

WILLIAM S. POST
ASSOC. MEM. A. S. C. E.
FLETCHER BLDG., 924 8TH ST.
SAN DIEGO, CALIFORNIA

REPORTS ON
WATER SYSTEMS AND PROJECTS

IN
SAN DIEGO COUNTY

BY
WILLIAM S. POST

Jan. 31, 1914.

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REPORT ON WATER PROJECT
OF
VOLCAN LAND AND WATER COMPANY

BY
W. S. POST

&
C. E. HICKOK

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 OF
VOLCAN LAND AND WATER COMPANY

BY
W. S. POST & C. E. HICKOK

DESCRIPTION

The project consists of the following reservoirs and conduit systems:

Warners Reservoir - on San Luis Rey River. Elevation 2700 feet. Drainage area 209 square miles. Flooded area 2,960 acres. Height of dam 85 feet. Capacity to 80 foot contour, 78,310 acre-feet; or 26 billion gallons.

CAPACITY

<u>Elevation of Water Surface</u>	<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet.</u>
2620	0	0	0
2630	10	17	58
2640	20	58	381
2650	30	260	1870
2660	40	875	7650
2670	50	1027	17150
2680	60	1922	31400
2690	70	2300	52010
2700	80	2960	78310

Cost of 70 foot dam with high water level 65 feet ----- \$ 108,000

Cost of 80 foot dam with high water level 75 feet ----- \$ 148,000

Warner Conduit. From Warners Dam to a power fall into Pano Valley. Length 8.85 miles. Capacity 80 million gallons per day.

Warner Power Station. will utilize a fall of 1,500 feet and generate 5,000 horse power.

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2043	130	452	20708
2053	143	524	25590
2063	153	587	31148

Cost of dam 130 feet high with water to 130 foot contour ----- \$350,000

Cost of dam 140 feet high with water to 140 foot contour ----- \$380,000

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130

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1937

Remona Conduit. Length 4.3 miles, conveying surplus Santa Ysabel waters to Santa Maria Reservoir. Capacity 40 million gallons per day.

Santa Maria Reservoir. on Santa Maria Creek. Elevation 1,300 feet. Storing the runoff of Santa Maria Creek (56 square miles) and the surplus diverted from Sutherland Reservoir through Remona Conduit. Height 105 feet. Capacity 29,000 acre-feet, or 9½ billion gallons. Flooded area 1,540 acres.

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Cost of dam 105 feet high
 with depth of reservoir
 100 feet ----- \$ 245,000

Pamo Reservoir. Elevation 990 feet. Six miles from and below Sutherland Reservoir on Santa Ysabel Creek. Height of dam 145 feet. Drainage area 114 square miles. Flood-ed area 805 acres. Capacity 34,900 acre-feet, or 12 billion gallons. This acts as a receiving basin for Farmers Dam water and also impounds all water not impounded above or diverted to Santa Maria Reservoir.

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970	120	539	21560
980	130	662	27570
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Cost of dam 130 feet high
 with water 125 feet deep ----- \$ 355,000

Cost of dam 140 feet high
 with water 135 feet deep ----- \$ 400,000

Pamo Conduit. From Pamo Reservoir to San Clemente Reservoir on Linda Vista Mesa. Length 24.83 miles. Capacity 45 million gallons per day. This conveys the Warner water and water stored in Pamo and other reservoirs. At the 8th mile it picks up the waters let down from Santa Maria Reservoir.

San Clemente Reservoir. This is virtually a distributing reservoir, available for the entire Linda Vista Mesa or the City of San Diego. Its altitude is 670 feet. Height of dam 85 feet. Capacity 6,370 acre-feet, or 2.08 billion gallons.

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590	0	0	0
600	10	3	2
610	20	23	15
620	30	60	451
630	40	79	1085
640	50	93	1943
650	60	129	3054
660	70	166	4530
670	80	201	6370
680	90	238	8570

Cost of dam 85 feet high
 with depth of water 80 feet ----- \$ 200,000

Alternative to Santa Maria Reservoir.

Instead of diverting the waters of Santa Ysabel Creek in Sutherland Reservoir into Santa Maria Reservoir, it is feasible to divert this stream to the San Diego Flume of the Guyanese Water System by a conduit delivering the water at the head of the Massey Grade and thence by Postons to Monte Tunnel.

Bernardo Reservoir. Elevation 350 feet. Near Bernardo post office. Drainage area 256 square miles. Height of dam 90 feet. Capacity 10,000 acre-feet, or 17 billion gallons. Flooded area 1,600 acres.

<u>CAPACITY</u>			
<u>Elevation of Water Surface</u>	<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet.</u>
260	0	0	0
270	10	9	30
280	20	70	900
290	30	165	2200
300	40	327	4585
310	50	596	10010
320	60	850	16800
330	70	1100	28000
340	80	1350	40900
350	90	1602	53260

Cost of 80 foot dam ----- \$ 150,000

Cost of 90 foot dam ----- \$ 200,000

Charged

Carroll Reservoir. Alternative to above. Elevation 325 feet. Two miles below Bernardo Reservoir. Height of dam 150 feet. Capacity 36,000 acre-feet, or 13 billion gallons. Flooded area 1,000 acres.

This site is especially favorable on account of volcanic basalt bed rock. The bed rock is exposed across the River, and no foundation work is required below the water level. A concrete masonry dam is recommended.

Elevation of Water Surface	CAPACITY		
	Depth	Acres Flooded	Capacity Acre-feet.
175	0	0	0
185	10	0	25
195	20	20	150
205	30	25	270
215	40	30	580
225	50	36	980
235	60	90	1800
245	70	155	3000
255	80	210	5010
265	90	290	7300
275	100	360	10500
285	110	480	15600
295	120	600	20900
305	130	720	26000
315	140	840	31000
325	150	960	36000

Cost of dam 120 feet high with water level to 120 feet ----- \$ 290,000

Cost of dam 130 feet high with water level to 130 feet ----- \$ 330,000

Changed

REPORT ON THE CUYAMACA WATER CO. SYSTEM

OF

MURRAY AND FLETCHER

BY

WILLIAM S. POST

DESCRIPTION

This system consists of the following reservoirs and conduits:

Cuyamaca Reservoir on the highest portion of the San Diego drainage. Elevation 4250 feet. Drainage area 12 square miles. Mean annual runoff 4,254 acre-feet. Height of dam 37.5 feet. Area flooded 940 acres. Capacity 11,000 acre-feet, or 4 billion gallons.

The waters here stored are held under normal conditions until July 1st, when the gates are opened and furnish the supply until December. The water is turned down the natural channel of Boulder Creek for a distance of 12½ miles, where it joins the main San Diego River and reaches the Diverting Dam.

Depth	CAPACITY	
	Acres-Flooded	Capacity Acre-feet.
0	0	0
10	6	15
20	346	1580
30	768	7116
34.5	930	10600

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DIVERTING DAM

This is a diversion and regulating reservoir, at the beginning of the flume. The altitude is 800 feet. Capacity 70 acre-feet, or 23 million gallons. Height 30 feet. The drainage area is 92 square miles exclusive of Cuyamaca Lake drainage area, or a total of 104 square miles.

SAN DIEGO FLUME.

This flume is 33.6 miles long. It is made up of the following construction:

	<u>Miles.</u>
Redwood flume on trestles --	5.90
Steel flume on trestles ----	.48
Redwood flume -----	24.97
Concrete flume -----	.33
Tunnels -----	.90
Steel syphons -----	.79
Concrete syphon -----	.23
	<u>33.60</u>

Ten per cent of the system may be said to be of permanent construction. The remainder of redwood lumber, lined with asphaltic roofing felt has a life of 10 to 15 years.

The capacity of the flume is 2,000 miners inches through four miles of its length and the remainder is 900 miners inches or 12 millions of gallons per day.

SOUTH FORK FEEDER.

At the 6th mile, the flume receives an additional supply from the South Fork. The drainage area of the South Fork is 43 square miles.

-2-

-3-

The feeder consists of:

Steel flume -----	.5 miles
Redwood flume ---	.5 "
Total -----	1.0 miles

The capacity of this flume is 1,000 miners inches.

Murray Hill and Eucalyptus Receiving Reservoir.

At the end of the flume are located Murray Hill and Eucalyptus Reservoirs with a joint capacity of 50 millions of gallons. They are connected by a 24" concrete pipe line, which is virtually the beginning of the distributing system.

La Mesa Ditch.

At the end of the flume there also starts the La Mesa ditch of 600 miners inches capacity, conveying flood waters to La Mesa Reservoir. Its length is 3.7 miles including 1242 feet of 36" syphon.

La Mesa Reservoir

La Mesa Reservoir is both a storage reservoir and a distributing reservoir to the "low service" portion of the system. The height of the dam is 65 feet. Its capacity is 478 millions of gallons. Elevation 485 feet above sea.

This reservoir is connected with the 16" main distributing line by a 24" redwood pipe line 1.2 miles in length, capacity 8 million gallons per day. The present storage capacity of La Mesa Reservoir is more than sufficient to supply its present consumers.

-3-

DISTRIBUTING SYSTEM

The system supplies the municipalities of La Mesa and a portion of East San Diego, and the communities of Grossmont, Chollas Heights, Lemon Grove, Spring Valley, Kensington Park and Normal Heights.

The principal main is along El Cajon Avenue. It is 14 and 16 inches in diameter and is 8 miles long. It extends from the Murray Hill and Eucalyptus Reservoirs to the East City Limits of San Diego, and is supplied midway by La Mesa Reservoir.

The larger pipe lines are scheduled as follows:

	<u>Linear Feet.</u>
16" coated steel pipe -----	25,000
14" coated steel pipe -----	16,000
8" pipe - riveted -----	5,000
6" pipe - riveted -----	1,200
10" and 12" casing -----	2,000
3" and 4" casing -----	15,000
2" standard pipe -----	80,000
6" cast iron pipe -----	7,400
4" cast iron pipe -----	1,700
	153,300

SERVICE DEMANDS.

A judicial determination by the State Railroad Commission has declared void and illegal the old water right contracts. The Railroad Commission has found that 256 miners inches constitutes the full service supply to the present Cuyamaca consumers; and has authorized the sale of all surplus above this amount at 25 cents per 1,000 gallons.

The following table shows all the present consumers and the nature of the service obligations of the Cuyamaca Water Co., requiring 256 miners inches in all.

<u>Division</u>	<u>Continuous Miners Inches</u>			<u>No. of Services</u>	<u>App-rox. popu-lat-ion</u>	<u>App-rox. acres sup-p-lied</u>
	<u>Irrigation</u>	<u>Domestic</u>	<u>Total</u>			
Main Flume --	122	1	123	160	500	2020
High Service-	78	10	88	540	2000	2450
Low Service -	54	10	45	1807	6000	944
	254	21	256	2507	8500	5424

DOMESTIC WATER RATES.

The rates for domestic water - rates established by the State Railroad Commission - are as follows:

	<u>per 1,000 gallons</u>
Metered service rate	25 cents
Wholesale - low service	18 cents
Wholesale - high service	15 cents

FUTURE PLANS AND EXTENSIONS.

The following plans and surveys have been made to increase the storage or supply of the system.

Poverty Flat Reservoir upon King Creek Branch of South Fork. Capacity 1,500 acre-feet. Estimated cost \$150,000. Dam 90 feet high. Elevation 2,900 feet.

Depth	CAPACITY	
	Acres Flooded	Capacity Acre-feet.
0	0	0
10	1	5
20	2	16
30	3	39
40	5	77
50	9	145
60	15	264
70	25	461
80	35	760
90	43	1500

Conejos Reservoir upon Conejos Creek branch of South Fork. Capacity 900 acre-feet. Estimated cost \$63,000.

Lands under contract U. S. Government. Height of dam 80 feet. Elevation 1,500 feet.

