

LINES OF COMMUNICATION BETWEEN COLORADO AND
 NEW MEXICO.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

Reports on lines of communication between Colorado and New Mexico.

MARCH 9, 1878.—Referred to the Committee on Appropriations and ordered to be printed.

WAR DEPARTMENT,
 March 8, 1878.

The Secretary of War has the honor to transmit to the House of Representatives copies of report on existing and required lines of communication between Southern Colorado and Northern New Mexico, with maps; also, report and maps of the San Juan reconnoissance in 1877.

The commanding general Department of the Missouri forwards these papers with the following remarks:

Garland will undoubtedly be the shipping point, for some years, of all freight destined for Southwestern Colorado, Eastern Arizona, and the whole of New Mexico, excepting only the posts of Union and Stanton; freight rates from Garland, as will be seen, being much below any others offered.

From Garland depart three routes for this service—one to San Juan country, one to the posts in Arizona, including Fort Wingate, New Mexico, and one via Santa Fé to the Lower Rio Grande.

The amount required on each of these roads to make good roads, and thereby still further cheapen freights and facilitate communication, is as follows, viz:

To San Juan country and site of the military post in that region, to which	
Fort Garland is to be transferred	\$11,517 00
To Fort Wingate and posts in Arizona north of Gila River	2,485 00
To Santa Fé	10,000 00
Total	24,002 00

With this small amount these roads can be put in excellent condition; and there is no doubt that the whole sum will be repaid twice over in a few years by reduction of freight-rates. I respectfully ask that the Secretary of War ask a special appropriation for this work, of the amount specified, the work to be done under the charge of Lieutenant Ruffner, chief engineer of this department. The sooner it can be done, the better for the government and all concerned.

The great importance of the roads in the settlement and development of the regions which they traverse need not be set forth. It will suffice to say that in my opinion every interest of the government in that section of country will be greatly benefited at very small expense in this direction.

2 COMMUNICATION BETWEEN COLORADO AND NEW MEXICO.

The General of the Army approves this recommendation, and says:

The completion of the railroad across the Sangre de Cristo Mountains into the valley of the Rio Grande opens up a most interesting and extensive new country. Twenty-four thousand dollars could not be better expended than on the roads herein described, and Captain Ruffner is peculiarly qualified for the work.

An appropriation of \$24,000 for this work is accordingly recommended.

GEO. W. McCRARY,
Secretary of War.

The SPEAKER
of the House of Representatives.

COPIES OF REPORTS ON EXISTING AND REQUIRED LINES OF COMMUNICATION BETWEEN SOUTHERN COLORADO AND NORTHERN NEW MEXICO, WITH MAPS. ALSO, REPORT AND MAP OF THE SAN JUAN RECONNAISSANCE, 1877.

Official copies.

E. D. TOWNSEND,
Adjutant-General.

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE,
Washington, March 6, 1878.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF ENGINEER,
Fort Leavenworth, Kans., January 31, 1878.

SIR: Since writing to you under date of January 11, 1878, relative to existing and required lines of communication between Southern Colorado and Northern New Mexico, the contracts for wagon-transportation from the railroad termini in Colorado to points in New Mexico and Arizona have been let for the present year, and these contracts show a saving in actual cost to the government in favor of Garland, Colo., over El Moro, per 100 pounds for the whole distance, of 22 cents to 59 cents for the Southern New Mexico posts, of 21 cents for Camp Apache, Ariz., and for Fort Wingate the bids are 2 cents greater. The total amount of freight transported annually to these posts is nearly 2,000,000 pounds. The government is therefore already benefited by the extension of the railroad to Garland during the past year at least \$2,000, and at most \$12,000; probably about \$6,000. Rates to Wingate and Camp Apache, in Arizona, are somewhat improved, and will be more so in case the improvements recommended in my paper are made.

Inasmuch as it is now settled that Garland will be the shipping point to posts in Southern and West New Mexico, Eastern Arizona, and as the populated districts in the San Juan region require additional military protection, and therefore facility of communication, a general summary of the needs may be given thus:

Santa Fé and thence to Southern New Mexico:		
Improvement of existing road (estimate).....		\$10,340
In case Army-ration may be sold to laborers	\$6,900	
Southwest to Fort Wingate and Arizona:		
Improvement of road from Puerco Station to Chama Crossing..	1,482	1,485
Survey of line down the Puerco River to Rio Grande.....	1,000	1,000

West of San Juan country:

Proposed Chama-Navajo road (estimate).....		\$9,775
In case Army-ration may be sold to laborers.....	\$6,517	
For general use in roads in Southwest Colorado and Northern New Mexico		5,000
In case Army-ration may be sold to laborers	3,500	
Total	19,402	27,600

The needs for these various items have been fully set forth in the previous portions of the report.

The especial value of the first item is manifest when greater freighting is expected to be done over the line.

The call for the Chama-Navajo line is apparent when it is known that its construction will save 37.3 miles to a district that is constantly urging the propriety of building a military post in that vicinity.

The table of population here offered has just been prepared, and throws additional light on this matter. The towns in italics are concerned in the construction of this road.

MAIN POPULATED DISTRICTS, 1877.

	Population.
Conejos and neighboring plazas (Mexican)	2,390
Tierra Amarilla plazas (American, 50; Mexican, 800).....	850
<i>Settlers on Rio de Lospinos</i>	80
<i>Animas City and vicinity</i>	450
<i>Parrott City</i> (registered voters 61)	125
<i>Hermosa</i>	60
<i>Silverton</i> (registered voters 250)	700
<i>Adjoining mining camps</i> (registered voters 150).....	400
Lake City (registered voters 800)	2,000
Adjoining mining camps and towns.....	700
Ouray	700
Adjoining mining camps.....	300
Del Norte (registered voters 500).....	1,500
The Summit	125

I am, sir, very respectfully, your obedient servant,

E. H. RUFFNER,
First Lieutenant Engineers.

The ASSISTANT ADJUTANT-GENERAL,
Department of the Missouri.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF ENGINEER,
Fort Leavenworth, Kans., January 11, 1878.

SIR: I have the honor to forward herewith a report on lines of communication between Northern New Mexico and Southern Colorado, accompanied by a map. This report has been prepared in obedience to verbal instructions of the department commander.

Very respectfully, your obedient servant,

E. H. RUFFNER,
First Lieutenant Engineers.

The ASSISTANT ADJUTANT-GENERAL,
Department of the Missouri.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF ENGINEER,
Fort Leavenworth, Kans., January 9, 1878.

SIR: I had the honor to render you a report under date of January 28, 1876, on lines of communication between Southern Colorado and Northern New Mexico.

This report was published, together with the map also submitted at the same time, as Ex. Doc. No. 172, Forty-fourth Congress, first session.

Since that time the railroad extensions, foretold in that paper, have been made and the reasons there given for asking for appropriations to complete and construct certain military wagon-roads still remain and are more permanent.

With a view of refreshing your memory upon this subject and to describe the present state of these lines of communication and the needs of new ones, I now submit a report upon this subject and a map showing the country and roads in question.

The present railroad termini are El Moro, near Trinidad, and Garland City, near Fort Garland, all in Colorado.

From these two points I will describe the

EXISTING LINES OF COMMUNICATION.

From El Moro to the south the conditions are favorable to freighting. The grades are very good with the exception of the passage of the Raton Mountains, which now, in the long, easy slope of the customary route, present no serious obstacle.

The grass and water are ample in quantity and good in quality. Delays occur frequently from incidents of the weather—unusual snows at times, heavy rains in the rainy season, or protracted drought at other periods. Still, these delays do not seriously embarrass trade nor extend over many days at a time. The altitude of the highest point, the Raton Pass, is not great enough to make any practical difference in winter or early spring between this and other portions of the road; and in fact the uniformly high altitude of the whole area in question renders the climate more dependent upon this condition than on the element of latitude, and if the route is in good condition in one portion it is apt to be so in all. In the rainy season storms sometimes cause the streams to rise so as to be impassable, but this is exceptional, and the delay is rarely more than a day or two, or long enough for the water to run out. The most important of these streams are bridged. A daily line of stages runs from Pueblo and West Las Animas, joining at Trinidad, via Fort Union and Las Vegas, to Santa Fé.

From south point Sangre de Cristo range to the Rio Grande.—The next section of the route to be described is that embracing the various roads passing from the east slope of the mountains to the valley of the Rio Grande. Of these, the most northerly is that up the valley of the Pecos River, and thence, via Santa Fé, to Peña Blanca, on the Rio Grande.

The most southerly pass is via Anton Chico and the cañon Blanco to Albuquerque, and is, perhaps, thirty miles farther south. The character of the country now becomes different from that previously encountered. The smooth roads of the prairie are replaced by rocky hills at times, and at others sandstone strata nearly horizontal in position make the road difficult and the grass scanty. The cañons and sandy or gravelly ridges of the elevated plateau upon which Santa Fé is situated are succeeded by the sandy valley of the Rio Grande, and throughout the whole region the abundant grasses of the eastern front of the mountains

are succeeded by a scanty growth, which a delayed rainy season will almost cause to disappear. In the cañons of the more northerly route the snows of a late spring sometimes cover the grazing pastures to such an extent that the starving cattle of the freight-trains, dependent entirely upon this fortuitous grazing, can hardly drag light loads over the heavy roads. Although the main chain of lofty mountains abruptly breaks down in the vicinity of Santa Fé, still the plateau itself maintains its high altitude, and is nowhere lower than 6,000 feet, continuing in a southwest direction until south of Albuquerque, when high mountains again appear. Isolated masses like the Placeres and the Sandia Mountains form obstacles which are avoided only by following down the cañons which seam their sides. From this plateau to the valley of the Rio Grande, by all the routes, necessitates a descent of 1,500 feet in from ten to eighteen miles. The greater portion of this fall is by one road concentrated in one tremendous hill at La Bajada. The ascent to this plateau from the east is fortunately more gradual, and from Anton Chico, which has about the same elevation as the Rio Grande at Peña Blanca, from thirty to forty miles may be given as occupied in the rise. The valley of the Rio Grande is fortunate only in the abundance of good water. The universal occupation of tillable ground by a crowded population allows no pasturage that is not already overstocked, and the sandy mesas furnish a scant substitute, which is only too kindly described as "poor." The roads are good in some places, but are more often sandy. The only route, however, in which the valley of the Rio Grande is followed for any distance is in going from Santa Fé via Algodones and Albuquerque, where twenty-three miles are located in the valley.

From the Rio Grande to Fort Wingate.—From the Rio Grande to Fort Wingate two routes are followed: the lower, via Albuquerque, one hundred and twenty-four miles; the upper, to the west from Peña Blanca, one hundred and fifty miles.

The latter, passing through the rolling foot-hills of the Valles and Jemez Mountains, and across the shattered remnants of the extremity of the lava-field of the Rio Grande, is tedious with sand, and broken with low gravel-hills as far as the Jemez River, at San Ysidro. Scanty grass is the rule, and there is no water between the Rio Grande and the Jemez.

After leaving this portion the road improves, and, although rolling and broken, the lava formation of the first few miles no longer appears, and the absence is not a loss.

At the Rio Puerco the new or proposed route comes in from the north, and from this point to Fort Wingate the two coincide. Water can be found every twelve to eighteen miles; the grazing improves in quality and quantity as one goes farther west; and the road is fair—never very good, never very bad—with sand and clay. The lower route meets the same obstacle after crossing the Rio Grande. Heavy sand-hills and a desolate rolling country separate the dry bed of the Puerco from the Great River of the North. Upon reaching the bed of the San José a good road is met. Gypsum disappears, muddy pools become a running stream, and there are agricultural spots. At Blue Water, thirty-eight miles to the east of Fort Wingate, the other route is joined. These two lines deviate from a direct line in order to pass the imposing mass of Mount Taylor, and one passes to the north as much as the other to the south. This huge peak rears its lofty form, superb in grandeur and regal in its isolation. Scarred volcanic rocks drift down its sides and are lost in its vastness. Its huge base of thirty miles in length and fifteen in width forms a worthy foundation to the structure, piercing to the skies. Easily seen from Santa Fé, one hundred miles to the east, it

is the monarch of these desolate, weather-worn, and wasted lands. Sandstone mesas, water-washed, reach out from the mountain's skirts and repel approach.

Over both routes freighting can be done, and easily; but the difference between the "plains" and these barren mesa-lands, with their scattered pools of water and scant grass, is very great. Over the upper road a regular mail-route has recently been established, a buckboard going twice a week from Santa Fé to Fort Wingate and returning.

Although freighting and, indeed, communication of every kind has heretofore passed from the east to Fort Wingate by the route just described, almost exclusively, still it is not the only way in which it might be done. In lieu of making the detour around the Santa Fé end of the mountains, they may be crossed to the north and the road correspondingly shortened. As will be shown, there was good reason why this was avoided until very recently, and for further reasons it will always be accompanied with objections unless natural obstacles are converted into aids.

