THE LEAMINGTON CUT-OFF OF THE OREGON SHORT LINE R. R. IN WESTERN UTAH.

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The importance of direct alinement and easy grades and curves for a trunk-line route has become fully appreciated during the past few years, as witnessed by the entire rebuilding of long stretches of line on many of the trunk lines in the western part of the United States. One of the best examples showing the contrast between the old and the new is afforded by the work to be described.

The Utah Central R. R., from Ogden to Salt Lake City, was completed in 1869-70; the Utah Southern, from Salt Lake City to Juab, was begun in 1871 and built by stages till Juab was reached in 1879; and the Utah Southern Extension, from Juab to Milford and Frisco, was built in 1879-1880. These roads were built by separate companies, composed of the Mormon residents of Utah and Union Pacific R. R. interests, and, though separate in ownership, they were operated as one line and under one management. In 1881 the two latter were incorporated with the Utah Central. Like many of the other pioneer roads, the location of the line was dictated by considerations of economy in first cost, and though the road has answered well its purpose of taking care of local traffic, it fills none of the requirements of a line that has to handle the traffic of a transcontinental route at the present day.

In 1881-82 the Union Pacific R. R. Co. built a line from Lehi Junction, 29 miles south of Salt Lake City, running southwesterly, called the Salt Lake Western. This was intended to be a through line to Los Angeles, and was strongly favored by President S. H. H. Clark. This was opposed, however, and construction was abandoned after reaching a point called Tintic, just southwest of the Tintic Mining District. The road has since been known as the Tintic branch of the main Utah line.

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Before this time, about 1876, another road, the Utah & Nevada (begun 1872), was completed by the Union Pacific, from Salt Lake City to a terminus near Stockton, a then flourishing mining camp. This road, which was narrow-gage, ran westerly to the south shore of Great Salt Lake, reaching Garfield Beach, 18 miles out, and at two miles further on it left the lake and ran southerly through the Tooele Valley to the station called Terminus, a distance of 37 miles. This road was also projected as a through line to southern California. All three of these lines were long controlled by the Union Pacific R. R., and with the segregation of the Oregon Short Line R. R. lines in 1897 they became parts of the latter system.

The extension of the Utah Central line, from Milford (221 miles from Salt Lake City) to the coast in southern California, has long been contemplated, and in 1889-90 over 140 miles of grade were constructed, leading from Milford on to Pioche, Nevada. During the past two or three years renewed attention has been drawn to the desirability of a line from Salt Lake City to southern California, and the accounts of the rivalry between the San Pedro, Los Angeles & Salt Lake and the Oregon Short Line railways for possession of rights of way through Nevada are still fresh in the public mind.

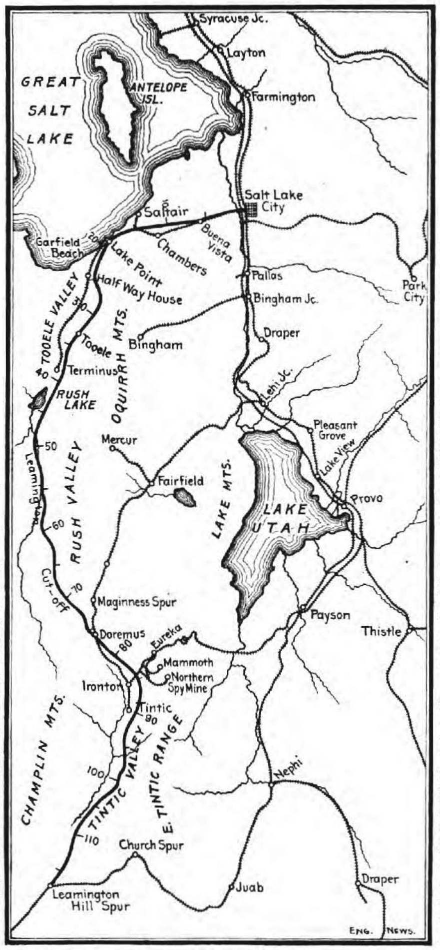


Fig. 1. Map of Railway Lines Running South from Salt Lake City.