Depth	CAPACITY	
	Acres Flooded	Capacity Acre-feet.
0	0	0
10	1	1
20	1	2
30	3	17
40	7	63
50	11	153
60	19	304
70	28	537
80	38	867

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Tule Reservoir. Ten miles below Cuyamaca Reservoir, and with an equal water supply. Capacity 1,400 acre-feet. Estimated cost \$50,000. Height of dam 80 feet. Elevation 2,500 feet.

Depth	CAPACITY	
	Acres Flooded	Capacity Acre-feet.
0	0	0
15	1	13
25	4	40
35	9	105
45	18	240
55	30	477
65	43	840
75	58	1347

Diverting Dam Reservoir This plan contemplates raising existing structure to a height of 80 feet, its present height being 30 feet. Capacity 2,600 acre-feet. Estimated cost of 70 foot dam \$130,000. 80 foot dam \$180,000.

Elevation of Water Surface	CAPACITY		
	Depth	Acres Flooded	Capacity Acre-feet.
786	0	0	0
806	20	2	2 flume level
816	30	10	69 present top
826	40	24	200
836	50	40	640
846	60	58	1140
856	70	74	1715
866	80	93	2600
876	90	129	4480
886	100	157	6000
896	110	186	7620
906	120	217	9700
916	130	249	12000

OK

La Mesa Reservoir. Capacity with 140 foot dam - 6 billions of gallons. Cost of concrete dam to a height of 100 feet; \$325,000.

CAPACITY

<u>Elevation</u>	<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet.</u>
430	0	0	0
440	10	1	3
450	20	5	20
460	30	12	110
470	40	24	290
480	50	41	610
490	60	62	1120
495	65	70	1460 present dam
500	70	83	1650
510	80	113	2820
520	90	152	4120
530	100	205	5960
540	110	259	8000
550	120	322	10500
560	130	391	14100
570	140	444	18900

The present flume which supplies La Mesa Reservoir, is capable of delivering 10,000 acre-feet per year, or 3 billion gallons.

The further development of La Mesa dam proposed is a concrete masonry type of dam, to a height of 100 feet. Estimated cost \$325,000.

By raising the dam to 135 feet, the surplus storage would be 14,100 acre-feet or nearly 5 billion gallons. This would be stored at 500 foot elevation, 6 miles from University Heights reservoir, the elevation of which is 400 feet.

RELATION TO CITY RESERVOIRS.

The especial value of the position of the flume terminus, elevation 640 feet and La Mesa reservoir elevation 500 feet, lies in its proximity to Chollas Reservoir. A 3 mile pipe line connecting with La Mesa reservoir will permit of "backing up" San Diego River water into the Lower Otay Reservoir to the extent of a safe additional yield of 3 billions of gallons annually.

El Capitan Dam Site. This is an alternative to the above reservoirs as a reserve for continuous dry seasons. The capacity for 100 foot dam is 20,000 acre-feet. Estimated cost \$500,000.

There is a serious question whether this construction has as sound economic basis as the preceding developments. The depth and quality of the bed rock in this situation is important, and is still problematical. The catchment area below the Diverting Dam is comparatively unimportant, after storage developments are completed above. Its elevation requires pumping into the flume or the alternative of a pressure line 20 miles long across the El Cajon Valley to reach La Mesa reservoir or University Heights reservoir. The cost of such a pipe line would easily reach \$500,000. The damage to riparian owners near Lakeside would appear more real by the cutting off of underflow; and might cost a large amount in litigation.

DESCRIPTION OF COTTONWOOD SYSTEM

OF THE CITY OF SAN DIEGO

BY WILLIAM S. POST

The system purchased or under option by the City of San Diego, from the Southern California Mountain Water Company, consisted of:

Moreno Dam Under option by the City. Drainage area 135 square miles. Mean runoff 7,361 acre-feet. Height of dam 150 feet. Flooded area 1,370 acres. Capacity 40,000 acre-feet, or 15 billion gallons.

Delsura Conduit. Altitude 1,500 feet. Capacity 3,000 miners inches. Length 13.4 miles. Drainage area 270 square miles, including Moreno Dam. Mean runoff 14,722 acre-feet.

Lower Otay Dam Altitude 400 feet. Drainage area 100 square miles. Height of dam 130 feet. Length 615 feet. Flooded area 1,000 acres. Capacity 13 billion gallons.

Upper Otay Dam Negligible under present existing conditions.

30" Pipe Line 15.2 miles in length, including 1.2 miles of tunnel.

Chollas Reservoir Height 56 feet. Length 526 feet. Capacity 90 million gallons.

University 24" pipe Line Length 4 miles.

CONVERSION TABLE

1 miners inch	=	13,000 gallons per day
1 miners inch	=	4-3/4 million gallons per year
1 miners inch	=	14-1/2 acre feet per year
1 acre foot	=	1/3 million gallons
1 million gallons	=	3 acre feet.
1 million gallons per day	=	78 miners inches

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The following is a statement of the available water supply of the different watersheds of San Diego County according to United States Government measurements and gage heights, where available. From November 1, 1913 to March 6, 1914, the runoff has been as follows:

	Gallons	Sq. Mi. Watershed
San Dieguito River at Bernardo Damsite --	6,680,000,000	264
San Luis Rey River at Warners Damsite ---	5,970,000,000	210
Santa Ysabel River at Pamo Damsite -----	5,151,000,000	114
San Diego River at Diverting Dam intake -	3,525,000,000	147
Sweetwater River at Sweetwater Dam -----	1,122,000,000	186
Lower Otay Reservoir exclusive of Moreno- (This does not include any water that (could not be taken by the conduit at (Barrett.)	1,138,000,000	235
Moreno Reservoir -----	1,040,000,000	135

The following is the daily discharge of all streams visited by the Water Commission on March 5th and 6th, 1914:

San Dieguito River at Bernardo	March 5th	52,000,000 gallons
Santa Ysabel at Pamo Damsite --	" 5th	37,500,000 "
San Luis Rey River at Warners Dam	" 5th	31,000,000 "
Cottonwood Creek into Moreno Dam	" 6th	3,500,000 "
Pine Creek into Delzura Conduit at Pine Valley -----	" 6th	2,000,000 "
Delzura Creek into Otay Dam ---	" 6th	11,000,000 "
San Diego River not including Cuyemaca Lake -----	" 6th	25,000,000 "

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MEXICO
Boundary Line



SAN
DIEGO

Chlorine
Reservoir

San Marcos
River

Le Mans
Reservoir

San Geronimo
Reservoir

San Jacinto
Reservoir

San Marcos
Reservoir

San Jacinto
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San Geronimo
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 with water to 130 foot contour -----\$ 350,000

Cost of dam 140 feet high with
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Ramona Conduit. Length 4.3 miles, conveying surplus Santa Ysabel waters to Santa Maria Reservoir. Capacity 40 million gallons per day.

Santa Maria Reservoir, on Santa Maria Creek. Elevation 1,300 feet. Storing the runoff of Santa Maria Creek (56 square miles) and the surplus diverted from Sutherland Reservoir through Ramona Conduit. Height 105 feet. Capacity 29,000 acre-feet, or 9½ million gallons. Flooded area 1,540 acres.

CAPACITY

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1260	0	0	0
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Cost of dam 105 feet high
 with depth of reservoir
 100 feet ----- \$ 245,000

Pano Reservoir. Elevation 990 feet. Six miles from and below Sutherland Reservoir on Santa Ysabel Creek. Height of dam 145 feet. Drainage area 114 square miles. Flooded area 805 acres. Capacity 34,900 acre-feet, or 12 billion gallons. This acts as a receiving basin for Warners Dam water and also impounds all water not impounded above or diverted to Santa Maria Reservoir.

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 with water 125 feet deep ----- \$ 365,000

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WILLIAM S. POST
ASSOC. MEM. A. S. C. E.
FLETCHER BLDG., 924 8TH ST.
SAN DIEGO, CALIFORNIA

- 6 -

Alternative to Santa Maria Reservoir

Instead of diverting the waters of Santa Ysabel Creek in Sutherland Reservoir into Santa Maria Reservoir, it is feasible to divert this stream to the San Diego Flume of the Cuyamaca Water System by a conduit delivering the water at the head of the Massey Grade and thence by Fosters to Monte Tunnel.

--- 000 ---

- 6 -

- 7 -

Carroll Reservoir. Elevation 315 feet. Height of dam 100 feet. Capacity 36,070 acre-feet, or 12 billion gallons. Flooded area 1,208 acres.

This site is especially favorable on account of volcanic basalt bed rock. The bed rock is exposed across the river, and no foundation work is required below the water level. A concrete masonry dam is recommended.

CAPACITY

<u>Elevation of Water Surface</u>	<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet</u>
215	0	0	0
225	10	4	20
235	20	20	140
245	30	65	310
255	40	123	1480
265	50	220	3200
275	60	336	6000
285	70	490	10200
295	80	720	16200
305	90	980	24500
315	100	1208	36070

Cost of concrete masonry dam 90 feet high with water level to 90 feet --- \$ 275,000

Cost of concrete masonry dam 100 feet high with water level to 100 feet -- \$ 308,000

- 7 -

WILLIAM S. POST
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REPORT ON THE CUYAMACA WATER CO. SYSTEM

OF

MURRAY AND FLETCHER

BY

WILLIAM S. POST

DESCRIPTION

This system consists of the following reservoirs and conduits:

Cuyamaca Reservoir on the highest portion of the San Diego drainage. Elevation 4250 feet. Drainage area 12 square miles. Mean annual runoff 4,254 acre-feet. Height of dam 37.5 feet. Area flooded 940 acres. Capacity 11,000 acre-feet, or 4 billion gallons.

The waters here stored are held under normal conditions until July 1st, when the gates are opened and furnish the supply until December. The water is turned down the natural channel of Boulder Creek for a distance of 12½ miles, where it joins the main San Diego River and reaches the Diverting Dam.

CAPACITY

<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acres-foot</u>
0	0	0
10	6	13
20	346	1520
30	766	7116
34.3	930	10600

- 2 -

DIVERTING DAM

This is a diversion and regulating reservoir, at the beginning of the flume. The altitude is 800 feet. Capacity 70 acre-feet, or 23 million gallons. Height 30 feet. The drainage area is 92 square miles exclusive of Cuyamaca Lake drainage area, or a total of 104 square miles.

SAN DIEGO FLUME

This flume is 33.6 miles long. It is made up of the following construction:

	<u>Miles</u>
Redwood flume on trestles ----	5.90
Steel flume on trestles ----	.48
Redwood flume -----	24.97
Concrete flume -----	.33
Tunnels -----	.90
Steel syphons -----	.79
Concrete syphon -----	.23
	<u>33.60</u>
	=====

Ten per cent of the system may be said to be of permanent construction. The remainder of redwood lumber, lined with asphaltic roofing felt has a life of 10 to 15 years.

The capacity of the flume is 2,000 miners inches through four miles of its length and the remainder is 900 miners inches or 12 millions of gallons per day.

SOUTH FORK FEEDER.

At the 6th mile, the flume receives an additional supply from the South Fork. The drainage area of the South Fork is 43 square miles.

- 3 -

The feeder consists of: Steel flume ----- .5 miles
Redwood flume --- .5 "
Total ----- 1.0 miles

The capacity of this flume is 1,000 miners inches.

Murray Hill and Eucalyptus Receiving Reservoir.

At the end of the flume are located Murray Hill and Eucalyptus Reservoirs with a joint capacity of 50 millions of gallons. They are connected by a 24" concrete pipe line, which is virtually the beginning of the distributing system.

La Mesa Ditch.

At the end of the flume there also starts the La Mesa ditch of 600 miners inches capacity, conveying flood waters to La Mesa Reservoir. Its length is 3.7 miles including 1242 feet of 36" syphon.

La Mesa Reservoir.

La Mesa Reservoir is both a storage reservoir and a distributing reservoir to the "low service" portion of the system. The height of the dam is 65 feet. Its capacity is 478 millions of gallons. Elevation 485 feet above sea.