By Fort Garland and the west of the mountains to Santa Fé.—Wagon communication between Pueblo and Santa Fé, by the western side of the Sangre de Cristo range, has been possible for many years. It has always been very difficult until recently; but with the completion of the military road from Santa Fé to Taos, a great improvement has been made.

The recent extension of the Denver and Rio Grande Railroad to Garland City has materially altered freighting conditions, as will be shown hereafter.

From Fort Garland to the west and north, through the San Luis Park, fifty-five miles of natural road from the commencement of the route to the San Juan mining district; thirty-eight miles to the southwest, over an excellent natural road, excepting only the crossing of the Rio Grande, forms the first section of the proposed route to Fort Wingate and Arizona; fifty-five miles to the south, over the same excellent and level road furnished by the San Luis Park, will bring us to the Rio Colorado on our way to Santa Fé; a fine grazing country, with abundance of mountain-streams. The only drawback is, perhaps, that the number of cattle on the range is too great, and the pastures are overstocked.

We now commence to cross the foot-hills, which reach out to the river, or near it, and the park is left with many feelings of regret and longing for its beautiful roads.

Rio Colorado to Taos.—From the Rio Colorado to Taos about twenty-five miles of bad road is encountered, steep hills, up and down which the road must go. The soil is good, and grazing abundant, and water is found almost anywhere.

The pine forests of the mountains come down over these foot-hills, and there is a surprising quantity of fine timber. The valleys of the streams are found in cañons, and the lava-field of the Rio Grande has spurs stretching up these cañons, to the permanent ruin of all roads found therein. In order to make this section of the road really safely passable, work must be done between the Rio Colorado and Taos to considerable extent, an estimate for which will be found on next page.

In the valley of Taos is found at present the most valuable agricultural district in New Mexico. A population of 7,000 is engaged mainly in the cultivation of wheat and corn. Two flouring-mills are supported in the manufacture of what is considered peculiarly fine flour. Large quantities of this flour are consumed in Santa Fé, and during the year

1875, the contract for Fort Union was held by parties who filled it from this region.

The hill to the south of Red River crossing was a very bad one, but has been much improved by citizen labor, done under the direction of officers detailed by the commanding officer District of New Mexico. The grade is now good, and little is needed except widening. The next arroyo, to the south of this hill, is very steep, and although the road on the north side has been much improved by citizen labor, it is still too narrow; on the south side is a steep pull for a short distance, which should be remedied by a new location, at an estimated cost of \$400. The next arroyo is descended by a siding nearly a mile long, made by much labor, and as it is very narrow, should be widened throughout, at an estimated cost of \$1,000. The south side of San Cristoval Hill is bad, and should have a new location; estimate, \$500. The north side of Arroyo Hondo Hill is very steep, but work here should be done by people resident in the valley. The hill of descent into the Criniguilla Arroyo is sandy and bad. It is susceptible of improvement by digging out the sand and substituting a layer of clay, which can be found in the hill. A new location would be very expensive. Estimate for this work, \$700.

Incidental work along the first six miles of the new road constructed in 1874, in the cañon, requires, \$300.

The embankment constructed along the lower portion of this upper cañon work needs strengthening, as it is subject to wash from high water; estimate, \$1,500.

Two sharp turns in this portion are the worst places in the road, and being in the midst of lava-rock, as is the greater part of this work, the expense for correction is great; an estimate not too great is submitted, \$650.

The crossing of the Embudo River, which is impassable in high water, requires a substantial pile-bridge about 500 feet long, for which an estimate is made of \$2,500.

The lower cañon road, which is entirely on lava-rock, should be improved by widening the road-bed, which is very narrow here. This should be done through a distance of about three miles; estimate, \$1,500.

RECAPITULATION.

First arroyo south of Red River Hill.....	\$400
Second arroyo south of Red River Hill.....	1,000
San Cristoval Hill.....	500
Criniguilla Hill.....	700
Incidental work, six miles, upper cañon.....	300
Widening and strengthening embankment.....	1,500
Straightening two bad turns.....	650
Bridge at Embudo River.....	2,500
Widening road in lower cañon.....	1,500
Total.....	9,050
No allowance having been made for tools, add.....	350
Add 10 per cent. for contingencies.....	940
	<hr/>
	10,340

In case permission can be obtained to sell the Army ration to the laborers at cost prices, fully one-third of this can be omitted, leaving, say, \$6,900.

It will be recollected that when this road was opened the difficult character of the work and the limited appropriations made it necessary to attempt nothing beyond a practicable route at first, leaving its proper completion to the future.

Taos to Santa Fé.—Between Taos and Santa Fé there formerly existed a very disagreeable passage by a steep and bad road over a mountain-spur reaching from the main chain to the cañon of the Rio Grande. This spur, called the Picuris Range, could be avoided only by a long detour crossing the Rio Grande twice. Freight, except such as could be carried by burros, was almost prohibited, and the customary route for individuals going from Santa Fé to Fort Garland was via Fort Union and the Sangre de Cristo Pass in preference to attempting the more direct line.

Now, however, through the munificence of the general government, the new road constructed down the cañon of the Rio Grande, a level route, straighter than either of the old roads, can accommodate all possible travel.

The last forty miles of this route pass through a country remarkable for its barren desolation; hills of drifting sand or gravelly soil support almost nothing, and every spot capable of cultivation is occupied. Freighting by cattle-teams must always be very difficult through this region. It should be remarked, however, that the approach to Santa Fé from any direction is but a slight improvement on this picture. With the improvement in the road made between Taos and the Rio Colorado, this line would be far preferable as a stage-route from Garland to Santa Fé and the south, and, as it is, several days are saved in travel by government teams passing between the two places, and drawing their forage from the regularly-established agencies.

We have now looked at all of the existing routes to the south and southwest from the railroad termini.

Perhaps, were the freighting conditions equally as good by the west of the mountains as by the east, there would be no cause to improve upon the route last described. But we are here confronted by two rather remarkable physical features of the country, which it might be interesting and instructive to describe.

Lava-field of the Rio Grande.—In the first place, there is the lava-field of the Rio Grande. This is a tremendous exhibition of volcanic power. Commencing at the angle between the Conejos River and the Rio Grande, in Colorado, one continuous sheet covers the face of the country to the south for eighty miles unbroken, and then for fifty miles farther is now exhibited in outlying areas and detached masses, separated from the main body only by the exercise of the power of erosion through prolonged ages. One hundred and thirty miles in length, and perhaps thirty in breadth at its widest place, the area of a principality lies swallowed up forever. From craters existing, probably, in the San Antonio Mountain and the Ute Peak, and possibly in other centers, this flood poured over the land. Reaching to the east, it was checked by the mountains of the Sangre de Cristo Range; flowing to the west, the mountains and hills of the main divide and the spur now between the Chama and the Rio Grande limited its extent. To the south it was deflected westwardly by the spur of the mountains called the Picuris Range, some fifteen miles south of Taos. Protected by this spur, we find the east bank of the Rio Grande for many miles free from the lava. Confined on the west by the slopes of the Jemez Mountains, the breadth of the field is narrowed; but from the village of San Ildefonso to Peña Blanca we find the lava on both sides of the Rio Grande, spreading to the east as far as the valley of the Santa Fé Creek. Secondary centers in the Jemez Mountains possibly contributed to this extension, but the main force of the eruptions was probably felt farther to the north. However, in this vicinity the edges and extremity of the field have been

reached, and there has been so much erosion at places since its deposition that outlying masses, as in the bluffs to the west of San Felipe, alone remain. Throughout the whole region thus depicted this lava-field is the great and controlling element. The streams that have eaten their way through it with untold difficulty are found in narrow and deep cañons, having no land for cultivation. A dangerous feat for man to descend these precipices, the passage by an animal is almost impossible. The Rio Grande passes for eighty miles or more through its black abyss, with walls of seven or eight hundred feet in height, crowned with perpendicular cliffs of solid lava two and three hundred feet high. Throughout the whole region there is no agriculture. The valley of Taos is formed only by the fortunate detrition of the adjoining mountains spreading over the edges of this plain a thin soil. Outlying patches are cultivated at other points near the perimeter of the basin. Agriculture on the Rio Grande is possible only, as before alluded to, in the section that was, so to speak, in the lee of the Picuris Range, or from La Joya to San Ildefonso. The surface of the mesa itself supports a scanty grass which feeds a few wandering flocks of sheep, and the dwarf cedar proves anew its wonderful hardiness. In consequence of these features, roads across this country are almost an impossibility. From Cienigilla to the Ojos Calientes is found the only wagon-road crossing the mesa from east to west.

The fortuitous cañon of the Rio Chama furnished a route from Santa Fé to the northwest. From Peña Blanca to the west the road is possible because of the erosion of bluffs which were probably as formidable once as those of San Felipe, ten miles to the south.

The road from Fort Garland to Taos keeps to the east of the basin, touching it only at the Rio Colorado and at the Arroyo Hondo. Lieutenant Morrison's route in 1872 is unavailable because of passing over the western shore of this no longer sea of fire, where sterility and absence of water are the rule.

In the construction of the military road from Santa Fé to Taos it was necessary to follow the cañon of the Rio Grande from La Joya to Cienigilla, and the expense of the construction arose from the necessity of passing through the blocks of lava forming the *débris* at the foot of this gigantic mesa cliff.

Under these conditions the problem of passing to the west of this section becomes a strategic one of turning its flanks. The routes via the south point of the Santa Fé Range turn it to the south as well as the range itself. The proposed route will turn it by the north.

The marls of Santa Fé.—The second physical feature remains to be described. Underlying this gigantic field of lava, probably throughout its whole extent, certainly in its southern portion, there exists a series of immense beds of marls, sands, and clays, and imperfect sand and limestones. Of many hundreds of feet in thickness, the coarse character of the sand and the immense quantities of gravel show that they are formed by the very rapid erosion of a lofty mountain-range. From this cause the formation of a finely comminuted soil has been impossible. Barrenness and desolation are the results, and the country to the south of the Picuris Range and Santa Fé and its vicinity suffers accordingly.

The foot-hills of the mountains and the valley of the Rio Grande are alike sandy and sterile. Narrow strips of ground are irrigated in the immediate vicinity of the streams, but away from these feebly-green spots aridity and bleakness extend. There is no grass except during the few weeks succeeding an unusually protracted rainy season. Cattle learn

to eat anything that is green, and the sight of the goat eating the thorny stems of the tall cactus is no more striking to the stranger than to see the gaunt ox feeding on the running pine and the dwarf cedar. Sheep and cattle are driven from this region to the "Conejos Country," full sixty miles, to pasture and to winter. The valley of the Chama is similar in its character, being formed by the excavation of the same beds of marl, and the Rio Grande below the junction of this stream never loses its predominant characteristic of sand. These marls extend to Santa Fé and farther south. The Santa Fé Creek irrigates a small portion of tillable land some six miles or more in length in the immediate vicinity of Santa Fé. Besides this and a starving hamlet at Galisteo no sign of civilization breaks the desert solitude of sand and gravel that stretches southwardly down this elevated plateau, save the isolated ranches near the rare springs of water, such useful oases in the passage of this divide. The civil division of the country of Santa Fé very nearly covers this barren area from the Rio Pojoaque to Galisteo. In this country, with a population, by the last census, of 9,699, there is reported as the total area of improved land 10,925 acres only, with a total annual value of farm-products of \$99,410, or about \$9 per acre. This in a country where corn is cheap at 2 cents per pound. The production of wheat was given at 6,314 bushels and corn 20,262 bushels. Beyond necessary working-cattle and horses no stock except sheep are kept in this region; 630 having been reported as the total of "other cattle," held in the country. To avoid the lava-field in going to the west by the south from Fort Garland we necessarily encounter at least sixty-seven miles of this desert.

It might not be an impertinent digression at this point to answer the question why was Santa Fé established in the face of these disadvantages? Its lovely climate, protected as it is from the north by its near mountains, and elevated at 6,840 feet into an atmosphere charming in its freedom from moisture and balmy in its mildness, may perhaps have had its influence. An abundance of excellent water is found at a short depth by digging wells at almost any point of the locality and fresh and sweet; it alone in those regions is reason sufficient for settlements. The immediate vicinity probably supplied its earlier inhabitants with sufficient food for their limited numbers. By reason, then, of these two formidable features it has not been advisable heretofore to use the route thus described in passing from Colorado to Western New Mexico. As shown, however, progress in railroads has made this route a desirable one to Southern New Mexico in case it shall be improved, as indicated before, between Taos and Fort Garland.

It is now necessary to describe the lines of reconnaissance and survey examined in search of a new route, and to give a general view of the country through which they pass.

DESCRIPTION OF NEW ROUTES SURVEYED.