A part of the latter company's plans for the through line was a radical change of a large part of its line from Salt Lake City to Milford. The old operated line from Salt Lake City to Leamington Hill, a point on a high mesa in Millard County, 133 miles distant, was not suitable for a through line, on account of excessive grades and distance. It was decided to connect these points by a totally different route.

The new line, called the Leamington cut-off (Fig. 1), has been constructed during the past year. It runs westerly from Salt Lake City for 20 miles, rounding the north end of the Oquirrh range of mountains where they break off toward the south shore of Great Salt Lake. Then, at Lake Point, the new line turns southerly, running through the Tooele valley, then through the Rush valley (both on the west side of the Oquirrh range), and finally through the Tintic valley, west of the Tintic range of mountains. The distance is 117 miles, as against 133 miles by the old line. For 38 miles the road runs very close to the old Utah & Nevada road (the track of which has been torn up), and for 7 or 8 miles it lies near the Tintic branch of the main line, but outside of this it runs through an entirely new country.

The guiding principle in location and construction was to furnish a roadbed in every way suited to form a part of a transcontinental route, and the standards and limits employed in the rebuilding of the Union Pacific Ry. in Wyoming have been used throughout. The maximum grade is 0.8% (42 ft. per mile), compensated on curves up to 3° at the rate of .03% per degree; for 3° 30′ curves and sharper, at .04% per degree. The maximum curvature is 4°. All curves of 2° and over are spiraled. The spiral used is an adaptation of Searle's, using a constant chord length of 30 ft. For 2° curves there are 7 chords; for 3°, 11 chords; and for 4°, 15 chords. This spiral is unusually long, the length for 4° curves being 450 ft. The required length of tangent between ends of spirals where curves turn in the same direction is 500 ft.; for reversed direction it is 600 ft. Breaks in grade are made with vertical curves, the rule being that the rate of change per 100 ft. shall not be over 0.1% on summits, and 0.05% on sags. The roadbed in embankments is 18 ft. wide, and cuts are excavated to 24 ft. width. In the latter case the roadbed proper is made 16 ft. wide, leaving 4 ft. on each side for excavation of a drain ditch, 1 ft. deep. Slopes in all earth cuts are 1½ to 1, and for firmer material they vary to suit the case.

All covered openings for drainage are either cast-iron pipe or concrete arch culverts, and for a few small irrigation ditches near grade wooden box culverts are used. The provision for drainage is most complete, although the line runs through an arid region for most of its distance. The only perennial stream crossed is the Jordan River, in Salt Lake City.

The preliminary surveys and nearly all of the location were made by Mr. B. F. House. For construction, the line was divided into two districts. The first district, embracing 65 miles of line out from Salt Lake City, was in charge of Mr. E. G. Taber, and the second one, taking in the 52 miles of line at the south end, was in charge of Mr. House. The entire work was in general charge of Mr. W. M. Ashton, Resident Engineer for the Oregon Short Line R. R. Co., which office carries with it all the duties of that of a chief engineer. The Leamington cut-off location and construction were under the general supervision of Mr. W. P. Watson until his resignation on Dec. 1, 1902, after which his former work was conducted directly by Mr. Ashton's office. The line was divided into divisions from 8 to 16 miles in length, each in immediate charge of a division engineer. There were six divisions on each district. The contract for building was let to the Utah Construction Co., of Ogden, Utah.

LOCATION.

Beginning at the Salt Lake City yards (Fig. 1), the line follows that of the old Utah & Nevada for 3½ miles, the roadbed being widened and improved, to Buena Vista Station, where material yards were located. It here leaves the old line and heads directly for a point near Garfield Beach, formerly reached by a detour to the south. The new line here has a tangent 13 miles long. The grade to Garfield Beach is practically level. Shortly beyond this point an ascending grade of the maximum of 0.8% begins, and it continues to the Stockton cut, a distance of 20 miles. In the first two miles of this occurs about the only really solid rock on the line.

In the Tooele valley the ascending grade takes the line in places as much as two miles from the old road. The latter keeps on the flatter ground nearer the bottom, with an undulating grade, some of it adverse, so that notwithstanding that a 1% rate is kept up for most of the last 13 miles of it, at Terminus Station it is below the new grade. The new line, which keeps on the eastern slope of the wide Tooele valley, has more distance, more curvature and more grading than would be necessary on one following the lower level of the old one, but the location is necessary to gain the required elevation at the Stockton bar.

