9850 0001 Little Valley

315
Item 1

A TERTIARY RIVER CHANNEL NEAR CARSON CITY, NEVADA.

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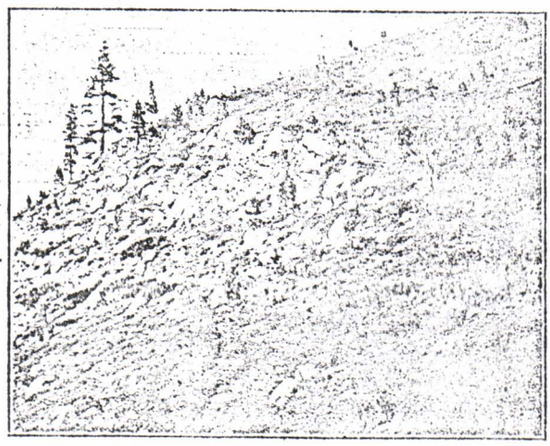
The geologic history of the Sierra Nevada must be interpreted largely through a knowledge of the Tertiary rivers whose channels are so well preserved upon the western slope of the range. These ancient channels are economically important for their store of gold, which has added many million dollars to the world's treasure. There is thus a



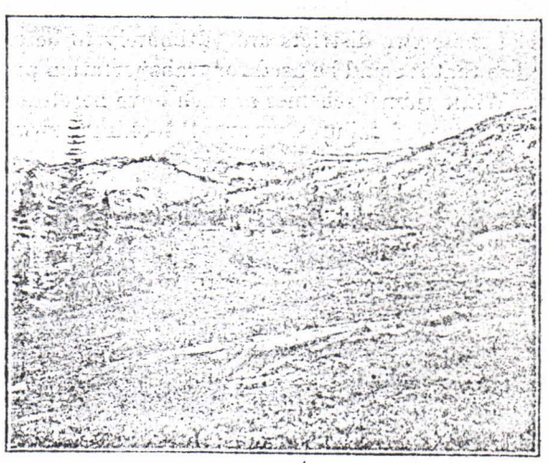
Buried Gravel Exposed by Faulting.

double interest in the old rivers of the Sierra, that of the scientist and that of the miner, and the latter individual must not forget that his highest interests are best served by pushing scientific inquiries to the farthest point possible, for science is the partner of industrial art.

At the present time our knowledge of these Tertiary rivers is confined to those on the west slope of the range. From the discovery of gold in California, through the first wonderful days of mining, down to the vicissitudes of recent times, the miner and geologist alike have investigated the channels of the old westerly flowing rivers, until our knowledge of them is fairly complete. Nothing, however, has been noted concerning Tertiary rivers east of the summit of the Sierra. There is a large and well defined channel on the east slope that needs description, both for purely scientific and commercial reasons. The details of the geologic bearing of this old river upon the history of the region will be presented as part of a larger paper now in preparation; it seems advisable at this time and in this place to present such facts about the channel as appertain to the mining industry.

This Tertiary river is found between the northeast corner of lake Tahoe and Washoe lake, and lies about six miles northeast of Carson City, Nevada. It crosses the east summit of the Sierra Nevada, there being two crests in the east-west section of the range through lake Tahoe. No traces have been found west of the lake, but scattered gravels on the hills of the Virginia range, east of Washoe valley, indicate its original extension farther in that direction. One of the old stories commonly heard at Virginia City concerns the finding of gold different in character to that of the Comstock in gravels underlying American Flat, west of Gold Hill. The portion of the channel preserved is remarkable in that, unlike the well known ones of the same age to the west, it traverses a region intensely broken and faulted, the great fault-zone of the Sierra Nevada. Precipitous scarps and gently rounded or flat summits characterize the topography. The latter in part represent the old eroded surface of the region at the time when it was drained by the ancient river and its tributaries. The topography is also characterized by a large well formed longitudinal valley, called Little valley. A second similar but much smaller valley lies east of the larger about two miles, and two other smaller ones are found still farther east. Each follows the plane of a north-south fault and separates two adjacent portions of the old river. The larger valleys are flat-bottomed, though less than half a mile wide. With their groves of tamarack pine along the floors, and their steeply rising walls, once well timbered but now only partly covered with low shrubs, they give a park-like aspect to the landscape.

