far that the cost of irrigation under that project would be so excessive that the owners of land under the project could not pay the water rates and farm their lands at a profit. The statute provides that the charges for irrigation shall be "reasonable" but what is reasonable in any case must depend largely on the cost of constructing and operating the irrigating works.

The agreed statement of facts on which the judgment of the District Court is based may be held to include by reference the findings of the Territorial Engineer and those of the Board of Water Commissioners although it is not made clear that they are to be part of the stipulated facts, as it should be if that was the intention of the parties. Even if they are to be considered we are still without proper material for a conclusion. The Territorial Engineer finds that the Young-Norton project is "better within the available water supply," but that furnished no reason why he should no have approved the earlier project for the amount of land there is water for. He does not find that the cost of water under the Hinderlider project would be prohibitory or excessive, but only that it would be considerably greater per acre than under the Young-Norton project. The price which the owners of the land can afford to pay for irrigation must depend in part on the use to which it can be put.

For ordinary farm crops forty dollars per acre for water might be prohibitory, while for fruit or garden truck in certain localities it might not be excessive. But neither the Territorial Engineer nor the Water Commissioners have touched on that point in their reports. The Territorial Engineer apparently bases his approval of the latter project as against the former on the fact that Young and Norton and their associates are actual settlers on the land while Hinderlider is not a resident of the Territory. We do not say this circumstance should have no weight in determining the question of the public interest, but we think it should not outweigh the other considerations to which we have referred.

On the other hand, the Water Commissioners find that there is available unappropriated flood water of the La Plata River but do not find whether there is enough for fourteen thousand or any number of acres, nor whether the cost of the Hinderlider project

would be such as necessarily to make the irrigation charges under it prohibitory or excessive.

We find in Armijo vs. County Commissioners, 11 N. M. 294, a precedent for the course which we think it advisable to pursue in this matter.

The case is therefore remanded to the District Court to obtain facts through the Water Commissioners and Territorial Engineer, or by argument of counsel or otherwise essential to a satisfactory decision of the cause. It is not meant to limit the District Court to the precise points we have named, but to leave the matter open for the introduction of any facts bearing on the question of public interest. And the judgment of the District Court is set aside in order that it may on further consideration render such decision as it shall deem proper.

IRA A. ABBOTT,
Associate Justice.

We concur: William H. Pope, C. J.; Frank W. Parker, A. J.; Merritt C. Mechem, A. J.; Edward R. Wright, A. J.

McFie, A. J., having heard this cause in the District Court did not participate in this decision.

BOARD OF WATER COMMISSIONERS.

(By Charles Springer, President.)

The Board of Water Commissioners has had considerable work during the past two years, acting upon appeals from the Territorial Engineer's decisions, and some very important rulings have been made. Material has been collected during the meetings of the Board in such form as to be later of service to the District and Supreme Courts where six appeals are now under consideration. The decisions of the Board are made after thorough investigations as to the facts and a comprehensive knowledge of the rules and regulations of the Territorial Engineer, being closely in touch with the workings of that office. The members of the Board have made a particular study of irrigation conditions, irrigation laws, and the decisions of the courts of the semi-arid states and of the United States, upon this subject, and so far the decisions rendered by the Board have been sustained by the District and Supreme Courts of the Territory.

Six quarterly meetings of the Board were held in the office of the Territorial Engineer and a special meeting was held Jan. 13, 1909, in Farmington on the Hinderlider-Young & Norton case

where a number of witnesses were introduced and oral testimony taken. This case was one of the most important considered by the Board.

On February 1st, 1909, the Board convened in Santa Fe for the purpose of acting upon the Hinderlider-Young & Norton case and the transaction of other business. This case was on appeal from the Territorial Engineer's decision in approving an application by Young & Norton filed in the office of Territorial Engineer, December 20, 1907, applying for waters of La Plata River in San Juan County, N. M., for the irrigation of about 5000 acres of land. The appellant, M. C. Hinderlider, had previously filed with the Territorial Engineer an application for waters of La Plata River for the purpose of irrigating 14,000 acres of land.

The Engineer approved the subsequent filing of Young & Norton and rejected the application of M. C. Hinderlider on the grounds that the project covered by the subsequent application was more within the water supply and therefore more feasible, and that it would be more to the public interest because it might enable farmers to purchase water at a lower price than under the Hinderlider project. From this decision Hinderlider appealed.

After several hearings and study of briefs and authorities, the Board reversed the Territorial Engineer directing the approval of the Hinderlider application and the rejection of the Young & Norton filing which he had approved. This decision is important as it undertakes to interpret the meaning of Section 28, Chapter 49, Laws of 1907, as to the power of the Engineer to reject applications for certain reasons.

"The Territorial Engineer may reject an application if he finds that the project would be contrary to the public interest in that it would be a menace to the public health or safety and not for the reason that another project described in a subsequent application would be more advantageous to owners of private property in the neighborhood.

"The same principle should govern with respect to applications to appropriate water under the New Mexico statute as in application for entrys of lands under the public land laws of the United States; the first applicant making a filing in compliance with the law should be recognized and if he shall subsequently comply with the regulations and statutes, his application should be approved unless it is, in the opinion of the Territorial Engineer, a menace to the public health or safety or unless there is no water available under the application."

This case was appealed to the District Court which sustained

the Board; thence to the Supreme Court of the Territory where it was remanded to the lower court for further consideration.

At this same meeting the Board considered and disposed of the appeal of E. O. Dean and J. M. Hewes from the approval of an application by Fred Vanderwork applying for permit to appropriate spring water appearing on the appellants land. In this case the Board held: "This water on the land of Hewes and Dean is not subject to appropriation without their consent so as to deprive them of the use thereof upon their land," and that, "an application is not required for the appropriation and use of the water of springs or surface waters upon the land of the person making the appropriation."

This case was appealed to the District Court and later to the Supreme Court and in both courts the action of the Board was sustained.

The meeting of May 4th, covered routine business and the appeal of Jay Turley against the approval of change of point of diversion by C. W. Thuringer on application No. 69. The Board sustained motion by counsel for appellee to quash owing to the notice of appeal from the Engineer to Board not having been made in accordance with the law.

On August 10, the Board met to consider business argued at the previous meeting. Decisions were made on appeal of Sidney Willcoxon on application of M. B. May stating that the approval of the Territorial Engineer on this application protected prior valid rights and gave no grounds for appeal.

Appeal of Aubrey & Crozier on their application No. 220 from decision of Engineer restricting the use of water to New Mexico lands although nothing was mentioned in application as to intended use on Arizona lands. This question brought before the Board the important point of inter-state appropriations. There being no precedent on this point in New Mexico cases, the Board asked opinion from the Attorney-General Hon. F. W. Clancy. The decision of the Board practically sustained the Territorial Engineer modifying the wording of the approval only.

"It may be true that the waters of the Gila River are subject to appropriation and reasonable use by the citizens of either territory but in this case the Board is not called upon to express an opinion upon that question. The authority of the Territorial Engineer of New Mexico does not extend beyond the boundary line and he certainly has no authority to grant a permit to appropriate water for use in irrigating lands or for other purposes in Arizona. This is necessarily so because he has no authority

to go into Arizona and ascertain whether or not, as between an applicant and other water users, there is any unappropriated water of the Gila River available for the purpose of such application. . .

"The Board is of the opinion that the Territorial Engineer can not properly or lawfully consider or act upon the statements on the map with reference to the extension of the canal into Arizona or as to the land in Arizona to be irrigated therefrom, and that he must treat the application as though such statements and surveys were omited from the map. In other words, he must treat it as an application solely for a permit to appropriate water for the irrigation of certain lands within the Territory of New Mexico."

Appeal from decision of Territorial Engineer on application No. 157 of Lyman H. McNett for waters of Apache Tejo Springs, by the Victorio Land & Cattle Co. upon whose land the springs arose was next considered. Decision of Board was to reverse the Territorial Engineer and direct the rejection of the application of Mr. McNett. The opinion of the Board in this case is so interesting and important in its bearing upon many vital questions connected with irrigation laws, that I feel justified in quoting the following extracts from it:

"The right to the use of the waters of private springs and of percolating water and surface or flood water in or upon land under private ownership, belongs to the owner of the land, at least to the extent which he can beneficially use the same upon or in connection with his land. This is a property right incident to the ownership of land.

"It is not founded upon the doctrine of riparian rights, which applied to waters not necessarily having their source upon the owner's land but to waters of a stream flowing through or along the boundary line of the land.

"The right to the use of the waters of springs and percolating water is founded upon the theory that such water is part and parcel of the land and estate.

"It is contended that unless the waters of private springs be subject to appropriation by the public the development of the country will be retarded and that as a considerable portion of the waters of the Territory come from private springs there will be little water subject to appropriation under the statute. Even if this were true it would furnish no valid reason for undertaking to deprive citizens of their property rights without just compensation; but it is not true. Generally it is not practical to use waters of a spring so as to prevent a portion of it from flowing

down the natural grade enter by following the surface depression or channels or by percolation, in to the natural water courses. Owners of springs do not use the waters all the time and owners of different springs do not all use water at the same time.

"The result is that even if a country where irrigation from springs is generally practiced there is a constant flow of water from the many springs into public water courses in addition to flood waters from rains and melting snows.

"The Courts and statutes of the states in the semi-arid region where irrigation is the most important factor in agricultural development have departed a long way from the principals of the Common Law to establish a new doctrine of prior appropriation. It is said there has been a sort of evolution of law to meet the new conditions and necessities of irrigation.

"But to carry the doctrine of appropriation to the extent contended for by counsel for applicant would not be conducive to the highest development of the natural resources of the country. On the contrary it would result in depriving much of the land of the water which should naturally be used for developing its fertility. If the water from springs, rains and snows is to be utilized to the best advantage of the whole people it should be first applied to the irrigation of the land where it first appears, the upper valleys of the several stream systems. When so applied a considerable portion of it is returned to the streams either by direct runoff or by percolation. Even that which is evaporated from the surface and through trees and plants is not lost to the lower owners because it increases the humidity of the atmosphere and undoubtedly causes a better distribution of the rainfall even if it does not cause an actual increase in the annual precipitation.

"But the most important result of storing and utilizing the waters for irrigation upon the uppermost lands first and in turn for the next lower lands, is in preventing the erosion of the soil. In the natural condition of the Rocky Mountain country before the destruction of the forests, undergrowth, marshes, beaver dams and luxuriant vegetation of the upper valleys, the water from rains and snows penetrated the soil to a much greater extent than at present. The floods were not so great and the flow of the streams was more constant. The storage and use of the waters of head springs and small streams of the upper valleys was more constant. The storage and use of the waters of head springs and small streams of the upper valleys would tend to restore natural conditions.

"It is well known that under present conditions the erosion

and damage from floods are increasing from year to year at an alarming rate. While this is the case to some extent in other parts of the United States, it is more noticeable and the damage and danger are vastly greater in the Rocky Mountain region than elsewhere by reason of the heavy grades of the slopes and rapid currents of the streams flowing away from the mountains.

"There are many instances recorded of great damage and even the utter destruction by erosion and floods of once fertile districts; where the soil of the upper watershed has been eroded away down to the rocks, a great decrease in precipitation is reported on water sheds so denuded of soil and vegetation and the silt and debris have destroyed the fertile valleys below.

"If the people of the Rocky Mountain region are to avoid similar disaster they should endeavor by every possible means to prevent erosion. It is not enough to preserve the forests from further destruction. The washing of arroyos, gulches and channels of small streams in all the valleys and slopes has advanced to such an extent that they must be dammed up wherever possible and the water distributed over the surface.

"If the evolution of the doctrine of prior appropriation was necessary to meet the exigencies and requirements of the people in the Rocky Mountain region in order that the waters might be utilized for irrigation, this doctrine should be modified if necessary, to meet the new conditions and dangers and so as to permit the use of the waters to the best advantage for the benefit of the people of the whole country."

At the meeting of February 8, 1910, the Board heard the appeal of Henry Tipton against approval of application by F. E. Downs for waters of Pecos River near Carlsbad. The Board after considering the case and argument of counsel dismissed the case finding no grounds for appeal. This case has been appealed to the District Court.

Meeting of May 3rd, brought considerable business before the Board in appeals on applications No. 244, by the Placita Ranch Co.; 320 by A. A. Jones, and 341 by Board of Trustees Town of Las Vegas, which were heard by the the Territorial Engineer on January 4th, 1910.

In matter of the appeal by the Board of Trustees on approval of application No. 244 of the Placita Ranch Co. for waters of Sapello River, the Board dismissed the case on account of failure of appellants to serve notice upon appellee within time prescribed by law.

In the matter of the appeal of A. A. Jones from action of Ter-

ritorial Engineer in rejecting his application No. 320, because the Territorial Engineer considered the project infeasible and that the maps and field notes filed with the application were not made from actual surveys and measurements, the Board sustained the action of the Engineer.

The Board held: That under Sec. 24, Chapter 49, Laws of 1907, and the rules and regulations established by the Territorial Engineer in accordance with that Act, an applicant shall furnish at the time of filing his application data necessary for the proper description and limitation of the right applied for together with such information, maps, field notes and specifications as may be necessary to show the method and practicability of construction; which maps and field notes must be made from actual surveys and measurements.

"No application will be accepted or given any priority unless accompanied by maps and field notes made from actual surveys and measurements, showing sufficient data to identify and limit the right applied for and the method and practicability of construction.

"In the practical administration of the Territorial Engineer's office any other rule would result in endless confusion and open the door to the filing of numerous applications for purely speculative purposes or for holding up and blackmailing persons engaged in making surveys and measurements preparatory to filing *bona fide* applications."

The Board also held that the question as to whether the maps and field notes were made from actual surveys and measurements can be raised by any one interested at any time while the matter is still pending in the Territorial Engineer's office and that if he discovers they were not made from actual surveys and measurements, he should not return them for correction but should reject the application.

Action of Territorial Engineer in approving application No. 431 by the Board of Trustees of the Town of Las Vegas, excepting the appropriation of waters of the Sapello which had been previously applied for by the Placita Ranch Co. under No. 244, was modified so as to allow the Board of Trustees to appropriate water of the Sapello in event that it should be found that water was available over and above the appropriation of the Placita Ranch Company.

All three of the above cases were appealed to the District Court.

DRAINAGE.

Generally speaking, the future State of New Mexico has very little drainage work to be done. The principal places requiring drainage are located in the Rio Grande and Pecos Valleys. The former is caused by the seeping of water into the lowlands lying adjacent to the Rio Grande River from waters of the Rio Grande higher up, while in the Pecos Valley the swampy land is caused by the invariably poor casing of artesian wells and the excessive irrigation of lands higher up. In a great many of the wells the casing is not extended down to the impervious strata while in many other cases the casing has had poor connection and is rusting out and now leaks, thus, allowing the water, under the great pressure of the under strata, to seep through and causing considerable swampy ground.

The remedies in the former case have heretofore been pointed out in an address at the National Irrigation Congress at Albuquerque: The straightening of the river; the confining of the channel, thereby increasing its velocity and scouring out the bottom of the channel, thus, lowering the water table and the direct drainage by the construction of drainage canals emptying into the river lower down and running up the river to a sufficient distance so as to drain the swampy lands. There would evidently be reclaimed from this one valley alone many thousand acres of land. A large portion of this land has been irrigated at one time or another.

The valley has considerable swampy land and I feel quite safe in saying that the water lost by evaporation from a given area of swampy ground, where the water-table is just above the surface, if economically used will irrigate several times that area. Thus in conserving the water of the valley which is now lost by evaporation from swampy land and the broad crooked river itself you would increase the stream's flow sufficiently to provide water for irrigation for all of its lower lands, and still have water to spare.

In the Pecos Valley remedies should be taken, both by the proper casing of the artesian wells and the drainage of these low swampy lands directly to the Pecos River. The prompt drainage or use of these waters will prevent to a large extent the increasing of alkali in the water for if these waters are allowed to stand and half of the water is evaporated the remaining water will have double the alkali.

THE RE-APPEARANCE OF LOST WATERS.

The formation of our Territory is more or less broken and the water in many of our streams sinks, sometimes to reappear in the river below and other times to form underflow and artesian basins. An illustration of the re-appearing of such water is given in the following report:

INVESTIGATIONS ON THE PECOS RIVER BETWEEN RIBERA AND FORT SUMNER, N. M.

(By G. H. Russell, Junior Engineer, U. S. Geological Survey.)

The investigations were made for the purpose of ascertaining the amount of water sinking into the river and as to whether it reappears farther down the valley. The trip was made between March 9 and 16, 1910. Starting at Ribera, the trip was made more or less continuously along the river as far as Los Colonias. At Los Colonias it was found impracticable to follow the course of the river, and between there and Santa Rosa the journey was made across the mesa to the west of the river. From Santa Rosa to about four miles below Puerta de Luna, the course of the river was followed, and after that was not touched again until about five miles above Ft. Sumner. For nearly the entire distance the river flows through strata of red standstone, varying in thickness from a few feet to several hundred. Strata of gypsum and limestone overtop the sand stone generally on the upper portion of this section. The gypsum and limestone strata tend to dip to the east, and at Colonias are overtopped by thick layers of standstone intermixed with thin layers of gypsum. This condition obtains also for the section below Santa Rosa. The river-bed throughout its entire course consists of sand, gravel and boulders. Quicksand is common. The boulders appear in frequent riffles and the sand in the quieter portions of the stream. In general, the valley lies between steep bluffs, ranging about 500 feet in height. Lying back of the top of these bluffs is mesa land, which has been considerably eroded, in places being so cut up by canons and gulches as to make it quite rugged and difficult to get through. The mesa is covered with a thin coating of soil, on which a scant growth of gramma grass and scattering bunches of low pines and oak exist. There is very little habitation on it, as it is too dry for farming, and even water for domestic purposes must be brought from the river. The canons are intermittent, carrying only surface water from the heavier rains. The princi-

pal use of the mesa is for sheep and goat range, and to this industry seems best adapted.

There are, however, tracts of open level country, which would be admirably adapted to irrigation were the water brought upon it. The feasibility of getting water to this elevation above the river is rather improbable, owing to the necessary length of ditch and the rugged and stony character of the country through which is would be brought. This, however, can only be ascertained with assurance by the proper surveys.

The valley between San Miguel and La Cuesta has an average width of about three-fourths of a mile, and is farmed in a crude way. Water for irrigation is taken from the river. The farms are divided into small tracts and the labor is done largely by hand and antiquated methods. The principal crops are oats, beans, corn, and Mexican peas.

The river between La Cuesta and Anton Chico flows through a narrow box canon and affords a number of good sites for reservoirs. Between Anton Chico and Los Colonias the valley broadens again, the bluffs becoming less precipitous. A small section is irrigated at Anton Chico and another at Los Colonias. From Los Colonias to Santa Rosa the valley is narrow. At Santa Rosa it broadens out considerably, narrowing up again about five miles below, and then gradually broadens and becomes shallower until at Ft. Sumner the water flows among sand-bars and the banks slope gradually back to the uplands.

The Gallinas River, which enters the Pecos near La Junta, is the principal tributary and the only one carrying perennial flow. This flow, however, is small, and is derived from a series of springs about eight miles above its mouth. The regular surface flow of this river disappears some distance above the springs. The mouth of the Gallinas was not visited on this trip. Residents, however, stated that little or no water was flowing there.

The discharge measurements were taken successively down stream excepting the measurement taken four miles below La Cuesta. This measurement was taken while going from Anton Chico to San Miguel. Having lost the way and strayed into a canon at this point, it was thought well to take a measurement while there, as the river is almost inaccessable for several miles at this section. The measurements I feel are quite accurate. They were always taken at chosen sections. The following is a list of discharges, giving date and distance below Ribera:

	Place	Below Ribera.	Discharge.
March 11	San Miguel	½ mile	Sec. ft. 92
March 11	(1 mile above La Cuesta)	14 miles	" " 87
March 10	(4 miles below La Cuesta)	19 "	" " 89
March 12	(1 mile below Anton Chico)	30 "	" " 81
March 12	(1 mile above La Cueva)	38 "	" " 77
March 13	(1 mile below Los Colonias)	46 "	" " 20
March 13	(Santa Rosa)	65 "	" " 11
March 14	(6 miles below Santa Rosa)	71 "	" " 86
March 14	(4 miles below Puerta de Luna)	87 "	" " 88
March 16	(At cable Sec. Ft. Sumner)	120 "	" " 85

The water probably begins to sink near Anton Chico. However, the disappearance does not become noticeable until it reaches La Cueva. Between La Cueva and Los Colonias the river flows over a strata of porous limestone into which the stream gradually disappears. At normal stages the water disappears a mile or more above Los Colonias. A day or two before these measurements were started, however, there was a small rise in the river caused by melting snows in the lower mountains, and three days before the measurement was taken at Colonias no water was passing that point. The measurements below Santa Rosa were made ahead of the rise.

Considering the river as being in a fairly constant stage during measurements from Ribera to Los Colonias, and likewise from Santa Rosa to Ft. Sumner, we will refer to the above data.

The difference between the discharge at four miles below La Cuesta and at Los Colonias is 69 feet. As usually no water sinks below Los Colonias, this 69 feet must be the normal amount of water disappearing. The amount reaching the river normally at six miles below Santa Rosa is about 65 to 90 feet. This would indicate an increase over the amount sinking above of about 20 second feet. An inspection of the topographic sheets of this section affords rather conclusive evidence that the sinking waters above Los Colonias reappear in the region of Santa Rosa. (See New Mexico Corazon Sheet.) This conclusion is somewhat strengthened by an observation trip across the mesa between Los Colonias and Santa Rosa. The chain of sinks, or so-called dry lakes, are continuous from near the place of sinking to the flowing lakes at Santa Rosa. They vary in size from large smooth depressions of several acres, into which surface water collects and settles away, to holes of 50 feet in diameter. The depressions of recent times have vertical sides, varying from a few feet to a

hundred or more in depth. Gradual erosion rounds off the edges and fills the middle until there remains only a pot-shaped hole. Some of these depressions have developed since the settlement of the country. A story is told of a man who lived upon the mesa, waking up one morning to find a hole 60 feet in diameter and about 150 feet deep in front of his house. Another case is on record where a large sinking was followed by the depression filling with water. Two men laid claim to it and took the controversy to court. However, before the court had rendered a decision the water sank away and left only a dry hole.

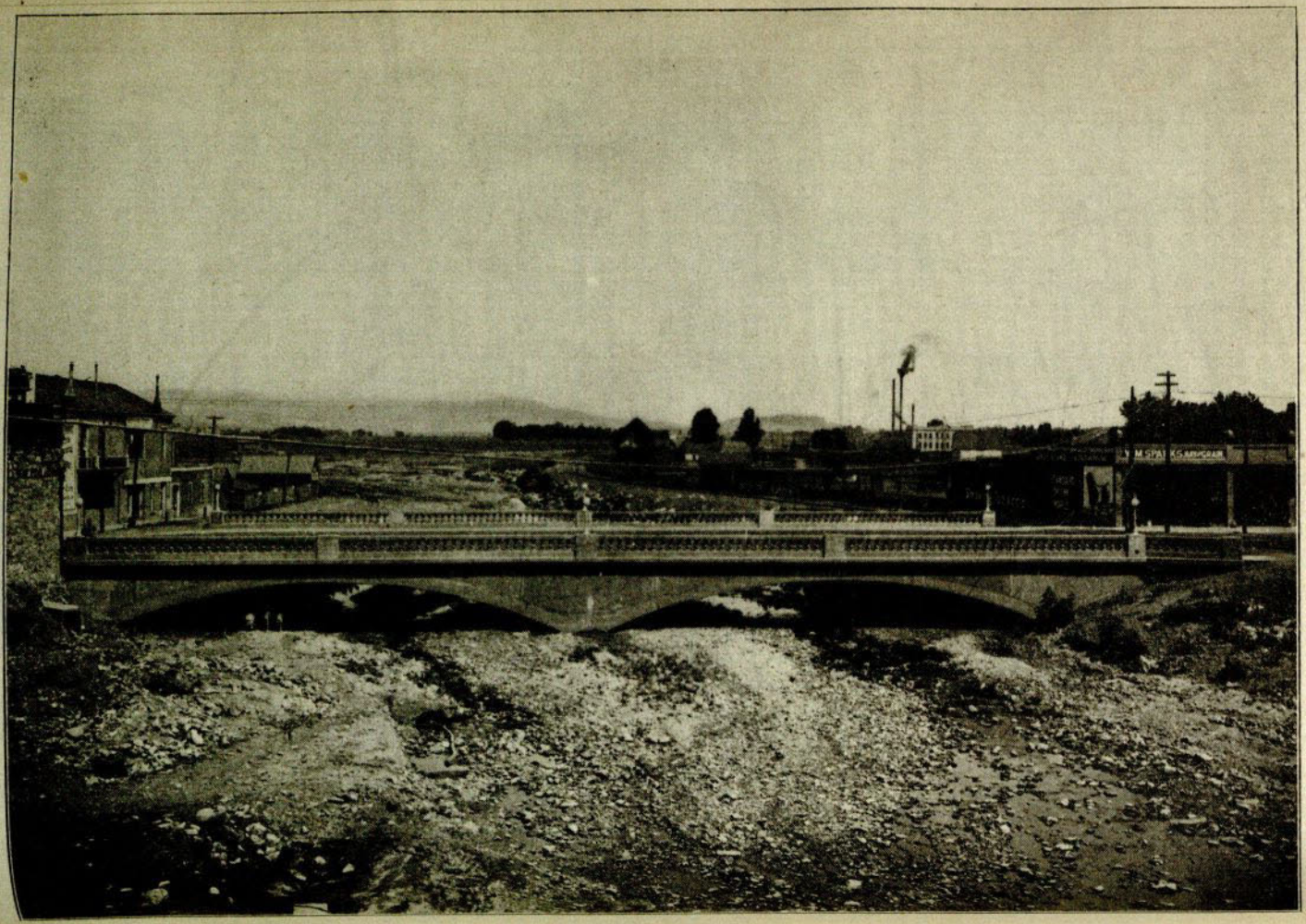
The lakes near Santa Rosa are about 200 feet to 300 feet in diameter, and the bottom of some of them have been sounded at a depth of about 250 feet. They receive no surface drainage, though each has a constant outflow of several second feet. The surface of these lakes is only some few feet above the river and is about 300 to 400 feet below and sink holes on the mesa. The water is heavily charged with gypsum and gives off a "gyppy" odor.

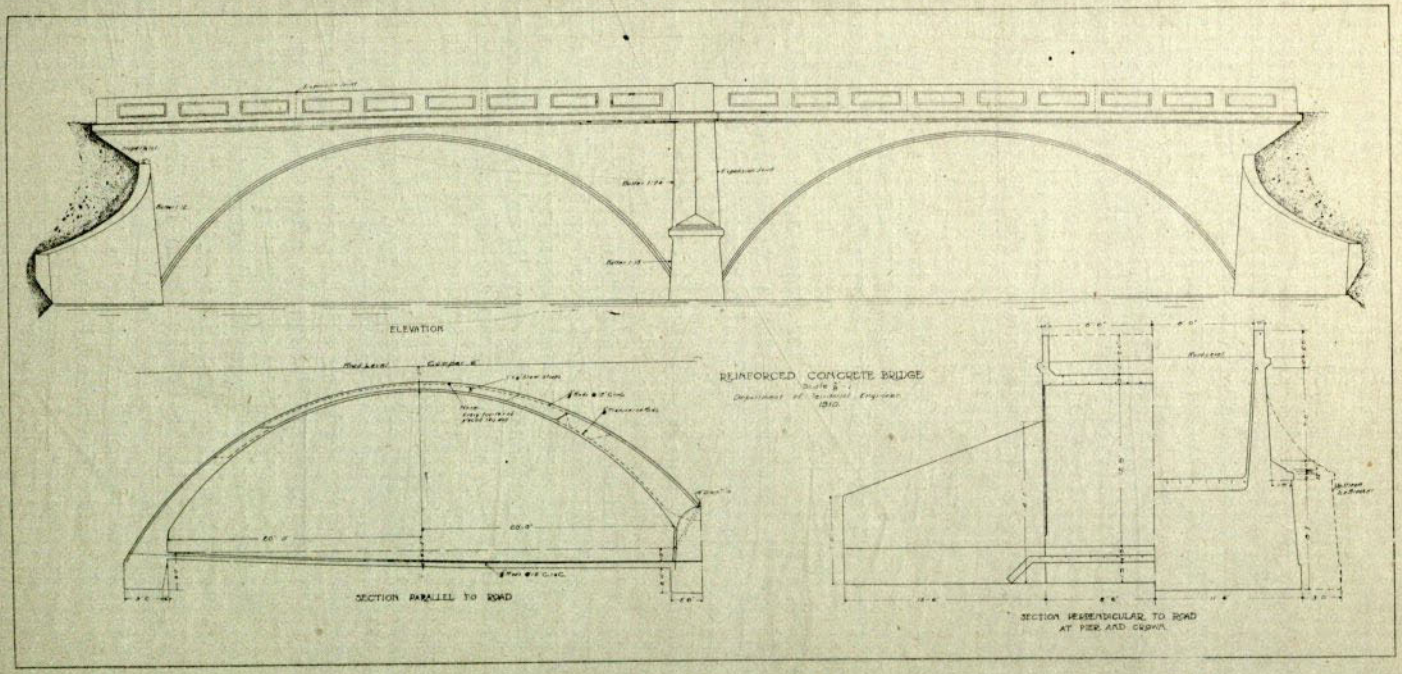
These sinks are conclusive evidence of underground erosion, and the course of their succession, leading as they do from the place of the river's sinking to that of the reappearance of the water in the lakes, would seem to afford very good ground for the above conclusion. Another incident affording some evidence, is that mentioned above, in which the cave-in was followed by the depression filling with water. In this case it is reasonable to conclude that the cave-in chocked some well defined subterranean water course, and having no outlet, the head from above forced the water upon into the depression until it could make a new way for itself, when the head was relieved and the water in the depression sank away.

As there is no surface water entering the stream between Santa Rosa and Los Colonias, the increase of 20 second feet of the discharge at Puerta de Luna over that at La Cuesta, must also be derived from some subterranean source. Part of this may be derived from the sinking of the Gallinas above the springs. The remainder can probably be accounted for from ground water.

BRIDGES.

Examinations of plans and specifications, contracts, etc., relating to the construction of bridges throughout the Territory, where the expenditure amounts to over $1000, was a new duty given the Territorial Engineer by the Legislature of 1909 through the provisions of Chapter 43. This bill also covers the building





Plans of a Concrete Bridge.

of roads and this phase is treated more fully elsewhere. The Department has so far examined the plans, locations, contracts, etc., making necessary alterations and amendments and recommendations of the following bridges. Concrete bridge across Gallinas River; connecting the old and new towns of Las Vegas. This bridge is now in operation after the formal opening of May 31st. This bridge was designed by Mr. Morrison of Las Vegas and constructed by the Missouri Valley Bridge and Iron Co., of Leavenworth, Kan., at a cost of $32,000. Bridges across the Rio Grande at Albuquerque, one called the Barela and the other the Alameda bridge; one across the Vermejo, one on the Red at Maxwell, Raton Creek at Raton, Pecos at Carlsbad, one on the Penasco and another over Eagle Draw.

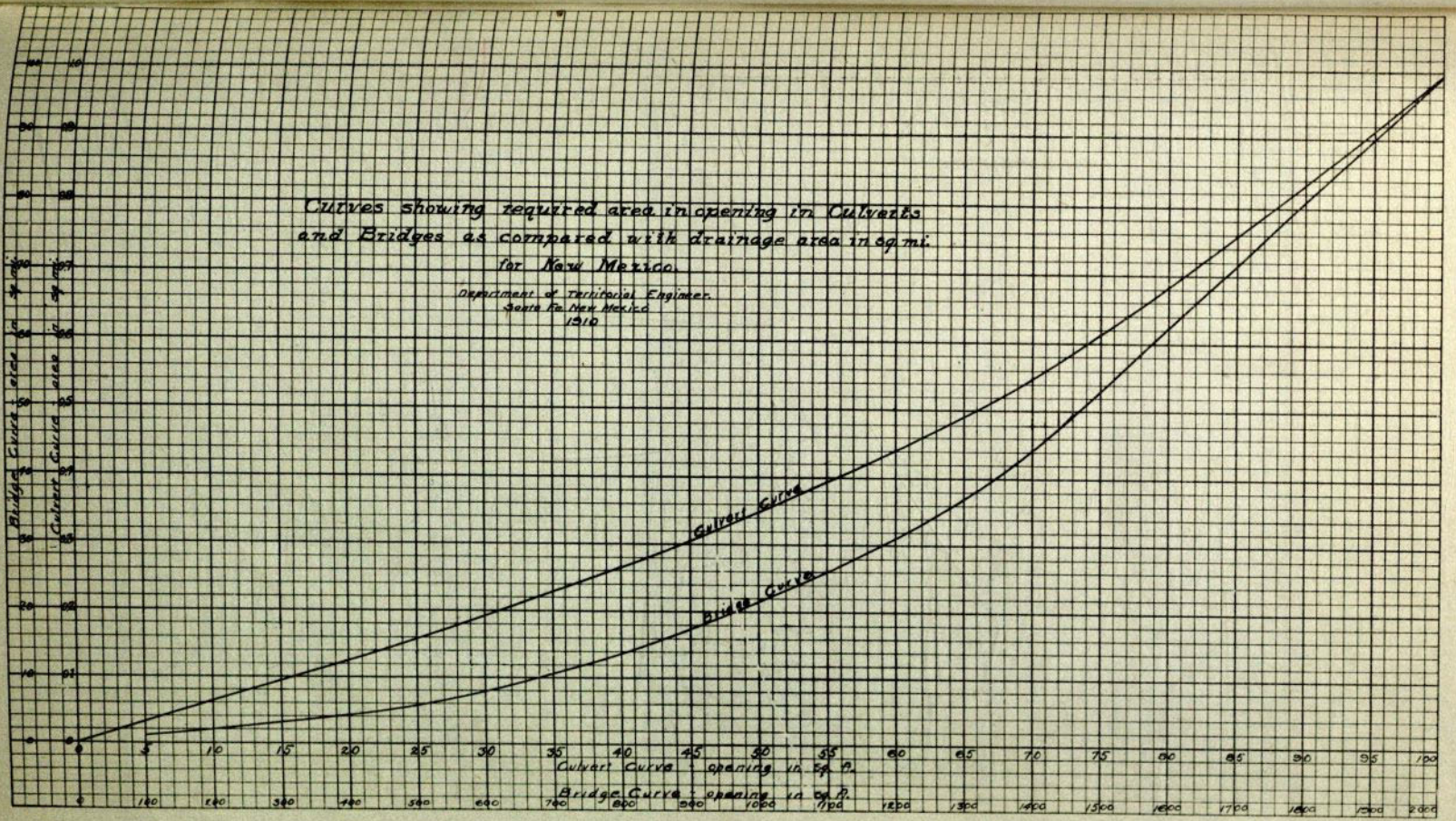
These bridges are built by the different counties through their County Commissioners after submitting plans, etc., to this Department for approval. Help has been afforded by a detailed knowledge of run-off from various areas by making necessary corrections in openings to allow for floods and save the bridges from washing away. Sufficient stress is not placed on the highly torrential character of the New Mexico streams by the designers or contractors.

The cut on opposite page represents a good plan for a reinforced concrete bridge which could be followed in bridge building by making necessary changes for local conditions and needs.

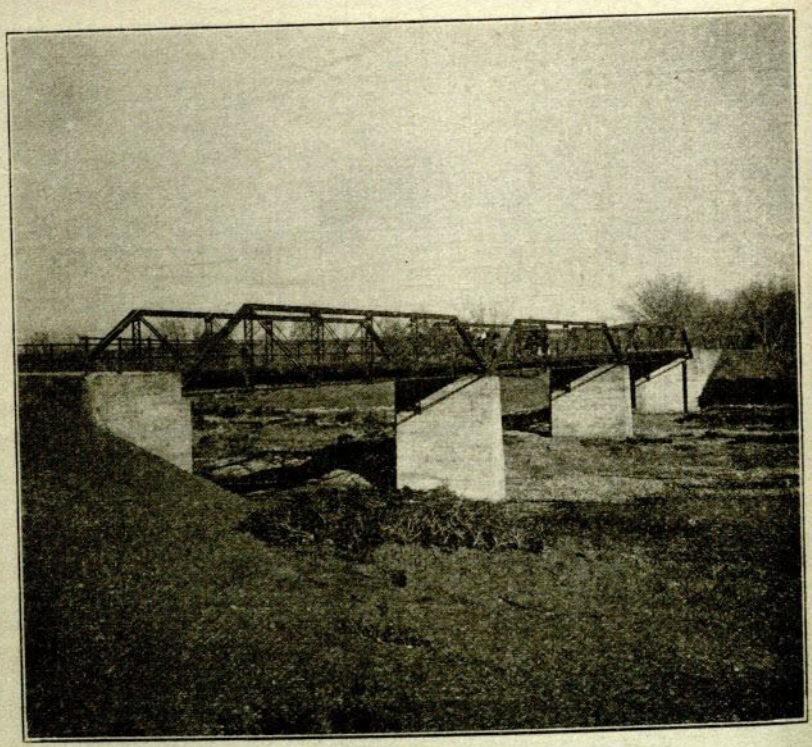
Cut shown herewith gives a curve worked up by this Department for apertures in bridges and culverts according to drainage area above location. One portion of the curve is enlarged for culverts to make it easily read. These curves are also used for spillway capacities. The necessity for large spillways in reservoirs in this Territory is very great.

The floods of September, 1904, give a good idea of the magnitude of these floods. Two or three dams in this Territory suffered very materially in not being able to cope with the immense bodies of water coming down the canons after heavy rains. In examining plans and specifications of dams in water right applications the Engineer makes frequent enlargements of spillways. and specifies foundations to be on solid rock.

After careful work on the figures shown by the above curves same was submitted to the engineers of the A., T. & S. F. F. Ry. Co., who have had considerable experience in New Mexico in building culverts and bridges for railroad uses. The curves were pronounced to be satisfactory.



Area Curve for Opening in Bridges.



Pecos River Bridge, Carlsbad, N. M.

STREAM GAGING.

