obtained, having a constant melting point of 207°. It is soluble in chloroform, slightly soluble in ligroin, and insoluble in ether.

Calculated as $C_{26}H_{24}O_4$.	Found.
C 78.00	77.62
H 6.00	6.13

The acetate and oxim have been prepared, but as yet no analyses have been made, but the physical properties determined correspond very closely with those of the other Δ^2-keto-R-hexene derivatives which I have prepared.

An investigation of the reaction of anisoin with cuminalacetone, piperonylenacetone and anisylidenacetone is being carried on.

Geology of the Jemez-Albuquerque Region, N. M.

Albert B. Reagan.

(Abstract.)

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GENERAL DESCRIPTION.

The Jemez-Albuquerque Region described in this paper, is in northwestern New Mexico between longitude 106.° 20′ and 107° W. and latitude 35° and 36° N. Roughly speaking, it is a triangle with its apex toward the south. It is bounded on the southeast by the San Dia Mountains, on the southwest by the Rio Puerco, and on the north by the upper plateau of the Jemez Mountains. Its principal river is the Rio Grande, and its commercial center is Albuquerque. The Santa Fe Railroad enters the region at the northeast, near Thornton, and passes through it, just to the east of the Rio Grande to Albuquerque. At this point the road branches, one branch of the system going to El Paso, Texas, the other, the Atlantic and Pacific, to California and the Pacific coast.

GENERAL SURVEY.

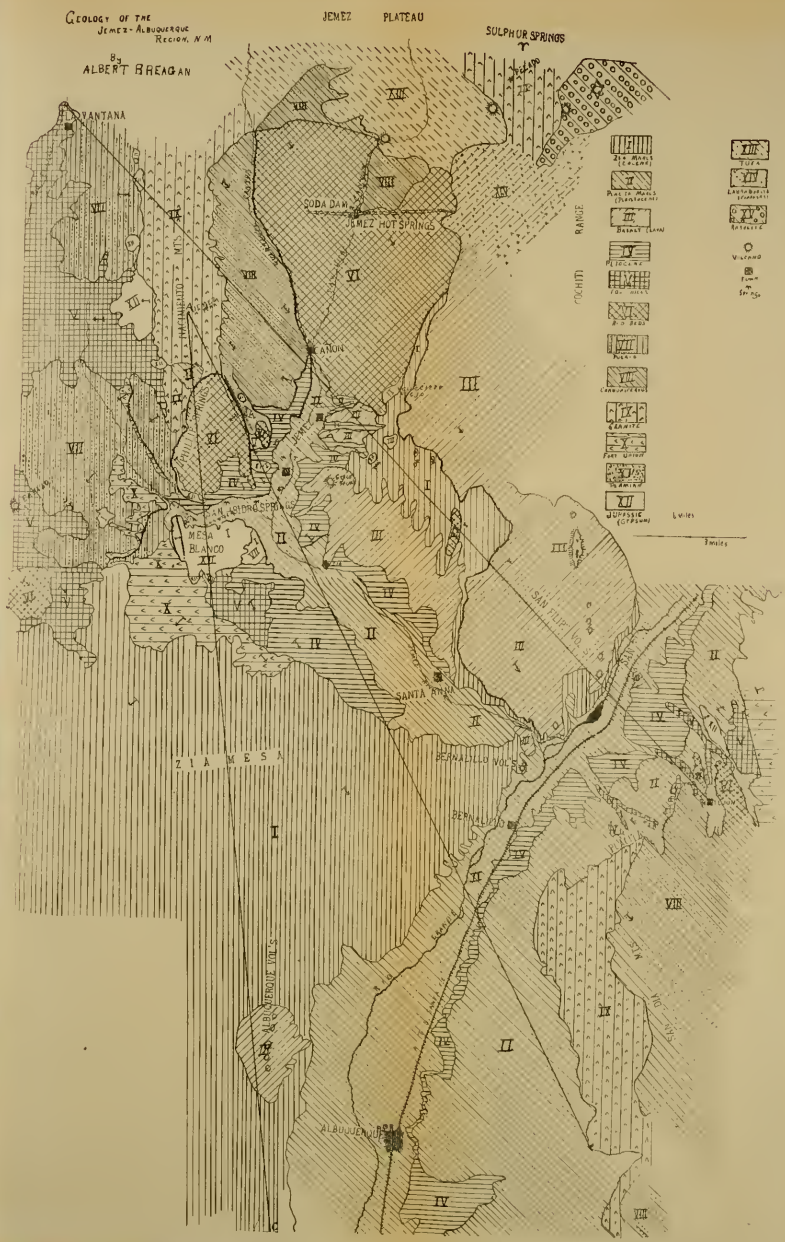
This section, as a whole, is one vast desert area, sparsely covered with grass, piñones, red cedar, sage brush and cactus, except in the valleys where there is sufficient water for irrigation. In these valleys corn, wheat, fruit and beans are raised by the natives and Mexicans. To consider the

