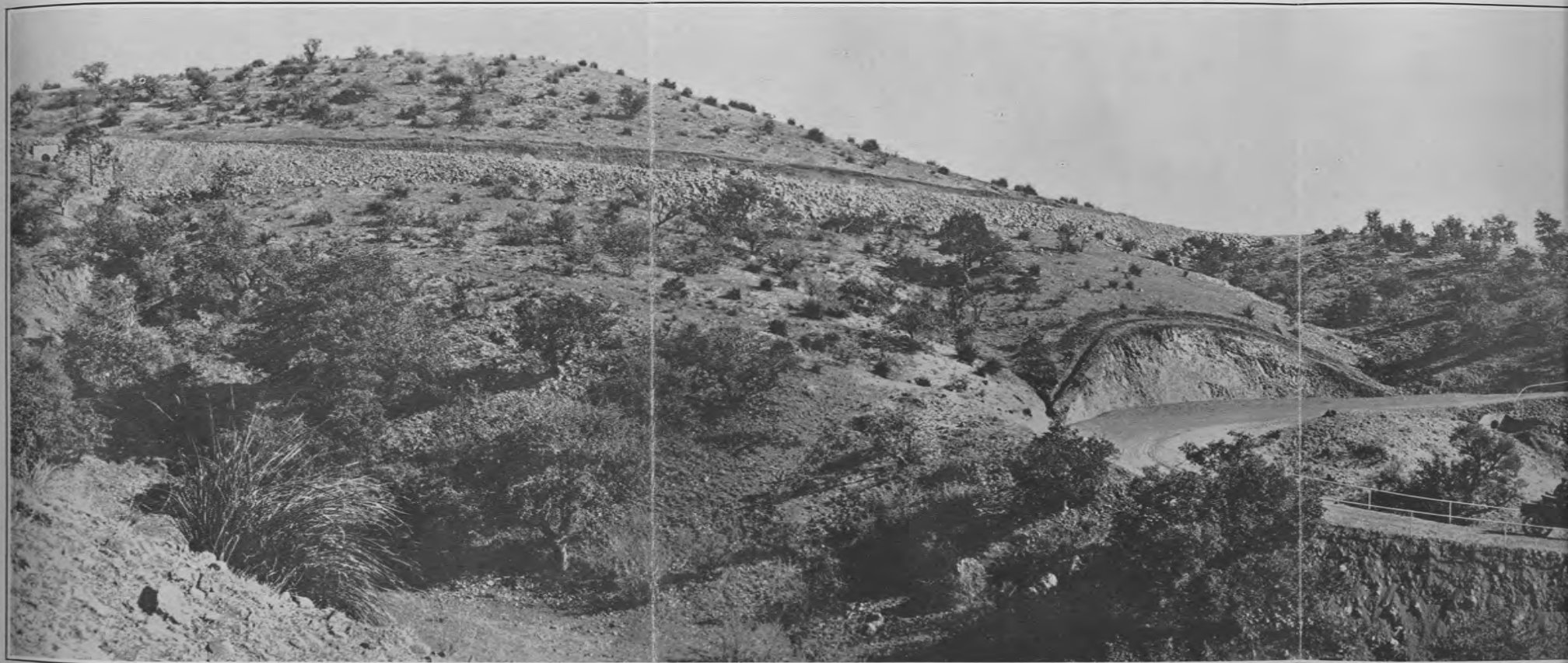


SECOND REPORT
OF THE
STATE ENGINEER
OF
NEW MEXICO

COVERING THE PERIOD FROM
DECEMBER 1, 1914 TO
NOVEMBER 30, 1916

JAMES A. FRENCH
STATE ENGINEER



GRANT COUNTY.

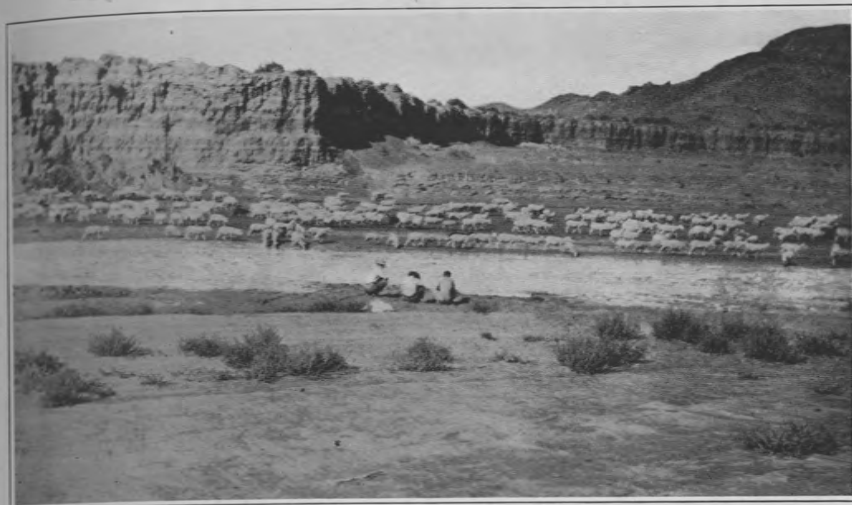
State Road No. 42. Sec. 1. Grade from Continental Divide into Tyrone on the Silver City Road



GRANT COUNTY.

Sec. 1. Grade from Continental Divide into Tyrone on the Silver City Road.

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VALENCIA COUNTY.
State Road No. 6. Sec. 2. Ford over Rio Puerco before construction of bridge at
Rio Puerco.



VALENCIA COUNTY.
State Road No. 6. Sec. 2. Rio Puerco bridge.

LETTER WITH 1914-1916 REPORT.

December 30, 1916.

*Hon. William C. McDonald, Governor,
Santa Fe, New Mexico.*

DEAR SIR:

In giving you the report of the work of the State Engineer's office for the 1915-1916 fiscal years, I wish to advise that on account of the large amount of construction work in progress and in consequence thereof the excessive amount of office work, together with the immense amount of detail work in preparing a complete financial statement of the funds involved in the statements herewith, the recapitulation statements are delayed a little, but will be handed to you in a few days.

Very truly yours,

JAMES A. FRENCH,
State Engineer.

Letter of Transmittal.

Santa Fe, New Mexico, Dec. 1, 1916.

*To the Hon. William C. McDonald,
Governor of the State of New Mexico,
Santa Fe, New Mexico.*

SIR:

I beg to submit herewith my official report, covering the work done by my department under my direction and by authority of the several laws prescribing the duties and powers of the State Engineer for the period from December 1, 1914, to November 30, 1916.

The attached report is not carried out in detail as planned for publication, but is a complete summary of the work accomplished and recommendations I believe necessary to expedite the work in hand.

Very truly yours,

JAMES A. FRENCH,
State Engineer.



VALENCIA COUNTY.
State Road truck being loaded at gravel pit on Road 1. Sec. 1.



VALENCIA COUNTY.
State Road truck spreading gravel on Road 1. Sec. 1.

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Introduction.

The report is divided into two parts, one relating to the work of the State Highway Commission, the other covering the work of the State Engineer, as provided by law, relating to Irrigation, Hydrographic Surveys, Stream Gaging, Rio Grande Protection and Well Digging on State Lands.

PART I.

STATE HIGHWAY COMMISSION



CHAVES COUNTY.

State Road No. 18. Sec. 1. Type of road frequently constructed through deep sand where a hard-pan base occurs.



CURRY COUNTY.

State Road No. 19. Sec. 3. Lime-clay surfacing through sand; east of Melrose.

State Highway Commission.

ORGANIZATION.

State Highway Commission.

The State Highway Commission consists of the Governor of the State, William C. McDonald, Chairman; the State Land Commissioner, Robert P. Ervien, Secretary, and the State Engineer, James A. French, Engineer of the Commission. They serve without additional compensation except their actual and necessary traveling expenses while engaged upon their work as members of the Highway Commission. Meetings of the Commission are prescribed by law on the first Wednesday of January, March, June and September, and special meetings were held whenever in the opinion of the Commission they were necessary.

Intent of Law.

The intent of the law in New Mexico is, while leaving the actual expenditure of the county road funds under a lower board, to, at the same time, provide for a degree of co-operation between said boards and the State Highway Commission. Therefore, the law creates two distinct sets of officials, those of the State Highway Department who are State officials, who have charge of all expenditures of State funds, and county officials (appointed by the Highway Commission), who expend the county road funds under general rules and regulations furnished by the State Commission.

State Engineer—Duties Under the Commission.

The State Engineer is the engineer of the State Highway Commission, and is subject to the orders of the Commission. The salary of the State Engineer is paid out of the general appropriation fund and the actual and necessary traveling expenses connected with the work, out of the general road fund and in part from the highway bond fund. He has supervision of the construction, maintenance and repair of all highways and bridges whereon State funds are expended either wholly or in part, and also supervision of all county bridges built by contract where the amount thereof exceeds the sum of \$1,000, and no county bridge which exceeds in cost the sum of \$1,000 may be constructed until he shall have approved the site for such bridge, the contract and specifications therefor.

Assistant Highway Engineer.

Mr. J. W. Johnson has been, during the period covered by this report, assistant in charge of highways and bridges. The work has been more or less co-operative and divided between the State Engineer and Mr. Johnson. Mr. Johnson has given more attention to general detail and design, while the State Engineer has carried out the general policy of administration and supervision.

Divisions of the Office.

Besides the construction division, of which the Assistant Engineer is in charge, there are three other divisions at Santa Fe, namely, the Bridge Division, the Clerical Division, and the Disbursing Division.

Bridge Division.

Under the Bridge Division there is employed a bridge engineer, Mr. H. K. Morgans (resigned), and Mr. Frank Hermann, appointed to fill the vacancy. He is responsible for the detail work under the direction of the Assistant Highway Engineer.

Clerical Division.

At the head of the Clerical Division is the Chief Clerk, Mr. C. F. Kanen. He is assisted by one clerk and assistant. At frequent intervals additional clerks have been engaged to assist when the work of this division was heavy.

Disbursing Division.

All payments are made by the Disbursing Division, which is in charge of Mr. C. M. Wells, Disbursing Clerk. The Disbursing Clerk is under bond and all disbursements must be approved by the State Engineer.

Salary Apportionment.

The salaries of the above clerks are paid not entirely from the road funds, but have been proportioned according to their estimated time given on other work not connected with the State Highway Commission, part of their pay coming from the Stream Gaging, Rio Grande Protection and other funds available.

Records and Accounting.

The system followed in accounting and disbursing is what is known as the complete voucher system. Double-entry books are kept. All bills,

personal expense and payrolls presented for payment to the office are endorsed for correctness by the party purchasing and received by the bookkeeper, and then are checked by the requisition, order or contract as to authority for purchase substantiating same.

The voucher is then made, showing an itemized statement as to units and prices of the article or work performed, and is certified to by the claimant and purchaser. The voucher is then certified by one of the assistant engineers in charge of that particular district or department and passed to the State Engineer for his approval. If all endorsements are found sufficient, the voucher is sent to the Disbursing Clerk for payment by warrant.

Neither the bookkeeper nor the disbursing clerk have authority one over the other, each office being separate from the other and each reporting independently to the State Engineer. The State Engineer is under bond for the faithful performance of his duties, and the disbursing clerk is under sufficient bond to the State Engineer, the amount of each bond being \$10,000 in surety companies.

Two sets of books are kept, one covering the general road fund, the other the highway bond issue.

In connection with purchases for operation and the execution of authorized work by the employees of the office, engineers and foremen are required to file carbon copies of the purchase order with the bookkeeper, the claimant sending in the original purchase order with this bill, and the employe retaining a third copy for his record. This system gives a check on all purchases. Authority is granted to the engineers and foremen for the smaller and emergency purchases in the field, and for camp maintenance, and special request is made for larger purchases in the way of equipment through the Santa Fe office. The larger purchases are made under competitive bids and a great saving has been made in prices obtained by this method.

Personal and traveling expenses are allowed employees when traveling on official business away from designated headquarters. When men are in camp and a mess is maintained they have their board. Generally all camps maintain a mess and all laborers are charged board, except by agreement with the State Engineer. When men are stationed at a certain place for certain periods it becomes their headquarters and no subsistence is allowed unless specially arranged for by agreement by the State Engineer. Definite rules and regulations are made in regard to expenses of this kind and only those expenses are allowed that are under the regulations. In travel expenses, receipts are taken for all hotel bills, and itemized statements, showing the place, date, rate and amount

demand. Personal funds in cash are not allowed to be paid for wages (except emergency cases), as all expenditures are paid by the disbursing clerk, with the exception of small amounts necessitated while traveling. Payrolls must show complete details as to location, names, duties, rate, time and deductions. They are signed by the foremen and time-keepers and remain with the disbursing clerk as the original receipts for warrants, a carbon copy going to the bookkeeper for his accounting. Purchase vouchers must show a complete record of the transaction. Expenditures are classified to show, namely: Engineering, Superintendence, Labor, Supplies, Material and Equipment.

Property Inventory.

Road engineers and foremen are required to make a quarterly inventory report on non-expendable property classed as work equipment, and a similar report of camp equipage. A monthly report of food, feed and supplies on hand at the end of each month, and the amount received during the month, is required.

The accumulation of property throughout the State is large and the accounting for it is carefully watched. In cases when camps have abandoned work temporarily, the property is stored in some near convenient quarters and the inventory filed with the records at the Santa Fe office. Where equipment is available after conclusion of a job and it is known where it may be used again shortly, it is shipped to that destination and put in use or stored, as circumstances require. In cases where doubt exists as to future use, it is returned to the warehouse at Santa Fe and held in reserve for other work.

The construction of a warehouse on leased property of the Santa Fe Railway at Santa Fe for the assembling of equipage and storage of large purchases not immediately demanded has been found very satisfactory in use and a saving to the State. Insurance is carried on the building and property stored there.

There is no provision by law for the disposal of old and worn-out property. Upon the advice of the Attorney General, a board is appointed by the State Engineer to condemn and sell such property, the funds being returned to the fund from which the purchase was made. Only in exceptional cases, where inconvenient to follow out the advice of the Attorney General, has property been disposed of otherwise.

Disbursing Officer's Duties.

All disbursements of funds handled by the office are made by checks drawn by the disbursing clerk against properly executed and approved



VALENCIA COUNTY.

Old road, looking east toward under-head crossing between Bluewater and Baca.



VALENCIA COUNTY.

State Road No. 6. Old road, looking west from under-head crossing between Bluewater and Baca.

vouchers drawn by the bookkeeping department. Inventory of all State property and equipment is accounted for and all transfers of property from the various camps is kept track of in this department. The following is a list of record forms and a brief description of the use of each is submitted:

List of Record Forms.

Cost numbers. To be used by foremen and timekeeper in account number column on form 14-15.

Foreman's Time Sheet. Form 14-15. This sheet is sent in by foremen or engineers and is retained in the office file as the original by the disbursing clerk. These time sheets are sent in twice a month. The column "D. C. No." is used to show number of discharge checks issued, form 9-14.

Form 9-14. Discharge check, original (white) and duplicate (yellow). This form is used by the foremen in discharging men only, so that they can get their pay immediately. Foremen are allowed to use these checks only for the above purpose. They are marked "non-transferable," to prevent laborers cashing them back and forth among themselves and to avoid confusion in identity. Generally the engineer or foreman arranges with the nearest bank or convenient store to cash them, and send the original to this office for a warrant. The duplicate is then sent to this office by the foremen and after comparison the warrant issued.

Form 13 3-8—16. Payroll voucher and duplicate. Upon receipt of form 14-15, the time sheet, a copy is made upon this form with carbon on 4-A. The time sheet is attached to 4-A and then approved and given to the disbursing clerk to write the pay checks. 4-A is retained by the chief clerk for the files. Distribution of the accounts is made upon the forms where indicated.

Known as Order Book. Form 25-13, and is issued to foremen and engineers for purchases that are needed for camp supplies, repairs, etc. The white is given to the dealer and the dealer transmits it with his invoice. The yellow (carbon) is forwarded by the foreman or engineer to this office and the blue (carbon) is retained by the foreman or engineer. Purchases for equipment are made by the office and are not permitted by the foreman.

Form 20-12. Invoices reaching the office frequently from the smaller stores are on the stores' own bill heads. These are copied on voucher form 18-16 and transmitted to the dealer with form 20-12. The larger commercial houses, where considerable merchandise is purchased, are furnished with these forms 18-16 and they fill them out, typewritten.

Memorandum of check transmitted with voucher form 18-16.

Forms 18-16 and 18-14. Vouchers for purchases and their duplicates (pink). No. 8 is short form. No. 9 is the long form for carrying forward. The original remains with the disbursing clerk, the duplicate with the chief clerk.

No. 10 is form 6-12 and used for travel expenses as allowed under instructions upon the back. No. 10-A is form 5-12, a sub-voucher for receipts for personal expenses as required by regulation on back of the main voucher.

Form 3-12. Used for purchase of equipment, lumber, cement, machinery, etc., bought direct from this office.

Form 51-14. Used for inventories of camp equipment and reported quarterly.

Form 50-14. Used for inventories of road equipment and reported quarterly.

Form 52-14. Mess inventories giving the amount of all foods on hand, etc., used, and reported monthly.

Road voucher. Used only by the State Highway Commission in drawing warrants upon the State Treasurer to be deposited in bank in Santa Fe.

Form 300-12-15. Quit-claim deed for right-of-way purchases.

Form upon which the County Road Boards report their disbursements to this office monthly.

Report in duplicate for foremen to show charge and total labor cost of work for each half month.

Chauffeur's daily report as to work done by and cost of operating five-ton truck.

Monthly report of work completed, made by foreman in charge of work.

Yearly statement by months of statement shown on No. 19. For each road separately.

Records of vouchers sent to disbursing clerk for payment. This is auxiliary only, for checking bills paid. Used to record vouchers alphabetically.

A voucher *number* record to keep a consecutive list of voucher numbers (auxiliary record).

A journal voucher used for transfer entries for mess supplies, camp and road equipment from one job to another, besides for general journal entries.

Road ledger form. The "Dr. Bal." column is used for extension of debits for "Total Cost" of job.

Classification sheet for road work or a distribution of the expenditures on a road job. Can be carried in same book opposite the ledger sheet or in a separate binder.

Numerical Designation of Highways.

In order to systematize the great mileage of roads throughout the State for the purpose of accounting, a method of numbering the highways became imperative. The system is outlined, in part, as follows:

Road No. 1, the main State highway, practically follows the route of the Camino Real. Road No. 2 is the road from Santa Fe to Roswell, and so on throughout the State. As each road passes through a county, it is known as a division. A further subdivision is made within the county lines. Each approximate distance of ten or more miles is designated as a section. So that Road No. 1, Sandoval Division, Section 1, would be definitely the first ten miles in Sandoval County. Road No. 2, Torrance Division, Section 3, would be that portion between the twenty and thirty-mile points of that road in that county. Further divisions are made by miles and feet for engineering purposes. Each road, division and section is accounted for in the cost, distribution and accounting, each piece of road having its credits, debits and depreciation charges worked out. The map of the State Highway system gives the road numbers as adopted for the system. In some of the counties a system of numbering has been adopted by the respective road boards, though not generally, and some of the boards use names of roads for designation purposes.

Cost of Administration.

The following table shows the percentage of the total amount spent on roads and bridges for administrative and travel expense during the period December 1, 1915, to December 1, 1916:

Month	Year	Travel Expense	Office Expense	Office Engineering	Total
December,	1915.....	.01991	.02311	.02093	.06395
January,	1916.....	.00967	.01664	.01834	.04465
February,	1916.....	.0216	.0265	.0221	.0702
March,	1916.....	.0102	.0128	.0124	.0354
April,	1916.....	.018	.0225	.0175	.0580
May,	1916.....	.0086	.014	.0094	.0320
June,	1916.....	.018	.014	.0074	.0394
July,	1916.....	.011	.0215	.0151	.0476
August,	1916.....	.00516	.01143	.00785	.02444
September,	1916.....	.01209	.0071	.00115	.02034
October,	1916.....	.00655	.00339	.00064	.01058
November,	1916.....	.00518	.00583	.00139	.01240
Average per cent for 12 months.....		.012163	.01490	.011183	.038246

DISTRICT ENGINEERS.

The State has been divided into districts, each district having its engineer and so arranged geographically for travel convenient to visit the various construction camps.

In dividing the State into districts with a resident or district engineer, there has been considerable saving in time and travel of these engineers to and from the various road camps. During the two years the boundaries of these districts have been changed at times to suit the working conditions. An engineer is sent from the office as occasion warrants. The districts given below is the arrangement at this date:

Bernalillo, McKinley, Valencia and Socorro—J. S. Harvey, at Los Lunas.

Dona Ana, Otero—Earl Patterson, at Las Cruces.

Grant, Luna, Sierra—C. B. Sampson at Silver City.

Quay and north half of Guadalupe—W. H. Fisher, at Tucumcari.

Santa Fe, Taos, Rio Arriba, Sandoval, west half of San Miguel and west half of Mora—J. H. Walker, at Santa Fe.

San Juan, Colfax, Union, east half of San Miguel and east half of Mora—J. R. Farwell, at Raton.