This reservoir is connected with the 16" main distributing line by a 24" redwood pipe line 1.2 miles in length, capacity 8 million gallons per day. The present storage capacity of La Mesa Reservoir is more than sufficient to supply its present consumers.

- 3 -

DISTRIBUTION SYSTEM

The system supplies the municipalities of La Mesa and a portion of East San Diego, and the communities of Grossmont, Chollas Heights, Lemon Grove, Spring Valley, Kensington Park and Normal Heights.

The principal main is along El Cajon Avenue. It is 14 and 16 inches in diameter and is 8 miles long. It extends from the Murray Hill and Eucalyptus Reservoirs to the East City Limits of San Diego, and is supplied midway by La Mesa Reservoir.

The larger pipe lines are scheduled as follows:

	<u>Linear Feet.</u>
16" coated steel pipe -----	25,000
14" coated steel pipe -----	16,000
8" pipe - riveted -----	8,000
6" pipe - riveted -----	1,200
10" and 12" casing -----	2,000
3" and 4" casing -----	15,000
2" standard pipe -----	80,000
6" cast iron pipe -----	7,400
4" cast iron pipe -----	1,700
	<u>153,500</u>

SERVICE DEMANDS

A judicial determination by the State Railroad Commission has declared void and illegal the old water right contracts. The Railroad Commission has found that 256 miners inches constitutes the full service supply to the present Guyanaca consumers; and has authorized the sale of all surplus above this amount at 25 cents per 1,000 gallons.

The following table shows all the present consumers and the nature of the service obligations of the Cuyamaca Water Co., requiring 256 miners inches in all.

<u>Division</u>	<u>Continuous Miners Inches</u>			<u>No. of Services</u>	<u>App-rox. popu-lation</u>	<u>App-rox. acres supplied</u>
	<u>Irrigation</u>	<u>Domestic</u>	<u>Total</u>			
Main Flume	122	1	123	160	500	2030
High Service	78	10	88	540	2000	2450
Low Service	34	10	45	1807	6000	944
	<u>234</u>	<u>21</u>	<u>256</u>	<u>2507</u>	<u>8500</u>	<u>5424</u>

DOMESTIC WATER RATES

The rates for domestic water - rates established by the State Railroad Commission - are as follows:

	<u>per 1,000 Gallons</u>
Metered service rate	25 cents
Wholesale - low service	10 cents
Wholesale - high service	15 cents

FUTURE PLANS AND EXTENSIONS

The following plans and surveys have been made to increase the storage or supply of the system.

Poverty Flat Reservoir upon King Creek Branch of South Fork. Capacity 1,500 acre-feet. Estimated cost \$150,000. Dam 90 feet high. Elevation 2,900 feet.

<u>CAPACITY</u>		
<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet</u>
0	0	0
10	1	5
20	2	16
30	3	39
40	5	77
50	9	145
60	15	264
70	25	461
80	35	760
90	45	1500

Conejos Reservoir upon Conejos Creek branch of South Fork. Capacity 900 acre-feet. Estimated cost \$63,000. Lands under contract U. S. Government. Height of dam 80 feet. Elevation 1,500 feet.

<u>CAPACITY</u>		
<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet</u>
0	0	0
10	1	1
20	1	2
30	3	17
40	7	63
50	11	153
60	19	304
70	28	537
80	38	807

Tule Reservoir. Ten miles below Cuyamaca Reservoir, and with an equal water supply. Capacity 1,400 acre-feet. Estimated cost \$50,000. Height of dam 80 feet. Elevation 2,500 feet.

<u>CAPACITY</u>		
<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet</u>
0	0	0
15	1	13
25	4	40
35	9	105
45	18	240
55	30	477
65	43	640
75	58	1247

Diverting Dam Reservoir. This plan contemplates raising existing structure to a height of 80 feet, its present height being 30 feet. Capacity 2,600 acre-feet. Estimated cost of 70 feet dam \$130,000. 80 foot dam \$180,000.

<u>CAPACITY</u>			
<u>Elevation of Water Surface</u>	<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acre-feet</u>
786	0	0	0
806	20	2	2
816	30	10	69
826	40	24	200
836	50	40	640
846	60	58	1140
856	70	74	1715
866	80	93	2600
876	90	129	4460
886	100	157	6000
896	110	185	7620
906	120	217	9700
916	130	249	12000

flume level present top

La Mesa Reservoir. Capacity with 140 foot dam - 6 billions of gallons. Cost of concrete dam to a height of 100 feet, \$325,000.

<u>CAPACITY</u>			
<u>Elevation</u>	<u>Depth</u>	<u>Acres Flooded</u>	<u>Capacity Acro-feet</u>
430	0	0	0
440	10	1	3
450	20	3	30
460	30	12	110
470	40	24	290
480	50	41	610
490	60	62	1120
495	65	70	1460
500	70	83	1850
510	80	113	2820
520	90	152	4120
530	100	205	5960
540	110	259	8000
550	120	322	10500
560	130	381	14100
570	140	444	18900

present
dam)

The present flume which supplies La Mesa Reservoir, is capable of delivering 10,000 acre-feet per year, or 3 billion gallons.

The further development of La Mesa Dam proposed is a concrete masonry type of dam, to a height of 100 feet. Estimated cost \$325,000.

By raising the dam to 135 feet, the surplus storage would be 14,100 acre-feet or nearly 5 billion gallons. This would be stored at 500 foot elevation, 6 miles from University Heights reservoir, the elevation of which is 400 feet.

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RELATION TO CITY RESERVOIRS

The especial value of the position of the flume terminus, elevation 640 feet and La Mesa reservoir elevation 500 feet, lies in its proximity to Chollas Reservoir. A 3 mile pipe line connecting with La Mesa reservoir will permit of "backing up" San Diego River water into the Lower Otay Reservoir to the extent of a safe additional yield of 3 billions of gallons annually.

El Capitan Dam Site. This is an alternative to the above reservoirs as a reserve for continuous dry seasons. The capacity for 100 foot dam is 20,000 acre-feet. Estimated cost \$500,000.

There is a serious question whether this construction has a sound economic basis as the preceding developments. The depth and quality of the bed rock in this situation is important, and is still problematical. The catchment area below the Diverting Dam is comparatively unimportant, after storage developments are completed above. Its elevation requires pumping into the flume or the alternative of a pressure line 20 miles long across the El Cajon Valley to reach La Mesa reservoir or University Heights reservoir. The cost of such a pipe line would easily reach \$500,000. The damage to riparian owners near Lakeside would appear more real by the cutting off of underflow; and might cost a large amount in litigation.

- 9 -

- 1 -

DESCRIPTION OF COTTONWOOD SYSTEM
OF THE CITY OF SAN DIEGO
BY WILLIAM S. POST

This system purchased or under option by the City of San Diego, from the Southern California Mountain Water Company, consisted of:

Moreno Dam under option by the City. Drainage area 135 square miles. Mean runoff 7,561 acre-feet. Height of dam 150 feet. Flooded area 1,370 acres. Capacity 40,000 acre-feet, or 15 billion gallons.

Delsura Conduit. Altitude 1,500 feet. Capacity 3,000 minors inches. Length 15.4 miles. Drainage area 270 square miles, including Moreno Dam. Mean runoff 14,722 acre-feet.

Lower Otay Dam. Altitude 400 feet. Drainage area 100 square miles. Height of dam 130 feet. Length 615 feet. Flooded area 1,000 acres. Capacity 13 billion gallons.

Upper Otay Dam. Negligible under present existing conditions.

30" Pipe line. 15.2 miles in length, including 1.2 miles of tunnel.

Chollas Reservoir. Height 56 feet. Length 526 feet. Capacity 90 million gallons.

University 24" pipe line. Length 4 miles.

- 1 -

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CONVERSION TABLE

1 miners inch	=	15,000 gallons per day
1 miners inch	=	4-3/4 million gallons per year
1 miners inch	=	14-1/2 acre feet per year
1 acre foot	=	1/3 million gallons
1 million gallons	=	3 acre feet
1 million gallons per day	=	78 miners inches

--- 000 ---

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 SAN DIEGO, CALIFORNIA

The following is a statement of the available water supply of the different watersheds of San Diego County according to U. S. Government measurements and gage heights, where available. From July 1st, 1913 to May 15th, 1914:

	<u>Gallons</u>	<u>Sq. Mi. Watershed</u>
San Dieguito River at Carroll Dam site	7,320,000,000	264
San Luis Rey at Warners Dam site	7,070,000,000	210
San Diego River at Diverting Dam including Cuyamaca Lake Catchment	3,846,000,000	147
Sweetwater Dam	1,102,000,000	186
Moreno Dam	1,100,000,000	135
Lower Otay	668,000,000	235
Santa Ysabel River at Pano Dam site	6,380,000,000	114

The following is the daily discharge of all streams visited by the Water Commission on March 5th and 6th, 1914:

San Dieguito River at Bernardo	March 5th	52,000,000	gallons
Santa Ysabel at Pano Dam site	5th	37,500,000	"
San Luis Rey at Warners Dam	5th	21,000,000	"
Cottonwood Creek into Moreno Dam	6th	3,500,000	"
Pine Creek into Delsara Conduit at Pine Valley	6th	2,000,000	"
Delsara Creek into Otay Dam	6th	11,000,000	"
San Diego River not including Cuyamaca Lake	6th	25,000,000	"

DISCHARGE OF STREAMS ON MAY 15, 1914.

	<u>Per 24 hours</u>	
San Dieguito River at Carroll Dam site	5,350,000	gallons
Santa Ysabel River at Pano Dam site	12,600,000	"
San Luis Rey River at Warners Dam site	7,100,000	"
San Diego River at Diverting Dam not including Cuyamaca Lake	11,000,000	"

No. 1

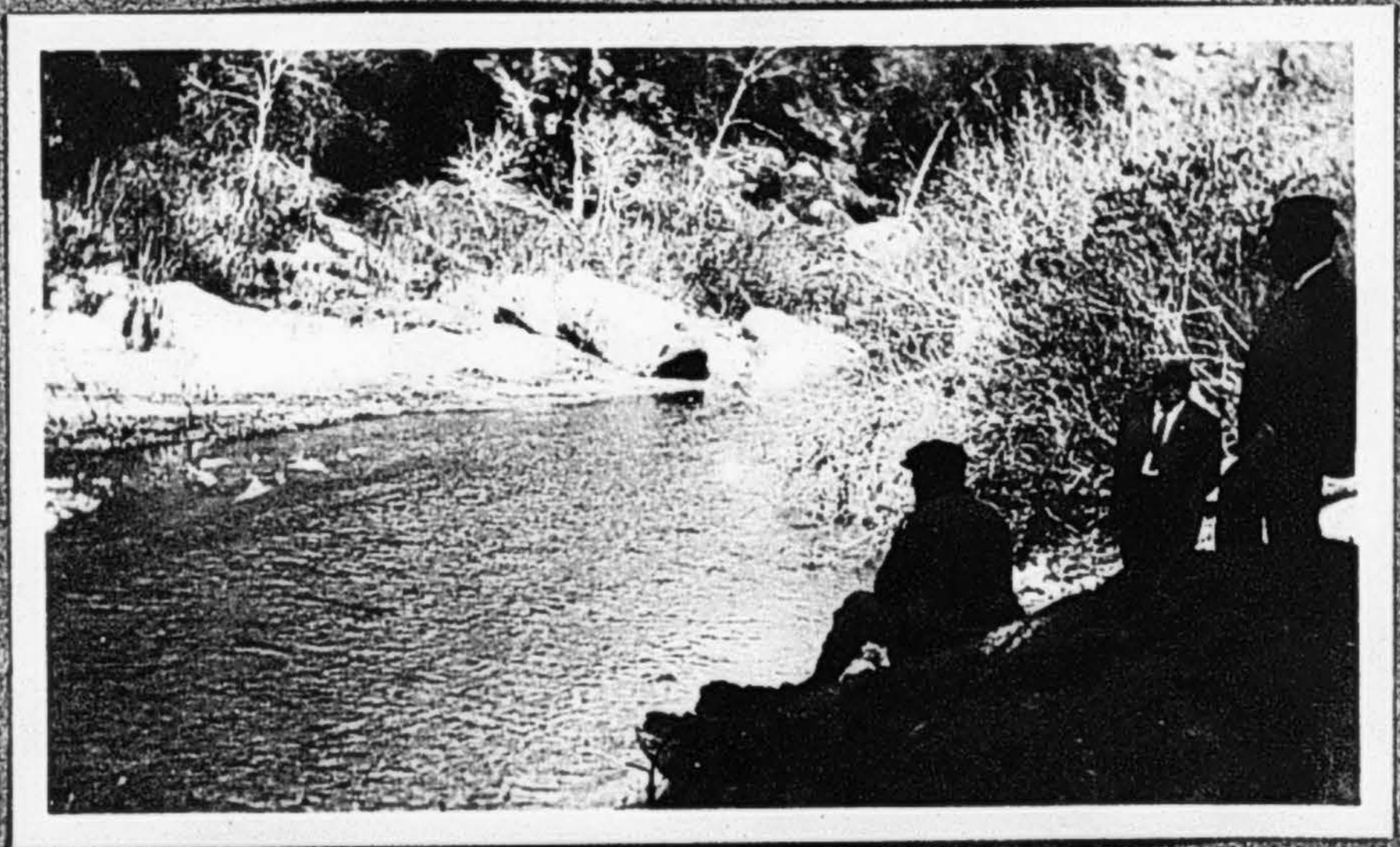
Carroll Reservoir Site

March 5, 1914 - 52,000,000 gallons
of water flowing per day.