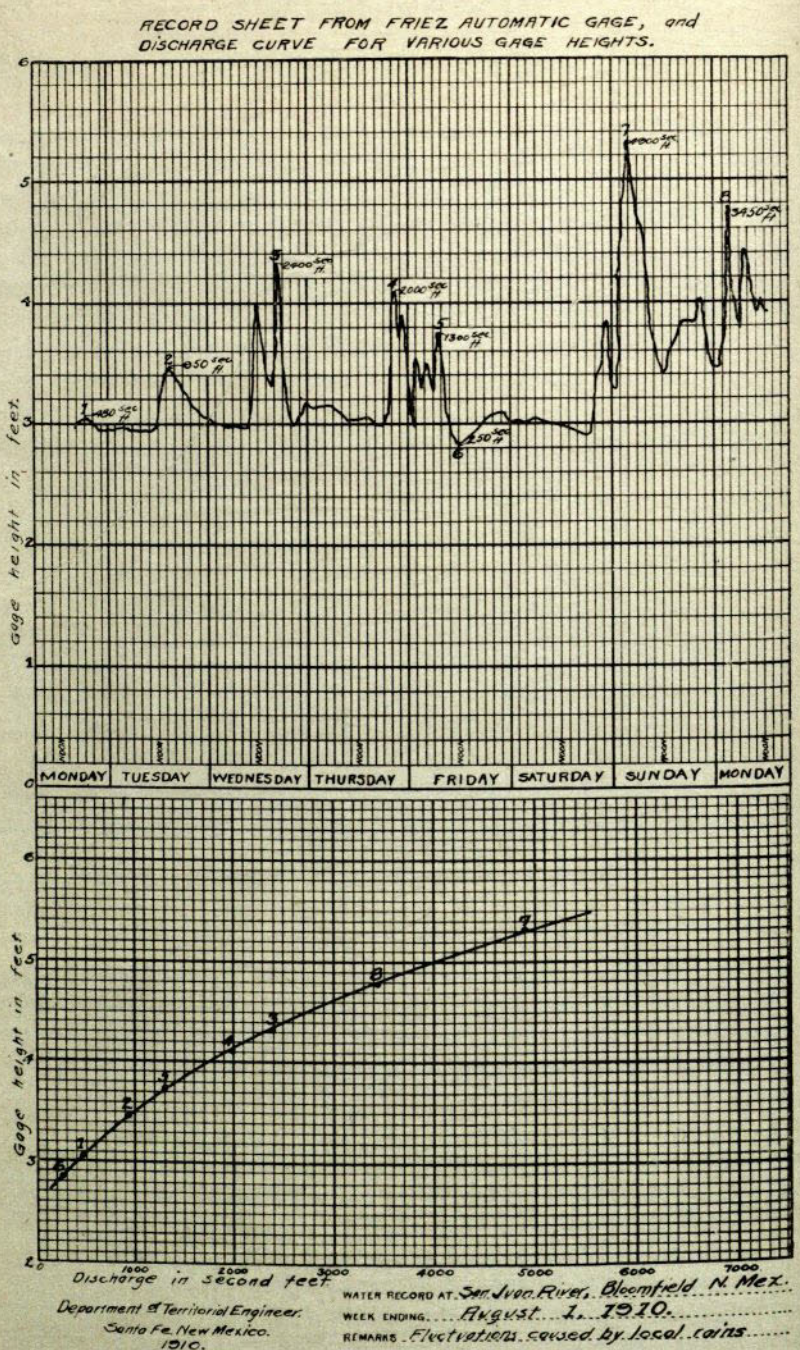
The Territory of New Mexico was fortunate to secure co-operation with the Water Resources Branch of the U. S. Geological Survey in the measurement, calculation, etc., of the water supply in this Territory. The office of the Territorial Engineer has established about thirty stations, collected the daily records, measured the flow by current meter and the results therefrom have been worked up by the Denver office of the Geological Survey under the immediate supervision of W. B. Freeman, District Engineer, and the Territorial Engineer. The Territory has been favored with this expert assistance as the men employed by that branch of the Government service have had many years of training and experience and probably stand as authorities in working up results from data collected from stream flow measurements. The curve from which daily discharges are derived and which are made from a series of discharge measurements are sent to experts in Washing-

ton for approval before any of the daily gage heights or automatic gage sheets are used for computation.

The Atchison, Topeka and Santa Fe Railway Company has also contributed liberally to this office, making an appropriation of $1000 annually for stream measurement work. This money has been donated to the Territorial Engineer's funds made up of $2500 appropriated annually by the 38th Legislative Assembly to which the United States Geological Survey has contributed $2500 more, making a permanent fund of $6000 to be spent in this work. Besides the above, private parties have aided materially in the maintenance of gaging stations throughout the Territory. Thomas Lyons paid the expenses of a hydrographer making discharge measurements and the salary of gage observer on the Gila at Redrock station. A. J. Meloche of Raton, N. M., gave financial assistance in the installation and maintenance of an automatic gage for the station on the Una de Gato. Messrs. J. D. Hand and A. A. Jones are assisting financially in the Tecolitito station on the Pecos. E. H. Fisher gave financial assistance in the installation of an automatic gage at Cowles on the Pecos River. E. H. Bickford co-operates on the Mimbres. The Santa Fe Water and Light Company of Santa Fe on the Santa Fe Creek Station, etc., etc.

The Territorial Engineer solicits the co-operation with parties interested in the development of particular enterprises, owing to the fact that the money available is not more than enough to cover the stations already established. It is desired in all cases, if possible, to install automatic gages, the Territory buying same, to be held the property of the Territory and the co-operating parties to pay traveling expenses of hydrographers and salary of gage observers. As the sheet of an automatic gage needs changing once a week the expense of the observer feature which costs from three to five dollars per month. Frequently salaries of the observers are gratis as at the Stephens Creek and Cameron Creek Stations and various stations on the Forest Reserves.

The Territory has installed thirteen automatic gages of the Friez type on the following streams: Canadian at Logan; Cimarron at Ute Park; Gila at Redrock; Mimbres at Faywood; Pecos at Cowles; Pecos at Tecolotito; Rio Grande at Buckman; San Juan at Bloomfield; Una de Gato at Meloche's ranch; Chico Rico at Raton; San Jose at Suanee; Rio Puerco at Rio Puerco; Rio Puerco at La Joya, and has found the results secured in this manner to be absolute. The gages or registers are the only means of getting records absolute, owing to the torrential character of our streams



Automatic Gage Sheet and Discharge Curve Showing How Records Are Collected.

and the sudden rising of floods, etc., however, the records secured from staff gages, owing to the close checking by measurements and frequent readings, are found to be perfectly satisfactory, but where the automatic gages can be installed of course same is to be preferred.

A brief description of the workings of these automatic gages is given herewith and the figures shown give a good idea of the instrument itself.

The instrument records the height of the water continuously so that at any time of the day you have a record of the water and it is accomplished by having a pen, run by a clock, which travels over the length of a drum, a sheet of paper is fastened to the drum that is marked off in parts of hours, hours, days, etc. The drum rotates by a float that raises and lowers as the water changes in the river. This rotation is in harmony with the divisions on the paper that represent tenths, inches and feet or the exact height of the water.

Regarding the work of this Department in its effort to obtain data as to stream flow, W. B. Freeman of the U. S. Geological Survey writes as follows:

Mr. Vernon L. Sullivan,

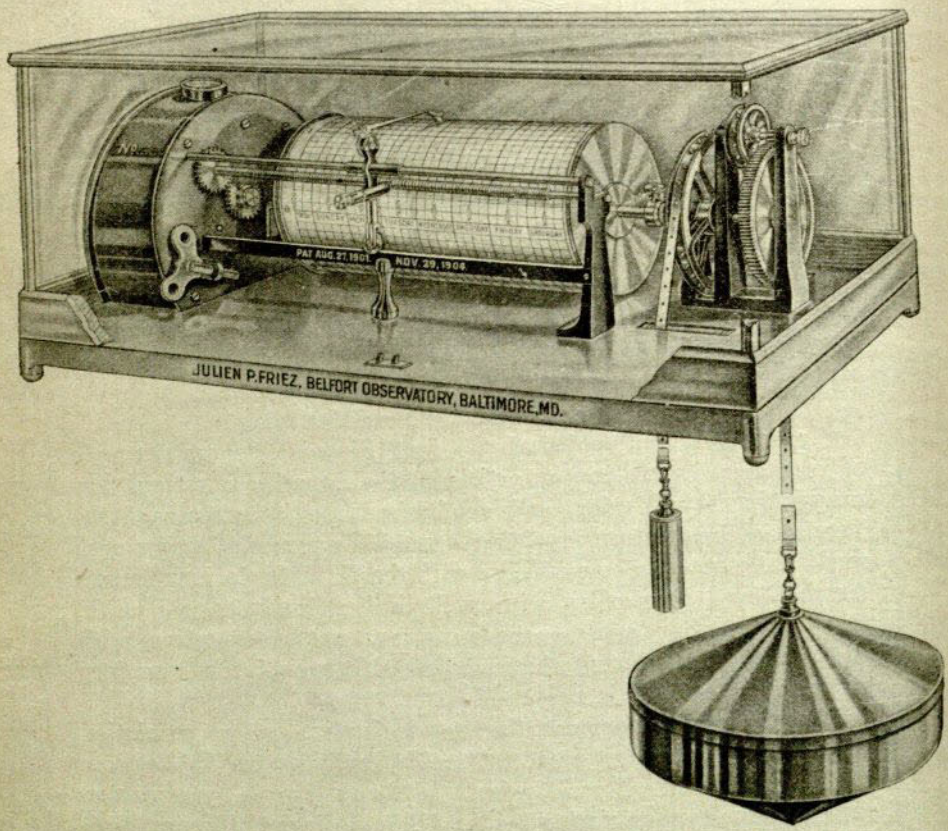
Territorial Engineer, Santa Fe, New Mexico.

Sir:—When you published the first Biennial Report a couple of years ago, I gave you an article on the necessity of stream flow records in New Mexico, and emphasized the importance of the Territorial Legislature providing a specific appropriation for such work, to be spent in co-operating with the U. S. Geological Survey. At that time your office, with such limited funds as you could spare from your general appropriation, was co-operating with the Survey to the extent that we were able to maintain seventeen stations.

Through your efforts at the last legislature an appropriation of $2500, annually, was set aside specifically for stream gaging work in New Mexico, to be spent in conjunction with an equal appropriation by the U. S. Geological Survey. With this increased money it was possible to enlarge work. Not only that, but the interest your office has taken in such investigations has aroused the public to the need of such work, and it is gratifying to note that companies and private parties have contributed quite material financial assistance.

The result has been that there are now about $7,000 annually available for this work, and the number of stations in operation has been doubled within the last two years. More money being

available for the salaries and expenses of hydrographers, it has been possible to secure more discharge measurements than in the past, and also to obtain more accurate records by the establishment of automatic gages. Your idea of installing automatic gages, especially on the flood streams, was a very happy one. If the matter had been left entirely to our office I am afraid that some of our gaging stations would have had to wait a little longer



Friez Automatic Gage Where Gage Sheet is Placed for the Collecting of the Height of the Water.

for such gages, as we have rather regarded them as a luxury. However, the records shown by the Friez gages on the New Mexico streams, have emphasized the importance and necessity of automatic gages for precise records, and it is hoped that every station will be thus equipped within the next two years. As it is there

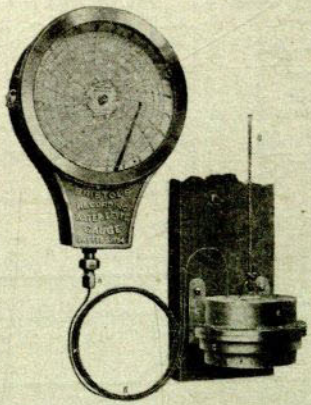
are now nearly a dozen of them in operation, in which respect the Territory is as well off just now as any of the states in this section—better than any except Colorado.

The records which are being obtained in the Territory, in consideration of the difficulties encountered in measuring your flood streams, are highly gratifying to me, and their efficiency is rapidly increasing. For this, I am frank to say that the credit is largely due to the interest which your office has shown in the work.

It is hoped that the next Legislature will be able to double the stream gaging appropriation, and I believe that the Geological Survey will be able to meet you half way.

Very respectfully,

W. B. FREEMAN,
District Engineer.



Bristol Automatic Gage.

Map of New Mexico Showing Location of Gaging Stations.

ITEMIZED STATEMENT OF TERRITORIAL STREAM GAGING FUND—1909-1910.

No.	Warr. No.	In favor of	Amount	Appropriations
		Fund of Territory 1909.....		$2500.00
1	15744	A. Leschen & Sons Rope Co.....	111.02	
2	15745	J. B. Stewart	284.87	
3	15746	V. L. Sullivan.....	27.93	
4	15866	V. L. Sullivan.....	12.28	
5	15865	J. B. Stewart.....	168.40	
6	15942	J. B. Stewart.....	100.00	
7	15948	Julien P. Friez.....	170.50	
8	16014	V. L. Sullivan.....	19.60	
9	16019	J. B. Stewart.....	263.60	
10	16074	V. L. Sullivan.....	123.00	
11	16073	J. B. Stewart.....	159.21	
12	16112	J. B. Stewart.....	100.00	
13	16150	W. H. Sutton.....	185.30	
16	16320	J. B. Stewart.....	98.78	
17	16378	C. D. Miller.....	14.75	
19	16379	W. H. Sutton.....	151.55	
18	16379	V. L. Sullivan.....	28.95	
19	16377	W. H. Sutton.....	151.55	
14	16151	Julien P. Friez.....	120.00	
20	16458	J. B. Stewart	194.74	
21	16457	Julien P. Friez.....	235.00	
22	16459	J. B. Stewart.....	100.00	
23	16556	V. L. Sullivan.....	16.51	
24	16568	J. B. Stewart.....	142.35	
25	16613	C. D. Miller.....	18.05	
26	17096	V. L. Sullivan.....	1.50	
26	17032	V. L. Sullivan.....	2.43	
27	17233	V. L. Sullivan.....	1.50	
28	17336	V. L. Sullivan.....	26.60	
29	17378	J. P. Friez.....	123.75	
30	17427	G. H. Russell.....	59.50	
31	17473	J. B. Stewart.....	181.94	
32	17578	J. B. Stewart.....	61.35	
33	17641	V. L. Sullivan.....	155.15	
		Contributed by A. T. & S. F. R. R. Co. for 1909.....		1000.00
		Fund of Territory for 1910.....		2500.00
		Contributed by A. T. & S. F. R. R. Co. for 1910.....		1000.00

No.	Warr. No.	In favor of.	Amount	Appropriations
		Contributed by A. J. Meloche.....		250.00
		Contributed by G. N. Wynkoop....		500.00
		Contributed by Thomas Lyon.....		51.00
		Contributed by E. H. Bickford...		100.00
		Contributed by S. A. Wiseman....		125.00
		Contributed by S. A. Wiseman....		5.00
		Contributed by E. H. Fisher.....		48.80
34	16644	W. & L. E. Gurley.....	61.20	
35	17645	J. P. Friez.....	247.00	
36	17650	F. M. Davis Iron Works Co.....	36.00	
37	17674	J. B. Stewart.....	190.05	
38	17701	American Steel & Wire Co.....	60.65	
39	17704	J. P. Friez.....	123.50	
40	17705	C. W. Dudrow.....	2.28	
41	17756	C. D. Miller.....	51.75	
42	17787	V. L. Sullivan.....	13.87	
43	17790	J. B. Stewart.....	312.50	
44	17952	J. B. Stewart.....	87.20	
45	17964	J. B. Stewart.....	100.00	
46	17998	V. L. Sullivan.....	19.20	
47	18229	J. B. Stewart.....	42.75	
48	18303	J. P. Friez.....	615.30	
49	18304	V. L. Sullivan.....	31.17	
50	18335	V. L. Sullivan.....	141.90	
54	18390	J. B. Stewart.....	119.40	
53	18409	Davis Iron Works.....	18.40	
52	18408	American Steel & Wire Co.....	32.77	
51	18373	V. L. Sullivan.....	40.63	
19	18427	J. B. Stewart.....	37.80	
20	18495	V. L. Sullivan.....	63.17	
21	18506	W. W. Mills	145.10	
22	18530	V. L. Sullivan.....	51.45	
23	18531	J. B. Stewart.....	96.76	
24	18648	J. B. Stewart.....	233.10	
25	18727	C. D. Miller.....	43.30	
26	18745	J. B. Stewart.....	60.55	
27	18756	J. B. Stewart.....	125.00	8079.80
		By allottment for New Mexico 1909.....		$2500.00

STATEMENT OF EXPENDITURES OF GEOLOGICAL SURVEY IN COOPERATION WITH TERRITORY OF NEW MEXICO.

Date.		No.	In favor of	Amount
Sep.	29	1-G	S. F. Bates & Co.	$ 18.00
	30	2-G	J. B. Stewart	50.00
	30	3-G	W. B. Freeman	35.00
	30	4-G	Manuel Martinez	10.50
	30	5-G	Wm. Frank	15.00
	30	6-G	Cleofes Valdez	6.50
	30	7-G	E. E. Curtis	15.00
	30	8-G	Aron Martinez	10.50
	30	9-G	J. C. Pacheco	36.00
	30	10-G	Frank Williams	10.50
	30	11-G	Hugh Loudon	15.00
	30	12-G	Wm. Prager	18.00
	30	13-G	W. L. Sever	9.00
	30	14-G	H. S. Wattles	9.00
	30	15-G	J. W. Ausherman	4.70
	30	16-G	Mrs. Cora Jackson	5.00
	30	17-G	Mrs. R. P. Woodward	9.00
Oct.	15	18-G	W. B. Freeman	177.05
	23	19-G	Mrs. Minnie Bowers	10.00
	28	20-G	Ralph C. Trujillo	15.00
	31	21-G	Jno. A. Phillips	5.00
	31	22-G	W. B. Freeman	60.00
Nov.	13	23-G	J. P. Paulson Mfg. Co.	2.25
	15	25-G	W. B. Freeman	84.00
	30	25-G	G. H. Russell	15.00
	30	26-G	J. B. Stewart	40.00
	30	27-G	A. Leschen & Sons Rope Co.	7.34
Dec.	1	28-G	Bohm-Allen Jewelry Co.	6.00
	1	29-G	Vulcan Iron Works	11.00
	10	30-G	G. H. Russell	73.30
	15	31-G	G. H. Russell	20.00
	21	32-G	J. B. Stewart	45.00
Jan.	8-10	33-6	J. B. Stewart	24.70
	10	34-G	Manuel Martinez	10.50
	10	35-G	Cleofes Valdez	9.00
	10	36-G	Mrs. Minnie Bowers	14.83
	10	37-G	W. L. Sever	9.00
	10	38-G	R. C. Trujillo	15.00
	10	39-G	Aron Martinez	10.50

Date.		No.	In favor of	Amount.
	10	40-G	Wm. Frank	15.00
	10	41-G	C. D. Wells	10.00
	10	42-G	Wm. Prager	8.00
	12	43-G	W. W. Dougan	10.50
	12	44-G	Hugh Loudon	15.00
	12	45-G	H. S. Wattles	9.00
	12	46-G	Frank Williams	10.50
	14	47-G	J. C. Pacheco	36.00
	22	48-G	J. B. Stewart	30.00
	24	49-G	Mrs. R. P. Woodard	9.00
	31	50-G	W. B. Freeman	12.00
	31	51-G	J. B. Stewart	10.00
	31	52-G	G. H. Russell	11.34
Sep.	23-09	6-B	D. & R. G. R. R. Co.	30.00
Oct.	4	7-B	N. M. C. R. R. Co.	30.00
	5	8-B	A. T. & S. F. R. R. Co.	75.00
	12	9-B	S. P. R. R. Co.	4.80
	23	10-B	Dawson R. R. Co.	6.35
			Denver office for year	310.87
Feb.	14-10		L. F. Gates & Co.	22.00
	14		G. H. Russell	57.25
	15		G. H. Russell	22.68
	15		W. B. Freeman	48.00
	15		Gibson LLbr. & Hdwe. Co.	11.28
	15		J. B. Stewart	36.70
	17		J. B. Stewart	56.67
Mar.	14		J. B. Stewart	7.00
	31		G. J. Lyon	23.35
Feb.	18		W. Lowenheim & Son	3.00
	23		W. B. Freeman	37.55
	28		Jas. B. Stewart	123.58
Mar.	11		M. N. Chaffin	24.00
	19		W. W. Dougan	8.66
	19		J. C. Pacheco	24.00
	31		G. H. Russell	87.77
Feb.	9		A. T. & S. F. R. R. Co.	75.00
	15		A. T. & S. F. R. R. Co.	5.15
Jan.	31		N. M. C. R. R. Co.	30.00
Apr.	4	B-6	Geo. J. Lyon	10.00
	30		W. B. Freeman	87.25
May	31		W. B. Freeman	38.90

Date.	No.	In favor of	Amount.	
June 30		R. H. Bolster	29.50	
May 30		G. H. Russell	36.18	
	Total		2500.00	2500.00
		Allottment for 1910		$2500.00
Aug. 30		D. M. Barringer, Jr.	18.70	
27		L. F. Bates & Co.	7.50	
July 19		J. B. Stewart	55.01	
25		A. T. & S. F. R. R. Co.	75.00	
Aug. 24		N. M. C. R. R. Co.	30.00	
July 13		F. A. Ellis & Son	13.00	
13		Jas. B. Stewart	33.34	
Sept. 30		Robert Parker	8.84	
30		Atilano Baca	12.00	
30		Cleofes Valdez	9.00	
30		Frank Smith	15.00	
30		Alex. J. Anderson	12.00	
30		Aron Martinez	9.45	
30		E. Rivera	9.00	
30		C. L. Justice	15.00	
30		R. C. Trujillo	15.00	
30		Frank Williams	10.00	
30		Mrs. R. P. Woodard	9.00	
30		H. S. Wattles	12.00	
30		Hugh Loudon	15.00	
30		Wm. Prager	18.00	
30		Wm. Frank	15.00	
30		E. Martinez	10.50	
30		W. B. Freeman	28.00	
Oct. 29		G. H. Russell	68.20	
Aug. 15		J. B. Stewart	50.00	
19		Contingents	6.48	
31		Geo. J. Lyon	35.00	
31		J. B. Stewart	46.67	
Aug. 31		W. B. Freeman	126.15	
30		E. Heringa	12.00	
30		Jay Walrath	8.00	
Oct. 15		Atilano Baca	2.00	
31		Cleofes Valdez	3.00	
31		G. H. Russell	34.00	
31		W. B. Freeman	29.85	

Date.	No.	In favor of.	Amount.	
Nov.	5	J. B. Stewart	102.75	
			979.94	
		Balance on hand in fund..	1520.06	
			2500.00	2500.00

WATER ANALYSIS.

Cooperative work has been carried out with the New Mexico Agricultural College, N. M., wherein the Territorial Engineer furnished hydrographers, paid their traveling expenses, furnished supplies with which to collect water samples of all the principal streams of the Territory. These samples were collected and sent to the Agricultural College where they have been analyzed by the Chemical Department of that Institution with a view of determining the relative value of each primarily for domestic use and secondarily for irrigation and the production of crops. These results which are printed herewith. They do not go into the bacteriological side of the question but adhere closely to the relative values for irrigation and domestic use.*

*The results have been used to advantage by places where the water has been used for domestic purpose and cities as Santa Fe, Alamogordo, Taos, Fort Bayard, etc., will be able to demonstrate the value of their water supply. On the whole the waters of the Territory are exceptionally good. With only one exception, the solids in solution run too high to be of value for domestic use, the larger portion being the flow from pure mountain springs and snows. The results will, therefore, be of information to the home-seeker and destroy the prevailing idea in the states as to the quality of New Mexico waters.

It is planned to continue this work during the spring months when the waters will present better specimen for analysis.

In making water analyses the objects are usually to determine its fitness as a drinking water, an irrigating water, or a boiler water.

No matter for what purpose the water is to be used, there are always certain determinations which are essential. For instance, the total amount of solids or dissolved salts in solution should be determined in any sort of water analysis.

When it is desired to know the agricultural value of a stream, we first learn if the water carries much silt, etc.; if so, how much, and how much plant food and material detrimental to plant growth

Laboratory No. of Sample.	Description of the Sample.	Location.	Date of Collection.	PARTS PER 100,000 OF WATER: Total Solids.	Lime CaO.	Magnesia MgO.	Soda Na_2O.	Potash K_2O.	Iron, Alumina and Silica $Fe_2O_3Al_2O_3SiO_2$.	Sulphates SO_3	Chlorides Cl.	Carbonates CO_2	Crystal H_2O and Organic Matter.	Oxygen Equivalent Chlorine.	PARTS PER 1,000,000: Black Alkali.	Free Ammonia.	Albuminoid Ammonia.	Nitrates.	Sodium Carbonate Na_2CO_3.	PROBABLE COMBINATION PARTS PER 100,000: Limestone Calcium Sulphate $CaCO_3$.	Gypsum Calcium Carbonate $CaSO_3$.	Magnesium Carbonate $MgCO_3$.	Epsom Salt Magnesium Sulphate $MgSO_4$.	Common Salt Sodium Chloride NaCl.	Glauber's Salt Sodium Sulphate Na_2SO_4.	Crystal Water and and Uncombined.
3298	Rio Grande	Buckman, N. M.	Oct 11, 1910..	39.00	10.00	2.74	.....	.....	.....	14.14	4.14	6.64	.....	0.94	none	none	none	.06	.....	7.01	14 72	.....	8.22	6.83	.....	2.22
3299	Santa Fe Creek	Santa Fe, N. M.	Oct. 11, 1910..	13.20	3.45	.....	.....	.....	.....	.....	1.18	.....	.....	.27	.....	.04	.10	.02	none	6.14	.....	.....	.....	1.95	.....	.....
3300	Vermejo River	Dawson, N. M	Oct. 11, 1910..	30.00	7.89	1.80	1.99	.....	.....	5.49	1.78	5.45	6-00	.40	none	.....	.....	.06	none	12.43	2.24	.....	5.40	2.92	1.01	6.00
3301	Chama River	Chama, N. M.	Oct. 11, 1910..	12.50	2.96	1.02	1.76	.....	.....	2.23	1.18	3 27	.35	.27	none	.....	.....	.06	none	4.92	.49	3.12	.....	1 95	1.67	.35
3302	Red River	Questa, N. M	Oct. 15, 1910..	21.00	6.16	1.71	none	.....	2.00	6.69	n me	3.27	1.17	none	.....	.....	.....	.04	none	7.46	4.81	.....	5.13	.....	Trace	3.60
3303	Taos	Taos, N. M.	Oct. 15, 1910..	17.40	3.45	1.04	1.54	.....	1.00	3.03	1.76	2.18	3.80	.40	none	.....	.....	.07	none	2.37	5.15	2.18	.....	2 90	.....	4.80
3304	Rio Pueblo de Taos	Taos, N M	Oct. 15, 1910..	16 30	5.42	.98	.40	.....	1.00	2.47	none	4.36	1.67	none	none	.....	.....	.01	none	9.94	.....	.....	2.94	.....	.91	2.51
3305	Gila River	Red Rock, N M	Oct 15, 1910.	29.10	6.16	1.60	3.87	.....	2.50	2.58	2.35	8.72	1.85	.53	none	.....	.....	.01	none	15.87	.....	3 36	.....	3.88	4.59	1.40
3306	Fernando de Taos	Taos, N. M.	Oct. 15, 1910..	30.00	10.84	3.02	none	.....	.....	5.62	none	8.72	2.00	none	none	.....	.....	none	none	12.31	9.55	6 34	.....	.....	.....	2.00
3307	Zuni River	Zuni Indian Reservation	Oct. 15, 1910..	37.20	10.35	2.16	1.65	.....	2.20	9.61	1.18	8.72	1.60	.27	1.05	.....	.....	none	1.05	16.22	8.99	.....	6.48	1.95	.....	2.51
3308	La Plata	La Plata	Oct. 15, 1910..	90.00	21.93	7.12	10 45	.....	.....	32.28	2.35	13.09	3.31	.53	0.53	.....	.....	none	0.53	11.76	37.25	14.95	.....	3.88	18.44	3.19
3309	Animas	Aztec, N M	Oct. 15, 1910..	52 40	16.27	3.15	3.09	.....	1.00	17.23	3.53	6.57	2.39	.80	.....	.....	.....	.06	none	14.91	19.2	.....	9.45	5.82	.....	3.02
3310	San Juan	Bloomfield, N. M	Oct. 15, 1910..	28.60	7.39	1.58	3.89	.....	6.40	8.75	none	5.45	1.14	none	.....	.....	.....	.02	.....	12.42	1.02	.....	4.74	.....	8.88	1.54
3311	Rio Puerco	La Joya, N. M.	Oct. 15, 1910..	412.10	51.52	15 91	99 48	.....	1.50	175 30	31.86	9.81	35.92	7.20	.....	.....	.....	none	.....	22.36	97 57	.....	41.73	52.57	163.35	37.42
3315	Canadian	Fort Bayard, N. M	Oct 15, 1910..	34.50	9.12	4.39	4.00	.....	trace	2.40	3.54	10.91	.94	.80	.....	.....	.....	.....	.....	13.86	3.26	9.22	.....	6.84	.85	.47
3325	La Luz River	La Luz Station	Nov. 5, 1910..	190.00	37.46	14.84	24.82	.....	.....	69.98	27.71	7.63	13.82	6.26	.....	.....	.....	.08	.....	17.40	67.29	.....	44.52	45.72	1.25	13.82
3326	Pecos River at	Santa Rosa, N. M.	Nov. 5, 1910..	193.00	59.65	10.08	4.13	.....	.....	91.61	4.7	6.54	17.34	1.06	.....	.....	.....	.02	none	14.91	124.61	.....	30.24	7.77	.....	15.47
3327	Sapello River	Los Alamos, N. M.	Nov 5, 1910..	53.50	15.77	4.86	2.04	.....	.....	18.96	1.18	8 72	2.24	.27	.....	.....	.....	.02	none	19.88	13.63	.....	14.58	1.94	2.31	2 16
3328	Rayado River	Springer, N. M	Nov. 5, 1910..	17.30	4 93	2.23	.52	.....	.....	3.81	.59	4.36	.99	.13	.....	.....	.....	.02	none	4.35	6.05	4.68	.....	.97	.....	1.25
3329	Cimarron	Ute Park, N M	Nov 5, 1910..	18.50	6 90	1.69	.66	.....	.....	2.16	.59	6.54	.09	.13	.....	.....	.....	.02	none	10.67	2.21	3.55	.....	.....	1.51	.56
3330	Mora River	La Cueva, N. M	Nov. 5, 1910 .	33.50	9 86	3.71	1.02	.....	.....	7.55	1.17	7.64	2.81	.26	.....	.....	.....	.025	none	17.72	.....	.....	11.13	1.93	.....	3.02
3331	Gallinas River	Las Vegas Hot Springs.	Nov. 5, 1919..	27.90	8.38	2.59	2.06	.....	.....	5.46	2.35	6 54	1.05	.53	.....	.....	.....	.02	none	14.91	.....	.....	7.77	3.87	.....	1.35
3332	Una de Gato River	Raton, N. M	Nov. 5, 1910..	59.50	12.81	8.07	3.34	.....	.....	19.43	1.17	9.81	5.13	.26	.....	.....	.....	.02	none	22.37	.61	.....	24.21	1.93	5.30	5.08
3333	Pecos River	Tecolote, N. M.	Nov. 5, 1810..	26.00	8.21	3.24	.51	.....	.....	4.29	.59	7.63	1.66	.13	.....	.....	.....	.03	none	9.28	7.29	6.80	.....	.97	.....	1.66
3358	Alamo Spring Water	Alamogordo, N. M	Nov. 25, 1910..	52.50	11.33	1.59	6.72	.....	.....	10.85	2.83	7.63	12.19	.64	.....	.04	.08	.07	.....	17.40	3.79	.....	4.77	4.67	9.68	12.19

is present in this silt, etc. Then the total solid matter in solution is examined, to learn the amounts of alkalies carried by the water. These are usually limited to sodium sulphate (Glauber's salt), sodium chloride (common table salt), sodium carbonate (sal soda, washing soda), sodium bicarbonate (baking soda), magnesium sulphate (Epsom salt), magnesium chloride, and potassium sulphate or chloride. Most waters contain calcium carbonate (limestone) or magnesium carbonate held in solution by means of the gaseous carbon dioxide present in all waters. These, together with calcium sulphate (gypsum), are generally conceded to be harmless, excepting where present in very excessive amounts. Of the alkalies, the so-called black alkali consists of sodium carbonate or bicarbonate. The others are classed as white alkalies. Black alkali streams are undesirable for irrigation, on account of the constant vigilance necessary to prevent accumulation of this salt in harmful amounts in the soil irrigated. Most authorities place .05 per cent of black alkali in a soil as the limit for ordinary plant growth. Magnesium chloride is rarely found in waters, and is very corrosive in its action upon plants. Sodium chloride is perhaps the most troublesome foe to plant life next to black alkali. This salt should not be present in excess in irrigating waters, and the limit for ordinary plant growth is about .25 per cent in a soil. The other white alkalies are harmful, usually, when present in a soil to exceed about 1.00 per cent. From the above one can readily see that the best irrigating water is that containing the least amount of the least harmful salts. It is quite difficult to define a limit for the amount of salts or solids a water should have to class it as good for irrigation, because so much depends upon the method of cultivation, drainage and character of the soil, and crop to be raised. However, for a general statement, considering average cultivation, drainage conditions, etc., it is generally conceded that any water with no black alkali, containing about 120 parts of mineral matter or salts per 100,000 parts of water, or 70 grains per gallon, is about the limit for successful irrigation.

With the above explanation of the water analyses herewith printed, it is hoped that many people of this Territory may be able to see at a glance the good quality of most of the streams analyzed. At a later date we hope to discuss more in detail the results of analyses representing practically every locality of the Territory.

PECOS RIVER AT CARLSBAD, NEW MEXICO.

The following summary shows the quality of the water discharged by the Pecos from May 1906 to April 1907.

Results are shown in parts per 100,000.

	Calcium (Ca)	Magnesium (Mg)	Alkalis (Na & K)	Sulphate (SO_4)	Carbonate (CO_3)	Acid Carbonate (HCO_3)	Chlorin (Cl)	Nitrate (NO_3)	Solids Suspended	Solids Dissolved
1906										
May	35.8	8.2	25.5	115.	None	12.7	38.6	None	257.5	34.1
June	40.3	8.9	26.4	120.	None	8.3	41.4	None	271.7	17.8
July	34.9	7.6	19.2	109.	.52	9.8	35.7	None	237.0	12.4
Aug.	42.0	9.5	27.6	125.	None	13.1	43.6	None	275.5	14.5
Sept.	41.7	10.2	28.5	122.	.52	15.7	38.0	.001	279.0	10.3
Oct.	39.73	9.8	26.1	128.	.17	15.7	41.3	.0001	241.1	46.9
Nov.	46.6	9.6	27.7	126.	None	15.7	40.6	None	282.1	8.0
Dec.	41.55	11.	47.2	127.	None	16.2	62.2	.003	298.2	17.5
1907.										
Jan.	44.0	10.	35.7	128.	None	16.2	48.8	.003	280.8	15.7
Feb.	41.0	11.	33.3	127.2	.19	15.3	51.6	None	289.5	24.4
Mar.	45.3	11.	32.7	131.	.35	15.3	52.1	None	301.5	3.1
Apr.	38.3	9.	25.6	137.	.11	18.6	40.0	None	244.7	10.8
July	34.9	7.6	19.2	109	.52	9.8	35.7	None	237.0	12.4

CONTINGENT EXPENSES FOR DEC. 1, 1908. DEC. 1, 1909.

Warr. No.	In favor of	Amount	
	Appropriation for 60th fiscal year..		$1500.00
4740	V. L. Sullivan	$ 91.34	
4784	V. L. Sullivan	309.23	
4725	V. L. Sullivan	77.13	
4864	V. L. Sullivan	132.90	
4905	C. D. Mller	107.53	
4906	V. L. Sullvan	126.00	
4960	C. D. Miller	92.42	
4961	V. L. Sullivan	8.50	
4998	V. L. Sullivan	85.09	
5089	V. L. Sullivan	50.63	
16127	V. L. Sullivan	55.55	
5136	C. D. Miller	90.72	

Warr. No.	In favor of	Amount	
5221	V. L. Sullivan	134.30	
5222	V. L. Sullivan	138.47	
Balance		.19	
		$1500.00	$1500.00

CONTINGENT AND TRAVELING EXPENDITURES DEC. 1, 1909. DEC. 1, 1910.

No.	Warr. No.	In favor of	Amount.	
				$3400.00
	16923	Remington Typewriter Co.	$ 105.00	
	17034	V. L. Sullivan	215.26	
1		V. L. Sullivan	25.25	
2	17232	V. L. Sullivan	281.41	
3	17240	Berger Manuf. Co.	40.80	
4	17334	V. L. Sullivan	96.65	
5	17335	New Mexican Printing Co.	114.65	
6		V. L. Sullivan	190.01	
1	17483	V. L. Sullivan	120.93	
12	17579	Kueffel & Esser Co.	7.20	
12	17597	Santa Fe Water & Light Co.	240.00	
14	17640	V. L. Sullivan	97.57	
15	17788	V. L. Sullivan	185.81	
16	17999	V. L. Sullivan	131.89	
17	18305	V. L. Sullivan	114.86	
18	18372	V. L. Sullivan	20.25	
19	18494	V. L. Sullivan	166.13	
20	18759	V. L. Sullivan	65.19	
21	18873	V. L. Sullivan	105.77	
22	18834	C. D. Miller	57.95	
23	18872	Williamson-Haffner Co.	23.55	
24	18873	V. L. Sullivan	636.62	
25	18874	C. D. Miller	75.00	
			3117.75	
	Total		3117.75	
Balance			282.25	
			3400.00	3400.00

GOOD ROADS.

"The location of a railroad is giving it its constitution. It may be sick, almost unto death, with accidents of construction and management, but with a good constitution it will ultimately recover." D. H. AINSWORTH.

Method of Road Grading.

The above is also applicable to the construction of Good Roads and great care should be taken to cut down grades and expense in locating or re-locating of roads.

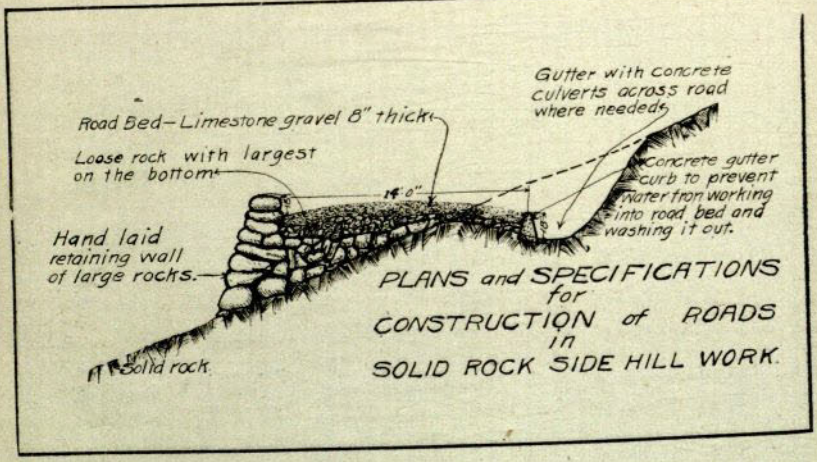
A Good Roads Commission was created a little over a year ago by an act of the Legislature of 1909 and the wisdom of such legislation is borne out by the results that have been accomplished by this Commission since its creation.