STOCKTON BAR CUT.

The Stockton bar is a remarkable bench or dyke, presumably all composed of sand, gravel and other material deposited by the action of the waters in Lake Bonneville, the ancient body of water which once occupied the basin of Great Salt Lake. The bar connects the Oquirrh range with the Stansbury range, to the west, and forms a divide between Tooele valley and Rush valley, to the south. These valleys once formed only a single valley and the bar occurs at its most constricted part, about 1½ miles in width.

A profile of the bar, from east to west, shows it to be nearly level. The top corresponds with the high-water level of Lake Bonneville, and is a little over 1,000 ft. higher than the present surface of the lake. Being deposited across the wide, trough-shaped basins of the two valleys which it separates, the result is that each valley abruptly terminates. From these basins the natural slopes of the sides of the bar (at angles of 30° to 35°) lead directly to the top, over 300 ft. higher. At the highest part of this natural embankment, near its west end, the width is much less than towards the east end, forming a narrow neck of land.

When the Utah & Nevada R. R. ceased building at Terminus Station, on the north side of the bar, the survey for a continuation of the road through the bar called for a line following closely the hillside till the narrowest part of the bar was reached, and then reversing to the left and passing through this on a tangent with a tunnel not over 800 ft. long, with shallow approach cuts. At the south end the line curved to the eastward, running along a lower level of the bench and passing on to the slopes of the Rush valley. Ten degree curves were required at each end of the tunnel.

A line enabled to pass through the bar at the low level of this survey would have the advantages of easier grades, shortened distance and easier ground to build through for a distance of nearly 25 miles. But the curve limits of the new line would not allow of the detour and the turn required, and the deep V-shaped basins adjacent to the neck of the bar afforded no supporting ground for approaching it head-on or directly.

Thus, notwithstanding the features that could have been taken advantage of by a narrow-gage line, or one with the limits formerly permissible for a standard-gage line, the new line was compelled to use a continuous maximum grade for 20 miles, and then to go through the bar with a cut of 100 ft. in depth, containing 780,000 cu. yds. of material. Former surveys have shown that a 1% line will reach the top of the bar in 18 miles, starting at the north end of the Tooele valley.

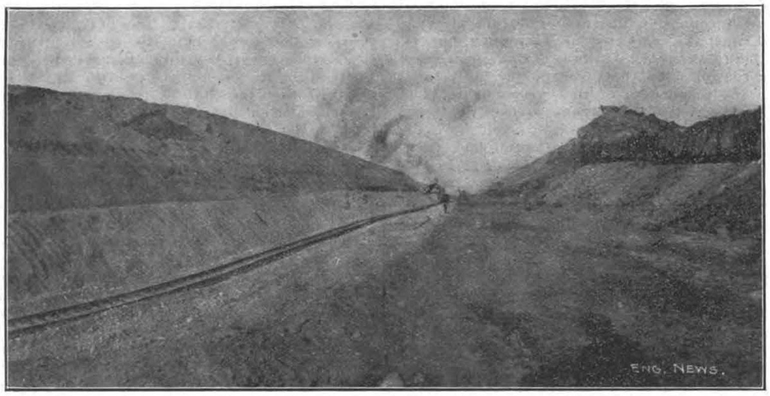


FIG. 2. EXCAVATING STOCKTON BAR CUT, LEAMINGTON CUT-OFF.

A tunnel, of about 2,000 ft. length, was at first contemplated, but test pits, sunk to a depth of 75 ft., showed that only sand and gravel would be encountered, which of course meant very expensive work for supporting the ground.

The cut (Fig. 2), is 3,500 ft. in extreme length, of which over 3,000 ft. is a through cutting. For 700 ft. the cut on the center line runs 95 ft., and it is nowhere less than 85 ft. for 1,150 ft. The transverse slope of the ground is nearly level except at the north end, where there is some side-hill work. The cut is 320 ft. wide on top at the deepest part. A vertical curve 2,300 ft. long is used to join the grades on opposite sides of the summit. The north end is on a 4° curve, and there is a 1° 20′ curve at the south end. The deepest cutting is near the north end, through the highest bench level, which continues out to the narrow neck before spoken of. The surface then breaks off to another bench to the south, the cut being reduced from 95 ft. to 48 ft. inside of 250 ft., after which it gradually tapers out. The bottom was made only 20 ft. wide, the intention being to widen it by additional excavation for ballast material. Side slopes are 1½ to 1.