No 2

El Capitan Damsite.

March 6, 1914 - 25,000,000 gallons
of water flowing per day.



No 3

Marston works, Choate bosses.

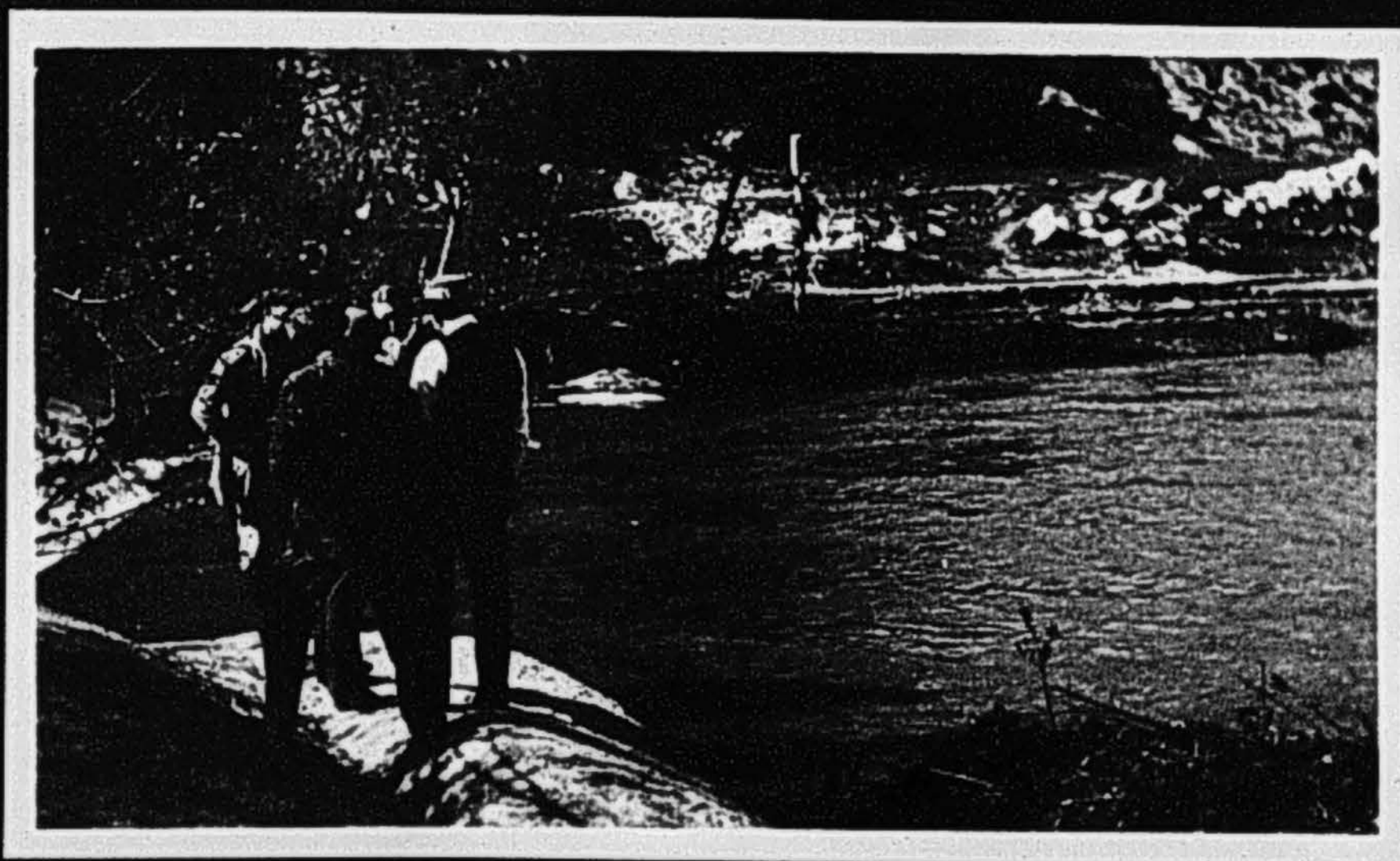
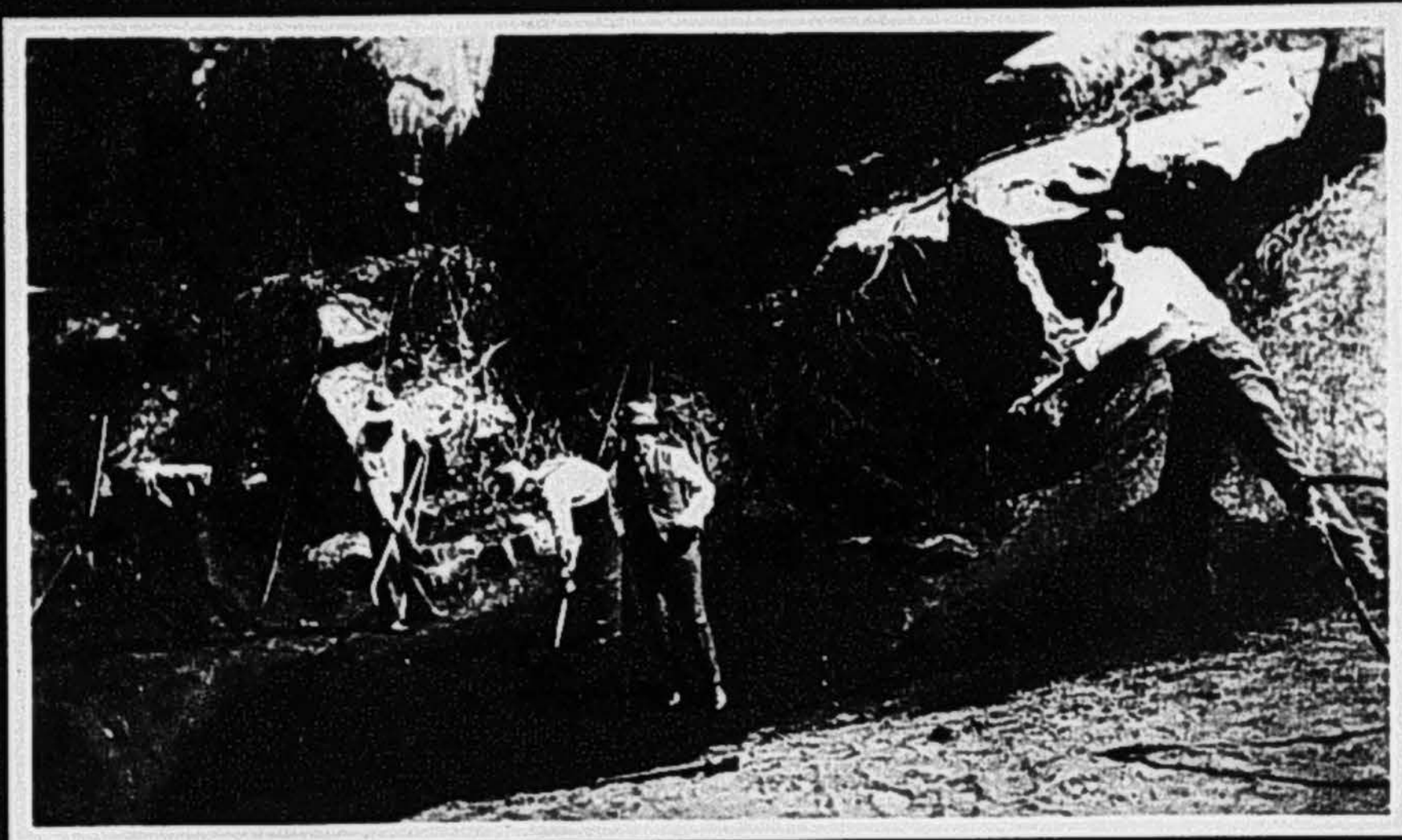
San Pasquel Grade.

No 4

Pano Damsite

March 5, 1914 - 57,500,000 gallons

flowing daily.



No 5

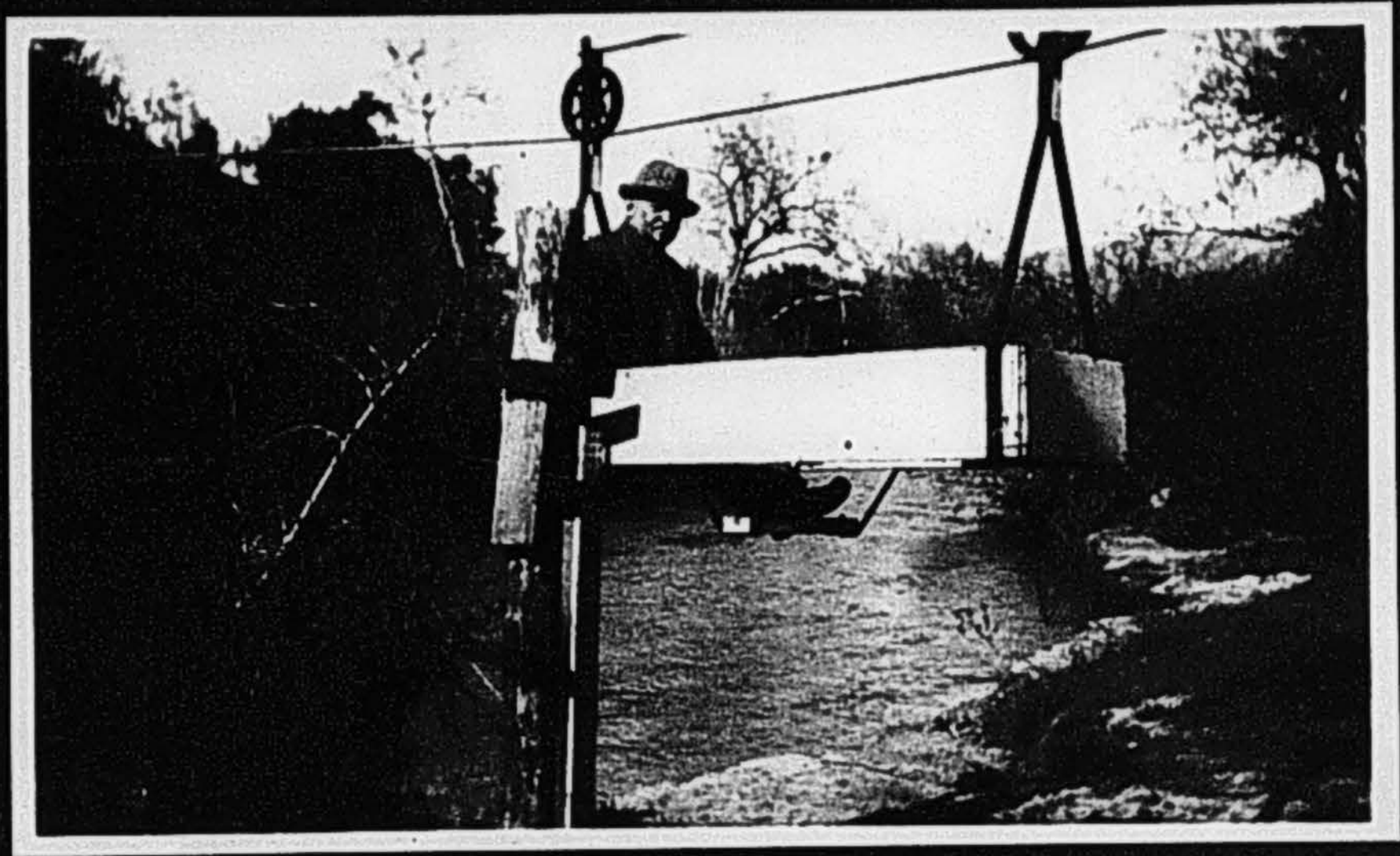
Hon. Simon Levi,

In Government Measuring Car.