The rocks of this area are few in number. The well known grano-diorite of the Sierra Nevada forms the only bedrock, the gravel resting directly upon it. A small residual spot of older schist, into which the grano-diorite is intrusive, occurs a few hundred feet south of the channel in the eastern part near Washoe valley. There are two rocks of later age than the gravel, both of volcanic origin. These, in order of relative age, are rhyolite and andesite. The rhyolite is white when fresh, weathering to pink. Frequently it is a breccia in its lower portions, and massive,

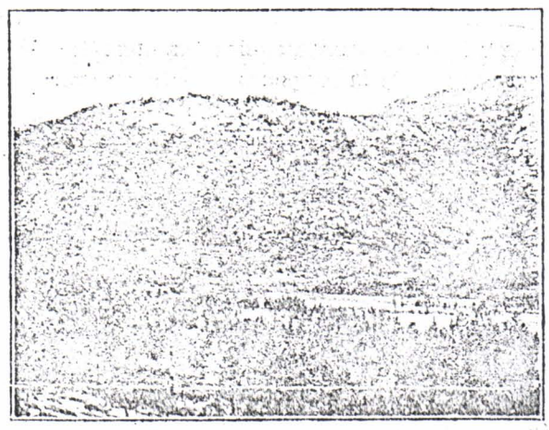


Buried Gravel Outcrops, Little Valley, Nevada.

often slightly vesicular, above. It rests directly upon the gravel over a large part of its length, as shown in the section. In the main this cap is not thick. Connected with the acid lava are certain small occurrences of pitchstone, one of which, as a dike, is found just north of the gravel south of Washoe valley. The other volcanic is a hornblende andesite, of steel-gray to black color. This rock occurs in small isolated areas near the old river. In only one of these spots does the andesite actually overlie the gravel, and there but to a small extent. East of lake Tahoe the two volcanics have not been found in jux-

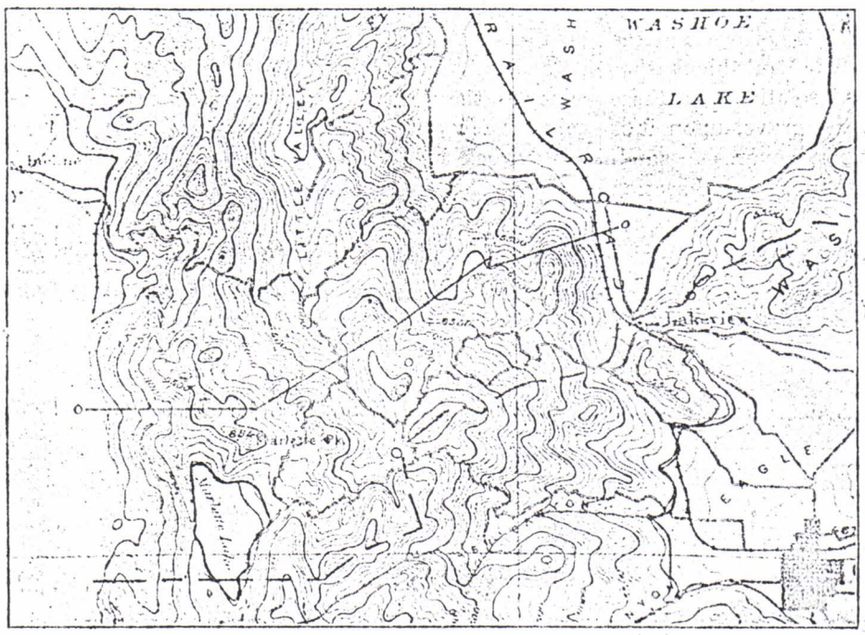
taposition; west of the lake the rhyolite underlies the andesite, as is also the case to the north in the Virginia range near Reno.