The cut was excavated by the Flick & Johnson Construction Co., who took the subcontract for this work alone. The excavation was made with steam shovels, loading on to dump cars that were hauled by "dinkey" engines out to dumping grounds and wasted. A 65-ton Bucyrus shovel was used at either end. These shovels, which have dippers of about 2½ cu. yds. capacity, did excellent work. With a 14-ft. reach, the limit of width cut by one is 28 ft. They averaged about 25 ft. width of cutting, with a depth of usually 12 to 15 ft. at each passage of the shovel. Much time was lost in shovel work on account of moving the dump car tracks.

Apparently, a shortage in the amount of track material caused the work to be done at a disadvantage, both on account of more frequent changes and the failure to reach more suitable dumping grounds. The material was loaded onto the cars, which were made up into trains of 9 to 14 cars, usually of about 12. Most of the cars were of the 3-yd. size, some of 4 yds. One was loaded with two shovelfulls. Records kept throughout the work (keeping tab on the number of carloads and measuring the material excavated) showed that the average carload varied from 3¼ cu. yds. in the early summer months to 2½ cu. yds. in the late winter months. Two shifts of ten hours each were worked. The average record for the two shovels in 24 hours was about 3,700 cu. yds., with a maximum of 7,000.

On an average about 100 to 150 men were worked during the day and 50 to 60 at night. During the day all needed track changes were completed, to avoid the disadvantage of such work in darkness, and other extra work was attended to, so that a good run with the shovels could be made during the night.

Over the entire bar, and within 2 or 3 ft. of the surface, a layer of cemented gravel was found, running from 1 to 5 ft. in thickness. This had to be shot, but all the rest of the cut could be taken out without the use of powder, though it was often used to make easier work for the shovels. Over 2,000 cu. yds. was classified as solid rock and about 40,000 as loose rock. Much the greater part of the material was wasted from the south end of the cut.

Two engines were used on each train of dump cars, delivering the train to another engine at the dumping grounds. This engine handled the train in unloading, while the two engines returned to the shovel with a train of empties.

A 45-ton Vulcan shovel was also used to some extent on the work.

For a water supply to the shovels and engines, and also the electric light plant needed for night-work, the contractors were obliged to build a pipe line three miles long. Water was pumped from some springs near Rush Lake, being forced through a 3-in. main to a wooden tank on top of the bar.

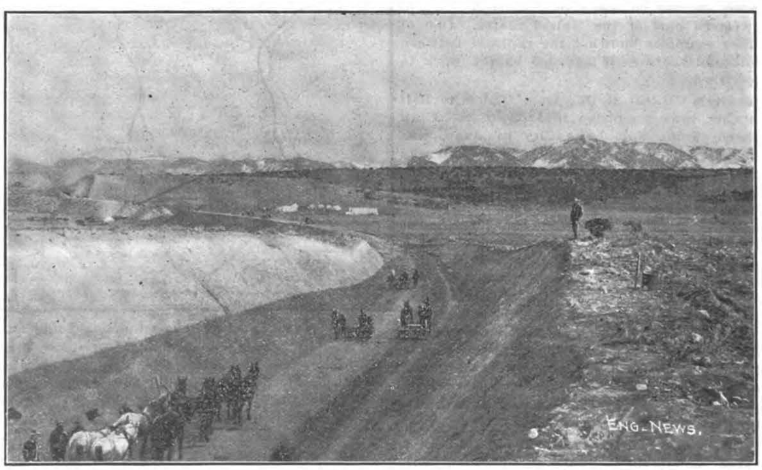


FIG. 3. A 50-FT. CUTTING ON MILE 70; WEAVER & THOMPSON, SUB-CONTRACTORS.

Gravel pits will be opened in the Stockton bar cut, using the material for ballasting the track. This material ranges from sand to cobble stones as large as a quart cup, which latter will have to be separated in spreading the ballast.

Just how deep it is to solid rock at the Stockton bar is not known. It seems probable that a comb or crest must have projected above the general surface originally, in order to start the accumulation of sand and gravel at the site.