The Commision is composed of the Governor who is the Chairman of the Commission, the Commissioner of Public Lands who is the Secretary and the Territorial Engineer who is the Engineer

of the Commission and under whom the supervision of the construction work is done.

Before commencing construction work on the building of good roads it was necessary to make many surveys to determine upon the best location for the road and the engineering features as to how such work should be done.

The Commission was in the first place handicapped through the fact that the Act provided that the money to be used in the construction of Good Roads should be collected from a levy of one mill which did not become available for use until about De-



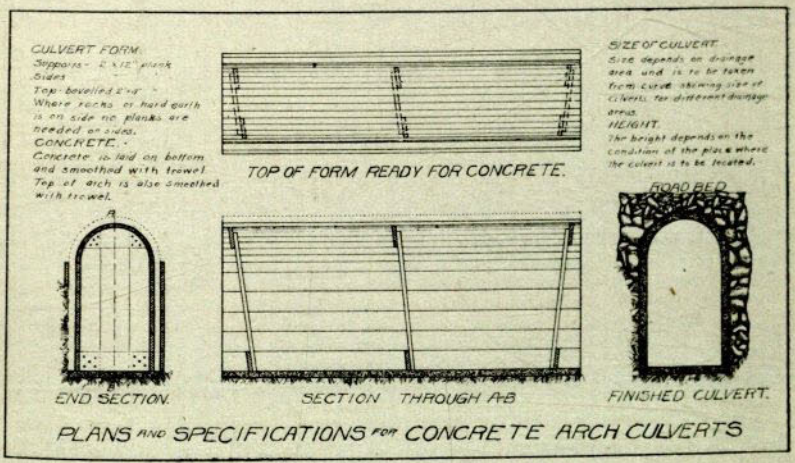
cember, 1909, but in spite of the lack of funds many surveys were immediately commenced before the regular appropriation was available. The cost of making these surveys was paid by donations in many instances and in others out of a small amount of money that was left over from the El Camino Real Fund, thus, by the time the first appropriation was available construction work was started on several different roads.

Since the Commission was created it has actually surveyed and platted over five hundred miles of road, examined into various roads amounting to something like 1000 miles and has actually constructed in the neighborhood of one hundred and fifty miles of road and repaired over two hundred miles more.

The principal roads that have been surveyed and constructed or practically constructed are the Las Vegas-Raton and Colorado State Line Road and the Albuquerque-Santa Fe Road, both of which is a part of the Great Scenic Highway, the Silver City-Mogollon Road, the Roswell-Carrizozo Road and the Deming Road.

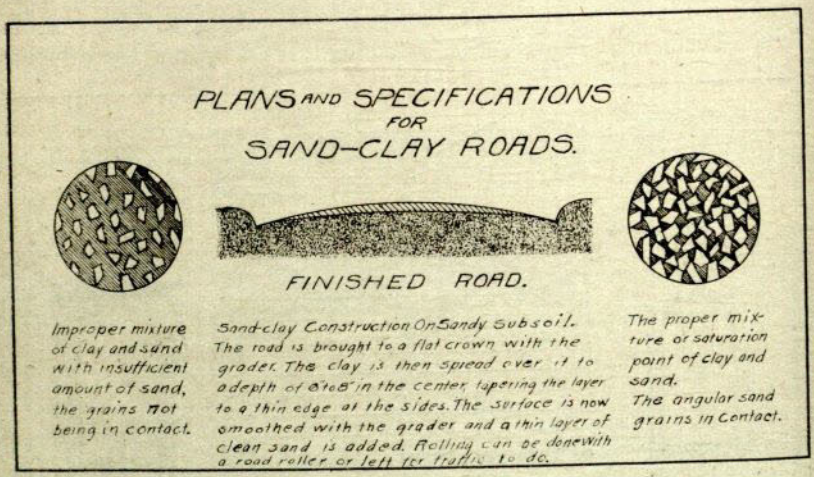
These roads that have been constructed have been either built with convicts or through the force-account system as it is very difficult to measure up the construction work connected with the building of roads when let by contract and in this way the Commission has been able to save for the Territory the contractor's profit.

The natural conditions of the Territory are generally favorable for cheap and easy maintenance of good roads when they have been properly constructed, the rainfall being light and the natural material good. Grades in the mountainous country are being kept under a nine per cent grade while in the valleys they are much less. Permanent construction is contemplated by the use of long



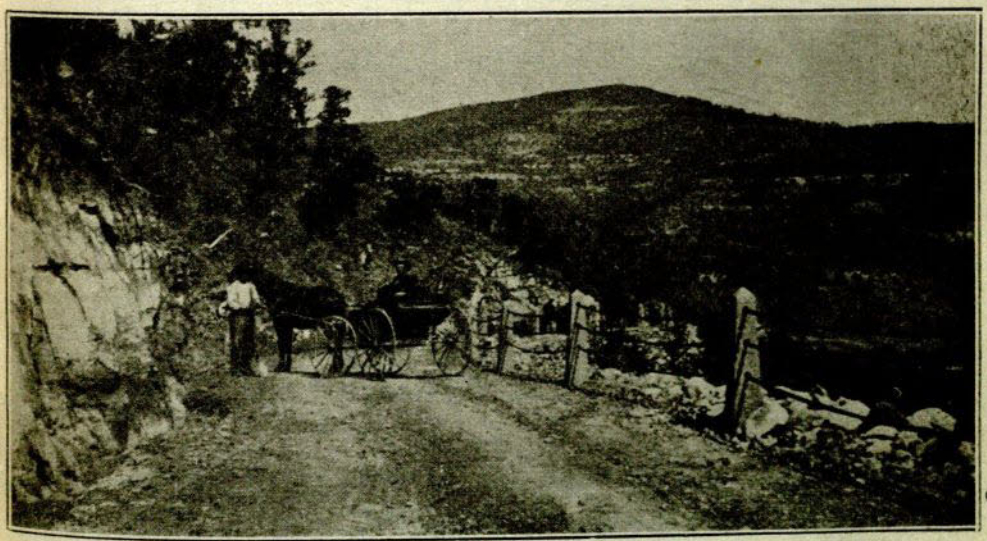
life material. Sandy stretches are acadamized by what is called a sand-clay road bed, the road is graded up properly and the sand water and clay is mixed in proper proportions and spread over the road bed in layers and then rolled, thickness of sand-clay roads eight to fourteen inches, each layer being packed thoroughly. This material makes a hard surface and wears well, the sand relieves the sticky qualities of the clay when wet and the clay itself binds the sand particles together making a solid mass unaffected by temperature or moisture. A thin layer of gravel spread over a sand-clay road and then rolled adds to the wearing surface and probably makes one of the best roads possible out of natural material for crossing sandy stretches. One of the greatest difficulties encountered in road building in this Territory is the lack of moisture and water to bring the material to the proper consistency for the material to bond.

On soil material where limestone gravel is abundant road beds are made of this material, the grades being constructed first, then a coating of limestone gravel spread over the surface of the road bed and thoroughly packed, the traveling over the road bed packs it down more and grinds up the finer portion of the gravel into a cement and practically cements the road bed together in one solid piece, thus, making an excellent road bed. Clean hard gravel when used needs a small amount of clay mixed with it as a binder and when property built and sprinkled with a small amount of oil makes an excellent road.



The cost of constructing sand clay roads vary from three hundred to two thousand dollars per mile, according to the grading, the distance the clay has to be drawn and the amount of moisture there is in the clay to commence with, together with the distance that water has to be hauled. Gravel roads cost about the same as sand-clay roads excepting possibly a little cheaper. Simply grading roads over prairie lands costs from fifteen to fifty dollars per mile, while grading roads over rolling country where there is some side-hill work but which can be done with a steel grader costs from twenty to one hundred and fifty dollars per mile varying on the natural conditions. Rock work in mountainous roads costing all the way from one thousand to several thousand dollars per mile. The most expensive road construction is where the work has to be done by hand labor and in such places where there is large quantities of solid rock work, convicts are used to a good advantage, the cost of boarding the convicts vary in different localities of the Territory from thirty-one to thirty-four cents per day.

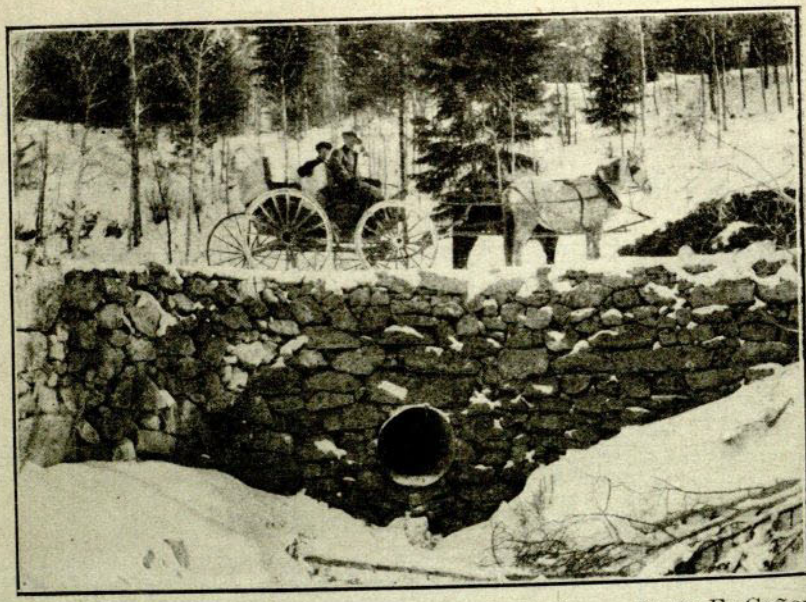
Bridges and culverts have been largely made of reinforced concrete as this material grows better by age. However we have been testing and are now using American Ingot Iron corrugated culverts in many places as they are easy to put in and can be transported very cheap, thus making them very suitable for out-of-way places. We are testing the lasting qualities of this iron by cutting out a piece of iron from each culvert that we put in and submerg-



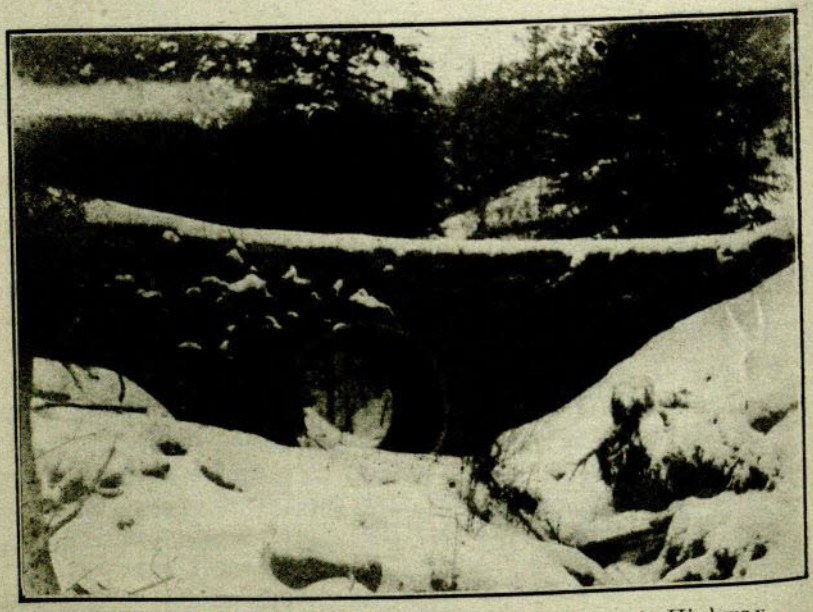
Raton Scenic Highway, Showing Concrete Posts and Chains.

ing it in 25 per cent Sulphuric Acid (H_2SO_4) for one hour and twenty minutes. This is a very severe test but these acids are used as they contain nearly all of the substances the iron would be subjected to in actual use only many times more severe. These tests show a very slight deterioration on the American Ingot Iron or less than 3 per cent, while on steel in the same test the deterioration was 96 per cent. This indicates that the lasting qualities of the American Ingot Iron to be, under these conditions, over thirty times longer than steel.

We have also just completed another comparative test with some pieces of iron that we cut out of a corrugated iron culvert put in the road between Anthony and Las Cruces by the County Commissioners of Dona Ana County. These pieces of iron were one inch by two inches, one of them we ground off the galvanizing while on the other we left it on. The other two pieces of iron were cut out of an American Ingot Iron culvert that we had re-

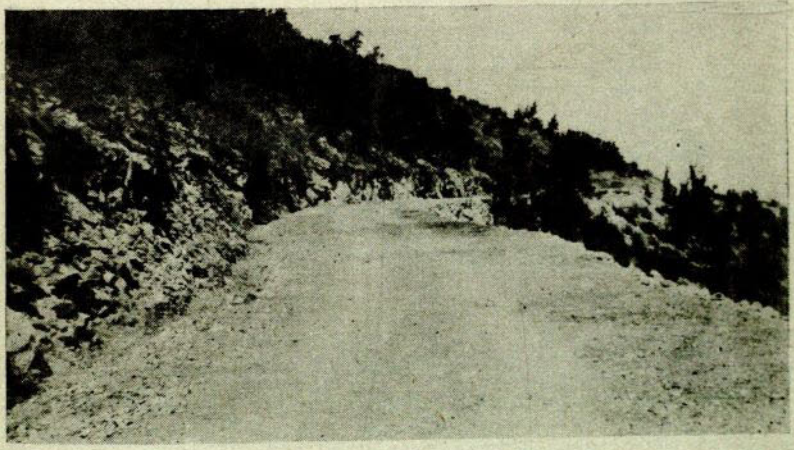


American Ingot Iron Culvert used on Scenic Highway, Santa Fe Cañon.



Six-foot American Ingot Iron Culvert in Place, Scenic Highway, Santa Fe Cañon.

ceived from the Western Metal Manufacturing Company of El Paso, Texas, each piece being of the same gauge and size as the pieces from the iron culvert from Dona Ana County. One piece we ground off the galvanizing while on the other we left it on so as to make them exactly similar to the pieces of iron cut from the Dona Ana County culvert. These four pieces, after being marked, were all put in a 25 per cent solution of 750cc of Sulphuric acid ($H_2 SO_4$) and kept in this solution for one and one-half hours at a temperature of 154°F. The ungalvanized iron taken from the culvert of the Las Cruces Road was entirely eaten up by corrosion while of the other piece there was only a trace left.



Scenic Highway, near State Line.

and on the American Ingot iron where the galvanizing was off the loss by corrosion was 6.45 per cent and on the American Ingot Iron where the galvanizing was left on the loss was 10.63 per cent.

We are now putting in some of these culverts along with concrete in the Santa Fe Canon so that the lasting qualities may be compared. From our tests we believe that these culverts will fill a long-felt want in road building. Dangerous places in the mountains are protected by the use of concrete posts connected with steel chains.

The policy of this Good Roads Commission, judging from what it has done in the past, is to establish a system of highways as economically as possible where it is most needed and to construct the road in the most difficult parts on such system in a permanent manner leaving such portions, in event any is left, where it can

be easily completed by the counties through which the system traverses, in other words, it is demonstrating what can and should be done in the way of building roads, etc.

THE SCENIC HIGHWAY.

The first highway constructed under the supervision of the Territorial Good Roads Commission was from Raton, N. M., to the Colorado State Line, where it connects with a similar road built by the State of Colorado.

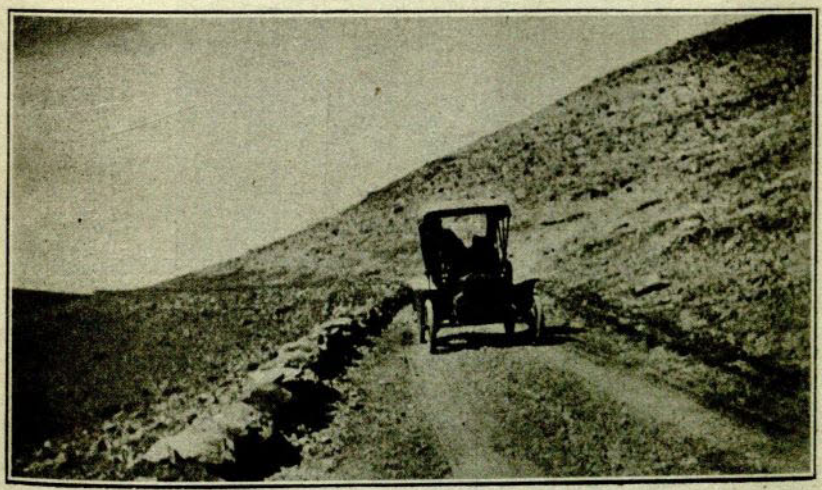
Retaining Wall, Picacho Hill, Roswell-Carrizozo Road.

Previous to the building of this road it was quite an undertaking to get a wagon and team from Trinidad, Colo., to Raton, and almost impossible with an automobile while now it is made in one hour and twenty minutes. On the New Mexico side this road is built along the top of a high ridge, a spur of the Raton Mountains, thus, affording a magnificent view of the mountains on either side, every turn in the road presenting a new picture of mountain scenery. Near the south end where the ridge drops abruptly eight hundred feet, one gets a bird's-eye view of the city of Raton and the prairie country to the south for eighty miles. This road is built in a very substantial manner, long stretches of it being blasted out of the mountain sides of solid rock, and in places where the bluffs are very steep are placed large concrete posts with heavy iron chains to guard against any possible accidents. It was built to a standard width of eighteen feet and gen-

erally very light grades used; only in one place in the maximum of eight per cent used. Shortly after this road was opened it had become quite a thoroughfare, not only locally, but for transcontinental automobilists and is destined to become much more so as to the roads further west are improved.

During the fall of 1909 the Good Roads Commission made some much more needed improvements on the road from Raton to Las Vegas, particularly at Dog Canon and Coyote Creek which were almost impassable. Here the grades are cut down and new fords made so that no trouble is experienced in crossing them.

Considerable work was done towards improving the Scenic Highway between Las Vegas and the Hot Springs, though on account of the extreme cold weather in December this work had to be temporarily abandoned. Practically all of this work was done with convict labor.

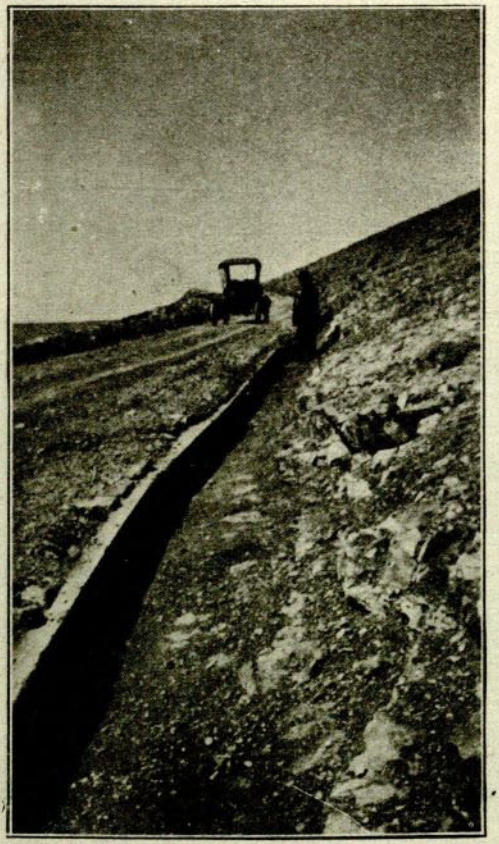


Scene, Roswell-Carrizozo Road.

ROSWELL-CARRIZOZO ROAD.

In the latter part of November, 1909, construction work was commenced on the Roswell-Carrizozo Road which connects the town of Roswell, county seat of Chaves County, on the Eastern Railway of New Mexico, a branch of the Santa Fe system, with Carrizozo, county seat of Lincoln County, on the El Paso and Southwestern Railroad, a distance of about ninety-five miles. This road connects two important towns with the two principal railway systems of the Territory and traverses for a distance of thirty-five miles the rich valleys of the Hondo and Bonito Rivers.

The funds for this work being limited, it was decided to commence work on those portions of the road which were in the worst condition and most difficult to construct. Picacho Hill, about thirty-two miles west of Roswell, was commenced first and was constructed in the following manner: The road bed was made

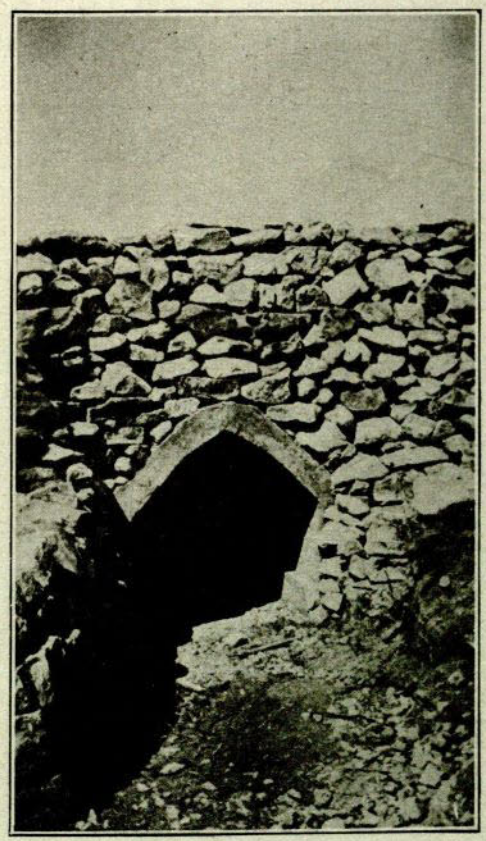


Method of Drainage, Roswell-Carrizozo Road.

fourteen feet wide in the clear between the outside retaining wall and the gutter which was blasted out of the solid rock on the side next the hill, with turnouts wherever necessary eighteen feet wide. The road was built in the solid rock, a gutter two feet wide by one foot deep being blasted out on the upper side and a retaining wall from three to eighteen feet in height constructed on the lower side. The retaining wall was formed of heavy stones from

the gutter and the adjoining hillside laid dry and with a face of one (1) horizontal and four (4) vertical.

The road bed was constructed as follows: First stones of all size were brought by hand and wheel barrows from the gutter and the hillside and used for the bottom of the fill, the surface



Culvert and Rock Walls, Roswell-Carrizozo Road,

being carefully leveled by hand, next coarse gravel and earth mixed was brought from the hillside and a layer about nine inches in thickness carefully spread over the road bed and on this was placed a layer of earth, entirely free from coarse gravel, three inches in thickness. The road was then thoroughly wetted and packed by running over with loaded wagons, no roller being available. The wearing surface was formed by spreading gravel over the surface. This was carefully leveled, well sprinkled and well

packed by running over with heavily loaded wagons producing a surface on which the heaviest loads made little if any impression. As a protection for teams and vehicles a guard wall, two feet in height and two feet thick, was built along the outside of the road. In order to prevent leakage from the gutter the side next the road was given a four inch coating of concrete and as a protection to this concrete as well as to the gutter, a row of heavy stones, one foot wide and one foot high, was laid along the

Concrete Drainage Culvert.

side of the road adjoining. Concrete culverts were built along the road at frequent intervals being designated to carry off the heaviest floods over the tributary watershed which was carefully measured. The road bed was given a slope of four-tenths of a foot towards the gutter and in order to prevent the water flowing down the wheel tracks and producing gullies, the culverts were made two or three inches higher than the surface immediately above them.

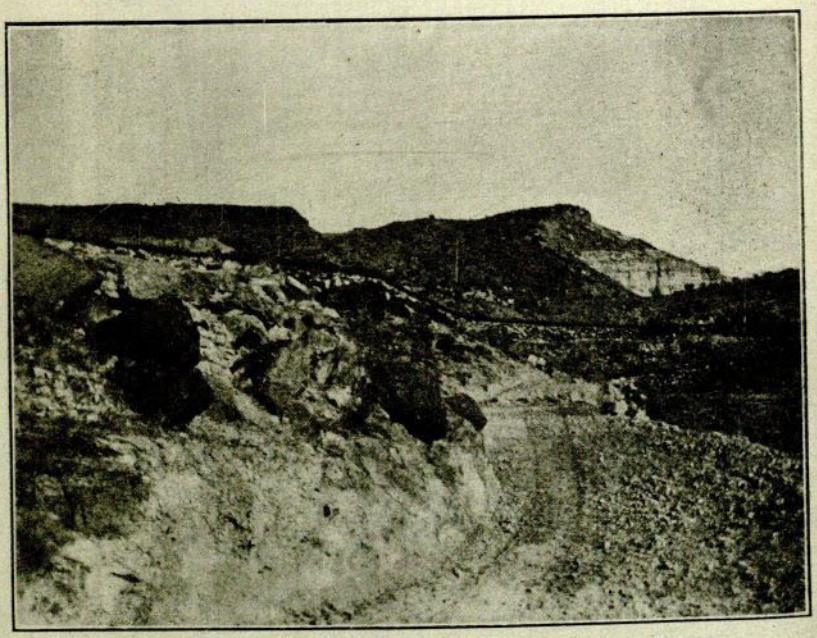
The next heaviest piece of work was Nogal Hill where the

Convicts working on Silver City-Mogollon Road.

grade was cut in two and a good wide road bed built. Considerable repair work was also done in the valleys of the Hondo and the Bonito.

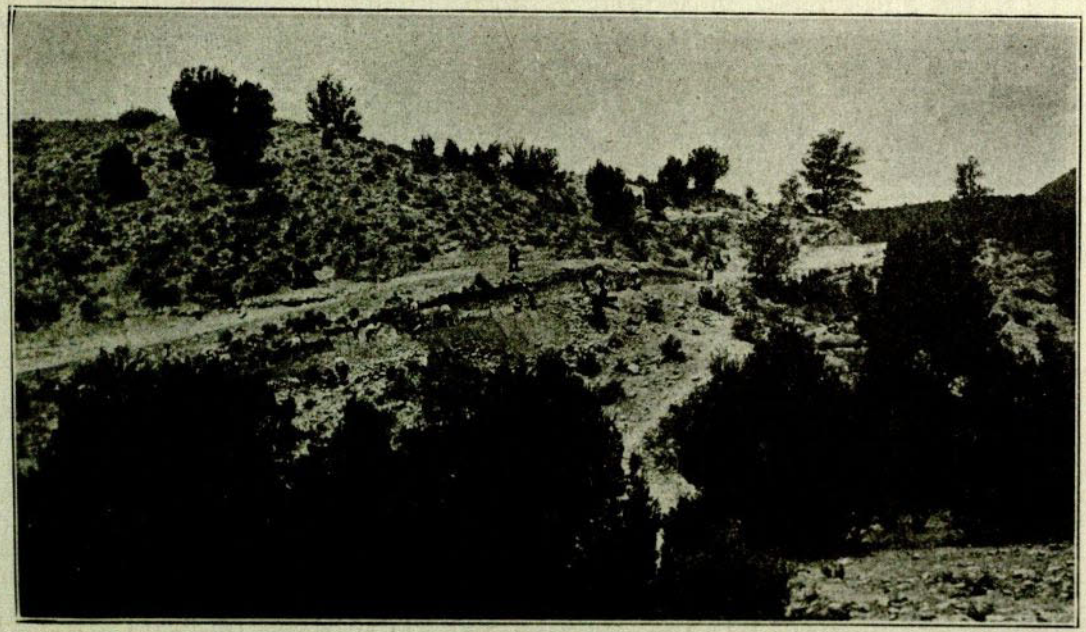
SILVER CITY-MOGOLLON ROAD.

During the summer of 1909, surveys were made for a road between Silver City and the Mogollon Mining District, a distance of seventy-six miles. Surveys of different routes aggregating one hundred and twenty-five miles were made in order to determine the best location.

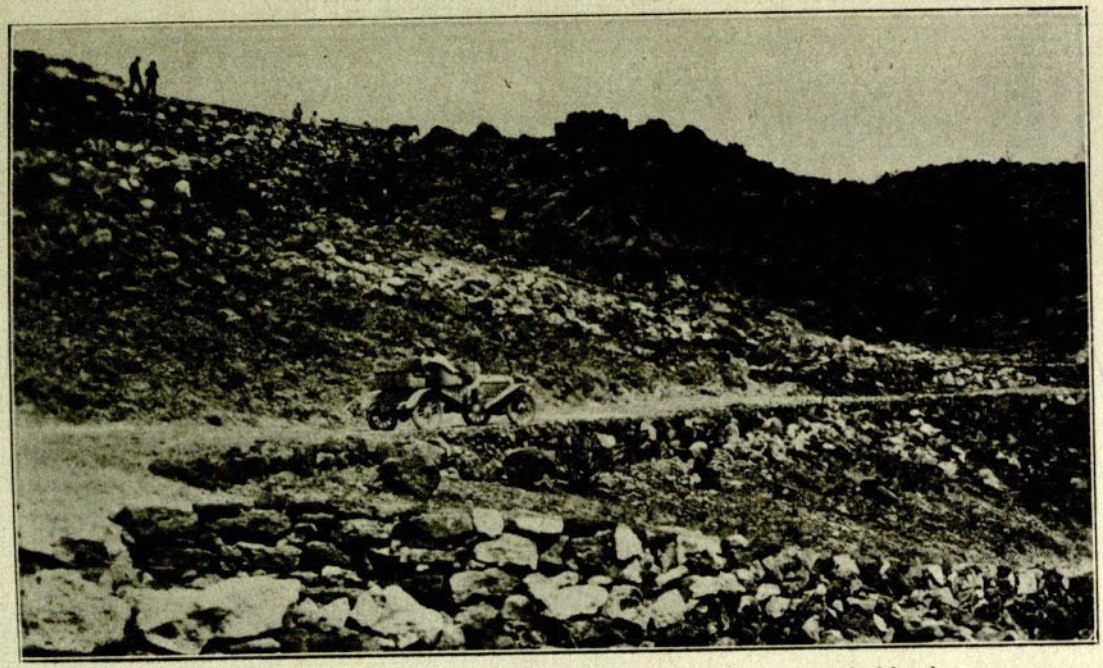


La Bajada Hill, Santa Fe-Albuquerque Road.

In January of 1910 active construction was begun at Silver City and has progressed steadily ever since, having at the present time finished about twenty-five miles, six of this being heavy construction work. The first mile west of Silver City being seventy per cent solid rock, this was built to a standard width of eighteen feet and a maximum grade of seven per cent and saves a mile and a half over the old route. The grade over the continental divide was cut down from a maximum of eighteen to seven per cent, and several long grades have been reduced in like proportion.

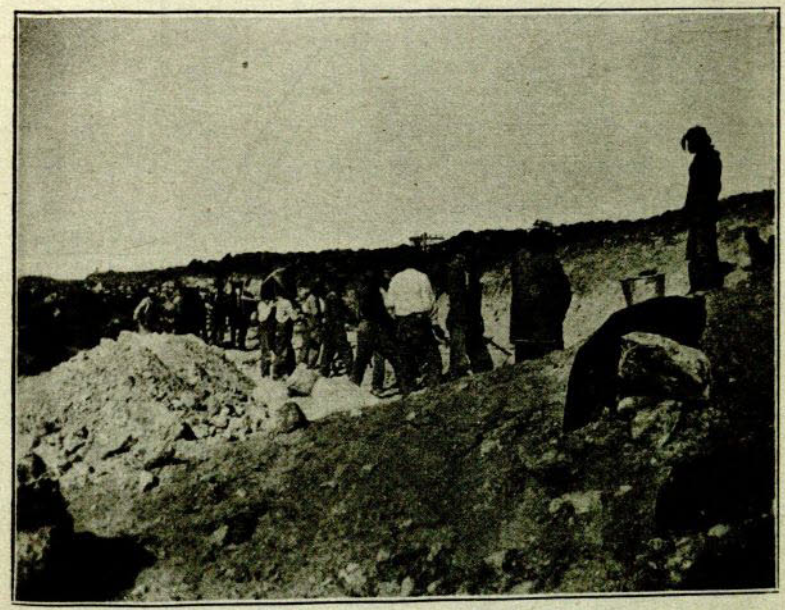


Convicts Working on Silver City-Mogollon Road.



La Bajadn Hill, Santa Fe-Albuquerque Road. Showing switchbacks.

This is a very busy road over which is hauled an immense tonnage of supplies for Gila, Cliff, Glenwood, Alma and Mogollon, and on the return trip loaded with concentrates from the Mogollon mines. Where previously all heavy teams had to stop and double up the grades, now they pull them with ease. This saving of time alone for these teams will pay for the improvements within a year, not to mention the terrible strain on teams pulling such grades which cut the useful life of a horse down to four or five years. This work is being done largely by convicts. The convict camp being located near Glenwood where there is a great deal of heavy work being done.



Cochiti Indians working on Santa Fe-Albuquerque Road.

SANTA FE-ALBUQUERQUE ROAD.

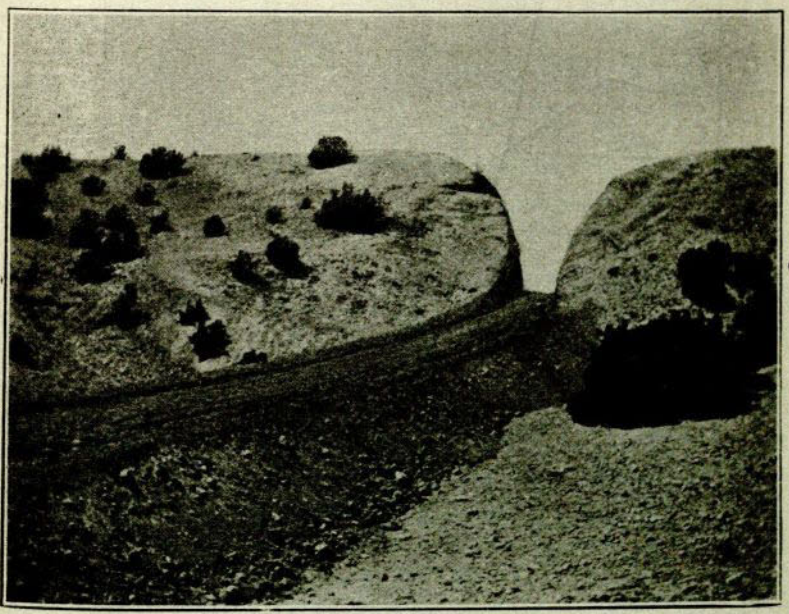
This road is one of the links of the Scenic Route from Cheyenne, Wyoming, to El Paso, Texas. From Santa Fe is extends along Agua Fria Street, then through Agua Fria, La Bajada. Domingo, Algodones, Bernalillo and connects with Fourth Street, Albuquerque.

Construction work was begun in November, 1909, and the road built from La Bajada to Algodones, a distance of 19.5 miles. Much sand was encountered and about four miles were clayed. It

La Bajada Hill, Santa Fe-Albuquerque Road.

was also necessary to make two cuts, one fifteen feet deep and the other sixty feet deep. A maximum grade of 10 per cent at the approach of one cut was necessary, but for the rest of the distance the grade is light.

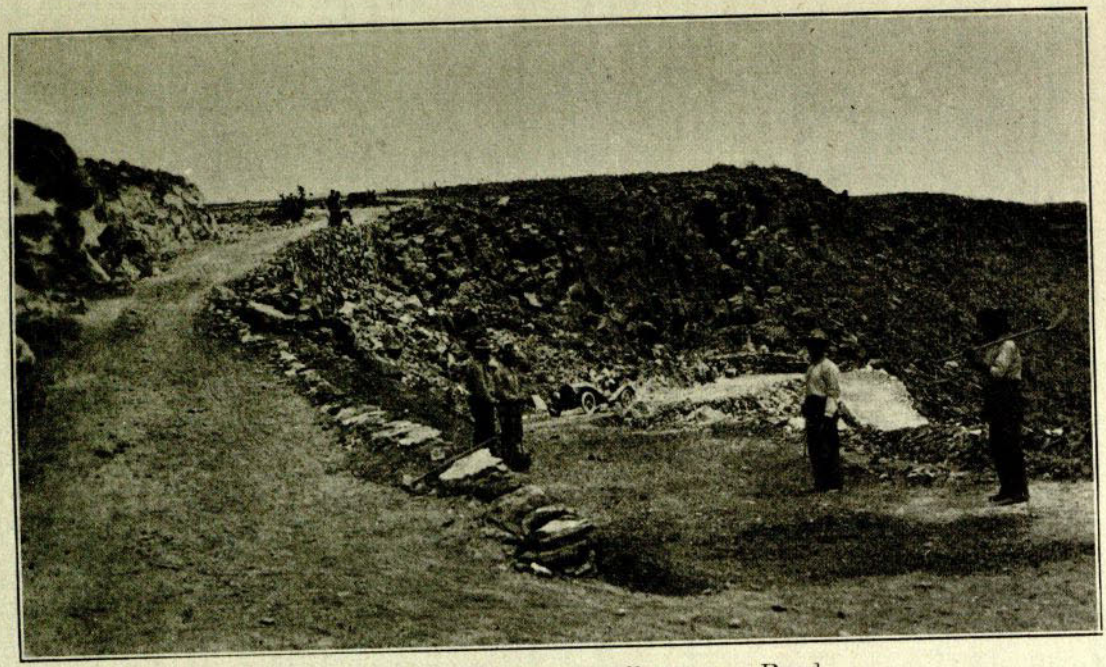
From Agua Fria to La Bajada, a distance of 16.1 miles, the road runs across mesas and most of the work was done by grader. At La Bajada Hill was found the heaviest work on the road. The Hill is 1.5 miles long and and for most part of this distance was solid lava rock. This work was done by a force of convicts from the Penitentiary and by Cochiti Indians. The Good Roads Com-



Sixty foot cut on Santa Fe-Albuquerque Road.

mission was assisted by the Indian Service to the extent of $1000.00, used to hire Indians to work on the hill. Another lava rock hill above Cieneguilla was built by the convicts.