The section across the range through the river-channel affords a striking example of geologic structure. There exist seven distinct fault-blocks, each



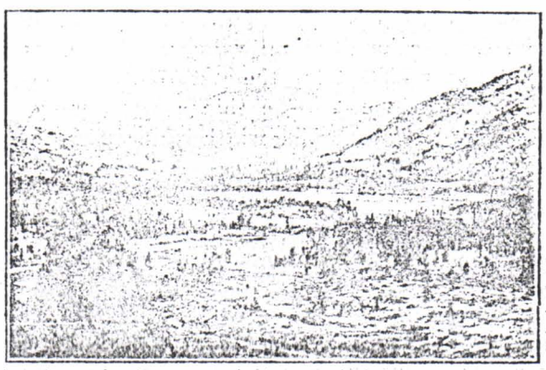
Tamarack Flats, Little Valley, Nevada.

of which bears a remnant of the river-bed on its crest. The westernmost occurrence of the waterworn material is found at an elevation of 7900 ft. in a small exposure under the edge of the rhyolite area north of Marlett lake, on the upper part of the magnificent fault-scarp that here rises directly from lake Tahoe. No other traces of the river are found on this west fault-block. The length is presumably between half and three-quarters of a mile. Abutting against the



Topographic Map Showing Ancient River Channel.

east edge of the first rhyolite cap is a large outcrop of the gravel on the second section of the channel. Here the highest point is reached by the river deposit, 8700 ft. From this place to the bottom of Little valley, upon the summits of the two fault-blocks, the gravel persists in an irregular manner. The actual width of the channel is masked by rock disintegration and the action of recent forces of erosion and deposition. From surface indications this dimension is large, reaching a quarter of a mile or more at Little valley. At the summit the width is roughly 300 yards. The old river-bed has been tilted to the east in the second and third block; the condition of the first is unknown. In Little valley the gravel lies between the contours of 7200 and 7500 ft., the upper portion only being shown; therefore the



Little Valley, Nevada, Looking South.

bottom of the channel west of the creek in Little valley is probably several hundred feet below the bed of the creek. The length on the second and third blocks is about two miles. The fourth block, with its load, lies between the third and the second largest longitudinal valley.

The finest exposure is found on the east wall of Little valley, where some idea of the size of the ancient river can be gained. The north-south fault through the largest valley has caused the up-throw of the east block, thereby making an incomplete vertical cross-section of the watercourse. The best portion of the exposure shows the gravel resting upon the north side of the bed, which dips to the south. The photograph shows this feature. The gravel rises steeply above the floor of Little valley toward the flat crest of the ridge. The thickness is at least 500 ft., with the bottom not exposed. It may be suggested that part of this thickness is due to faulting, but the rhyolite, which caps the ridge and in part the gravel, fails to confirm this idea. The width here is 300 or 400 yards, giving a large volume of deposit. On this fourth block to the east the lava covers the channel, and a comparatively small outcrop appears near the top of the steep scarp. The elevation of the bottom of the channel on the west side is approximately 7100 ft.; on the east side the elevation is 7500 ft. This indicates a tilting to the west. Further, although full details are yet to be deciphered, the posi-