Lincoln, Chaves, Eddy, Roosevelt, Curry, south half of Guadalupe—W. C. Davidson, at Roswell.

SUMMARY OF ROADS AND BRIDGES CONSTRUCTED

Roads—1915.

During the year December 1, 1914, to December 1, 1915, there were constructed 174.8 miles of road. The mileage and classification built under the direction of this office from the State fund, bond fund and special fund is given in the table below, showing the county, road number, and with number of miles constructed in county and the classification:

Mileage and Classification of roads built by State Engineer during the year December 1st, 1914, to December 1st, 1915.

Class A indicates graded roads with surface and culverts.

Class B same as Class A but not surfaced.

Class D machine graded surfaced roads.

County	Road No.	Miles	Class
Bernalillo	Road No. 1	9	A
Chaves	Road No. 31	5.5	A
Colfax	Road No. 1 Sec. 1	1	A
Curry	Road No. 18 Sec. 3	2.5	B
Dona Ana	Road No. 3 Sec. 2	2	A
Mora	Road No. 30 Sec. 3	4	B



CHAVES COUNTY.

State Road No. 13. Sec. 1. Graded earth road, hard surfaced from material within right-of-way, about twenty miles west of Roswell.



CHAVES COUNTY.

Acme bridge across the Rio Pecos on State Road No. 18. Sec. 2.

County	Road No.		Miles	Class
Mora	Road No. 30	Sec. 1 and 2	2	A
Otero	Road No. 3	Sec. 1	23	D
Otero	Road No. 24	Sec. 4	2.3	A
Roosevelt	Road No. 18	Sec. 2 and 3	20	B
Sandoval	Road No. 1		8	D
Sandoval	Road No. 1		1	A
San Miguel	Road No. 1		3.5	A
Santa Fe	Road No. 8		2	A
Santa Fe	Road No. 1		1	A
Santa Fe	Road No. 10		1	B
Sierra	Road No. 1		7	A
Sierra	Road No. 1		9	D
Socorro	Road No. 1		5	A
Socorro	Road No. 5		1	B
Socorro	Road No. 9	Sec. 2	5	A
Taos	Road No. 3		3	A
Torrance	Road No. 2		25	D
Valencia	Road No. 1		1	A
Valencia	Road No. 1		21	B
Valencia	Road No. 6		1	A
Valencia	Road No. 6		9	D
			174.8	

SUMMARY OF MILEAGE BY CLASSIFICATION FOR 1915.

Class A	51.3
Class B	49.5
Class D	74.0
Total	174.8

Bridges—1915.

During the year December 1, 1914, to December 1, 1915, there were constructed fifteen wooden bridges by the office, from State funds, in the following counties, along State highways:

8 in San Juan County.
 2 in Santa Fe County.
 3 in San Miguel County.
 1 in Rio Arriba County.
 1 in Valencia County

In addition this office has pursued the policy of assisting the counties in the construction of the large bridges across the perennial streams, both by designing, supervising, construction and in contributions. During the year 1915 assistance was rendered as given in the following table:

1915—Miscellaneous Bridge Payments.

Divisions	Highway Bond	General Roads	County Fund	Totals
Colfax Division—				
Raton Bridge	\$ 6.50	\$ 117.87	\$	\$ 124.37
French Bridge		42.97	.....	42.97
Chaves Division—				
Hagerman Bridge		75.85	.....	75.85
Felix Bridge	.40	.....	.....	.40
Dona Ana Division—				
County Bridges	102.62	53.38	.....	156.00
Eddy Division—				
Artesia Bridge	1,422.11	344.89	.....	1,767.00
Hope Bridge	.75	.....	.....	.75
Grant Division—				
Fort West Bridge		482.94	.....	482.94
Guadalupe Division—				
Puerto de Luna Bridge.....		296.18	.....	296.18
Fort Sumner Bridge		674.35	.....	674.35
Anton Chico Bridge		4,200.55	.....	4,200.55
Lincoln Division—				
Carrizozo Bridge		84.90	.....	84.90
Mora Division—				
Watrous Bridge		5,778.84	.....	5,778.84
Cebolla Bridge.....		331.11	2,989.16	3,320.27
Sapello Bridge		.90	.....	.90
Quay Division—				
Revuelto Bridge		936.61	.....	936.61
County Bridges	79.32	200.02	.....	279.34
Rio Arriba Division—				
Embudo Bridge	301.82	268.15	.....	569.97
Socorro Division—				
Sun Marcial Bridge	273.31	250.71	.....	524.02
San Miguel Division—				
San Jose Bridge.....		1,164.87	.....	1,164.87
Tecolote Bridge		1,357.77	.....	1,357.77
Pino Solo Bridge		434.42	.....	434.42
Santa Fe Division—				
Galisteo Bridge Protection..		624.56	48.33	672.89
Tesuque Bridge		848.58	2,000.00	2,848.58
Santa Fe Creek Bridge,				
First Crossing	407.43	1,005.60	.....	1,413.03
Santa Fe Creek Bridge,				
Second Crossing	.47	.....	.....	.47
Atoscosa Bridge .....		.....	3,241.67	3,241.67
Agua Fria St. Bridge .....		.....	18.70	18.70
Sierra Division—				
Co. Bridge Arrey		529.21	.....	529.21
Valencia Division—				
Rio Puerco Bridge	678.86	3,467.30	.....	4,146.16
Laguna Bridge	1,946.02	348.91	.....	2,294.93
	\$5,219.61	\$23,921.44	\$8,297.86	\$37,438.91

EXPENDITURES DECEMBER 1st, 1914, TO DECEMBER 1st, 1915.

The following amounts were expended by the State Engineer on roads and bridges:

General Road Fund	\$106,421.54
State Bond Fund	51,749.73
County Special Fund	28,028.32
County Donations	25,057.03
Total	\$211,256.62

Roads—1916.

During the year December 1, 1915, to December 1, 1916, there were constructed 314.54 miles of roads. The mileage and classification built under the direction of this office from State fund, bond fund and special fund is given in the table below, showing the county, road number, section number, miles graded, miles surfaced, number of corrugated culverts, number of wooden culverts, number of wooden bridges and number of concrete arroyo crossings. The classification is arranged differently from 1915, in that it gives the number of miles of graded road and in the surface column gives the miles of that road surfaced.

MILEAGE AND CLASSIFICATION OF ROADS BUILT IN 1916.

Division	Rd. No.	Sec. No.	Miles Graded	Miles Surf.	No. Culv. Corrugated	No. Culv. 2-12"	No. Culv. Wooden	No. Bridges Wooden	Con. Arroyo Crossings
Bernalillo	1	2	1.00	1.00					
Bernalillo	10	1 and 2	1.78	1.00	13		2		
Bernalillo	46	1	2.11	1.72	12				
Chaves	13	1	18.73	13.75	44		3		
Chaves	18	1 and 2	6.25	0.36	4				
Colfax	38	1	1.78	1.73		5			
Colfax	1	2	8.00	8.00	8		1		
Colfax	1	1	8.00		43				
Colfax	33	1	11.75			20			
Curry	18	3	3.50	.40	6				
Curry	19	1 and 2	14.50	1.40	6	1			
Curry	*		1.50	0.50	1				
Dona Ana	1	1	9.25	8.50	25		4		
Dona Ana	4	3	1.18	0.78	6				
Eddy	2	4	8.50						
Grant	42	1 and 2	8.20	1.21	29	3	2		
Guadalupe	3	1	3.50		1				
Guadalupe	19	2	19.25	3.11	8		2		
Guadalupe	20	1	6.00						
Lincoln	3	4	9.25	1.01	13	2			
Lincoln	13	1	2.40						
Luna	4	2	2.25				1		
Mora	21	2	1.01	1.01			3		
Mora	30	4	1.00	1.00	7				
McKinley	6	6	1.75		3				
Otero	3	2			2				11
Otero	24	4	2.31	2.09	6				
Quay	3-a	1	.75	1.40	2-rock				
Quay	3	4	5.50	1.33	7		1		
Roosevelt	17	1	12.00	.40					
Roosevelt	18	1, 2 and 3	27.07	.86	17				
Roosevelt	19	1	3.25		2				
Rio Arriba	8	5	1.00	1.10	6		4	1-147'	



EDDY COUNTY.

State Road No. 2. View taken about two miles out from Carlsbad; showing graded earth road.



RIO ARRIBA COUNTY.

State Road No. 36. Sec. 5. A graded gravel road through heavy sand on the Espanola-Abiquiu road.

MILEAGE AND CLASSIFICATION OF ROADS BUILT IN 1916.

Division	Rd. No.	Sec. No.	Miles Graded	Miles Surf.	No. Culv. Corrugated	No. Culv. Wooden	No Bridges Wooden	Con. Arroyo Crossings
Rio Arriba	36	5	....	....	....	....	.... (126'	....
Sandoval	1	....	....	2.00	....	....	2-(252'	....
Santa Fe	1	1 and 3	2.42	3.60	21	....	(24'	....
Santa Fe	1	5 and 6	7.97	11.02	17	....	2-(52'	....
Santa Fe	8	2	1.01	1.13	7	....	1-42'	....
Santa Fe	1-a	....	1.00	1.00	....	....	1-12'	....
Santa Fe	10	2	3.32	0.42	14	....	42'	....
San Juan	32	1 to 7	2.12	1.20	12	....	3-(12', 22'	....
San Miguel	1	1	1.77	1.77	6	....	....	....
San Miguel	1	4, 5, 6 and 7	3.89	5.40	8	14	....	....
Sierra	1	4	6.60	2.61	44	....	3-(1-42'	1-30'
Sierra	1	5	1.69	0.37	7	....	2-63'-126'	5
Socorro	1	77	5.21	5.39	9	....	....	....
Socorro	5	1	0.40	....	1	....	....	....
Socorro	9	2	2.50	2.40	....	6	(1-42'	....
Socorro	9	1	13.00	rough with	....	....	5-(120', 3-11'	....
Taos	8	2	3.96	grader only	....	....	1-63'	....
Taos	8	2	....	....	....	14 (log)	4	....
Torrance	41	2 and 3	12.75	....	....	....	1	....
Torrance	23	2	2.50	2.50	....	....	1-22'	....
Union	18	2	....	....	....	....	....	....
Valencia	6	1 to 6 Incl.	6.23	....	7	14	1-12'	1-54'
Valencia	1	1, 2 and 3	2.50	10.77	....	3	(2-42'	11-others small
Valencia	1	2, 3 and 4	....	9.30	....	3	1	1-20'

MILEAGE AND CLASSIFICATION OF ROADS BUILT IN 1916.

Division	Rd. No.	Sec. No.	Miles Graded	Miles Surf.	No. Culv. Corrugated	No. Culv. Wooden	No Bridges Wooden	Con. Arroyo Crossings
Valencia—Peralto Tome Rd.			5.20	5.51	....	22	....	....
Valencia—Peralta Gravel Pit			.72	.72	....	....	....	....
Totals			314.54	134.14	426	127	64	22

* Approaches to Bridges.

† (1915 work on road widened, ditched and repairs.)

‡ 7 Concrete Culverts.

§ 2 Concrete Culverts.

SUMMARY OF MILEAGE BY CLASSIFICATION FOR 1916.

Class A.....	134.14
Class B.....	180.40
Total.....	314.54

Bridges—1916.

During the year December 1, 1915, to December 1, 1916, there were constructed sixty-four wooden bridges by the office from State funds, as follows:

In Bernalillo county.....	2
In Chaves county.....	3
In Colfax county.....	1
In Dona Ana county.....	4
In Grant county.....	2
In Guadalupe county.....	2
In Luna county.....	1
In Mora county.....	7
In Quay county.....	1
In Rio Arriba county.....	1
In Sandoval county.....	2
In Santa Fe county.....	7
In San Miguel county.....	3
In Sierra county.....	2
In Socorro county.....	6
In Taos county.....	5
In Torrance county.....	1
In Union county.....	1
In Valencia county.....	12
In San Juan county.....	5

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During the year 1916 this office has continued its policy of former years, of assisting the counties in the promotion and construction of bridges. The general procedure has been for the counties through their Board of County Commissioners to indicate to this office their intention to build a bridge at a certain place and to ask for a survey, plan and specifications for the bridge. Immediately an advertisement is prepared and published, an engineer is sent to the proposed location, making the necessary survey and soundings. Upon this report the design and specifications are prepared and sent to responsible bridge companies who do construction work of this kind in the Southwest. The preparation of these plans and specifications, and attendance at the opening of the bids, entails considerable work. After the contract is let, the shop plans submitted by the successful bidder are gone over in detail. A bond is given by the contractor to the amount of the contract price of the bridge. As soon as material is delivered at the site an inspector is sent upon the

work, who keeps all records and progress of the work in detail. The office also attends to certifying to the County Commissioners the payments from time to time as contained in the contract.

The system and method established by the office in co-operation with every county, except one, in the State has resulted in general benefit to the State as a whole, and the records on file in this office will show a decided economy to each county in following this method. The old policy pursued formerly by the counties, asking bridge companies to send in designs to the counties, resulted in inferior structures, as such kind of competition resulted in each contractor submitting the lightest and shortest bridge design, solely in order to get the contract. The method pursued by this office has been the reverse of this; the office designing a structure suitable for each case, and then asking all of the bridge companies to submit their bids on the plan designed. The result is that the bridges built in the past several years are designed for certain loads to be carried at this time and estimated heavier loads in the future. In nearly all cases the waterways for bridges have been made large enough to care for the estimated largest floods. In cases where there was not sufficient funds to do this the dirt approaches to a bridge have been lowered to permit extreme floods passing around one or both ends of the bridge.

MISCELLANEOUS BRIDGE PAYMENTS—1916.

	Highway Bond	General Roads	County Funds	Totals
Bernalillo Division—				
Tijeras bridges	\$ 3,518.15	\$ 253.19	\$ 3,400.00	\$ 7,171.34
Colfax Division—				
Raton bridge		1.47	.....	1.47
French bridge		2.68	.....	2.68
Chaves Division—				
Bridge 12-mile draw	238.07	10.43	.....	248.50
Bridge 16-mile draw	490.64	21.33	.....	511.97
Bridge 13-mile draw	16.00	126.20	.....	142.20
Curry Division—				
County bridges	120.45	.26	.....	120.71
Dona Ana Division—				
County bridges	25.98	2.94	.....	28.92
Hill bridge	114.87	26.45	.....	141.32
Berino bridge		147.39	.....	147.39
Vado bridge		231.55	.....	231.55
Las Cruces bridge		24.82	.....	24.82
Dona Ana bridge		36.83	.....	36.83
La Mesa bridge		.50	.....	.50
Eddy Division—				
Artesia bridge	1,714.11	182.11	2,500.00	4,396.22
Hope bridge	36.56	39.46	.....	76.02
County bridge	10.42	.....	.....	10.42



SAN MIGUEL COUNTY.

State Road No. 1. Sec. 6. Showing old road to left and new construction and location to right.



VALENCIA COUNTY.

State Road No. 6. Sec. 2. Abandoned railroad grade used for state highway. Original width fourteen feet; widened to eighteen feet.

	Highway Bond	General Roads	County Funds	Totals
Guadalupe Division—				
Puerto de Luna bridge.....		3.09	.....	3.09
Fort Sumner bridge.....		2.98	.....	2.98
Dilia bridge.....	56.30	16.52	.....	72.82
Canyon Blanco bridge.....	4.03	.....	.....	4.03
Anton Chico bridge.....		9.29	.....	9.29
Truchas.....		16.45	.....	16.45
Grant Division—				
Fort West bridge.....		544.19	.....	544.19
Lincoln Division—				
Hondo bridge.....	4,312.09	457.75	.....	4,769.84
Carrizozo bridge.....		12.39	.....	12.39
Luna Division—				
Spalding bridge.....	255.86	53.05	.....	308.91
County bridges.....	.61	.....	.....	.61
Mora Division—				
Watrous bridge.....		53.47	.....	53.47
Mora bridge.....	1,935.70	91.66	2,200.00	4,227.36
Red River bridge.....	167.52	1.65	.....	169.17
County bridge.....	1.19	.....	.....	1.19
Cebollo bridge.....		7.44	.....	7.44
Quay Division—				
Revuelto bridge.....		2.06	.....	2.06
County bridges.....	359.80	5,176.59	.....	5,536.39
Logan bridge.....	131.73	4.81	.....	136.54
Barrancas Creek bridge.....	42.18	.....	.....	42.18
Rio Arriba Division—				
Embudo bridge.....	1,255.14	50.85	300.00	1,605.99
Chamita.....		18.50	.....	18.50
Sandoval Division—				
Santa Fe Creek bridge.....	401.71	1,125.74	.....	1,527.45
Tonque Arroyo bridge.....	6.05	1,744.43	.....	1,750.48
Santa Fe Division—				
Atoscosa bridge.....		7.01	.....	7.01
Cerrillos bridge.....	1,842.77	148.77	1,530.00	3,521.54
Eleven-Mile Arroyo bridge....	451.42	97.74	.....	549.16
La Cueva Canyon bridge.....	208.19	7.94	.....	216.13
Gurule bridge.....	148.71	13.69	.....	162.40
Santa Fe Creek 1st cross br..		67.30	.....	67.30
Agua Fria Street bridge.....		19.28	181.30	200.58
Buckman bridge.....		6.45	.....	6.45
Glorieta bridge.....		15.78	.....	15.78
Galisteo bridge protection....		1.37	.....	1.37
Sierra Division—				
County bridge Arrey.....		1.16	.....	1.16
Socorro Division—				
San Marcial bridge.....	25.00	15.21	.....	40.21
Abo Canyon bridge.....	20.36	751.82	.....	772.18
Glenwood bridge.....		25.13	.....	25.13
Reserve bridge.....		67.56	.....	67.56
Red Canyon bridge.....		402.57	.....	402.57

	Bond Highway	Roads General	Fund County	Totals
San Miguel Division—				
San Jose bridge.....		2.56		2.56
Chaperito bridge		.26		.26
Pino Solo		.95		.95
Tecolote bridge		3.00		3.00
Taos Division—				
Red River bridge.....	1,215.80	165.85		1,381.65
Union Division—				
Tramperas bridge	83.62			83.62
Valencia Division—				
Rio Puerco bridge.....	2,722.37	173.15		2,895.52
Laguna bridge	255.71	16.14		271.85
County bridges	18.59			18.59
Arroyo Colorado bridge.....	18.66	276.03	122.64	417.33
Bibo bridge		131.51		131.51
McCarthy's bridge		252.35	522.74	775.09
Horace bridge		150.69	273.82	424.51
Los Lunas bridge.....			1,332.02	1,332.02
	\$22,226.36	\$13,321.79	\$12,362.52	\$47,910.67

SUMMARY OF ROAD MILEAGE AND NUMBER OF BRIDGES FOR THE TWO-YEAR PERIOD DECEMBER 1, 1914, TO DECEMBER 1, 1916.

1915-1916 Roads.

During the two-year period there were constructed in 1915-1916 miles of road as follows:

	Miles.
1915.	
Class A	51.3
Class B	49.5
Class D	74.0
Total.....	174.8
1916.	
Class A	136.45
Class B	178.09
Total.....	314.54

1915-1916 Bridges.

The following table shows the number, location, and kind of bridges built in the State during the years 1915 and 1916. During this period a total of 108 bridges were built. Of this number one was of concrete, thirteen of steel, and ninety-four of wood.

The thirteen steel bridges were built by contract. Three of these were paid for by the State Highway Commission, two were paid for

partly by the counties and partly by the State, and eight were paid for entirely by various counties.

Of the ninety-four wooden bridges fourteen were built by contract, and eighty by State forces. The State paid for five of the bridges, which were built by contract, and various counties paid for the other nine.

		Concrete.	
County.	Location	Road No.	Length Ft.
1 Dona Ana.....	Hill	..	25
1 Total.			
		Steel.	
2 Bernalillo	Tijeras	10	2—*60
1 Colfax	Raton	37	100
1 Dona Ana.....	Las Cruces.....	..	450
1 Eddy	Hope	34	50
1 Grant	Fort West.....	11	376
1 Guadalupe	Dilia	..	182
1 Lincoln	Hondo	13	100
1 Luna	Spalding	11	193
1 Luna	Seventy-six Draw	29	50
1 Mora	Mora	..	300
1 Socorro	Reserve	12	222
1 Union	Tramperas	18	230
13 Total.			

Wooden Trestles By Contract.

1 Chaves	Acme	18	806
1 Curry	Clovis	..	105
1 Curry	Clovis	..	189
1 Curry	Texico	19	147
1 Dona Ana	Berino	1	186
1 Dona Ana	Vado	1	403
1 Dona Ana	Dona Ana	1	186
1 Dona Ana	Salem	1	496
1 Quay	Plaza Larga	18	155
1 Quay	Barancas	18	248
1 Quay	Trujillo	3	310
1 Quay	Bull Creek	3	155
1 Quay	Mineosa Creek	18	124
1 Quay	Revuelto P. O.....	3	403
14 Total.			

Wooden Trestles By State Forces.