Lieutenant Morrison's route in 1872.—In 1872 Lieutenant Morrison made a reconnaissance by the west side of the Rio Grande. Crossing the river at Meyer's Ferry, he went down the lava-field near its western edge to Ojo Caliente; thence by a long curve to the west and north he crossed the Chama some fifty-three miles from Ojo Caliente; from this point down the course of the Puerco to the road from Peña Blanca to Wingate, and with it to that place. Unfortunately his report was not as full as it might have been, and I shall endeavor to supplement it from other sources.

It is an interesting historical fact that during the suppression of

the Indian insurrection in New Mexico by the Spaniards in 1690-93, an expedition to conquer the Pueblos of the Taos Valley having been longer in its undertaking than presupposed. found itself blocked up on its return to Santa Fé by snow in the Picuris Range. Fearing to attempt the passage under the circumstances, the plan was adopted of going north into the Utah country, now Colorado, crossing the river above the cañon of the river Grande, probably in the vicinity of the Rio Costilla, and then returning to the south. The line of march on the west side of the river was the same as that followed by Lieutenant Morrison, and the lapse of one hundred and eighty years has found us in nearly as intimate a knowledge of this country as the Spaniards had then.

Conejos to the Chama.—The lava country, of course, through its whole extent, furnishes hard roads, level in stretches, and very rough from detached fragments, which have an almost perfect hardness, weathering very slowly and never crushing into macadam. The cañons of the water-courses on this route and the edges of the field are descended by very rough and very bad roads, incapable of permanent improvement, and not even easy to be bettered.

The longest distance without water is twenty-five and one-half miles, being that from leaving the Conejos and its tributaries to some water-holes on the lava-field. The last stretch of seventeen and one-half miles into Ojo Caliente is without water, and as the road has left the lava, the sand of the marl formation thus discovered makes the traction difficult.

Rolling country and steep hills between Ojos Calientes and the crossing of the Chama, in addition to the undesirableness of the preceding section, do not tend to reconcile one to the long detour thus made between the Conejos and Upper Chama in order to avoid the mountains of the direct line. In this section Lieutenant Morrison examined three routes, and of these recommended one which would necessitate some work before it could be used by wagons. The others have objections to their use in being longer and in other features of a physical character.

Were the curve of the more level route located through a prosperous region, or were the roads smooth and quickly traveled, with good grass and abundant water at reasonable distances, it might not be considered worth while to attempt to shorten the line by passing over a chain of mountains. But when the mountain-route has its usual advantage of water at all points and good grass, and its grades are fairly reasonable, the question of cost of construction may well be considered. And when in addition to this the saving in distance, as in this case, amounts to fifty-five miles, the economy of a judicious investment is well-nigh manifest.

The Jemez Mountains.—The mass of the Jemez and Gallinas Mountains necessarily deflected Lieutenant Morrison's line, and the north-western point of this obstruction was the objective from Fort Garland selected by me in the line surveyed. The mountains form a bold and imposing feature in the landscape. Rising in swelling masses and terraces, they are always grand in effect and graceful in outline. Culminating in one high summit, every defense of bastion and outlying rampart seemed combined for its protection, alike from the attack of man or the fiery onslaught of natives. Though lofty enough to be surrounded by the summer-clouds and darkened by the summer-storms, these mountains are not of sufficient area to form and protect mountain-streams, as does the Sangre de Cristo range. Agriculture, therefore, is represented only by the scanty fields of the Jemez River or the with-

ered banks of the Puerco. No communication exists through its forbidding cañons, nor indeed does the prospect even invite a search.

Rio Chama to Wingate.—To the westward still we find the great Atlantic and Pacific divide, with a general direction of south-southwest. Having turned the Gallinas Mountains, our crossing of the Rio Chama is found to be probably not more than fifteen or twenty miles to the east of the crest of the divide. From this point to Blue Water station, a distance of one hundred and forty-seven miles, the road is sensibly parallel to the line of the crest. Bacon Spring is found on the west, and is the first water encountered on the Pacific slope.

The general character of the country, from the line of the road to the north and west, is very much the same everywhere. Recent sedimentary rocks, and soil from their detrition, are the geological features. The altitude of the divide is not great, rarely over 7,000 feet, and the rain-fall is very slight. But the soft soil washes very easily and the water-courses to the west become cañons at short distances from the sources. Two of these cañons have been carefully examined and described.

The Cañon del Chaco was reported by Lieutenant Simpson, in 1849, to contain remains of a former population of considerable size. Its rocky walls now look down only on a dry bed and dusty ruins. Pueblo succeeding pueblo formerly lined the banks of what must have been a fertile river-valley. To-day not even is it safe for the passing train to depend upon finding sufficient water there except during the rainy season.

Capt. J. H. Macomb passed through the Cañon Largo in 1859, finding it still more desolate than the Cañon Chaco, although exhibiting ruins indicating former habitation. The great divide itself is not a precipitous chain of mountains, but rather a rounded plain, and the whole country is made up of approximately plain surfaces, now cut up into gigantic sandstone mesas, crumbling, dry, and barren. The only routes that can be followed are by the gorges between. It is impossible to cross the system, save with much work and many detours. The topography of this feature is well illustrated by the detail sheets of the accompanying atlas and also by the general map.

However desirable it might be to rectify the line of the route between Chama and Fort Wingate, it would be difficult, if not impossible, to do so with a wagon-road. If we pass to the west, we shall find ourselves on the dry crest of the divide; if still farther to the west, we are in a dearth of water, and a difficult line to travel for all possible reasons.

Lieut. G. S. Anderson, Sixth Cavalry, surveyed in 1874, under my directions, two routes over the Chama spur of the main range. These two routes led from the settlements on the Conejos to the Wingate or lower crossing of the Chama. My former report contains minute details of these lines, both in respect of natural obstacles and proposed means of correction. Since that time chartered toll-roads have been commenced over both of these lines, and this whole subject will be reviewed further on.

Lieut. C. A. H. McCauley, Third Artillery, on duty in this office, was detailed in the spring under the specific instructions of the department commander to examine and report upon all existing or needed roads in Southwestern Colorado and Northwestern New Mexico. An immense amount of information on this subject has been obtained, and is now being digested. At present Lieutenant McCauley submits a report upon those lines leading to the southwest from Fort Garland across the Chama spur and thence to the lower New Mexico country, the Fort Wingate region or the southwest, and the San Juan country or the west. All

of these routes are of great importance in a military point of view, and Lieutenant McCauley's descriptions and summary are of value, and his conclusions as hereinafter given are approved by me and incorporated in my own general summary formed later.

At the close of Lieutenant McCauley's portion of this report the remaining portions of the routes in question will be described and the general recommendations made.

THE SAN JUAN COUNTRY.

This noted region, bidding fair to become in time one of the richest silver-producing sections in the world, is that portion of Colorado lying in the southwestern part of the State, to which of late emigration has rapidly increased, and the attention of capital been attracted by its fine agricultural valleys and the great mineral wealth of its mountains, so that several towns and numerous settlements have sprung into existence in remote localities, while much of the country has been occupied with a view to farming and pastoral pursuits.

The appellation of "San Juan" is derived from the river of the same name, into which pour all the streams and waters of the lower country. Long before the advent of the white man upon the continent its banks teemed with an unknown population of whose habits and mode of life history speaks not and tradition is silent, with naught to aid the intelligent investigator save fragmentary pottery and the ruins of their dwellings. After long lapses of time, their former lands are being occupied by the progressive Anglo-Saxon in his inexorable movement westward.

Within the last quarter of a century, the country had been penetrated in part by explorers, and reports of the wonderful wealth in its mountains had attracted thither, at the risk of death from hostile red-men, numbers of prospectors. A tide of immigration set in, and nearly two decades have passed since the same kind of adventurous spirits as at present may be found there were flocking to the country. Disappointments, continual attacks of hostile Indians, and other causes combined to stay the tide, and with its reflux the lands were left to the tribes that possessed them by virtue of original habitation.

A comparative wilderness, unoccupied by whites, the country remained unnoticed or forgotten until 1870, when it was again penetrated by a small party of prospectors with the resulting discovery near the present town of Silvertown of the "Little Giant," a gold lode famous for the value of its ore and notorious in subsequent litigation. Their wonderful discovery, bruited abroad, was the cause of another influx, solely of hardy prospectors, resulting in the establishment of a permanent population.

In the treaty of March 2, 1868, setting aside for the Utes all, save a fragment, of Colorado west of the one hundred and seventh meridian, the San Juan land became a definite portion of the Indian reserve. Their numbers and hostility were too powerful to be overcome by the settlers within their country; the white man demanded the valuable territory of the weaker one, and force compelled him to yield. What is generally known as the Brunot convention, from the name of the United States commissioner, ensued. Articles of agreement for the cession of the San Juan were entered into September 13, 1873, by the confederated Utes, and the necessary satisfaction made by Congress April 29, 1874. The portion ceded by the Brunot convention contains about 6,000 square miles, and includes all of the rich mineral sections save the Summit District, a gold region; that part of the State generally known as the

San Juan country, comprising, however, in addition to the above contiguous territory aggregating over 13,000 square miles, one-eighth of the entire State, and an area equal to that of Massachusetts, Rhode Island, and Connecticut combined.

In the lower portion of the great Continental Divide, in a general direction of northwest and southwest, is for 125 miles or more known as the San Juan Mountains, including many lofty peaks and spurs.

For convenience of treatment, the main agricultural region, watered by streams and rivers springing from the summits and flowing down on the southern and western trend of the range all on the Pacific watershed, may be distinguished as the lower country; the rest the upper.

LINES OF COMMUNICATION.

Roads are the highways of civilization. Their construction is the first and essential stage in the gradual development of any section. Without an easy outlet for its resources, no country, however productive, can acquire that wealth and prosperity which free and easy communication alone can furnish. This is particularly so in an inland section and a mountainous region. The discovery of the precious metal is almost invariably made by one or more adventurous prospectors, whose outfit, of the most modest nature, is generally borne upon "burros," or jackasses, capable of climbing over difficult mountainous country. With the discovery of a fine mineral deposit, their log cabin is established, becoming the nucleus of a mining-camp. The outlet and inlet by a trail permitting pack-trains only with the advent of new-comers, an embryo town appears, and well-watered lands *en route* are taken up for grazing and farming purposes.

With increasing signs of permanency and material wealth, the necessities for a wagon-road become daily more evident, until it is finally furnished by some enterprising capitalist, or a stock company, and the settlement is opened to the basis of supply.

From this dates permanent prosperity. Slow-moving pack-animals are succeeded by more rapid freight-trains, with greater carrying facilities, high prices for commodities of life and business are diminished, and the stage-coach appears upon the scene. Easy access, well-rewarded labor, and profitable investments invite the laborer and immigrant, as well as the speculator. The country increases in agricultural and mining industry until, with the lapse of time, the railroad approaches and the frontier settlement assumes a metropolitan air; and on the march of civilization continues.

The roads of the San Juan are, therefore, of prime importance, and whatever can be done to shorten the lines of communication and open as yet undeveloped sections will be of the first and most material value.

The recent advance of the Denver and Rio Grande (a narrow-gauge railroad) over the Sangre de Cristo Range has enabled it to control all the freight and passenger traffic destined for the San Juan, as well as all of New Mexico, save the northeastern part. Its present terminus is Garland City, 6½ miles from Fort Garland, situated in the eastern part of San Luis Valley, at the foot of the western slope of the mountain, whence travel for the upper country passes northwest to Del Norte and via the toll-road up the cañon of the Rio Grande to the settlements beyond, while that for the lower takes its course due southwest, passing Conejos, a Mexican plaza, known also as Guadalupe.

Of the lower country the seat of the largest population is that part of the valley of the Animas known as the Animas Park, lying in a gen-

eral direction north and south, and containing over 10,000 acres of tillable land, susceptible of easy irrigation, above which, and beyond the grand cañon of the river, lies the largest populated region and the seat of the greatest mineral wealth.

Silverton, upon the Animas, and other towns and contiguous mining camps, may be reached from the railroad and Del Norte directly by following up the valley of the Rio Grande and crossing the mountain-range that forms the divide between the waters of that and the Animas; more indirectly, by reaching the lower country and the Animas, and thence passing up the cañon of the river.

As the lower country is the least favored with respect to outer communication, it may be well to first consider it. Hemmed in upon the north and east, which, with outlying spurs that contain many peaks of great altitude and few practicable or natural passes, the summits of the mountain-chain lie approximately in the arc of a circle with Pagosa Springs nearly at the center. It is, moreover, south of the position of Garland City but 11 miles, being about 100 miles west thereof. From the railroad terminus all roads to the lower country at present have a common point, viz, the crossing of the Chama at the plaza of Los Ojos, one of the villages of the Tierra Amarilla section, whence the main-traveled line, known as the "Upper road," passes to the Animas, via Pagosa Springs, while the distance to the Animas is greater by this than by the route called the "Middle road," which, passing by the Laguna de los Caballas, Piedras de Legunados, and the Cañon Curaçon, to the San Juan below the mouth of the Navajo, and crossing the Rio Piedra and Rio de los Pinos, unites with the upper road on the Rio Florida; it is preferable to the latter, on account of more frequent water and the fine grazing along the route, timber being everywhere abundant. Hence, from its natural position and the relative points of supply, Pagosa becomes a strategic point, and the line which will easiest and quickest enable travel to reach it will, and in fact must, become the popular and frequented route.