No. 6

Hon. George Marston

on his fiery steed, San Luis Rey River.



No 7

San Luis Rey River

March 5, 1914 - 31,000,000 gallons

flowing daily.

Note Hon. Simon Levi in measuring

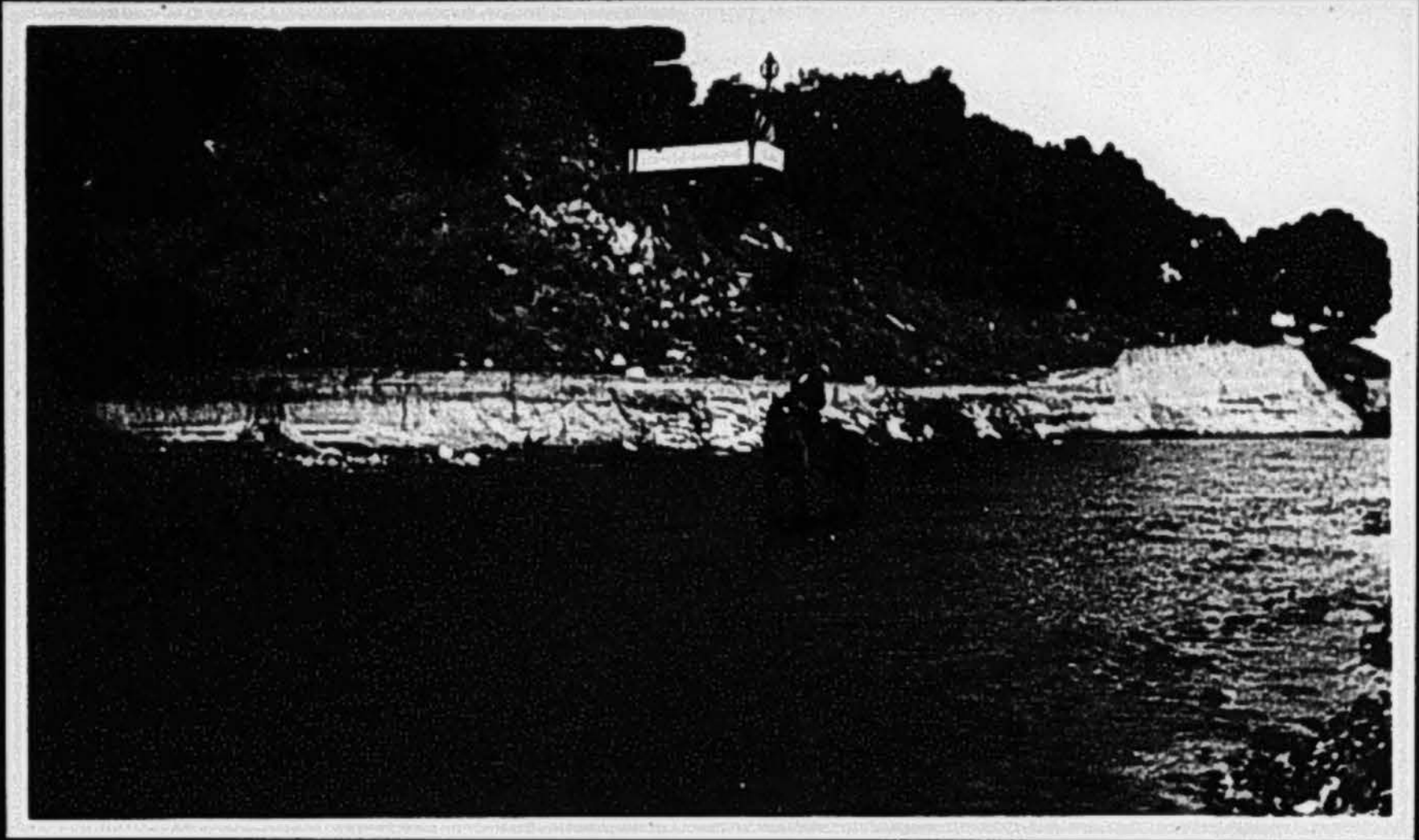
car.

No. 8

San Luis Rey River.

March 5, 1914

and Water Commission.

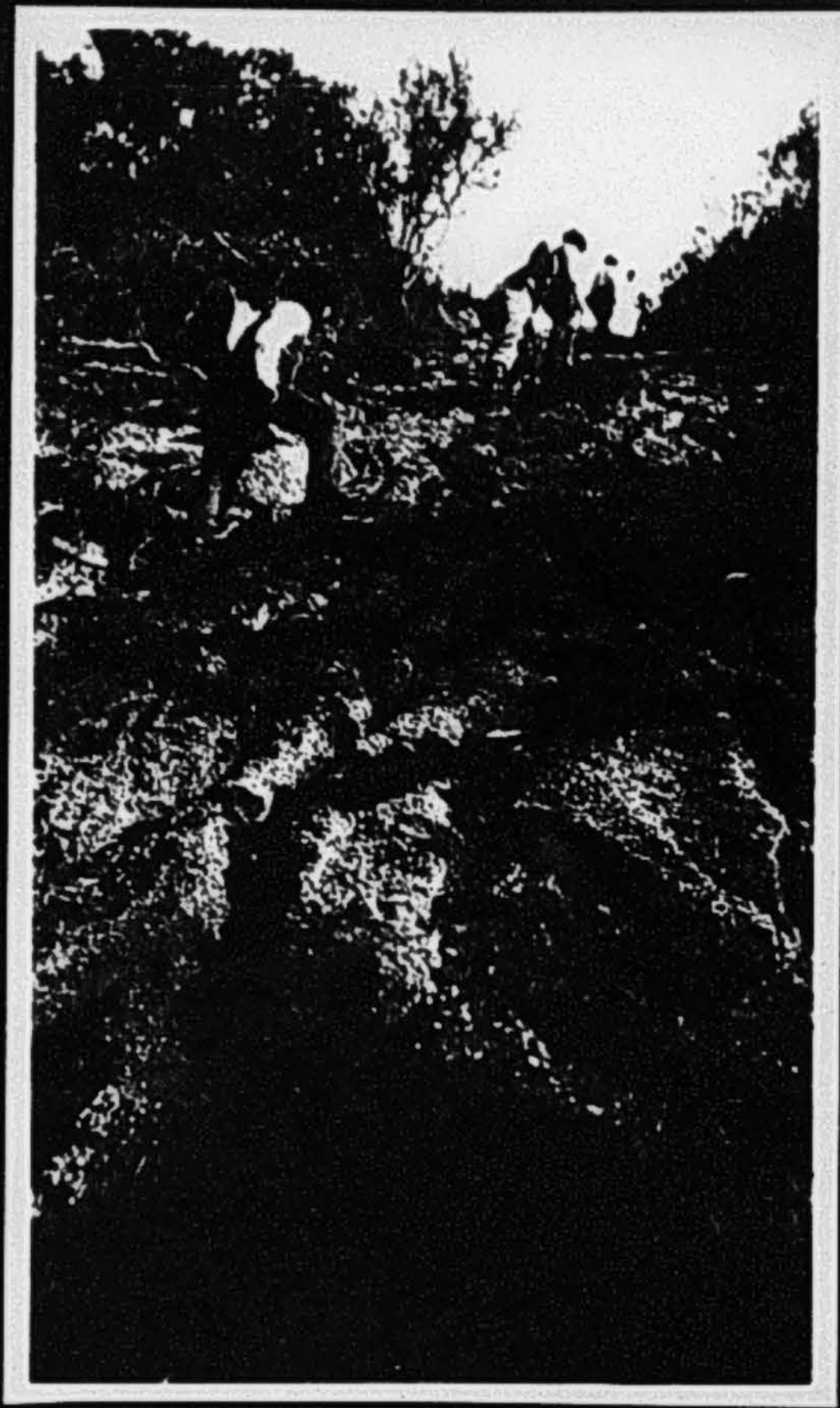


No 11

Climbing South Fork
of San Diego River.

No 12

The return of Hon. Rufus Choate
with Whitney a bad second.

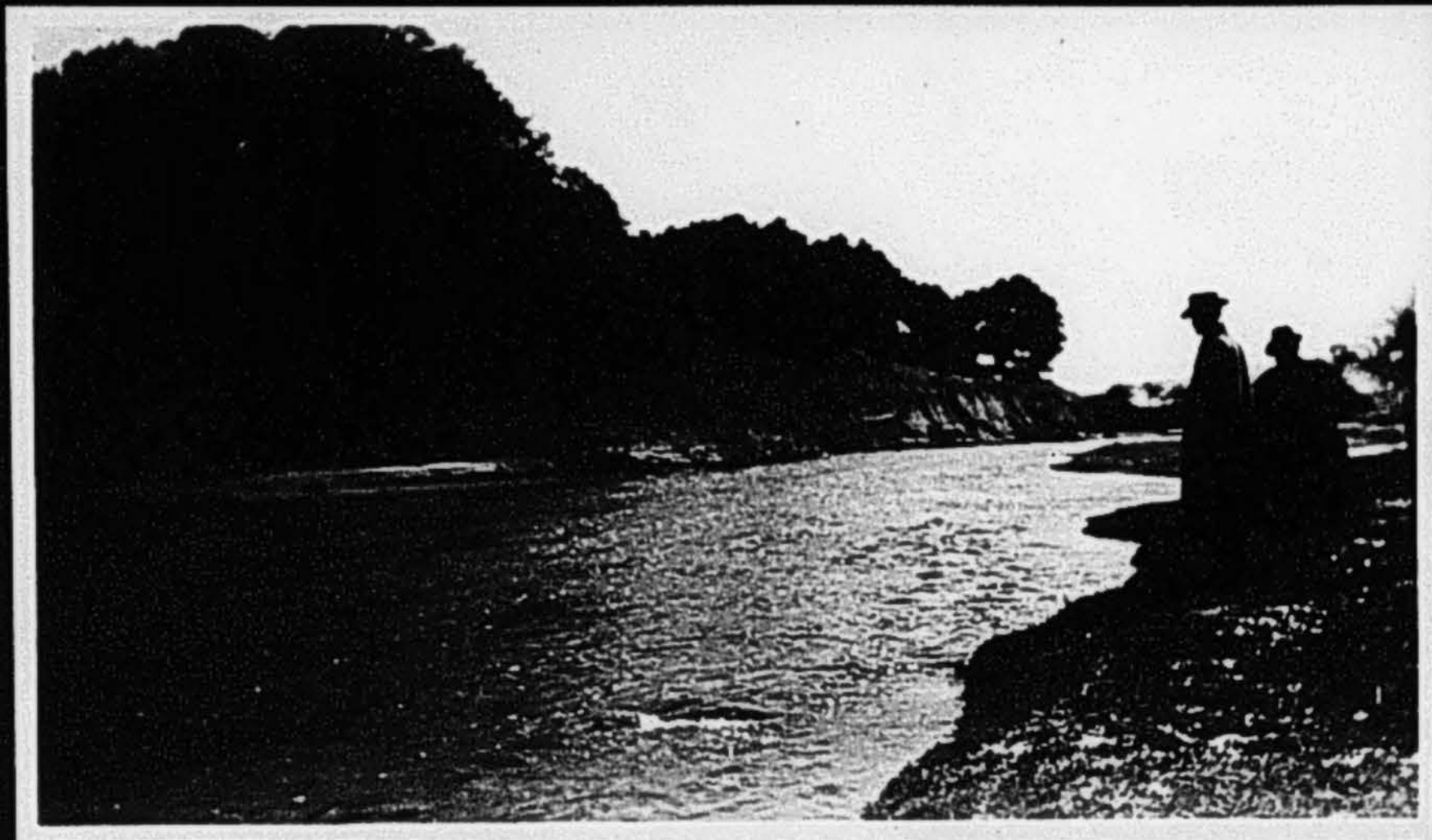


No 13

San Luis Rey River, March 1, 1914
Flowing 37,000,000 gallons daily.
Visit of Messrs. Manney, Schmidt
and Adams.