2 Bernalillo	Tijeras Canon	10	* 21
1 Chaves	Sec. 1	13	105
1 Chaves	Sec. 1	13	63
1 Chaves	Sec. 1	13	42

2	Dona Ana	1	* 22
2	Dona Ana	1	* 16
1	Grant	42	63
1	Grant	42	12
2	Guadalupe Sec. 1	3	* 31
1	Lincoln Sec. 1	3	15
1	Lincoln Sec. 1	3	18
1	Luna Sec. 2	4	105
1	Mora	21	10
1	Mora	21	14
1	Mora	21	18
1	Quay Sec. 4	3	31
1	Rio Arriba Embudo	8	147
1	Sandoval La Bajada	1	126
1	Sandoval Tonque Arroyo	1	252
1	San Juan Sec. 2 Miller Arroyo	32	106
1	San Juan Sec. 2 Hart Arroyo	32	147
1	San Juan Sec. 3 Murr Arroyo	32	21
1	San Juan Sec. 4 McCoy Arroyo	32	63
1	San Juan Sec. 4 Peach Arroyo	32	42
1	San Juan Sec. 4 Durnell Arroyo	32	42
1	San Juan Sec. 5 Dain Arroyo	32	21
1	San Juan Sec. 5 Farmington Arroyo	32	63
1	San Juan Sec. 5 Twister Arroyo	32	63
1	San Juan Sec. 5 Coolidge Arroyo	32	84
1	San Juan Sec. 6 De Luche Arroyo	32	21
1	San Juan Sec. 6 Stevens Arroyo	32	84
1	San Juan Sec. 6 Wheeler Arroyo	32	42
3	San Miguel	1	* 10
1	San Miguel Pino Solo	1	51
1	San Miguel	1	42
1	San Miguel San Jose	1	106 1/4
1	Santa Fe Tesuque	8	126
1	Santa Fe Tesuque	8	42
1	Santa Fe Tesuque	8	12
1	Santa Fe Tesuque	8	* 21
1	Santa Fe Sec. 6 Santa Fe Creek	1	12
1	Santa Fe Sec. 3 Santa Fe Creek	1	24
1	Santa Fe Sec. 7 Santa Fe Creek	1	52
1	Santa Fe First Crossing Santa Fe Creek	1	84
1	Sierra	1	18
1	Sierra	1	30
2	Socorro	9	* 63
3	Socorro	9	* 11
1	Socorro	9	42
1	Socorro	9	20
1	Taos	8	19
1	Taos	8	16
2	Taos	8	* 10
2	Torrance	41	22
1	Taos Red River	8	231
1	Union	18	12
2	Valencia	6	* 42
2	Valencia	6	* 18
4	Valencia	6	* 16
1	Valencia	6	40
1	Valencia	6	30



OTERO COUNTY.

State Road No. 3. Sec. 2. Type of concrete overflows between Tularosa and Alamogordo.



OTERO COUNTY.

State Road No. 3. Sec. 2. Downstream view of above.

1	Valencia	.....	6	12
1	Valencia	Laguna	6	189
1	Valencia	.....	1	12
80	Total.			
	*Each.			

The following amounts were expended during the year December 1, 1915, to December 1, 1916, upon the construction of roads and bridges:

General Road Fund.....	\$ 86,856.42
State Bond Fund.....	298,828.03
County Special Fund.....	23,677.78
County Donations	19,089.65
Total.....	\$428,451.88

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—GENERAL ROADS ACCOUNT.

	ROADS.		BRIDGES.		Totals
	1915	1916	1915	1916	
General Roads.					
Bernalillo Division—					
Road 1, Sec. 2.....	\$ 11,870.88	\$ 1,620.23			\$ 13,491.11
Road 10, Secs. 1-2.....		1,791.26			1,791.26
Tijeras bridges.....				\$ 253.19	253.19
Road 46, Sec. 1.....		1,201.62			1,201.62
Coffax Division—					
Road 1, Secs. 1-2.....	1,285.71	360.21			1,645.92
Raton bridge.....					
Road 38, Sec. 2.....	26.49	65.51	117.87	1.47	119.34
Road 33.....		162.58			92.00
French bridge.....					162.58
Curry Division—					
Road 18.....	81.35	26.57			107.92
Road 19.....		309.54			309.54
Road 19, Texico Br. Appr.....		8.98			8.98
Road 18, Frio Br. Appr.....		10.59			10.59
Road 19, Clovis Br. Appr.....		2.00			2.00
County bridges.....				.26	.26
Chaves Division—					
Road 31.....	6,655.65	23.66			6,679.31
Hagerman bridge.....					
Road 13, Sec. 1.....		5,136.28	75.85		75.85
Bridge Sixteen-Mile Draw.....				21.33	21.33
Road 18, Secs. 1-2.....		803.45			803.45
Bridge Twelve-Mile Draw.....				10.43	10.43
Bridge Thirteen-Mile Draw.....				126.20	126.20
Dona Ana Division—					
Road 1.....	153.83	1,173.22			1,327.05
County bridges.....				2.94	2.94
Road 3.....		7.97			56.32
Road 4.....	33.74	96.70			41.71
Berino Bridge.....				147.39	96.70
					147.39
	\$ 20,107.65	\$ 12,800.37	\$ 290.07	\$ 565.89	\$ 33,763.93

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—GENERAL ROADS ACCOUNT.

	ROADS.		BRIDGES.		Totals
	1915	1916	1915	1916	
General Roads.					
Dona Ana Division—					
Vado bridge.....					
Las Cruces bridge.....				\$ 231.55	\$ 231.55
Dona Ana bridge.....				24.82	24.82
Road 4, Borderland Route.....		1.33		36.83	36.83
La Mesa bridge.....				.50	.50
Hill bridge.....				26.45	26.45
Eddy Division—					
Road 2, Sec. 4.....		122.96			122.96
Artesia bridge.....			344.89	182.11	527.00
Hope bridge.....				39.46	39.46
Guadalupe Division—					
Puerto de Luna bridge.....					
Fort Sumner bridge.....					
Anton Chico bridge.....					
Road 19.....		871.43			299.27
Bridge at Truchas.....				16.45	677.33
Bridge at Dilia.....				16.52	4,209.84
Road 3.....		320.61			871.43
Road 20-a.....		16.06			16.45
Grant Division—					
Fort West bridge.....					320.61
Road 42.....		1,748.17			16.06
Road 4.....		29.51			
Luna Division—					
Road 29.....	173.52	22.93	482.94	544.19	1,027.13
Spaulding bridge.....					1,027.13
Road 4, Sec. 2.....		573.93			1,748.17
					29.51
	\$ 20,281.17	\$ 16,507.30	\$ 6,288.98	\$ 1,753.18	\$ 44,830.63

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—GENERAL ROADS ACCOUNT.

General Roads.	ROADS.			BRIDGES.		
	1915	1916	Total	1915	1916	Totals
Lincoln Division—						
Road 3	\$ 348.88	\$ 111.37	\$ 460.25	.....	.....	\$ 460.25
Hondo bridge .....	.....	.....	.....	.....	457.75	475.75
Carrizozo bridge .....	.....	.....	.....	84.90	12.39	97.29
Road 13 .....	.....	9,410.97	9,410.97	.....	.....	9,410.97
Mora Division—						
Road 30, Secs. 1-2	6,279.62	222.15	6,501.77	.....	.....	6,501.77
Watrous bridge .....	.....	.....	.....	5,778.84	53.47	5,832.31
Road 1	95.01	3.62	98.63	.....	.....	98.63
Cebolla bridge .....	.....	.....	.....	331.11	7.44	338.55
Sapello bridge .....	.....	.....	.....	.90	.....	.90
Road 30, Sec. 3	522.56	60.45	583.01	.....	.....	583.01
Road 21	34.50	435.48	469.98	.....	.....	469.98
Mora bridge .....	.....	.....	.....	.....	91.66	91.66
Red River bridge .....	.....	.....	.....	.....	1.65	1.65
McKinley Division—						
Road 6	30.06	56.51	86.57	.....	.....	86.57
Otero Division—						
Road 3	2,094.74	253.49	2,348.23	.....	.....	2,348.23
Road 24	209.35	126.18	335.53	.....	.....	335.53
Quay Division—						
Revuelto bridge .....	.....	.....	.....	936.61	2.06	938.67
County bridge .....	.....	.....	.....	200.02	5,176.59	5,376.61
Road 3 .....	.....	212.53	212.53	.....	.....	212.53
Bridge at Logan .....	.....	.....	.....	.....	4.81	4.81
Road 3-a .....	.....	4.00	4.00	.....	.....	4.00
	\$ 29,895.89	\$ 27,404.05	\$ 57,299.94	\$ 13,621.36	\$ 7,561.00	\$ 21,182.36
						\$ 78,482.30



SAN MIGUEL COUNTY.

State Road No. 1. Sec. 7. Between Glorieta and Pecos. Old road to the right.



SAN MIGUEL COUNTY.

State Road No. 1. Sec. 6. Limestone surfaced with motor truck.

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—GENERAL ROADS ACCOUNT.

General Roads.	ROADS.			BRIDGES.		
	1915	1916	Total	1915	1916	Totals
Roosevelt Division—						
Road 18	\$ 10,441.36	\$ 101.60	\$ 10,542.96	.....	.....	\$ 10,542.96
Road 17 .....	.....	63.61	63.61	.....	.....	63.61
Road 19 .....	.....	71.78	71.78	.....	.....	71.78
Rio Arriba Division—						
Embudo bridge .....	.....	.....	.....	268.15	50.85	319.00
Road 8	31.39	198.62	230.01	.....	.....	230.01
Road 36, Sec. 5 .....	.....	2,196.37	2,196.37	.....	.....	2,196.37
Chamita bridge .....	.....	.....	.....	.....	18.50	18.50
Sandoval Division—						
Road 1	4,268.85	318.04	4,586.89	.....	.....	4,586.89
Road 7	94.06	37.75	131.81	.....	.....	131.81
Santa Fe Creek bridge .....	.....	.....	.....	.....	1,125.74	1,125.74
Arroyo Tonque bridge .....	.....	.....	.....	.....	1,744.43	1,744.43
Socorro Division—						
Road 1	1,238.69	2,213.92	3,452.61	.....	.....	3,452.61
Road 1	98.80	278.97	377.77	.....	.....	377.77
Road 9	1,700.32	2,471.16	4,171.48	.....	.....	4,171.48
Road 12	1,252.46	2.75	1,255.21	.....	.....	1,255.21
San Marcial bridge .....	.....	.....	.....	250.71	15.21	265.92
Road 43	326.59	.72	327.31	.....	.....	327.31
Bridge Abo Canyon .....	.....	.....	.....	.....	751.82	751.82
Bridge Glenwood .....	.....	.....	.....	.....	25.13	25.13
Bridge Reserve .....	.....	.....	.....	.....	67.56	67.56
Red Canyon bridge .....	.....	.....	.....	.....	402.57	402.57
Road 5 .....	.....	46.85	46.85	.....	.....	46.85
Road 13 .....	.....	25.25	25.25	.....	.....	25.25
	\$ 49,348.41	\$ 35,431.44	\$ 84,779.85	\$ 14,140.22	\$ 11,762.81	\$ 25,903.03
						\$ 110,682.88

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—GENERAL ROADS ACCOUNT.

	ROADS.			BRIDGES.			Totals
	1915	1916	Total	1915	1916	Total	
General Roads.							
San Miguel Division—							
Road 1	\$ 6,026.39	\$ 1,458.89	\$ 7,485.28	.....	.....	.....	\$ 7,485.28
San Jose bridge .....	.....	.....	.....	.....	2.56	1,167.43	1,167.43
Tecolote bridge .....	.....	.....	.....	.....	3.00	1,360.77	1,360.77
Pino Solo bridge .....	.....	.....	.....	.....	.95	435.37	435.37
Chaperito bridge .....	.....	.....	.....	.....	.26	.26	.26
Santa Fe Division—							
Road 8	274.14	2,176.78	2,450.92	.....	.....	.....	2,450.92
Road 1	2,453.03	7,203.59	9,656.62	.....	.....	.....	9,656.62
Road 2	9.00	7.76	16.76	.....	.....	.....	16.76
Atoscosa bridge .....	.....	.....	.....	.....	7.01	7.01	7.01
Galisteo bridge protection .....	.....	.....	.....	.....	1.37	625.93	625.93
Tesuque bridge .....	.....	.....	.....	.....	.....	848.58	848.58
Santa Fe Cr. bridge 1st crossing .....	.....	.....	.....	.....	67.30	1,072.90	1,072.90
Road 22	359.93	.....	359.93	.....	.....	.....	359.93
Agua Fria Street bridge .....	.....	.....	.....	.....	19.28	19.28	19.28
Road 10	93.85	682.92	776.77	.....	.....	.....	776.77
Buckman bridge .....	.....	.....	.....	.....	6.45	6.45	6.45
Road 1—Agua Fria St. branch .....	.....	162.82	162.82	.....	.....	.....	162.82
Eleven-Mile Arroyo bridge .....	.....	.....	.....	.....	97.74	97.74	97.74
Road 46 .....	.....	24.88	24.88	.....	.....	.....	24.88
Cerrillos bridge .....	.....	.....	.....	.....	148.77	148.77	148.77
La Cueva bridge .....	.....	.....	.....	.....	7.94	7.94	7.94
Gurule bridge .....	.....	.....	.....	.....	13.69	13.69	13.69
Glorieta bridge .....	.....	.....	.....	.....	15.78	15.78	15.78
San Juan Division—							
Road 32	883.62	4,516.95	5,400.57	.....	.....	.....	5,400.57
Sierra Division—							
Road 1, Secs. 1-4	13,718.34	12,360.96	26,079.30	.....	.....	.....	26,079.30
Road 1, Sec. 5	6,260.78	5,348.81	11,609.59	.....	.....	.....	11,609.59
	\$ 79,427.49	\$ 69,376.80	\$ 148,803.29	\$ 19,570.02	\$ 12,154.91	\$ 31,720.93	\$ 180,534.22



CURRY COUNTY.

State Road No. 18. Sec. 2. Bridge on Running Water draw, north of Clovis.



CURRY COUNTY.

State Road No. 18. Sec. 2. Same as above after completion; looking north.

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—GENERAL ROADS ACCOUNT.

General Roads.	ROADS.		BRIDGES.		Totals
	1915	1916	1915	1916	
Sierra Division—					
County Br. Arroyo.....	108.27	75.93			184.20
Road 40	\$ 108.00	359.79			467.79
Road 26					
Taos Division—					
Road 8	97.65	577.24			674.89
Red River bridge.....					
Torrance Division—					
Road 2	59.61	30.76			90.37
Road 23		56.95			56.95
Road 41		13.04			13.04
Union Division—					
Road 18		24.23			24.23
Valencia Division—					
Road 1.....	328.10	1,090.15			1,418.25
Rio Puerco bridge.....					
Road 6, Secs. 7-12, inclusive.....	14.36	749.87			764.23
Road 6, Secs. 1-6, inclusive.....	1,684.09	628.24			2,312.33
Road 9	6.60	56.79			63.39
Laguna bridge					
Road 6 survey.....	44.06				44.06
Road 6 Appr. Rio Puerco Br	83.47				83.47
Peralta-Tome Road.....	96.28	495.84			592.12
Bibo bridge					
McCarthy's bridge					
Horace bridge					
Arroyo Colo. bridge.....					
Maintenance and repairs.....	\$ 82,057.98	\$ 73,534.63	\$ 23,921.44	\$ 13,321.79	\$ 37,243.23
Advertising State Highway Bonds	\$ 267.12				\$ 267.12
	175.00				175.00
	\$ 82,500.10	\$ 73,534.63	\$ 23,921.44	\$ 13,321.79	\$ 193,277.96

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—1913 HIGHWAY BOND.

Highway Bond.	ROADS.		BRIDGES.		Totals
	1915	1916	1915	1916	
Bernalillo Division—					
Road 1, Sec. 2.....	\$ 4,945.65	\$ 1,812.40			\$ 6,758.05
Road 10, Secs. 1-2.....		14,141.40			14,141.40
Tijeras bridges.....				3,518.15	3,518.15
Road 46, Sec. 1.....		6,420.82			6,420.82
Colfax Division—					
Road 1, Secs. 1-2.....	3,735.72	11,913.68			15,649.40
Raton bridge.....			6.50		6.50
Road 38, Secs. 1-2.....	416.30	3,323.10			3,739.40
Road 33, Secs. 1-2.....		10,024.03			10,024.03
Chaves Division—					
Felix bridge.....			.40		.40
Road 13, Sec. 1.....		35,684.82			35,684.82
Road 31.....		9.63			9.63
Bridge Twelve-Mile Draw.....			238.07		238.07
Bridge Sixteen-Mile Draw.....			490.64		490.64
Road 18.....		4,517.01			4,517.01
Bridge Thirteen-Mile Draw.....			16.00		16.00
Curry Division—					
Road 18, Sec. 3.....	1,298.19	498.50			1,796.69
Road 19, Secs. 1-2-3.....		6,402.88			6,402.88
County bridges.....				120.45	120.45
Road 18, Frio bridge appr.....		723.11			723.11
Road 19, Clovis bridge appr.....		136.43			136.43
Road 19, Texico bridge appr.....		758.28			758.28
Dona Ana Division—					
County bridges.....			102.62		102.62
Road 3.....	963.98	167.98			1,131.96
Road 1, Sec. 4.....	660.42	1,405.13			2,065.55
Road 1, Sec. 1.....		15,064.33			15,064.33
Road 1, Sec. 5.....		3,324.63			3,324.63
Road 4, Secs. 2-3.....		3,066.36			3,066.36
	\$ 35,030.50	\$ 31,630.43	\$ 1,09.89	\$ 4,409.80	\$ 72,179.59



GRANT COUNTY.

State Road No. 42. Sec. 1. Rock-surfaced, 5 1-2 per cent grade between Silver City and Tyrone.



SAN MIGUEL COUNTY.

State Road No. 1. Sec. 6. This road is of rock, surface of crushed limestone.

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—1913 HIGHWAY BOND.

Highway Bond.	ROADS.			BRIDGES.		
	1915	1916	Total	1915	1916	Totals
Dona Ana Division—						
Road 4-B Borderland Route....	.....	\$ 74.21	\$ 74.21	.....	.....	\$ 74.21
Hill bridge .....	.....	.....	.....	.....	114.87	114.87
Eddy Division—						
Artesia bridge .....	.....	.....	.....	.....	.....	.....
Hope bridge .....	.....	.....	.....	.....	.....	.....
Road 2, Sec. 4.....	.....	6,147.75	6,147.75	.....	.....	.....
County bridges .....	.....	.....	.....	.....	10.42	10.42
Grant Division—						
Road 42, Secs. 1-2.....	.....	24,290.33	24,290.33	.....	.....	24,290.33
Guadalupe Division—						
Road 19, Secs. 1-4, inclusive....	.....	13,199.81	13,199.81	.....	.....	13,199.81
Road 20-a, Secs. 1-2.....	.....	719.75	719.75	.....	.....	719.75
Road 3 .....	.....	967.13	967.13	.....	.....	967.13
Dilla bridge .....	.....	.....	.....	.....	56.30	56.30
Truchas Spillway No. 1.....	.....	10.41	10.41	.....	.....	10.41
Canyon Blanca bridge.....	.....	.....	.....	.....	4.03	4.03
Lincoln Division—						
Road 3	525.18	5,799.80	6,324.98	.....	.....	6,324.98
Road 13 .....	.....	2,879.79	2,879.79	.....	.....	2,879.79
Hondo bridge .....	.....	.....	.....	.....	4,312.09	4,312.09
Luna Division—						
Spalding bridge .....	.....	.....	.....	.....	255.86	255.86
Road 4, Sec. 2.....	.....	5,251.04	5,251.04	.....	.....	5,251.04
County bridges .....	.....	.....	.....	.....	.61	.61
	\$12,545.44	\$178,734.54	\$191,279.98	\$ 1,532.38	\$10,914.14	\$203,726.50

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—1913 HIGHWAY BOND.

Highway Bond—	ROADS.			BRIDGES.		
	1915	1916	Total	1915	1916	Total
Mora Division—						
Road 30, Secs. 1-2-3.....	\$ 452.98	\$ 2,128.63	\$ 2,581.61			\$ 2,581.61
Road 21		1,992.89	1,992.89			1,992.89
Mora bridge					1,935.70	1,935.70
Road 1, Sec. 2		22.95	22.95			22.95
Red River bridge					167.52	167.52
County bridges					1.19	1.19
McKinley Division—						
Road 6, Secs. 1-6.....		3,927.41	3,927.41			3,927.41
Otero Division—						
Road 3	1,674.49	5,863.92	7,538.41			7,538.41
Road 24	271.37	4,006.14	4,277.51			4,277.51
Quay Division—						
County bridges						
Road 3, Secs. 3-4		2,488.54	2,488.54	79.32	359.80	439.12
Logan bridge					131.73	131.73
Road 18		8.20	8.20			8.20
Barrancas Creek bridge					42.18	42.18
Road 18 a		9.41	9.41			9.41
Road 3-a		273.06	273.06			273.06
Roosevelt Division—						
Road 18, Secs. 1-2-3	2,549.47	5,241.29	7,790.76			7,790.76
Road 17, Sec. 1		1,374.33	1,374.33			1,374.33
Road 19, Secs. 1-2		2,034.16	2,034.16			2,034.16
Rio Arriba Division—						
Embudo bridge						
Road 8, Sec. 2	504.20	3,527.65	4,031.85	301.82	1,255.14	1,556.96
Road 36, Sec. 5		2,327.73	2,327.73			2,327.73
	\$ 17,997.95	\$ 213,960.85	\$ 231,958.80	\$ 1,913.53	\$ 14,807.40	\$ 16,720.92
						\$ 248,679.72

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—1913 HIGHWAY BOND.