entire area again, it presents two basin-shaped districts, the Rio Puerco and the Rio Grande, with the strata in each respective basin dipping in general toward its center. The separating line at the north between these basins is the Nacimiento Mountains, the west wing of the Jemez uplift. It is continued at the south in a line of hills which decrease in altitude as they recede from the main range. The two basins merge into one below Albuquerque. The whole area is faulted and much broken and high escarpments often still mark the fault lines. Examples of such escarpments are the San Dia Mountains, Mesa Blanco, and one on each side of the Red Beds just south of the Jemez range. There is also evidence that the Nacimiento Mountains were, originally, the result of a drop on their western side. The resulting escarpment has been worn down and subsequently covered in part by sedimentations that it is not so strong in relief as the San Dia escarpment; the Carboniferous strata which flank this range on the east are entirely wanting to the west of these mountains. Mesa Blanco was left an escarpment by a drop on its northern side of more than 1,600 feet, 1,000 feet of which still remain. The escarpment to the east of the Red Bed mesa is now 900 feet in height and the escarpment to the west of the same mesa is 1,200 feet. On its western margin the strata of this mesa dip toward the east at a great angle, and at a greater angle toward the west on its eastern side. The whole country, as is indicated above, is extremely broken up; the rivers in their process of base-leveling have chiseled their channels deep into the rock. Great dikes and numerous volcanoes puncture the strata; and lava-flows cover hundreds of square miles of its surface. The dip of the whole region, when a dip is noticeable, is usually away from the mountains at an angle ranging from 15° to 90.° In many places the region is a bad land country. Where the lava is superimposed on it, it is of the "mal pais" type; and where the lava is wanting, especially along the break-lines, "manvaises terres." The culminating points of the area under consideration are, the crest of the San Dia Mountains, the monolith Mt. Cabizon on the Rio Puerco and Mt. Pelado, the culminating point of the Jemez Mountains.

NATURE OF ROCKS.

The rocks of this region are intrusive, eruptive and sedimentary.

The intrusive rocks are the cores of the respective mountain districts of Jemez and San Dia, and the dikes throughout the entire area. They are granites, porphyries, gneisses, etc. The eruptive rocks are volcanic


GEOLOGY OF THE JEMEZ-ALBUQUERQUE REGION, N.M.
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JEMEZ PLATEAU
SULPHUR SPRINGS
VANTANA
SODA DAM
JEMEZ HOT SPRINGS
ANON
MESA BLANCO
SANTA ANA
ZIA MESA
BERNALILLO VOLS.
BERNALILLO
ALBUQUERQUE VOLS.
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SAN FELIPE
OCHITI RANGE
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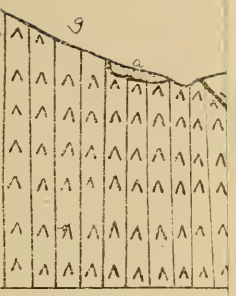
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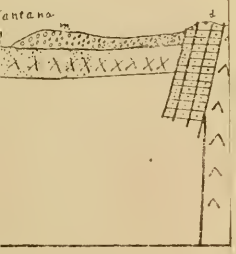
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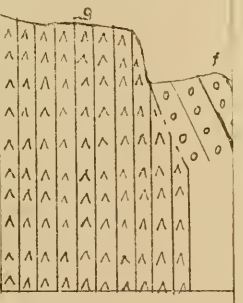
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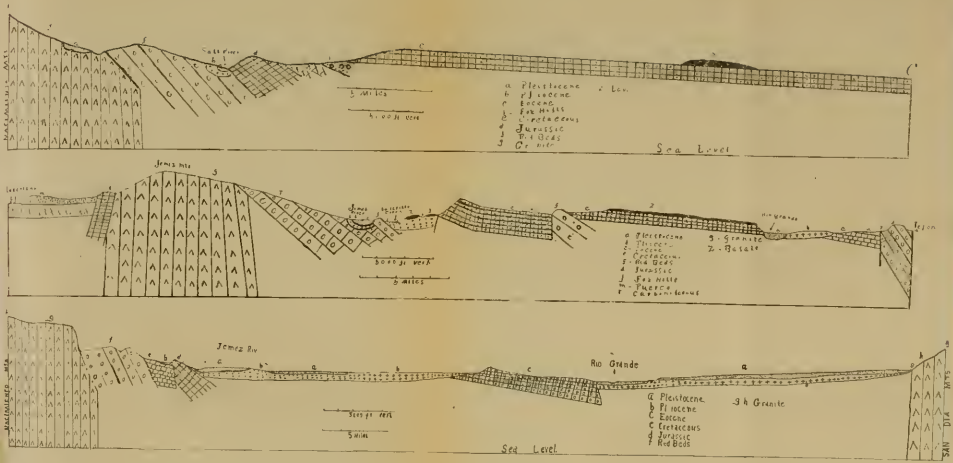