The Rio Grande River, which emerges from the mountains at Del Norte, taking a southeasterly course through the San Luis Valley, is, during most of the year, easily passed, being fordable with but little difficulty at a number of points from Del Norte south. Like all streams, however, that spring from lofty summits in the main range and are fed by banks of eternal snow, it is subject to great increase in its waters during the spring months of the year. The small brooks become waving rivers, and with difficulty are crossed, where earlier and later the passage may be a matter of no difficulty. At such times the Rio Grande is a formidable barrier, and can be crossed only by bridge or ferry. A few miles below Del Norte a bridge over the river secures travel of all kinds from any interruption at all seasons, while that below, bound southwest, finds passage during high stages of water in one or two ferries that are located on the lines of travel.

THE LOWER COUNTRY—GARLAND TO CONEJOS.

From Garland City to Conejos and the southwest two routes are optional. The first, in a general southwesterly course north and not far from the Rio Trinchera, crosses the Rio Grande just above its mouth, at a distance of 19½ miles from Fort Garland and 26 miles from Garland City. Thence it continues some 26½ miles due southwesterly along the north bank of the Rio Conejos, a tributary of the Rio Grande, with its mouth a mile, below the Trinchera, reaching the plaza of Conejos at a distance from the railroad of 52½ miles.

Part of the way on this route another road may be taken by crossing the Trinchera a few miles below Fort Garland and continuing south of, and near it, about as far distant as the former above. It reaches the Rio Grande at the mouth of the Conejos, whence, passing due west, it comes into the other road at a distance of 4 miles. While no appreciable distance is saved by this route, its only advantage ordinarily being, perhaps, a preferable ford to the one at Stewart's, it, like other points, presents no crossing-place over the Rio Grande during high-water seasons and hence will not be considered.

The second route from Garland City passes a little west of south to the Rio Culebra, crossing it at Mexican plaza of Lower Culebra, thence southwest to the Rio Grande, where is the ferry formerly kept by Mr. Fred. Meyer, now in the hands of Señor Valdez, $39\frac{1}{2}$ miles from Garland City, 33 from the fort; thence the road passes due west to Conejos, 18 miles distant, and $57\frac{1}{2}$ from the railroad. Both roads lie wholly in San Luis Valley and are natural ones, as easy in traveling and as hard as the ordinary prairie, save in a few places where they are heavy from shifting sands, a belt of which extends over the valley.

In June, while in that section, a whirlwind would here or there keep in sight almost constantly a cloud of sand, and as they occasionally passed, they shut out completely earth and sky, filling eyes and ears, taking along hats and other movables if possible—happily a brief visitor, leaving as a souvenir a fine stratum of sand. The height to which these moving, flying pillars rose, seemingly gathering strength as they whirled along, was very great. The approach to the Rio Grande on the upper or Trinchera road is over low ground. During the high-water season the river reaches back for some distance upon either side, and with its diurnal fall and rise the ground, at other seasons hard and dry, is changed to a marsh, and easy access to and from the river-ferry is for heavy teams often quite problematical.

In our crossing the ferry in June last, one of the wagons of the train, in the detour which is selected as the best approach upon the eastern bank, mired twice in the boggy-ground, and caused a delay of two hours; upon the opposite shore another long and tedious delay resulted, the road being two feet under water, necessitating unloading by hand in water above the knees. There is a bend in the course of the river just above the ferry, and as the ground here rises but slowly from the stream outward, it is at the best a faulty location for such a purpose.

The river was then about 150 feet in width, with a very rapid current. The ferry-boat, rather a small affair, about 20 feet in length, barely held an army-wagon and the wheel span of the team; a flimsy rail was along each side, protection chiefly in appearance, each mule requiring holding during the passage. In taking over the cavalry escort, the horses were led on the boat, heads alternating up and down stream, to equalize the load, which was limited to eight. A crossing with horses only was made in eight minutes, and four six-mule wagons, including the teams, were ferried over safely in one and a quarter hours. A small pier or planking of some kind was lacking, nothing of service in the nature of gangway being provided. The rates charged were, for single horsemen, 50 cents; light wagons, \$1.25; two-horse wagons, \$1.50, and four-horse wagons, \$1.75. The ferriage was, however, reduced in consequence of the size of the party to 25 cents per animal, riding and team, with no charge for wagons. The more direct and better road, as before stated, is up the course of the Conejos river, above and skirting the edge of the plain, always high and dry; it is, however, nearly barren of grazing, in need of which the command took a left-hand road at a distance

of about 12 miles from the ferry; this passes over what is known as the Island, a long point of land included between the San Antonio and Conejos Rivers, across which, during high water, flows a net-work of small streams, rendering it the best watered and most fertile land in this section; it is, without doubt, the garden-spot of the entire valleys of the two rivers, and would be literally "flowing with milk and honey," were it in the hands of eastern farmers instead of those of Mexican descent, whose ambition is generally satisfied with cigarettes and a "buile."

The Conejos was crossed at the plaza of Los Cerritos (more properly called Las Sierritas, the "Little mountain," taking the name from some high hills that are grouped near by), whence the road soon passed into that from Chavez ferry to Conejos.

The passage of the Conejos was made without loss, though not without difficulty, the stream high and rapid, with about a six mile current, was in the beds of the rivers, and one of the team-mules falling in the river and becoming entangled in the harness, was with difficulty saved from drowning. From the appearance of the banks at 1 o'clock p. m., it was evident that the water had very lately fallen fully a foot.

Chavez ferry.—The ferry on the lower road differs in location, &c., materially from that above. It is in a direct line 18 miles south of it, by the windings of the river about twice as much; a trail leading down from the upper ferry, which is called by the Mexicans but 12 miles. This ferry, formerly known as Myer's Ferry, and described in 1874 as a "dilapidated affair," was purchased from Mr. Myer in the spring of 1875 by Señor Caledrina Valdez, the present owner, for \$450. The boat sunk in the following fall, and last spring it was replaced by the present one, very serviceable and greatly superior to Stewart's. It is about 45 feet long and 12 in width and strongly constructed of stout timbers. A strong side railing is provided, and a small row-boat is in tow, for a possible necessity, certainly a nice precaution; for the river in June was here 10 feet in depth and about 250 feet in width. The cable is firmly held upon strong piles about a foot in diameter, with heavy triangular braces, thence passing over a windlass to the rear. The crossing with a load was made in four minutes. The charges are about the same as at Stewart's; its capacity greater. The owner reported that at a single crossing they had carried 400 sheep, the charge for the trip being \$5. In its location this ferry has, furthermore, an advantage over its rival. The river is here about 25 feet below the general surface of the plain, and as the road descends gradually and easily, no possible miring of teams can occur. A short distance below this point the Rio Grande enters its long cañon, which increases in depth southward, the lava sides vertical or piled with sharp-edged rock, perfectly impassable, and a veritable scene of desolation in nature.

To the San Antonio River, *en route* to Conejos from the ferry, the road is a magnificent natural one, fine, hard, and level; on the way, upon either side, some two or three miles off, rise rounded hills with sand-stone strata, on which lay the cold, volcanic rocks, blessed with but little timber, and that but a poor piñon, with an occasional cedar, the only kind that will befriend so dismal, inhospitable a surface. Lava rock liestrewn along the bases of the hills and out over the plain everywhere; its hot and parched surface relieved only by an occasional breeze from the mountains to the west. Its vegetation is exceedingly sparse, almost nothing save sage-brush and a few cacti breaking the monotony. No grazing can be found at or near the ferry, nor on the lower road to any extent beyond the crossing of the Trinchera, until the San Antonio is

reached. The latter was found very high and the ordinary ford impracticable, necessitating our crossing a mile lower down.

Of the two routes from Garland to Conejos, the upper or Trinchera is preferable. Its chief disadvantage is the inferior condition, in addition to low approaches of Stewart's ferry as compared with that of Chavez, the latter as a crossing being greatly preferable. The upper route has, however, several advantages over the lower not to be lost sight of, which are mainly—

1st. It is considerably shorter.

2d. Its hard surface or natural road, save a small sandy portion, less than half of that on the other.

3d. Wood, water, and sufficient grazing for convenient camping places at no long intervals, the Conejos being timbered with cottonwood.

4th. Except the Rio Grande, but a single stream of any importance to be crossed, the Rio Conejos at the plaza of Conejos (or Guadalupe), while on the lower road are the Trinchera and Culebra east of the Rio Grande, and the San Antonio on the west. By one route a bridge is essential for the Conejos, by the other for the passage of the San Antonio. At the plaza of Conejos the river was formerly passed by a bridge which was, they there informed me, washed away in 1874. After numerous resolutions to replace it, the citizens have let the matter drop, and teams now find their way over as best they may. At the town, fortunately, there is a spot where the river broadens to over three times its usual width, so that generally a passage may be found. The river here is about 200 yards and the approaches low, so that a slight rise in the water materially increases the difficulties of passage. A superior location may be found not far distant and the river bridged at a cost not exceeding \$1,300.

CONEJOS TO PAGOSA.

Communication between the above may be considered under the following heads:

1st. Old line via Tierra Amarilla section.

2d. New line via Tierra Amarilla section.

3d. *Proposed lines.*

1st. *The old lines.*—Up to the present summer the only mode of access from the railroad to the Lower San Juan was from Conejos southward to Ojo Caliente and northwest to Tierra Amarilla, a distance of 150 miles. A cut-off above Ojo Caliente via Cueva, shortening this distance to 120 miles, has diverted travel in its favor. It is in general a good and easy road, being largely over country with a hard and level surface, having been the scene of some volcanic eruption; some mesas passed over present difficult points, the chief objections, however, being the absence of grazing and the long distance between water making it an exceedingly hot summer route.

Crossing the Chama at Los Ojos, where it was about 75 feet wide, 2½ feet deep, the "upper" route is over a natural road, through low valleys or over gently undulating hills, covered with fine grass wherever sheep-herds may not have tarried. The Continental Divide is here a line of sharp mesas of the steepest kind, 400 to 600 feet in height, with sandstone outcroppings and sides timbered with scrubby piñon. The road winds so gently through an easy pass between, that one can scarcely realize the passage from the Atlantic to the Pacific watershed. A dearth of water existed in July last between the Chama and Navajo, and for 33 miles no running water was found, although many dry beds of streams were met with, which heavy rain-storms of the previous day

and night had failed to fill. The soil is to some extent alkaline, and upon pools of rain-water our camp depended. From the Navajo to Pagosa, 23 miles, water is abundant, the Blanco and tributaries being crossed *en route*. Pagosa being 56 miles from the Chama at Los Ojos, necessitated a journey of 206 miles to reach it from Conejos—reduced to but 176 via Cueva—a long and tedious trip.

2d. *New lines via the Tierra Amarilla section.*—From Conejos two roads are now constructing, both following the general lines of survey examined by Lieutenant Anderson, Sixth Cavalry, in 1874, in obedience to instructions from the chief engineer of the department.

The first, which may be known as the

CHAMA ROUTE,

ascends the Conejos for 11 miles in a fertile and cultivated valley over a natural road-bed. Its direction is a little south of west, and its grade during this distance only about 39 feet per mile, or less than 9 inches rise per 100 linear feet, practically a level. From this point it passes nearly westwardly for 20 miles, in which it reaches the Los Pinos Creek, above the deep and impassable cañon of the central part of the stream, along which it follows for about 3 miles, thence ascending the low divide that separates the watershed of the Conejos and its tributaries from that of the Chama and its branches, it passes to the slopes of the latter streams, with its highest point not over 9,800 feet. In this section the average grade is about 75 feet per mile, or a rise of $1\frac{1}{2}$ feet in 100 linearly.

As the summit of the divide is approached, a number of low hills of gentle slopes are passed, along whose sides easy grades, at no point exceeding a 3 to 4 foot rise per hundred linearly, are readily obtainable, so that at no point is there anything so difficult to overcome as to need special mention. Leaving its westerly course, the road passes southwest for 13 miles, following first a tributary and then the Chama itself, and in a southerly direction by the banks of the river, some $16\frac{1}{2}$ miles, to Tierra Amarilla, as the main plaza, Los Nutritas (2 miles beyond Los Ojos), is generally called, a total length of 60.69 miles, as measured last July. The entire route is well supplied with grazing, timber, and water; springs and nutritious grasses being particularly abundant in the most elevated regions. Via this line, the distance of Pagosa from Conejos is reduced to 114.7 miles.