Highway Bond.	ROADS.			BRIDGES.		
	1915	1916	Total	1915	1916	Total
Santa Fe Division—						
Road 8	\$ 2,516.89	\$ 1,664.67	\$ 4,181.56			\$ 4,181.56
Road 22	49.11		49.11			49.11
Santa Fe Cr. Br. first crossing				407.43		407.43
Road 1, Secs. 5-6	634.17	2,066.29	2,700.46			2,700.46
Road 1, Secs. 1-4	1,502.81	2,710.54	4,213.35			4,213.35
Road 2	2.50	30.00	32.50			32.50
Santa Fe Cr. Br. 2nd crossing				47		47
Cerrillos bridge				1,842.77		1,842.77
Eleven-Mile Arroyo bridge				451.42		451.42
Road 1, Agua Fria branch		1,899.99	1,899.99			1,899.99
Road 46		242.11	242.11			242.11
La Cueva Canyon br'				208.19		208.19
Road 10, Secs. 1-2		309.48	309.48			309.48
Gurute bridge				148.71		148.71
Socorro Division—						
Road 9	3,310.15	2,892.54	6,202.69			6,202.69
Road 1, Secs. 6-7-8	4,478.37	5,302.17	9,780.54			9,780.54
San Marcial Br				273.31		273.31
Abo Canyon Br				25.00		25.00
Road 13, Secs. 1-2-3		35.20	35.20	20.36		20.36
Sierra Division—						
Road 1, Secs. 3-4		925.69	5,245.52			5,245.52
Road 1, Sec. 5			4,186.04			4,186.04
San Miguel Division—						
Road 1, Secs. 3-7, inclusive	3,766.14	12,471.42	16,237.56			16,237.56
Sandoval Division—						
Road 1	2,270.28	2,098.59	4,368.87			4,368.87
Santa Fe Creek bridge				401.71		401.71
Arroyo Tonque bridge				6.05		6.05
	\$ 45,034.24	\$ 246,609.54	\$ 291,643.78	\$ 2,594.73	\$ 17,911.61	\$ 20,506.34
						\$ 312,150.12

STATEMENT OF SUNDRY EXPENDITURES ROADS AND BRIDGES—1913 HIGHWAY BOND.

ROADS.				BRIDGES.		
Highway Bond.	1915	1916	Total	1915	1916	Total
San Juan Division—						
Road 32 .....	.....	\$ 7,232.52	\$ 7,232.52	.....	.....	\$ 7,232.52
Torrance Division—						
Road 2	\$ 954.19	432.22	1,386.41	.....	.....	1,386.41
Road 23, Sec. 1 .....	.....	1,425.68	1,425.68	.....	.....	1,425.68
Road 41, Sec. 2-3 .....	.....	908.03	908.03	.....	.....	908.03
Taos Division—						
Red River bridge .....	.....	.....	2,374.52	.....	.....	2,374.52
Road 8 .....	.....	2,374.52	.....	.....	1,215.80	1,215.80
Union Division—						
Road 18, Secs. 2-3 .....	.....	1,460.85	1,460.85	.....	.....	1,460.85
Road 37 .....	.....	38.92	38.92	.....	.....	38.92
Tramperos bridge .....	.....	.....	.....	.....	83.62	83.62
Valencia Division—						
Rio Puerco bridge .....	.....	.....	.....	678.86	2,722.37	3,401.23
Laguna bridge .....	.....	.....	.....	1,946.02	255.71	2,201.73
Peralta-Tome Road	110.59	209.84	320.43	.....	.....	320.43
Road 6, Secs. 7-12, inclusive	23.64	2,608.06	2,631.70	.....	.....	2,631.70
Road 1, Sec. 1, gravel	366.88	4,741.18	5,108.06	.....	.....	5,108.06
Road 6, Secs. 1-6, inclusive	40.58	6,753.27	6,793.85	.....	.....	6,793.85
Road 1, Secs. 2-4-5 .....	.....	435.96	435.96	.....	.....	435.96
Road 6, Secs. 1-12 sur .....	.....	59.68	59.68	.....	.....	59.68
Road 9, Sec. 1 .....	.....	1,311.40	1,311.40	.....	.....	1,311.40
County bridges .....	.....	.....	.....	.....	18.59	18.59
Arroyo Colorado bridge .....	.....	.....	.....	.....	18.66	18.66
	\$ 46,530.12	\$ 276,601.67	\$ 323,131.79	\$ 5,219.61	\$ 22,226.36	\$ 27,445.97
						\$ 350,577.76



OTERO COUNTY.

State Road No. 24. Sec. 4. Stone wall under construction.
with 3-inch pipe imbedded in concrete for railing.
Vicinity of Cloudercroft; elevation 9,000 feet
above sea level.

SUNDRY EXPENDITURES OF COUNTY SPECIAL FUNDS—1915-1916.

	ROADS.			BRIDGES.			Totals By Counties
	1915	1916	Total	1915	1916	Total	
Highway Bond.							
Otero County—							
Road 24	\$ 4,496.48	.....	\$ 4,496.48	.....	.....	\$ 4,496.48	\$ 7,634.21
Road 3 .....	.....	\$ 3,137.73	3,137.73	.....	.....	3,137.73	.....
San Juan County—							4,426.39
Road 32	4,426.39	.....	4,426.39	.....	.....	4,426.39	.....
Taos County—							8,054.55
Road 8	3,376.01	4,375.66	7,751.67	.....	.....	7,751.67	.....
Ojo Caliente bridge .....	.....	.....	.....	.....	43.37	43.37	.....
Red River bridge .....	.....	.....	.....	.....	259.51	259.51	.....
Valencia County—							31,590.95
Road 1	15,476.99	3,008.99	18,485.98	.....	.....	18,485.98	.....
Peralta Tome Road	252.45	6,787.20	7,039.65	.....	.....	7,039.65	.....
Road 6 .....	.....	4,537.94	4,537.94	.....	.....	4,537.94	.....
Road 9 .....	.....	809.31	809.31	.....	.....	809.31	.....
Gravel Pit to Road 1 .....	.....	323.39	323.39	.....	.....	323.39	.....
McCarty's bridge .....	.....	.....	.....	.....	272.04	272.04	.....
Arroyo Colorado bridge .....	.....	.....	.....	.....	122.64	122.64	.....
	\$ 28,028.32	\$ 22,980.22	\$ 51,008.54	.....	\$ 697.56	\$ 697.56	\$ 51,706.10

RECAPITULATION.

	Otero	San Juan	Taos	Valencia
Balance, December 1, 1914 .....	.....	.....	.....	\$ 49.00
Receipts, 1915	\$ 4,496.48	\$ 4,294.76	\$ 3,744.97	16,647.65
Receipts, 1916	3,137.73	131.63	4,309.58	14,964.04
Payments per statement	\$ 7,634.21	\$ 4,426.39	\$ 8,054.55	\$ 31,660.69
Balance, December 1, 1916 .....	.....	.....	.....	\$ 31,590.95
				\$ 69.74

SUNDY EXPENDITURES COUNTY FUNDS ACCOUNTS.

	ROADS.		BRIDGES.		Totals
	1915	1916	1915	1916	
Bernalillo Division—					
Tijeras bridge					
Chaves Division—					
Road 31	\$ 2,588.69			\$ 3,400.00	\$ 3,400.00
Eddy Division—					
Artesia bridge					2,588.69
Mora Division—					
Road 30, Secs. 1-2	2,971.48			2,500.00	2,500.00
Cebolla bridge					2,971.48
Road 30, Sec. 3	5,000.00				2,989.16
Mora bridge					5,000.00
Rio Arriba Division—					
Embudo bridge					2,200.00
Road 36, Sec. 5					2,200.00
Socorro Division—					
Road 1	3,994.54			300.00	300.00
Road 5, Sec. 1 (Co. For. Rd.)					3,000.00
Sierra Division—					
Road 40	183.47				3,994.54
San Miguel Division—					2,246.81
Road 1	300.00				183.47
Santa Fe Division—					
Road 8	1,220.99				300.00
Tesuque bridge					
Atoscosa bridge					1,220.99
Galisteo br. pro.					2,000.00
Agua Fria Street bridge					3,241.67
Cerrillos bridge					3,241.67
Road 10					48.33
Road 1, Sec. 6					181.30
Valencia Division—					1,530.00
Road 6, Sec. 6					1,530.00
Los Lunas and other bridges					375.00
	500.00				500.00
					1,856.54
					1,856.54

STATEMENT OF COUNTY DONATIONS ON ROADS AND BRIDGES.

Period Dec. 1, 1914, to Dec. 1, 1916.

Division and Road	Receipts		Total		Expenditures		Refunds		Transfers		Total Bal. 12-1-1916	
	Bal. 12-1-14											
Bernalillo County—												
Tijeras Bridges	\$	3,400.00	\$	3,400.00	\$	3,400.00	\$	.....	\$	3,400.00	\$	.....
Chaves County—												
Road 31	588.69	2,000.00	2,588.69		2,588.69					2,588.69		
Dona Ana County—												
Rincon-Las Cruces Rd	1.35		1.35						1.35	1.35		
Eddy County—												
Artesia Bridge		2,500.00	2,500.00		2,500.00					2,500.00		
Grant County—												
Deming-Lordsburg Rd	2,310.79		2,310.79					2,310.79		2,310.79		
Mora County—												
Rd. 30 Sec. 1-2	705.63	2,265.85	2,971.48		2,971.48					2,971.48		
Cebolla Bridge	2,315.16	674.00	2,989.16							2,989.16		
Rd. 30 Sec. 3		2,500.00	2,500.00		2,500.00					2,500.00		
Rd. 1	200.00		200.00					200.00		200.00		
Mora Bridge		2,200.00	2,200.00		2,200.00					2,200.00		
Rio Arriba County—												
Embudo Bridge		300.00	300.00		300.00					300.00		
R. 36 Sec. 5		3,000.00	3,000.00		3,000.00					3,000.00		
Socorro County—												
Rd. 1 Elmendorf	3,994.54		3,994.54							3,994.54		
Rd. 5 Sec. 1 Co. For Fund		4,000.00	4,000.00		2,246.81					2,246.81		1,753.19
Sierra County—												
Rd. 40	183.47		183.47		183.47					183.47		

STATEMENT OF COUNTY DONATIONS ON ROADS AND BRIDGES.

Division and Road	Bal. 12-1-14	Period Dec. 1, 1914, to Dec. 1, 1916.				Transfers	Total	Bal. 12-1-1916
		Receipts	Total	Expenditures	Refunds			
San Miguel County—								
Rd. 1 .....	.....	300.00	300.00	300.00	.....	.....	300.00	.....
Mora Rd. 30 Sec. 3 ..	.....	2,500.00	2,500.00	2,500.00	.....	.....	2,500.00	.....
Santa Fe County—								
Rd. 8	220.99	1,000.00	1,220.99	1,220.99	.....	.....	1,220.99	.....
Tesuque Bridge .....	.....	2,000.00	2,000.00	2,000.00	.....	.....	2,000.00	.....
Atoscosa Bridge .....	.....	3,241.67	3,241.67	3,241.67	.....	.....	3,241.67	.....
Galisteo Bridge .....	.....	.....	.....	.....	.....	.....	.....	.....
Protection .....	.....	48.33	48.33	48.33	.....	.....	48.33	.....
Agua Fria St. Bridge ..	.....	200.00	200.00	200.00	.....	.....	200.00	.....
Cerrillos Bridge .....	.....	1,530.00	1,530.00	1,530.00	.....	.....	1,530.00	.....
Rd. 10 .....	.....	1,500.00	1,500.00	1,500.00	.....	.....	1,500.00	.....
Rd. 1 Sec. 6 .....	.....	375.00	375.00	375.00	.....	.....	375.00	.....
Valencia County—								
Rd. 6 Sec. 1-6 .....	.....	500.00	500.00	500.00	.....	.....	500.00	.....
Los Lunas and other	.....	1,856.54	1,856.54	1,856.54	.....	.....	1,856.54	.....
Bridges .....	.....	.....	.....	.....	.....	.....	.....	.....
TOTALS	\$10,337.15	\$38,074.86	\$48,412.01	\$44,146.68	\$2,510.79	\$1.35	\$46,658.82	\$1,753.19



DONA ANA COUNTY.

Concrete road below state line at Anthony, in Texas, on the Camino Real.



DONA ANA COUNTY.

State Road No. 3. Sec. 2. Concrete floor covering sand arroyo four miles northeast of Las Cruces.

1915—GENERAL ROADS ACCOUNT.

Balance, Dec. 1st, 1914		\$ 4,465.59
Santa Fe Bank.....	\$2,465.59	
Santa Fe Bank.....	2,000.00	
Receipts		\$132,199.94
Auditor's Warrants	\$113,330.23	
Various County Funds	17,413.32	
Various Road and Bridge account refunds..	423.36	
General Roads Fund account refunds.....	602.50	
Sale of Equipment	72.96	
Co. Warrant Book Sales	57.50	
Trans. Cont. Scrip Refunds	259.12	
Sale of Blue Prints, Maps, etc.	40.95	
		Total \$136,665.53
Expenditures		\$136,069.41
Roads and Bridges per statement	\$131,478.57	
General Equipment	710.99	
Office Equipment	228.27	
Transportation Scrip	91.25	
Guadalupe-Mora-Lane Refund	200.00	
Grant Co. Forest Refund	2,310.79	
General Roads Fund Refund	4.50	
Valencia Special Refund	602.50	
Add—		
Amount credited to Roads and Bridges on		
\$131,478.57 above	423.36	
Amount transferred to 1916 on \$131,478.57		
above	19.18	
Balance December 1st, 1915.....	\$	596.12*

\$ 8,478.45

	Year 1915	Year 1916
Auditor's Warrants, State Funds.....	\$113,330.23	\$5,836.61
Auditor's Warrants, County Funds.....	17,413.32	20,661.54
Sundry Roads and Bridge Account Refunds.....	423.36	489.90
General Roads Fund Account Refunds.....	602.50	206.68
Sale of Equipment.....	72.96	1,046.77
County Warrant Book Sales.....	57.50	187.10
Trans. Cont. Scrip Refunds.....	259.12	166.50
Sale of Blueprints, Maps, etc.....	40.95	15.60
Fortells on Plans and Specifications.....	.....	10.00
Use of Automobile.....		108.50
	<u>\$132,199.94</u>	<u>\$250,685.64</u>
		\$255,151.23

Expenditures.....	246,672.78
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Roads and Bridges, per Statement.....	\$131,478.57	\$105,946.07	\$237,424.64
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Roads and Bridges, per Statement.
General Equipment
Office Equipment
Transportation Scrip
Gundalupe-Mora-Lane Refund
Grant County First Account Refund
General Roads Fund Account
Valencia Special Office Exp.
County Warrant Books.....

Add—

Amounts credited to Roads and Bridges above,	
Amounts transferred to year 1916.....	
Amounts credited to Roads and Bridge direct,	

Deduct—
 Amount transferred from year 1915.....\$ 19.18
 Transportation Scrip used excess over purchase.. 187.15

Balance December 1, 1916.....

8.478.45

DISBURSING CLERK'S FINANCIAL STATEMENT

For the Period From December 1, 1914, to December 1, 1916.

Following is a statement by the Disbursing Clerk, of funds received and disbursed through the office of the State Engineer, for the fiscal periods December 1, 1914, to November 30, 1915, and December 1, 1915, to November 30, 1916.

The statement shows the source of funds, as "Auditor's Warrants," "Appropriation by Legislation," "Refunds," etc.

Auditor's warrants are warrants drawn by the State Auditor against funds accumulated in the State treasury by levy of taxes or otherwise placed there for uses of the office of the State Engineer. Such warrants are drawn by the Auditor to cover vouchers stating the amount needed and the purpose for which needed. These vouchers are prepared in this office and presented to the Auditor for payment.

Appropriation by Legislation is used where a stipulated amount is authorized by legislation for a certain purpose. These appropriations are only removed from the Treasury for that certain purpose, in such amounts as may be needed. They are drawn by voucher on the State Auditor.

Refunds are amounts received in refund of moneys expended from the fund in which they occur. Scrip Books are purchased for the transportation of field engineers, and a refund obtained at the time the book is finally consumed. Stationery, engineering materials, etc., purchased from one fund and occasionally used for funds is another source of small refunds.

GENERAL ROADS FUND.

Third Fiscal Year—

Bal. Dec. 1, 1914	\$ 4,465.59	
Auditor's Warrants	130,743.55	
Refunds	1,456.39	
Total, all sources	\$136,665.53	
Expended for roads as per vouchers on file	\$136,069.51	\$ 596.02
Balance, November 30, 1915.....		

Fourth Fiscal Year—

Balance—December 1, 1915.....	\$ 596.02	
Auditor's Warrants	117,477.25	
Refunds	1,181.91	
Total, all sources.....	\$119,264.18	
Expended for roads.....	\$110,785.73	\$8,478.45
Balance—November 30, 1916.....		



VALENCIA COUNTY.

State Road No. 1. Road condition found before road construction begun in Sections 1 to 4.



VALENCIA COUNTY.

State Road No. 6. Sec. 2. Abutment of abandoned railroad grade used for highway bridges. Span 32 feet.

1913 HIGHWAY BOND FUND.

This fund consists of \$500,000.00 on deposit in certain banks known to this department as bonded permanent depositories. The working account is supplied by funds drawn monthly from these depositories and transferred to the working account.

The expenditure of this fund when it became available through the sale of bonds, September 1, 1915:

Drafts on Depositories.....	\$385,000.00	
Refunds and Transfers.....	2,272.28	
	<u>\$387,272.28</u>	
Paid by vouchers.....		\$352,850.04
Balance in working account, November 30, 1916.....		\$ 34,422.24
Balance in permanent Depositories, November 30, 1916.....		115,000.00

IMPROVEMENT OF THE RIO GRANDE.

Balance from previous appropriation..	\$ 1,103.62	
February, 1915, appropriated by Legislature	22,745.56	
Donated by Counties.....	452.00	
Refunds	40.37	
	<u>Total funds available.....</u>	<u>\$ 24,341.55</u>
Expended by vouchers.....		\$ 23,098.42
Balance—November 30, 1916.....		\$ 1,243.13

STREAM GAGING FUND.

Balance December 1, 1914.....	\$ 376.41	
Annual appropriation	15,000.00	
Refunds	359.34	
	<u>Total available funds.....</u>	<u>\$ 15,735.75</u>
Expended by vouchers.....		\$ 14,687.31
Balance November 30, 1915.....		\$ 1,048.44
Balance December 1, 1915.....	\$ 1,048.44	
Appropriation	15,000.00	
Refunds	147.68	
	<u>Total funds.....</u>	<u>\$ 16,196.02</u>
Expended by vouchers.....		\$ 14,767.38
Balance November 30, 1916.....		\$ 1,428.64

STATE WELL DRILLING FUND.

Appropriation by Second Legislature..	\$ 15,000.00	
Refunds	2.20	
Total funds.....	\$ 15,002.20	
Paid by vouchers.....		\$ 9,639.96
Balance November 30, 1916—		
In bank		\$1,362.24
In treasury		4,000.00
		\$5,362.24
		116.63
		\$5,245.61
Paid by Auditor September 9, 1914, and December 1, 1914, Voucher No. 1..		

HYDROGRAPHIC SURVEY FUND.

Third Fiscal Year—		
December 1, 1914, balance.....	\$ 221.00	
Auditor's Warrants	3,500.00	
	\$ 3,721.00	
Paid by vouchers.....		\$ 3,134.37
Balance November 30, 1915.....		\$ 586.63
Fourth Fiscal Year—		
Balance December 1, 1915.....	\$ 586.63	
Auditor's Warrant	500.00	
Refund	11.25	
Total	\$ 1,097.88	
Paid by vouchers.....		\$ 1,074.50
Balance November 30, 1916.....		\$ 23.38

Further, in the refund items, are certain transfers from one fund to another, due to the fact that certain payments of discharge checks were made from one fund, and later the Disbursing Clerk learned that they should have been paid from another fund and a transfer was effected. This occurs only between the General Road Fund and the Highway Bond Fund swelling the refunds and also the disbursements an equal amount and not affecting the balances.

CONVICT CAMPS.