No 14

San Diego River at Diverting Dam.
March 1, 1914 - flowing 54,000,000
gallons daily.
Visit of Messrs. Manney, Schmidt
and Adams.



103
No 16

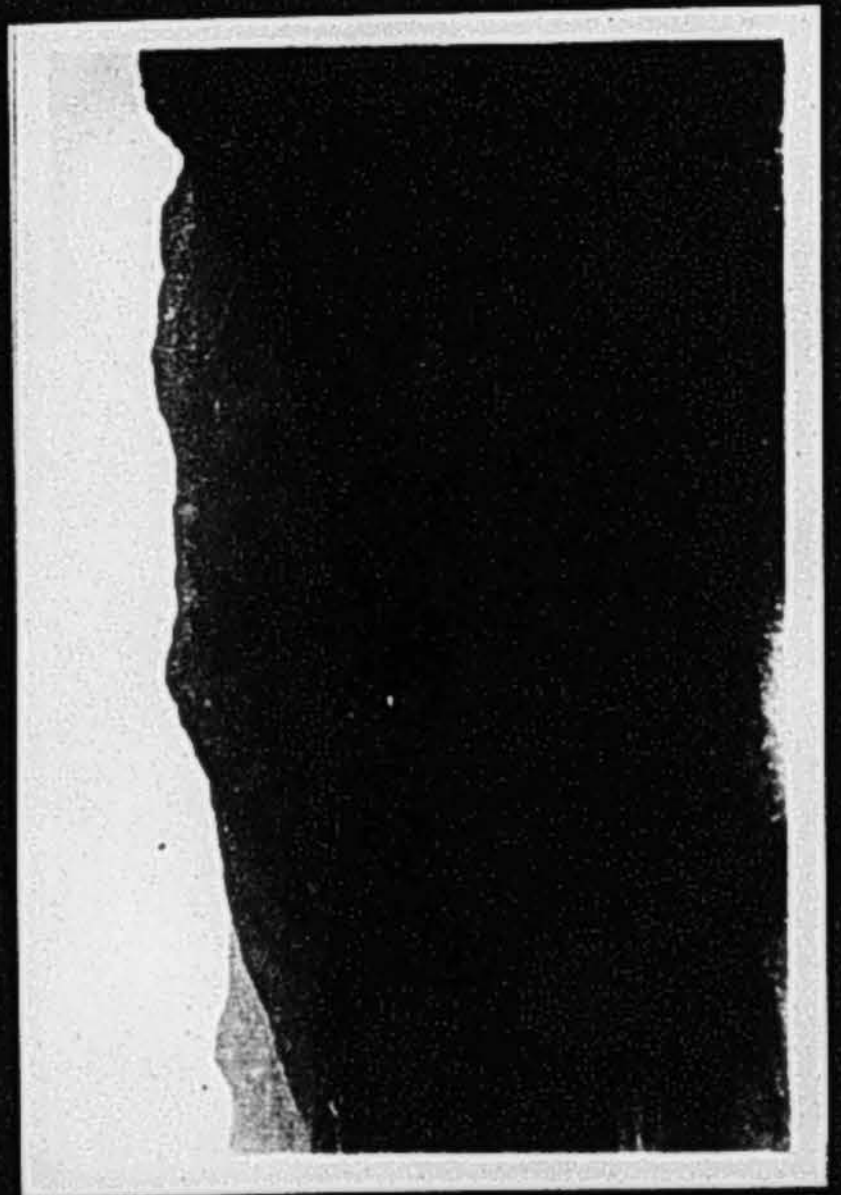
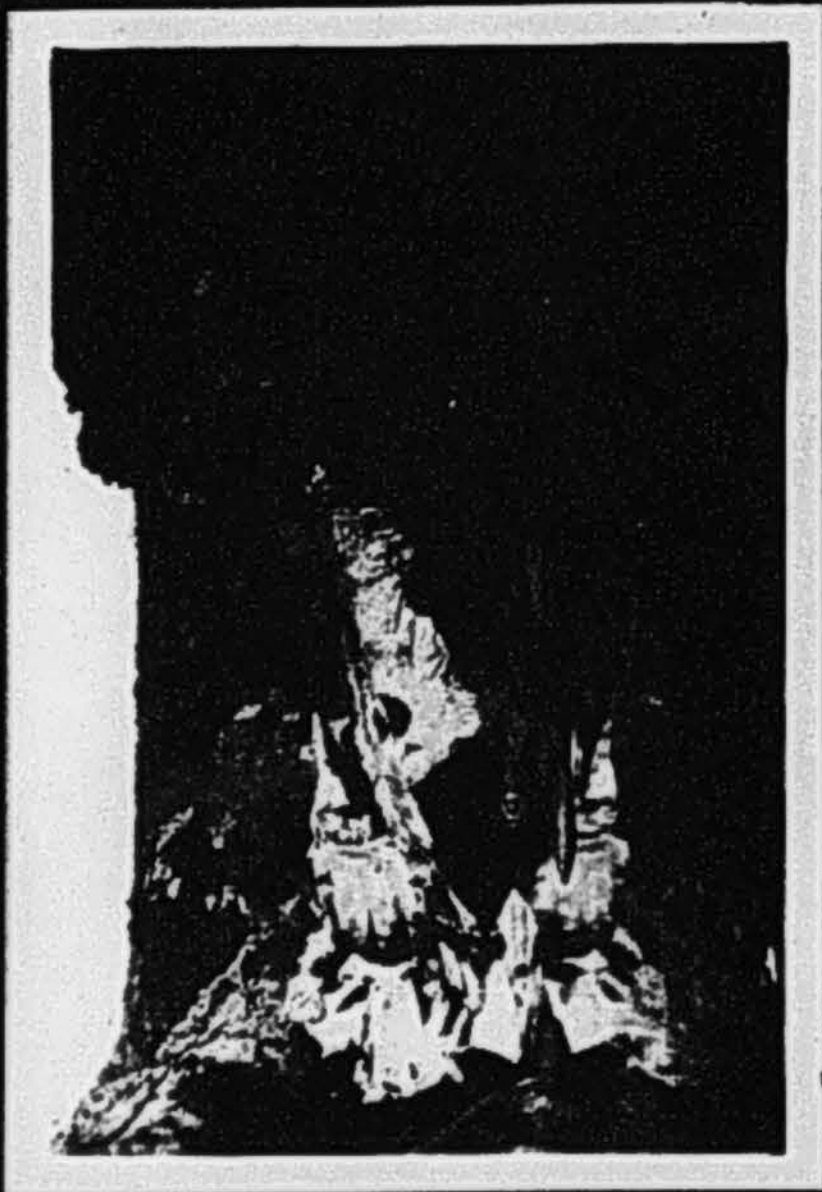
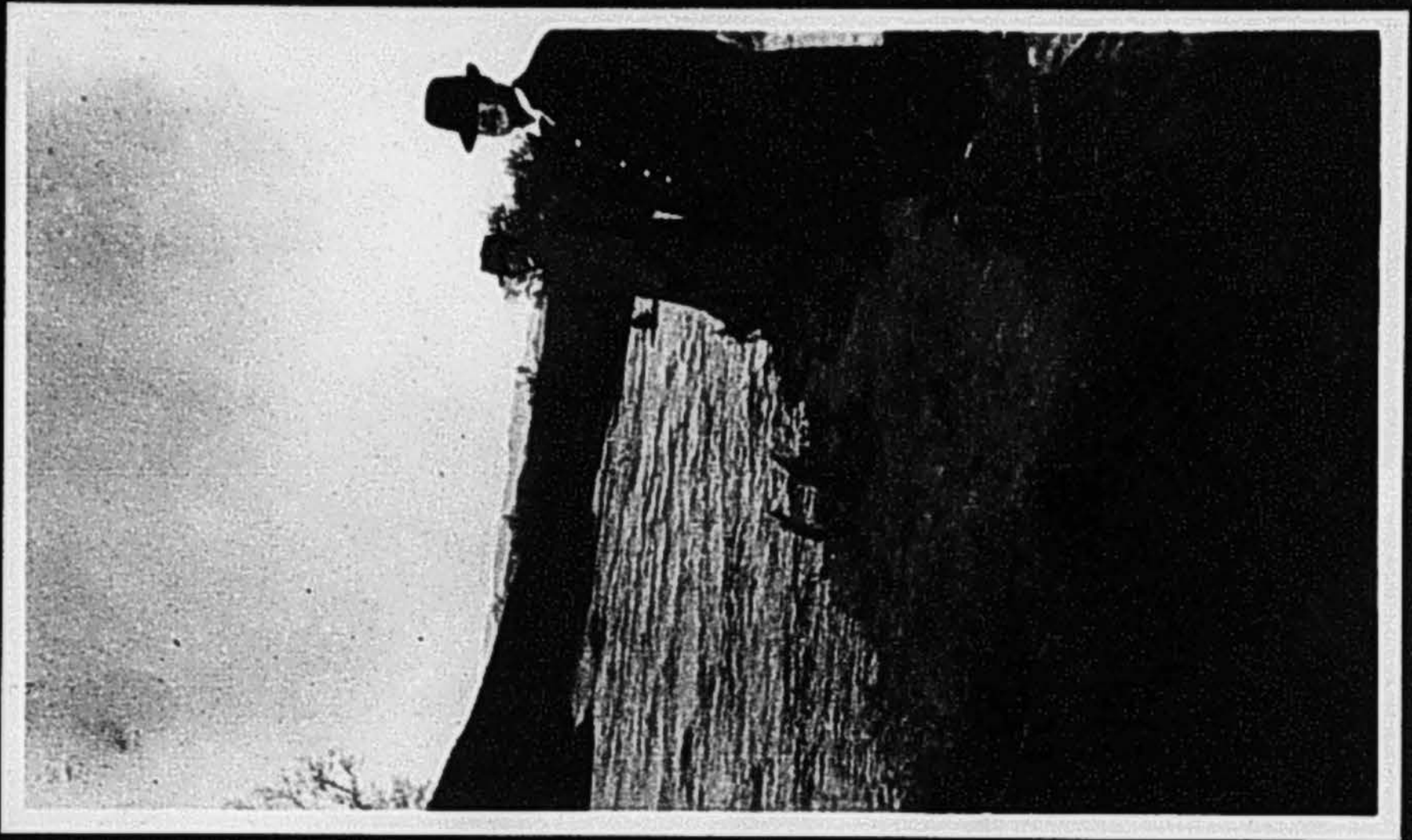
Conejos Reservoir Damsite
Showing bed rock exposed.