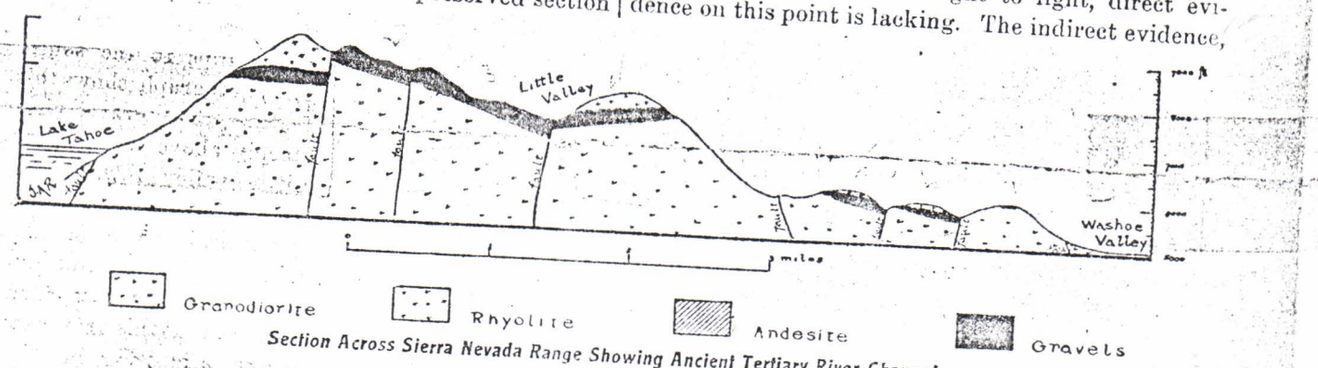
tion of the rhyolite upon the gravel may possibly indicate some tilting before the volcanic flow. The channel on this block has a length of nearly a mile. Across the second longitudinal valley a large part of the old river is missing, the gravel being found scattered in the present streams to the northward. The next two blocks are closely associated, at low elevation, and are largely lava-capped. The fifth fault-block carries only traces of waterworn material on the west side, but a deep deposit on the east, in one of the smaller longitudinal valleys. The elevation on the west is 5900 ft., on the east 5750 ft., with bottom not in evidence. The thickness at the latter place is about 300 ft. The width is uncertain, but is only a few hundred feet at most. This small dimension is almost certainly due to east-west faulting parallel to the channel, as both gravels and rhyolite capping cease suddenly to the south. Here again are details carefully to be worked out, particularly after more mining exploration has opened the ground beneath the surface. The length of this fragment is about half a mile, tilted to the east. The sixth block is also tilted eastward, the elevations of the gravels on the west and east respectively being 6000 ft. and 5700 ft. A horizontal element of the north-south fault that separates the fifth and sixth blocks has caused the latter portion to shift a few hundred yards to the south. A complex of small faults at this point renders further investigation necessary. No dimensions except the length of about three-eighths of a mile are obtainable, for the deposit is to be seen only along the south edge, where it lies beneath the thin rhyolite cap. The latter is in part a breccia. (The seventh, or last, portion of the river channel occurs on the large symmetrical hill just west of the south arm of Washoe valley. The fault-block that forms this hill has been elevated relatively to those adjacent, with the result that the gravel upon it is found at a height of 6000 ft. and over.) A small amount only is present, and no well preserved section of the river-bottom. On the east of Washoe valley the scattered boulders and pebbles were found at an elevation of 5500 ft. A rather large deposit of the same is found northeast of Carson, at a place where a small wet-weather stream debouches upon the floor of Eagle valley. This occurrence is undoubtedly due to the erosion of the original river-bed and re-deposition at a lower spot.

The gravel consists of well rounded pebbles and boulders of the bedrock complex of the Sierra Nevada, and includes quartzite, meta-andesite, schist, grano-diorite, and some pebbles of a more basic crystalline rock—probably a gabbro. Decomposition prevented the precise determination of the last rock mentioned. In the gravel of the fifth block, at the exposure shown in the photograph, a large number of boulders of iron ore occur. This ore is hematite in lustrous black plates, accompanied by some magnetite. It is associated with quartz and metamorphic rocks. In size the gravels range from 6 and 8 in. boulders down to small pebbles less than one inch. The coarser material appears to occur toward the bottom of the channel.

The exact position of the gold cannot yet be ascertained. It seems to be well distributed on the surface and wherever mining has been done. The size of the well-rounded grains varies from that of mustard seeds to that of coarse nuggets.

Prospecting Buried River Gravels.

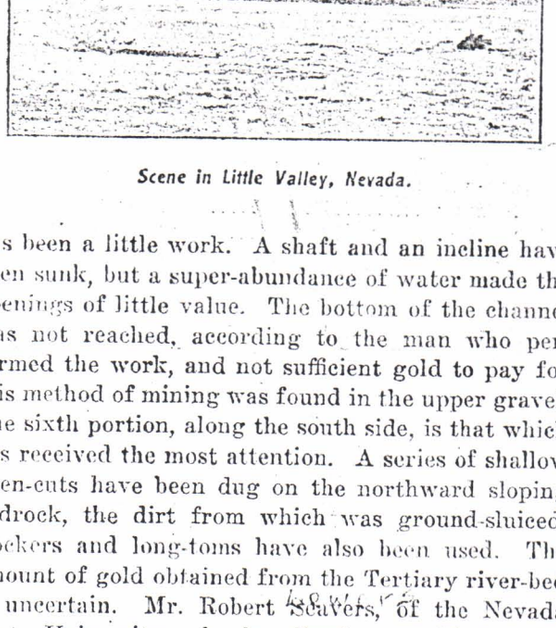
A question of interest, both to the geologist and miner, is the flow of this Tertiary river. Exposures being so few and poor, and no fresh contact of gravel on bedrock being yet brought to light, direct evidence on this point is lacking. The indirect evidence, on the other hand, all indicates an eastward movement of the current. The gravels are composed of rocks exactly similar to those found to the west, and not to the east within reasonable distance. The quality of the gold is Californian, rather than that of the Great Basin deposits. The summit region of the Sierra, now chiefly granitic in character, was once covered with a great thickness of altered rocks, just as are the lower westward slopes today. In these altered rocks it is probable that gold-bearing quartz veins were present. The metal from these was carried away by the ancient streams and depos-



Section Across Sierra Nevada Range Showing Ancient Tertiary River Channel.

ited in favorable sites in their beds. The gold in this particular river is probably of such an origin. Furthermore, if the river were a westward flowing stream, it seems difficult to account for the entire absence of a large channel west of lake Tahoe in line with the one east of the lake.