During the past two years two convict camps have been maintained, one in Sierra County during 1915 on State Road No. 1, and the other in Bernalillo County on State Road No. 1 between Albuquerque and Isleta. The Bernalillo camp was moved to Tijeras Canon Road No. 10 the latter part of 1915, and in February, 1916, the camp from Sierra County was consolidated with it. This was done owing to the scarcity

of prisoners for each camp, necessitating too high overhead expense. Since the consolidation of the camps the number of convicts furnished is hardly sufficient to keep this camp in full force as estimated upon.

With this camp are the mule teams purchased from Bernalillo County. During the year three of the mules died.

THE FEDERAL AID ACT.

The Congress of the United States during the Sixty-fourth Congress passed "An Act to provide that the United States shall aid the States in the construction of Rural Post Roads, and for other purposes," and was approved by the President, July 11, 1916. The bill provides for assisting the various States that have State Highway Commissions financially, in the construction of roads. Under the law certain rules and regulations have been laid down by the Secretary of Agriculture in order that the States may meet the requirements of the Act. Under letter of July 24, 1916, you assented to the provisions of this Act, which was required by law, and in my recommendation in this report to you, I wish to call your attention to the recommendation that assent must be made by the Legislature to receive the benefits of this Act. At the invitation of the Secretary of Agriculture, a conference of State Engineers and Highway Engineers was held at Washington, August 15-20, 1916, to discuss methods of carrying out the Act. I was present at this conference. Under the Act, there was apportioned to the State of New Mexico for the fiscal year ending June 30, 1917, by certificate of the Secretary of Agriculture under date of July 21, 1916, the sum of \$78,000, in round numbers. For the five-year period there would be apportioned to the State by June 1, 1921, the sum of \$1,170,000, in round numbers.

The plan of the State Highways of New Mexico has been forwarded to the Secretary for his approval, and upon his favorable action the various road projects may be taken up from time to time as finances will permit. The program for the five-year period submitted to him will require some new legislation and funds made available to meet the Federal assistance.

Five-Year Program, Under Federal Co-Operation.

The estimated cost for the system as outlined is \$5,469,250. If we deduct from this cost of work done to date, amounting to \$1,250,000, we have an estimated cost for work yet to be done of about \$4,250,000.

To meet this amount the State funds will net about \$800,000 in the next five years, based on the income from the present laws in effect and allowance made for some increase to the income as valuations in-

crease. The apportionment from the Federal Aid Bill will amount to \$1,170,000, which must be met with an equal amount of State funds. This means that we will have to increase our State income by \$370,000 during the next five years. This must be done by an increase in taxes, subscriptions, county donations or bond issues.

The Forest Service Fund for road work will approximate \$42,000 annually for the next five years, or \$210,000. In this manner we can raise an amount of money for carrying out the five-year program, as follows:

Federal Aid	\$1,170,000.00
State Money to Meet Federal Aid	1,170,000.00
Forest Apportionment (5 years)	210,000.00
Total.....	\$2,550,000.00

This total will still leave a balance of \$1,700,000 necessary to complete the work as outlined.

Under present conditions we will be able to raise only about \$800,000 by State taxes, leaving a balance of \$370,000 which must be raised if we take advantage of the Federal aid.

In other words, if we wish to complete during the next five years the present system of highways as outlined, the State must raise a total of \$2,070,000 in addition to her present sources of income for this purpose.

RECOMMENDATIONS.

In working convicts under the present law some needed legislation would make for economy and efficiency. The present law provides for the maintenance of the convicts out of the road fund. Under this law the State penitentiary gets the credit to that institution, the amount that would have to be paid by the penitentiary. I believe a law should be passed embodying authority for the Superintendent of the penitentiary to furnish convicts at the road work at a stated amount per day, the penitentiary authorities to care for, maintain and transport the convicts. The State road foreman would supervise their work during the working hours, with only authority to discharge and hire from the camps the convicts, as would be done on any other work. This would result in far more efficient work and economy. As it is now it hardly pays and many times it is questionable just what action to take when a convict is lazy, as it may cost the foreman ten to twenty dollars to get the convict back to the penitentiary.

I would recommend a tax on all horse-drawn vehicles. This tax



VALENCIA COUNTY.

State Surveyor's camp wagon on top of malpais between McCarthys and Horace.



VALENCIA COUNTY.

Old road over malpais between McCarthys and Horace.

might be graduated to tire widths to encourage wide tires. The law should become operative several years hence and should prohibit the use of narrow tires and the sale or manufacture within the state of narrow-tired wagons. This would not be a hardship either on the dealers or on the owners, should the law not go into effect in several years.

I would also suggest the repeal of the law giving half of the automobile license to the counties, as the distribution of this fund to the counties is small in many counties and is not used for a permanent system of road building, but more for repair and patch work. As the automobile is used so much for inter-county travel, the result from its expenditure on inter-county or State roads would have better results in opening up the State system.

I would also call your attention to the recommendations made in my First Report of the State Engineer, 1914, pages 28 to 30, which in substance should result in giving a State road law that will be much more efficient than the one under which we are at present operating. This suggestion as to change in the road law was presented in a bill to the last Legislature, but with the numerous changes made as it finally passed that body, it was so radically altered that it completely changed the intent of the bill.

Under the Federal Aid Act, entitled, "An Act to provide that the United States shall aid the States in the construction of Rural Post Roads, and for other purposes," before the State can receive the aid, the Legislature must assent to the Act. I recommend that this Act be assented to by the Legislature to receive the benefits that will result from this action. The Federal Bill is known as H. R. 7617, Sixty-fourth Congress, approved July 11, 1916.

The present law of this State relative to the construction of county bridges is unsatisfactory in so far as it relates to payments for the work. The law should be amended and provisions made so that counties can pay for the work immediately upon its completion.

As heretofore pointed out, the sum of \$2,000,000 is needed to complete the present system of State roads within the next five years, and take advantage of the Federal appropriation. On this account I would recommend a bond issue of \$2,000,000 to become effective at the earliest opportunity.

SANTA FE STREET PAVING.

Chapter 23 of the Laws of New Mexico, 1913, appropriated \$13,000 for the purpose of paving the streets on the east, south and west sides of the Capitol grounds and the street on the south side of the Old Palace Building in the City of Santa Fe, New Mexico.

Under authority conferred by this Act, the State Engineer decided to pave the street on the south side of the Old Palace with brick to conform with paving already laid in the central part of the city.

Plans for this work were prepared and work was done by the State Engineer, using convict labor wherever possible. A six-inch course of concrete was laid; on top of this a sand cushion of 1 1-2 inches in thickness and on top of the cushion was placed the brick surface. The concrete was mixed in the proportion of one part cement, three parts sand and six parts gravel.

Eighteen hundred and two square yards of paving were laid. Of this amount the City of Santa Fe paid for 315 1-2 yards at a cost of \$568. The total cost of the work was \$3,260.50.

The following table gives a statement of this fund and shows the balance now in the hands of the State Treasurer:

Appropriated by State	\$13,000.00
Paid out by State	2,692.50
Balance in Fund	\$10,307.50

DON GASPAR AVENUE PAVING

In the Fall of 1915 the City of Santa Fe, in conjunction with property owners abutting on the street, decided to pave Don Gaspar Avenue from San Francisco Street to the bridge over Santa Fe Creek. This work was turned over to the State Engineer, who carried out the work, using convicts wherever possible.

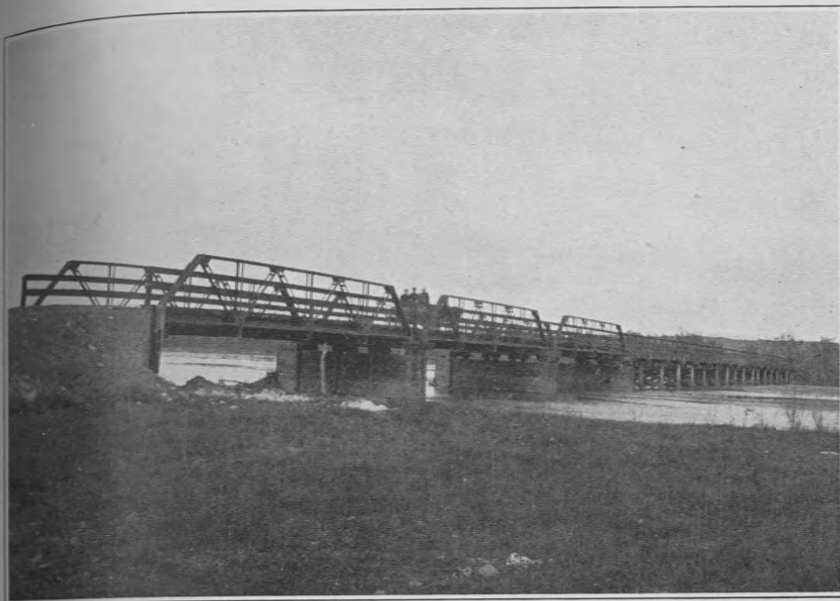
A one-course concrete pavement was laid. The paving has a thickness of six inches at the edge and seven and one-half inches at the center. Concrete was mixed in the proportion of one part cement, two parts clean sand and four parts screened gravel. Carey Elastite joints were placed at an angle of 70 degrees with the center line and spaced about thirty feet apart. The width varied from twenty-two feet to twenty-six feet. A longitudinal joint was used on the twenty-six foot width. At the intersection of Don Gaspar Avenue and Water Street a flat paving, thirty-eight feet in width, was constructed. This portion was reinforced with one-fourth inch round rods spaced twelve inches in each direction.

The surface was finished with a wood float.

The cost of this work was \$1.663 per square yard.

The City of Santa Fe and the property owners paid the entire cost.

Part II STATE ENGINEER



SOCORRO COUNTY.

State Road No. 9. Sec. 2. Bridge across the Rio Grande at Pueblito, four miles north of Socorro.



SOCORRO COUNTY.

State Highway No. 1. Sec. 9. Crossing Milligan Gulch, a 6 per cent grade, south of San Marcial.

State Engineer

IRRIGATION.

Filings.

The record of applications for permit to appropriate the public waters during the period December 1, 1914, to December 1, 1916, shows a total of 169 filed, of which twenty-three have been canceled. Out of the 146 still standing there are eighty-six pending, sixty having already been granted permit to construct their works and apply the water to a beneficial use towards completing their appropriations. Also, forty previously pending applications for permit have been approved.

Of the said 146 applications, 136 were filed for irrigation purposes, and in the event they are totally developed the cultivation of 100,938 acres will result. Their total appropriation calls for 621.68 cubic feet per second and 41,754.68 acre-feet of water. The other ten applications were filed for power purposes. They represent a total hydro-electric development of 56,675 horse-power, requiring, as estimated by the plans, the use of 1,576 cubic feet per second of water.

1907 to 1916.

The records of this office, since the initiation of the office in 1907, show filings totaling 290,676.15 acres proposed to be irrigated, which estimate their requirements at 1,904.91 cubic feet per second and 196,114.94 acre-feet of water. Of the said acreage, 66,477.19 acres have been granted licenses to appropriate an equivalent of 723.43 cubic feet per second of water for their cultivation, or an average duty of one cubic foot per second for each 91.89 acres irrigated on a basis of eight months' use per annum.

Lapsed Filings.

The records also show quite a number of filings having lapsed during previous administrations, without action being taken at the time of lapse. The majority were left of record without sufficient information to justify a subsequent administration in canceling them, which necessitated the procuring of evidence for the files to substantiate an adverse action. To date 160 such filings have been canceled, which represented an estimated total appropriation of 15,975 cubic feet per second of wa-

ter, enough, on the basis of the duty above given, to cultivate 1,467.94 acres of land. The said total reverted to the public, subject to appropriation for beneficial uses. This policy of keeping the records clear is being insisted upon, to the end that no material number of lapsed permits are allowed to remain of record to the detriment of the rights of the public or prospective appropriators in the natural waters within the limits of the State of New Mexico.

Irrigation Progress.

Irrigation progress has been marked of late, and the future is bright for the diversion of capital back into this line of investment. The projects of standing have all been looking closely to their rights, and in consequence the record shows quite a number of applications for extension of time, of which sixty-four completed the record in compliance with the law and regulations by being granted permits. All projects previously reported on have been active with the exception of the Fort Sumner project, this project being at a standstill awaiting the completion of the financing. The United States Rio Grande project has been the most active, the Elephant Butte dam having been completed and dedicated this last year. The other large projects deserving mention at this time are by the Springer Land & Irrigation Company, known as the Eagle's Nest project; the Board of Trustees of the Town of Las Vegas, or Las Vegas project; the Costilla Estates Dev. Co., or Costilla project; the Lake Charette Land & Irrigation Company, a Carey Act project, and the City of Raton, a municipal development. They all have been very active this last year along the lines of actual construction, and, it is believed, by the end of 1917, the works will all be complete to their ultimate development. From present indications the large body of arid State land in Taos county, under option originally to the Red River Land & Water Company, is now in line to become valuable as farming land. The interests of Guy S. Exon, applicant for the water appropriation, have taken over the project and are now making extensive surveys to complete the filing, to the end that they be allowed to start construction work in the near future.

Power Projects.

As previously stated, a number of the applications were filed for the development of hydro-electric power and for mining and milling purposes. The progress in this field has been very marked the last two years, projects for the total development of 56,675 horse-power having been filed on and are actively complying with the requirements of the office and the completion of financing.

Fees.

For the period from November 30, 1914, ending November 30, 1916, the accounting department shows the total water-right fees receipted for amounting to \$7,048.08, of which \$5,474.08 has been earned and deposited with the Treasurer for use in prosecuting hydrographic surveys (so badly needed in this State), \$277.57 unearned and \$1,296.43 refunded. In comparing the above receipts with the total receipts for the previous two-year period, which were above the average, you will note that the business of the water-right office has increased in the sum of \$458.37.

Protests and Hearings.

Testimony was taken in connection with the following cases called up on protest:

- Application No. 331. E. F. Shellabarger vs. H. Laumbach. Hearing held in Santa Fe.
- Application No. 883. J. O. Nabours vs. Fred Neighbauer. Hearing held in Carrizozo.
- Application No. 973. Kennedy and Waller vs. J. L. Johnson. Two hearings held in Alamogordo.
- Application No. 35. Bluewater Development Co. vs The Bluewater Users' Association. Hearing held in Bluewater.

Three other protests, one from the Pecos Valley and two from the Canadian drainage, are pending to be called for hearing sometime next month.

The rule requiring the protestant to deposit fees in advance sufficient to cover the costs and expenses incurred by the office for holding the hearing, has worked out satisfactorily, only one amendment being found necessary. In order to protect the protestant in making an advance deposit, the applicant is now required to file his affidavit guaranteeing the payment of the said costs and expenses in the event the protest is sustained.

Miscellaneous.

Besides the necessary detail to be closely followed in keeping the records required of this office in accordance with the law and the rules and regulations, quite a large correspondence taken care of, maps and plans and specifications checked for acceptance, blueprints and copies of all public records furnished upon request, filings of old appropriations accepted and filed for record, water meter reports checked and approved for the consideration of the County Commissioners and the usual other

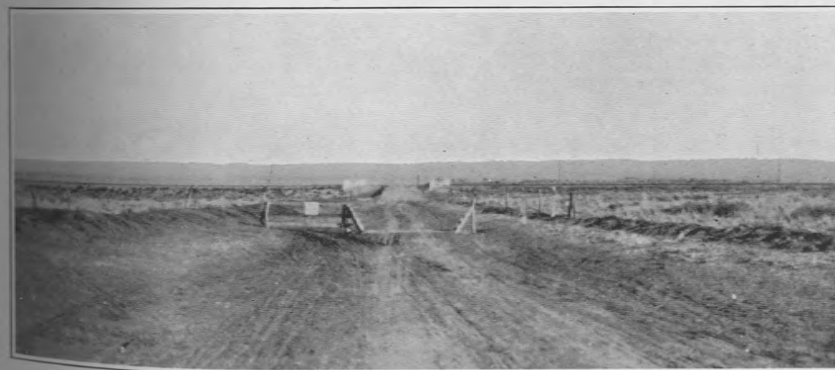
routine necessary in its administration, this office acts in an advisory capacity for the Board of Water Commissions and the Carey Act Land Board.

The work in this department has been in charge of Mr. A. S. Kirkpatrick.



SAN JUAN COUNTY.

State Road No. 32. Concrete floor on Knickerbocker arroyo. The road approaches and fills were not made when photo was taken.



GUADALUPE COUNTY.

State Road No. 19. Sec. 2. Through sand area, showing cattle-guard through fence crossing road.

STATEMENT OF IRRIGATION FEES.
Office of State Engineer. Period December 1, 1914, to December 1, 1916.

Earned Fees	Credits	Filing	Recording	Examination	Extension of Time	Certificate of Construction	License to Appropriately	Change Use	Blueprints	Copies	Miscellaneous
December 30, 1914.....\$ 140.65		\$ 67.00	\$ 31.75	.....	\$ 30.00	\$ 5.00	\$ 5.00	.....	\$ 1.00	\$.90	.....
End 1st quarter, 1915..... 630.20		293.25	70.25	40.00	120.00	35.00	25.00	5.00	1.00	40.70	.....
End 2d quarter, 1915..... 1,187.90		366.65	139.00	354.00	180.00	40.00	15.00	10.00	8.00	73.25	\$ 2.00
End 3d quarter, 1915..... 1,812.57		158.42	25.00	1.00	20.00	30.00	40.00	.....	24.00	14.15	.....
End 4th quarter, 1915..... 743.16		384.81	79.00	15.00	140.00	30.00	30.00	.....	42.00	22.35	.....
End 1st quarter, 1916..... 457.30		225.65	60.00	43.00	60.00	5.00	5.00	5.00	21.00	32.65	.....
End 2d quarter, 1916..... 1,032.40		568.30	108.00	275.00	10.00	25.00	25.00	.....	7.45	13.65	.....
End 3d quarter, 1916..... 324.90		136.20	62.00	3.00	50.00	30.00	20.00	.....	10.75	12.95	.....
Oct. and Nov., 1916..... 194.40		71.00	21.00	.....	20.00	30.00	35.00	.....	5.00	12.40	.....
Totals.....\$5,023.48		\$2,271.28	\$ 596.00	\$ 731.00	\$ 630.00	\$ 230.00	\$ 200.00	\$ 20.00	\$ 120.20	\$ 223.00	\$ 2.00

RECAPITULATION

December 1, 1914—Balance on hand in Bank:	
Advance fees	\$ 2,454.60
Earned fees	450.60
Received cash on fees, 12-1, 1914, to 12-1, 1916.....	
Total.....	\$ 9,953.28
Refund of advance fees.....	\$ 1,296.43
Paid expenses water right hearings from deposits	67.35
by protestants for that purpose.....	5,289.68
Paid earned fees to State Treasurer.....	
December 1, 1916—Balance on hand in Bank:	
Advance fees	\$ 3,115.42
Earned fees	184.40

RECOMMENDATIONS.

(Sec. 5671, 1915 Codification.)

Lack of Complete Records.

It has been found that the lack of complete records of actual users of the natural waters of this State is becoming serious. Numerous investors have been to this office with proposals for development, dependent on conclusive data as to the total amount of water being diverted and applied to a beneficial use from the stream or system in question. They procured from this office the data in detail from March 19, 1907, but any reliable information as to the actual use being made by appropriators initiating their claims prior to that date is impossible to be obtained from any records in the State. Of course, the law provides a means to the end by authorizing the making of hydrographic surveys and adjudication suits through the courts. Although this means is satisfactory when applied, it is too expensive a procedure to employ until a system is settled up, and invariably over-appropriated. The State is not and will not be for some time to come, financially able to appropriate sufficient funds to survey all the stream systems of the State. For example, the State never will feel justified in making a sufficient appropriation to fully survey the main Rio Grande and Pecos river drainage in New Mexico for adjudication. Federal aid will have to be called upon. What good is a decree based upon the doctrine of prior appropriation going to be on these streams unless the whole drainage is surveyed and all the users made parties? Even after the funds are available, a number of years will pass before the technical data can be procured for the courts.

Conflict Without Full Records.

The user under old rights and the future development of the State demands a remedy until such time as the rights have been adjudicated. Especially have the Spanish-American users been anxious to record their rights so as to be protected from future encroachments. As it is, the State Engineer, having no knowledge of their rights, may approve a subsequent application to appropriate water from a stream already totally appropriated by prior users not of record. In case of the Spanish-American user, he seldom sees the publication notices printed in connection with an application for permit, and, therefore, has been brought to realize that protection lies in having his rights properly of record.

The said demands will be served by adding the following amendment, in black-faced type, to Sec. 5671, 1915:

"Sec. 18. The State Engineer shall make rules and regulations and prescribe forms* for the filing of record rights acquired to the use of the natural waters of the state initiated prior to March 19th, 1907, and shall make hydrographic surveys and investigations of each stream system and source of water supply in the State, beginning with those most used for irrigation, and obtaining and recording all available data for the determination, development and adjudication, of water supply of the State—including the location and survey of suitable sites for dams and reservoirs and the determination of the approximate water supply, capacity and cost of each. He shall be authorized to co-operate with the agencies of the United States engaged in similar surveys and investigations, and in the construction, of works for the development and use of water supply of the State, expending for such purposes any moneys earned under the provisions of Section 5662, and any money available for the work of his office, and may accept and use in connection with the operations of his department the results of the agencies of the United States."

