Tunnel 3, Length 4,044 Feet.

(Through decomposed granite of medium hardness, dissected by slips and talcose planes requiring timber where ground was wet, and also containing pockets of carbon-dioxide gas, making work difficult and requiring extra provisions for ventilation. Average speed, 140 feet per month.)

	Cost per foot of tunnel.
Excavation	$12.67
Engineering	.24
Adit proportion	.35
Permanent equipment	2.35
Timbering (3,570 feet)	2.71
	$18.32

Tunnel 4, Length 2,033 Feet.

(Through medium-hard to hard granite at an average speed of 145 feet per month.)

	Cost per foot of tunnel.
Excavation	$12.00
Engineering	.24
Adit proportion	.16
Permanent equipment	2.35
Timbering (1,705 feet)	2.16
	$17.01

Tunnel 5, Length 1,178 Feet.

(Through medium-hard to very hard granite at an average speed of 120 feet per month.)

	Cost per foot of tunnel.
Excavation	$11.10
Engineering	.21
Adit proportion	.08
Permanent equipment	2.35
Timbering (916 feet)	1.83
	$15.57

Tunnel 7, Length 3,596 Feet.

(Through biotite granite of variable hardness at an average speed of 140 feet per month.)

	Cost per foot of tunnel.
Excavation	$13.55
Engineering	.27
Adit proportion	.13
Permanent equipment	2.35
Timbering (3,609 feet)	3.60
	$19.90

Tunnel 8-S for 1,334 Feet.

(Through medium-hard to hard granite at an average speed of 135 feet per month.)

	Cost per foot of tunnel.
Excavation	$12.82
Engineering	.19
Adit proportion	.18
Permanent equipment	2.35
Timbering (126 feet)	.39
	$15.93

Tunnel 9 for 3,506 Feet.

(Through medium hard to hard granite at an average speed of 195 feet per month.)

	Cost per foot of tunnel.
Excavation	$12.19
Engineering	.18
Adit proportion	.07
Permanent equipment	2.35
Timbering (305 feet)	.29
	$15.08

Tunnel 10 for 5,657 Feet.

(Through medium-hard to hard granite at an average speed of 200 feet per month.)

	Cost per foot of tunnel.
Excavation	$13.50
Engineering	.19
Permanent equipment	2.35
Timbering (194 feet)	.11
	$16.15

Tunnel 10A-N for 1,496 Feet.

(Through medium-hard to hard granite at an average speed of 165 feet per month.)

	Cost per foot of tunnel.
Excavation	$13.02
Engineering	.13
Permanent equipment	2.35
Timbering (24 feet)	.78
	$16.28

Tunnel 10A-S for 2,200 Feet.

(Driven through medium-hard to hard granite at an average speed of 200 feet per month.)

	Cost per foot of tunnel.
Excavation	$12.37
Engineering	.20
Permanent equipment	2.35
Timbering (215 feet)	1.15
	$16.07

GRAPEVINE DIVISION TUNNELS.

Location: Kern County, Cal.

Purpose: Water supply, power and irrigation.

Cross-section: Straight walls, arched rod, dished bottom.

Size: 7 feet 10 inches wide by 8 feet 5 inches high.

Type of power: Electric power purchased from aqueduct plant.

Ventilators: Pressure blowers.

Size of ventilation pipe: 12 inches.

Drills: Pneumatic hammer, usually 2 in each heading.

Mounting of drills: Horizontal bar.

Number of holes per round: Usually 18 to 20.

Average depth of round: 6 to 8 feet.

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

Number of drill shifts per day: Usually 2.

Explosive: 40 per cent. ammonia dynamite, but 60 per cent. and 75 per cent. gelatine dynamite were employed in hard ground.