

tance of transmission from west portal to power house approximately 23 miles.

Ventilator: Pressure blower.

Size of ventilating pipe: 14 inches.

Drills: Piston pneumatic, usually 2 in the heading.

Mounting of drills: Vertical columns.

Number of holes per round: 16 to 18.

Number of drillers and helpers per shift: 2 drillers and 2 helpers.

Number of drill shifts per day: 3.

Explosive: 40 per cent. gelatine dynamite.

Number of muckers per shift: 6.

Number of mucking shifts per day: 3.

Type of haulage: Electric after first 2,000 feet.

Wages: Drillers \$3.50, helpers \$3.25, muckers \$2.75, motormen \$3.25, brakemen \$2.75, blacksmiths \$4, helpers \$2.75.

Maximum progress in any calendar month: 500 feet, November, 1910.

Average monthly progress: 320 feet per heading.

#### Cost of Driving.

	Feet.	Cost per foot of tunnel.
West heading:		
Previous to 1909 .....	1,613	\$60.05
During 1909 .....	3,892	33.58
During 1910 .....	5,021	30.56
During 1911 .....	3,491	41.52
January to July, 1912 .....	2,382	36.79
East heading:		
October, 1911, to July, 1912 ...	2,682	33.04
Average for .....	19,081	\$36.78

#### Detailed Cost of Driving the West Heading for the Year 1909, 3,892 Feet.

	Cost per foot of tunnel.
Labor:	
Engineering .....	\$0.49
Superintendence .....	.73
Shift bosses .....	1.22
Timekeepers .....	.36
Drillmen and helpers .....	3.15
Miners (for handwork, trimming, etc.) ..	.23
Muckers .....	2.96
Track and dumpmen .....	.74
Mule drivers .....	.39
Motormen and brakemen .....	.44
Electricians and blower men .....	.07
Disabled employees .....	.19
Timbermen .....	.22
Miscellaneous .....	.40
	<hr/> \$11.59
Materials:	
Powder, fuse, caps, etc. ....	3.08
Lumber .....	.29
Oils, candles, etc. ....	.22
Ventilating pipe .....	.64
Track, including ties .....	.68
Pressure air pipe .....	.40
Drill repair parts (including hose) .....	.18
Miscellaneous .....	.19
	<hr/> 5.68
Repairs:	
Machine-shop expense (including labor and supplies) .....	.93
Blacksmith-shop expense (including labor and supplies) .....	1.22
	<hr/> 2.15
Power (all purposes) .....	7.65

#### Depreciation:

Haulage equipment .....	.09
General equipment .....	1.00
	<hr/> 1.09
General expense .....	3.96
Camp expense .....	1.21
Corral expense .....	.25
	<hr/> 5.42
Total .....	\$33.58

"General expense" includes a proportionate charge for the expenses of the Provo office, such as salaries, stationery, telephone, and supplies; also a proportionate charge for the expenses of the Washington, the Chicago, and the supervising engineer's offices. The Provo office covers approximately 68 per cent. of this charge, the Washington office 23 per cent., the Chicago office 2 per cent., and the supervising engineer's office 7 per cent.

#### GUNNISON TUNNEL.

Location: Montrose, Colo.

Purpose: Irrigation and reclamation.

Shape of cross-section: Horseshoe.

Size: 10 feet wide at the bottom, 10 feet 6 inches wide at the spring line, 10 feet high at the spring line, 12 feet 4 inches high at the centre of the arch.

Length: 30,645 feet.

Character of rock penetrated: Chiefly metamorphosed granite with some water-bearing clay and gravel, some hard black shale, and a zone of faulted and broken rock.

Type of power: Steam.

Ventilator: Pressure blower.

Size of ventilating pipe: 17 inches.

Drills: At first, pneumatic hammer, 4 drills in the heading; afterwards, pneumatic piston, 4 drills in the heading.

Mounting of drills: Horizontal bar for the hammer drills, vertical columns for the piston drills.

Number of holes per round: 20 to 24 in the heading (approximately one-half of the tunnel).

Average depth of round: 6 to 7 feet.

Number of drillers and helpers per shift: 4 drillers and 2 helpers.

Number of drill shifts per day: 3.

Explosive: 60 per cent. gelatine dynamite, with some 40 per cent.

Number of muckers per shift: 5 to 8.

Number of mucking shifts per day: 3.

Type of haulage: Electric.

Wages: Drillers \$3.50 and \$4, helpers \$3 and \$3.50, muckers \$2.50 and \$3, blacksmiths \$3.50 and \$4, motormen \$3, brakemen \$2.50 and \$3, power engineers \$4.

Maximum progress in any calendar month: 449 feet.

Average monthly progress: 250 feet, approximately.

#### Cost of Driving.

	Cost per foot of tunnel.
10,019 feet driven by undercut heading and subsequent enlargement .....	\$87.23
20,626 feet driven by top heading and bench .....	62.18
Average cost of excavation of entire tunnel .....	70.66

These costs include all labor, all materials, all repairs, all power, depreciation figured as 100 per cent. on all equipment, with a proportionate charge for general (supervisory) and miscellaneous expenses of the entire reclamation project.