* Subject to the approval of the Board of Water Commissioners.

One regulation that ought to be established under such a law would be that the State Engineer should send an engineer from this office at State expense to locate accurately the point of diversion, measure the capacity of the ditch or ditches, and get such other technical data as could not be furnished by the party filing the rights of record. This would give an old right as valuable a standing of record as that of an applicant granted permit under the irrigation law. This system was employed by Wyoming in getting of record their old Territorial rights, and has proven very satisfactory; in fact, Wyoming enjoys the reputation of having settled the majority of State water appropriations without litigation.

(Section 5674. 1915 Codification.)

Under said section, when a suit is brought, as provided for through the courts, the attorneys often disagree as to the meaning of the provision:

"The costs of such suit shall include the fees of witnesses, the taking of depositions and the fees of the officers for serving the process and together with the costs on behalf of the State."

It has been held that the costs on behalf of the State include the cost and expenses of the hydrographic survey, but in the La Luz and Fresno case, now before the court, it was contended by counsel for the defendant that the sum of \$7,000 for the expense of the hydrographic survey should not be included and charged pro-rata, according to their construction of the law. This contention has held the case up for four years, and the State has not been getting the benefit of that amount,

which should have been refunded sometime ago for further investigation of the State's use of water by survey. Such a technicality should be remedied and is serious enough to require conclusive attention of the Legislature this coming session. The operation of the total provisions of the hydrographic survey act is and will continue to be retarded so long as there remains a question as to the construction of the statute on this point.

The following addition, in black-faced type, ought to clear up the question:

"The costs of such suit shall include the fees of witnesses, the taking of depositions and the fees of the officers for serving process and together with the expenses of the hydrographic survey and costs on behalf of the State."

Percolating and Spring Waters.

The few opinions and decrees that have been rendered on the subject of percolating and spring water as distinguished from natural waters, as described in the statute, are so conflicting that it is believed to be high time to furnish the future appropriator a true definition or basis by statute to work on. A number of cases before the State Board of Water Commissioners are pending, awaiting a decision of this question.

Assistant Engineer.

The water-right department of this office has grown and extended its operations according to authority given under the law, to such bounds that the need of an engineer is becoming serious. The appropriators in good faith are not getting the service necessary to the working out of the irrigation law in detail. For example, the parties who have been granted permits are now coming in rapidly with their final proofs, and asking for the inspection and report as provided and required by law, to the end that their final certificates and licenses may be granted. As it is, the office has to authorize some private engineer to make the inspection, oftentimes a party with very little idea of what is required by the law, who reports on the project and charges the applicant quite a sum for his services. It can be seen that the interests of the State cannot be wholly safeguarded by one paid by the party for whom the report is being made. The report has to be taken as the basis for issuing the license to appropriate the public waters of New Mexico, and the engineer making the report and inspection should be from the State Engineer's office as the law intended. There being no appropriation for such an engineer, the applicants cannot be held up on their licenses, so the inspection has to be made at the least cost to the appropriator by the safest means at hand.



SIERRA COUNTY.

State Road No. 1. Sec. 4. The Arrey bridge across the Rio Grande.



SIERRA COUNTY.

Type of mesa road constructed by a drag to make the rut. This type on flat mesas can be made for about \$5 per mile; does not require drainage.

Such an engineer would be subject, when not employed in the pursuit of his initial requirements, to the State Engineer's orders and, therefore, could be used for any work in his line, such as inspector on large construction works that might be a menace to public life and safety, if allowed to be put in improperly; one qualified to examine and pass on plans and specifications for storage dams and the like, and be subject to call at any time to report on the feasibility of sites for dams and reservoirs and the determination of the approximate water supply, capacity and cost of each, and such other duties as may require his supervision and inspection.

SANTA FE HYDROGRAPHIC SURVEY.

The field work of the Santa Fe Hydrographic Survey consisted in measuring the amount of land irrigated from the first land above Santa Fe to the last irrigated lands two miles below Agua Fria.

The actual field survey began September 22, 1913, and was completed September 7, 1914.

Eight triangulation stations were established, using the meridian established by the United States Government Survey engineers.

Transit lines were run from station No. 3 up Santa Fe Creek to Monument Rock, about seven miles, then from station 6 to station 4, and from station 6 down the Santa Fe Creek for about three miles.

There are forty-two topographic sheets outside the city limits, showing all land under irrigation and contours every five feet, and cover a total of 2,000 acres.

That inside the city limits was platted on detail paper taken from Norman King's map, and all irrigated tracts were measured with a tape.

There were thirty-eight irrigating ditches with weirs ranging from twelve inches to thirty-six inches. All were visited every day during the irrigation season of 1914. River stations numbers 2, 3A, 4, 5 and 6 were visited every day from December 1, 1913, to October 31, 1914. Weirs were used and ranged from four to six feet in width. Automatic gaging stations numbers 1, 1A, 3, 1B and 1C were flumes ranging from one foot to five feet in width and were maintained during two irrigation seasons, 1914 and 1915.

The field work is complete and the report is being assembled. Tracings of the topographic sheets are being made.

The survey was under the immediate direction of Mr. S. S. Carroll, Assistant Engineer.

It is estimated that the assembling of the report will be completed by January 1, 1917, and will immediately be filed with the Attorney General, with instructions to bring suit for adjudication of the stream system.

SANTA FE RIVER HYDROGRAPHIC SURVEY.

Cost of Project to December 1, 1916.

Paid from August 31 to December 1, 1913.....	\$ 1,748.43
Paid from December 1, 1913, to December 1, 1914..	5,782.13
Paid from December 1, 1914, to December 1, 1915..	1,391.67
Paid from December 1, 1915 to December 1, 1916..	592.79

Total..... \$ 9,515.02

CHICO RICO HYDROGRAPHIC SURVEY.

Field work started October, 1913, and completed November, 1914.

Report completed October 26, 1916.

Total drainage affected, about three hundred fifty square miles.

Total area mapped by survey, 5,840 acres, 3,280 acres of which is cultivated. Thirty-eight topographic sheets were made.

Gaging Stations Maintained.

A total of twenty-nine stream-gaging stations were maintained, the longest record being from October, 1913, to October, 1915, and the shortest from July, 1914, to October, 1914. At two of these stations rating flumes were maintained.

A total of twenty-six ditch-gaging stations were maintained through the irrigating season of 1914. Of these, one was a weir station, nine were rating flumes installed by the survey, six were old flumes rated by the survey, and ten were staff gages.

Reservoirs.

A total of thirty-nine reservoirs were measured, three for city water supply, twenty-four for irrigation, and twelve abandoned irrigation reservoirs.

One rain gage and one evaporation station were maintained from May 3, 1914, to November 12, 1914.

A total of 61.5 acres of city irrigation was measured.

CHICO RICO HYDROGRAPHIC SURVEY.

Cost of Project to December 1, 1916.

Paid September 30 to December 1, 1913.....	\$ 1,703.78
Paid December 1, 1913, to December 1, 1914.....	5,877.22
Paid December 1, 1914, to December 1, 1915.....	1,589.08
Paid December 1, 1915, to December 1, 1916.....	470.46

Total..... \$ 9,640.54

On October 27, 1916, the report of the Chico Rico Hydrographic Survey was filed with the Attorney General of New Mexico, with instructions to bring suit for adjudication of the rights of this stream system.

At the request of some of the ditch owners on the Rio Santa Cruz, Santa Fe, a preliminary investigation was made of this stream for a hydrographic survey during June, 1915. The report is contained in the files of the office and the investigation did not warrant the ordering of the survey at that time.

STATEMENT OF HYDROGRAPHIC SURVEYS.

Receipts and Disbursements Third and Fourth Fiscal Years December 1, 1914, to December 1, 1916.

Receipts.

Dec. 1, 1914, balance on hand in bank..	\$ 221.00
Received from State Auditor, 1915....	3,500.00
Received from State Auditor, 1916....	500.00
Total	\$ 4,221.00
Received for property sold to Rio Grande Improvement account....	11.25

\$4,232.25

Disbursements.

Paid on Chico Rico River Survey, 1915	\$ 1,589.08
Paid on Chico Rico River Survey, 1916	\$ 481.71
Less property sold.....	11.25

470.46

\$2,059.54

Paid on Santa Fe River Survey, 1915..	\$ 1,391.67	
Paid on Santa Fe River Survey, 1916..	592.79	1,984.46
Paid on Santa Cruz River Survey, 1915	153.62	
Paid on waters transferred to Rio Grande Improvement account.....	11.25	

\$4,208.87

December 1, 1916, balance on hand in bank	\$ 23.38
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STREAM GAGING.

The Stream Gaging work was carried on by authority of House Bill No. 77, approved June 8, 1912. At the beginning of the third fiscal year, *i. e.*, December 1, 1914, the co-operation with the United States Geological Survey was discontinued and this work was placed in charge of Assistant Engineer S. S. Carroll, who resigned July 8, 1916, and the Stream Gaging work was taken over by Robert L. Cooper, September 1, 1916.

During the two fiscal years, in addition to the Assistant Engineer in charge of the work, there were employed from three to five hydrographers and a stenographer or clerk.

For the calendar year, 1915, the run-off records for eighty stations were published. Some of these records were furnished by the State Engineer of Colorado, the United States Geological Survey, and the United States Reclamation Service. This report has been in the hands of the printer for some time. It is similar to the reports already published for 1911-1912, 1913 and 1914. Both proofs have been read and the book should be ready for distribution early in 1917.

There has been a great demand for these printed reports on Surface Water Supply of New Mexico, by engineers and experiment stations throughout the country, as well as by investors and promoters and others interested in the development of the irrigation and power resources of the state.

The report for the calendar year 1914 was printed early in 1915, and the report for 1916 is now being worked up and should be in the hands of the printer before March 1, 1917.

There has been a compilation of the run-off of all streams in New Mexico where there has been record kept by any competent authority for any period of time, from 1889 to 1915, inclusive, and this is now in the hands of the printer.

At the end of the fourth fiscal year, *i. e.*, December 1, 1916, we were maintaining sixty-five gaging stations on New Mexico streams and had five hydrographers in the field. The nature of the New Mexico streams is such that in order to make reliable estimates the relation of the gage height and discharge has to be established by frequent discharge measurements, and as our gaging stations are distributed all over the State and in some cases it is very expensive to reach them, we have our hydrographers assigned to districts so arranged as to facilitate travel.

For the amount of money appropriated, we have obtained very desirable results in our stream gaging work. We have a continual demand



ROOSEVELT COUNTY.

State Road No. 18. Sec. 1. Before construction; looking south.



ROOSEVELT COUNTY.

State Road No. 18. Sec. 1. Same locality as above photograph; looking north.

for the establishment of new stations, but cannot undertake any more such work with our present appropriation, which is hardly sufficient to enable us to visit the stations now being maintained as often as necessary.

I respectfully submit the following financial statement for the two fiscal years, which has been worked out in detail for the last fiscal year, showing the distribution of expenses.

STATEMENT OF STREAM GAGING FUND.

Receipts and Disbursements for the Third Fiscal Year
December 1, 1914, to November 30, 1915.

	Disbursements.	Receipts.
Balance on hand Dec. 1, 1914.....	\$ 376.41	
Annual appropriation	<u>15,000.00</u>	\$ 15,376.41
Refunds on railroad scrip books.....		<u>340.84</u>
Total credits		\$15,717.25
Less refunds		<u>340.84</u>
Paid on general stream gaging work	\$ 14,668.81	
Less refunds on railroad scrip books	<u>340.84</u>	
	\$ 14,327.97	
Balance on hand Dec. 1, 1915.....	\$ 1,048.44	
	<u>\$ 15,376.41</u>	\$15,376.41

Note: As published in 1915 Water Supply report.

STATEMENT OF STREAM GAGING FUND RECEIPTS AND DISBURSEMENTS

During the Fourth Fiscal Year, December 1, 1915, to December 1, 1916.

Receipts.

Dec. 1, 1915. Balance on hand in bank.....	\$ 1,048.44
Annual Appropriation	15,000.00
State Funds	16,048.44

Donation on Bluewater work	13.50
Refunds on R. R. scrip books.....	134.08

Total	\$16,196.02
Less refunds	134.08

Net receipts

\$16,061.94

Disbursements.

Paid on General Stream Gaging work	\$14,504.49
Less refunds on R. R. scrip.....	134.08

Net payments	\$14,370.41
Paid for reports on Rio Mimbres Irrigation Project to be refunded by Court order.....	262.89

Net payments

\$14,633.30

Dec. 1, 1916. Balance on hand in bank.....

\$ 1,428.64

Financial Statement for Period December 1st, 1915, to December 1st, 1916.

Hydrographers' salaries	\$ 4,606.94
Hydrographers' travel expense	3,627.95
Gage observers	2,900.70
Equipment	289.04
Maintenance of gaging stations	140.11
Office expense, forms, stationery, clerk and stenographer salaries, printing 1914 and 1915 reports, summary of Water Supply Records 1889-1915, and portion of First Report of State Engineer...	2,805.66
Report on Rio Mimbres Irrigation Project (Field and office expense) to be refunded by court order	262.89
Balance in fund Dec. 1st, 1916	1,428.64

Balance in fund Dec. 1st, 1915.....	
Appropriation, 1916	
Donation for Bluewater gage	

\$16,061.94

\$ 1,048.44
15,000.00
13.50

\$16,061.94

RECAPITULATION OF STREAM GAGING FUND.

Receipts and Disbursements During Third and Fourth Fiscal Years, December 1, 1914, to December 1, 1916.

Receipts.

Dec. 1, 1914—Balance on hand in bank..	\$ 376.41
Annual appropriation, 1915.....	15,000.00
Annual appropriation, 1916.....	15,000.00

Total State funds.....	\$ 30,376.41
Donation on Bluewater work.....	13.50
Refunds on railroad scrip books.....	474.92

Total receipts

\$30,864.83

Disbursements.

Paid on General Stream Gaging work, 1915	\$ 14,668.81
Less refunds on railroad scrip.....	340.84

Net expenditures, 1915.....

\$ 14,327.97

Paid on General Stream Gaging work, 1916	\$ 14,767.38
Less refunds on railroad scrip.....	134.08

Net expenditures, 1916.....

\$ 14,633.30

Total net expenditures, 1915 and 1916

\$ 28,961.27

Paid for railroad scrip afterwards refunded

474.92

Total payments

\$29,436.19

Dec. 1, 1916, balance on hand in bank....

\$ 1,428.64

RIO GRANDE IMPROVEMENT—1915.

Upon taking up this work on March 1, 1915, I found a balance of \$1,103.62 in the Rio Grande Improvement Fund from prior appropriations, of which \$379.59 should be spent in Sandoval County under the distribution provided for in Chapter 66, Session Laws of 1912.

After a preliminary study of conditions along the river, with a view to ascertaining what could be done practically with the funds available, I found the following to be the pertinent facts:

The Espanola Valley.

The Espanola Valley is considered here as that portion of the Rio Grande between Embudo and the Denver & Rio Grande Railroad bridge across the Rio Grande, below San Ildefonso, at the head of the cañon known as Buckman Cañon, which opens a little at Buckman for entering the White Rock Cañon. In this valley the Rio Grande has encroached upon some valuable agricultural land at several places. The encroachments upon the land in almost every instance have been caused by an acequia diversion uncontrolled, from the delta at the mouth of a tributary arroyo or from a kick-back caused by some artificial obstruction, such as bridges, piles of driftwood or protection dykes or jetties. In a few instances, however, the channel has been changed owing to heavy gravel bars formed during extreme high water.

In almost every case in the valley where the river is encroaching upon adjacent agricultural land, a study of conditions in the immediate vicinity of the encroachment shows that it is possible by channel direction and bank protection to remedy the condition. In a few instances the amount of work necessary is too expensive to undertake with our funds.

In general, throughout the Espanola Valley, it is possible to handle the river by correcting local conditions when sufficient funds become available. The amount of property involved is not of sufficient value to justify a detached preliminary survey with a view toward ultimately confining the river in a permanent flood channel forced by artificial control and bank protection to an alignment determined by such survey.

The Albuquerque Valley.

In this report what I designate as the Albuquerque Valley is the series of valleys lying between the mouth of White Rock Canon and San Marcial. Throughout this valley it is conservative to say that 75 per cent of the irrigable land is affected by water logging to some extent, and that 40 per cent is virtually unfitted for farming. It is stated by



SOCORRO COUNTY.

State Highway No. 1. Sec. 8. Six per cent grade into Nogal Canyon.



SOCORRO COUNTY.

State Road No. 1. Sec. 8. Gravel-surfaced ten-mile stretch south of San Antonio.

men living in the valley that in a great many places the river bottom is higher than the irrigable lands on either side, and we have a number of levels to show that this is probably true at a few points. In practically all cases the community acequias are in terraplain due to years of silt deposit and the fact that from year to year the acequias were not cleaned to the original bottom.

It has been claimed that silt deposits are raising the channel of the Rio Grande from year to year throughout this valley, but I seriously question this, and believe that the following is the general condition: The channel is now far wider than necessary for floods, in most places, and is composed of numerous high and low-water channels, the river wandering at will from channel to channel. These different channels have been originally caused, in almost every instance, by uncontrolled acequia diversions, or artificial obstructions, such as bridges or protection work, the river at flood stages having followed an acequia or been diverted by some obstruction into a new channel. And it is my opinion that as the river is at present, it scours and fills locally, straightening itself in one place to form a heavy bar in an old bend below, and that while it may appear to be filling in a certain stretch, it is probably scouring somewhere else, and that the general profile throughout the entire valley has not become materially higher since the settlement of the valley. It is, of course, a fact, that the community acequias, of which there are about ten to twenty times as many as a properly designed irrigation system for the valley would require, as well as the laterals, are becoming higher from year to year under the present method of silt disposition.

Owing primarily to the excessive number of community acequias in terraplain and the absolute lack of control at the diversion of such acequias, the water-logging is becoming worse from year to year. In my opinion it is vital to the welfare of one of the most thickly populated sections of the State, and what could be made one of the most prosperous farming sections in the West, that something be done toward a solution of the problem of control of floods on the Rio Grande, a properly designed irrigation system and drainage of the water-logged area. The first step necessary in the solution of this problem is a topographic survey of this valley, from which the amount of land which could be reclaimed and the probable value thereof determined, and the benefit thus obtained balanced against the estimated cost of the feasible method of controlling floods, draining the valley and taking care of the irrigation system.

Until such a survey has been made and a comprehensive plan worked out, all work done in this valley toward bank protection must necessarily be of a temporary nature, as it is impossible from local investigations to determine what nature of construction will act as permanent protection,

not knowing what is likely to happen above, *i. e.*, with reference to channel changes or protections or diversion work by private parties or communities.

I deem it advisable to call your attention to the fact that in several instances where we have had applications for bank protection the danger is caused by improperly placed and uncontrolled acequia diversions, or two or three acequia diversions where one should serve for all, and that it is impossible to build even temporary protection work without changing such diversions, and that under court interpretation of the irrigation law, and advice from the Attorney General, this office has no authority to make such changes or cause them to be made.

In view of the above facts, I have only attempted work where bridges, villages or valuable property of some extent were endangered, and such work was done with the idea of the most economical form of temporary protection practical with the funds available, designed upon all information obtainable as to the location of the channel, and the probable future changes thereof.

The Mesilla Valley.

In the Mesilla Valley, in the future it should not be necessary to protect against destructive floods, as the Elephant Butte dam should regulate the flow of the river, and any work that is done will be some sort of artificial contractors, built to prevent further encroachment or narrow and straighten channel, and any structures built should not be subjected to destruction by extreme high water and should in a few years become part of a permanent bank.

GENERAL.

All the work on the river is in the nature of bank protection, either to hold the present bank, or prevent further encroachment, by some sort of breakwater diverting new channels back into the main channel, as nearly as it can be determined; or dykes to prevent inundation of low ground.

In investigating the type of construction best fitted for these purposes, I find that there are several types which have been used advantageously, principal among which are the following:

1. Pile and brush breakwaters. These are built in three ways: First, the double row of piling spaced eight to ten feet center to center in rows, rows eight to ten feet apart, these piling wired together and filled with brush and rock or sod. Second, single row of piling, with barbed wire on both sides and brush planted between piles. Third, pile

or sod driven in bents 50 to 150 feet apart and brush fastened to a cable suspended between bents.

2. Pile and lumber jetties.
3. Brush and sod, or tierron jetties.
4. Breakwater built of brush and rock or brush and sod, with two or four strands of woven wire fencing spliced to run the full length of the structure, brush wired together in bundles and wire carried through to woven wire fencing.
5. Basket work of brush and rocks. (Indian.)

The pile and brush breakwaters of the double-row type have proven very successful when properly maintained, but they are difficult to maintain, and have to be refilled each year; the beaver along the river get into them and in some cases have destroyed some of the piling. The only one of these structures that has proven entirely satisfactory is the breakwater above Barelás bridge, near Albuquerque, and this has been maintained at considerable expense by the County Commissioners of Bernalillo County. The single row of piling with brush planted between piles appears to be one of the most satisfactory yet built. The brush takes root and unless the beaver destroy the piling before the silt becomes well deposited behind the breakwater, this structure should prove very permanent.