A road was also graded from the Santa Fe-Albuquerque Road below Agua Fria to the Cerrillos Road, a distance of 3.0 miles. The completion of this road will afford the farmers of the Rio Grande Valley a way to get their produce to market. The grade of La Bajada Hill was reduced from 28 per cent to 7.8 per cent. The first month after the road was opened traffic increased 121 per cent.



La Bajada Hill, Santa Fe-Albuquerque Road.

Entire distance sixty-two miles, distance completed thirty-eight and six-tenths miles; minimum grade 10 per cent (at one place for short distance.)

CARLSBAD- MONUMENT ROAD.

The proposed Carlsbad-Monument Road connects Carlsbad county seat of Eddy County, on the Eastern Railway of New Mexico, with the rich grazing and dry farming districts of the Eastern New Mexico Plains, of which the towns of Monument and Knowles are the chief trading centers. The distance between Carlsbad and Monument is about sixty-three miles, the road to be constructed will be over a gentle undulating country and in fairly good condition, with the exception of two strips of sand extending for a long distance north and south at right angles to the course of the road. The first of these sand strips some twenty-six miles from Carlsbad, is about two miles in width and the sand varies from a few inches to several feet in depth. A careful examination disclosed a route which would avoid this sand with a very slight increase in distance. The second strip of sand beginning about forty-three miles from Carlsbad is four miles in width at the nearest point extending to the break of the plains a rocky, precipitous hill rising to a height of about two hundred feet above the sand.

The construction of the road across this sand will be particularly difficult, the distance from the base of supplies being great and suitable materials for road construction being hard to obtain except at distance whence the haul would be prohibitive. However, a method of construction is now being devised which it is believed will give good results at a minimum cost.

SANTA FE-SANTA CRUZ ROAD.

This proposed road extends from Santa Fe through Tesuque, Cuyamungue, Pojoaque, Santa Cruz to the Santa Fe-Rio Arriba County line, a distance of 25.18 miles.

Following the ridge road north of Santa Fe to the top of the divide and descending into the Tesuque Valley along another ridge, an ideal location is found. From the Tesuque Pueblo more or less sand is found and a sand-clay road could be constructed there. Clay is found at a short distance from the road.

A survey of this road was made in May at a cost of $224.00. No construction has been started yet. The estimated cost of the road is ten thousand dollars. Maximum grade nine per cent.

This road would afford a means for the farmers in the vicinity

of Santa Cruz, Espanola, etc., where ten thousand acres are irrigated, to get their produce to Santa Fe.

It also forms a portion of the road to the rich valleys of Taos, Rio Arriba and San Juan Counties.

DEMING ROAD.

Generally speaking the road between Deming and Silver City is very good excepting that portion just north of Deming where there are several miles on either side of the Mimbres River that the road is in very heavy sand. It is proposed to cross this sand by building a sand-clay road with a wearing surface of gravel spread over the sand-clay foundation. All material necessary for the construction of this road can be found along its alignment. The water necessary for the bringing of the material to the proper consistency can be gotten from a well located near the central portion of the road.

The people of Deming have raised money to be used by the Good Roads Commission in the building of this road and construction work has already been commenced.

LAS VEGAS-SANTA FE ROAD.

A floating camp is repairing the road to Las Vegas so as to make it possible for teaming. The Canoncito Hill is avoided in the new alignment of the road near this place. The camp is now near Glorieta.

FARMINGTON-GALLUP ROAD.

There is a great need of a road from Farmington to Gallup and especially for mail and passenger service and to that end the County of San Juan made a partial survey of the road extending towards Gallup of that portion lying in that county and the Territorial Engineer made an inspection of the proposed road. It was found that this road would cross a country in which it would be hard to construct a good road on account of lack of water and the roughness and sandy nature of the country. The distance between Gallup and Farmington by what is thought to be the best location for a road would be about one hundred and five miles. Nothing further has been done towards the construction of same.

CLOUDCROFT-ALAMOGORDO ROAD.

A proposed road from Alamogordo to Cloudcroft by way of Dry Creek, Fresnal Canon and the Middle Fork of Fresnal Creek has been surveyed by the county and inspected by the Territorial Engineer. The road, while very scenic if built, is very expensive to construct, especially that portion of Dry Creek and Fresnal Canon.

in the latter we are afraid that snow will blockade the road in the winter.

Other roads in Otero County have also been inspected by the Territorial Engineer.

LAS VEGAS-MORA ROAD.

Survey has been completed and work will commence soon on the building and reconstruction of the road from Las Vegas to Mora. This road will leave Las Vegas going northeast over the Mesa, crossing the Sapello at the Sapello concrete bridge, hence through the canon to Cebolla and up the Cebolla and across the divide to the Mora River hence to the town of Mora.

This road will cost in the neighborhood of $15,000.00 but is fully justified as it is one of the principal roads of the Territory.

ANTHONY-DONA ANA ROAD.

An examination and recommendation of the construction of this road has been made. This is a part of the Great Scenic Road and will extend that part already built by El Paso to the New Mexico line. A sand-clay foundation with a gravel wearing surface is recommended.

INDEX TO REPORT.

R.

GOOD ROADS EXPENDITURES.

Voucher No.	Warrant No.	In Favor of—	Silver City—Mogollon.		Albuquerque—Santa Fe.		Roswell—Carrizozo.		Las Vegas—Mora.		Luna County.		River Wall.		Santa Fe—Las Vegas.		Carlsbad—Monument.		Santa Fe—Santa Cruz.		General Expense.		Scenic Highway and Canon.		Time Sheet for Period Ending
			Warrants	Time Sheets.	Warrants	Time Sheets.	Warrants.	Time Sheets.	Warrants.	Time Sheets.	Warrants	Time Sheets.	Warrants.	Time Sheets.	Warrants.	Time Sheets.	Warrants.	Time Sheets.	Warrants.	Time Sheets.	Warrants.	Time Sheets.	Warrants	Time Sheets.	
1	15742	W. & L. E. Gurley																					$ 178.00	$ 539.67	Aug.
2	15743	V. L. Sullivan																					263.20	557.69	Sept.
3	.....	H. S. Allison																					776.41	584.65	Oct.
4	.....	Capt. Chrisman																					5.25	.....	Jan. 29, 1910
5	.....	H. S. Allison		$ 744.58																			727.65	.....	Feb. 5, 1910.
6	.....	V. L. Sullivan		766.45																			10.30	.....	" 12, 1910.
8	.....	H. S. Allison		68.50																			636.43	.....	" 19, 1910.
9	16039	V. L. Sullivan		77.00																			41.90	.....	" 26, 1910.
11	16114	V. L. Sullivan		69.09																			154.00	.....	March 5, 1910.
12	16155	Western Wheeled Scraper Co		870.97																			125.00	.....	" 12, 1910.
13	16156	V. L. Sullivan		533.93																			64.58	.....	" 19, 1910.
13a	16787	Consolidated Supply Co		80.26																			44.65	.....	" 26, 1910.
15	16157	H. S. Allison		23.85																			1,123.79	.....	April 2, 1910.
17	16401	H. S. Allison		269.25																			740.58	.....	" 9, 1910.
18	16398	V. L. Sullivan		834.08																			104.84	.....	" 16, 1910.
21	16394	B. F. Pankey		189.10																			75.00	.....	" 23, 1910.
23	16499	Wood-Davis Hardware Co		117.60																			298.38	.....	" 30, 1910.
26	16560	J. D. Meriwether		190.00																			332.15	.....	May 7, 1910.
27	16552	V. L. Sullivan		892.93																			132.34	.....	" 14, 1910.
30	16585	J. D. Meriwether		113.00																			870.32	.....	" 21, 1910.
36	16791	J. D. Meriwether		239.19																			700.67	.....	" 28, 1910.
44	16808	New Mexico Penitentiary		10.00																			50.25	.....	June 4, 1910.
48	16921	J. D. Meriwether		126.10																			757.83	.....	" 4, 1910.
60	17047	J. D. Meriwether		708.86																			820.08	.....	" 18, 1910.
148	.....	C. H. Neel		77.26																			319.15	.....	" 25, 1910.
159	18651	C. H. Neel		158.15																			113.30	.....	July 2, 1910.
169	.....	Western Metal Manufacturing Co		184.00																			.....	.....	" 9, 1910.
172	.....	C. H. Neel		41.45																			591.66	.....	" 16, 1910.
....	16573	V. L. Sullivan		90.65																			.....	.....	Aug. 13, 1910.
....	16587	V. L. Sullivan		535.17																			133.55	.....	" 29, 1910.
....	16518	Wood-Davis Hardware Co		14.55																			167.00	.....	" 20, 1910.
....	16801	George Dietzel		196.17																			139.70	.....	Oct. 1, 1910.
....	16802	L. Tafoya		80.00																			69.40	.....	Sept. 3, 1910.
....	16803	New Mexico Penitentiary		668.44																			5.80	.....	" 1, 1910.
....	17244	C. H. Neel		32.00																			9.03	.....	" 17, 1910.
....	17245	Wood-Davis Hardware Co		13.85																			157.12	.....	Oct. 8, 1910.
57	17031	V. L. Sullivan		355.87																			267.44	.....	Nov. 5, 1910.
58	17070	Consolidated Supply Co		338.08																			132.60	.....	Dec. 4, 1909.
....	16958	New Mexico Penitentiary						$ 15.00															.....	.....	" 11, 1910.
61	17048	H. I. Kimball						47.25														$ .35			" 11, 1909.
67	17080	Nathan Jaffa						46.25														55.15			" 13, 1909.
....		V. L. Sullivan						153.75														13 00			" 18, 1909.
118	17693	Williamson-Hafner Co						151.50														32.90			" 25, 1909.
119	17782	Newman Clock Co						107.88														575.00			" 25, 1909.
122	.....	R. P. Ervien						128.50														26.98			Jan. 1, 1910.
128	18038	New Mexican Printing Co						341.25														14.10			" 1, 1910.
133	.....	Keffuel & Esser Co						288.28														59.50			" 8, 1910.
137	18338	Good Roads Machinery Co						176.19														3.50			" 15, 1910.
139	18340	V. L. Sullivan						347.94														3.25			" 22, 1910.
....								180.75														193.16			" 22, 1910.
177	.....	W. E. Dunn & Co						198.50														17.50			" 29, 1910.
181	.....	V. L. Sullivan						451.33														36.88			" 29, 1910.
182	.....	Independent Hardware Co						357.40														82.40			Feb. 5, 1910.
16	16158	V. L. Sullivan						128.75														36.04			" 5, 1910.
19	16396	C. H. Neel						181.62														4.85			" 12, 1910.
20	16395	Santa Fe Hardware Co						384.66														.....			" 12, 1910.
22	16492	V. L. Sullivan						3 5.33															220.53		" 19, 1910.
24	16499	Capitol Coal Yards						137.63															74.10		" 19, 1910.
25	.....	New Mexico Penitentiary						177.64															29.00		" 26, 1910.
....								335.00															237.50		March 5, 1910.
....								378.12															2.25		" 5, 1910.
....								195.41															253.20		" 12, 1910.
....								171.00																	" 12, 1910.
....								456.74																	" 19, 1910.
37	16788	V. L. Sullivan						313.92																	" 19, 1910.
7	.....	J. D. Meriwether		$ 325.65				241.12																	" 19, 1910.
9	16038	J. D. Meriwether		431.30				182.75															19.00		" 26, 1910.
10	16113	V. L. Sullivan		26.70				446.02																	" 26, 1910.
14	16154	J. D. Meriwether		358.85				28.50																	April 2, 1910.
68	17082	A. T. & S. F. Railroad Co		225.60				406.55																	" 2, 1910.
73	17092	A. T. & S. F. Railroad Co		397 70				234 59																	" 9, 1910.
74	17103	A. T. & S. F. Railroad Co		19.40				225.18																	March 9, 1910.
80	17249	J. D. Meriwether		346 53				237.94																	April 16, 1910.
96	17380	J. D. Meriwether		261.42				153.07																	" 23, 1910.
97	17381	Western Wheeled Scraper Co		138.00				252 58																	" 23, 1910.
108	17031	V. L. Sullivan		.40				255.51																	May 14, 1910.
111	.....	J. D. Meriwether		275.90				274.97																	" 21, 1910.
112	.....	H. J. McGrath		15.55				264.09																	" 28, 1910.
115	.....	New Mexico Penitentiary		15.85				273.28																	June 4, 1910.
118	17694	V. L. Sullivan		75.75				158.50																	May 7, 1910.
124	17845	J. D. Meriwether		322.55				114.75																	June 4, 1910.
131	18041	J. D. Meriwether		283.10				125.30																	" 4, 1910.
....	.....	J. D. Meriwether		391.35				101.50																	" 18, 1910.
....	.....	V. L. Sullivan		256.50				22.90																	Jan. 8, 1910.
....	18473	J. D. Meriwether		196.10				131.74																	" 15, 1910.
149	18515	J. D. Meriwether		75.00	$ 10.25			291.24																	Nov. 20, 1909.
153	.....	New Mexico Penitentiary		354.95	259 98																				" 27, 1909.
165	18671	J. D. Meriwether		14.55	243 89																				Dec. 4, 1909.
166	.....	P. H. Gallegos		256.50	187 00																				" 11, 1909.
179	.....	J. D. Meriwether		8.50	214.71																				" 18, 1909.
184	.....	A. T. & S. F. Railroad Co		231.73	185.18	$ 37.14																			" 25, 1909.
39	16792	M. I. Pardee		112.25	160.60	.....																			Jan. 1, 1910.
....					83.25	153.60																			" 8, 1910.
47	16809	Western Wheeled Scraper Co			88 25	135.90																			" 15, 1910.
51	16959	J. W. Lewis			377.50	27.72																			" 20, 1910.
54	16964	Pecos Valley L. Co			297 00	38.75																			" 29, 1910.
55	16965	Independent Hardware Co			280.46	31.95																			Feb. 5, 1910.
56	16967	Joyce-Pruit Co			350.75	2.59																			" 19, 1910.
58	17031	V. L. Sullivan			479.17	.....																			March 5, 1910.
....	.....				234.41																				" 5, 1910.
....	.....				1,039.24																				" 19, 1910.
66	17080	J. W. Lewis			1,175.42	287.13																			" 12, 1910.
69	17088	Ullery Furniture Co			146.50	113.16																			April 2, 1910.
70	17089	Independent Hardware Co			264 32	19.69																			" 9, 1910.
71	17090	Pecos Valley L. Co			895.69	11.45																			" 2, 1910.
72	17091	Joyce-Pruit Co			252.20	43.40																			" 16, 1910.
79	17284	J. W. Lewis			415.38	300.01																			" 23, 1910
....	.....				539.73	.....																			May 7, 1910.
98	17342	Independent Hardware Co			109.75	52 65																			" 21, 1910.
94	17343	Ullery Furniture Co			55.50	45.80																			" 28, 1910.
95	17379	J. W. Lewis			51.00	116.10																			June 11, 1910.
98	17382	Pecos Valley L. Co			369 08	51.13																			" 25, 1910.
99	17383	Independent Hardware Co			464.65	45.85																			July 23, 1910
00	17384	Joyce-Pruit Co			534.02	38.55																			" 30, 1910.
02	.....	Joyce-Pruit Co			208.75	31.75																			" 9, 1910.
03	.....	Pecos Valley L. Co			119.00	107.39																			Aug. 27, 1910.
05	.....	V. L. Sullivan			179.80	105.36																			" 6, 1910.
33	16619	J. W. Lewis			194.00	629.55																			Sept. 18, 1910.
13	.....	J. W. Lewis			321.75	138.30																			Aug. 1910.
15	.....	Meade Neel				154.10															$ 65.02				Aug. 24, 1910.
06	.....	J. W. Lewis				233.15															165.70				Sept. .....
20	.....	Meade Neel				141.10															69.38				Oct. 1, 1910.
23	.....	Meade Neel				129.00															100 25				" 8, 1910.
28	16557	C. H. Neel																			91.25				" 15, 1910.
32	16586	V. L. Sullivan		321.49																	194.50				" 22, 1910.
37	16789	V. L. Sullivan		79.11																	126.34				" 29, 1910.
38	16789	Wood-Davis Hardware Co		32.05																	114.25				Oct. 1, 1910.
40	16790	C. H. Neel		50 50																	197.00				Nov. 12, 1910.
49	16422	C. H. Neel		71.80								85 95													Oct. 1, 1910.
58	17031	V. L. Sullivan		140.48								276.25													" 8, 1910.
59	17046	C. H. Neel		1.65								316.75													" 15, 1910.
75	17244	C. H. Neel		274.28								284.50													" 22, 1910.
76	17244	Wood-Davis Hardware Co		267.44								92.00													" 29, 1910.
77	17246	Chas. Closson		132.60								322.50													Nov. 5, 1910.
78	17247	V. L. Sullivan		15.00								166.00													" 5, 1910.
91	17344	V. L. Sullivan		2.15								380.70													Sept. 10, 1910.
92	17345	C. H. Neel		98.20										100 85											Oct. .....
04	.....	Wood-Davis Hardware Co		316.32										192.96											
15	.....	C. H. Neel		2.60																					
21	17784	C. H. Neel		392.15																					
27	18037	C. H. Neel		145.95																					
36	.....	C. H. Neel		359.50																					
38	.....	P. B. Johnson		216.80																					
07	.....	C. H. Neel		192.00																					
41	17548	Bernalillo Mercantile Co		283.32																					
47	18346	Bernalillo Mercantile Co		407.18																					
48	.....	C. H. Neel		342.44																					
52	.....	P. B. Johnson		40.25																					
61	18654	Fred Thayer		208.00																					
62	18655	G. Gallegos		22.67																					
63	18656	New Mexico Penitentiary		22.67																					
21	17784	C. H. Neel		17.00																					
50	18851	C. H. Neel																							
30	18040	J. W. Lewis																							
55	.....	Meade Neel																							
40	.....	J. W. Lewis																							
50	18516	J. W. Lewis																							
58	18650	J. W. Lewis																							
76	.....	J. W. Lewis																							
83	.....	Walter Welch																							
42	18347	J. D. Meriwether																							
46	18421	Edward Redding								593.32															
48	.....	C. H. Neel								82.05															
59	18651	C. H. Neel																							
72	.....	C. H. Neel																							
....	.....	J. D. Meriwether																							
64	.....	J. D. Meriwether																							
78	.....	J. D. Meriwether										190.30													
33	.....	S. W. Portland Cement Co										190.70													
34	.....	New Mexico Central Railway Co										204.10													
48	.....	C. H. Neel										.....		404.00											
51	.....	L. Camponola												228.00											
55	.....	L. Camponola												10.00											
59	18651	C. H. Neel												4.00											
60	18652	J. G. Miller												4.00											
68	.....	L. Camponola												51.50											
70	.....	C. W. Dudrow												92.00											
71	.....	S. W. Portland Cement Co												4.00											
72	.....	C. H. Neel												247.00											
73	.....	J. G. Miller												402 00											
74	.....	New Mexico Penitentiary												51 50											
75	.....	New Mexico Penitentiary												100.00											
89	18890	New Mexico Penitentiary												143.00											
86	18887	C. H. Neel												66.30											
86	18887	C. H. Neel												141.75											
86	18887	C. H. Neel												61.75											
93	18894	New Mexico Penitentiary	22.15																						
88	18889	J. G. Miller												100.00											
90	18891	Will Tucker												3.20											
91	18892	Ramon Romero												36 80											
83	18885	Walter Welch												.....											
87	18888	L. Camponola												4.00											
92	18893	Fred Thayer												.....											
94	18895	Western Metal Manufacturing Co												40.00											
			$ 5,367.83	$ 9,115.29	$ 4,385.60	$ 10,786.75	$ 3,212.16	$ 10,580.74	$ 675.37	.....	$ 585.10	$ 1,824.65	$ 2,194.80	$ 293.81	$ 391.50	$ 1,123.69	$ 1,141.85	.....	$ 254.00	.....	$ 1,154.54	.....	$ 12,124.57	$ 1,682.01	.....

DEPARTMENT OF

TERRITORIAL ENGINEER.

Water Supply Records

FROM

SEPTEMBER 1908

TO

OCTOBER. 1910.

SANTA FE, N. M.
NEW MEXICAN PRINTING COMPANY
1911.

INTRODUCTION.

In the Territorial Engineer's Second Biennial Report acknowledgment was made of cooperation services secured from various sources.

This booklet is supplementary to Bulletin No. 3 issued by this department during October, 1908, and continues the records of water supply from the 1st day of October, 1908, to September 30, 1910 inclusive. The former bulletin collected all known records on New Mexico water supply up to October, 1908, going back as far as fifteen years on different stations in order to bring to a working level all water records of this territory. With a few exceptions where stations have been recently established or discontinued the period covers two full years.

Methods and equipment for the collecting of this data have been greatly improved and owing to a longer period of time upon which to base foundations for computation, the records here printed probably follow more closely absolute river flow than those obtained heretofore.

Final results are in acre-feet for convenience of engineers and others in their computations. One acre-foot is an acre covered to the depth of 1 foot. One second-foot, or one cubic foot per second of time, running twenty-four hours gives 1.98 or practically 2 acre feet.

Records collected from automatic registers are indicated by foot notes.

The following data will give the description of the various gaging stations and the discharge of the streams at the location of the gaging sations during the period of September, 1908, to September, 1910. (For water supply records prior to that time write the Territorial Engineer.)

ANIMAS RIVER AT AZTEC, N. M.

This station was originally established June 21st, 1904, at a highway bridge about three-eighths of a mile west of Aztec. It was discontinued December 14, 1904, and re-established at the same location June 8th, 1907. On September 13, 1908, it was moved to a new suspension bridge about one-half mile up-stream. Present location about one-third of a mile west of Aztec, although 20 miles above the mouth of the river it is below all important tributaries. The La Plata, San Juan and Animas join at Farmington, N. M. The drainage area above station is about 1300 square miles. Gage observer is H. S. Wattles.

Discharge Measurements of Animas River at Aztec, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec Ft.
1908.					
December 9	J. B. Stewart	82	108	3.30	181
1909.					
January 12	C. D. Miller	75	101	3.3	177
March 29	J B. Stewart	145	228	4.15	657
May 13	J. B. Stewart	157	539	6.2	3070
June 27	V. L. Sullivan	151	731	6.9	4470
July 28	J. B Stewart	155	457	5.65	2010
September 27	W. B. Freeman	150	252	4.65	793
November 16	J B. Stewart	149	152	4.05	342
September 6	Flood—Max *	.....	.....	11	....
1910					
February 9	W. B. Freeman	149	168	4	383
March 27	G T. Lyon	151	364	5.3	1440
May 31	G. H. Russell	155	709	7.3	4212
June 21	R. H. Bolster	151	436	5.24	1364
August 17	C. T. Lyon	135	130	3.95	291
August 21	V. L. Sullivan	135	161	3.9	340
	*Main Section Area	.....	1400	Est. Disc.	14000
	Overflow Section Area	.....	740	Est. Disc.	2000
				Total Q..	16000

*Overflow probably at Gage Height of 10 in.

Daily discharge January 1. to September 6, 1909, from fairly well defined rating curve between 130 and 46000 second feet.

Daily discharges September 7 to December 31, 1909 obtained by tho indirect method o shifting channels.

Daily Discharge, in Sec. Feet, of Animas River, at Aztec, N. M.

	1908			1909											
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1	292	292	235	235	292	350	858	1510	1860	3690	1050	2390	700	830	3
2	292	292	235	235	292	471	930	1400	2390	3410	1100	1740	620	640	3
3	292	292	264	235	292	594	1010	1400	3590	3230	930	1740	620	500	4
4	292	292	264	235	292	594	1100	1860	5610	2880	930	2240	700	450	4
5	350	292	292	235	292	657	1190	3410	7700	3230	1190	6570	750	450	4
6	292	292	264	235	292	788	1010	3780	8780	3320	858	12500	800	450	4
7	292	292	235	235	292	721	858	3980	8920	3050	823	12100	700	390	3
8	292	292	205	235	292	721	788	4490	8780	2710	788	7450	750	390	3
9	264	292	180	235	292	721	788	4080	8780	2240	894	5950	680	390	3
10	235	292	235	235	292	657	930	3230	8240	1980	823	3300	680	380	3
11	235	292	235	180	292	594	1100	2880	7570	1740	930	2640	680	380	3
12	235	235	235	180	292	532	1100	2960	6450	1630	858	2620	620	380	3
13	235	235	235	180	292	471	930	2880	6810	1510	930	2190	620	370	3
14	235	235	235	180	292	471	1010	2880	6450	1400	894	1900	620	370	3
15	235	235	350	180	292	532	1510	2710	6090	1290	858	1770	620	370	3
16	235	235	394	225	292	594	2390	2710	6450	1100	1980	2550	620	370	3
17	235	235	721	292	235	657	3230	2880	6690	1010	1630	2550	742	310	3
18	235	235	532	235	235	721	3780	3140	7310	930	1190	2050	1400	310	3
19	350	235	292	235	235	721	4180	3880	7180	858	1190	1970	1400	310	2
20	410	2 5	235	235	235	858	3590	4180	6810	858	1190	1900	1390	310	2
21	410	235	235	292	264	788	2110	4280	6570	930	1400	1800	1390	310	2
22	410	235	235	350	264	721	2240	3050	5970	1290	1190	1650	1380	350	2
23	350	235	235	440	264	930	1740	2880	5850	2240	1100	1800	1380	350	2
24	350	235	235	292	264	788	1400	2880	5730	2470	1400	1780	1360	350	2
25	350	235	235	292	264	858	1190	2390	5490	2390	1740	1780	1350	350	2
26	350	235	235	235	292	930	1192	2240	5040	1510	2390	1110	1340	350	2
27	350	245	235	180	292	930	1680	2710	4820	2710	1400	910	1290	380	2
28	292	235	235	180	292	858	1510	4180	4600	2180	1630	760	1270	380	2
29	292	235	235	180	.....	788	2110	4180	4080	1740	3050	700	1250	380	2
30	292	235	235	180	.....	788	1860	2880	3880	1400	3590	700	1250	380	2
31	292	.....	235	350	.....	788	.....	2110	.....	1190	2710	.....	1100	.....	
Total	9271	7677	8658	7403	7808	21592	49912	94020	184490	62116	42636	90110	30750	11930	10

Daily Discharge, in Sec. Feet, of Auimas River, at Aztec, N. M.—Con'd.

1910

Day	Jan.	Feb.	Mar.	April	May.	June	July.	Aug	Sept.
1	405	340	615	940	2860	4670	1030	855	235
2	475	340	615	940	2420	4090	940	615	235
3	475	340	775	940	2020	4300	855	545	212
4	405	340	855	940	1770	3530	815	775	235
5	405	340	940	940	1890	3180	775	1590	285
6	340	340	1130	900	2020	3020	695	1230	260
7	340	340	1330	900	2140	2700	695	855	235
8	340	340	1430	940	2140	2490	655	695	235
9	340	340	1540	940	3020	2420	615	615	235
10	405	340	1230	940	3620	2280	615	545	235
11	475	340	1030	940	4280	2140	580	545	235
12	475	340	1030	1030	4670	2130	545	510	235
13	405	340	1170	1130	4090	2140	475	475	235
14	340	372	1230	1130	3530	2130	475	475	235
15	340	440	1230	1130	3260	2020	440	475	235
16	340	372	1230	1130	2940	1820	405	405	235
17	340	285	1230	1030	2560	1650	405	340	235
18	340	235	1230	840	2280	1330	405	340	235
19	372	235	1330	940	2280	1330	405	285	235
20	405	312	1330	1130	2350	1330	405	285	285
21	405	340	1480	1770	2280	1230	405	285	235
22	405	340	1650	1830	2020	1230	405	285	340
23	405	340	1890	1650	1770	1230	405	285	340
24	405	405	1890	2020	1540	1130	372	235	285
25	405	545	1770	2420	1890	1130	372	235	285
26	372	615	1770	2940	2020	1030	340	235	285
27	340	440	1430	3020	1770	940	545	235	260
28	340	475	1340	3020	2720	855	5 0	190	260
29	340	.....	1230	3620	3710	1330	475	190	235
30	340	.....	1130	3530	4280	1280	475	190	235
31	340	.....	1030	.....	4670	.....	615	235	.....
Total	12199	10171	39060	45670	84810	61835	17149	15055	7562

Note.—The totals in second feet do not indicate the total number of second feet running for the month but are the totals of the *average daily flow*, hence the average daily flow running twenty four hours (discharge in second feet x 1.98) gives so many acre feet and to facilitate computation, the daily average discharges are totaled for the month and then changed to acre feet.

Year	Month.	Run-off in Acre Feet
1908	October	18.400
	November	15.200
	December	17,200
	Total for period	50,800
1909	January	14700
	February	15500
	March	42900
	April	98800
	May	186000
	June	366000
	July	123000
	August	84800
	September	179000
	October	61000
	November	23700
	December	20500
	Total for year	1,215,909
1910	January	24200
	February	20200
	March	77500
	April	90400
	May	168000
	June	123000
	July	3 000
	August	29900
	September	15000
	Total for period	958200

CANADIAN RIVER NEAR LOGAN, N. M.

This station was originally established June 29, 1904, and discontinued February 26, 1905. It was re-established December 22, 1908. Until August 5, 1910, it was located at the C. R. I. & P. Railroad Bridge which is one mile south of Logan. On the latter date a Friez Automatic Gage was substituted for the rod gage. It is located on the left bank about one mile above railroad bridge. The gage observations are taken gratis by I. F. Romine.

Discharge Measurements for Canadian River at Logan, N, M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge
1908					
November 3	.....	.....	.....	.....	32.5
December 22	.....	.....	.....	2.15	43
1909					
January 26	J. B. Stewart.....	265	15.7	3 57	10.2
May 31	do	35	2.2	3.78	21
June 29	do	141.5	136	4 22	249
July 21	W. H. Sutton.....	43	42	3.52	24.4
August 22	do	270	402	5.62	1848
October 22	W. B. Freeman.....	90.8	101	3.48	150
December 4	G. H. Russell.....	58	67	3.2	69
April 12	J. B. Stewart.....	.....	Dry	.....	.....
September 6	do	Flood Floa t	Measure	ment	.....
1:30 p. m.	do	Floats 410	4660	16	69.9
2:30 p. m.	do	415	5380	18	87.7
3:00 p. m.	do	428	6640	21	111
4:00 p. m.	do	438	7930	24	141
1910					
January 31	G. H. Russell.....	81	77	3.45	107
March 15	do	86	113	3.55	134
May 7	J. B. Stewart.....	115	144	4.28	323
June 18	do	275	239	4.10	612
June 18	do	249	227	3.98	54
August 24	W. W. Mills.....	137	111	.....	230

Daily Discharge, in Second Feet, of Canadian River at Logan, N. M.

Day	1909 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	20	14	Dry	.4	Dry	26	13	290	38	.....	.....	.....
2	20	14	"	.6	"	26	7	290	13	.....	.....	.....
3	20	14	"	.8	"	26	7	290	.....	.....	.....	69
4	20	14	"	.6	"	26	2	290	Dry	.....	.....	155
5	20	11.9	"	.4	"	26	23	240	.....	.....	.....	145
6	20	11.9	"	.3	"	25	13	650	3800	.....	.....	145
7	20	7.8	"	.2	"	26	13	350	53209	.....	.....	145
8	20	6.2	"	Dry	"	14	7	290	26200	.....	.....	178
9	20	3.7	"	"	"	4.5	25	350	3350	.....	.....	199
10	20	2.4	"	"	"	1.8	980	350	1840	.....	.....	.....
11	20	1.4	"	"	"	1	480	290	2300	.....	.....	190
12	20	.8	"	"	"	4700	155	290	810	.....	.....	190
13	20	.4	"	"	"	3800	85	350	2170	.....	.....	290
14	20	.3	"	"	"	5150	38	1420	3800	.....	.....	202
15	35	.2	"	"	"	5150	480	1420	870	.....	.....	216
16	35	.1	"	"	"	4700	135	290	1550	.....	.....	230
17	35	.1	"	"	"	3800	155	138	.....	.....	.....	330
18	85	.1	"	"	"	2950	130	290	.....	.....	.....	330
19	35	.1	"	"	"	2600	58	860	.....	.....	.....	315
20	20	.....	"	"	"	2300	38	7300	.....	.....	.....	315
21	20	.....	"	"	"	1800	23	5820	.....	.....	.....	315
22	20	.....	"	"	"	1424	23	1800	.....	.....	.....	315
23	20	.....	"	"	14	1260	13	1180	.....	.....	.....	315
24	14	.....	"	"	14	1260	568	102	.....	.....	.....	315
25	14	.....	"	"	480	1800	560	48	.....	.....	.....	315
26	14	.....	"	"	335	1600	480	38	.....	.....	.....	315
27	14	.....	"	"	210	989	480	38	.....	.....	.....	315
28	14	.....	"	"	110	480	410	38	.....	.....	.....	315
29	14	.....	"	"	110	218	350	58	.....	.....	.....	316
30	14	.....	"	"	44	58	350	350	.....	.....	.....	315
31	14	.....	"	"	44	.....	290	265	.....	.....	.....	315
Total	647	101.6		3.3	1361	46229.3	6431	25775	99941	.....	.....	7000

Daily Discharge, in Sec. Feet, of Canadian River at Logan.—Con'd.

Day	1910 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	352	76	48	100	260	178	80	.....	.....
2	805	76	48	100	375	178	220	.....	.....
3	1180	76	48	155	375	216	550	.....	.....
4	1340	76	48	178	375	278	160	.....	.....
5	1180	76	55	178	375	425	130	.....	.....
6	320	76	55	178	375	650	136	.....	.....
7	920	62	55	178	330	295	140	.....	.....
8	920	62	67	178	202	178	220	.....	.....
9	805	69	62	32	135	155	710	.....	.....
10	805	69	69	32	135	135	1840	.....	.....
11	920	76	76	32	135	100	450	.....	.....
12	980	76	76	135	116	100	410	.....	.....
13	920	76	92	135	135	55	280	.....	.....
14	980	76	108	135	178	42	280	.....	.....
15	1180	92	.....	135	135	6550	235	.....	.....
16	1180	92	.....	135	116	10800	53	.....	.....
17	920	92	.....	100	155	620	185	.....	.....
18	920	92	.....	100	202	420	130	.....	.....
19	1040	76	.....	100	135	420	130	.....	.....
20	1040	76	.....	135	116	370	110	.....	.....
21	930	69	.....	135	116	800	80	.....	.....
22	805	62	.....	202	116	130	30	.....	.....
23	805	55	.....	202	100	75	10	.....	.....
24	805	55	.....	202	100	65	10	.....	.....
25	525	55	.....	230	84	65	150	.....	.....
26	400	48	.....	230	84	90	130	.....	.....
27	295	48	.....	202	84	115	110	.....	.....
28	245	48	.....	230	84	115	47	.....	.....
29	190	.....	.....	190	84	130	130	.....	.....
30	166	.....	.....	190	126	00	130	.....	.....
31	84	.....	.....	.....	145	.....	3400	.....	.....
Total	24448	1982	902	4464	5483	23340	10540	.....	.....

Year	Month	Run-off in Acre Feet
1909	January	1290
	February	202
	March	.....
	April	7
	May	2700
	June	91600
	July	12700
	August	51100
	September	198000
	October	.....
	November	.....
	December	13900
	Total for the year	371000
1910	January	48600
	February	3930
	March	1790
	April	8870
	May	10900
	June	46300
	July	20900
	August	.....
	September	.....
	Total for period	141290

CAMERON CREEK AT FT. BAYARD, N. M.

This station was established on January 17, 1907. It is located near the pumping station at Ft. Bayard and about 2 miles below the mouth of Stephens Creek. Ft. Bayard is 8 miles from Silver City. The gage is a vertical rod gage located on right bank about 50 feet above the crest of an old masonry dam.

For the greater part of the year the flow comes from springs and amounts to less than one second foot daily. Gage observations have been taken gratis by Sergt. T. J. McBurney, U. S. Army.

Discharge Measurements of Cameron Creek at Ft. Bayard, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1908					
November 9	R. L. Cooper	.....	.....	1.45	.5
1909					
January 5	J. B. Stewart	.....	.....	1.65	.6
February 5	do	2.2	1.5	1.70	.3
April 16	do	.....	.....	.....	.5
June 4	do	.....	.....	1.62	.5
July 7	do	.....	.....	1.62	.5
August 8	do	.....	.....	1.32	.5
October 8	W. B. Freeman	.....	.....	1.35	.....
1910					
February 10	J. B. Stewart	.....	.....	1.48	.3
May 8	C. D. Miller	.....	.....	1.4	.2
September 15	J. B. Stewart	.....	.....	.....	Dry

Monthly Discharge of Cameron Creek at Fortt Bayard, N. Mex., for 1907 and 1908.

Month.	Mean discharge in second-ft.	Run-off (total in (acre-ft.)	Month.	Mean discharge in second-ft.	Run-off (total in acre-ft.)
1907			1908		
January 19-31	2.53	65.5	January	0.50	30.7
February	1.02	56.6	February	.52	29.9
March	1.00	61.5	March	.50	30.7
April	1.00	59.5	April	.50	29.8
May	1.00	61.5	May	.50	30.7
June	1.00	59.5	June	.50	29.8
July	1.31	80.6	July	1.06	65.2
August	2.35	144	August	2.05	126
September	.50	29.8	September	.50	29.8
October	.50	30.7	October	.50	30.7
November	.50	29.8	November	.50	29.8
December	.50	30.7	December	.50	30.7
The period		710	The year	.68	494

NOTE.—Monthly discharge, 1907 and 1908, approximate.

Daily Discharge, in Sec. Feet, of Cameron Creek at Fort Bayard.

1909

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.2	0.2
2	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
3	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
4	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
5	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
6	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
7	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
8	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
9	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
10	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
11	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
12	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
13	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
14	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
15	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
16	.5	.5	.5	.5	.5	.5	1	.5	.2	.2	.2	.2
17	.5	.5	.5	.5	.5	.5	.5	96	.2	.2	.2	.2
18	.5	.5	.5	.5	.5	.5	1	.5	.2	.2	.2	.2
19	.5	.5	.5	.5	.5	.5	8	.5	.2	.2	.2	.2
20	.5	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2
21	.5	.5	.5	.5	.5	.5	.5	96	.2	.2	.2	.2
22	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2	.2
23	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2	.2
24	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2	.2
25	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2	.2
26	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2	.2
27	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2	.2
28	.5	.5	.5	.5	.5	.5	.5	.2	.2	.2	.2	.2
29	.5	.....	.5	.5	.5	.5	.5	.2	.....	.....	.2	.2
30	.5	.....	.5	.5	.5	.5	.5	.2	.....	.....	.....	.2
31	.5	.....	.5	.....	.5	.....	.5	.2	.....	.....	.....	.2
Tot.	15.5	14	15.5	15	15.5	15	24	203.8	6	6.2	6	6.2

Daily Discharge, in Sec. Ft., of Cameron Creek at Fort Bayard—Con'd

1910

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									Dry
12								1	
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									Dry
25									
26							13		
27									
28									
29									
30									
31									
Total	6.2	5.6	6.2	6.0	6.2	6.6	19	7	3.8

Year	Month	Run-off in Acre Feet
1909	January	31
	February	28
	March	31
	April	30
	May	31
	June	30
	July	47
	August	404
	September	12
	October	12
	November	12
	December	12
	Total for the year	680
1910	January	12.3
	February	11.1
	March	12.3
	April	11.9
	May	12.3
	June	13.1
	July	37.5
	August	14.1
	Seplember	7.7
	Total for period	132.3

CHICO RICO CREEK NEAR RATON, N. M.