No. 15

Bernardo River, March 1, 1914.
Flowing 76,000,000 gallons daily.
Visit of Messrs. Manney, Schmidt
and Adams.

104
No. 17.

Conejos Reservoir Site
Looking up stream from
near the Damsite.
Capacity 360 acre feet.

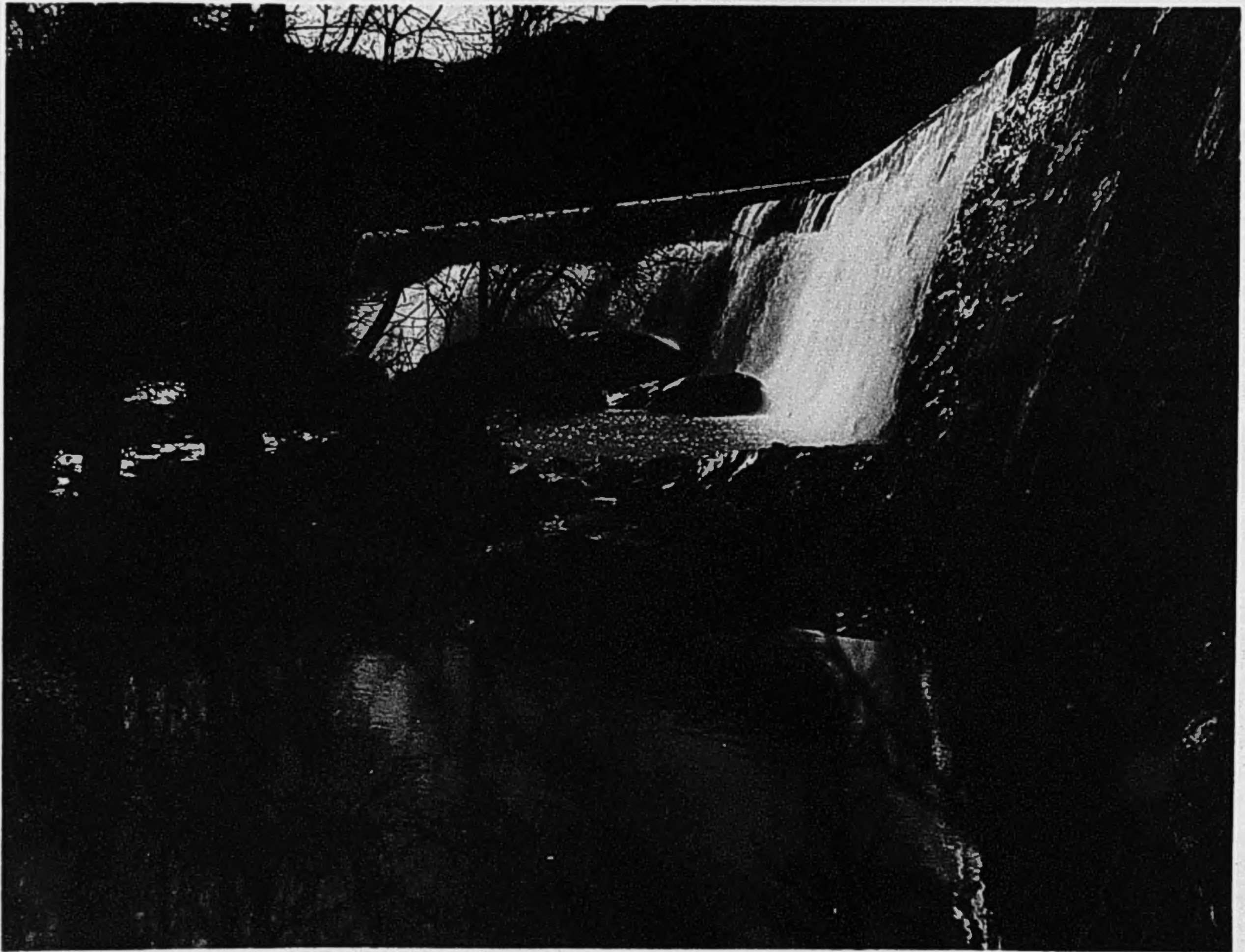


No 18

Diverting Dam, San Diego River.

February 25, 1914.

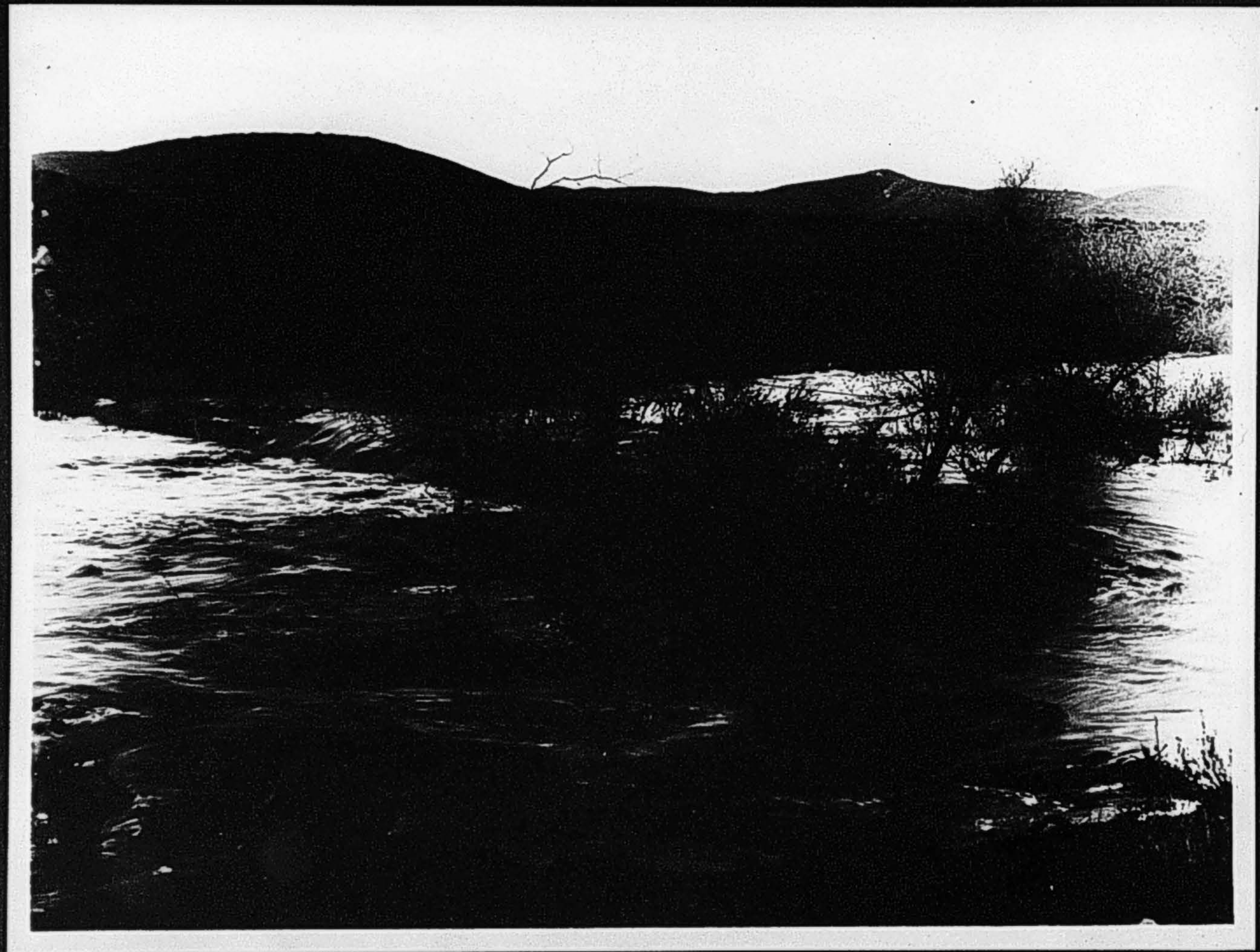
Flowing 62,000,000 gallons daily.



No. 19

San Diego River February 21, 1914.

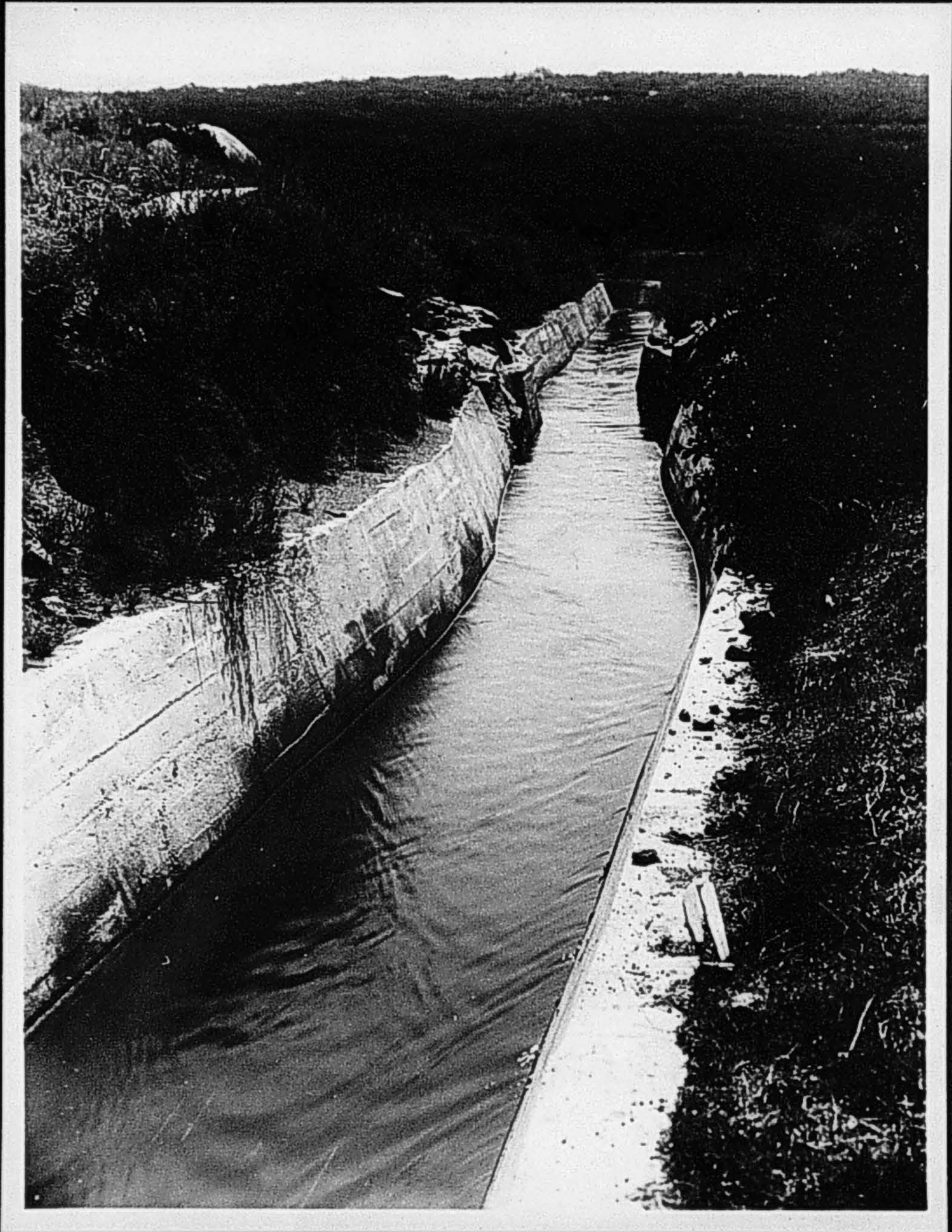
Flowing 970,000,000 gallons daily.