Sea Level
Jemez Mts
Jemez Riv
Rio Grande
Sea Level

plugs, lavas and tuffs. The lavas are basalt, trachyte and rhyolite. Obsidian also occurs in large quantities on the Jemez Plateau. The sedimentary deposits are the country rocks of nearly the entire region where not covered with lava. They were laid down in the seas and lakes that surrounded the islands which now form the high mountains of San Dia and Jemez. These deposits date back well into the Carboniferous, and continue almost without break to the recent times.

RIVERS.

The rivers of the region are the Rio Puerco, the Jemez and the Rio Grande. The Rio Puerco, as we have seen, closes in on the west the region discussed in this paper; the Jemez River and its tributaries drain the south and also the southwest slopes of the Jemez Mountains; and the Rio Grande passes south through the section east of the Jemez Mountains, and west of the San Dias. The Rio Puerco and the Jemez rivers are tributaries of the Rio Grande.

MOUNTAINS.

The mountains, as has been stated, are the San Dia and Jemez. The former was caused by a fault of 11,000 feet along their western side, 7,000

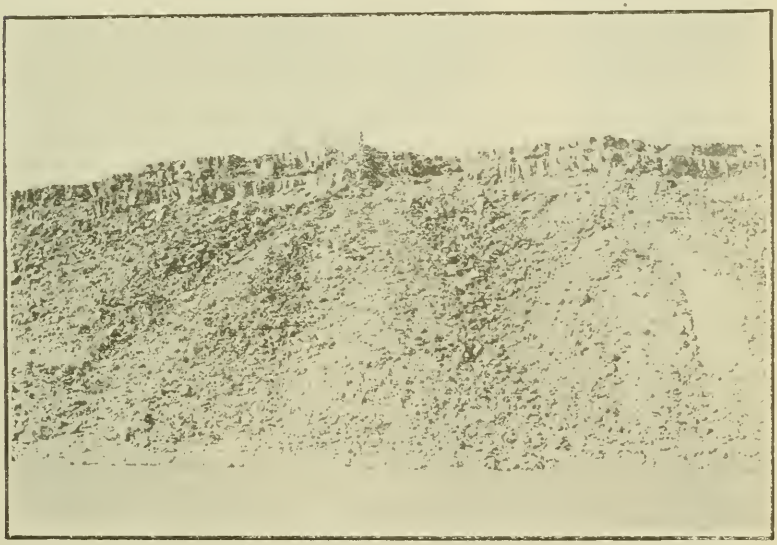
Little Pigmy Volcano.

feet of which still remain, as an escarpment. Their core is granite, their cap Carboniferous. The latter (the Jemez Mountains) have a core of red granite, overlaid in most cases, with hundreds of feet of volcanic debris, except along the west wing of the group where the crest is granite.

STRATIGRAPHY.

At the close of Carboniferous times or earlier, the Jemez Mountains were uplifted, and associated with their development are to be found large intrusions of granites and porphyries occupying an axial position. During the period of mountain building the western flank of the Jemez was faulted off. These mountains were subsequently surrounded by a shallow Jurassic sea, in which were deposited red sandstones and shales to a thickness of 2,600 feet. Then came the Jurassic revolution. The mountains were re-elevated and the Jurassic strata to the west of the mountains were faulted and tilted to a nearly vertical position. At this time the volcanoes near Pelado became active, and poured out the great rhyolitic sheet which now on the plateau covers the granite porphyritic core of the Jemez range, over which these same volcanoes, at a later time,

hurled out 120 feet of pumiceous tuff. These mountains were still islands in Cretaceous times, but their area then was much greater than formerly. In this period the mountains seem to have been gradually rising until in the Fort Union epoch great swamps covered the entire country, the sea being obliterated for a time. In these swamps vegetation was luxuriant, and the vegetable matter laid down in them forms today the coal fields of northwestern New Mexico. At the close of the Fort Union epoch, there was a slow subsidence. The Puerco was deposited on the Fort Union, and then the Eocene on that, the whole series being conformable. Then



there came a violent change. The whole country was elevated above the sea, much faulted and broken up, and blocked basins on a grand scale resulted. These depressions were the lakes of Pliocene times. One large lake existed in the vicinity of Jemez, and another in the Rio Grand Valley. The lake at Jemez was filled up with the Jemez marls by the tributaries of the Jemez River; and the Rio Grande Lake was silted up with the Albuquerque marls, probably by the tributaries of the river which at present occupies that valley. When these lakes were almost filled, there was a further re-elevation of the country, and the rivers at once commenced to cut down their respective channels; but this deepening of their


C.B.H.

channels was suddenly arrested by the seismic disturbances and the lava flows of Post-Tertiary times. The former changed the incline of the river channels, and the latter dammed up the rivers, thus forming lakes. In these lakes were deposited the Pleistocene marls of the river valleys. At the close of the Pleistocene, these lakes in turn were obliterated and the country took on the general appearance that it has today.