This station was established July 31st, 1910. It is located at St. Louis, Rocky Mountain and Pacific Railroad bridge which crosses the stream about 10 miles southeast of Raton. It is a short distance above the mouth of Raton Creek and also above the Una de Gato. A Friez automatic gage is secured to the railroad bridge. The normal flow is very small and it was principally to secure flood data that the station was established. The gage observer is Jay Walrath.

Discharge Measurements of Chico Rico River at St. L. R. M. and P. R. R. Bridge Near Raton, N. M.

Date	Hydrographer	With	Area of Section	Gage Height	Discharge in sec. ft.
1910. August 26	W. W. Mills	8.8	4.4	1.6	1.6

Daily Gage Heights of the Chico Rico River at St. L. R. M. and P. R. R. Bridge Near Raton.

1910

Day	Jan.	Feb	Mar.	April	May	June	July	Aug.	Sept.
1								1.4	1.65
2								2.0	1.65
3								1.5	1.60
4								2.4	1.60
5								2.7	1.6
6								1.9	1.6
7								1.85	1.6
8								1.8	1.6
9								1.8	1.6
10								1.8	1.6
11								1.9	1.6
12								2.0	1.6
13								1.85	1.6
14								2.0	1.6
15								1.7	1.55
16								1.6	1.55
17								1.6	1.55
18								1.6	1.60
19								1.6	1.6
20								1.6	1.6
21								1.6	1.6
22								1.6	1.6
23								1.7	1.6
24								1.65	1.6
25								1.65	1.6
26								1.65	1.6
27								1.6	1.6
28								1.65	1.6
29								1.65	1.6
30							1.6	1.6	1.6
31							1.5	1.6	
Total									

NOTE—Owing to lack of discharge measurements gage heights only are given

CIMARRON RIVER AT UTE PARK, N. M.

This station was established June 14, 1907. It is located at highway bridge 300 feet north of railway station at Ute Park, N. M., a station on the St. Louis, Rocky Mountain and Pacific Railroad. It is about one-half mile below the mouth of Ute Creek and is below all the important mountain tributaries except the Rayado which enters several miles below. A Friez Automatic Gage is secured to down-stream side of bridge. Very little water is diverted above this point but most of the normal flow of the stream is used for irrigation in the valley below. The Eagles Nest Reservoir site is situated in the canon a few miles up stream from the station and has a capacity of over 100,000 acre feet.

The gage observer is R. P. Woodard.

Discharge Measurements of Cimarron at Ute Park, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1908.					
November 1	R. L. Cooper	25.5	13.9	.40	14.1
December 19	J. B. Stewart	25	12.8	.40	7.1
1909					
January 24	J. B. Stewart	19.5	13	.43	14.2
April 10	J. B Stewart	24.5	27	.65	35
April 10	J. B Stewart	25.5	19.4	.65	40
May 27	J B. Stewart	27	23.6	.70	58
May 27	J B Stewart	28	24.6	.70	54
June 28	J. B Stewart	18.5	10.8	.40	11.8
July 24	W. H Sutton	20	14.4	.50	21.3
August 28	C. D. Miller	24	28	.65	45
October 13	C D. Miller	22	19.1	.45	24.4
October 24	W B Freeman	21	15.6	.40	17.1
November 27	G. H. Russell	8	4	.32	8.7
1910					
January 27	G. H Russell	16.5	23.2	.48	23.2
January 27	G H Russell	16.5	23 2	.45	22.4
March 5	G. H. Russell	19	34	.60	44
May 4	J B Stewart	31	41	.98	136
June 14	J. B Stewart	225	15	.47	17
July 27	J B Stewart	15.5	7.6	.20	3 9
August 28	W. W. Mills	19.1	9.0	.35	8.2
August 28	W. W. Mills	20.5	15.1	.35	8.3

Daily Discharge, in Sec. Ft., of the Cimarron River at Ute Park.

Day	1908 Oct.	Nov.	Dec.	1909 Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov	Dec.
1	9	22	7	9.5	10	16	31	86	104	12	6	35	13	10	16
2	9	22	10	9.5	10	16	31	86	104	12	8	35	13	10	16
3	6	14	.....	9.5	16	20	31	99	77	12	13	35	16	10	16
4	.....	.....	....	9.5	16	21	31	139	77	12	8	21	16	10	13
5	.....	.....	10	7.2	20	21	31	153	35	12	8	130	16	10	10
6	.....	14	15	7.2	20	25	31	153	35	8	8	78	16	10	10
7	.....	13	15	7.2	20	55	31	154	35	8	8	56	25	10	10
8	.....	.....	15	7.2	20	42	31	167	35	8	8	56	22	10	10
9	.....	.. ..	8	7.6	20	30	21	154	35	8	8	57	22	10	13
10	.....	.....	.....	7.6	20	20	31	154	35	8	10	38	22	10	13
11	....	.....	.....	7.6	20	16	46	155	35	8	13	38	22	10	13
12	.....	.....	8	7.6	20	13	23	127	35	8	13	38	22	10	16
13	.....	.....	4	8.	16	13	30	127	35	8	13	39	22	10	16
14	... .	.....	4	11	16	16	47	127	34	8	13	39	16	10	16
15	.....	13	7	11	16	17	58	128	34	8	36	30	22	10	16
16	.....	8	7	19	13	17	70	128	34	8	36	25	22	10	16
17	.....	5	12	19	13	25	94	128	34	8	55	25	22	10	16
18	.....	.....	12	19	13	43	121	128	34	6	55	25	22	10	16
19	.....	.....	12	19	13	64	122	128	34	6	36	20	22	10	16
20	.....	5	8	19	16	31	122	129	12	6	36	20	16	10	16
21	.....	7	.....	12	16	31	109	182	7	6	36	20	16	10	16
22	.....	.....	.....	12	13	31	96	129	7	6	102	15	16	10	16
23	.....	.....	.....	12	13	26	123	129	7	8	55	15	16	10	16
24	.....	.....	.....	16	13	26	96	130	7	22	55	15	13	10	16
25	.....	.....	.....	16	16	26	96	130	7	8	55	15	13	10	16
26	6	.....	8	16	16	31	97	131	7	6	55	15	13	10	16
27	9	.....	13	16	16	31	97	91	12	6	55	16	10	10	16
28	9	.....	13	12	16	31	124	55	12	6	55	16	10	10	16
29	14	.....	13	8	... ..	43	151	36	12	6	53	16	10	6.5	16
30	14	7	9	8	.....	43	98	130	12	6	53	16	10	10	16
31	14	.....	9	8	.....	43	.....	109	.....	6	53	.....	10	.....	16
Total	222	315	295	358.2	447	833	2120	3897	983	260	1018	999	523	296.5	460

1910

Day	Jan.	Feb	Mar.	April	May	June	July	Aug.	Sept.
1	16	16	16	101	.....	31	8.4	3.3	11
2	16	13	16	88	.....	25	5.8	3.3	8.4
3	16	13	36	64	.....	25	5.8	5.8	8.4
4	16	13	44	64	125	25	5.8	8.4	8.4
5	16	13	64	54	112	20.	5.8	11.	8.4
6	16	16	141	64	100	20	4.6	8.4	8.4
7	16	16	154	64	87	15	4.6	5.8	8.4
8	16	13	141	64	75	16	4.6	5.8	8.4
9	16	13	101	88	65	12	4.6	8.4	8.4
10	16	13	76	88	65	12	4.6	8.4	8.4
11	16	13	88	114	65	12	8.4	11	8.4
12	16	13	64	101	66	9.5	8.4	16	5.8
13	16	13	76	114	66	10	11	11	5.8
14	16	16	76	110	66	27	8.4	16	8.4
15	16	13	64	106	78	26	8.4	11	5.8
16	16	8	64	101	.....	20	8.4	11	8.4
17	16	8	64	114	.....	16	8.4	11	11
18	13	8	76	128	....	16	8.4	11	8.4
19	16	10	88	141	.....	11	8.4	11	8.4
20	16	10	101	154	.....	11	8.4	11	8.4
21	16	10	101	154	.....	11	8.4	11	8.4
22	16	10	114	154	.....	8.4	5.8	11	8.4
23	16	13	114	154	....	8.4	4.6	16	8.4
24	16	22	128	141	.....	8.4	5.8	16	8.4
25	16	22	114	182	.....	11	5.8	11	5.8
26	13	13	114	182	.....	11	5.8	11	5.8
27	13	13	101	182	.....	11	3.3	8.4	5.8
28	16	13	114	182	.....	11	2.8	8.4	4.6
29	16	.....	88	226	24	11	2.8	8.4	4.6
30	16	.....	101	197	31	8.4	4.6	8.4	5.8
31	16	.....	101	.....	31	.....	4.6	11	5.8
Total	487	367	2740	3676	1056	459.1	195.5	309.2	228.8

Year	Month	Run-off in Acre Feet
1908	October	440
	November	620
	December	580
	Total for period	1640
1909	January	713.
	February	889
	March	1750
	April	4210
	May	7750
	June	1950
	July	516
	August	2020
	September	1980
	October	1040
	November	588
	December	910
	Total for year	24,300
1910	January	965
	February	728
	March	5440
	April	7260
	May	2100
	June	910
	July	387
	August	613
	September	454
	Total for year	18900

CIMARRON RIVER AT SPRINGER, N. M.

This station was established July 13, 1907, and discontinued December 31st, 1909. It was located at the highway bridge which crosses the river about one-half mile above the A., T. & S. F. Railroad bridge. It is 6 miles below the couth of the Rayado and 6 miles above its junction with the Upper Canadian or Red. The drainage area above station is about 1000 square miles. Gage readings by W. L. Sever.

Discharge Measurements of Cimarron River at Springer, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1908					
October 31	R. L. Cooper	.....	.....	.10	13.50
December 19	J. B. Stewart	.....	.....	.10	13.50
1909					
January 22	J. B. Stewart	17.5	4 7	.15	2.6
April 7	do	17	3.3	.10	1.3
May 24	do	51.5	23.8	.68	29
June 26	do	8.4	3	.18	1.7
July 27	W. H. Sutton	6	1.5	.18	.96
September 27	J. B. Stewart	38	22.5	.74	26
October 14	C. D. Miller	17	6.2	.35	5.8
October 26	W. B. Freeman	14	481	.23	3.7
November 28	G. H. Russell	13	8.2	.20	5.3

Daily Discharge, in Second Feet, of Cimarron River, at Springer, N. M.

	1908			1909											
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct	Nov.	Dec.
1	1.1	17	5.3	12	2.2	2.2	2.2	31	8	2.8	.8	.9	5.6	3.3	*5
2	1.1	17	5	7.8	8	2.2	2.2	25	5.2	2.8	.8	.9	5.6	3.3	5
3	1.1	17	7.2	8.2	3.3	2.2	2.2	19	5.2	2.8	.6	.9	5.6	3.3	5
4	1.1	17	6.9	5.6	3.3	2.2	1.4	12	4.2	6.6	12	.9	5.8	3.3	5
5	1.1	16	6.6	3.7	2.2	2.2	1.4	12	4.2	2.2	.9	800	5.8	3.3	5
6	1.2	15	6.3	9	1.4	1.4	2.2	25	4.2	3.3	.9	490	5.8	3.3	5
7	1.2	14	6.1	5.8	3.3	1.4	2.2	31	4.2	1.8	.9	455	5.8	3.3	5
8	1.2	9.4	5.9	5.8	2.2	2.2	2.2	41	5.2	4.2	.9	77	6	3.3	5
9	1.2	8.9	5.6	3.9	3.3	1.4	2.2	110	4.2	4.2	.9	74	4.9	3.3	5
10	1.2	8.7	5.4	3.9	5.2	1.4	2.2	84	4.2	4.2	.9	16	4.9	3.3	5
11	1.2	8.2	5.1	3.9	3.3	3.3	1.8	51	5.2	3.3	.9	500	4	3.3	5
12	1.3	12	4.9	4.1	1.4	8	1.8	19	51	3.3	9	24	4.1	5.2	5
13	1.3	12	7.2	4.1	1.4	8	1.4	12	8	3.3	.9	22	5.1	5.2	5
14	1.3	11	4.5	4.1	3.3	8	1.8	12	6.6	3.3	.9	27	6.4	5.2	5
15	1.4	11	2.9	2.8	3.3	5.2	2.2	12	6.6	3.3	.9	11	6.6	6.6	5
16	1.4	10	2.8	2.8	2.2	5.2	2.2	8	6.6	3.3	.9	11	5.2	6.6	5
17	1.4	6.4	1.6	2.9	2.2	2.2	2.2	8	4.2	3.3	.9	8.9	4.2	5.2	5
18	1.5	5.9	2.6	2.9	2.2	2.2	3.3	8	4.2	.9	.9	9.4	4.2	6.6	5
19	1.5	5.6	6.1	3	3.3	2.2	4.2	8	4.2	.9	3.3	7.6	5.2	5.2	5
20	1.5	5.3	6	3	2.7	3.3	8	8	5.2	.9	4.2	6.1	4.2	5.2	5
21	1.5	5.1	6.2	3.1	1.4	2.2	19	19	5.2	.0	1.4	6.1	4.2	5.2	5
22	6	4.9	6.2	2	2.2	2.2	51	51	5.2	.9	2.2	6.4	4.2	5.2	5
23	9.6	3	4.1	2.2	3.3	2.2	51	51	4.2	.9	2.2	6.4	3.3	5.2	5
24	9.6	2.9	4.3	2.2	3.3	2.2	41	31	3.3	.9	2.2	6.4	3.3	5.2	5
25	9.6	2.8	4.5	2.2	2.2	1.4	31	31	3.3	.9	.9	4.1	3.3	5.2	5
26	9.9	2.7	26	2.2	2.2	1.4	41	41	3.3	.9	.9	5.4	4.2	5.2	5
27	9.9	2.6	11	2.2	2.2	1.4	31	51	3.3	.8	.9	5.4	4.2	5.2	5
28	9.9	14	7.3	2.2	2.2	1.4	42	41	3.3	8	.9	5.4	4.2	5.2	5
29	16	5.6	4.8	2.2	.....	1.4	19	31	2.8	.8	.9	5.4	4.2	5	5
30	16	5.4	5	2.2	.....	1.4	51	19	2.8	.8	.9	5.6	4.2	5	5
31	16	.....	7.6	2.2	.....	2.2	.....	12	.....	.8	.9	.....	3.3	.....	5
Tot.	139.3	276.4	191	124.2	78.2	85.8	296.3	914	187.3	70.1	48.6	2599.2	147.6	138.9	155

*Estimated.

Year	Month	Run-off in Acre Feet
1908	October	276
	November	548
	December	379
	Total for period	1203
1909	January	247
	February	155
	Myrch	170
	April	786
	May	1810
	June	371
	July	139
	August	97
	September	5150
	October	293
	November	276
	December	307
	Total for the year	9800

RIO FERNANDO DE TAOS NEAR TAOS, N. M.

This station was established April 6, 1910. It is located in mouth of canon about 2 miles south of Taos tnd 200 yards upstream from head gate of B. G. Randall's intake ditch which is the highest diversion of any importance. Gage readings are from a vertical rod gage located on left bank. Observations are taken gratis by B. G. Randall.

Discharge Measurements of Rio Fernando de Taos, Above Randall's Ditch, near Taos, N. M.

Date	Hydrographer	With	Area of Section	Gage Height	Discharge in sec. ft.
1910					
April 6	J. B. Stewart	14.5	7	1.05	17.8
July 12	do	9	2.3	.7	2 2
September 15	C. D. Miller	3.5	1.12	.7	.8

Daily Gage Heights, in Feet, of Rio Fernando de Taos, Above Randall's Ditch, Near Taos.

Day	April	May	June	July	Aug.	Sept.
1	.....	1.4	.85	.7	.8	.75
2	.....	1.4	.85	.7	.8	.75
2	.....	1.4	.85	.7	.8	.75
4	.....	1.4	.8	.65	.8	.....
5	.....	1.3	.85	.65	.8	.8
6	1.05	1.3	.9	.65	.8	.75
7	.....	1.3	.85	.65	.8	.75
8	1	1.3	.85	.6	.9	.75
9	1.05	1.3	.85	.6	.8	.75
10	1.3	1.2	.8	.6	.8	.75
11	1.3	1.15	.8	.7	.8	.....
12	1.3	1.15	.8	.7	.8	.....
13	1.5	1.05	.8	.85	.8	.....
14	1.5	1.05	.8	.75	.75	.....
15	1.3	1.05	.8	.7	.75	.....
16	1.1	1	.8	.7	.75	.....
17	1.2	1	.8	.7	.75	.....
18	1.2	1	.75	.7	.75	.....
19	1.3	.95	.75	.65	.8	.....
20	1.5	.95	.75	.65	.8	.....
21	1.5	.95	.75	.7	.8	.....
22	1.3	.9	.75	.65	.75	.....
23	1.3	.9	.75	.7	.75	.....
24	1.4	.9	.7	.7	.75	.....
25	1.4	.9	.75	.75	.75	.....
26	1.5	.9	.75	.75	.75	.....
27	1.5	.9	.7	.85	.75	.....
28	1.5	.9	.75	.85	.75	.....
29	1.5	.85	.7	.8	.75	.....
30	1.6	.85	.7	1.5	.75	.....
31	.....	.85	.....	.9	.75	.....
Total	.....	.....	.....	.....	.....	.....

NOTE.—Owing to lack of discharge measurements only gage heights are given.

THE GALLINAS RIVER NEAR LAS VEGAS, N. M.

This station was established August 13, 1903. The gage was washed out September 29 and re-installed October 19, 1904. It is below all perennial tributaries. The gage is a vertical rod located on right bank a short distance above the foot bridge at power house. Very little water is diverted above the station, though practically all the normal flow is used for irrigation in the valley below. The drainage area above the station is about 90 square miles.

The gage observer is William Prager.

Discharge Measurements of Gallinas River at Hot Springs, Near Los Vegas, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1908					
October 30	R. L. Cooper	.....	.....	1.6	1
December 15	J. B. Stewart	21.6	8.7	1.78	4.2
1909					
January 20	J. B. Stewart	17	7	1.75	3.1
April 5	do	24	18.5	2.05	18.7
May 22	do	24	17	1.7	19.7
June 24	do	6	1.3	1.88	1
July 28	W. H. Sutton	22	22	14.1	14.1
August 29	do	16	20.8	2.20	35
October 26	W. B. Freeman	17	9.6	1.68	1.7
November 29	C. H. Rudsell	18.5	11.4	1.77	4.3
1910					
Februrry 5	C. H. Russell	19	11	1.75	3.5
March 6	do	20.5	14.4	1.85	8.4
April 24	J. B. Stewart	28	26	22	40
August 81	W. W. Mills	18.2	5.6	1.75	1.8

Daily Discharge, in Sec. Feet, of Gallinas River, at Hot Springs, Near Los Vegas.

	1908			1909											
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov	Dec.
1	2	.3	1.8	5	5	3.4	10.5	27	16	2	8	19	.....	.3	5
2	3	.3	1.8	5	5	10.5	5	27	16	2	7	20	.....	1	5
3	1.8	.3	1.8	5	5	7.8	7.8	27	13	2	10	20	.....	5	5
4	1.8	.3	2	5	5	10.5	29	27	13	3	14	37	.....	5	5
5	1.8	.3	.5	5	5	7.8	.24	27	9	8	14	51	.....	5	1.8
6	1.8	.3	.5	5	5	5	14.8	27	9	6	10	280	.....	5	1.8
7	1.8	.3	.5	5	5	5	10.5	27	9	12	7	177	1	5	1.8
8	1 8	.3	.5	5	3.4	14 8	10.5	39	9	43	7	61	5	5	1.8
9	1.8	.3	.5	5	1.8	10.5	14.8	39	9	13	7	89	24	5	5
10	.3	.3	.5	5	1.8	10.5	10.5	39	9	5	9	79	5	5	5
11	.3	.3	.5	5	1.8	10.5	19	38	9	5	21	62	7.8	5	5
12	.3	.8	.5	5	1.8	10.5	19	33	9	3	45	54	7.8	5	5
13	.3	.3	.5	1.8	14.8	19	19	27	9	3	78	46	5	5	5
14	.3	.3	.5	1.8	10.5	19	19	27	9	13	50	40	7.8	5	5
15	.3	.3	.5	1.8	5	24	19	26	4	5	50	40	10.5	5	5
16	.3	.6	.5	1.8	3.4	24	19	26	4	3	43	40	5	5	5
17	.3	1.6	.5	1.8	1.8	14.8	29	26	4	14	43	29	5	5	5
18	.3	1.8	.5	1.8	1.8	7.8	41	25	4	6	40	29	10.5	5	5
19	.3	1.8	.5	5	1.8	19	41	20	4	5	40	29	10.5	5	1.8
20	.3	1.8	.5	5	1.8	10.5	41	15	5	3	62	14.8	10.5	5	1.8
21	.3	1.8	.5	5	1.8	10.5	34	25	5	3	47	5	10.5	5	1.8
22	.3	1.8	.5	5	3.4	10.5	28	25	5	3	21	10.5	10.5	5	1.8
23	.3	1.8	.5	5	1.8	10.5	34	20	2	3	52	5	10.5	5	5
24	.3	1.8	.5	5	1.8	10.5	34	15	2	36	38	1.8	5	5	5
25	.3	1.8	.5	5	10.5	10.5	28	15	2	36	52	1.8	5	5	5
26	.3	1.8	.5	5	3.4	10.5	28	15	2	36	50	1.8	1.8	5	5
27	.3	1.8	.5	5	1.8	10.5	28	15	2	24	49	1.8	1.8	5	5
28	.3	5	.5	5	1.8	10.5	28	15	2	16	36	1.8	1 8	5	1.8
29	.3	5	.5	5	.....	10.5	28	16	2	11	35	1.8	14.8	5	1.8
30	.3	5	.5	5	.....	10.5	28	16	2	8	35	13	5	5	1.8
31	.3	.....	.5	5	.....	10.5	.....	16	.....	8	35	.....	1.8	.....	1 8
Total	23	40	15.2	135.8	112.8	360.4	701.4	782	199	340	1015	1248 4	183.9	141.3	116.6

Daily Discharge, in Sec. Feet, of Gallinas River, at Hot Springs, Near Los Vegas.—Con'd.

	1910								
Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	1.8	5	5	10.5	41	5	1.8	5	10.5
2	5	5	5	10.5	41	5	1.8	3.4	7.8
3	10.5	6	5	10.5	41	3.4	1.8	1.8	3.4
4	10.5	5	7.8	14.8	41	1.8	1	1.8	1.8
5	3.4	5	10.5	19	29	1.8	1	3.4	1.8
6	1.8	5	10.5	14.8	29	1.8	1.8	7.8	1.8
7	1.8	5	19	10.5	29	1.8	.3	3.4	1.8
8	5	5	24	19	29	1.8	1	10.5	.3
9	5	5	24	19	29	1.8	1	5	7.8
10	5	5	35	19	29	1 8	1.8	29	1.8
11	5	5	29	19	29	1.8	1	55	.3
12	5	5	48	35	29	1.8	1.8	35	.3
13	5	5	24	41	29	1.8	41	35	1
14	5	1.8	29	41	29	1.0	19	19	5
15	5	1.8	55	41	29	7.8	7.8	24	1.8
16	5	1.8	48	35	29	5	5	19	1
17	5	1.8	35	29	24	3.4	5	19	.3
18	5	1.8	29	35	19	1.8	3.4	24	.3
19	5	1.8	14.8	41	14.8	1.8	1.8	14.8	.3
20	5	3.4	19	41	19	1.8	3.4	10.5	1.8
21	5	5	19	41	10.5	1.8	7.8	10.5	5
22	5	5	19	41	10.5	.3	7.8	7.8	1.8
23	5	5	19	41	10.5	.3	1.8	10.5	1.8
24	5	5	19	41	10.5	.3	1.8	7.8	1.8
25	5	5	19	41	10.5	.3	1.8	5	1.8
26	5	5	19	41	7.8	.3	1.8	3.4	1.8
27	5	5	19	41	5	.3	5	3.4	1
28	5	5	19	41	5	.3	1.8	1.8	.3
29	5	.....	14.8	41	5	1.8	5	1.8	.3
30	5	.....	10.5	41	5	1.8	5	1.8	.....
31	5	....	10.5	.....	5	.....	10.5	1.8	.....
Total	154.8	119.2	664.4	915.6	674.1	62.3	152.6	382	68.9

Year	Month.	Run-off in Acre Feet
1908	October	46
	November	80
	December	307
	Total for period	433
1909	January	269
	February	224
	March	713
	April	1390
	May	1510
	June	393
	July	676
	August	2010
	September	2480
	October	365
	November	280
	December	231
	Total for year	10500
1910	January	307
	February	237
	March	1320
	April	1810
	May	1340
	June	123
	July	303
	August	756
	September	136
	Total for period	6332

THE GILA RIVER NEAR REDROCK, N. M.

This station was established May 14, 1908. It is located about 2 miles east of Redrock and about 300 yards above the lower end of the Middle Box Canon of the Gila. The two nearest railroad points are Silver City about 36 miles east of Redrock and Lordsburg about 30 miles south. On July 16, 1909, a Friez Automatic gage was installed. It is located on left bank a short distance above the mouth of the canon. The station is about 12 miles below the Mangas River, an intermittent but important tributary. The drainage area above the station is about 3500 square miles. The gage observer is J. L. Nard.

Discharge Measurements of Gila River Near Redrock, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1908					
November 8	R. L. Cooper	140	95	.8	101
December 29	J. B. Stewart	116.5	77	1.15	129
1909					
February 1	J. B. Stewart	82.5	107	1.38	244
October 14	W. B. Freeman	47.5	62	1.43	92
1910					
February 7	J. B. Stewart	73.5	69	1.65	107
March 20	J. B. Stewart	49	55	1.55	80
	do	49	55	1.55	88
	do	22	27	1.55	84
March 21	J. B. Stewart	30.5	48	1.55	91
March 22	do	31.1	44	1.52	82
May 10	C. D. Miller	497	51	1.7	66
July 3	J. B. Stewart	36	27	1.05	29
September 13	do	34	29	1.45	35.8

Daily Discharge, in Sec. Feet, of Gila River, at Redrocd.

Day	1908		1909											
	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	80	47	248	174	415	288	142	25	185	173	72	90	103
2	.....	70	47	160	390	415	253	142	30	185	147	68	90	116
3	.....	58	42	98	390	360	253	142	30	185	143	78	90	181
4	.....	58	42	59	395	360	205	100	35	185	158	90	90	123
5	.....	50	42	126	365	299	205	100	35	220	280	90	90	123
6	.....	97	42	98	462	195	253	100	40	210	1120	84	90	123
7	.....	90	37	86	395	195	205	60	45	210	410	84	90	123
8	.....	80	37	203	395	243	205	60	50	260	278	84	90	123
9	.....	62	37	98	395	299	205	36	55	320	282	86	95	123
10	.....	54	33	370	536	299	205	36	60	370	268	86	95	181
11	.....	51	116	250	610	360	205	36	65	420	475	86	95	103
12	.....	76	70	210	610	565	205	46	52	470	505	88	95	103
13	.....	67	47	166	1030	730	193	58	40	530	395	88	103	109
14	.....	67	42	102	1210	435	193	85	40	590	378	90	103	109
15	.....	49	42	102	620	370	240	24	40	710	345	90	103	109
16	.....	105	49	38	258	620	370	240	24	85	435	312	90	103
17	.....	96	83	56	210	860	308	240	24	58	473	284	90	103
18	.....	75	64	56	166	698	308	240	16	105	416	255	90	103
19	.....	75	52	44	380	620	250	193	16	233	375	230	90	103
20	.....	66	52	44	258	1040	250	193	16	220	333	205	95	95
21	.....	53	52	84	258	860	435	240	16	220	280	180	95	95
22	.....	53	52	65	174	620	435	240	16	220	273	155	90	103
23	.....	106	43	56	137	775	376	240	16	220	226	125	103	103
24	.....	80	43	56	107	767	313	178	16	220	232	100	103	103
25	.....	74	83	49	174	629	313	178	16	233	202	82	103	103
26	.....	65	55	44	217	962	255	178	16	233	284	75	109	109
27	.....	395	47	44	174	962	255	178	16	220	158	72	109	109
28	.....	330	48	44	174	962	255	178	24	185	315	72	109	109
29	.....	132	40	74	.....	708	255	178	24	185	180	78	109	103
30	.....	80	42	56	.....	1050	313	178	24	185	152	72	90	103
31	.....	42	44	.....	1230	.....	178	.....	185	167	.....	90	.....	190
Total	1785	1856	1577	5063	21280	10231	6563	1447	3649	9551	7654	2829	2950	4591

Daily Discharge, in Sec. Feet, of Gila River at Redrock.—Con'd.

Day	1910								
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	114	107	95	118	71	50	33	30	50
2	123	107	95	98	71	55	33	30	50
3	123	107	95	98	65	60	31	30	70
4	154	107	95	98	61	05	30	30	60
5	176	107	79	96	61	57	30	30	50
6	152	107	79	87	60	46	30	30	50
7	141	107	79	80	60	46	28	30	40
8	128	107	79	65	63	44	28	30	40
9	118	107	79	90	62	42	28	30	40
10	118	107	79	98	58	39	28	250	38
11	118	107	78	104	54	36	29	30	37
12	139	107	67	104	54	36	28	30	37
13	162	107	67	102	50	55	88	26	36
14	185	107	78	102	50	24	52	30	36
15	185	107	78	100	50	34	42	30	36
16	173	97	78	100	50	33	180	3	38
17	173	97	77	100	50	33	34	30	36
18	185	97	77	98	50	32	34	168	40
19	185	105	77	82	50	31	34	35	42
20	185	105	84	81	50	31	34	34	42
21	185	105	91	74	43	31	34	35	44
22	185	105	82	67	43	31	34	35	44
23	185	114	90	57	45	31	34	35	43
24	185	104	90	65	45	31	35	35	43
25	185	96	89	74	45	31	35	40	43
26	185	104	96	74	45	33	35	54	41
27	185	104	104	74	45	33	35	50	41
28	185	104	104	72	45	44	40	50	43
29	173	.....	104	71	45	38	45	50	43
30	173	.....	111	71	45	36	58	50	52
31	173	.....	120	.....	50	50	50	.....	
Total	5036	2942	2696	2620	1591	1181	1289	1432	1289

Year	Month	Run-off in Acre Feet
1908	November	3540
	December	3680
	Total for period	7220
1909	January	3130
	February	10100
	March	42200
	April	20300
	May	13000
	June	2870
	July	7260
	August	18900
	September	15200
	October	5610
	November	5850
	December	9100
	Total for year	154000
1910	January	9960
	February	5830
	March	5350
	April	5190
	May	3250
	June	2340
	July	2560
	August	2840
	September	2560
	Total for period	39880

RIO GRANDE NEAR LOBATOS, COLO.

This station was located on June 28, 1899, by A. L. Fellows. It is at the state bridge across the Rio Grande, at a point near the Colorado-New Mexico state line and about 10 miles east of Lobatos, Colorado. Drainage area 7,695 square miles. Results at this station show amount of water entering New Mexico.

Discharge Measurements of Rio Grande, Near Lobatos, Colo.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1908					
October 6	Thomas Grieve, Jr		126	1.5	236
December 2	J. B. Stewart	132	111	2.2	243
1909					
February 13	J. B. Stewart	198	150	2.2	390
March 26	do	224	402	1.9	480
May 16	Freeman & Stewart	251	990	4.6	3960
June 22	W. B. Freeman	255	1178	50.1	4310
August 2	G. H. Russell	196	256	1.4	170
September 29	do	233	572	2.62	1140
November 12	J. B. Stewart	222	426	2.05	500
December 19	G. H. Russell	120	258	2.28	280
1910					
January 27	J. B Stewart	212	323	1.85	438
February 23	G. H. Russell	214	273	2.7	366
April 9	W. B. Freeman	239	596	2.68	1210
May 26	G. H. Russell	235	585	2.68	1220
June 24	do	215	272	1.2	138
July 15	J. B. Stewart	44	22	.65	24
August 19	Ferguson & Christivusen	115	118	1.15	123
September 10	Comstock & Christivusen	95	69	.75	42

Monthly Discharge, in Sec. Feet, of Rio Grande, Near Lobatos, Colo.

Yaer	Month	Discharge in Sec. Ft.	Run-off in Acre Feet
1908	March	21066	41700
	April	18780	37400
	May	24400	47000
	June	35568	68400
	July	10088	19400
	August	19968	38400
	September	9464	18200
	Octobor	9256	17800
	November	7748	14900
	December	.....	.....
	Total	.....	303000

Daily Discharge, in Sec. Feet, of Rio Grande at Lobatos, Colo.

1909

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug	Sept	Oct.	Nov.	Dec.
1	400	410	350	460	1470	2480	1730	205	1730	1000	460	660
2	400	410	320	460	1170	2130	1540	165	1660	1000	460	705
3	400	410	372	460	1170	2130	1290	165	1730	950	530	615
4	400	420	460	460	1540	2480	1110	165	1600	850	530	615
5	400	420	495	460	2060	3220	1110	135	1730	800	530	600
6	400	440	495	460	2990	5200	1230	135	2410	900	530	600
7	400	440	495	460	3920	6120	1230	122	3530	1060	530	600
8	400	440	495	460	4630	6920	1350	135	4230	1350	530	570
9	400	450	495	460	4790	7370	1110	150	4390	1350	530	570
10	400	430	572	460	4870	7460	900	165	4550	1350	530	570
11	400	430	495	460	4630	7190	800	205	4070	1230	530	550
12	400	400	615	460	4470	6830	615	228	3530	1060	530	550
13	400	390	572	430	4310	6380	460	205	3140	1060	615	500
14	400	380	430	430	4150	5940	400	205	3140	1060	615	500
15	400	380	495	705	4310	5610	295	205	2920	1000	615	450
16	400	380	572	705	4230	5110	250	205	2840	900	615	450
17	400	370	572	705	3600	4490	205	205	2630	900	530	400
18	400	370	495	950	3780	4550	165	295	2410	850	495	300
19	400	370	495	2130	4310	4710	165	345	2276	752	460	280
20	400	370	495	2990	4550	4870	165	400	2130	752	430	300
21	400	380	495	3060	4710	4790	110	460	1920	705	495	300
22	400	380	495	2480	4550	4550	110	460	1800	705	615	300
23	400	380	495	2060	3840	4310	110	1000	1600	705	615	300
24	400	380	495	1600	3450	3840	110	705	1410	660	705	300
25	400	380	495	1350	2920	3530	122	752	1410	615	705	300
36	400	380	495	1230	2560	330	400	900	1350	615	705	300
27	400	380	495	1110	2480	2990	530	900	1230	615	705	300
28	400	380	495	1170	2770	2770	372	1000	1230	615	615	300
29	400	.....	495	1410	3140	2480	295	1170	1170	530	615	300
30	400	.....	495	1800	3140	2200	295	1470	1170	495	705	300
31	400	.....	460	.....	2630	.....	250	1600	.....	495	.....	300
Total	12400	11150	15195	31835	107120	135850	18824	14457	70870	26929	17075	13685

Daily Discharge, in Second Feet, of Rio Grande at Lobatos, Colo.—Con'd.

1910

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	450	350	450	1230	5320	3300	85	30	45
2	450	350	500	1230	5280	3530	65	20	45
3	450	350	705	1230	4710	3300	65	20	45
4	450	350	705	1230	4070	2840	65	20	30
5	450	350	800	1230	3840	2560	45	30	30
6	450	350	800	1230	3450	2410	45	30	30
7	450	350	950	1230	3300	2130	30	30	30
8	450	350	1110	1170	3140	1410	30	30	30
9	450	350	1110	1230	3220	1170	30	30	45
10	450	350	1170	1290	3530	950	30	38	38
11	450	350	1230	1290	4070	850	30	55	38
12	460	350	1060	1410	4550	752	30	65	38
13	450	350	1060	1730	4950	752	30	85	38
14	450	350	1230	1730	5200	658	30	110	45
15	450	350	1230	1730	5110	532	30	135	45
16	450	350	1230	1660	5200	495	20	135	45
17	450	350	1230	1600	4790	400	20	122	45
18	450	350	1170	1600	4070	345	20	135	45
19	450	350	1230	1470	2770	250	20	135	45
20	450	350	1290	1730	2560	272	20	135	45
21	450	350	1350	1860	2480	205	20	110	65
22	450	360	1470	2200	2130	228	20	110	65
23	450	365	1470	2200	1920	185	20	110	55
24	450	370	1730	2340	1660	185	20	85	55
25	450	400	1990	2770	1410	165	20	85	45
26	450	400	2060	3220	1230	122	20	85	38
27	440	400	1990	3840	1410	85	20	85	45
28	400	400	1800	4150	1660	85	20	65	55
29	400	.....	1730	4790	1920	85	20	65	45
30	400	.....	1540	5280	2340	85	24	55	45
31	400	.....	1350	.....	3060	.....	75	55	.....
Total	13740	10045	38659	60900	104390	30376	1019	2300	1300

Year	Month	Run-off in Acre Feet
1909	January	24600
	February	22100
	March	30100
	April	63100
	May	21300
	June	269000
	July	37300
	August	28700
	September	140000
	October	53400
	November	33900
	December	27100
	Total for year	942000
1910	January	27200
	February	19900
	March	76900
	April	121000
	May	207000
	June	60100
	July	2020
	August	4560
	September	2580
	Total for period	521000

RIO GRANDE AT RIO GRANDE NEAR BUCKMAN, N. M.

This station was originally established February 1st, 1895, and was re-established June 22, 1909. It is located about one-eighth of a mile east of Rio Grande Station on D. & R. G. Branch to Santa Fe. Gage is a Friez Automatic gage secured to downstream end of pier under D. & R. G. Bridge. Gage observer is Jose Espinosa.