Just north of the bar, at Terminus Station, a 7,000-ft. drain tunnel is being built, to drain the famous Honorine and other mines on the slope of the mountains to the eastward. This tunnel, which will serve both for drainage and in place of shafts for operation, starts well toward the bottom of the basin and runs southeasterly into the mountain side, crossing the railroad at about 140 ft. below its grade. For ½ mile in from the mouth no solid rock at all is encountered, the material varying from a mixture of sand and clay to heavy cobble stones. Hard material was run into only after the tunnel was bored to a point even with the slope of the mountains, at a depth of 250 to 300 ft.

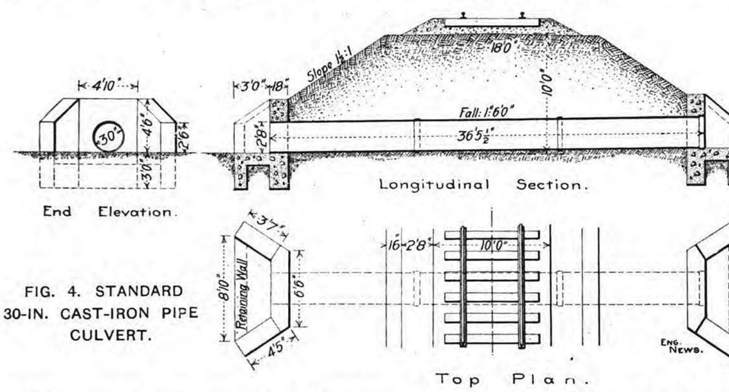


FIG. 4. STANDARD 30-IN. CAST-IRON PIPE CULVERT.

LOCATION FROM STOCKTON SOUTHWARD.

Going south from the Stockton bar the grade descends into the Rush valley, a rate of 0.65% (34 ft. per mile), serving to reach the bottom in about three miles distance. The line runs by the town of Stockton, just beyond the bar. Rush valley is an arid basin draining into Rush lake at its north end, which has no outlet.

Then follow between 11 and 12 miles of light grades, except for one stretch of ¾ mile of the maximum ascending, with comparatively light work. There is also one tangent of 10 miles length through this valley.

In mile 55 an ascending grade of 0.7% to the south begins, the line keeping on the west slope of the basin. This is increased at the end of two miles to the maximum of 0.8%, which is unbroken, save for the compensation on curves, for the distance of nearly 22 miles to Boulder summit, which separates Rush valley from Tintic valley on the south. On miles 58 and 59 a long swale has to be crossed, which is the principal feature in controlling the elevation of the grade line from here to the summit, 20 miles distant. The grade is adjusted to make a fill averaging from 15 to 18 ft. for a distance of 8,800 ft. across the swale. This fill has a maximum height of 22 ft., and it contains 160,000 cu. yds.

On mile 70 is a cut (Fig. 3) with a maximum of 50 ft. on the center line, which, though only 550 ft. long, contains nearly 57,000 cu. yds. On mile 71 is another cut containing 45,000 cu. yds., and on mile 76 is a cut 1,050 ft. long, and containing 105,500 cu. yds. This has a maximum depth of 53 ft. on the center.

The Boulder summit, at the end of mile 79, is crossed with a cut 1,900 ft. in length and containing 103,000 cu. yds. The maximum depth here is 52 ft.

From Boulder summit going south an almost continuous descending grade of the maximum of 0.8% is required for a distance of 26 miles to reach the bottom of the Tintic valley. The line lies on the east side of the valley. A grade rate of 1% would reach the bottom in a much shorter distance, and by adopting a maximum of about 1½% for the first few miles the bottom of the valley could then be followed with a grade of not over 1% at the start and gradually reducing to almost level.

There is only comparatively light work beyond mile 102. In mile 106 the end of the supported grade of 0.8% is reached. Back of this point, on mile 101, there is a reduction to a grade of 0.16% extending over ½ mile, to avoid too heavy a cutting in crossing a ridge. Beyond mile 106 the grade is undulating, with short lengths of light adverse grade. The drainage from the valley soon disappears in sinks beyond this point, and the country opens out onto the broad Sevier River Desert. There is one tangent of 4 miles in length shortly before joining the old line at a siding on Leamington Hill.