The jetties of types 2 or 3 are used for the purpose of holding the bank as it is, and have proven very satisfactory when enough are used to prevent a scour from the kick-back or eddy between jetties. This fact, that it requires so many jetties, makes this type of construction very expensive where there is any considerable length of bank endangered.

The bank protection of basket work of brush and rock (Indian), serves about the same purpose as the jetties, but is not continuous and is likely to break in places and would probably prove very satisfactory if used in connection with the jetties, being placed between jetties (which would prove very expensive).

The breakwater or bank protection built of brush tied in bundles laid in layers with woven wire fencing spliced to run entire length of structure and laid horizontally every two or three feet throughout the height of the structure, with wires from bundles carried through to the wire fencing, has so far proven to serve the same purpose as the double row of piling filled with brush, and though it is subject to the same criticism, that it has to be built up from year to year, and is expensive to maintain, this is counterbalanced by the fact that the first cost is less

than half that of the piling and brush, while the maintenance cost is about the same.

I respectfully submit a detailed report of the work that has been done in the various counties, as follows:

BERNALILLO COUNTY.

Preliminary Engineering.

This work was giving levels to the people of several precincts above old Albuquerque for the purpose of straightening out and cleaning an old drainage ditch, and the cost including transportation and personal expense was \$23.35.

Barelas Job.

This work consisted in extending the breakwater for the protection of the west end and approach of Barelas bridge an additional one hundred feet. This breakwater was built by the State in 1913, and has been maintained by the county commissioners, who extended it in 1914 and 1915, as shown in the accompanying plat. The pile driving on the hundred feet we built in 1915 was done by contract and the brush filling with paid labor.

The cost of the work was as follows:

Pile driving (contract)	\$456.00	
Labor (placing brush)	293.85	
Material	33.90	\$783.75
Engineering and Supervision, (including transportation and expenses)	205.58	
	\$989.33	

DONA ANA COUNTY.

Anthony Bridge Job.

This work was for the protection to the west approach of the Anthony bridge, and consisted of twelve bents of three 30-foot piles each, bents about one hundred and fifty feet apart, and cable with brush fastened to it suspended between bents. This work was done under contract by the Dona Ana County Road Board, and cost as follows:

Contract	\$499.68
Engineering	10.00
	\$509.68



MORA COUNTY.

State Road No. 30. Sec. 3. Near top of divide between Mora and Taos counties.



COLFAX COUNTY.

State Road No. 1. Sec. 2. Rock-surfaced road south of Raton. Completed December 1916.

Hill Job.

This consisted of about one thousand feet of bank protection on the east bank of the river, forcing the present channel back into the old channel against the hills on the west. This was brush and rock of type 4, and cost as follows:

Labor	\$ 737.50
Material	138.93
	\$ 876.42
Engineering and supervision, (including transportation and expenses)	151.88
	1028.31

RIO ARRIBA COUNTY.

Preliminary Engineering. See page 14.

La Villita Job.

The work at La Villita consisted in turning the channel from the east bank back into the old channel on the west. The channel along the east bank was annually destroying many acres of valuable agricultural land belonging to the people of La Villita. This dyke was built just below the mouth of the large sand arroyo above La Villita and was of type 4. This dyke was 620 feet long, average height four feet, width twelve to fourteen feet, and cost as follows:

Labor	\$465.21
Material	49.00
	\$514.21
Engineering and Supervision	73.01
	\$587.22

Espanola Job.

The general location of the breakwaters at Espanola is shown on map accompanying this report. The first work done at Espanola was refilling the upper breakwater originally built by the State with brush and rock. Later the bank washed out at the upper end of this breakwater and a portion of the breakwater went out, primarily owing to beaver having damaged some of the pilings. The breakwater was extended 290 feet at upper end with cedar brush, rock and wire fencing, type 4, and another dyke of the same type was built about a mile above, length 578 feet, average height 12 feet. The Denver & Rio Grande Railroad Company furnished a work train and hauled all brush and rock to points on their right of way opposite the dykes for both the extension of old breakwater and the new breakwater. The people of Espanola donated: cash, \$452.00; and labor, \$43.62.

The cost of this work (not including donated labor) was as follows:

Labor	\$1,960.52	
Material	118.02	
Engineering and Supervision	225.12	\$2,078.54
	<u>\$2,303.66</u>	

Santa Clara Job.

The land across the river from the Santa Clara pueblo has been washing away for years; there are several places where the owners have been forced to abandon their old homes and move back onto the higher land. After conferring with the Indian Service Engineer it was decided to try to force the channel back into the old original channel, the Indians to protect on the west side and the State work to be done on the east bank. The location of the dykes built by the State is shown on the map accompanying this report. Of the two main dykes the upper one was 220 feet long and 8 feet high and the lower one 680 feet long and 9 feet high. These dykes were of willow brush and rock, type 4, height six feet, and cost as follows:

Labor	\$1,117.02	
Material	69.99	
Engineering and Supervision	183.19	\$1,187.01
	<u>\$1,370.20</u>	

Donated Labor—\$32.50.

Hobart Job.

At Hobart, on the west side of the river, opposite the old Hobart place, there were several pieces of valuable alfalfa and orchard land which were being gradually destroyed by the river, owing to a big bend formed after a big flood several years ago. The native people living on these places have spent considerable money and labor to hold the banks, but failed. The breakwater built to divert the channel back to its original location was 844 feet long, of willow brush and rock, type 4, average six feet, and cost as follows:

Labor	\$640.57	
Material	81.02	\$721.59
Engineering and Supervision	244.71	
	<u>\$946.30</u>	

Donated Labor—\$15.14.

SANDOVAL COUNTY.

The only place in Sandoval County where we have had an application for work is just above Pueblito, the summer pueblo of the Santa Ana Indians. This is on the east bank of the river, and the condition at this point is shown on map accompanying this report. The United States Indian Service talked with this office in regard to co-operation in work here. The best plan here is the entire channel diversion (considered), as shown on map; but this plan was very expensive and did not meet with favor with the Indian Service. The Indian Service is now building several jetties of piling and lumber, as shown on accompanying map, and we have made arrangements with the contractor, Mr. Charles M. Boren, to supplement their work with two additional jetties at \$187.48 each.

The land affected is Indian land, and the only object the State could have in doing work here is to protect the Bernalillo Ditch, which is endangered at one point, as shown on map.

The work done here has been in the nature of preliminary engineering, and cost \$48.87.

SANTA FE COUNTY.

Preliminary Engineering.

On the representations of a petition for the people living on the east side of the river from Round Mountain to the head of the Buckman Cañon, I made an investigation of the conditions existing there, and find that there is considerable damage being done. It will be a bigger job than we have funds for at present; the bank will have to be protected in long stretches, and the Rio Pojaque will have to have extensive training works at its mouth.

The cost of this investigation was \$30.52.

Pajarito Job.

The work at Pajarito consisted of bank protection with brush and wire mats, and the repair and extension of an old dyke of logs and rock originally built by Miss Clara D. True. This extension was of willow brush and rock, type 4. All the work at Pajarito was on the west bank of the river, and cost as follows:

Labor	\$544.08	
Material	60.00	\$604.08
Engineering and Supervision	35.86	
	<u>\$639.94</u>	

SOCORRO COUNTY.

There have been no applications for protection so far in Socorro County, and there has been no work done in this county. However, we paid for a pair of nippers for pile-driving hammer, which were purchased for a pile driver used in this county when the work was done under the old appropriation.

The cost of these nippers was \$30.

VALENCIA COUNTY.**Bosque Job.**

This consisted in building a dyke for the protection of some meadow lands in the Bosque ranch from inundation. This dyke was on the east side of the river and cost as follows:

Labor	\$45.71	
Supervision	4.20	
		\$49.91

Peralta Job.

The work here consisted in refilling the old pile and brush breakwaters built by the State in 1913 and hire of a watchman during extreme high water. The cost of the work here was:

Labor	\$ 79.68	
Material	20.25	\$99.93
Engineering and Supervision	7.50	
		\$107.43

Los Lentos Job.

For several years the river has been working in a bend toward the west, originally caused by the diversion of the Southwestern Farms Company Ditch, and has at times inundated portions of the settlement of Los Lentos. The people of Los Lentos have spent considerable money and labor on a protection dyke and some pile and sod jetties. This dyke has served the purpose very well, but is now being threatened at several points by the water bank having caved clear back to the inner toe of the dyke. The original plan here was to build a breakwater of type 4, some distance above, throwing the current to the east bank and entirely away from the moon, or bend, which is causing the trouble; but this plan was abandoned on account of high water and the work done consisted in building several sod and brush jetties to hold the bank

**SOCORRO COUNTY.**

State Road No. 1. Sec. 9. North side of Nogal Canyon.

**SIERRA COUNTY.**

State Road No. 1. Sec. 5. Graveled-surface road leading from the Arrey bridge.

as it is for the time being. It is planned to build the proposed channel diversion this winter or spring. The cost of the emergency work done here was as follows:

Labor	\$655.72	
Material	16.45	\$672.17
Engineering and Supervision	132.47	
	\$804.64	

Donated Labor—\$4.85.

Valencia Job.

The danger point here was at the head of the St. Francis ditch, on the east bank of the river, opposite to and down stream from the Southwestern headgate. The bend here was of recent formation and we asked the St. Francis Ditch people to change their diversion to a point about a quarter of a mile above. They did this work and we furnished the grades for them. We built an earth dyke 1100 feet long, 10 feet wide on top, inner slope 2 to 1, outer slope $1\frac{1}{2}$ to 1, the inner slope protected by a double layer of willow brush tied in bundles fastened to woven wire fencing running the entire length of the dyke. But before this work was entirely completed an unforeseen and complete channel change caused by the formation of a gravel bar, threw the main current directly at the lower end of the dyke, which gave way from the foundation and most of the dyke was lost. Some money was spent endeavoring to fill the first break, but to no avail. It is now planned to build a pile and brush breakwater at this point, with a single row of piling, type 1. The cost of the work here was:

Labor	\$ 935.85	
Material	162.30	
Engineering and supervision.....	162.56	\$1,098.15.
	\$1,260.71	

La Constancia Headgate.

The headgate of the Constancia Ditch below the Valencia dyke, and on the same side of the river, was built by the Constancia Ditch people on our design to protect Road No. 1 from inundation and possibly destruction. The cost of designing and locating this structure was \$18.78.

Sausal Job.

At Sausal, above Belen, on the west bank of the river at the head of the Los Garcias ditch, the river has been working in the bend toward the old channel that lies to the west of the present channel, and runs

toward Belen, on the east side of the tracks of the Rio Grande Division of the Atchison, Topeka & Santa Fe Railway Company. The State built several double rows of piling breakwaters, type 1, at the lower end of the big bend to prevent further encroachment, in 1913, which have never been properly filled or maintained by the people and are now virtually destroyed. Later the people of Sausal and Valencia County Commissioners built a sod dyke above, with the intent of taking advantage of a seeming pocket to silt up the bend, which held for two years, but went out in 1915, owing to the diversion of the Los Garcia ditch, which went right through the east end of the dyke. We are now working on two brush and sod breakwaters at this point, with the intention of throwing the head of the Garcia ditch to the east of a small wooded gravel bar on the east of the big bend and the west of the main channel, hoping in this manner to silt up the big bend. Some money was spent at Sausal to attempt to save the old dyke, and the entire cost of all the work at Sausal to November 30, 1915, was as follows:

Labor	\$ 432.21
Engineering and supervision.....	45.25
	\$ 477.46

This work was still in process of construction November 30, 1915.

Preliminary Engineering.

There has been considerable work in the nature of studies of the general location of the channel through Valencia County, with a view to the proper location of such breakwaters as are attempted, and this study has cost \$78.32.

RIO ARRIBA COUNTY.

(*See Page 8.)

Preliminary Engineering.

This was an investigation of conditions on both banks of the river, above and below Espanola, before any construction was attempted, and cost \$51.50.

Office Expense.

The entire office expense on this work has been \$640.22. This includes salaries and stationery and all office charges.



COLFAX COUNTY.

State Road No. 1. Sec. 1. On the Camino Real; Scenic Highway near New Mexico-Colorado line.



DONA ANA COUNTY.

State Road No. 1. Sec. 4. Reinforced concrete girder bridge across Dona Ana Canal, on the Camino Real at Hill.

GENERAL FINANCIAL STATEMENT.

Labor (paid)	\$ 8,863.60	
Labor (donated)	96.11	
	<u>\$ 8,959.71</u>	
Material	779.86	\$ 9,739.57
Engineering and supervision.....	1,461.33	
Office expense	640.22	
Preliminary engineering	251.34	
	<u>\$ 12,092.46</u>	
Total spent	96.11	
Deduct donated labor.....		
Cash spent (Mar. 1 to Nov. 30, 1915) ..	\$ 11,996.35	
Deduct cash donated.....	452.00	
Spent from Legislative Appropriation..	\$ 11,544.35	
Balance from 1912 and 1913 appropria		\$ 1,103.62
tions		22,745.56
1915 appropriation		<u> </u>
Available for work, Nov. 30, 1915.....	\$ 12,304.83	
	<u>\$ 23,849.18</u>	\$ 23,849.18

RIO GRANDE IMPROVEMENT—1916.

Upon taking up the work March 1, 1915, I found a balance of \$1,103.62 in the Rio Grande Improvement Fund from prior appropriations, of which \$379.59 should be spent in Sandoval County under the distribution provided for in Chapter 66, Session Laws of 1912. This balance was divided as follows:

In hands of Treasurer.....	\$ 134.33
In banks, subject to check.....	959.29
	<u>\$1,103.62</u>

The appropriation made by the 1915 law was for \$22,745.56, making a total of State funds available of \$23,849.18.

The work done in Sandoval County in 1915 and 1916 amounts to more than \$379.59, due that county under the 1912 law, as will be shown in financial statement accompanying this report.

In the report submitted November 30, 1915, I went into a detailed description of conditions prevailing in the Rio Grande Valley from the mouth of the big canyon ending at Embudo, to El Paso, and the types of protection best adapted to the varying conditions from an economic standpoint, and in this report only desire to call your attention to two things which I deem vital in the successful improvement of drainage and high water conditions along the Rio Grande.

That portion of the Rio Grande Valley from Pena Blanca, at the mouth of White Rock Canyon, to San Marcial, will eventually be a marsh if something is not done toward the solution of the problem of control, i. e., straightening, narrowing and deepening the channel of the Rio Grande—a properly designed irrigation system and drainage.

The conditions are too well known, and have been discussed by drainage and soil experts in various bulletins to sufficient extent as not to warrant any discussion here.

As will be shown in financial statement, there was a balance in this fund November 30, 1916, of \$1,243.13 for emergency work this coming spring, some of which will be spent in Sandoval County strengthening work on Silo dyke built by the State in 1913.

The following is a brief summary of work done during the two years ending November 30, 1916:

BERNALILLO COUNTY.

Barelas Job.

Extending breakwater for protection west end of Barelas bridge a distance of 100 feet. This breakwater was extended again in the spring of 1916, by Bernalillo County. This is a double row of piling filled with brush wired together. Cost as follows:

(1915)—	
Pile driving (contract).....	\$ 456.00
Labor (placing brush).....	293.85
Material	33.90
	\$ 783.75
Engineering and supervision.....	205.58
Total.....	\$ 989.33

Alameda Job.

This work was extending the pile breakwater built by Bernalillo County for the protection of the west approach of the Alameda bridge a distance of 200 feet and consisted in driving fifty 30-foot piling in two rows, ten feet apart, piling eight feet center to center in rows, and filling the space between rows with willow brush in bundles all wired together with hog wire laid longitudinally. This work cost as follows: (1916)—

STATE ENGINEER NEW MEXICO

Pile driving (contract).....	\$ 600.00
Labor (placing brush).....	161.72
Material (piles and wire, etc.).....	433.30
	\$1,195.02
Engineering and supervision.....	140.94
Total.....	\$1,335.96

Preliminary Engineering (1915).

Giving levels to people of several precincts above Old Albuquerque, west of river, for cleaning and strengthening old drainage ditch.

Cost	\$23.35
------------	---------

DONA ANA COUNTY.

Anthony Bridge Job.

Breakwater about 1,800 feet long for protection of west approach of Anthony bridge, built under contract with Dona Ana County Road Board.

(1915) Cost—	
Contract	\$ 499.68
Engineering	10.00
Total.....	\$ 509.68

Hill Job.

Bank protection of brush and wire and rock about 1,000 feet long on east bank of river, near Hill station.

(1915) Cost—	
Labor	\$ 737.50
Material	138.93
	\$ 876.43
Engineering and supervision.....	151.88
	\$1,028.31

RIO ARRIBA COUNTY.

Preliminary Engineering (1915).

Investigation of river from Prince Station, Denver & Rio Grande, to water tank above Buckman.

Cost	\$51.50
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La Villita Job.

A 620-foot dyke of brush, wire and rock above settlement of La Villita, east bank of Rio Grande.

(1915) Cost—	
Labor	\$ 465.21
Material	49.00
	\$ 514.21
Engineering and supervision.....	73.01
	\$ 587.22
(1916) Repair—	
Labor	\$ 31.98
Supervision	30.00
	\$ 61.98
Total, both years.....	\$ 649.20

Espanola Job.

Repairing breakwaters above Espanola originally built by State and building new one of brush, rock and wire, above all three on west bank.

(1915) Cost—	
Labor	\$1,960.52
Material	118.02
	\$2,078.54
Engineering and supervision.....	225.12
	\$2,303.66
(1916) Repair, refilling and raising—	
Labor	\$ 457.27
Material	22.35
	\$ 479.62
Engineering and supervision.....	91.51
	\$ 571.13
Total, 1915 and 1916.....	\$2,874.79

Santa Clara Job.

Three brush, wire and rock dykes on east bank of Rio Grande, opposite Santa Clara pueblo.

(1915) Cost—	\$1,117.02
Labor	69.99
Material	
	\$1,187.01
Engineering and supervision.....	183.19
	\$1,370.20
(1916) Repair, refilling and raising—	\$ 501.91
Labor	4.80
Material	
	\$ 506.71
Engineering and supervision.....	98.24
	\$ 604.95
Total, 1915 and 1916.....	\$1,975.15

Hobart Job.

Brush, rock and wire dyke, 844 feet long, on west bank of river, near Hobart station on the Denver & Rio Grande.

(1915) Cost—	\$ 640.57
Labor	81.02
Material	
	\$ 721.59
Engineering and supervision.....	224.71
	\$ 946.30
Total.....	

SANDOVAL COUNTY.

(1915) Preliminary engineering, Santa Ana job.....	\$48.87
--	---------

Santa Ana Job.

Two pile and lumber jetties on east bank, above Pueblito, summer pueblo of Santa Ana Indians, above and supplemental to jetties built by United States Indian service for protection of Bernalillo ditch.

(1916) Cost—	\$ 374.96
Labor (contract)	15.58
Engineering and supervision.....	
	\$ 390.54
Total, 1915 and 1916.....	\$ 439.41

Note: Balance due Sandoval County in 1914 under 1912 law was \$379.59.

SANTA FE COUNTY.**Preliminary Engineering.**

Investigation of conditions on east bank of Rio Grande from Round Mountain to Buckman. Petition. Found work necessary, but funds insufficient.

Cost\$ 30.52

Pajarito Job.

Repair and extension of dyke for Miss True, and bank protection with brush mats.

(1915) Cost—	
Labor	\$ 544.08
Material	60.00
	\$ 604.08
Engineering and supervision.....	35.86
	\$ 639.94
(1916) Repair Cost—	
Labor	\$ 17.63
Total, 1915 and 1916.....	\$ 657.57

SOCORRO COUNTY.

Nippers for pile driver borrowed in 1912 or 1913 for work in this county.

(1915) Cost—
Material\$ 30.00

San Marcial Dike Repair.

(1916) Cost—	
Labor	\$ 225.00
Supervision	30.00
Total.....	\$ 255.00

Preliminary Engineering (San Marcial Bridge).

Investigation of needed protection for Santa Fe bridge, account of danger caused by new wagon bridge.

(1916) Cost\$ 12.10

**SANTA FE COUNTY.**

State Road No. 8. Sec. 2. Tesuque Hill on road leading north toward Taos. Grade completed ready for crowning.

**SANTA FE COUNTY.**

State Road No. 1. Sec. 6. Showing old road on top of mesa east of La Bajada Hill.

(1916)	Repair Cost—	
	Labor	\$ 544.08
	Material	60.00
		\$ 604.08
	Engineering and supervision.....	35.86
		\$ 639.9

VALENCIA COUNTY.

Bosque Job.

Dike on east bank of Rio Grande for protection of meadow lands on the Bosque Ranch.

(1915)	Cost—	
	Labor	\$ 45.71
	Supervision	4.20
	Total.....	\$ 49.91

Peralta Job.

Refilling old pile breakwaters built by State in 1913 and hire of watchman during extreme high water.