In the spring of 1876, a settlement called Park View was located 2 miles above Los Ojos, in the valley of the Chama, by a Chicago and Santa Fé company. Circulars with information of an enticing character to promote immigration were circulated. The town was passed on the 9th of July last, in a lovely valley with about 8 acres, not exceeding 10 at most, under cultivation; eight cabins of the settlers being scattered about in the fine forest adjoining. The charter for the road from Conejos to Los Ojos was taken out with the view of making it a feeder to the colony, diverting trade of the vicinity from Los Nutritas, its present center.

To have reduced so materially the long detour by Ojos Caliente or Cueva was a desideratum; and to avoid this, travel at once started over the Chama line by Park View, it being announced last spring by those in charge of its construction that it was passable. The apparent object was accomplished, that of getting teams over a part of the road which nature had prepared, when, part way in, rather than return, the freighters

would work along to enable their teams to get through; for in no sense of the term was there a way ground in existence over most of the route.

Having been personally and authoritatively assured in June that no difficulty whatever would be experienced in getting through a wagon-train, as much machinery had already been transported over it, we started from Conejos July 4, reaching Tierra Amarilla on the afternoon of the 9th. Over the central part of the route, three entire days were taken up in going 19½ miles. This distance was over side slopes, summits of hills, and some arroyas; the train being gotten over safely, however, by changing the front wheels of each wagon to the up-hill side, the rear ones being on the lower one, holding up the wagons with ropes, using large logs as pulleys and picket lines in ascending arroyas, and resorting to similar expedients.

While the general route is one perfectly adapted to the end in view, the location was found very faulty, the road passing over tops of little hills and abruptly down the ends, instead of seeking a uniform and easy grade along the sides. I have been since informed by the officers of the road company that it is now everywhere in complete order—new locations having been made in the faulty localities. Lieutenant Gibbon traveled over this road in September, reaching Tierra Amarilla from Fort Garland in four days. His report contains no remarks on this part of the road, except that 12 miles remained uncompleted.

The second and rival route, which may be known as the

SAN ANTONIO,

in contradistinction to the former, approaches nearer a direct line. Ascending the valley of the Conejos, to include the plaza of San Raphael, it passes south across the plain to the plaza of San Antonio and contiguous towns in the fertile valley of that river, near which it is crossed. Thence it passes almost due south, near the right or east bank of the river, and between it and San Antonio Peak, following what was an old Indian trail southwest over the divide. Thus far the construction will be inexpensive, as there is at present a hay-road used by the Mexican teams up to this point—the chief items of cost being slopes of volcanic mesas that are met with, and the bridge over the river. When once put in traveling order, this part will but rarely need repair.

From the time of departure from the San Antonio, west of the Peak, until the volcanic field intervening to the mountains has been passed, occurs an interval, much less than a day's drive, however, between water, after which it is found at short intervals. The route over the range is similar to that of the Chama line, over an easy pass and through low valleys or depressions between the elevated ridges.

Several small streams, tributary to the Servilleta, a creek flowing southeast into the Rio Grande, are crossed near their heads, together with one on the Chama or Brazos watershed. Thence it passes to Las Nutritas, not far from its head and some eight miles distant from the plaza of the same name (Tierra Amarilla), to which it proceeds along the bank of the stream in a westerly direction, the total length of the line from Conejos being 55 miles. Over this latter part is already a road used by hay-wagons, and along the trail followed in general by the route Mexican shepherds have for years driven to and fro their numerous flocks—a favorite range, on account of the fine grazing and water in the mountain parks and valleys.

Timber being abundant in the elevated regions, there will be little expense, save where it may be needed for small bridges or corduroy.

The route being much of the way parallel to the line of drainage, there will be obviated what are always two items of considerable expense in such localities—cutting on side slopes for embankment, and side ditching above the road for drainage. The melting of snows on the mountain slopes, and the thawing of frozen surfaces in the spring, keep such a surface constantly moist, and a road inclined to the flow of water boggy and miry to a great extent, on being traveled.

Save the short section of 8 miles from Nutritas Creek to the plaza of that name, the entire road will be a portion of the shortest line *en route* from the railroad to Fort Wingate and the Arizona posts. From the Nutritas, the latter passes southwest to the Rio Nutria and the Chama, reaching the latter at the mouth of the former, where it is intended to bridge the river.

To consider briefly this in relation to the route to Fort Wingate, the distance, as surveyed by Lieutenant Anderson in 1874, is from the point of departure from the road to Tierra Amarilla (which place is 8 miles distant; Conejos being 47), down to the crossing of the Rio Chama, near the mouth of the Rio Nutria, 18.2 miles, making the Chama crossing distant from Conejos, by this, the San Antonio line, 65.2 miles.

Via the Chama road, as above stated, the distance from Conejos to Tierra Amarilla is 60.7 miles. The crossing of the Chama River by the Wingate road, having been found to be 14.5 miles distant from Tierra Amarilla, in an examination made during September last, by Lieut. D. J. Gibbon, Ninth Cavalry, we have the following summary to the Fort Wingate route :

Wingate crossing of the Chama River—			
	From Conejos.	From Fort Garland.	From Garland City.
	Miles.	Miles.	Miles.
Via Chama route and Tierra Amarilla.....	75.2	121.2	127.7
San Antonio route.....	65.2	111.2	117.7
Distance saved by San Antonio.....	10	10	10

A charter for the construction of the San Antonio road, under the name of the "Tierra Amarilla and Narrow Gauge Wagon Road," was taken out March 5, 1877, and filed on the 29th of the same, the incorporators being five men of means, any one of them being alone able to construct the entire line. The capital stock is \$15,000, over half of which, I have been informed, has been paid in to the treasurer. The necessary tools were purchased last summer, and it was intended to have the road completed and open this winter, but the small-pox epidemic, advancing up the Rio Grande, reached that section and proved a terrible scourge. Most of the able-bodied men of the country suffered from the disease, and at Tierra Amarilla, during the summer and fall, there were over 200 deaths. I have been informed by one of the officers of the company that work thereon will be commenced at both ends of the line as early as practicable in the spring, opening it for summer travel. The directors being men of capital and controlling all the trade and produce for miles about Tierra Amarilla, the statement may be relied on, inasmuch as its construction will be a good speculation, increase the business of the vicinity and probably not entail the expenditure of half,

perhaps not over a third, of the capital in opening the road to passengers and freight.

The advantages of the San Antonio over the Chama route are as follows:

1st. To Tierra Amarilla from Conejos several miles shorter; to the Chama crossing, *en route* to Pagosa, about the same, nothing more, certainly, with equally fine advantages in the natural supplies of wood, water, and grass.

2d. With no portion of the route in a region more elevated, it lies farther south, and the general lines of drainage being from the summit of the range to the east and west, it will be exposed to winds and storms from such directions only, and sheltered on the north, leaving travel less liable to interruption.

3d. It is a portion of the shortest and most practicable line between the railroad and points in the Southwest, or Fort Wingate and other Arizona posts, and should on that account have been built by the government. The amount of freight in the shape of Army and Indian supplies shipped to that point is very large. The charge of the toll-road company, judging from the usual prices on the mountain-roads of Colorado and New Mexico, will be \$2.50 per freight-team of six mules.

No greater economic appropriation could have been made on the part of the government than the amount for the construction of this line asked for in 1876.

Turning to the San Antonio line, it will be seen to be but a portion of a mountain route through and along western slopes of the ranges, which are all a continuation of the San Juan Mountains and part and parcel of the Rocky Mountain system, and as a mountain-line it is preferable to a highway on the plain, with its natural supplies of wood, water, and grass.

At this point it seems just that the conclusions drawn and recommendations made in the prior report on lines of communication between Southern Colorado and Northern New Mexico be referred to again. In that report the predictions made concerning railroad extension and its probable influence on this subject were carefully stated, and those predictions have been literally fulfilled. In that report two lines were described as having been surveyed for improved roads; over both of these lines charters for toll-roads have been obtained, and the road over one line is in use. The recommendations made from this office, if followed out, would have resulted in economy to the government and the roads would have been better made and sooner than now reported.

3d. *Proposed lines.*—1st. By both the Chama and San Antonio routes, there is required a long and unnecessary detour to Pagosa. Add to this a long march without water, or dependence upon capricious rain-storms, and pools muddied oftentimes by sheep-herds, between the Chama and the Navajo, and we find an imperative need of a shorter, more direct route, well supplied with water, wood, and grass.

The location I found preferable for so desirable a line, a cut-off on the Chama, may, from its situation, be known as the

CHAMA NAVAJO.

The great continental backbone, hemming in upon the north and east the lower San Juan region, abruptly changes at about latitude 37°, the dividing line of Colorado and New Mexico, from a chain of lofty peaks with high connecting mountains to a series of lower ridges with high elevations detached and at greater intervals. Immediately to its south,

and at the very base of the Chama Peak, whose elevation is 12,200 feet, occurs an exceptionally fine pass fully 3,500 feet below, watered by the west fork of the Upper Chama, completely protected on the north and east by the mountains and out lying slopes, with the summit of the divide to the northwest. This mountain-valley lies sheltered and warm, exposed chiefly to winds from the south only. Possessing the requisite elevation to impart to its grasses the peculiar flavor of a mountain growth, it is perfectly adapted to heavy traffic, for which subsistence for animals should be found in abundance, and is in every respect preferable to any already described, as a short line to the west.

Leaving the Chama route, on the upper part of that river, near the mouth of the main tributary that comes from the east, crossing the main stream and sweeping in a curve to the south and west to avoid high basaltic mesas and vertical walls of rock that shut out the river from passage and approach as securely in some places as a box-cañon, we reach the valley of the West Fork. On easy grades it can be ascended to the divide, which is lower than the one on the Chama line; this passed, brings us to the Navajo, down which it follows for about 5 miles in a westerly direction.

This section is an especially fine grazing region, and abundantly supplied with timber. Herds of Mexican sheep are driven into the valley of the West Fork, and the Ute Indians, for fully two months last summer, had established their camp upon the Navajo in this vicinity. This river is their preference of all the eastern streams in the lower country, and its valley will make an excellent farming or cattle region. Leaving the Navajo, at a few miles distance northwestwardly, tributaries of the river are crossed, whence, after the passage of the main divide between the water-sheds of that and the Blanco, we reach at a short distance the present "upper road" to Pagosa.

The distances on the Chama Navajo are as follows:

	Miles.
From Conejos to point of departure from the Chama road.....	33
Thence to Rio Navajo, via the west fork of the Chama and over pass 8,720 feet..	14.5
Along the Rio Navajo	5.5
Thence to the present traveled road	9.9
Thence via the present traveled road, the upper one, to Pagosa.....	14.5
<hr/>	
Total, Conejos to Pagosa.....	77.4
Distance via the Chama line to Pagosa.....	114.7
<hr/>	
Distance saved by the Chama-Navajo road	37.3

This would bring Pagosa to within 123.4 miles of Fort Garland, and 129.9 from the railroad.

My estimate for the construction of that part of the line from the point of departure from the "Chama" until the "Upper," the present road in use, is reached, a distance, as will be seen above, of 29.9 miles, is as follows:

Rock-blasting, &c.	\$3,000
Road embankment and construction, except the above.....	4,200
Bridge over the main Chama, including crib-work and approaches.....	725
Bridge over the Navajo.....	475
Smaller bridges <i>en route</i>	625
Contingencies	750
<hr/>	
Total	9,775
If the Army ration can be sold at cost price to laborers, deduct one-third.....	3,258
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	6 517

2. THE ALAMOSA LINE

From the present railroad terminus, the shortest most practicable route to Pagosa is in general direction due west, and mainly, of course, a water-line; for in all mountainous regions, particularly a highway, whether a rail or wagon road, must follow lines of drainage for the line of least resistance. Crossing the Rio Grande above the mouth of the Alamosa, continuing on to near the point where it debouches from the mountains to the plain, it thence follows up the cañon of the river. Near the headwaters of the south fork of the river, whose source is to the southwest, this water-line is left and another followed, leading up a tributary to one of the most feasible spots for a pass, for some distance, a depression between two lofty peaks. The range is crossed below timber-line, from which can be followed a tributary flowing due west into the east fork of the San Juan, and in the cañon of that stream and the main river to Pagosa.

This is as direct a route as can be at all economically obtained. Both the La Jara and the Conejos on the Atlantic slope of the San Juan Mountains, each with a general eastern course, were carefully examined, as were also the Navajo and the Blanco, with southwesterly ones on the Pacific side. In whatever way a line be run otherwise than as that described, there are difficulties to be overcome almost insuperable, save at great expenditure. So many streams, main rivers with their tributaries lying oftentimes in deep cañons, intervene on a direct line, that it could be constructed at great cost only, not at all warranted by the necessities of present or prospective commerce or any very material saving in distance.