Discharge Measurements of Rio Grande at Rio Grande Station, Near Buckman, N. M.

Date	Hydrogapher	Width	Area of Section	Gage Height	Discharge in sec. ft.
1909					
June 22	J. B. Stewart	157.5	1164	5.75	6861
August 2	J. B. Stewart	103	253	2.15	603
August 27	J. B. Stewart	.....	462	3.70	2039
October 5	W. B. Freeman	.....	.....	3.10	.....
1910					
June 17	C. D. Miller	195	389	3.08	1230
July 23	C. D. Miller	81	95.75	1.05	149
August 11	C. D. Miller	120	174	1.75	336
August 18	J. B Stewart	90	191	1.77	369

Daily Discharge, in Sec. Feet, of Rio Grande at Buckman.

1909

Day	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3210	636	2370	1670	709	533
2	.....	2780	500	2600	1320	636	672
3	.....	2600	636	2480	1220	672	672
4	.....	2600	747	2370	1220	672	747
5	.....	2370	1080	3280	1130	566	865
6	.....	2780	1180	5140	1180	636	825
7	.....	2480	785	4880	1880	566	747
8	.....	2320	672	5060	2100	533	672
9	.....	2420	566	5400	1570	500	601
10	..	2260	500	5310	1780	440	470
11	.....	1830	533	5670	1990	386	500
12	.....	1670	709	5060	1990	413	413
13	.....	1570	785	4720	1830	362	533
14	.....	1470	785	4400	1780	386	566
15	.....	1320	865	4100	1670	337	500
16	.....	1620	865	3950	1570	362	470
17	.....	1420	950	3810	1570	362	413
18	.....	1130	1520	3540	1520	413	440
19	.....	950	2100	3280	1270	386	470
20	.....	601	2320	3020	1180	337	470
21	.....	533	4800	2900	1130	362	533
22	.....	636	2210	2720	1040	337	601
23	6330	785	1880	2600	994	362	672
24	5850	672	2150	2320	950	533	601
25	5060	865	2040	2210	865	533	533
26	4800	1040	2320	1990	825	533	672
27	4560	950	2210	1830	785	636	601
28	4170	785	2100	1720	865	533	533
29	3810	865	2210	1830	709	636	601
30	3400	672	2100	1780	709	533	533
31	.....	601	2540	.....	709	.....	470
Total	37980	47805	45294	102340	41021	14672	17999

Daily Discharge, in Sec. Feet, of Rio Grande at Buckman.—Con'd.

1910

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	672	601	2040	2960	12400	4320	440	295	386
2	747	672	2480	2840	12100	4640	230	295	386
3	825	672	2480	2780	11100	4720	180	278	362
4	995	533	3020	2900	10100	4640	180	278	260
5	825	440	3210	2840	9120	4400	180	295	230
6	672	470	3340	2840	9120	4100	169	295	218
7	747	413	3020	2900	8540	3800	148	295	205
8	533	386	2960	3020	8430	3470	138	295	205
9	500	362	3140	3020	7990	2960	148	362	180
10	440	386	3210	3860	7240	2480	158	386	158
11	413	440	3020	3870	8880	2260	158	500	158
12	470	500	2720	3660	7560	2150	158	865	158
13	500	566	2840	3940	8100	1930	180	566	158
14	500	636	2720	4240	8770	1830	218	636	158
15	440	533	2960	4560	9470	1720	169	500	158
16	470	533	3020	4400	9470	1620	192	440	158
17	601	470	3020	4100	8540	1420	169	440	158
18	601	413	3210	3940	7880	1270	158	362	169
19	672	413	3210	3800	7030	1220	138	362	260
20	709	413	3400	4320	5950	1130	138	362	413
21	630	413	3660	4800	4400	995	138	386	295
22	533	500	3660	5770	4020	865	138	386	500
23	533	566	4020	5770	4020	865	120	295	636
24	672	533	4170	6230	4020	1420	138	295	.....
25	709	636	4480	7240	3540	1470	148	295	.....
26	601	709	4240	8770	3280	1320	205	260	.....
27	601	1130	4100	10100	2960	1180	205	230	.....
28	533	1420	3730	10300	2660	636	158	230	.....
29	672	.....	3660	11400	2220	413	138	230	.....
30	566	.....	3140	12300	2420	566	205	230	.....
31	470	.....	2900	.....	3280	.....	295	230	.....
Total	18858	15759	100780	153270	214710	65810	5537	11174	5969

Year	Month	Run-off in Acre Feet.
1909	June	75400
	July	94700
	August	89800
	September	203000
	October	81200
	November	29100
	December	35500
	Total for period	609000
1910	January	37400
	February	31300
	March	200000
	April	304000
	May	426000
	June	130000
	July	11000
	August	22100
	September	11800
	Total for period	17462000

RIO HONDO NEAR ARROYO HONDO, N. M.

This station was established April 8, 1910. It is located at highway bridge at John Dunn's ranch 200 yards above the mouth of the stream into the Rio Grande and below all tributaries and diversions. It is 15 miles from Servilleta, the nearest railroad point, and 14 miles from Taos. Gage readings are from a slope rod gage which is fastened to left bridge abutment. Gage readings are taken gratis by John Dunn.

Discharge Measurements of Rio Honáo at Dunn's Ranch, Near Arroyo Hondo Postoffice.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1910					
April 6	W. B. Freeman	23.8	12.5	1.85	31
July 12	J. B. Stewart	11	3.5	1.55	5.2

Daily Discharge, in Sec. Feet, of Rio Hondo at Dunn's Ranch, Near Arroyo Hondo Postoffice.

1910

Day	April	May	June	July	Aug.	Sept.
1	.....	.....	.....	3.5	3.5	.....
2	.....	.....	.....	3.5	.....	.....
3	.....	.....	.....	3.5	.....	.....
4	.....	.....	.....	3.5	.....	.....
5	.....	.....	.....	3.5	.....	.....
6	32	.....	.....	2.4	.....	.....
7	.....	.....	.....	2.4	.....	.....
8	32	.....	.....	3.5	58	.....
9	.....	.....	.....	3.5	58	.....
10	.....	.....	125	48	58	.....
11	39	.....	100	24	58	.....
12	58	.....	100	5.5	58	.....
13	39	.....	100	5.5	58	.....
14	48	.....	100	3.5	.....	.....
15	58	.....	100	3.5	.....	.....
16	78	.....	100	3.5	.....	.....
17	48	.....	100	3.5	3.5	.....
18	58	.....	89	3.5	3.5	.....
19	89	.....	100	3.5	3.5	.....
20	125	.....	100	3.5	3.5	.....
21	125	.....	100	3.5	3.5	.....
22	100	.....	100	3.5	.....	.....
23	112	.....	89	3.6	.....	.....
24	100	.....	89	3.5	.....	.....
25	.....	.....	78	3.5	.....	.....
26	.....	.....	78	3.5	.....	.....
27	.....	.....	58	3.5	.....	.....
28	.....	.....	58	.....	.....	.....
29	.....	.....	58	.....	.....	.....
30	.....	.....	58	.....	.....	.....
31	.....	.....	.....	.....	.....	.....
Total	1141	.....	1880	161.3	369	.....

Year	Month	Run-off in Acre Feet
1910	April	2260
	May	.....
	June	3730
	July	320
	August	732
	September	.....
	Total for period	7040

NOTE.—Rating curve not well defined above gage height of 2.30; therefore discharge for gage heights above 2:30 omitted.

RIO LUCERO NEAR TAOS, N. M.

This station was established April 7, 1910. It is located in mouth of Canon about 9 miles above Taos and about 1¼ miles above Myers' ranch. It is about 200 yards up-stream from headgate of Seco Ditch which is the uppermost diversion. The gage readings are from vertical rod gage on right bank.

This is a temporary station and only occasional readings are secured as there is no regular observer.

Discharge Measurements of Rio Lucero, Near Taos, New Mexico.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1910					
April 7	J. B Stewart	12	10.2	1.05	21.2
May 12	S. S. Carroll	.....	.....	.....	11.4
July 12	J. B. Stewart	12.6	13.8	.95	14.7
September 15	C. D. Miller	12.5	12.7	.82	10

NOTE.—Owing to lack of gage readings and discharge measurements, records at this station are not published in the report.

RIO LA LUZ NEAR LA LUZ, N. M.

This station was established August 13, 1910. It is located about 200 feet above Ranger's cabin which is one mile above La Luz. It is about 200 feet above head of Development Ditch, the uppermost diversion of any importance, and one-half mile below the mouth of the Fresnal. A vertical rod gage is located on right bank. The gage observer is Sam A. Blocker, Forest Ranger.

Discharge Measurements of Rio La Luz, Near La Luz, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1910					
August 13	W. B. Freeman	18.3	5.9	1.58	13.7

NOTE.—Owing to lack of observations and short period of time since station was established, records at this station are not printed.

MIMBRES RIVER NEAR FAYWOOD, N. M.

This station was established April 23, 1908. It is located about 6 miles southeast of Faywood Hot Springs and 10 miles from Faywood station on the Silver City branch of the A., T. & S. F. Railway. On August 14, 1909, a Friez Automatic gage was installed. It is located on right bank about 400 feet below the proposed Rio Mimbres dam site. The station is for collecting flood data as nearly all the normal flow is diverted above for irrigation purposes. No tributaries enter in the vicinity of the station although numerous intermittent tributaries come in both above and below. The drainage area above station is about 450 square miles. The gage observer is Ralph C. Trujillo.

Discharge Measurements of Mimbres River, Near Faywood, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1909					
January 6	J. B. Stewart	21.5	5.4	3.9	8.8
February 3	do	8.8	3.8	3.6	5.2
April 27	do	7	1.6	3.65	2
June 10	do	8	1.8	3.7	1.1
July 8	do	8.3	1.6	8.9	1.4
August 13	do	79.5	4.4	4.7	164
August 20	do	11.5	2.1	4.15 1.16a	1.5
September 1	do	17	3.2	4.3 1.3a	3.5
1910					
February 13	J. B. Stewart	7.7	2.5	.79	4.3
March 18	do	6.5	2.9	.72	3.2
March 23	do	7	2.9	.7	3.1
May 8	C. D. Miller	8.3	2.33	.65	1.8
September 20	J. B. Stewart				Dry

Daily Discharge, in Sec. Feet, of Mimbres River, Near Faywood.

Day	1908 Oct.	Nov	Dec.	1909 Jan.	Feb.	Mar.	April	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
1	42	28	28	46	21	7.8	5	3	1.6	.1	1.7	35	2	7	3.5
2	42	16	28	46	21	7.8	5	1.8	1.5	1.1	1.7	2	2	7	3.5
3	61	16	28	30	5.2	7.8	5	1.8	1.5	7.8	1.7	4	2	7	3.5
4	61	16	17	17	4.6	7.8	2	1.8	1.4	.4	2.7	4	2	7	3.5
5	42	16	17	17.5	10	7.8	2	3	1 4	.1	3.5	18	2	7	2
6	61	16	17	8.8	20	7.8	2	3	1.3	1.7	5.4	2.5	2	7.5	2
7	61	16	17	8.5	10	6.7	1.6	1.5	1.2	9.1	5.4	1	2	7.5	2
8	61	16	17	8.5	10	6.7	1.6	2.4	1.1	1.4	5.4	.5	2	7.5	2
9	42	28	17	4.4	10	6.7	4	2.4	1.1	1.6	3.5	.5	2	7.5	2
10	61	28	17	5	10	6.7	4	2.4	1.1	1.6	5 4	1	4	7.5	2
11	61	28	17	6	4.6	6.7	4	1.5	.8	1 6	9	15	4	8	2
12	61	28	17	6	4.6	6.7	4	1.5	.8	1.6	18	8	4	8	2
13	61	44	30	13	4.6	14	4	2.4	1.6	95	9	8	4.5	8	2
14	61	44	46	13	4.6	25	4	2.4	1.6	2.7	108	5.5	4.5	8	2
15	61	28	46	15	4	14	4	3.2	1.3	2.7	108	4	5	8	1.5
16	42	16	65	15	4	6.7	4	3.2	1.3	1.6	7	4	5	8	1.5
17	42	16	46	15	4	6.7	3.5	3.2	1.3	1.6	3	4	5	6	1.5
18	42	28	46	15	4	4.8	3.5	3.2	.5	2.2	1	4	5	8.5	1.5
19	42	28	16	20	8.8	4.8	2.6	3.2	.7	2.2	1	2	5	8.5	1.5
20	42	16	30	20	8.8	4.8	2.6	3.2	.7	5.3	1.5	2	5.5	8.5	1.5
21	42	16	30	10.4	17.5	4 8	2.6	3.2	1.7	5.3	2	1	5.5	8.5	1.5
22	42	16	30	10.4	17.5	4.8	2 6	3.2	1.7	3.4	2	1	6	6.5	1 5
23	42	16	30	13.5	17.5	4.8	2 6	2	1.2	2.2	20	1	6	5	1.5
24	42	28	30	13.5	8.8	4.8	2.6	1.6	1.2	3.4	8	1.5	6	5	1 5
25	61	28	46	13.5	8	12.1	2.6	1.6	1.2	5.3	5	1.5	6	5	1.5
26	61	28	46	13.5	8	23	2	.7	.5	5.3	1.5	1.5	6.5	5	2.5
27	61	28	46	45	8	23	2	.7	.2	2.7	1.5	1.5	5.5	5	2.5
28	44	28	30	30	8	10 5	3	.7	.2	2.7	1	1.5	6.5	5	2.5
29	44	28	30	17	.....	10.5	3	1.6	1 6	2.8	1	1.5	6.5	5	4
30	44	28	30	17	.....	5	3	1.6	4.2	4.3	1	1.5	6.5	5	4
31	28	.....	30	21	.....	5	.....	1.6	.....	6.7	8.5	.....	7	.....	4
Tot.	1560	716	940	534	267.1	276.1	94.4	68.6	37.5	183.4	353.4	107	138.5	207	70

Daily Discharge, in Sec. Feet, of the Mimbres River, Near Faywood—Con'd.

Day	1910 Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep..
1	4.5	10	2	2.5	2.5	1 6	.....	17	.....
2	4.5	8	2	1.6	2.5	1.6	.....	17	.....
3	4.5	8	2	1.6	2.5	1.6	.....	17	8
4	4.5	8	2	1.6	2.5	1.6	.....	17	8
5	4.5	8	2	1.6	1.6	2.5	.....	17	8
6	3	8	2	1.6	1.6	2.5	.....	17	8
7	5	4	2	2	1.6	2.5	1	17	3
8	3	4	2	2	1.6	2.5	.....	17	3
9	3	3.5	2	2	1.6	2.5	.....	27	.....
10	3	3.5	2	2	1.6	2.5	.2	196	.....
11	5	4	2.5	2	1.6	2.5	.2	21	.....
12	5	4.5	2.5	2	1.6	3.5	.2	21	.....
13	5.5	5	2.5	2	2.5	2.5	.2	21	.....
14	5.5	5	2.5	2.5	2 5	2.5	.2	16	.....
15	5.5	5	2.5	2 5	2.5	2.5	33	42	.....
16	5.5	5	2.5	2.5	1.6	2 5	.....	42	.....
17	6	3	2.5	2.5	1.6	2.5	.....	28	.....
18	6	3	2 5	2.6	1.6	2.5	.....	28	.....
19	6	3	2.5	2.5	1.6	2.5	.....	28	.....
20	6	3	2.5	2.5	1.6	2 5	.....	28	.....
21	6	3	2.5	2.5	1.6	2.5	.....	28	.....
22	4	3	2 5	2.5	1.6	2.5	.....	28	.....
23	4	2	2.5	2.5	1.6	1.6	.....	28	.....
24	4	2	2.5	2.5	1.6	6	4.5	86	.....
25	5	2	2.5	2.5	1.6	.5	2.5	34	.....
26	5	2	2.5	2.5	1.6	12.5	1	28	.....
27	6	2	2.5	2.5	1.6	.5	1	21	.....
28	6	2	2.5	1.6	1.6	.5	57	.....	.....
29	7	.....	2.5	2.5	1.6	.5	30	.....	.....
30	8	.....	2.5	2.5	1.6	.5	3	.....	.....
31	8	.....	2.5	.....	1.6	.....	3	.....	.....
Total	158.5	123.5	72.5	66.1	55.9	74	149	858	37

Year	Month	Run-off in Acre Feet
1908	October	3090
	November	1420
	December	1860
	Total for period	6370
1909	January	1060
	February	530
	March	548
	April	187
	May	136
	June	74
	July	364
	August	701
	September	212
	October	275
	November	411
	December	139
	Total for year	4640
1910	January	314
	February	245
	March	144
	April	131
	May	111
	June	147
	July	236
	August	1700
	September	73
	Total for period	3160

MORA RIVER AT LA CUEVA, N. M.

This station was established August 25, 1903. The gage was Washed out September 29, 1904, and replaced April 29, 1905. It is located at wagon bridge at La Cueva which is 26 miles north of Las Vegas. A vertical rod gage is attached to bridge abutment. The station is a few miles above Cebolla Creek and a short distance down-stream from the intake of the La Cueva canal. The gage observer is Hugh Loudon.

Discharge Measurements of Mora River at La Cueva, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1909					
January 21	J. B. Stewart	17.7	11.8	.64	11.8
April 6	J. B Stewart	15.5	9.4	.60	8.6
April 6	J B. Stewart	16.5	11.9	.60	8.5
May 23	J. B. Stewart	21	23.7	1.13	48
June 25	J. B. Stewart	18	14.5	.69	17
July 29	W. H Sutton	10	4	.42	27
August 28	W. H Sutton	26	42	2.20	111
October 27	W. B. Freeman	17	15.6	1.11	15
November 30	G. H. Russell	19	15.8	1.08	15.6
1910					
February 6	G. H. Russell	15.5	14.6	1.00	17
March 7	Russell & Strong	19	14.7	1.02	20.3
March 7	Russell & Strong	19	14.7	1.02	20.5
April 26	J B Stewart	33.5	40	1.8	115
June 12	J B Stewart	10.5	3.5	.62	5.3
August 12	J. B Stewart	18	8.5	1.15	23.5
August 30	W. W Mills	14.6	4.6	.7	3.8
October 21	G. H. Russell	16	7.3	.91	8.75
October 29	R. L Cooper	20	13 0	.70	15.9
December 16	J. B. Stewart	17.5	11.6	.62	11.6

Daily Discharge, in Sec. Feet, of Mora River Near La Cueva, N. M.

Day	1908 Oct.	Nov	Dec.	1909 Jan.	Feb.	Mar.	April	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
1	6.5	16	16	*	12	10	5.5	15	38	42	1.5	49	18	18	10
2	8	16	16	.....	12	10	5.5	26	29	34	.9	35	18	18	12
3	6.5	16	16	.....	7.8	10	12.	22	29	22	106	35	18	15	14
4	6.5	16	16	.....	5.5	10	5.5	34	29	62	52	32	18	12	15
5	8	16	16		15.0	3.8	5.5	9	38	79	36	268	22	12	18
6	6.5	16	10	12	12	2.0	5.5	42	68	91	31	320	22	10	18
7	6.5	16	8	10	10	5.5	10	47	47	79	22	211	22	12	18
8	5	16	10	5.5	10	5.5	5.5	52	47	57	125	155	22	12	12
9	6.5	16	10	5.5	10	5.5	5.5	47	38	52	26	125	29	15	15
10	5	16	13	1.0	10	10.	12.	38	38	38	51	115	29	12	13
11	6.5	16	16	0	12	12	7.8	34	47	34	49	120	29	12	15
12	8	3.5	16	12	10	15	7.8	38	57	18	38	92	26	12	18
13	13	3.5	13	15	10	15	10.	22	52	10	156	82	26	12	15
14	16	6.5	16	10	12	15	3.8	18	47	10	49	71	22	12	12
15	16	10	6.5	10	22	12	2.0	22	42	10	151	61	15	15	15
16	16	3.5	8	10	10	15	3.8	29	29	7.8	41.	58	22	15	15
17	16	8	10	10	10	15	5.5	18	29	5.5	31	53	22	10	12
18	16	6.5	6.5	10	12	12	10.	15	29	5.5	18	53	29	25	†
19	16	1.5	19	10	12	12	29.	18	79	5.5	172	48	26	15	.....
20	16	6.5	16	10	10	12	22	57	103	5.5	83	43	26	12	.....
21	16	6.5	16	10	10	14	15	42	57	3.8	76	39	22	15	.....
22	16	1.5	12	12	15	15	18	47	52	5.5	44	27	22	10	.....
23	16	6.5	12	10	22	12	18	47	27	10 0	194	27	22	12	.....
24	16	3.5	12	10	12	10	22	42	15	5.5	143	27	22	12	.....
25	16	6.5	12	10	10	10	15	42	15	15.	234	27	22	12	.....
26	16	10	12	5.5	10	15	18	42	15	22	188	25	22	10	.....
27	16	2.3	12	10	10	15	12	12	15	18	155	25	15	10	.....
28	16	1.5	12	10	10	15	15	38	7.8	3.8	111	22	18	12	.....
29	16	1.5	12	22	.....	15	29	42	5.5	5.5	100	22	18	12	.....
30	16	16	12	22	.....	15	22	47	47	5.5	84	18	12	15	.....
31	16	.....	12	18	.....	5.5	.....	42	.....	2.0	58	.....	15	.....	.....
Total	530	281.3	393.0	320.5	323.3	348.8	355.2	1096.0	1173.3	764.4	2626.4	2285	671.0	376.5	358

* Estimated 10 Sec. Ft per Ice G. C. S day † Estimated 8 Sec. Ft. per day.

Daily Discharge, in Sec. Feet, of Mora River Near La Cueva, N. M.—Con'd.

Day	1910 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1									
2	10	11	8	28	105	46	2	47	.8
3	10	11	8	24	102	28	2	20	.8
4	10	24	10	24	102	28	2	9	1.2
5	10	15	12	21	90	32	2	94	1.2
6	10	15	18	19	90	28	1	34	1.2
7	10	17	18	19	78	28	2	14	.8
8	10	15	18	16	78	28	1	14	1.2
9	10	15	19	19	72	14	1	14	1.2
10	10	15	19	19	66	9	.5	9	1.2
11	10	18	19	39	78	6	1	14	1.2
12	10	15	20	39	66	5	1	14	1.2
13	10	24	20	48	66	5	1	23	1.2
14	10	18	27	87	78	7	3	20	.8
15	11	10	20	87	78	9	.5	14	7
16	11	6	20	87	78	44	.5	14	9
17	14	18	20	75	66	33	.5	11	9
18	14	15	21	89	66	16	.5	26	2.1
19	18	15	21	89	61	10	.5	26	2.1
20	15	15	18	89	61	10	.5	26	2.1
21	15	15	33	108	51	8	.5	12	1.2
22	21	15	25	114	51	9	.5	14	1.2
23	15	15	22	114	56	7	.5	14	9
24	15	12	29	114	56	3	.5	14	3
25	15	10	33	114	36	3	.5	5	1.2
26	15	10	39	102	36	3	1.5	3	5
27	22	12	39	115	36	20	.....	3	7
28	22	12	35	122	28	20	.....	3	7
29	29	12	23	128	32	22	.....	3	9
30	16	.....	23	128	36	10	.....	4	2.1
31	6	.....	32	122	36	4	186	3	2.1
Total	10	.....	21	.....	28	.....	68	.8	.....
	414	405	690	2199	1973	485	280.5	522.8	93.1

Year	Month	Run-off in Acre Feet.
1908	October	1050
	November	456
	December	688
	Total for period	2194
1909	January	633.0
	February	639.0
	March	695.0
	April	702.0
	May	2180
	June	2330
	July	1520.0
	August	5210.
	September	4530.
	October	1330.
	November	750.0
	December	707
	Total for year	21200
1910	January	824
	Febraury	805
	March	1370
	April	4360
	May	3910
	June	964
	July	556
	August	1040
	September	184
	Total for period	14013

PECOS RIVER NEAR COWLES, N. M.

This station was established March 9, 1910. It is located about three-quarters of a mile below Cowles Postoffice, 13 miles above Pecos and about 20 miles northeast of Glorieta, a station on the A. T. & S. F. Railroad and 24 miles by trail from Santa Fe. It is at second wagon bridge above Holy Ghost Creek and about half way between that Creek and Willow Creek. A Friez Automatic gage is located on left bank. Gage observer is Encarnacion Rivera.

Discharge Measurements of Pecos River, Near Cowles, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1910					
March 7	Stewart & Fisher	31	33	.....	79
March 8	do	31	34	.....	80
March 9	do	31	32	1.3	72
March 10	J. B. Stewart	31	31	1 23	64
Adril 23	do	37	57	1.82	173
April 23	do	48	59	1.82	181
June 9	do	35	43	1.5	105
August 20	Stewart & Mills	34	34	1.18	52
September 7	W W Mills	33	26	1.05	36
October 31	J. B. Stewart	33	22	.98	25

Daily Discharge, in Sec. Feet, of Pecos River, Near Cowles.

1910

Day	Mar.	April	May	June	July	Aug.	Sept.
1	.....	70	370	172	55	62	36
2	.....	62	355	160	55	62	30
3	.....	70	340	160	55	62	36
4	.....	70	340	148	55	98	36
5	.....	70	335	127	55	88	36
6	.....	70	340	127	55	70	36
7	.....	62	340	117	55	55	36
8	.....	62	325	107	48	55	30
9	70	62	325	98	55	70	30
10	62	62	325	88	55	79	30
11	62	88	340	107	55	88	30
12	62	88	340	127	62	117	30
13	62	98	355	148	70	79	30
14	70	98	370	127	70	70	36
15	70	88	370	127	55	62	36
16	62	88	340	117	55	62	30
17	62	88	310	107	55	62	30
18	62	107	295	98	62	55	30
19	70	127	251	88	55	55	36
20	70	223	223	79	55	55	30
21	70	160	223	79	55	48	36
22	79	148	210	70	55	48	36
23	98	184	197	70	55	42	30
24	107	223	197	70	55	36	30
25	107	266	197	79	79	36	30
26	107	295	184	79	70	30	30
27	98	310	184	88	62	30	30
28	98	340	172	70	55	30	30
29	88	384	172	70	62	30	30
30	79	340	172	62	70	36	30
31	79	.....	172	.....	70	42	.....
Total	1794	4403	8689	3166	1825	1814	966

Year	Month	Run-off in Acre Feet
1910	March	3560
	April	8750
	May	17200
	June	6300
	July	3620
	August	3600
	September	1920
	Total for period	44950

PECOS RIVER AT TECOLOTITO, N. M.

This station was established April 28, 1910. It is located about one mile below the town of Tecolotito and one and one-fourth miles below the mouth of Tecolote Creek. The station is about two miles above Anton Chico which is 30 miles below Las Vegas and 34 miles above Santa Rosa. A Friez Automatic gage is located on the left bank. The gage observer is A. A. Abercrombie.

Discharge Measurements of Pecos River at Tecolotito Near Anton Chico.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1910					
April 28	J. B. Stewart	106	135	2.05	280
April 30	J. B. Stewart	96	125	2.25	363
June 11	J. B. Stewart	45	44	.4	59
August 10	J. B. Stewart	62	56	1	123
September 3	W. W. Mills	58	25		26

Daily Discharge, in Sec. Feet, of Pecos River at Tecolotito.

1910

Day	April	May	June	July	Aug	Sept.
1			138		61	
2		332	138			
3			123			
4			123			23
5			123			20
6			123			20
7						23
8					0.71	23
9		282			32	23
10					342	18
11			52		219	18
12			52		76	18
13					76	28
14					61	35
15					52	35
16		312			43	35
17		292				32
18		292				23
19		292				26
20		292	61			35
21		273				35
22		255			138	35
23		219			94	35
24		185			52	26
25	292	153			28	23
26	292	138			23	23
27	292	123	61		18	20
28	292	116			18	20
29	292	116				20
30	292	116				23
31		138				
Total	1752	3926	994		1480	701

Year	Month	Run-off in Acre Feet.
1910	May	3480
	June	7780
	July	1970
	August	2930
	September	1390
	Total for period	17550

PECOS RIVER AT SANTA ROSA, N. M.

This station was established February 3, 1910. It is located on highway bridge which crosses the river about 400 feet below the C. R. I & P. Railroad bridge. It is about one mile above the mouth of Rio Agua Negra Chiquita and about 6 miles above the mouth of Canon Pintada. A chain gage is on down-stream side of bridge. The gage observer is Clifford Barhardt.

Discharge Measurements of Pecos River at Santa Rosa, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1910					
February 1	Russell & Stewart	28	12.5	1.35	12.7
February 3	do	30	13.8	1.38	12.8
March 13	C. H. Russell	37	12.2	1.46	10.7
May 8	J. B. Stewart	93	70	2.37	206
June 19	do	29	25	1.47	36
August 6	do	50	48	2	173
August 19	W. B. Freeman	133	274	2.95	1550
August 19	do	116	145	3.93	570
August 20	do	97	102	1.48	315
August 23	W. W. Mills	34	29	.87	42

Daily Discharge, in Sec. Feet, of Pecos River at Santa Rosa.

1910

Day	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	13	10	30	180	100	58	60	48
2	13	15	35	180	105	30	85	192
3	13	15	20	180	125	15	60	30
4	30	15	13	205	245	22	70	23
5	30	15	5	205	250	10	150	16
6	15	13	5	205	200	15	440	5
7	15	13	5	175	160	15	200	2
8	15	13	5	200	125	20	100	3
9	30	18	9	210	125	15	1730	2
10	30	10	9	270	110	10	1790	16
11	20	18	9	295	100	13	3300	5
12	20	10	13	225	100	35	1610	10
13	15	18	12	255	110	12	2500	5
14	28	10	12	290	110	12	1970	112
15	13	10	25	265	1010	75	2040	192
16	15	15	60	300	300	43	465	95
17	20	15	70	280	170	25	270	23
18	25	30	60	340	100	35	4300	10
19	25	28	50	260	65	25	1440	2
20	25	28	60	265	30	35	330	10
21	20	20	80	240	25	20	150	5
22	20	20	100	220	25	20	70	10
23	10	20	120	195	10	43	170	5
24	18	25	75	225	15	20	430	10
25	18	25	100	175	10	120	300	5
26	23	25	125	180	10	55	95	16
27	18	50	125	140	10	20	30	2
28	18	60	90	125	10	35	10	10
29	.....	48	125	130	170	43	10	70
30	.....	48	160	110	300	52	10	192
31	.....	40	.....	100	.....	35	39	.....
Total	553	700	1607	6526	4225	983	24224	1126

Year	Month	Run-off in Acre Feet
1910	February	1100
	March	1390
	April	3160
	May	1320
	June	8300
	July	1950
	August	48000
	September	2230
	Total for period	67570

PECOS NEAR FT. SUMNER, N. M.

This station was established June 12, 1904, and discontinued February 28, 1910. It was located about 12 miles northwest of Old Ft. Sumner, N. M., and 4 miles up-stream from the town of Ft. Sumner on the A., T. & S. F. Railway. The gage is an inclined rod located on right bank.

Due to the very shifting character of the channel at this point and the difficulty in securing accurate results the station was abandoned. The drainage area above station is about 5300 square miles. Gage readings by J. C. Pacheco.

Discharge Measurements of Pecos River Near Ft. Sumner, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge
1908					
November 5	R. L. Cooper	122	77	2.25	102
1909					
January 20	J. B. Stewart	62.5	58	2.2	91
April 14	J. B. Stewart	46	38	2.25	70
June 1	J. B. Stewart	72	59	2.52	126
June 30	J. B. Stewart	96.5	55	2.33	66
July 20	W. H. Sutton	35	60	2.05	89
August 25	W. H. Sutton	220	177	2.45	389
September 5	J. B. Stewart	209	161	2.7	400
October	W. B. Freeman	106	63	2.46	95
December 7	G. H. Russell	111	64	2.76	50
1910					
February 4	J. B. Stewart			2.75	130
March 3	G. H. Russell		68	2.1	83

Daily Discharge, in Sec. Feet, of the Pecos River Near Ft. Sumner.

Day	1908			1909											
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	60	78	185	165	137	95	115	75	116	295	168	485	63	48	14
2	60	97	155	130	170	95	95	72	118	92	246	250	63	42	14
3	60	97	155	165	137	95	95	87	73	110	168	230	60	53	12
4	60	97	125	130	170	120	95	107	95	72	246	245	75	37	12
5	58	78	155	130	137	73	92	105	68	130	246	295	73	48	15
6	58	97	125	135	170	90	110	83	77	170	204	1240	55	46	11
7	58	97	105	135	135	90	110	69	77	145	246	1480	85	58	50
8	87	78	125	110	135	90	110	67	80	190	514	920	127	53	37
9	87	78	125	110	168	73	110	97	148	345	340	660	85	38	20
10	87	78	165	137	168	135	90	150	127	500	340	440	127	48	15
11	105	80	125	110	168	250	102	150	127	285	246	510	127	35	12
12	86	80	125	170	130	205	88	95	127	215	662	500	80	28	16
13	86	98	160	250	130	162	88	95	280	183	1370	495	80	25	13
14	86	98	125	310	167	110	87	95	127	175	452	265	103	29	17
15	86	98	125	210	290	110	55	75	127	1620	340	265	80	27	18
16	85	100	87	137	205	105	85	60	161	660	1250	180	77	27	25
17	85	100	87	137	135	105	85	90	195	210	934	260	76	19	16
18	85	100	107	90	128	84	102	130	127	190	452	200	75	17	27
19	65	82	87	112	128	84	85	85	127	108	452	255	75	22	28
20	80	82	107	90	125	84	82	127	127	175	452	250	90	20	29
21	80	100	107	112	125	103	190	237	85	110	1140	170	112	19	30
22	80	100	87	137	150	103	122	237	85	73	1860	165	85	17	100
23	100	100	130	112	125	80	120	280	85	73	587	133	65	16	120
24	100	100	130	170	150	65	117	105	133	934	452	105	65	15	120
25	80	83	130	137	120	100	147	85	87	587	587	103	75	13	103
26	100	103	130	112	120	100	147	120	65	750	555	103	60	20	55
27	80	103	165	112	118	100	143	120	70	246	670	103	57	12	88
28	80	103	130	91	118	100	115	120	70	73	635	100	55	23	87
29	78	103	165	137	.....	117	92	80	88	168	750	64	53	16	60
30	78	125	165	137	.....	95	75	80	72	110	705	64	50	15	37
31	78	.....	165	137	.....	117	.....	95	.....	168	670	.....	48	.....	7
Total	2458	2813	4059	4357	4160	3335	3155	3473	3349	9122	17939	10532	2401	886	1218

Daily Discharge, in Sec. Ft., of the Pecos River near Ft. Sumner.—Con'd.

Day	1910	
	Jan.	Feb.
1	20	66
2	20	66
3	11	68
4	39	105
5	40	110
6	41	80
7	24	85
8	105	140
9	600	100
10	750	135
11	90	185
12	46	160
13	27	175
14	45	190
15	30	245
16	15	220
17	52	380
18	53	480
19	55	380
20	56	345
21	57	370
22	85	395
23	58	300
24	90	320
25	60	400
26	60	380
27	61	410
28	62	435
29	63	.....
30	64	.....
31	65	.....
Total	2844	6726

Year	Month	Run-off in Acre Feet
1908	October	4880
	November	5580
	December	8060
	Total for period	18520
1909	January	8670
	February	8280
	March	6640
	April	6250
	May	6890
	June	6660
	July	18100
	August	35600
	September	20900
	October	4770
	November	1760
	December	2420
	Total for year	127000
1910	January	5640
	February	13300
	Total for period	18940

PECOS RIVER NEAR DAYTON, N. M.

This station was established March 24, 1905, about three miles east of Dayton, New Mexico, 100 feet below the mouth of Penasco river and about six miles above McMillan dam at Lakewood, New Mexico.

Estimated Monthly Discharge, in Acre Feet, of Pecos River Near Dayton, New Mexico.

Year	Month	Estimated Discharge
1908	January	22900
	February	15900
	March	4840
	April	6490
	May	8480
	June	5440
	July	29400
	August	95900
	September	16100
	October	2790
	November	9220
	December	22300
	Total for year	240000

NOTE.—Description of station, page 13, T. E. Report S. Water Survey. Footnotes are copied from U. S. G. Records collected by U. S. R. S.

Discharge Measurements of Pecos River, Near Dayton, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge
1908					
December 6	U. S. Reclamation Ser.			3.8	301
1909					
June 24	U. S. Reclamation Ser.			2.95	80
June 28	do			2.6	40
June 29	do			4.4	456
July 8	do			3.8	244
July 19	do			4	280
July 27	do				1080
August 3	do			2.6	100
August 14	do			2.4	72
November 3	do			2.75	112
December 11	do			3.7	291
1910					
February 11	U. S. Reclamation Ser.			3.6	258
March 7	do			2.8	116
April 1	do			2.5	82.6
May 9	do			3.6	272
May 16	do			3.2	162
May 23	do			3.4	187
June 8	do			2.6	44.9
June 15	do			2.5	41.6
June 18	do			4.7	1080
July 13	do			2.45	31.7
August 17	do			6.1	2760
August 20	do			8.55	3990
September 7	do			3.3	204

Daily Discharge, in Sec. Feet, of Pecos River, Near Dayton N. M.

1909

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	260	230	85	60	60	60	236	.....	370	90	100	135
2	260	340	85	60	60	48	190	.....	330	90	100	135
3	300	260	85	72	48	40	151	90	230	90	100	135
4	260	230	85	72	48	36	115	90	186	82	100	135
5	385	230	70	60	36	40	115	82	186	82	100	135
6	490	200	70	60	32	40	151	82	167	82	100	135
7	385	200	70	60	32	40	151	74	135	90	100	330
8	340	230	70	72	32	36	290	67	122	90	100	290
9	300	230	70	72	22	36	151	74	4200	90	100	260
10	300	230	70	40	32	36	99	67	1340	82	100	260
11	300	200	70	40	32	36	85	90	1047	82	100	260
12	300	230	85	36	32	36	226	74	790	82	100	260
13	260	230	85	36	30	36	212	67	790	82	100	260
14	300	170	105	36	30	212	40	82	870	82	100	260
15	300	170	125	36	30	115	36	100	870	135	420	370
16	300	170	145	36	30	360	85	110	150	135	370	330
17	300	170	145	32	85	360	72	135	420	135	167	870
18	1080	170	260	32	85	262	450	135	290	135	110	420
19	440	170	230	36	48	212	290	135	290	135	110	420
20	385	170	230	36	48	151	190	330	230	167	110	420
21	385	170	170	30	60	115	151	260	186	150	110	420
22	385	170	145	30	60	115	115	530	167	135	110	420
23	300	145	125	32	72	99	85	260	135	167	110	650
24	385	125	125	30	72	78	99	207	135	167	110	650
25	300	125	125	36	72	72	1290	420	122	167	167	1440
26	300	85	85	32	72	48	.....	290	110	135	135	370
27	340	85	70	32	30	36	.....	230	100	100	135	290
28	340	85	70	115	151	36	.....	207	110	100	135	290
29	230	.....	70	85	175	170	.....	290	110	100	135	260
30	230	.....	70	72	85	262	.....	290	90	90	135	250
31	230	.....	70	.....	72	.....	.....	370	.....	100	.....	470
Total	10710	5220	3365	1478	1723	3223	5085	5238	14271	3449	3989	11230

Daily Discharge, in Sec. Feet, of Pecos River Near Dayton.—Con'd.