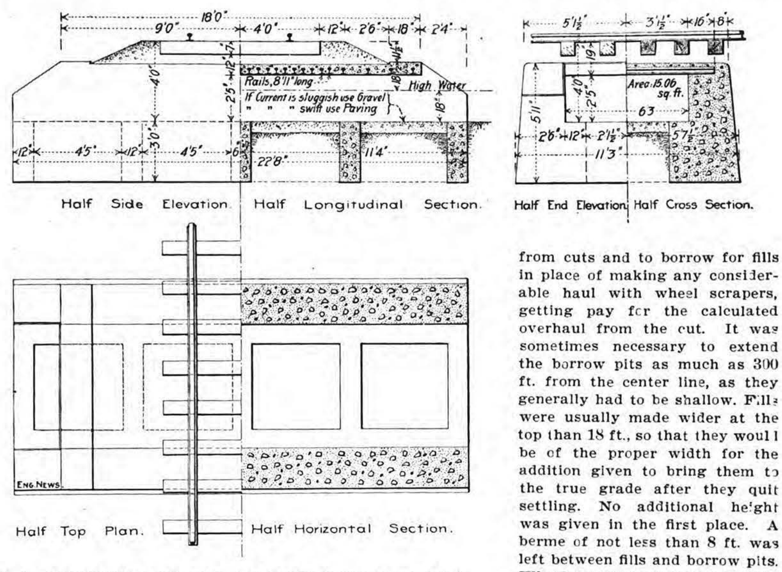


FIG. 5. STANDARD RAIL TOP CULVERT, 6 FT. 3 IN. SPAN.

There are no curves shorter than 3° on the south side of Boulder summit, ranging from that down to as light as 0° 30'. On the second district north of the summit there are but four curves as sharp as 4°, and on the first district there are but two.

The Leamington cut-off crosses the spur from Ironton in mile 85, at about two miles above Ironton. Trains were formerly backed up this spur from Ironton (the terminus of the main branch) to the towns of the Tintic Mining District, a distance of five miles. From the station of Tintic Junction, near here, a 3-track spur connects with the older system. The mining camp is reached by stub trains from this point. A climb of over 500 ft. is required to reach the station at Eureka.

The elevation of the road above the true sea level varies from a little over 4,200 ft. near Great Salt Lake to nearly 6,100 on Boulder summit. It is over 5,100 in the Stockton cut and about 5,000 at the north end of Rush Valley. At Salt Lake City it is about 4,250, and 4,800 on Leamington Hill.

The continuous supported grades used to ascend the summit on this line are unusually long. The grade line being rigidly fixed beforehand, and the limits of curves and connecting spirals and tangents calling for an alinement that can be made to follow only the general features of the country, the matter of a location becomes one involving much skill and judgment as well as labor. By following along near the bottom of the three valleys traversed, on drainage grade lines, the material to be moved would have been nearly all earth. The amount of grading would have been vastly less and the alinement much more direct, but all of this would have been impossible without using grades ranging from 1 to 2%. As built, the maximum grade each way is 0.8%, except where running from South Temple St. into the yards at Salt Lake City, where a 1.34% grade is necessary by reason of the street grades being fixed.

GRADING.

A considerable portion of the grading was done, and all the structures built, by the Utah Construction Co. with its own force, and the balance let in subcontracts covering from one to nine miles. The different methods of handling dirt, by scrapers, graders and steam shovels, were all used on construction. The free haul was 500 ft., and limit of haul 2,000 ft. The wheel scrapers were not used for actual hauls much exceeding 500 ft. Graders, loading directly onto dump wagons, were used by several of the sub-contractors for long hauls, some of which amounted to nearly 2,000 ft. The contractors often preferred to waste from cuts and to borrow for fills in place of making any considerable haul with wheel scrapers, getting pay for the calculated overhaul from the cut. It was sometimes necessary to extend the borrow pits as much as 300 ft. from the center line, as they generally had to be shallow. Fills were usually made wider at the top than 18 ft., so that they would be of the proper width for the addition given to bring them to the true grade after they quit settling. No additional height was given in the first place. A berme of not less than 8 ft. was left between fills and borrow pits. Wheel scrapers were also used to dump through traps into dump wagons, and in one case tongue scrapers were used to dump through a trap into 3-yd. dump cars, which were hauled by horses. Steam shovels were used on most of the heavier cuts. No shovels over the 45-ton size were used except on the Stockton bar cut, and the light shovels as a rule did not seem to be as satisfactory as the large ones. Some of the light ones, under favorable conditions, would move as much as 800 to 1,000 cu. yds. per day. The dippers in these were of 1¼ to 1½ cu. yds. capacity. Some of the cuts taken out by steam shovels were made wider than required, in order to obtain needed material for adjacent fills, this method of borrowing being peculiarly adapted to steam shovels.