Taking a bee-line from the railroad to the Rio Grande (where a wagon-road does not exist, but where the railroad line has been located with a view to its probable construction within a year at most), we have the following distances:

	Miles.
Garland City to a point at mouth of cañon of the Alamosa River	52.7
Up the cañon to the mouth of the North Fork of the river.....	26
Thence up South Fork and tributary to top of range	11
Down a tributary, the East Fork, and main San Juan River to Pagosa.....	35
Total railroad from Garland City to Pagosa.....	124.7

A saving of about 5 miles in all, not sufficient to warrant the great excess of expenditure when compared with the Chama-Navajo.

Under the name of the Conejos, Rio Grande and Pagosa Springs Toll-Road Company, four gentlemen, during the past summer, filed the necessary articles of association for the incorporation thereof in the recorder's office at Del Norte, Colo. The papers define their object and designate the route to be "from some point on the Rio Grande up the Alamosa, with a branch to the summit, and up the stream, over the top of the range, and down one of the branches of the San Juan to or near Pagosa Springs"; capital stock fixed at \$20,000. None of the incorporators are reported as men of means, or of sufficient enterprise to construct the line, and unless others should take it in hand, the road will not be made. It was doubtless recorded having in view the extension of the railroad west, in which event the toll-road would be a capital investment financially, and their charter, as is often done, might be sold for, probably, a valuable sum.

3. THE SUMMIT LINE.

From Garland, via Del Norte and the summit district, upon the north fork of the Rio Alamosa, near its headwaters, lying in the gulch of the

stream and on the slopes of South Mountain and Mount Belleview, is the mining-district known as the "Summit," thus far exclusively gold, and the finest in the San Juan region. About four and a half miles due west is the summit of the main range, beyond which spring tributaries of the San Juan, their general course hence to Pagosa being southwest. Connecting Del Norte with the summit is an old country road, with its route up San Francisco Creek to its head, thence around and south of the mountain, at the head of the Piedra Pintada, which is designated upon the Hayden maps as Pintada Peak, upon Wheeler's as Del Norte Peak, and is locally known as Old Baldy, thence winding along above timber-line until the north fork of the Alamosa and the summit is reached. Altogether a poor route and a wretched road at its best, it is now in disuse; another and a fine road, upon which toll is taken, is now in operation, saving fully six miles or more in distance. The latter, owned by Mr. John H. Shaw, of Del Norte, follows up the Los Pinos Creek, a natural road, for nearly twelve miles; thence up the mountain-slopes to the southwest, reaching the summit over a few miles of the old line. The toll-road is a very good one, though susceptible of much improvement in grade, location, &c., which would probably be made should there be sufficient increase in travel to warrant it.

From Garland the road is over the San Luis Park or Valley, is generally hard and level, to Del Norte, the Rio Grande being crossed by a bridge seven miles below the town. Distance from the fort, 60 miles; from Garland City, 66.5; from Del Norte to the summit, via the toll-road, it is 27.8 miles, and thence over a trail to Pagosa, 49 miles; making the springs about 77 miles distant, and the total distance from the railroad 143.3 miles, in excess of that by either the Alamosa or the Chama-Navajo lines.

SUMMARY.

This includes all of the short and practicable routes from the East across the range into the Lower San Juan.

From Pagosa to Animas City, a new settlement at the lower end of Animas Park, the distance on the upper road is as follows:

	Miles.
Pagosa Springs to Rio Nutria	13
Thence to Rio Piedra.....	12.1
Thence to Rio de los Piños.....	19.9
Thence to Rio Florida	13.6
Thence to Animas City	5.8
Total, Pagosa to Animas City.....	64.4

From Animas City up the valley, and over the new toll-road in the Grand Cañon of the river opened in the latter part of November, the distance to Silverton is 49.4 miles, making a total from Pagosa of 113.8 miles. With the present situation of the railroad terminus, we have, by the various mentioned lines, the following summary:

Garland City—	To Pagosa Springs.	To Animas City.	To Silverton.
	Miles.	Miles.	Miles.
Via Ojo Caliente and Tierra Amarilla.....	258.5	322.9	372.3
Cueva and Tierra Amarilla.....	228.5	292.9	342.3
The San Antonio route	165.3	229.7	279.1
The Chama route.....	167.3	231.7	281.1
The Chama-Navajo route.....	129.9	194.3	243.7
The Alamosa route.....	124.7	189.1	238.5
The Summit route via Del Norte	143.3	207.7	257.1

EXTENSION OF THE DENVER AND RIO GRANDE RAILROAD.

The proposed extension of the Denver and Rio Grande Railroad west from Garland City will materially change the aspect of affairs. The new terminal point, to be known as Alamosa, will, as I am informed by Col. D. C. Dodge, one of the officials of the railroad company, be on the western side of the Rio Grande, at or near some point on the Rio Alamosa, whence its name is derived, and will be $25\frac{1}{2}$ miles beyond Fort Garland, being an extension of 32 miles. The new line will be entirely straight, and almost a level, and its terminus 33 miles from Del Norte and 28 from Conejos. This will bring the latter place about $24\frac{1}{2}$ miles nearer the railroad than at present, and hence will lessen the distance to all points, including Pagosa, by the several routes passing through it to the same extent; it will diminish the Alamosa line to Pagosa still more, by 32 miles, and will shorten the summit route to the same point by $32\frac{1}{2}$ miles, whence the foregoing table becomes as follows:

From the new railroad terminus, or Alamosa—	To Pagosa Springs.	To Animas City.	To Silverton.
	Miles.	Miles.	Miles.
Via Ojo Caliente and Tierra Amarilla.....	234	298.4	347.8
Cueva and Tierra Amarilla.....	204	268.4	317.8
The San Antonio route.....	140	205.2	254.6
The Chama route.....	142.8	207.2	256.6
The Chama-Navajo route.....	105.4	169.8	219.2
The Alamosa route.....	92.7	157.1	206.5
The Summit route via Del Norte.....	109.8	174.2	223.6

The route to Fort Wingate having the choice of two of the above lines will have a corresponding decrease, as follows:

The Wingate crossing of the Chama—	From the railroad or Alamosa.	From Conejos.
	Miles.	Miles.
Via the Chama route and Tierra Amarilla.....	75.2	103.2
San Antonio route.....	65.2	93.2

THE DEL NORTE AND ALAMOSA RAILROAD.

Some of the citizens of Del Norte, chiefly men of property, conscious of the fact that their town has ceased to largely increase in property, and that unless a new impetus be given to revive business it will soon be outstripped by its more youthful rivals in the mining regions, have formed a company to build and operate a line of rail under the name of the Del Norte and Alamosa Railroad, to connect their town with the terminal point of the Denver and Rio Grande Railroad at Alamosa. I was informed that it would be constructed simultaneously with the extension of the Denver and Rio Grande.

With the railroad at Del Norte, and the toll-road to the summit in good order, the construction of a road thence over the range and down

the San Juan to Pagosa would be most expedient. With a route judiciously selected, the distance might be shortened fully 7 miles, bringing the springs less than 70 miles distant from the railroad.

RECOMMENDATIONS.

With the present situation of the railroad, I would recommend the construction of the Chama-Navajo as of prime importance for the development of the Lower San Juan. Both in a civil and military point of view would it be a most profitable investment. The entire route of travel would be settled upon at an early day, and thriving communities at various points arise, now remote from mails and other facilities. The roving and unsettled bands of Indians in the southwest corner of the State, and in adjoining territory of Utah and Arizona, committing frequent depredations on the whites, will necessitate better protection for the interests of civilization. The present post of Fort Garland, no longer a frontier station, should, in the event of its advancement west, be located somewhere in the Lower San Juan. Communication and lines of supply will necessitate the route via the Chama-Navajo.

The line of the Alamosa road will shorten the distance to Pagosa over the former but about 5 miles, and its cost being more than twice as much, its construction should not be made from any economic consideration. Being, moreover, a line of deep cañons and rocky defiles, no outlying country bordering thereon would be opened up or benefited, as in case of the Chama-Navajo, which is, especially beyond the Chama River, almost wholly a line of valleys. Being a lofty route, it passes over the range, being about 3,000 feet higher than the former, the Alamosa line would be blocked by snow and impassable for a portion of the year, unless constant traffic prevented. Upon the Chama-Navajo, with its lower situation and protection by sheltering mountains on the north, a natural blockade would not so completely occur.

In the event of the building of the railroad extension to Alamosa, the distance from its terminus to Pagosa by the Chama-Navajo would be 105 miles, and by the Alamosa about 13 miles less. This would be an important saving; but should the track be continued to that point, there is every probability of the construction of the Del Norte and Alamosa Railroad, making Del Norte a terminal point; in this event the summit line to Pagosa assumes the most prominent position, the distance by that route being diminished, as already mentioned, to 70 miles.

The construction of the unfinished link from the summit to the springs, nearly 49 miles by the trail, would entail an expenditure of \$18,000. The route will pass down the east fork of the San Juan, where judicious locations will give easy grades, and shorten the line as compared with the present trail, and afterward along the main stream, the whole a cañon region, presenting fewer difficulties of passage than that of the Alamosa. For several miles the main river above the mouth of the West Fork is inclosed in a box cañon, and here would be essential a considerable amount of blasting. Several ranchmen located last summer on the West Fork, in a fine open valley, above its mouth, and thence to Pagosa have made for their accommodation a passable way for light wagons, distance about 11 miles.

C. A. H. McCAULEY,
Second Lieutenant, Third Artillery.

The ADJUTANT-GENERAL,
Department of the Missouri.

From the lower crossing of the Chama, south and west, my prior report describes the first part of the route from this crossing to the south in the language of Lieutenant Anderson:

After leaving the Chama we passed down a trail made by Major Price, Eighth Cavalry, in the summer of 1872. The road at first ascends an arroya, skirting the base of the Gallinas Mountains; then rises a low divide some ten miles distant from the lower ford. The country near the river is furrowed by numerous deep gullies, and produces little else but sage-brush and cactus. At the divide we entered a valley some thirty-five miles in length and from three to twelve miles in width. This valley is bordered on the east by a range of mounts, through which two small streams, the Gallinas and the Copulin, find their way to the Chama. The north end of the range is called Gallinas, the middle section Copulin, and the south end Jemez. They are all covered with evergreens and aspens to their summits, and their more abrupt faces show strata of various colored sandstone. Near the plaza of Nacimiento the Jemez Mountains sent far into the valley spurs of low hills, covered with heavy pine and spruce timber. Between these hills are grass-grown meadows, traversed by clear mountain-streams, bordered with willows. The first of these streams is the Puerco, which, after reaching the main valley, turns to the south and receives the others as tributaries.

The west of this valley is shut in by a range of sandstone mesas from 100 to 500 feet high, showing, in their vertical sides, shales, conglomerates, clays, and various colored strata of friable sandstone. This formation extends down the west bank of the Chama to old Fort Lowell, from a point some twenty miles above it; near that fort it leaves the river and follows down to the west of the Puerco as far as the stage-road crossing, where it apparently ends. Its southern face is seen to the north of the road over its whole length to Fort Wingate. This valley is traversed, longitudinally, from its northern extremity to the head of the Puerco by one principal range, a number of smaller ranges of knife-edge hills of peculiar appearance, sometimes rising to a height of 300 feet. They are formed of a soft, light-gray sandstone, with strata having a dip to westward of near 45° .

The west face has a thin covering of soil supporting a growth of evergreens; the east face is nearly vertical, showing the edges of the strata; the bottom is filled with *débris*.

These ranges are in several places broken through by streams which take their rise at the foot of the mesas on the west, and find their way to the Chama. At the time of our passage they were dry, and to all appearances their principal use was to carry off surface-water. The remainder of the valley is gently rolling. The lower hills are covered with evergreens, and the level spaces between them with a rank growth of sage-brush. The flies were so numerous about these small creeks that we were obliged to go into camp nearly a mile from water, and send down our kegs for a night's supply. Many pieces of both painted and unpainted pottery and some stone arrow-heads were found on mounds of drift, among fragments of quartz and petrified wood, but none were to be seen on the higher hills, nor were they to be found in any numbers on the level plain. Near Nacimiento were several large meadows, supporting fine herds of stock; but little of the ground was under cultivation.

This same portion of the route was examined by Lieutenant Gibbon, Ninth Cavalry, with a special view to making an estimate of the amount of work needed to make it available for freighting purposes. The examination was made in September, 1877, and from Lieutenant Gibbon's report of the 21st September, the following estimate is quoted.