1910

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.
1	420	207	135	82	100	74	159	70	130
2	420	207	135	82	100	67	139	72	540
3	320	297	135	74	91	64	109	74	260
4	285	207	122	74	91	61	104	76	175
5	285	230	110	74	110	52	199	79	165
6	285	255	110	74	207	50	93	82	165
7	285	255	110	74	230	48	98	135	150
8	207	255	110	74	255	68	62	390	135
9	255	255	100	91	255	66	57	500	135
10	255	230	100	91	255	71	48	576	122
11	285	255	100	91	207	57	39	654	110
12	285	255	100	91	207	45	33	490	100
13	285	255	110	91	186	44	32	2390	100
14	475	255	110	82	167	43	35	6500	110
15	590	255	110	82	167	42	46	8350	122
16	475	255	110	82	167	55	37	4580	122
17	320	255	110	100	162	75	40	2400	150
18	285	255	110	100	160	1080	41	700	150
19	285	255	122	91	195	895	39	9100	135
20	255	255	110	91	276	462	40	3990	150
21	255	230	110	91	388	358	49	1280	135
22	320	207	110	82	240	276	50	510	135
23	285	186	110	74	187	188	52	292	110
24	285	186	110	67	150	185	54	165	110
25	207	207	110	74	148	182	56	130	100
26	207	207	110	74	129	143	58	115	82
27	230	186	110	74	138	139	60	110	82
28	230	167	91	74	132	136	62	112	82
29	207	.....	91	74	103	276	64	110	82
30	230	.....	91	74	40	260	66	113	74
31	230	.....	91	.....	38	.....	68	114	.....
Total	9243	6434	3393	2449	5281	5562	1959	44289	4218

Year	Month	Run-off in Acre Feet
1909	January	21200
	February	10300
	March	6700
	April	2930
	May	3420
	June	6370
	July	10100
	August	10400
	September	28300
	October	6820
	November	7910
	December	22300
	Total for the year	137000
1910	January	18300
	February	12800
	March	6700
	April	4860
	May	10500
	June	11000
	July	3890
	August	87900
	Seplember	8390
	Total for period	164340

PECOS RIVER AT LAKEWOOD, N. M.

This station was established January 11, 1906, for the purpose of comparing the amount of water available at the McMillan reservoir with that below the Avalon dam. It shows the flow discharge from the gates of the dam, but does not include the discharge from the spillway nor any leakage from the reservoir. It is located three miles southwest of Lakewood and one-half mile below McMillan dam.

Year	Month	Run-off in Acre Feet
190s	January	18800
	February	4620
	March	307
	Total for period	23727

Discharge Measurements of Pecos River at Lakewood, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1909					
July 12	U. S. Reclamation Serv.			1	97
July 12	do			1.2	143
July 12	do			1.55	209
July 27	do			3	625
September 23	do			3.9	1230
September 23	do			1.9	381
September 23	do			.8	89
1910					
August 20				8.4	3810

Daily Discharge, in Sec. Ft., of the Pecos River at Lakewood.

1909

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.
1	Dry	Dry	178	64	50	36	43	68	292	89
2	"	"	178	64	50	36	50	69	295	89
3	"	"	178	64	50	36	50	70	297	89
4	"	"	178	64	50	36	80	71	300	89
5	"	"	178	64	136	36	80	72	302	89
6	"	"	178	64	136	36	80	74	305	89
7	"	"	178	64	136	43	80	75	307	89
8	"	"	178	64	136	24	80	77	310	89
9	"	"	178	64	136	24	80	80	315	89
10	"	"	178	64	116	24	80	82	318	89
11	"	"	178	64	88	24	97	85	889	89
12	"	"	178	64	64	24	64	87	1520	89
13	"	"	178	64	64	24	64	91	1420	71
14	"	"	178	64	57	24	64	94	1380	54
15	"	"	178	64	50	57	168	96	390	54
16	"	"	178	64	50	136	178	99	250	690
17	"	"	178	64	50	36	157	101	250	1280
18	"	"	178	64	50	36	168	104	250	98
19	"	"	178	57	50	36	157	106	250	98
20	"	"	178	50	50	36	157	109	184	.....
21	"	"	178	50	50	36	157	111	128	.....
22	"	"	178	50	50	36	146	180	128	.....
23	"	"	178	50	50	36	136	241	250	.....
24	"	178	178	50	50	36	136	244	89	.....
25	"	178	178	50	50	36	524	247	89	.....
26	"	178	178	50	88	36	1280	250	89	.....
27	"	178	64	50	136	36	662	252	89	.....
28	"	178	64	50	136	36	157	255	89	.....
29	"	.....	64	50	136	36	65	258	89	.....
30	"	.....	64	50	136	36	66	287	89	.....
31	"	.....	64	.....	64	.....	67	290	.....	.....
Total	.....	890	4948	1759	2515	1124	5373	4325	10962	3413

Year	Month	Run-off in Acre Feet
1909	January	
	February	1770
	March	9840
	April	3490
	May	4960
	June	2230
	July	10600
	August	8610
	September	21700
	October	6790
	Total for period	70000

RIO PENASCO AT ELK, N. M.

This station was established August 15, 1910. It is located in Section 5, T. 16 S., R. 16 E., about 200 yards below Elk Postoffice. It is about one-half mile above the mouth of Elk Canon. There are numerous small irrigation ditches diverted for 30 miles above station. Gage is chain gage located on left bank. The observer is J. W. Belk, Forest Ranger.

Discharge Measurements of Penasco River Near Elk, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1910 August 15	W. B. Freeman	19	20.6	1 62	297

NOTE.—Owing to short period of observation and lack of discharge measurements, records taken at this station are not published in this report.

LA PLATA RIVER AT LA PLATA, N. M.

This station was originally established May 25, 1905, and reestablished June 18, 1907. It is located at a highway bridge about 16 miles northwest of Aztec and 1 mile south of the La Plata Postoffice in Sec. 3, T. 31 N. R. 13 W., of the N. M. P. M. A chain gage is located on the down-stream side of wagon bridge. The station is below all tributaries and about 15 miles above the mouth of the La Plata into the San Juan. The station is for the collecting of flood data as nearly all the normal flow is diverted above for irrigation. The drainage area above station is about 340 square miles. Gage observer is Frank Williams.

Discharge Measurements of La Plata River at La Plata, N. M.

Date	Hydrographer	With	Area of Section	Gage Height	Discharge in sec. ft.
1908					
December 8	J. B. Stewart			1.33	1
December 9	J. B. Stewart			1.40	1.5
1909					
January 12	C. D. Miller	7	1.8	1.5	3
March 29	J. B. Stewart	31	30	2.22	54
May 13	J. B. Stewart	33	58	3.05	264
June 27	V. L. Sullivan	29	15.1	1.8	12.4
July 26	J. B. Stewart			1.45	.8
September 25	W. B. Freeman	32	30	2.3	37
November 16	J. B. Stewart			1.9	1.2
September 6	Max. Gage Height.			7.65	7000
1910					
February 7	W. B. Freeman	26.5	138	2.05	9.4
March 25	G. T. Lyon	34.5	47.5	3.25	232
May 29	G. H. Russell	2.5	.9	1.85	.9
August 18	C. T. Lyon	1.7	.2	3.36	.1

Daily Discharge, in Sec. Ft., of La Plata River Near La Plata. N. M.

	1908			1909										
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	a	a	a	.9	3	390	67	127	76	4	.5	156	23	3	*.1
2	.....	.....	.....	.9	3	595	85	116	85	3	.5	150	23	3	.1
3	.....	.....	.....	.9	5.5	85	166	127	116	6	.5	88	19	3	.1
4	.....	.....	.....	.9	12.4	890	180	212	264	3	.5	70	16	3	.1
5	.....	.....	.....	.9	8.5	390	180	475	300	3	.5	5000	15	3	.1
6	.....	.....	1a	.9	5.5	352	105	475	309	2	.5	1550	12	3	.1
7	.....	.....	1a	9	5.5	317	116	520	370	2	.5	920	12	1.5	.1
8	.....	.....	1.8a	1.5	3	85	105	570	498	2	14	480	12	1.5	.1
9	.....	.....	1.5a	3	1.5	85	127	282	352	1.5	.5	300	12	1.5	.1
10	.....	.....	1.5	3	1.5	67	180	247	317	1.5	.5	184	11	1.5	.1
11	.....	.....	9	3	1.5	85	180	196	230	1.5	14	130	11	1.5	.1
12	.....	.....	9	3	.9	52	152	230	166	1.5	.5	142	11	1.5	.1
13	.....	.....	9	1.5	1.5	85	140	264	166	1.5	.5	130	10	1.5	.1
14	.....	.....	1.5	3	1.5	105	180	247	152	1.5	.5	20	10	1.5	.1
15	.....	.....	3	1.5	5.5	105	390	196	116	1	70	78	10	1.5	.1
16	.....	.....	5.5	12.4	8.5	67	620	180	116	1	156	88	10	1.5	.1
17	.....	.....	3	7	12.4	85	850	212	105	1	40	80	9	1	.1
18	.....	.....	.9	12.4	8.5	127	970	300	105	1	6	70	9	1	.1
19	.....	.....	1.5	5.5	12.4	85	930	212	95	1	40	62	7	1	.1
20	.....	.....	1.5	5.5	12.4	35	620	300	116	1	360	54	6	1	.1
21	.....	.....	1.5	12.4	8.5	67	390	180	95	8	70	54	6	1	.1
22	.....	.....	.9	12.4	5.5	52	282	166	76	8	20	46	6	.5	.1
23	.....	.....	1.5	27	3	67	212	152	76	8	13	40	5	.6	.1
24	.....	.....	.....	18.5	3	85	152	116	45	8	20	40	5	.5	.1
25	.....	.....	.....	5.5	3	52	127	105	230	8	500	40	5	.5	.1
26	.....	.....	.....	1.5	5.5	52	116	105	230	8	70	32	4	.5	.1
27	.....	.....	.....	5.5	8.5	67	140	105	18.4	5	108	28	4	.....	2.5
28	.....	.....	.....	5.5	27	105	212	127	10.4	5	13	23	4	.....	2.5
29	.....	.....	1.5	3	.....	67	230	152	8.5	5	216	53	4	.1	2.5
30	.....	.....	.9	3	.....	67	127	105	7	5	920	23	4	.1	2.5
31	.....	.....	.9	3	.....	67	.....	85	.....	5	250	.....	3	.....	2.5
Total	.....	.....	41.1	165.9	178.5	4885	8331	6886	4841.4	47.3	2906	10081	298	40.7	15.1

NOTE —a Doubtful; gauge out; do not know what discearge was. *Estimated.

Daily Discharge, in Second Feet, of La Plata River, Near La Plata, N. M.—Con'd.

1910

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	6.5	18	409	150	138	2.5	.5	.4	.5
2	4.5	18	138	138	114	2.5	.5	.4	.5
3	4.5	18	73	126	91	.5	.5	.4	670
4	4.5	18	495	114	73	.2	.5	163	21
5	4.5	18	331	114	58	.5	.5	14	.5
6	4.5	18	224	114	58	.5	.4	138	.5
7	4.5	10.2	258	114	51	.5	.4	73	.5
8	4.5	18	224	102	58	.5	.4	163	.5
9	4.5	18	193	102	66	.5	.4	14	.5
10	4.5	18	163	102	73	.5	.4	138	.5
11	14	18	163	91	58	.5	.4	73	.5
12	14	18	163	91	66	.5	.4	7000	.5
13	14	18	163	82	73	.5	.4	160	.5
14	14	18	193	102	66	.5	.4	3.1	.5
15	14	32	193	102	58	.5	.4	12	.5
16	14	44	163	91	44	.5	.4	6	.5
17	14	22	193	73	32	.5	.4	6	.5
18	14	22	224	66	14	.5	.4	6	.5
19	14	14	224	91	2.5	.5	.4	6	.5
20	14	14	224	102	9.5	.5	.4	2	.5
21	14	14	258	138	4.5	.5	.4	.5	2.5
22	14	14	224	138	2.5	.5	.4	.5	.5
23	14	91	224	150	2.5	.5	.4	.5	.5
24	14	73	193	163	1.5	.5	.4	.5	.5
25	14	114	163	258	2.5	.5	.4	.5	.5
26	14	138	138	331	1.5	.5	.4	.5	.5
27	14	163	114	258	.5	.5	.4	.5	.5
28	14	331	138	224	.5	58	.4	.5	.5
29	18	.....	91	224	.4	6.5	.4	.5	.5
30	18	.....	138	178	.4	2.5	.4	.5	.5
31	18	.....	178	.....	.5	.....	.4	.5	.....
Total	353	1330.2	6270	4129	1212.3	84.2	12.9	8011.7	707

Year	Month.	Run-off in Acre Feet
1908	December	82
	Total for month	82
1909	January	329
	February	354
	March	9720
	April	16500
	May	13600
	June	9580
	July	94
	August	5760
	September	20000
	October	590
	November	81
	December	30
	Total for year	76600
1910	January	701
	February	2640
	March	12400
	April	8210
	May	2400
	June	167
	July	26
	August	15900
	September	1400
	Total for year	43844

RIO PUEBLO DE TAOS ABOVE TAOS, N. M.

A temporary station was established April 7, 1910. Station is designated as temporary as there is no regular observer and so only occasional gage readings are secured. It is located about 2 miles up-stream from the Indian Pueblo de Taos and 200 yards up-stream from the uppermost irrigation diversion. It is below all mountain tributaries. A vertical rod gage is located on left bank.

Discharge Measurements of Rio Pueblo de Taos River, Above Taos.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1910					
April 7	J. B. Stewart	18	2.39	43	
July 12	J. B. Stewart	12	1.18	14	
September 15	C. D. Miller	8.9	.79	7.2	

NOTE.—Gage established April 7, 1910. No observer. Gage washed out between April and July 12.

THE PUEBLO DE TAOS NEAR LOS CORDOVAS, N. M.

This station was established April 6, 1910. It is located about 100 feet down-stream from mouth of Rio Grande del Ranchos and Arroyo Seco and about 1 mile below mouth of Rio Lucero. It is just below A. J. Anderson's grist mill and a short distance northeast of Los Cordovas. The readings are from a vertical rod gage, located on right bank. The gage observer is A. J. Anderson.

Discharge Measurements of Rio Pueblo de Taos, near Los Cordovas.

Date	Hydrographer	With	Area of Section	Gage Height	Discharge in sec. ft.
1910.					
April 6	J. B. Stewart	36.5	40	1.47	72
July 12	J. B. Stewart	10.5	6.4	.73	3
September 15	C. D. Miller	13	6.02	.8	3.2

Daily Discharge, in Second Feet, of Rio Pueblo de Taos at Los Cordovas.

1909

Day	April	May	June	July	Aug.	Sept.
1	.....	1000	60	1.5	3	4.5
2	.....	850	45	1.5	1.5	4.5
2	.....	700	45	1.5	1.5	4.5
4	.....	700	33	1.5	4.5	4.5
5	.....	632	33	1.5	4.5	4.5
6	70	565	23	1.5	4.5	4.5
7	80	565	20	1.5	4.5	4.5
8	94	502	12	1.5	4.5	4.5
9	80	632	9	1.5	1.5	4.5
10	80	440	9	4.5	1.5	4.5
11	1.5	440	4.5	4.5	3	4.5
12	1.5	440	4.5	3.	4.5	3
13	1.8	440	4.5	4.5	4.5	1.5
14	1.9	440	4.5	4.5	4.5	4.5
15	1.8	565	4.5	1.5	1.5	4.5
16	1.75	390	4.5	1.5	4.5	4.5
17	1.8	340	4.5	1.5	4.5	4.5
18	1.85	357	3	1.5	4.5	4.5
19	1.9	192	3	1.5	4.5	4.5
20	2	146	1.5	1.5	4.5	4.5
21	2.1	127	1.5	1.5	4.5	4.5
22	2.15	146	1.5	1.5	4.5	4.5
23	2.1	108	1.5	1.5	4.5	4.5
24	2.1	80	1.5	1.5	4.5	4.5
25	2.15	60	1.5	1.5	4.5	4.5
26	2.3	39	4.5	1.5	4.5	4.5
27	2.3	33	4.5	1.5	4.5	4.5
28	2.4	28	1.5	1.5	4.5	4.5
29	2.5	33	1.5	1.5	4.5	4.5
30	2.55	39	1.5	6.8	4.5	4.5
31	.....	52	.....	4.5	4.5	.....
Total	9061	10981	349	68.3	121.5	130.5

Year	Month.	Run-off in Acre Feet
1910	April	18000
	May	21800
	June	690
	July	135
	August	241
	September	259
	Total for the period	41125

RIO PUERCO AT RIO PUERCO STATION, N. M.

This station was established September 7, 1910. It is located at A. T. & S. F. Railroad bridge and crosses the Rio Puerco between the railway stations of Pavo and Rio Puerco. It is a short distance below the mouth of the San Jose. A Friez Automatic Gage is secured to a timbered retaining wall which is located on the left bank. The gage observer is J. A. Nicolay.

Discharge Measurements of Rio Puerco at Rio Puerco Station.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1910					
September 7	J. B. Stewart		Discharge	less than	.1
September 11	J. A. Nicolay		Est. less th	an	.5
September 18	do	6	.8	1.5	.5
September 25	do	19	14.7	1.5	24.3
October 2	do	6	.7	1.5	.64
October 9	do	8	.8	1.5	.44
October 16	do	7	.8	1.5	.44
October 23	No measurement: estima	ted			1.6
October 30				1.5	8.7
November 12					5
November 14					1

NOTE.—Flow at this station during September was estimated at less than one-half second foot. On September 24th a rise occurred carrying 24.3 second feet.

RIO PUERCO NEAR LA JOYA, N. M.

This station was established September 10, 1910. It is located at A. T. & S. F. Railroad bridge which crosses the stream about one-half mile above its mouth into the Rio Grande and about 2 miles north of La Joya. A Friez Automatic Gage is secured to down-stream end of bridge pier. The gage observer is Perfilio Garcia.

Discharge Measurements of Rio Puerco, Near La Joya, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1910					
September 10	J. B. Stewart				.5
September 21	do				.2
November 13	do				1

NOTE.—At this station low water stages are not recorded on automatic register. With the exception of a slight rise September 22 the stream has been carrying less than one second foot.

RATON CREEK AT RATON, N. M.

A temporary station was established July 29, 1910. It is located at First Street masonry bridge, 1 block below the Second Street concrete bridge. Gage is a vertical rod attached to up-stream side of bridge. Ordinarily the stream is dry and it was for the purpose of securing flood data that the station was established. There is no regular observer. Several gage readings, during slight rises, were recorded by I. A. Wiseman. No discharge measurements were secured.

THE RAYADO RIVER NEAR SPRINGER.

This station was established in the spring of 1908. It is located about three-quarters of a mile above the Abreu Ranch which is about 20 miles west of Springer, N. M., and 12 miles southwest of Cimarron. A chain gage is located on the left bank of the stream. The gage observer is Robert Parker.

Discharge Measurements of Rayado River, Near Springer at Abreu's Ranch.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1909					
January 23	J. B. Stewart	11.2	7.3	1.2	4.2
July 26	W. H. Sutton	13	14.7	1.2	3.8
August 9	do		8.8	1.35	9.4
August 16	do		7.2	1.3	5.5
August 12	do		8.4	.37	9.4
August 26	C. D. Miller	13	11.1	1.5	18.7
August 24	do	13	10.9	1.5	18.73
August 21	do			1.41	13.74
August 21	do			1.41	13.89
August 20	do		18.3	1.365	10.14
August 18	W. H. Sutton		9.9	1.95	73
August 15	do		6.1	1.45	13.6
August 13	do		7.2	1.2	3.8
August 11	do		7	1.26	4.8
August 3	do		6.2	1.22	4.1
August 9	do		6.2	1.19	3.6
August 9	do	13	7.9	1.10	3.7
August 7	do	12	7.9	1.24	4.4
August 7	do		7.9	1.24	4.4
August 7	do		7	1.24	4.4
August 3	do	12	7.53	1.22	4.1
October 14	C. D. Miller	13	6.2	1.3	5.12
October 25	W. B. Freeman	12.5	7	1.25	4.3
November 26	G. H. Russell	12.5	7.6	1.3	5.75
1910					
July 27	J. B. Stewart	12.5	5	1.25	3.6
June 14	do	13	8.4	1.55	8.3
May 4	do	14.8	18.8	1.9	49
March 4	G. H. Russell	12	8	1.45	7.8
March 4	do	13	8	1.45	7.7
January 28	do	13	13	1.6	13

Mean Daily Discharge, in Sec. Feet, of Rayado River at Abreu's Ranch.

Year	Month	Dis. in Sec. Feet
1909	January	4.75
	February	5.28
	March	5.78
	April	16.38
	May	21.2
	June	8.51
	July	6.82
	August	8.4
	September	12.05
	October	5.86
	November	6.13
	December	16.83

THE RAYADO RIVER AT MIAMI RANCH NEAR SPRINGER, N. M.

This station was established July 9, 1907, and discontinued August 6, 1909. It was located about one-half mile north of the office of the Farmer's Development Company which is at Miami Ranch 12 miles west of Springer, the nearest railroad point. The station is about 6 miles above the junction of the Rayado with the Cimarron River and below all important tributaries. The gage is a vertical rod gage located on left bank. The drainage area above station is about 100 square miles. Gage readings by J. W. Ausherman.

Discharge Measurements of Rayado River at Miami Ranch Near Springer, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1908					
October 3	J. B. Stewart	.....	.....	.1	0.30
December 19	R. L. Cooper	.....	.....	.1	.5
1909					
January 23	J. B. Stewart	3.4	.46	.05	.29
January 23	do	7.2	1.3	.05	.2
April 8	do	14.5	4	.29	5.9
May 25	do	12.5	2.9	.22	2.7
July 26	W. H. Sutton	.....	.....	.06	.2
September 13	J. B. Stewart	.....	.....	.4	.15
October 14	C. D. Miller	.....	.....	.2	.5
October 25	W. B. Freeman	8	1.9	.15	1.3

Daily Discharge, in Sec. Feet, of Rayado River at Maimi Ranch Near Springer.

Day	1908 Oct.	Nov	Dec	1909 Jan.	Feb.	Mar.	April	May	June	July	Aug.
1	.2	*.4	*.4	.4	.4	.4	3.8	1.8	2.6	.4	.4
2	.2	.4	.4	.4	.4	.4	5.8	10	1.8	.4	.4
3	.2	.4	.4	.4	.4	.4	5.8	11	1.8	.4	.4
4	.2	.4	.4	.4	.4	.4	11	11	1.8	.4	.4
5	.2	.4	.4	.4	.4	.4	10	11	1.8	.4	.4
6	.2	.4	.4	.4	.4	.4	11	11	1.8	1.8	.4
7	.2	.4	.4	.4	.4	.4	5.8	10.	1.8	.4	.4
8	.2	.4	.4	.4	.4	.4	5.8	11.	1.8	.4	.4
9	.2	.4	.4	.4	.4	.4	5.0	12	1.2	.4	.3
10	.2	.4	.4	.4	.4	.4	5.8	11	.5	.4	.3
11	.2	.4	.4	.4	.4	.4	5.8	6.8	.4	.4	.3
12	.2	.4	.4	.4	.4	.4	6.3	6.8	.4	.08	.4
13	.2	.4	.4	.4	.4	.4	13.	6.3	.6	.1	.4
14	.2	.4	.4	.4	.4	.4	6.8	5.4	.5	.08	.4
15	.2	.4	.4	.4	.4	.4	8.9	5.8	.4	.05	.4
16	.2	.4	.4	.4	.4	.4	11.	6.8	.4	.3	.4
17	.2	.4	.4	.4	.4	.4	.8	5.8	.4	.3	.4
18	.2	.4	.4	.4	.4	.8	13.	5.8	.4	.3	.4
19	.4	.4	.4	.4	.4	.8	25.	5.8	.4	.4	.4
20	.4	.4	.4	.4	.4	1.8	26.	.7	.4	.4	.5
21	.2	.4	.4	.4	.4	.8	17.	3.2	.4	.4	.5
22	.2	.4	.4	.4	.4	.8	16.	5.8	.4	.4	.5
23	.2	.4	.4	.4	.4	1.8	11.	5.8	.4	.2	.5
24	.4	.4	.4	.4	.4	1.8	3.8	3.4	.4	.4	.5
25	.4	.4	.4	.4	.4	1.3	1.8	4.6	.4	.4	.5
36	.4	.4	.4	.4	.4	.8	5.4	5.8	.4	.4	.5
27	.4	.4	.4	.4	.4	.8	7.4	2.6	.4	.4	.6
28	.4	.4	.4	.4	.4	.8	5.8	1.8	.4	.3	.6
29	.4	.4	.4	.4	.4	.8	6.3	1.8	.4	.3	.6
30	.4	.4	.4	.4	.4	.8	7.4	1.8	.4	.3	.6
31	.4	.4	.4	.4	.4	.8	5.4	1.8	.4	.3	.6
Total	8.2	12.4	12.4	12.4	11.2	23.4	277.9	190.2	25.2	13.0	14.0

* Dischages Estimated.

Year	Month.	Run-off in Acre Feet
1908	October	16
	November	25
	December	25
	Total for period	66
1909	January	25
	February	22
	March	46
	April	551
	May	378
	June	50
	July	26
	August	28
	Total for year	1130

RED RIVER BELOW QUESTA, N. M.

This station was established April 8, 1910. It is located about 2 miles below Questa and below the mouth of the Cabresto Creek. It is at head of Lower Canon 5 miles above the mouth and is below all diversions and tributaries of any importance. Gage readings are from vertical rod gage which is located on right bank fifty yards up-stream from Vigil's grist mill. The observer is Narciso Vigil.

Discharge Measurements of Red River Below Questa, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1910					
April 8	J. B. Stewart	28.5	25	1.52	80
July 13	do	18.5	19.7	1.48	45.6
September 12	C. D. Miller	24	14.5	1.17	26.5

Daily Discharge, in Sec. Feet, of Red River at Vigil's Mill, Below Questa.

1910

Day	April	May	June	July	Aug.	Sept.
1	.....	2.4	1.9	1.4	.....	.....
2	.....	2.3	1.9	1.3	.....	.....
3	.....	2.3	1.9	1.35	.....	.....
4	.....	2.3	2	1.3	.....	.....
5	.....	2.3	1.9	1.3	.....	.....
6	.....	2.25	1.9	1.3	.....	.....
7	.....	2.2	1.9	1.25	.....	.....
8	*1.5	2.2	1.8	1.2	.....	.....
9	1.55	2.3	1.8	1.2	.....	.....
10	1.5	2.3	1.7	.....	.....	.....
11	1.6	2.3	1.7	.....	.....	.....
12	1.6	2.3	1.7	.....	.....	‡1.18
13	1.7	2.45	1.6	†1.5	.....	.....
14	1.6	2.45	1.6	.....	.....	.....
15	1.6	2.35	1.55	.....	.....	.....
16	1.6	2.25	1.7	.....	.....	.....
17	1.6	2.2	1.6	.....	.....	.....
18	1.65	2.15	1.55	.....	.....	.....
19	1.65	2.1	1.5	.....	.....	.....
20	1.7	2	1.5	.....	.....	.....
21	1.85	1.9	1.5	.....	.....	.....
22	1.8	1.95	1.45	.....	.....	.....
23	1.9	1.9	1.4	.....	.....	.....
24	2	1.75	1.4	.....	.....	.....
25	2.3	1.7	1.4	.....	.....	.....
26	2.4	1.65	1.45	.....	.....	.....
27	2.35	1.8	1.5	.....	.....	.....
28	2.45	1.75	1.5	.....	.....	.....
29	2.55	1.9	1.4	.....	.....	.....
30	2.5	1.9	1.4	.....	.....	.....
31	.....	2	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....

NOTE.—Not enough measurements and data to determine curve; therefore only gage heights and these discharge measurements given. *80 Dis. †46 Dis. 26.5 Dis.

RIO RUIDOSO NEAR GLENCOE, N. M.

This station was established August 17, 1910. It is located 50 yards above Forest Ranger Station which is located about two and one-half miles above Glencoe Postoffice. It is about two miles above Eagle Creek. Numerous small ditches are diverted for irrigation for about 16 miles above the station, Glencoe is about 50 miles east of Tularosa, the nearest railroad point. Gage readings are from an nclined rod gage on right bank about 50 yards above Forest Ranger Station.

The gage observer is Ralph L. Bateman, Forest Ranger.

Discharge Measurements of Rio Ruidoso, Near Glencoe, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1910					
August 17	W. B. Freeman	8.8	8.1	1.48	7.6

NOTE.—Owing to short period of observation and lack of discharge measurements records at this station are not published in this report.

THE SAN FRANCISCO RIVER AT ALMA, N. M.

This station was established October 18, 1904. It was discontinued December 31, 1907, and re-established January 2, 1909. It is located about one-half mile southwest of Alma, N. M., and 85 miles northwes of Silver City. An inclined gage is located on left bank of stream. The station is a short distance below Mineral Creek and about four miles above Whitemater Creek an important tributary. The gage observer is G. G. Graham.

Discharge Measurements of San Francisco River at Alma, N. M.

Date	Hydrographer	Width	Area o4 Section	Gage Height	Discharge in sec. ft.
1909					
January 2	J. B. Stewart	38	19.6	.74	37
February 7	J. B. Stewart	39	19	1	52
April 21	do	61	60	1.55	2.14
June 6	do	25	7	.45	87
June 5	do	19	5.8	.45	8.5
July 4	do	25.5	8	.58	15.9
August 7	do	32.5	13.2	.65	28
October 10	W. B. Freeman	295	12.5	.75	15.8
1910					
Februrry 11	J. B. Stewart	3.35	14.3	.96	28
March 26	do	2.5	9.4	1.3	16.2
May 6	C. D. Miller			1.3	
September 17	J. B. Stewart	21.5	6.24	1.95	7.85
November 17	do	30	11.4	2.03	23.4

Daily Discharge, in Sec. Feet, of San Francisco River, at Alma.

1909

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	33	52	88	485	52	11	4	24	16	39	6	30
2	33	52	52	485	52	11	4	24	16	29	9	22
3	33	52	192	485	52	11	4	72	40	20	6	22
4	33	52	490	840	52	11	11	17	52	20	6	22
5	33	52	620	840	52	11	9	182	1140	20	9	30
6	31	52	420	485	52	9	23	32	52	18	9	30
7	31	52	485	485	52	9	11	72	52	18	9	34
8	31	192	355	485	35	7	11	70	52	18	7	34
9	31	52	192	485	35	7	12	118	48	18	7	34
10	36	52	192	295	35	7	12	690	36	16	7	34
11	34	52	192	295	23	7	3	70	36	13	9	30
12	34	52	148	295	23	7	3	194	36	11	9	30
13	33	355	88	295	23	7	6	143	28	9	9	30
14	39	192	88	295	23	7	3	410	28	9	13	30
15	39	192	192	295	23	7	3	116	28	9	13	30
16	37	114	192	295	23	7	19	105	28	7	13	30
17	37	114	690	485	23	7	10	12	26	13	13	30
18	37	52	1200	295	23	7	249	137	26	11	16	30
19	37	52	840	295	23	7	20	48	30	9	16	30
20	37	52	550	485	23	7	1200	37	30	9	16	30
21	35	52	620	240	23	5.5	22	37	30	9	13	30
22	35	52	485	148	16	5.5	22	80	30	6	13	30
23	35	52	485	148	16	4	22	37	30	6	13	30
24	35	52	485	114	16	4	38	73	30	6	13	30
25	35	52	240	78	11	4	40	25	30	9	16	30
26	33	68	355	68	11	4	68	18	30	13	16	30
27	510	68	485	68	11	4	23	12	30	6	13	30
28	1050	88	485	52	11	4	23	12	30	3	13	30
29	510	.....	485	52	11	4	17	12	30	6	18	30
30	208	.....	485	52	11	4	24	18	30	6	30	30
31	56	.....	485	.....	11	4	70	18	30	6	.....	30
Tot.	3237	2371	12361	9720	647	207.0	1986	2965	2100	392	360	922

Daily Discharge, in Sec. Feet, of the San Francisco River, at Alma.—Con'd.

1910

Day	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	38	36	22	11	.....	.....	.....	5	7.0
2	38	36	20	11	.....	.....	.....	3.	12.0
3	38	36	20	9	.....	.....	.....	.....	.....
4	38	36	20	9	.....	.....	.....	.....	.....
5	38	26	19	14	.....	.....	.....	.....	.....
6	38	36	19	14	.....	.....	.....	.....	.....
7	38	36	18	16	.....	.....	.....	.....	.....
8	38	36	18	25	.....	.....	.....	.....	.....
9	38	36	18	25	.....	.....	.....	.....	.....
10	38	36	30	32	.....	.....	.....	.....	.....
11	38	24	34	20	.....	.....	.....	.....	.....
12	370	24	30	24	.....	.....	.....	.....	.....
13	370	23	22	26	.....	.....	.....	.....	.....
14	132	22	26	22	.....	.....	.....	.....	.....
15	59	22	26	22	.....	.....	.....	.....	.....
16	46	21	24	21	.....	.....	.....	.....	.....
17	36	20	24	15	.....	.....	.....	.....	8
18	36	27	22	15	.....	.....	.....	.....	8
19	36	19	22	10	.....	.....	.....	.....	10
20	36	19	22	10	.....	.....	.....	.....	50
21	36	18	20	4	.....	.....	.....	.....	98
22	36	18	20	4	.....	.....	17	.....	9
23	36	17	20	4	.....	.....	.....	.....	9
24	36	16	17	5	.....	.....	.....	2.0	10
25	36	15	18	0	.....	.....	.....	30.	16
26	36	25	16	0	.....	.....	.....	56.	10
27	36	24	12	0	.....	.....	.....	.5	10
28	36	23	12	0	.....	.....	.....	160	10
29	36	.....	12	3	.....	.....	.....	56	11
30	36	.....	12	2	.....	.....	.....	13.	11
31	36	.....	12	.....	.....	.....	.....	.....	.....
Total	1935	727	627	373	.....	.....	17	321.5	283

Year	Month	Run-off in Acre Feet
1909	January	6400
	February	4700
	March	24500
	April	19300
	May	1680
	June	411
	July	3940
	August	5880
	September	4170
	October	775
	November	714
	December	1830
	Total for year	74300
1910	January	3840
	February	1460
	March	1240
	April	728
	May	.....
	June	.....
	July	307
	August	640
	September	559
	Total for period	8506

SAN JUAN RIVER AT TURLEY, N. M.

This station was established on June 26, by V. L. Sullivan being located one-half miles north of Turley postoffice. Measurements were taken by cable and boat and readings were recorded by Mr. Jay Turley, C. E. Later, on November 2, 1908, this station was moved down the river about three and one-half miles and was established at the new suspension bridge one-half mile southeast of Blanco, N. M. The new gage is a chain reading to feet and tenths and measurements are taken from the bridge. The bed of the river is rocky and fairly permanent. Readings are made at the new gage by F. T. Amiot. This gage was discontinued and replaced by that at Blanco, which in turn was replaced by the automatic gage at Bloomfield.

Monthly Discharge of San Juan at Turley.

Year	Month	Run-off in Acre Feet
1908	October	36400
	November	20100
	Total for period	56500

SAN JUAN RIVER AT BLANCO.

This station was established December 9, 1908, taking the place of the station at Turley, which was discontinued November 30th, 1908.

Blanco is about four miles below Turley Postoffice, 16 miles southeast of Aztec, and one-half mile above the mouth of Canon Largo.

On September 6th, 1909, the suspension bridge from which measurements were taken, was washed out. Since then no gagings have been made at this bridge, but gage readings were continued until October 31, 1910. On September 28, 1909, the station was moved to Bloomfield, where the results obtained include the discharge of the Canon Largo, an important intermittent tributary. Gage readings by Cleofes Valdez.

Discharge Measurements of San Juan River at Blanco, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec. Ft.
1908					
December 10	J. B. Stewart	194	194	2.6	157
1909					
January 11	C. D. Miller	110	298	2.8	526
March 30	J. B. Stewart	238	507	4.4	2010
May 14	do	246	915	6	5820
June 26	V. L. Sullivan	246	2060	6.7	5970
July 27	J. B. Stewart	243	794	5.8	4020
September 28	W B. Freeman	.....	.....	4.7	1100

Daily Discharge, in Sec. Feet, of San Juan River Near Blanco, N. M.