DRAINAGE.

The entire line is well provided with drainage ways. Crossing the wet alkaline flats west of Salt Lake City, a continuous drain ditch was excavated on each side of the roadbed, on the right-of-way. At long intervals an outlet ditch is run

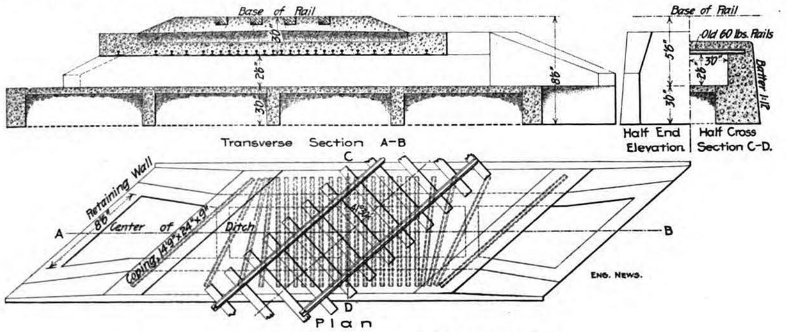


FIG. 6. 6-FT. RAIL TOP SKEW CULVERT.

from these to the northward, to discharge onto lower ground. Irrigation ditch crossings are made usually by use of a box culvert, but in some cases by a concrete culvert with a top made of old rails embedded in concrete. A form of culvert permitting a very near approach to grade is usually necessary for irrigation ditches. As the rule is to keep the grade above the natural surface wherever practicable, in open flat country the line is in fill averaging 3 to 4 ft. Through the Salt Lake Valley it ranges from $1\frac{1}{2}$ to 7 or 8 ft.

Where the line lies on the slope from the mountains, at Lake Point and beyond, the rush of waters that takes place from the gulches and canons after a cloud-burst is provided for by building a short diversion ditch at the mouth of such canons and carrying the water over into a drainage basin. This is because of the fact the floods have brought down boulders, etc., and piled them into long moraines reaching out towards the valley, the water channels remaining on the moraines, and where the roadbed cuts through the latter it is subject to floods pouring down into the cut unless the water is diverted Such channels have been treated, where they issue from the base of the mountains, at distances of $\frac{1}{2}$ mile or even $\frac{3}{4}$ mile from the line.

Drainage water is often conveyed in ditches across the drainage lines for $\frac{1}{2}$ mile or more alongside the roadbed, in order to concentrate it at one opening and so make the one take the place of several. The drain ditches are usually out a safe distance from the roadbed. This sometimes required deep cuts through the ridges, and where these would be too deep the cut for the roadbed is made 4 to 6 ft. wider on the upper side, so as to make room for a ditch of sufficient size alongside the track. Often where the drainage is divided on a ridge through which the road is cut, a dyke of the waste material is made instead of a ditch.

The openings for drainage are nearly all either cast-iron pipe or concrete-arch culverts, of the Oregon Short Line standards, Figs. 4 and 5. The former are of three sizes, 24, 36 and 48 ins. The culvert is made of full sections of 12-ft. pipe and a part length of 3 ft. or some multiple of 3 ft., as required. The lengths are put together without calking or cement. A concrete cross-wall, with a good footing, is built at each end of the pipe. The pipe between these rests on the ground, which is well tamped. A slight camber is given to allow for settlement due to the weight of the fill on top.

On the first district are 36 24-in., 12 36-in. and three 48-in. pipe culverts. On the second district there are 29 of the 24-in., 19 of the 36-in., and 16 of the 48-in.