There will be no difficulty in constructing a good road through this portion of the route in from twenty-eight to thirty days with a working force of twenty-five men at the following places:

	Days.
Nutritas to Chama River.....	2
At Rio Chama.....	6
Rio Chama to first valley.....	3
In Keracita Valley and Arroya.....	2
To second Chipadero Springs.....	2
At second Chipadero Springs.....	2
To and over Arroya Blanca.....	2
Over Butte Hill.....	3
Ojo San José.....	3
To Schaaap's Ranch.....	3

In May and June the Rio Chama cannot be forded. An estimate for the cost of a bridge was not made, however. In reducing this estimate to figures it will be recollected that the scene of operations is at a great distance from either Fort Garland or Santa Fé as military stations; that the reduced number of enlisted men for duty in New Mexico makes it entirely inadvisable to recommend their use for this purpose; and lastly, because any miscalculation as to rates of wages to be paid and amount of work done would seriously impair too small an estimate. I summarize the above as 30 men at \$1.50 per day for 30 days, equal to \$1,350, and adding 10 per cent. for contingencies, \$1,485.

On the route there is generally plenty of grass and always plenty of wood. There is plenty of water at the Rio Chama. Ojo San José and the La Jara Pond and a well dug at the Chipadero Springs would probably give a sufficiency of water there.

	Miles.
Tierra Amarilla to crossing of Chama.....	14½
Crossing of the Chama to North Chipadero Springs.....	12
Crossing of the Chama to South Chipadero Springs.....	15
Crossing of the Chama to Butte Hill.....	24½
Crossing of the Chama to San José Springs.....	25

Beyond this point no labor is necessary.

From the Chama Crossing to the Puerco Station, on the Santa Fé and Fort Wingate road, the distance is 83 miles. Lieutenant Gibbon's report minutely describes the proposed line of road, and in case an appropriation were made it could be used to much advantage by the person in charge of construction.

From Puerco Station to the west, to Fort Wingate, the regular traveled road gives 102 miles, and cannot probably be shortened or improved much.

To the south, however, a different promise is made. The present road to the southern country and posts strikes the Rio Grande at Albuquerque and follows down that river, which is crossed twice by ferries in order to reach a bad and sandy road on the opposite bank by leaving a worse one on the remaining side. The department commander is fully aware personally of this portion of the road and its character, and it is not necessary for me to dilate more upon it. If freighters were to leave the Wingate road at the crossing of the Puerco and follow down that stream to the Rio Grande, a large part of the sandy road would be avoided, as well as the Albuquerque crossing. An exact description of the characteristics of the Puerco River cannot now be given, but it is hoped to supply this deficiency in the spring. Meantime it is believed that for freighting purposes it is adapted equally as well as the Rio Grande Valley, and if it can be so used it would be advantageous. It is requested that a small sum be asked for a careful survey of this

route, and accordingly an estimate of \$1,000 is made. The approximate distance from Puerco Station to the mouth of the stream, or the Rio Grande, is 95 miles.

Inasmuch as present experience indicates decidedly that the progress of railroad building has rapidly and permanently altered freighting conditions in this section of the country, and that the part of wisdom would be to meet this progressive spirit and profit by it, it seems eminently proper to ask for a small contingent fund to repair and construct these new lines when needed. It may be noted that in this country many long roads are rendered useless because they are interrupted during short spaces, which if corrected at slight expense at once there is opened a long and valuable line. I therefore ask for \$5,000, or, if the Army ration may be sold to laborers, \$3,500 will be sufficient to open or repair military roads in Northwestern Mexico and Southwestern Colorado.

General table of distances from the railroad terminus in Colorado to points in New Mexico.

	Miles.
El Moro to Santa Fé via Fort Union	221
Garland City to Santa Fé via Taos	146
Saving from latter point	75
El Moro to Fort Stanton via Union	349
Garland City to Fort Stanton via Santa Fé	320
Saving from latter point	29
El Moro to Fort Craig via Fort Union and Albuquerque	381½
Garland City to Fort Craig via Santa Fé and Albuquerque	322½
Saving from latter point	59
To all points to the south of this, Fort Bayard, Fort Selden, and to El Paso, the saving will be the same, <i>i. e.</i> , 59 miles.	
	Miles.
El Moro to Fort Wingate via Fort Union	391
Garland City to Fort Wingate via Santa Fé	321
Saving from the latter point	70
El Moro to Fort Wingate via Fort Union	391
Garland City to Fort Wingate via Conejos and San Antonio road	294
Saving from the latter point	97
This saving of 97 miles is also effected to all points southwest and west of Fort Wingate, as, for instance, Camp Apache and Prescott, Arizona, in case of the extension of the railroad to Alamosa, which will shortly be done beyond a doubt.	
	Miles.
El Moro to Fort Wingate via Fort Union	391
Alamosa to Fort Wingate via Conejos and San Antonio road	271
Saved by the latter route	120
In all probability when the railroad extension reaches Alamosa it will be found desirable to reach Fort Craig and the lower posts from this point by following down the Puerco.	
	Miles.
El Moro to Fort Craig via Fort Union and Albuquerque	381½
Alamosa to Fort Craig via Conejos, San Antonio Road, and Puerco River	331½
Probable saving of about	50

This route has advantages which will probably be considered at the time the railroad extension is made.

RECAPITULATION.

Lines of communication between Colorado and New Mexico are important to the military service, and have been radically altered by railroad extension. Improvements should be made to existing roads—

1st. From Fort Garland to Santa Fé, estimate		\$10,340
If Army ration sold to laborers	\$6,900	-----
2d. From Fort Garland to Southwest Chama-Navajo road, new		9,775
If Army ration sold to laborers	6,517	-----
Chama Crossing to Puerco Station	1,485	1,485
3d. Survey of line down Puerco River	1,000	1,000
4th. For general use in Southwestern Colorado and Northern New Mexico		5,000
If Army ration sold	3,500	-----
		19,402 27,600

The above estimates are considered to be close, and with present prospects an immediate appropriation and application would result in a quick influence on freighting rates, and ease of supplying the entire western and southwestern posts. Throughout this report I have carefully abstained from expressing any views as to the military necessity of this or that road, and trust that this point will be developed by the department commander in forwarding this paper.

I am, sir, very respectfully, your obedient servant,

E. H. RUFFNER,
First Lieutenant Engineers.

THE CHAMA-NAVAJO ROUTE TO THE LOWER SAN JUAN.

Roads are the highways of civilization and are primarily *the desideratum* for the development of country with fine natural resources. The roads of the San Juan country of Colorado are of the first importance, and whatever can be done to shorten the lines of communication and open as yet undeveloped sections will be of the first and most material value.

The recent advance of the Denver and Rio Grande (a narrow-gauge railroad) over the Sangre de Cristo Range has enabled it to control all freight and passenger traffic destined for the San Juan, besides that of all of New Mexico, save the northeastern part. As the lower country of the San Juan is the least favored with respect to outer communication, its claims should be strongly considered. Hemmed in upon the north and east by lofty mountains, with outlying spurs that contain many peaks of great altitude and few practicable or natural passes, the summits of the mountain chains lie approximatively in the arc of a circle, with Pagosa Springs nearly at the center. From its natural position and the relative bases of supply, it becomes a strategic point, and is passed on the upper road to Animas Park and neighboring populated districts.

From the terminus of the railroad at Garland City, the route for all freight and passenger traffic to the Lower San Juan passes Tierra Amarilla, a group of Mexican villages, of which the main plaza is Los Nutritas. The old line by Ojo Caliente and the cut-off by Cueva have been considerably shortened by the construction, during last summer, of a toll-road from Conejos to Tierra Amarilla, which may be known as the "Chama" route, from the stream along whose waters it mainly lies. The road is passable, although 12 miles of the way remain as yet in a bad condition.

Upon another rival line between the same points work has been commenced, but its completion was prevented last fall by the outbreak of the small-pox among the Mexican inhabitants. This is known as the "San Antonio" route, the first part of the line passing mainly along that stream. All roads pass the Chama River at the Mexican plaza of Los Ojos, 2 miles from Los Nutritas; thence to Pagosa the way is almost entirely over a natural road, through low valleys or over gently undulating hills. Beyond the Chama, over the entire route, grass and timber are plentiful; but in July last no running water was found between the Chama and Navajo—33 miles—although frequent rains had but lately fallen. The soil is to some extent alkaline, and upon pools of rain-water camp was dependent. From the Navajo to Pagosa—23 miles—water is abundant, the Blanco and tributaries being crossed *en route*. The saving of distance between Garland City and Pagosa is, by either the Chama or San Antonio routes, 60 miles, compared with the Cueva line, and 90 less than that via Ojo Caliente. By both the Chama and San Antonio thoroughfares there is required a long and unnecessary detour to the south. Add to this a long march without water, or sole dependence upon capricious rain-storms or pools muddied by sheep-herds, between the Chama and the Navajo, and we find an imperative need of a shorter more direct route, well supplied everywhere with wood, water, and grass. The location found preferable for so desirable a line, a cut-off on the "Chama," may, from its situation, be known as the

CHAMA-NAVAJO.

The great continental back-bone, hemming in upon the north and east the Lower San Juan region, abruptly changes at about latitude 37°, the dividing line of Colorado and New Mexico, from a chain of lofty peaks, with high connecting mountains, to a series of lower ridges with high elevations, detached and at greater intervals. Immediately to its south and at the very base of the Chama peak, whose elevation is 12,200 feet, occurs an exceptionally fine pass fully 3,300 feet below. Watered by the west fork of the Upper Chama, completely protected on the north and east by the mountains and outlying slopes, this mountain valley lies sheltered and warm, covered with nutritious grasses, perfectly adapted and in every respect preferable to any other line to the west. This route leaves the Chama road on the upper part of that river, curves to the south on account of high basaltic mesas on the west bank, ascends the valley of the West Fork, and after passing the divide at an easy grade, descends to the Navajo, down which it follows for about 5 miles. From this river, northwestwardly, at a few miles' distance, tributaries are crossed, whence, after the passage of the main divide between the watersheds of the Navajo and the Blanco, at a short distance, is reached the present "upper road" to Pagosa. On this line the distances are as follows, from Conejos to Pagosa:

	Mil. s.
Conejos to point of departure from the Chama road.....	33.0
Thence, via West Fork and pass of 8,720 feet, to the Rio Navajo.....	14.5
Along the Rio Navajo.....	5.5
Thence to the "upper" or present traveled road.....	9.9
Along same to Pagosa Springs.....	14.5
<hr/>	
Total, Conejos to Pagosa.....	77.4
Distance via Chama line, Conejos to Pagosa.....	114.7
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Distance saved by Chama-Navajo route.....	37.3

being that amount less than any other short line now open or commenced.

The construction of this line, and its free use by the public, will be of immense benefit to the Lower San Juan. It would open up to settlement magnificent farming and grazing lands now remote from easy communication, and for many other reasons would be a most economic investment of public money. The estimate for its construction from point of departure from the Chama until the upper road is reached, as will be seen above, a distance of 29.9 miles, is as follows:

Rock blasting, &c.....	\$3,000
Road embankment and construction, except above.....	4,200
Bridge over main Chama, including crib-work and approaches.....	725
Bridge over the Navajo.....	475
Smaller bridges on route.....	625
Contingencies.....	750
Total	9,775

From the maps accompanying the entire route, with the old and new roads, the advantages of the above saving in distance can be readily noted.

With the present situation of the railroad, we have the following table of distances, showing the great desirability of shorter lines of communication:

Garland City—	To Pagosa Springs.	To Arimas City.
	Miles.	Miles.
Via Ojo Caliente and Tierra Amarilla.....	258.5	322.9
Cueva and Tierra Amarilla.....	228.5	292.9
The San Antonio route.....	165.3	229.7
The Chama route.....	167.3	231.7
The Chama-Navajo route.....	129.9	194.3

**HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF QUARTERMASTER,
Fort Leavenworth, Kans., January 29, 1878.**

SIR: I have the honor to submit, for the information of the department commander, a statement showing the rates paid by the Quartermaster's Department for wagon-transportation from El Moro, Colo., to certain posts in New Mexico and Arizona, during the six months ending December 31, 1877, as compared with the rates to be paid from February 1 to June 30, 1878, under contracts from Garland, Colo., which have been awarded to F. F. Struthy:

From—	To—					
	Santa Fe, N. Mex.	Fort Craig, N. Mex.	Fort Wingate, N. Mex.	Fort Selden, N. Mex.	Fort Bayard, N. Mex.	Camp Apache, Ariz.
El Moro, Colo., six months ending December 31, 1877 (per 100 pounds for whole distance).....	\$2 05	\$3 54	\$3 63	\$4 33	\$5 19	\$4 96
Garland, Colo., average of six months ending June 30, 1878 (per 100 pounds for whole distance).....	1 55	3 10	3 45	3 75	4 60	4 55
Difference in favor of Garland, Colo. (per 100 pounds for whole distance).....	50	44	18	58	59	41

34 COMMUNICATION BETWEEN COLORADO AND NEW MEXICO.

The total quantity of freight transported to these posts yearly is from one to two million pounds, probably nearer two than one million.