ECONOMICS.

CLIMATE.

The altitude of this region, 5,000 to 9,000 feet above the sea, and the latitude thirty-five to thirty-six degrees north, combine to give it a climate which for mildness and equality has no superior in the world. Its location, near the center of the vast rainless region of the West, and its remoteness from any large body of water, give it an atmosphere almost totally devoid of moisture. At the same time, by reason of the latitude and altitude, the air is both warm and light, thus furnishing, in unlimited quantities, nature's sovereign remedy for all diseases of the lungs.

Soil.—The soil on the table lands, especially on the Tertiary formations, is poor. There is too much alkali. But if the water for irrigating purposes could be had, even the soil of these mesas, in a few years, could be made productive. It would require considerable labor and the use of fertilizers such as gypsum, burned lime, etc., but in the end it would pay.

On the mountain plateaus the soil is good, especially in the Jemez Mountains in the Valle Grande country. This great valley, to interpret the Mexican, occupies a high altitude, averaging 9,000 feet. "It embraces 100,000 acres, and forms fine prairies with abundant grasses. On it also the fir and pine are most magnificently developed."

In the valleys the soil is, without exception, the best in the world. It surpasses even the soil of the Nile Valley. In speaking of the Rio Grande mud, Dr. Loew, in the U. S. Geological Surveys of the Territories west of the 100th meridian (Vol. III., p. 578-582) says:

"Irrigation with these mud-carrying waters furnishes the lands with a layer of the best virgin soil in a finely pulverized condition, and the belief of the farmer that the Rio Grande water is an efficacious fertilizing agent is fully warranted by the facts revealed by the chemical analysis.

Indian Village of Jemetz, Jemez Valley. Tertiary Buttes. Nacimiento Mountains.

Indian Village of San Felipee. Rio Grande and San Dia Mountains.

Indeed the inhabitants of the Rio Grande will never require any other fertilizer than the waters of the Rio Grande Del Norte."

MINERAL RESOURCES.

Coal.—The Fort Union coal formation underlies most all the lands in this region, except the mountain districts. Its coal outcrops are quite a distance from the railroad and until just recently only Mexicans and Indians knew of its occurrence. The coal is a good quality and the seams are thick. It is reasonable to believe that the time is not far distant when coal will be mined there on a large scale.

Gypsum.—The Jurassic rocks, wherever found, are capped with gypsum from ten to forty feet in thickness. Owing to its thickness and its lack of

Picture showing Tufa near Jemez Hot Springs.

cover, it can be worked to a great advantage. With railroad facilities a great industry will be developed, for the raw material is of good quality.

Gold, Silver and Copper.—The mountains are crossed in all directions by mineral bearing veins; but to date the ores found are too low in grade to ship, the railroad being too far away, and they are not enough in quantity to pay to put a smelter on the ground to smelt them. Should a railroad be put up Jemez Valley, mining would at once become a paying business. Besides the ore in veins, placer gold is found in the Pleistocene deposits, but water for hydraulic mining is wanting. Could the necessary water be obtained, this region would without doubt become one of the leading placer mining districts of the west.

Medicinal Springs.—The springs of the region are numerous, most all are hot, and all possess medicinal properties. Among them are the famous Jemez Hot Springs, and the Sulphurs. These springs surpass those of Minnesota and California. They are visited by people from every part of the United States, and foreigners not infrequently visit them.

This region, with its building stone, with its gypsum, with its forests, with its medicinal springs, with its gold and silver veins and coal fields, and with its fertile soil and unequaled climate, is one of the best regions in New Mexico; and under proper handling, will become one of the wealth-producing regions of the country.

The Jemez Coal Fields.

Albert B. Reagan.

The Jemez coal fields are situated about twenty-five miles west of Bernalillo, thirty miles a little to the west of north of Albuquerque, and six miles south of the Jemez River at San Isidro in longitude 106° 50′ west, and in latitude 35° 30′ north. They cover an area of about twenty square miles.

The strata of this field show a predominance of soft yellow sandstones interbedded with clays and sandy shales. Interbedded with these are strata of brown coal which are freely exposed in the perpendicular walls of the mesas. These coal seams vary from two to twelve feet in thickness; and, along one fault in this respective coal area, seventy feet of coal are exposed at one view. In examining these coal fields, it was observed