Day	1908 Dec.	1909 Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	410	230	650	1530	3350	4390	3250	1480	7050	950	570	470
2	.....	420	280	1060	2820	3350	4110	3100	1800	5770	950	570	470
3	.....	425	450	1280	4670	4390	5560	3100	1540	4560	950	570	470
4	.....	435	450	1840	4670	5860	7820	2880	1800	8400	830	480	550
5	.....	440	450	2000	2720	7140	10000	3330	2850	9650	2400	480	470
6	.....	450	380	2350	2260	7820	11500	3330	1800	13000	2400	480	470
7	.....	550	380	2000	1530	8170	11900	3200	1540	6190	3400	480	470
8	.....	475	380	2530	1530	8520	11500	2400	1540	6190	1700	480	470
9	165	570	450	2530	1190	8000	12300	2400	1480	6190	1550	460	470
10	165	575	300	900	1320	6810	10000	2050	1080	6190	1250	460	470
11	165	450	300	610	2530	6170	9100	1720	1480	6190	1150	460	470
12	90	370	300	610	2530	5860	8570	1640	1210	6190	1150	450	470
13	90	370	500	700	2170	5560	8450	1350	1210	6190	1150	450	470
14	90	370	420	700	2720	5860	7950	1480	970	6190	1000	450	420
15	210	425	420	1010	5860	5860	7500	1350	1940	6190	1000	450	420
16	100	500	350	1650	7310	6020	7670	1240	1940	6190	1000	450	420
17	100	650	350	2530	10200	6170	7560	1010	1940	6190	880	440	420
18	400	560	400	2720	10400	6170	8400	1010	1480	6190	880	380	420
19	280	490	400	2000	10400	7140	7600	1010	4290	6190	880	380	430
20	280	480	700	2170	8700	6490	7800	800	4290	6190	880	530	480
21	270	550	380	2170	6020	6490	7650	1140	6720	6190	760	620	500
22	300	925	200	1680	4670	5860	5850	1330	4560	6190	670	620	500
23	450	1280	150	2530	4390	5410	5420	4530	4290	6190	670	620	500
24	450	12-0	90	1680	3590	5260	5250	3980	4000	6190	670	550	500
25	350	1120	360	2170	3130	4670	5160	3240	6100	6190	670	550	500
62	350	890	300	2530	2920	4670	5350	2100	5470	6190	670	550	500
27	300	600	410	2350	3590	4390	4550	3280	9500	9190	670	460	500
28	300	290	650	2000	5260	4520	3750	2850	4000	1100	670	460	580
29	250	290	.....	2000	4670	5860	3750	2120	8050	1100	670	460	580
30	326	290	.....	1680	4119	4960	3750	1540	9110	950	670	460	580
31	320	290	.....	1680	.....	4390	.....	1540	7700	.....	670	.....	580
Tot.	16095	17220	10430	54340	129410	180900	220160	69300	107160	181560	33810	14820	14970

Daily Discharge, in Sec. Feet, of San Juan River Near Blanco.—Con'd.

Day	*1910 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.
1	4.5	4.2	4.9	5.70	6.90	.80	5	4.9	3.6
2	4.3	4.2	5	5.60	6.70	.50	4.7	4.8	3.6
3	4.5	4.2	5.1	5.60	6.60	.50	4.7	4.2	3.6
4	4.6	4.2	5.5	5.50	6.40	.30	4.7	4.8	3.6
5	4.5	4.2	5.8	5.40	6	6.40	4.7	4.8	3.6
6	4.5	4.1	6.2	5.40	6.10	6.40	4.7	4.8	3.6
7	4.4	4.1	6.2	5.50	6.10	6.20	4.6	4.7	3.6
8	4.4	4.1	6	5.50	6.20	6.10	4.6	4.2	3.6
19	4.4	4.1	6.1	5.50	6.60	5.50	4.6	4 2	3.6
10	4.4	4.1	5.9	5.50	6.90	5.50	4.4	4.2	3.6
11	4.5	4.1	5.9	5.50	7	5.50	4.2	4.2	3.6
12	4.5	4.1	5.8	5.60	7	5.50	3	4.4	3.6
13	4.5	4.1	5.9	5.60	7	5.40	2.9	4.6	3.4
14	4.5	4.2	6.2	5.70	6.90	5.30	2.9	4.6	3.4
15	4.4	4.2	6.1	5.70	6 60	5.30	2.9	4.7	3.4
16	4.4	4 2	5.3	5.30	6.30	5.30	2.9	4.6	3.6
17	4.6	4.2	6.3	5.80	6.10	5.30	3	4.2	3.6
18	4.6	4.1	6.4	5.80	6.20	5.20	3.3	3.9	3.6
29	4.5	4.1	6.5	5.90	6.20	5.20	3.8	3.9	3.6
20	4.5	4.1	6.7	5.90	6.10	5.10	3 8	3.8	3.7
21	4.4	4.1	6.8	5.90	6.10	5	3.7	3.7	4.25
22	4.4	4.2	6.7	6.00	6	4.90	3.7	3.7	4.1
23	4.4	4.3	6.7	6.10	5.90	4.70	3.7	3.7	3.7
24	4.4	4.4	6.4	6.40	5.90	4.60	3.6	3.7	3.7
25	4.4	4.5	6.5	6.60	5.90	4.50	3.6	3.8	3.6
26	4.3	4.6	6.2	6.70	6.20	4.80	3.5	3.8	3.6
27	4.3	4.7	6	6.80	6.30	4.90	3.5	3 8	3.6
28	4.3	4.8	5.8	6.90	6.70	5.30	3.5	3.8	3.6
29	4.2	.....	5.7	7.00	6.80	5.60	3.6	3.7	4.2
30	4.2	.....	5.7	7.00	7	5.90	4.2	3.6	.....
1	4.2	.....	5.7	.....	6.80	.....	4.9	.....	.....
Total	.....	.....	.....	.....	.....	.....	.....	.....	.....

Year	Month	Run-off in Acre Feet
1908	December	12100
	Total for month	12100
1909	January	34100
	February	20700
	March	108000
	April	256000
	May	359000
	June	437000
	July	138000
	August	213000
	September	360000
	October	67000
	November	29400
	December	29700
	Total for year	2050000

NOTE.—It was impossible to take any discharge measurements at this station during 1910, as the bridge was washed out in September, 1909. Therefore, practically the only real data we have on this stream for the year are the observer's gage heights

Beginning about February 8, 1910, we have a record on the San Juan at the Bloomfield bridge, about 12 miles below Blanco, but the gage record is rather fragmentary, until April 3, when the Friez gage commenced to operate. From April 3 to the end of 1910 we have a very good automatic record at Bloomfield.

The only tributary of any importance between the two stations is the Canon Largo which carries large quantities of flood waters at times. The plan was to take measurements at Bloomfield and assume the same discharge at Blanco on the days when the Canon Largo was not carrying water, the hydrographer making a reading of the Blanco gage on the same day as he took a measurement at Bloomfield. In this way a curve was to be developed for the Blanco station for 1910, and then by comparison of the flow at Blanco (the estimated daily flow) with the flow at Bloomfield, it would be possible to get the discharge of the Canon Largo. This plan has not worked out for the reason that the hydrographers were usually in too much of a hurry to go up to Blanco to read the gage, and if they did go, they forgot to state whether or not the Canon Largo was carrying water.

The only statement we find regarding the Canon Largo during the year was an estimate of 12 second feet by the district engineer on February 8.

Since the record at Bloomfield was not obtained from January 1 to February 7, 1910, inclusive, it is recommended that the discharge at Blanco be worked up for that period, using shifting channel methods with 1909 curve as standard. For the remainder of the year, that is, from February 8 to October 31, 1910, publish only the gage heights at Blanco. An inspection of the record sheets show that there is a great variation in gage height during the course of a day, so it would be difficult to compare a record at Blanco, with only one observation during the day, with an automatic record at Bloomfield, even though we had a complete list of discharge measurements at the former station.

*1910 gage heights only to Bloomfield. Station transferred.

SAN JUAN RIVER AT BLOOMFIELD, N. M.

This station was established September 28, 1909. It was established because the suspension bridge at Blanco, which is just above the mouth of Canon Largo, was washed out on September 6th, 1909. It is located at suspension bridge near Bloomfield and 9 miles from Aztec, the nearest railroad point. It is 30 miles below the mouth of Los Pinos and 11 miles below Canon Largo. On February 11, 1910, a Friez Automatic Gage was substituted for the wire gage which was installed when the station was first established. The gage observer is Mr. Sam Walton.

Discharge Measurements of San Juan River at Bloomfield, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	D scharge in sec. ft.
1909					
September 28	W B. Freeman	238	300	3.9	1100
November 17	J. B. Stewart	160	135	3.22	435
1910					
February 9	W B. Freeman	239	157	3.42	441
March 26	Geo. J. Lyon	267	668	5.35	4270
May 20	G. H. Russell	264	860	5.65	5870
May 30	G. H. Russell	264	985	6.06	7190
June 22	R H. Bolster	151	330	3.8	1492
August 20	Geo. J. Lyon	180	258	3 65	642
August 24	V. L. Sullivan	159	157	3.15	344

Discharges are at Blanco station for January 1 to February 7, 1910, inclusive.

Daily Discharge, in Sec. Feet, of San Juan River at Bloomfield.

1910

Day	Jan	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	580	500	3300	.....	6110	6110	900	740	340
2	580	500	8020	.....	5300	5500	770	478	310
3	760	500	.....	2050	4150	4910	880	440	370
4	865	500	.....	1940	3460	4340	870	645	255
5	760	500	.....	1830	3630	3800	820	1830	210
6	760	480	.....	1740	3800	3800	750	900	190
7	670	480	4520	1740	3630	3460	750	790	170
8	670	440	4340	1740	3980	3140	650	515	152
9	670	441	6520	1830	4910	3060	570	370	135
10	670	.....	.....	2050	5900	29 0	520	558	135
11	760	405	.....	2290	6520	2600	470	790	122
12	760		.....	2550	6520	2610	380	515	122
13	760	.....	.....	2830	6320	2500	380	558	110
14	760	.....	5100	3460	5900	2200	370	440	135
15	670	.....	4910	2830	5300	2260	300	370	152
16	670	690	4340	2550	3800	1850	310	478	170
17	860	515	.....	2290	2550	1650	255	515	190
18	860	.....	.....	2290	2290	1550	232	478	255
19	760	.....	.....	2550	2290	1470	210	440	255
20	760	.....	.....	3140	2290	1570	210	440	310
21	670	478	6110	4150	2050	1550	190	340	310
22	670	.....	6320	4520	1830	1490	190	405	310
23	670	.....	4720	4150	1 40	1300	170	310	310
24	670	.....	.....	4520	1460	1250	210	310	310
25	670	4520		5300	1740	1170	255	310	255
26	580	.....	4270	5900	2050	1080	370	310	255
27	580	.....	.....	6110	2 90	930	310	310	255
28	580	2690	4340	6520	3140	900	310	232	232
29	500	.....	3300	7180	4520	1100	255	210	232
30	500	.....	2690	6950	6320	1180	1150	210	232
31	500	.....	.....	.....	6520	....	960	255	.....
Total	21195	13539	73400	97000	122210	73100	14887	15492	6789

Year	Month	Run-off in Acre Feet.
1910	January	42100
	February	26900*
	March	145000*
	April	192000*
	May	242000
	June	145000
	July	29500
	August	30700
	September	13400
	Total for period	866600

* NOTE.—Totals for February and March are only for 15 days as recorded. Total for April only for 28 days as shown. Records missing for other days.

SAN JOSE NEAR SUWANEE STATION, N. M.

This station was established September 6, 1910. It is located about one and one-fourth miles below railroad station at Suwanee and about one-eighth of a mile below large spring which enters from right. Suwanee is a station on the coast line of the A. T. & S. F. Railway about 50 miles west of Albuquerque. The station is below all important diversions and tributaries and about several miles above its mouth into the Rio Puerco. A Friez Automatic Gage is located on left bank. The gage observer is H. W. Ordeman.

Discharge Measurements of San Jose River Near Suwanee, N. M.

Date	Hydrogapher	Width	Area of Section	Gage Height	Discharge in sec. ft.
1910					
August 30	J. B. Stewart	52	31	2.20	99.5
August 31	do	66	48	2.80	164
September 6	do	9	1.6	.48	2.1
September 11	H. W. Ordeman	10	2.4	.5	2.4
September 18	do	12	2.5	.5	1.9
September 25	do	12	2.5	.7	3.9
October 2	do	8	1.2	.5	.81
October 9	do	8	1	.5	.50
October 16	do	8	1.1	.5	.67
November 13	do	16	4.9	.7	5.4
November 20	do	15	4.3	.7	4.8
November 27	do	10	1.8	.5	2.15

Daily Discharge, in Sec. Feet, of San Jose River Near Suwanee.

1910

Day	Sept.
1	.....
2	.....
3	.....
4	.....
5	.....
6	2.4
7	2.4
8	2.4
9	2.4
10	2.4
11	2.2
12	2.2
13	2
14	2
15	1.9
16	1.9
17	1.9
18	5
19	13
20	55
21	422
22	380
23	245
24	5.5
25	5.5
26	5
27	5
28	5
29	5
30	.....
31	.....
Total	1177.1

Year	Month	Run-off in Acre Feet.
1910	September (6-30 inclusive)	2240
	Total for month	2240

SAPELLO RIVER AT LOS ALAMOS, N. M.

This station was originally established August 22, 1903. This gage was washed out by flood on September 29, 1904, and was replaced by the present gage April, 1905. It is located about 400 feet up-stream from W. N. Frank's store at Los Alamos which is 13 miles north of Las Vegas nearest railroad point. The observer is W. M. Frank.

Discharge Measurements of Sapello River at Los Alamos.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in Sec.Ft.
1908					
October 29	R. L. Cooper	8	1.6	—.2	1.9
1909					
January 21	J. B. Stewart	9	33	—.25	1.1
July 29	W. H. Sutton	12	3.3	—.18	1.7
August —	do	22	24.6	.30	12.5
October 27	W. B. Freeman	8	2.5	—.15	1.2
November 30	G. H. Russell	12	9	—.1	1.6
1910					
February 6	G. H. Russell	9	3.1	—.08	1.6
March 7	do	10.5	4.2	—.06	2.3
April 25	J. B. Stewart	12.8	5.5	.10	7.4
June 12	do	9	2.8	—.20	1.2
August 12	do	7.5	1.6	—.10	3.1
August 30	W. W. Mills	12.4	2.9	—.10	1.6

Daily Discharge, in Sec. Feet, of Sapello River at Los Alamos.

Day	1908 Oct.	Nov.	Dec.	1909 Jan.	Feb	Mar.	April	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
1	2	2	2	1.4	7	1.3	1.1	1.2	1.3	1.1	1.5	4.3	2.1	1.7	1.6
2	2	2	2	1.4	7	1.3	1.1	1.8	1.3	1.1	1.5	4.3	2.1	1.7	1.6
3	2	2	2	1.4	7	1.3	1.1	1.8	1.3	1.1	1.5	4.2	2.1	1.7	1.6
4	2	2	2	1.5	7	1.3	1.1	1.8	1.3	.7	1.5	4.2	2.1	1.7	1.6
5	2	2	2	1.5	7	1.3	1.1	1.8	1.3	.8	1.5	39	3.4	1.7	1.6
6	2	2	2	1.5	7	1.3	1.6	1.8	1.3	.8	1.5	159	3.4	1.7	1.6
7	2	2	2	1.5	7	1.3	2.1	1.8	1.2	5.9	1.5	121	2.1	1.7	1.6
8	2	2	2	1.5	7	1.3	2.1	1.7	1.2	4.8	1.5	77	2	1.7	1.6
9	2	2	2	1.5	7	1.9	2.1	1.7	1.2	2.3	1.5	4	2	1.7	1.6
10	2	2	2	1.5	7	1.9	2.1	1.7	1.2	1.2	29	5	2	1.7	1.6
11	2	2	2	1.5	7	1.9	1.5	1.7	1.2	1.2	5.3	5	2	1.7	1.6
12	2	2	2	1.5	7	.8	2.1	1.7	1.2	.8	2	5	2	1.7	1.6
13	2	2	1.5	1.6	7	1	2.1	1.7	1.2	72	4.3	4.9	1.9	1.7	1.6
14	2	2	1.5	1.3	7	1	2.1	1.7	1.2	6.1	3.4	4.9	1.9	1.7	1.6
15	2	2	1.5	2.8	1.2	1	2.1	1.7	1.1	1.3	4.3	4.9	1.9	1.7	1.6
16	2	2	1.5	2.8	.8	1	2.1	1.5	1.1	35	4.3	3.9	119	1.6	1.6
17	2	2	1.5	2.8	.8	1	2.1	1.5	1.1	2.4	2	3.9	1.9	1.6	1.6
18	2	2	1.5	2.8	.8	1	2.1	1.5	1.1	1.2	1.5	3.8	1.8	1.6	1.6
19	2	2	1.5	2.8	.8	1	2.1	1	1.1	1.2	15	3.8	1.8	1.6	1.6
20	2	2	1.5	2.8	.3	1	2.1	1.5	1.1	.8	5.3	2.9	1.8	1.6	1.6
21	2	2	1.5	1.1	.3	1	2.1	1.4	1.1	1.3	5.3	2.3	1.8	1.6	1.1
22	2	2	1.5	1.2	.8	1	2.1	1.4	1.1	1	4.3	2.3	1.8	1.6	.6
23	2	2	1.5	1.2	1.3	1	1.3	1.4	.7	1.3	5.3	2.2	1.8	1.6	.6
24	2	2	1.5	1.2	1.3	1	1.3	1.4	.7	.9	5.3	2.2	1.7	1.6	.6
25	2.5	2	1.5	1.2	1.3	1	1.3	1.4	.7	2.6	5.3	2.2	1.2	1.6	.6
26	2.5	2	1.5	1.2	1.3	1.5	1.3	1.4	1.1	1.3	5.3	2.2	1.2	1.6	1.6
27	2.5	2	1.5	7	1.3	1.1	1.3	1.4	1.1	1.4	5.3	2.2	1.2	1.6	1.6
28	2.5	2	1.5	7	1.3	1.1	1.3	1.4	1.1	1.4	5.3	2.2	1.2	1.6	1.6
29	2.5	2	1.5	7	.....	1.1	1.3	1.3	1.1	1.4	4.3	2.2	1.7	1.6	1.6
30	2.5	2	1.5	7	.....	1.1	1.3	1.3	.7	1.5	4.3	2	1.7	1.6	1.6
31	2.5	.....	1.5	7	.....	1.1	.....	1.3	.....	1.5	4.3	.....	1.7	.....	1.6
Total	65.5	60	52.5	48.3	23.4	36.9	50.5	47.7	33.4	217.4	144.2	487.1	59.1	49.5	45.1

Daily Discharge, in Sec. Feet, of Sapello River at Los Alamos.—Con'd.

Day	1910 Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
1	1.5	1.5	1	8.2	7.4	3.8	1.2	.....	1.5
2	1.5	1.5	1	3.2	7.4	3.8	1.2	.....	1.5
3	2.4	1.5	1	3.2	7.4	3.8	1.2	.....	.6
4	2.4	1.5	1	3.2	7.4	3.8	1.2	.....	1
5	2.4	1.5	1	2.4	7.4	8.8	1.2	.....	1.5
6	2.4	1.5	3.2	2.4	7.4	2.8	1.2	.....	1.5
7	2.4	1.5	6.3	2.4	7.4	2.6	1.2	.....	.6
8	2.4	1.5	1.5	3.2	7.4	2.8	1.2	.....	.6
9	3.2	1.5	1.5	3.2	7.4	1.2	1.2	.....	.6
10	3.2	1.5	1.5	3.2	7.4	1.2	1.2	.....	.6
11	3.2	1.5	1.5	3.2	7.4	1.2	2.8	.....	.6
12	3.2	1.5	1.5	3.2	7.4	1.2	1.2	2.8	.6
13	3.2	1.5	1.5	6.3	7.4	4.9	1.2	2.8	.6
14	3.2	1.5	1.5	10.2	7.4	4.9	.....	2.8	1
15	3.2	1.5	1.5	10.2	4.9	46	.....	2.8	.6
16	2.4	1.5	1.5	14.8	4.9	2.8	.....	1.2	.6
17	1.5	1.5	1.5	10.7	4.9	1.2	.....	1.2	.6
18	1.5	1.5	1.5	10.7	6.2	1.2	.....	112	.6
19	1.5	.6	1.5	10.7	6.2	1.2	.....	8.2	1
20	1.5	1	1.5	10.7	6.2	1.2	.....	3.2	2.4
21	1.5	1	1.5	10.7	6.2	1.2	.....	3.2	1.5
22	1.5	1	1.5	10.7	4.9	1.2	.....	3.2	.6
23	1.5	1	1.5	10.7	4.9	1.2	.....	14.8	.6
24	1.5	1	1.5	10.7	4.9	1.2	.....	3.2	.6
25	1.5	1	1.5	7.4	4.9	1.2	.....	1.5	.6
26	1.5	1.0	1.5	7.4	4.9	1.2	.....	1.5	.6
27	1.5	1.0	4.8	7.4	4.9	1.2	.....	1.5	.6
28	1.5	1.0	3.2	7.4	4.9	1.2	.....	4.8	.....
29	1.5	.....	3.2	7.4	3.8	1.2	.....	1.5	.....
30	1.5	.....	3.2	7.4	3.8	1.2	.....	1.5	.....
31	1.5	.....	3.2	.....	3.8	.....	.....	1.5	.....
Total	64.9	37.1	61.8	200.5	188.8	105.6	18.8	175.2	26.8

Year	Month	Run-off in Acre Feet
1908	October	130
	November	119.9
	December	104
	Total for period	353
1909	January	96
	February	47
	March	73
	April	100
	May	95
	June	66
	July	431
	August	286
	September	964
	October	117
	November	98
	December	89
	Total for year	2460
1910	January	129
	Febraury	73.3
	March	123
	April	397
	May	374
	June	211
	July	37.4
	August	348
	September	53
	Total for period	1791.8

STEPHENS CREEK NEAR FT. BAYARD, N. M.

This station was established January 17, 1907. It is located one-fourth mile above the Ft. Bayard Planting Station of the Forest Service which is three miles north of Ft. Bayard, and 11 miles from Silver City. The gage is an nclined rod located on the left bank and is about 2 miles above the junction of this stream with Cameron Creek. The normal flow of this creek is very small but for short periods during floods the run-off is heavy. Occasional observations are taken gratis by H. Turner.

Discharge Measurements of Stephens Creek Near Ft. Bayard, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1909					
January 5	J. B. Stewart			1.3	.3
February 5	J. B. Stewart			1.32	.4
October 8	W. B. Freeman			1.25	.01
1910					
February —	J. B Stewart			1.40	.2 Est.
March 24	J B. Stewart			1.47	.3
May 8.	C. D. Miller			1.39 *	
September 15	J. B. Stewart	Stream Es	timated to	be carryin	g .1 sec. ft.

* Practically Dry.

NOTE—Records not sufficient for publication.

THE UNA DE GATO NEAR RATON, N. M.

This station was established May 3, 1910. It is located about three-quarters of a mile above the St. Louis, Rocky Mountain, & Pacific Railroad bridge and about 2 miles above A. J. Meloche's ranch. It is 18 miles eas of Raton, the nearest postoffice. A Friez Automatic Gage is located on left bank. The gage is read gratis by A. J. Meloche.

Discharge Measuments of Uña de Gato River at Meloche Ranch.

Date	Hydrographer	With	Area of Section	Gage Height	Discharge in sec. ft.
1910					
May 3	J. B. Stewart	9.4	2.2	.90	2.0
August 26	W. W. Mills	.....	1.4	.8	.3

Daily Gage Heights, in Feet, of the Uña de Gato River at Meloche Ranch, Near Raton.

1910

Day	May	June	July	Aug.	Sept.
1	.....	.85	.95	.8	.8
2	.....	.85	1.0	.8	.8
3	0.9	.85	1.0	.95	.8
4	.9	.9	1.0	.95	.8
5	.9	.85	1.0	.9	.8
6	.85	.85	1.0	.8	.8
7	.8	.85	1.0	.8	.8
8	.8	.85	1.0	.8	.8
9	.8	.85	1.0	.8	.8
10	.8	.85	1.0	1.05	.8
11	.75	.85	1.0	.95	.8
12	.75	.8	1.0	1.0	.8
13	.8	.8	1.0	.8	.8
14	.75	.8	1.0	1.10	.8
15	.7	.8	1.0	.95	.8
16	.75	.8	1.0	.9	.8
17	.7	.8	.9	.8	.8
18	.7	.8	.9	.8	1.0
19	.7	.85	.9	.8	.8
20	.7	.85	.9	.8	.75
21	.75	.85	.9	.8	.75
22	1.05	.85	.9	.8	.8
23	1.10	.9	.9	.8	.75
24	1.15	.95	.9	.85	.75
25	1.15	.95	.9	.8	.75
26	1.10	.95	.85	.8	.75
27	1.05	.95	.85	.75	.75
28	1.05	.95	.85	.8	.75
29	.95	.95	1.0	.8	.75
30	.90	.95	.8	.8	.75
31	.85	.....	.8	.8	.....
Total	.....	.....	.....	.....	.....

NOTE.—No discharge measurements above 0.90 so impossible to make a curve. On this account only gage heights published.

THE UTE CREEK NEAR LOGAN, N. M.

This station was originally established August 12, 1904, and re-established April 13, 1909. It is located about 7 miles northeast of Logan and about 4 miles above mouth of Ute Creek which is a tributary of the Canadian. The gage is an inclined rod located on left bank about 100 yards northwest of Martinez's ranch. The gage observer is Aron Martinez.

Discharge Measurements of Ute Creek Near Logan, N. M.

Date	Hydrographer	Width	Area of Section	Gage Height	Discharge in sec. ft.
1909					
April 13	J. B. Stewart	.....	.....	.50	.2
July 22	W. H. Sutton	.....	.....	.....	Dry
August 23	.....	26	16.4	1.05	27
September 8	J. B. Stewart	96.5	83	2.10	310
October 21	W. B. Freeman	41	15.2	.90	10.4
December 4	G. H. Russell	26	10.2	.80	13.4
1910					
January 31	G. H. Russell	8	1.1	.42	.23
March 15	G. H. Russell	.....	.....	.....	.1
May 7	J. B. Stewart	.....	.....	.....	.0
June 17	do	.....	.....	.52	.....
August 1	do	58	51	1.45	177
August 3	do	42.5	18.6	1.22	31.8
August 24	W. W. Mills	24.3	9.2	1.4	10.2

Daily Discharge, in Sec. Feet, of Ute Creek at Logan.

1909

Day	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	Dry	Dry	Dry	Dry	Dry	Dry	Dry	4
2	.....	.....	.....	.....	.....	.....	.....	6
3	.....	.....	.....	.....	.....	196	.....	8
4	.....	.....	.....	.....	.....	232	.....	3
5	.....	.....	.....	.....	.....	310	.....	18
6	.....	.....	.....	.....	.....	310	.....	8
7	.....	.....	.....	.....	9500	310	.....	8
8	.....	.....	.....	.....	1700	310	.....	8
9	.....	.....	.....	.....	490	232	.....	8
10	.....	.....	.....	890	196	196	.....	8
11	.....	.....	.....	110	27	10	.....	8
12	.....	.....	.....	110	33	1.1	.....	8
13	.....	.....	.....	164	17	.....	.....	8
14	.....	.....	.....	6.2	4.5	.....	.....	8
15	.....	.....	.....	Dry	33	.....	.....	8
16	.....	420	.....	33	88	210	.....	8
17	.....	360	.....	78	58	132	.....	8
18	.....	164	.....	1120	21	19	.....	5
19	.....	1.1	.....	310	17	11	.....	5
20	.....	Dry	.....	164	1.1	10	.....	2
21	.....	.....	.....	150	Dry	1	.....	2
22	6.2	.....	.....	41	.....	Dry	.....	2
23	1.1	.....	.....	33	.....	.....	.....	2
24	Dry	.....	.....	78	.....	.....	.....	2
25	67.	8	.....	8	.....	.....	.....	2
26	6.2	190	.....	1.1	.....	.....	.....	2
27	Dry	1160	.....	Dry	.....	.....	.....	1
28	.....	67	.....	.....	.....	.....	.....	1
29	.....	196	.....	.....	.....	.....	.....	1
30	.....	232	.....	.....	.....	.....	2.0	1
31	.....	560	.....	.....	.....	.....	.....	1
Total	80.5	3458.1	.....	3460.3	12252.6	2201.1	2.0	171

Daily Discharge, in Sec. Feet, of Ute Creek at Logan.—Con'd.

1910

Day	Jan.	Feb.	Mar	April	May	June	July	Aug.	Sept.
1	.....	0.2	0.1	Dry	Dry	Dry	21	560	.....
2	3	0.2	0.1	.....	.....	.....	13	1210	.....
3	3	0.2	0.1	.....	.....	.....	136	640	6
4	2	0.2	0.1	.....	.....	.....	58	2130	.....
5	1590	0.2	0.1	.....	.....	.....	88	100	.....
6	1110	0.1	0.1	.....	.....	.....	310	24	.....
7	360	0.1	0.1	.....	.....	.....	136	24	.....
8	8	0.1	0.1	.....	.....	.....	136	13	.....
9	4	0.1	0.1	.....	.....	.....	640	6	.....
10	4	0.1	0.1	.....	.....	.....	6250	2710	.....
11	4	0.1	0.1	.....	.....	.....	4650	120	.....
12	4	0.1	0.1	.....	.....	.....	3700	980	.....
13	4	0.1	0.1	.....	.....	.....	2800	22	.....
14	4	0.2	0.1	.....	.....	.....	2050	42	.....
15	4	0 2	0.1	.....	.....	.....	2130	42	.....
16	4	0.2	0.1	.....	.....	.....	1400	4	.....
17	0.2	0.2	0.1	.....	.....	.....	88	200	.....
18	0.2	0.2	0.1	.....	.....	.....	67	3530	.....
19	0.2	0.2	0.1	.....	.....	.....	58	720	.....
20	0.2	0.2	0.1	.....	.....	.....	49	84	.....
21	0.2	0 1	0.1	.....	.....	.....	49	6	.....
22	0.2	0.1	0.1	.....	.....	.....	13	9	.....
23	0.2	0.1	0.1	.....	.....	.....	8	2	.....
24	0.2	0.1	0.1	.....	.....	.....	0.2	8	.....
25	0.2	0.1	0.1	.....	.....	.....	.....	4	.....
26	0.2	0.1	0.1	.....	.....	.....	.....	2	.....
27	0.2	0.1	0.1	.....	.....	88	.....	.....	.....
28	0.2	0.1	0.1	.....	.....	33	.....	.....	.....
29	0.2	.....	0.1	.....	.....	27	.....	.....	.....
30	0.2	.....	0.1	.....	.....	21	21	.....	.....
31	0.2	.....	0.1	.....	.....	21	1650	.....	.....
Total	3107.2	4.0	3.1	Dry	Dry	190	26621.2	3192	6

Year	Month	Run-off in Acre Feet.
1909	May	160
	June	6840
	July	.....
	August	6890
	September	24.300
	October	4370
	November	4
	December	338
	Total for year	42902
1910	January	6190
	February	7.8
	March	6.2
	April	.....
	May	.....
	June	377
	July	52600
	August	6350
	September	11.9
	Total for period	65,522,9

MISCELLANEOUS DISCHARGE MEASUREMENTS.

Date.	Stream	Location.	Discharge in second feet.	Hydrographer.
Oct. 15, 1910..	Arroyo Seco...	Arroyo Seco Town.....	1	J. B. Stewart
Sept. 19, 1910..	Buckhorn	Near Cliff.....	.25	J. B. Stewart
Aag. 17, 1910..	Rio Bonita.....	Fort Stanton.....	.25	W. B. Freeman
Mar. 13, 1910..	Rita Agua Negra Chiquita.....	Santa Rosa.....	29	G. H. Russell
Aug. 14, 1910..	Agua Chiquita	Near Elk.....	00.0	W. B. Freeman
Sept. 13, 1910..	Cabresto.....	Questa	6.2	C D Miller
April 9, 1910..	Costillo.....	Near Eastdale.....	32	W. B. Freeman
Oct. 27, 1909..	Cebolla Creek..	Road crossing between Los Alamos and La Cueva.....	3	W. B. Freeman
April 23, 1910..	Dalton Creek...	Dalton Ranch.....	10.7	J. B. Stewart
June 9, 1910..	Dalton Creek...	Mouth below Cowles.....	Dry	J B. Stewart
Sept. 19, 1910..	Little Dry Creek	Near Clenwood	Dry	J. B. Stewart
Sept. 19, 1910..	Dry Creek.....	Near Clenwood	Dry	J B Stewart
April 19. 1909..	Duck	Cliff.....	3.	J. B. Stewart
Aug. 15, 1910..	Elk Canon.....	Elk.....	.5	W. B. Freeman
Jan 23, 1006..	Farmera Del. Inlake Canal	Miami	3.4	J. B. Stewart
May 23, 1909..	Farmers Del Inlake Canal	Miami	5.6	J. B. Stewart
Aug. 15, 1910..	Felix	Near Elk.....	00	W. B. Freeman
Aug. 13, 1910..	Fresnal.....	Near La Luz.....	6	W. B. Freeman
Nov. 18, 1909..	Fresnal.....	7 Mi. N. R. of Alamogordo..	5.78	C D. Miller
April 24, 1909..	Gila.....	7 Mi. above Cliff	260.00	J. B. Stewart
April 23, 1919.	Holy Ghost Crk	Near Cowles	15	J B. Stewart
June 9, 1910..	Holy Ghost Crk.	At mouth near Cowles.....	85	J. B Stewart
April 23, 1919.	Indian Creek....	Between Pecos & Cowles..	2.8	J. B. Stewart
June 9, 1910..	Indian Creek ...	Mouth below Cowles.....	.55	J. B. Stewart
Aug. 14, 1910..	James Cañon. .	Mayhill..	25	W. B. Freeman
Sept. 13, 1910..	Latir	Cerro	4.8	C. D. Miller
Aug. 15, 1910..	Lincoln Canon..	Sec. 32, T. 13 S. R. 17 W.....	.25	W. B. Freeman
Mar. 12, 1919..	Rio Lucero.....	Taos	11.4	S. S. Carroll
Nov. 18, 1909..	La Luz 100 feet above Junction with Fresnal...	7 Mi. N. E. of Alamogordo..	12.328	C. D. Miller
Nov. 18, 1909..	La Luz 100 feet below Junction with Fresnal...	7 Mi. N. E. of Alamogordo..	12.689	C. D. Miller
Nov. 18, 1909..	La Luz at Junc.	7 Mi. N. E. of Alamogordo..	5 5	C. D. Miller
Mar. 12, 1910 .	Lucero	Taos	11.4	S. S. Carroll
Nov. 18, 1909..	La Luz 109 feet above Junction with Fresna ...	7 Mi. N. E. of Alamogordo..	4.6	C. D. Miller
April 23, 1910..	El Macho.....	El Micho between Pecos & Cowles	9.7	J. B Stewart
June 9, 1910..	El Macho.....	Mouth below Cowles.....	00.	J. B. Stewart
April 8, 1909..	Manuelitos.....	Manuelitos.....	8.4	J. B. Stewart
April 25, 1909 .	Mogollon.....	Cliff	48.0	J. B. Stewart
Oct. 28, 1908..	Manuelitos.....	Wagon road Sapello to Mora	3.8	Robt. L Cooper
Sept. 5, 1965..	Penasco.....	Laramore Ranch.....	121.0	Will Benson
Sept. 2, 1909..	Penasco.....	Laramora Ranch.....	68	V. L Sullivan
Sept. 7, 1905.	Pena co.....	G O Crossing.....	79	Will Benson
Mar. 26, 1910..	Upper Penasco.	Falls 1 Mi. below Cox Cañon	14.8	Will Benson
Mar. 23, 1910..	Penasco.....	Laramore Ranch.....	37.	Will Benson
Sept. 8, 1905..	Penasco.....	Hope Com. Ditch	70.	Will Benson
Mar. 23, 1910..	Penasco.....	Cieves Orchard.....	32.1	Will Benson
Mar. 22, 1910..	Penasco.....	G. O. Crossing.....	29.7	Will Benson
Mar. 22, 1910..	Penasco.....	Head Hope Ditch.....	22.1	Will Benson
Nov. 5, 1909	Penasoo.....	Head Hope Ditch.....	58.	V. L Sullivan
Aug. 14, 1910..	Penasco.....	Hayhill.....	53.8	W. B Freeman
Mar. 23, 1910..	Penasco.....	Laramore Ranch.....	37	Will Benson
Nov. 3, 1905..	Penasco.....	Laramore Ranch.....	68	V. L Sullivan
Mar. 26, 1910..	Upper Penasco.	Fall 1 Mi. below Cox Cañon.	15.2	Will Benson
Nar. 26, 1910..	Upper Penasco.	Fall 1 Mi. below Cax Cañon.	14.8	Will Benson
Mar. 22, 1910..	Penasco.....	G. O. Crossiag.....	31.4	Will Benson

MISCELLANEOUS DISCHARGE MEASUREMENTS *Con'd*

Date.	Stream.	Location.	Discharge in second feet.	Hydrographer.
Mar. 23, 1910..	Penasco.....	Cleves Orchard.....	32.3	Will Benson
Mar. 22, 1910..	Penasco.....	Head Hope Ditch.....	22.7	Will Benson
Feb. 3, 1910..	Pecos	8 Mi. below Santa Rosa just below mouth of Cañon Pintados.....	95	Russell and Stewart
Feb. 3, 1910	Pecos	Just below mouth of Pintado	95	J. B. Stewart & G. H. Russell
Feb. 3, 1910..	Pecos	Near Santa Rosa.....	6.7	G. H. Russell & J. B. Stewart
Aug. 18,..... 19, 20, 1910..	Pintado Canon..	Pintado	00	W. B. Freeman
May 12, 1910..	Pueblo de Taos	Pueblo de Taos.....	27.7	S. S. Carroll
Sept. 13, 1910..	Bed.....	Questa.....	20.6	C. D. Miller
Jan. 23, 1909..	Rayado.....	Springer.....	.12	J. B. Stewart
April 8, 1909..	Rayado.....	Springer.....	.5	J. B Stewart
May 25, 1909..	Rayado.....	Springer.....	.4	J. B Stewart
Aug. 16, 1910.	Salado	Capitan	00	W. B Freeman
Feb. 7, 1910.	Vallecitos	Vallecitos Res. Dam. Site...	12.2	Robt. L Cooper
Feb. 6, 1910..	Vallecitos	Near Tusas Jemez Forest..	12.2	Robt. L. Cooper
Mar. 11, 1910..	Weitewater	Glenwood.....	3.2	J. B. Stewart
Mar. 27, 1910..	Whitewater	Whitewater.....	9.6	G. W. Tower & J. B. Stewart
April 21, 1909..	Whitewater	Glenwood.....	84.	J. B. Stewart
May. 6, 1910..	Whitewater	Glenwood.....	7.2	C. D. Miller
May 6, 1910..	Whitewater	Glenwood.....	7.6	C. D Miller
Feb. 7, 1909..	Whitewater	Glenwood.....	8.3	J. B. Stewart
May 8, 1910..	Whitewater	Glenwood.....	7.2	C. D. Miller
Sept, 15, 1910..	Whitewater	Near Mogollon	2.7	J. B. Stewart
June 9, 1910..	Willow Creek ..	At Cowles.....	25	J. B. Stewart

IMPORTANT NOTE.

Parties interested in the water records given herewith should take into consideration the extremely low average precipitation for New Mexico during the period in which these records were collected. The run-off of all the streams was therefore below normal, especially in flood times, however, a few very large floods occurred in the middle western section of the Territory, the most notable being those at Bluewater and Zuñi.

INDEX TO REPORT