Very respectfully,

R. SAXTON,
Chief Quartermaster.

The ASSISTANT ADJUTANT-GENERAL,
Department of the Missouri, Fort Leavenworth, Kans.

[First indorsement.]

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
ASSISTANT ADJUTANT-GENERAL'S OFFICE,
Fort Leavenworth, Kans., January 31, 1878.

Respectfully returned to the chief quartermaster of the department, who is desired to add to the information herein contained a statement of the comparative cost of placing stores at El Moro and at Fort Garland.

By command of Brigadier-General Pope.

E. R. PLATT,
Assistant Adjutant General.

CHIEF QUARTERMASTER'S OFFICE,
DEPARTMENT MISSOURI,
Fort Leavenworth, January 31, 1878.

Respectfully returned to the assistant adjutant-general of the department.

The cost of placing stores at Garland, Colo., is just 20 cents per 100 pounds more than the cost of placing them at El Moro.

R. SAXTON,
Chief Quartermaster.

[First indorsement.]

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
Fort Leavenworth, Kans., February 2, 1878.

This letter, with the accompanying detailed reports, covering fully the entire subject, is respectfully forwarded for the consideration of the Secretary of War.

Garland will undoubtedly be the shipping point for some years of all freight destined for Southwestern Colorado, Eastern Arizona, and the whole of New Mexico, excepting only the posts of Union and Stanton freight rates from Garland, as will be seen, being much below any others offered.

From Garland depart three routes for this service. One to the San Juan country; one to the posts in Arizona, including Fort Wingate, New Mexico, and one via Santa Fé to the Lower Rio Grande. The amount required on each of these roads to make good roads, and thereby still further cheaper freights and facilitate communication, is as follows, viz:

To San Juan country and site of the military post in that region, to which Fort Garland is to be transferred	\$11,517
To Fort Wingate and posts in Arizona north of Gila River	2,485
To Santa Fé	10,000
Total	24,002

With this small amount these roads can be put in excellent condition, and there is no doubt that the whole sum will be repaid twice over in a few years by reduction of freight rates. I respectfully ask that the Secretary of War ask a special appropriation for this work of the amount

specified, the work to be done under the charge of Lieutenant Ruffner, chief engineer of this department. The sooner it can be done, the better for the government and all concerned. The great importance of the roads in the settlement and development of the regions which they traverse need not be set forth. It will suffice to say that, in my opinion, every interest of the government in that section of the country will be greatly benefited at very small expense in that direction.

JNO. POPE,
Brevet Major-General U. S. A., Commanding.

[Second indorsement.]

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, February 5, 1878.

Respectfully referred to the chief engineer officer of the division for examination. Please return.

By command of Lieutenant-General Sheridan.

R. C. DRUM,
Assistant Adjutant-General.

[Third indorsement.]

OFFICE CHIEF ENGINEER, MILITARY DIVISION MISSOURI,
Chicago, February 6, 1878.

Respectfully returned to the assistant adjutant-general, Military Division of the Missouri.

G. J. LYDECKER,
Captain of Engineers, Chief Engineer Military Division Missouri.

[Fourth indorsement.]

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, February 7, 1878.

Respectfully forwarded to the Adjutant-General of the Army.
In the absence of the Lieutenant-General commanding.

R. C. DRUM,
Assistant Adjutant-General.

[Fifth indorsement.]

HEADQUARTERS OF THE ARMY,
Washington, February 12, 1878.

Respectfully submitted to the honorable Secretary of War approved.

The completion of the railroad across the Sangre de Cristo Mountains into the valley of the Rio Grande opens up a most interesting and extensive new country. Twenty-four thousand dollars could not be better expended than on the roads herein described, and Captain Ruffner is peculiarly qualified for the work.

W. T. SHERMAN,
General.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF-ENGINEER,
Fort Leavenworth, Kans., February 5, 1878.

SIR: I have the honor to transmit herewith a map of Colorado, with a small portion of New Mexico, showing the general area covered by me during the San Juan reconnaissance, from June to November, 1877.

The lines of communication passable for wagon-trains are marked at all points, whether in the nature of county or private toll-roads. To

complete the scope of this paper as that of a partial report the location of the population has been given. Those portions of the country which have been occupied by settlers for farming, either ranching or grazing, and by prospectors for mining purposes, are also shown, the sections which are thickly populated being so indicated.

Of all the country adapted to agriculture, that drained by the Animas is receiving the largest amount of emigration, the portion known as the Animas Park extending from the mouth of Junction Creek, about 13 miles to the north, an especially beautiful and fertile valley, with an elevation from 6,500 to 6,800 feet, having already been almost wholly occupied. The ranchmen in general, however, have made no improvements worthy of mention on the land, and have done little save to barely establish and hold their claims, for with over ten thousand acres of tillable land, I found last fall the amount under actual cultivation to be less than one-tenth of the total. A few exceptional cases were noted, the ranch of Mr. Lamb, 4 miles above Animas City, deserving especial mention for the fine appearance of his farm, with all the usual outbuildings and external signs of thrift and comfort noticeable in one of the Eastern States.

Animas City referred to is a new and growing town on the right bank of the Animas, just above the mouth of Junction Creek. It is not laid down on any Hayden or Wheeler map, and must not be confounded with the "Animas City" of Wheeler, which is an old deserted place, about 12 miles above, and on the other bank of the river. The opening of the Jicarilla Apache reservation to settlement has, during the past year, drawn a considerable number of emigrants to the San Juan, the Lower Animas, and the La Plata.

The farming and grazing population established themselves on the lower parts of rivers and streams, and are permanently thereon; the mining-camps, wholly or almost entirely, are located at the headwaters of streams or upon mountain-peaks near by. Owing to the short working-season, and the intense severity of the winter at that elevation, the mining-population is of a semi-permanent nature, leaving about the latter part of October, and returning in May or June, from the towns or the lower regions, where they congregate for the winter. As an illustration of the brevity of the working-season may be mentioned my visits to the Summit, a gold-mining district southwest of Del Norte. They were three in number, and from different directions, during the reconnaissance: in June, from the Lower Alamosa; in August, from Pagosa, via the San Juan; and in October, from Del Norte. In August only was my way not impeded by snow; the total precipitation there for the year ending November 1 being 24 feet. In preparing the printed table of densest populated districts attached to the map, the population belonging to various mining-camps has been so accredited, since it there properly belongs, and with other of a floating nature, fully aggregates the numbers given. While there may be a percentage of error in the designated numbers in a few instances, it is, on the whole, believed to be less than the total of all the region visited from the existence of obstacles to an exact and actual count. The difficulties of arriving at a thorough and perfect census in such localities may well be imagined, for while a town is drained of its winter population for the mining regions, prospectors distribute themselves through localities almost uninhabited, or waver from one section to another as its prospects change. There were, for instance, from three to four hundred more persons in Lake City last spring than are so credited, owing to their temporary stay; immigration was very great to this locality, but

disappointed in endeavors to find employment, they either returned or spread out into new districts.

The total distance traveled, after leaving Fort Garland, Colorado, was 2,030 miles; this was wholly in the field, mainly with pack-trains, and is confined to that made in person, not including any mileage made by detached wagon-trains or by any members of my party unaccompanied by myself.

The following table gives the distances between interesting or important points visited :

Between what points.	Miles.	Remarks.
Garland City to Fort Garland.....	6.5	Railroad terminus at Garland City.
Fort Garland to Stewart's Ferry.....	19.5	} Stewart's, or upper ferry, on the Rio Grande.
Stewart's Ferry to Conejos.....	26.5	
Fort Garland to Chevez Ferry.....	31.5	
Chevez Ferry to Conejos.....	18	} Chevez, or lower ferry, formerly Myers's.
Conejos to Tierra Amarilla (Las Nutritas) via Ojo Caliente.....	150	
Conejos to Tierra Amarilla (Las Nutritas) via Cueva.....	120	
Conejos to Tierra Amarilla (Las Nutritas) via the Chama route.....	60.7	
Los Nutritas to Los Ojos.....	9	Chama River forded at Los Ojos.
Los Ojos to Rio Navajo.....	33.2	} Upper road to Pagosa.
Rio Navajo to Rio Blanco.....	12.3	
Rio Blanco to Pagosa Springs.....	10.6	
Conejos to Pagosa via Ojo Caliente.....	208	County-road; lower route.
Conejos to Pagosa via Cueva.....	178	County-road; cut-off.
Conejos to Pagosa via the Chama route.....	114.8	New toll-road; 12 miles incomplete.
Conejos to Pagosa via San Antonio route.....	112.8	New toll-road; constructing.
Conejos to Pagosa via Chama-Navajo route.....	77.4	Proposed United States road; the shortest route West.
Pagosa Springs to the Summit District.....	49	Trail up Rio San Juan.
Pagosa to Rio Nutria (spring near ranch of Colonel Pfeiffers).....	13	
Rio Nutria to Rio Piedra.....	12.1	} County-road.
Rio Piedra to Rio de los Pinos.....	19.9	
Rio de los Pinos to Rio Florida.....	13.6	
Rio Florida to Rio de los Animas.....	5.8	
Animas City to Parrott City.....	19.5	Via toll-road.
Parrott City to East Fork Rio Mancos.....	18.1	Via trail.
Parrott City to East Fork Rio Mancos.....	11.9	} County-road.
East Fork to West Fork Rio Mancos.....	.7	
Thence to Big Bend Rio Dolores (Camp 64, September 23).....	18.7	Trail.
Parrott City to mouth Rio La Plata.....	54	Toll-road.
Animas City to mouth Rio de las Animas.....	58.5	Trail.
Animas City to Hermosa.....	8.6	County-road.
Hermosa, via Grand Cañon of the Animas, to Silverton.....	40.8	Wightman's new toll-road.
Silverton to Howardsville.....	4.7	County-road.
Howardsville to Lake City, via Animas Forks and Burrow's Park.....	36.6	
Howardsville to Lake City, via Mineral City and Hensen Creek.....	31	} Toll road.
Howardsville, via old wagon-road, to Carr's.....	16.3	Summit of pass, 12,400 feet.
Howardsville, via Cunningham Gulch and trail over Summit, to Carr's.....	22.7	Pass, 11,900 feet.
Carr's to Alden's Junction or Antelope Springs.....	27	
Alden's to Lake City.....	33.5	} Toll-road; pass, 11,100 feet.
Alden's or Antelope Springs to Wagon-Wheel Gap.....	16	
Wagon-Wheel Gap to mouth South Fork Rio Grande.....	11.6	} Toll-road down Rio Grande.
Thence to Del Norte.....	15.8	
Del Norte to the Summit.....	27.8	Toll road.
Del Norte to Fort Garland.....	60	County-road.
Del Norte to Piedra Pintada.....	15.9	
Thence to La Jara post-office on Rio de la Jara.....	18.6	} In San Luis Park; county-road.
Thence to Conejos.....	13.5	

I am, sir, very respectfully, your obedient servant,

C. A. H. McCAULEY,

Second Lieutenant Third Artillery,

Assist. to Chief Engineer Dept. of Mo.

Assistant ADJUTANT-GENERAL,

Department of the Missouri, Fort Leavenworth, Kans.,

Through Chief Engineer.

[Indorsement.]

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
OFFICE OF THE CHIEF ENGINEER,
Fort Leavenworth, Kans., February 8, 1878.

Respectfully forwarded.

Particular attention is invited to this report, as it contains, in brief, much valuable information, collected with care and condensed with judgment.

The map of the whole of Colorado is furnished, so that a comparison may be readily made of the area reconnoitered with that of the whole of the State. In future reports on this subject a partial map will be prepared of the area in question and the whole State will not again be represented.

E. H. RUFFNER,
First Lieutenant Engineers.

HEADQUARTERS DEPARTMENT OF THE MISSOURI,
Fort Leavenworth, Kans., February 11, 1878.

Respectfully forwarded to the assistant adjutant-general, headquarters Military Division of the Missouri, in connection with the report on the same subject transmitted on the 2d instant.

These reports contain, as it appears to me, all the information necessary to determine, within limits, the location for a consolidated Ute reservation and agency and the military post needed in the San Juan country.

JNO. POPE,
Brevet Major-General, U. S. A., Commanding.

HEADQUARTERS MILITARY DIVISION OF THE MISSOURI,
Chicago, February 15, 1878.

Respectfully forwarded to the Adjutant-General of the Army.
In the absence of the Lieutenant-General commanding.

R. G. DRUM,
Assistant Adjutant-General.

HEADQUARTERS OF THE ARMY,
Washington, February 19, 1878.

Respectfully submitted to the Secretary of War, in connection with previous papers referred to by General Pope, which were submitted on the 12th instant.

W. T. SHERMAN,
General.