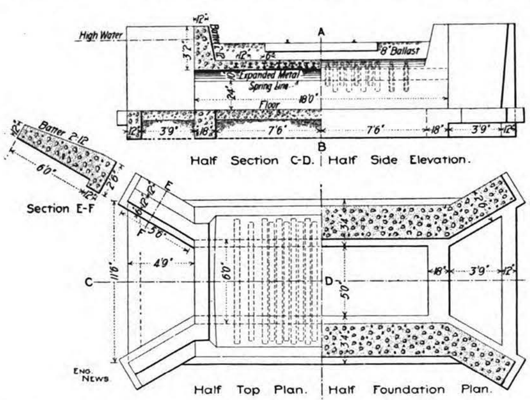
Concrete culverts (Figs. 5 to 7) are used for the larger openings. They are of either 6-ft. or 8-ft. span. On the first district there is one of each size. On the second district there are nine of the first size and two of the latter. The 8-ft. arch has side walls $5\frac{1}{2}$ ft. high, making a clear height of $9\frac{1}{2}$ ft. Under each wall is a footing course, 6 ft. wide and $3\frac{1}{2}$ ft. deep. The walls batter from 4 ft. width at the bottom to $3\frac{1}{3}$ ft. at the springing line, and the arch tapers to 14 ins. thickness at the crown. Heavy spandrel walls and wing walls, resting on footing courses, are at each end. The bottom is paved with stones 12 ins. deep, on a sand and gravel foundation. Connecting the outer end of the wing walls, at each end of the culvert, is another course of the same depth as a footing, which prevents underscouring the pavement. In long culverts, at intervals of about 50 ft., the footing courses are also connected by a wall across the bottom, which also helps hold the paving in place. The slope of the fill catches just behind the parapet wall at each end.

Utah Portland cement, sand and broken stone in proportions of 1, 3 and 6 are used for the concrete.

Outside of the pile-trestle bridge across the Jordan River there are but four of such bridges on the entire line. The standard pile bridges have bents spaced 15 ft., with five piles in each bent.

TRACK.

The ties used are 7 × 8-in. × 8-ft. Oregon fir, 3,000 to the mile. The rails at present used are 60-lb. rails that have been released in the laying



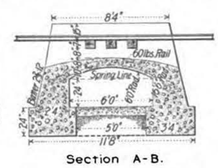


FIG. 7. CONCRETE AND STEEL ARCH; 6-FT. SPAN.

of heavier rails on the operated lines. They will doubtless be replaced by much heavier steel when the line is completed to southern California. Tie-plates are used on curves, and 36-in. 4-hole angle bars are used. So far only the line from Buena Vista across the wet clay ground to near Garfield has been ballasted. The excellent ballast here used, which came from Point of Mountain on the old line, is placed 7 ins. under and between the ties, and extends 1 ft. beyond their ends. The remaining ballast will be obtained from the Stockton bar cut.

The track on curves is elevated for a 40-mile speed for the present, though the system of curves and spirals was designed for a 50-mile speed.

Tracklaying is done by the railroad company's own force, with a tracklaying machine.

RIGHT-OF-WAY.

This is 200 ft. wide over the public lands, where it is obtained by U. S. grant. Where over private ground it is usually 100 ft., but sometimes more where there are high cuts or fills, or where ground for borrow is needed. The right-of-way has been fenced through all of the settled localities.

STATIONS.

At every way station a passing track 3,000 ft. long is put in, spaced 15 ft. centers from the main track. Where there is no depot the loading track switches off from the former, but where there is a depot the loading and house tracks are usually placed on the opposite side of the main track, with the depot between.

Much difficulty is experienced over most of the line in securing a supply of water for watering stations. The water usually has to be piped (sometimes pumped) from springs, which are often some distance from the line. A sufficient supply of water was also quite a consideration with the contractors, who sometimes dug wells and sometimes hauled from springs.

The cut-off passed from the hands of the Oregon Short Line R. R. Co. at the time of the purchase last summer of all the property of the company south of Salt Lake City by the San Pedro, Los Angeles & Salt Lake R. R. Co., and will form part of the latter company's through line to California.

The Leamington cut-off is a splendid example of recent railway engineering practice, and reflects credit on those connected with its construction. The completion of the contemplated through line to southern California will provide a new route for transcontinental traffic, over a road strictly in keeping with advanced railway standards, and one far better adapted for economical handling of heavy traffic than any of the older lines as first constructed.