The mining done has been of the rudest sort, and at only a few places. In Little valley, in the third portion, a tunnel has been driven southerly into the deposit. The value of the gravel struck is not known. In the early days near the same place shallow cuts disclosed a pocket beneath a portion of the gravel, from which it is reported $60,000 was recovered. The more recent work in Little valley has made evident the presence of much east-west faulting parallel to and through the channel. The same faulting is one of the larger characteristics of the fault-zone. In the immediate area under discussion the general effect has been to raise the country to the south, thus dropping the north edge of the river deposit. In the east side of the river portion there



Scene in Little Valley, Nevada.

has been a little work. A shaft and an incline have been sunk, but a super-abundance of water made the openings of little value. The bottom of the channel was not reached, according to the man who performed the work, and not sufficient gold to pay for this method of mining was found in the upper gravel. The sixth portion, along the south side, is that which has received the most attention. A series of shallow open-cuts have been dug on the northward sloping bedrock, the dirt from which was ground-sluiced. Rockers and long-toms have also been used. The amount of gold obtained from the Tertiary river-bed is uncertain. Mr. Robert Sawers, of the Nevada State University, who has lived near this locality for many years, informed me that about $100,000 in all has been recovered.

Mining has been not only desultory, but also spasmodic. Nothing has been done within the last few years except driving the tunnel in Little valley. The higher portions are known to contain much gold in places, nearly sufficient to pay fair wages to a man with no more than an ordinary miner's pan. The fact that this ground is owned by the Virginia City Water Co. prevents more work being done. The portions south of Washoe valley may be further explored, but excess of water and a cap of lava have discouraged local operators.

To become commercially profitable the gravel must be worked in a large way by hydraulic methods. This places the problem as one of water-supply, to be controlled by the water company. As a matter of possibility, it is evident from the topographic map that water can be brought to all sections of the channel except those at the highest elevations. If the gold content justified it, as is not improbable, other methods for working these elevated portions might be used. Much water that performs no useful work is running off these hills, particularly at the period of melting snow. Exact engineering data are not at hand, though doubtless they might be obtained by proper arrangement with the water company. The present indications and conditions appear to warrant a serious consideration of the exploitation of these gravels in a large way.

Reinforced concrete mine-timbers, if such a hibernianism may be permitted, have been introduced by D. W. Shepard of Denver, involving a new method of reinforcing by trussed rods. By this system greater resistance is given to lateral strains, increasing the strength of the concrete member in the direction in which its weakness has in the past proved an obstacle to its use. Thus, it is claimed, caps of reinforced concrete may be made having within less compass and lower cost than ordinary timber, decidedly superior strength. The reinforcing rods employed are of ½-in. steel, and the size of post and cap proposed as standard by Mr. Shepard is 4 by 9 in. For permanent shafts and gangways it is conceivable that a system of this kind may present advantages which will commend it to increasing favor among mine managers, on account of the rapidly growing expense of timber and the generally decreasing cost of cement throughout the country as a result of competition.

A case of rapid repair to a power plant occurred recently when an engine at the Davidson Rubber Works in Charleston, Mass., was wrecked just at the close of the day's work, the cylinder-head and frame being demolished and the crank-pin broken. Two days later an order was placed with the Allis-Chalmers Co. for a 20 by 48 in. engine, and the new foundation was begun. The engine was shipped by express three days later, and on the fifth day after letting the contract it reached its destination. Parts of the old engine were used again and the crank was re-bored to fit the new pin. The erection was complete and the engine working under full load ten days from the date of placing the order.

The cost of dredging under favorable conditions should be estimated to be 8c. per yard for operating expenses and depreciation. Much lower results have been published, but these are often based on short periods or inaccurate book-keeping. Large dredges of 80,000 cu. yd. per month may average as low as 5c. for operation and depreciation.