(1915)	Cost—	
	Labor	\$ 79.68
	Material	20.25
		\$ 99.93
	Engineering and supervision.....	7.50
		\$ 107.43

Refilling old breakwaters and building new double row of piling and brush breakwater two hundred feet long and with fifty piling, twenty-five in each row.

(1916)	Cost—	
	Labor (pile driving—contract).....	\$ 600.00
	Labor (placing brush).....	241.67
	Material (piles, wire, etc.).....	437.81
		\$1,279.48
	Engineering and supervision.....	125.32
		\$1,404.80
	Total, 1915 and 1916.....	\$1,512.23

Los Lentes Job.

Sod and brush jetties for bank protection.

(1915) Cost—	
Labor	\$ 655.72
Material	16.45
	\$ 672.17
Engineering and supervision.....	132.47
	\$ 804.64

Building main channel diversion, brush and sod dike on west bank of Rio Grande, and brush and sod jetties.

(1916) Cost—	
Labor	\$ 517.97
Material	80.94
	\$ 598.91
Engineering and supervision.....	111.69
	\$ 710.60
Total, 1915 and 1916.....	\$1,515.24

Valencia Job.

Dike 1,100 feet long on east bank of Rio Grande opposite Valencia Church, rip-rapped with brush, and furnishing grades for changing diversions of St. Francis ditch.

(1915) Cost—	
Labor	\$ 935.85
Material	162.30
	\$1,098.15
Engineering and supervision.....	162.56
	\$1,260.71

Driving one hundred piling in a single row and wiring and placing brush; also building several sod and brush jetties and repairing old jetties above Los Lunas bridge on east bank.

(1916) Cost—	
Labor (pile driving—contract).....	\$1,200.00
Labor, placing brush and building jetties.....	572.20
Material (piles, wire, etc.).....	715.86
	\$2,488.06
Engineering and supervision.....	466.39
	\$2,954.45
Total, 1915 and 1916.....	\$4,215.16

Sausal Job.

Repair on old sod dike and starting new dike of brush, wire and sod.

(1915) Cost—	
Labor	\$ 432.21
Engineering and supervision.....	45.25
	\$ 477.46

Finishing main dike of brush, wire and sod, 103 feet long, average width nineteen feet on bottom and ten feet on top, repairing same after first high water, and building new diversion for Los Garcias ditch.

(1916) Cost—	
Labor (contract—excavation and cleaning new diversion for Los Garcias ditch).....	\$ 426.40
Labor (building dike and auxiliary).....	801.64
Material (wire, etc.).....	188.21
	\$1,416.25
Engineering and supervision.....	253.99
	\$1,670.24

Total, 1915 and 1916.....\$2,147.70

Acequia Media.

Engineering for headgate.

(1916) Cost	\$ 8.73
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La Constancia Headgate.

Engineering for headgate.

(1915) Cost	\$ 18.78
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Preliminary Engineering.

Study of conditions affecting bank protection.

(1915) Cost	\$ 78.32
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Office Expense.

(1915) The office expense for 1915 was.....	\$ 640.22
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(1916) The office expense, including salaries, stationery, supplies, telephone and telegraph charges for 1916, i. e., from Nov. 30, 1915, to Nov. 30, 1916, was....	\$1,063.59
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Total, 1915 and 1916.....\$1,703.81

The cost of the Espanola job (Rio Arriba County), as will be noted, was \$2,874.79 for the two years, but the net cost to the State was \$2,422.79, as the people of Espanola donated \$452 in cash for this work in 1915, as shown in financial statement.

During the two years there was donated labor as follows:

Donated Labor.

(1915)	Espanola job	\$ 43.62
	Santa Clara job.....	32.50
	Hobart job	15.14
	Los Lentes job (Valencia County).....	4.85
		\$ 96.11
(1916)	Espanola job	\$ 6.39
	Pajarito job	20.00
	Total for two fiscal years.....	\$ 122.50

In addition to the above, the Denver & Rio Grande Railroad Company furnished a work train and crew for several days in 1915 on the Espanola job, Rio Arriba County, for hauling brush and rock. Desiderio Sanches did considerable work on the Sausal dike in 1915 and 1916, of which we have no record, and the people of Los Lunas did some work on the Los Lunas jetties. The people living on the east side of the Rio Grande below Espanola built several auxiliary brush and rock jetties between the two main Santa Clara dikes.

The improvement work on the Rio Grande has been under the immediate charge of Mr. Robert Cooper, Assistant Engineer, during the past two years.

RECOMMENDATIONS.

I wish to respectfully again call your attention to the deplorable condition of the Rio Grande Valley between White Rock Cañon and San Marcial; that is, the gradual and universal destruction of the farming communities by the elevation of the water horizon due from the gradual elevation of the river bed. Some thirty or more years ago there was begun an era of immense diversion of the Rio Grande in Colorado, approximating a million and a half acre-feet annually. These diversions have unquestionably brought about the radical physical changes so noticeable. Formerly, with the constant supply of water from the Colorado stream, the river bed was either in a process of scouring out the silt or at an equilibrium, where now, with the depleted water supply,



MORA COUNTY.

State Road No. 21. Sec. 3. Concrete reinforced girder across Cebolla creek.



MORA COUNTY.

State Road No. 21. Sec. 2. Gravel surface road across low ground, east of Mora, on the Camino real.

the river bed is gradually filling with silt, raising the bed above the surrounding plain and consequent elevation of the water plain. To correct this condition, that is, to reclaim the water-logged lands, a system of drainage is necessary. To do this is a big financial undertaking.

Very little is known at this time just what is needed, and before a problem of this kind is undertaken, sufficient surveys should be made in detail to find out what we have to plan further for construction, if found to be feasible. For many years the various communities have been holding meetings to discuss these drainage problems.

Recently at Albuquerque a meeting was arranged by the State Engineer between Mr. A. P. Davis, Director and Chief Engineer of the United States Reclamation Service, and some seventy or more farmers and landholders resident in the valley. Mr. Davis gave some excellent advice in how to proceed and how to arrange for assistance from the Federal Government. As the meeting was more or less semi-confidential, the detail of the discussion will not be gone into here. To me it seems the solution of the problem is co-operation with the Reclamation Service, and I wish strongly to recommend to you the re-introduction of House Bill No. 383, Second Legislature, which passed the House and was recommended favorably by the Senate Committee. It failed of passage owing to the rush during the last few days of the session. Since the meeting with Mr. Davis, I wish to make recommendation as to certain changes which have an important bearing upon anticipated Federal co-operation.

Under the Rio Grande Improvement work, which has been carried on satisfactorily for years past, I wish to request the passage of a bill similar to S. B. No. 27, approved February 26, 1915, appropriating funds available for the improvements of the Rio Grande.

GENERAL FINANCIAL STATEMENT.

Labor—1915	\$ 8,862.60
Labor—1916	6,730.25
Material—1915	779.84
Material—1916	1,883.27
	\$ 18,257.96
Engineering and supervision—1915.....	\$ 1,461.23
Engineering and supervision—1916.....	1,372.20
	\$ 2,833.72
Preliminary engineering—1915.....	\$ 251.24
Preliminary engineering—1916.....	12.10
	\$ 263.44
Office expense—1915.....	\$ 640.22
Office expense—1916.....	1,063.59
	\$ 1,703.81
Total two fiscal years.....	\$ 23,058.05
Balance 1912 and 1913 appropriations.....	\$ 1,103.62
Donated (cash), people of Espanola.....	452.00
1915 appropriations	22,745.56
	\$ 24,301.18
Available for work, Nov. 30, 1916.....	\$ 1,243.12
	\$ 24,301.18

STATEMENT OF RIO GRANDE IMPROVEMENT ACCOUNT
FOR THIRD FISCAL YEAR.

(State Engineer's Office, Santa Fe, N. M., December 1, 1915.)

Receipts

Balance forwarded from 1912 and 1913 appropriations.....	\$ 969.29
Received from State Auditor.....	134.33
Total forwarded from 1912 and 1913 appropriations.....	\$ 1,103.62
Received from State Auditor from 1915 appropriations.....	\$ 15,000.00
Total received on State appropriations.....	\$ 16,103.62
Received cash donations.....	\$ 395.00
Received cash donations.....	57.00
	452.00
Total funds received.....	\$ 16,555.62
Refunds and transfer entries.....	\$ 106.41
	\$ 16,662.03

Disbursements

(Net Amounts Paid.)

Bernalillo County—		
Preliminary engineering	\$ 23.35	
Barelas job	989.33	\$ 1,012.68
Dona Ana County—		
Hill job	\$ 1,028.31	
Anthony bridge job.....	509.68	\$ 1,537.99
Office expense		640.22
Rio Arriba County—		
Preliminary engineering	\$ 51.50	
Espanola job	2,303.66	
Hobart job	946.30	
Santa Clara job.....	1,370.20	
Villita job	587.22	\$ 5,258.88
Sandoval County—		
Preliminary engineering		\$ 48.87
Santa Fe County—		
Preliminary engineering	\$ 30.52	
Pajarito job	639.94	\$ 670.46
Socorro County—		
Preliminary engineering		\$ 30.00
Valencia County—		
Preliminary engineering	\$ 78.32	
Bosque job	49.91	
Constancia ditch headgate job.....	18.78	
Los Lentos job.....	804.64	
Peralta job	107.43	
Sausal job	477.46	
Valencia job	1,260.71	\$ 2,797.25
Net paid on improvement work.....		\$ 11,996.35
Refunds and transfer entries.....		106.41
Total as per Fund Account.....		\$ 12,102.76
Balance on hand in Bank, Dec. 1, 1915.....		4,559.27
		\$ 16,662.03

RECAPITULATION OF RIO GRANDE IMPROVEMENT FUND 1914-1915.

Balance of 1912 and 1913 appropriations on hand	
Dec. 1, 1914.....	\$ 1,103.62
1915 appropriation	22,745.56
Total State funds.....	\$ 23,849.18
Private cash donations.....	452.00
Total of all funds.....	\$ 24,301.18
Net amount paid during third fiscal year for work	\$ 11,996.35
Amount available during fourth fiscal year.....	\$ 12,304.83
December 1, 1915, balance on hand in bank.....	\$ 4,559.27
Balance of appropriation available Dec. 1, 1915....	7,745.56
Total funds available Dec. 1, 1915.....	\$ 12,304.83



CURRY COUNTY.

State Road No. 19. Sec. 3. Hard-pan natural surface, after sand is cleared away.



CURRY COUNTY.

State Road No. 19. Sec. 2. Surfaced road through sand east of Melrose, showing different treatment upon road above, and a few miles apart.

STATEMENT OF RIO GRANDE IMPROVEMENT FUND

For the Fourth Fiscal Year, Dec. 1, 1915, to Dec. 1, 1916.

Receipts.

Dec. 1, 1915, balance on hand in bank..	\$ 4,559.27	
Received from State Auditor on 1915 appropriation	\$ 7,745.56	
Total.....		\$ 12,304.83

Disbursements.

Bernalillo County—		
Alameda job	\$ 1,335.96	
Rio Arriba County—		
Espanola job	\$ 571.13	
Santa Clara job.....	604.95	
Villita job	61.98	
		\$ 1,238.06
Sandoval County—		
Pueblita job	.35	
Pueblita job	390.19	
		\$ 390.54
Santa Fe County—		
Pajarito job		\$ 17.63
Socorro County—		
San Marcial bridge job.....	\$ 12.10	
San Marcial dike job.....	255.00	
		\$ 267.10
Valencia County—		
Acequia Media job.....	\$ 8.73	
Los Lentes job.....	710.60	
Peralta job	1,404.80	
Sausal job	1,670.24	
Valencia job	2,954.45	
		\$ 6,748.82
Office expense	\$ 1,063.59	
Total payments		\$ 11,061.70
Dec. 1, 1916, balace on hand in bank..		\$ 1,243.12

RECAPITULATION OF STATEMENT OF RIO GRANDE IMPROVEMENT FUND ACCOUNT

For Third and Fourth Fiscal Years, Dec. 1, 1914, to Dec. 1, 1916.

Receipts.

Dec. 1, 1914, balance on hand in bank from 1912-1913 appropriation.....	\$ 969.29
Received from State Auditor balance 1912 and 1913 appropriation.....	134.33
Received from State Auditor 1915 ap- propriation	22,745.56
Received cash donations.....	452.00
Received refund on railroad scrip book	33.33

\$ 24,334.51

Disbursements.

Bernalillo County—		
1915.....	\$1,012.68	
1916.....	1,335.96	
		\$ 2,348.64
Dona Ana County—		
1915.....	\$1,537.99	\$ 1,537.99
Rio Arriba County—		
1915.....	\$5,258.88	
1916.....	1,238.06	
		\$ 6,496.94
Sandoval County—		
1915.....	\$ 48.87	
1916.....	390.54	
		\$ 439.41
Santa Fe County—		
1915.....	\$ 670.46	
1916.....	17.63	
		\$ 688.09
Socorro County—		
1915.....	\$ 30.00	
1916.....	267.10	
		\$ 297.10
Valencia County—		
1915.....	\$2,797.25	
1916.....	\$6,748.82	
		\$ 9,546.07
Office Expense—		
1915.....	\$ 640.22	
1916.....	1,063.59	



TORRANCE COUNTY.

State Well No. 1. Location, Sec. 8, T. 8, N. R. 13 E.
Depth of well 804 feet; completed and tested
May 3, 1917, supplying nine gallons per minute.

Total net payments.....	\$ 1,703.81	
Paid for railroad scrip, afterwards refunded	\$ 23,058.05	
	\$ 33.33	
Total payments		\$ 23,091.38
Dec. 1, 1916, balance on hand in bank..		\$ 1,243.13

WELLS ON STATE LANDS.

After advertising for bids a contract was signed June 26, 1915, for drilling three wells on State lands in Torrance and San Miguel Counties. These wells were designated as Well No. 1, Well No. 2 and Well No. 3, and were to be located in T. 8 N. R. 13 E., T. 8 N. R. 14 E., and T. 10 N. R. 12 E., respectively. Well No. 1 and Well No. 2 were to be each 500 feet deep and Well No. 3 was to be 800 feet deep.

Well No. 2.

This well was located September 6, 1915, and is in Section 8 T. 8 N. R. 14 E. It is 532 feet deep and has no water. It was finished on January 5, 1916. The last thirty-two feet was drilled under a supplemental contract under date of November 27, 1915.

We could go no deeper in this well, as the hole was too small to case with 5-inch inserted casing, the original contract only calling for a 500-foot well with a diameter of five inches at the bottom.

Well No. 1.

This well was located January 6, 1916, and is in Section 8, T. 8 N. R. 13 E., and was finished June 26, 1916. It is between 610 and 620 feet deep and is cased from top to bottom with 6 5/8-inch standard casing. In the bailer test it ran ten gallons per minute, but under a pump it is flowing about one to one and one-half gallons per minute.

Well No. 3.

This well is 1,280 feet deep and is not cased. It was tested for twelve hours at fifteen gallons per minute, November 17, 1916.

The logs for all three wells are contained in detailed reports for each well.

The following is the cost of each well, together with office expense incidental thereto, which have been apportioned among the three.

A contract has been let for drilling Well No. 4, which is located in Township 9 North, Range 11 East, and the contractor has commenced drilling on this well.

Well No. 1.

Contract, engineering and supervision.....	\$2,512.48
Office expenses and geologist's report (pro rata).....	74.25
Total.....	\$2,586.73

Well No. 2.

Contract, engineering and supervision.....	\$1,525.42
Office expenses and geologist's report (pro rata).....	45.00
Total.....	\$1,570.50

Well No. 3.

Contract, engineering and supervision.....	\$5,431.54
Office expenses and geologist's report (pro rata).....	160.52
Total.....	\$5,592.06

The above work was carried on under authority of Chapter 85, Session Laws of 1913 (H. substitute for H. B. No. 254), approved March 14, 1913—Section 5262 Codification 1915.

The supervision of work was under the immediate direction of Mr. Robert L. Cooper, Assistant Engineer.

WATER DEVELOPMENT ON STATE LAND.

An interesting example of what water development will accomplish in the general development and material advancement of the State is found on lands owned by the State in Torrance County, leased for grazing purposes by Capt. Charles L. Ballard and known as the Ballard lease. This lease comprises 86,000 acres, and prior to an exploration for water carried out by the State Engineer's department, the land was found practically valueless. The rainfall was not sufficient for farming without irrigation, and there was no surface water either for irrigation or livestock. The lessee had expended considerable amounts in drilling for water for his stock and sunk three wells to an average depth of five hundred feet without success. Thus the land was useless to the lessee and its value to the State was low. After an investigation the Engineering Department concluded that water would be encountered at greater depths and three test wells were sunk, under the provisions of the special appropriation for that purpose. These wells vary in depth from 700 to 1250 feet and in each one a flow of good water was developed, ranging from ten to twenty gallons per minute.

With this water supply available the State Land Department has been able to perfect a very satisfactory lease from the standpoint of the



SAN MIGUEL COUNTY.

State Well No. 3, in San Miguel County. Sec. 32, T. 10, N. R. 12 E., 1280 feet deep; tested November 17, 1916. Flow fifteen gallons per minute.

State and to develop a revenue from land which promised theretofore to remain idle on the State's hands. The lessee is now grazing approximately 3,000 head of cattle on the land and has range capacity for approximately 6,000 sheep. The lessee has equipped these wells with both gasoline engines and windmills and has demonstrated that windmills may be used successfully for raising water from great depths. The net result of the drilling of these test wells has been to increase the grazing area of the State by the acreage of this lease, and to add very materially to the value of the land.

STATEMENT OF STATE WELL FUND RECEIPTS AND DISBURSEMENTS

Third and Fourth Fiscal Years, Dec. 1, 1915, to Dec. 1, 1916.

Receipts.

Amount of Voucher No. 1, paid by State Auditor Sept. 9, 1914.....	\$ 92.50	
Amount of Voucher No. 1 paid by State Auditor Dec. 1, 1914.....	24.15	
Received from State Auditor.....	11,000.00	
Total receipts.....		\$ 11,116.65

Disbursements.

On Well No. 1, total cost.....	\$ 2,586.83	
On Well No. 2, total cost.....	1,570.50	
On Well No. 3, total cost.....	5,592.08	
On Well No. 4, total cost.....	5.00	
Total disbursements.....		\$ 9,754.41
Dec. 1, 1916, balance on hand in bank..		\$ 1,362.24
Funds available for fifth fiscal year—		
Balance in bank.....	\$1,362.24	
Balance in hands of Treasurer....	3,883.35	
	<u>\$5,245.59</u>	

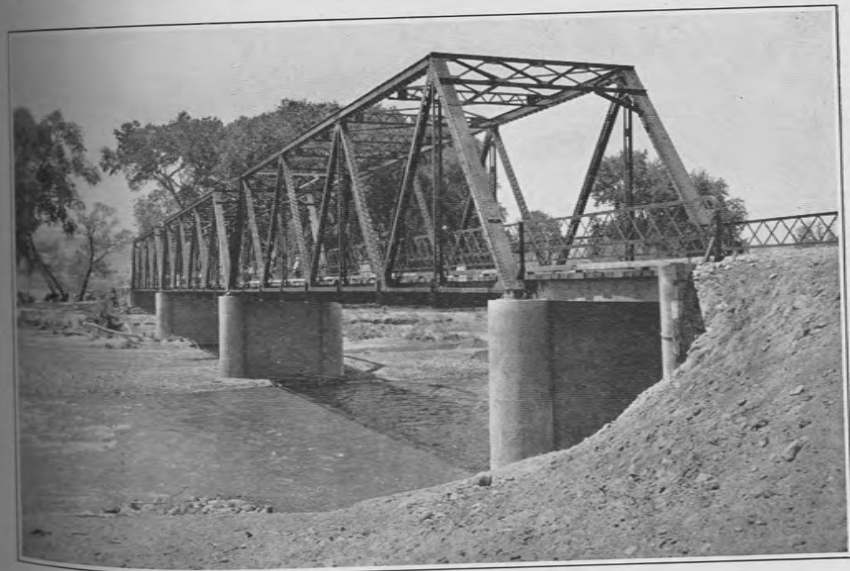
STATEMENT OF DISBURSEMENTS FROM STATE WELL FUND.

Well No. 1—		
Paid in 1915.....	\$ 13.40	
Paid in 1916.....	2,499.18	
		\$2,512.58
Well No. 2—		
Paid in 1915.....	1,310.50	
Paid in 1916.....	214.92	
		\$1,525.42
Well No. 3—		
Paid in 1916.....		\$5,431.56
Well No. 4—		
Paid in 1916.....		5.00
General Expense—		
Paid in 1915.....	33.20	
Paid in 1916.....	130.00	
		\$ 163.20
Expense of Geologist—		
In 1914	\$ 92.50	
	24.15	
		\$ 116.65
Total net expenditures.....		\$9,754.41



GRANT COUNTY.

State Road No. 42. Sec. 1. Grade 5 1-2 per cent. Burro mountains in the distance.



GRANT COUNTY.

State Road No. 11. Sec. 2. Bridge across the Gila on the Silver City-Mogollon road.
Three 112-foot spans.

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