No 20

Dalsura Conduit, March 1, 1914

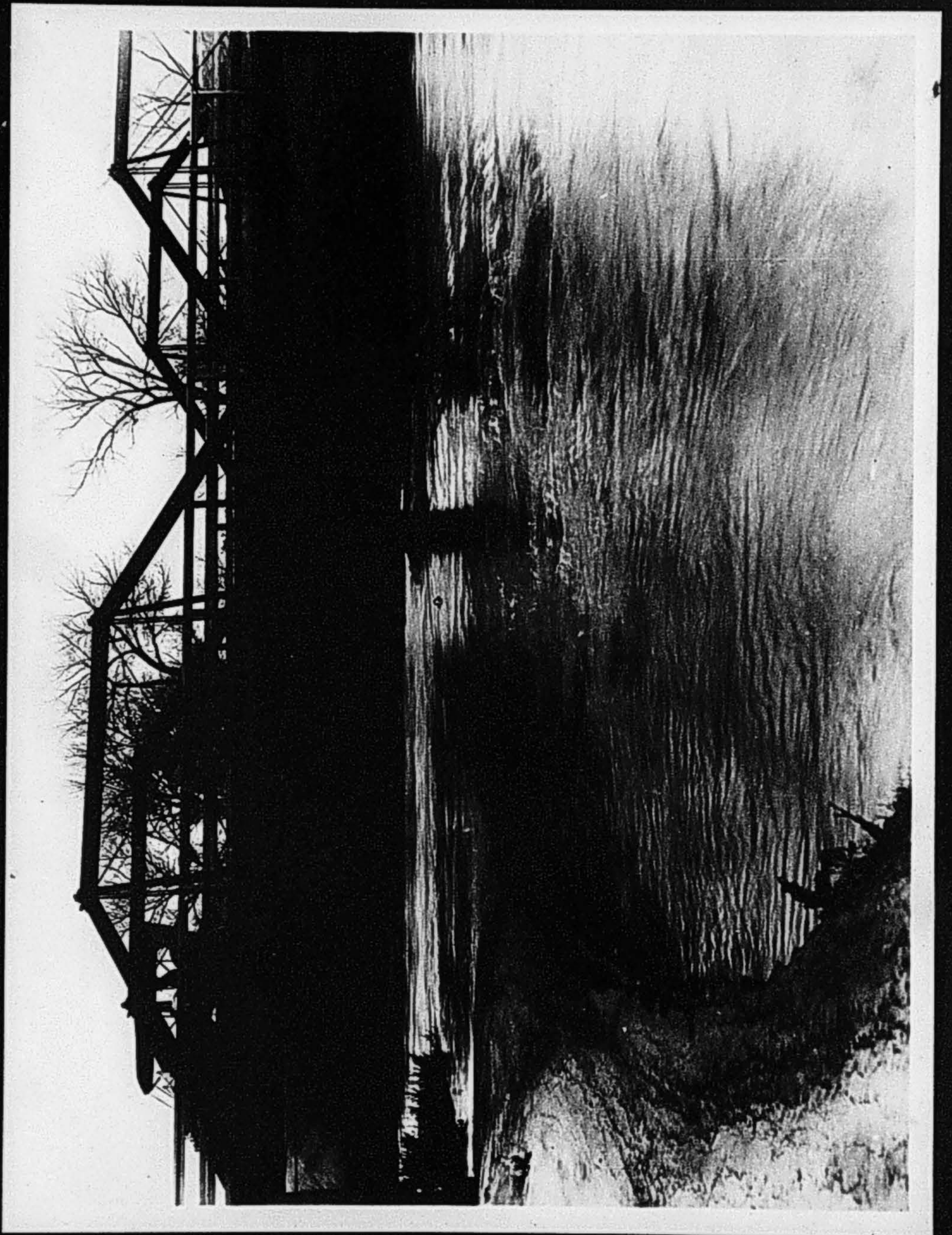
Flowing 10,200,000 gallons daily.



No 22

Bernardo River, February 22, 1914

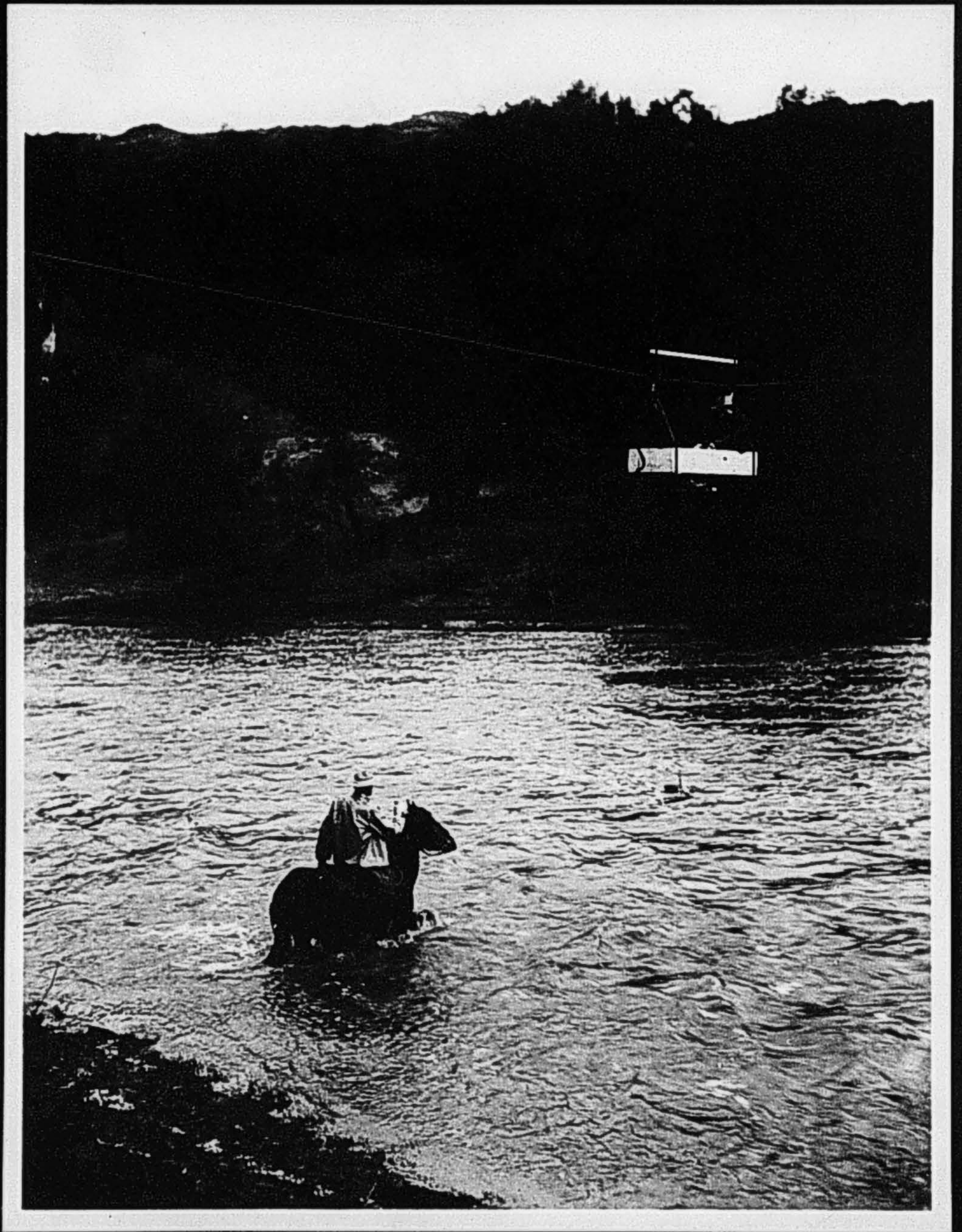
Flowing 1,560,000,000 gallons daily.



No. 25

San Luis Rey River, February 20, 1914.

Flowing 880,000,000 gallons daily.

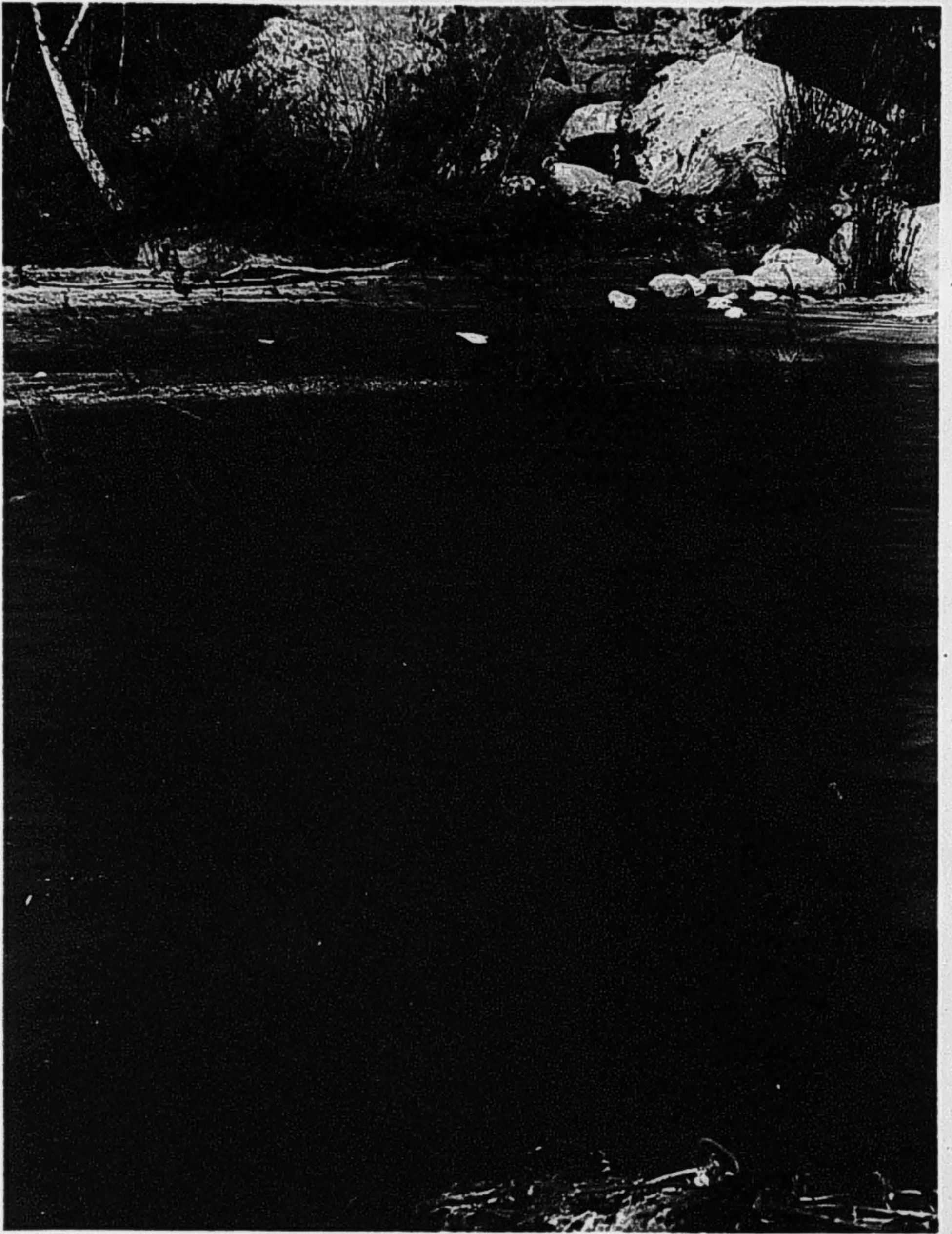


No 24

El Capitan Reservoir Site, San Diego River,

February 21, 1914 - flowing 500,000,000

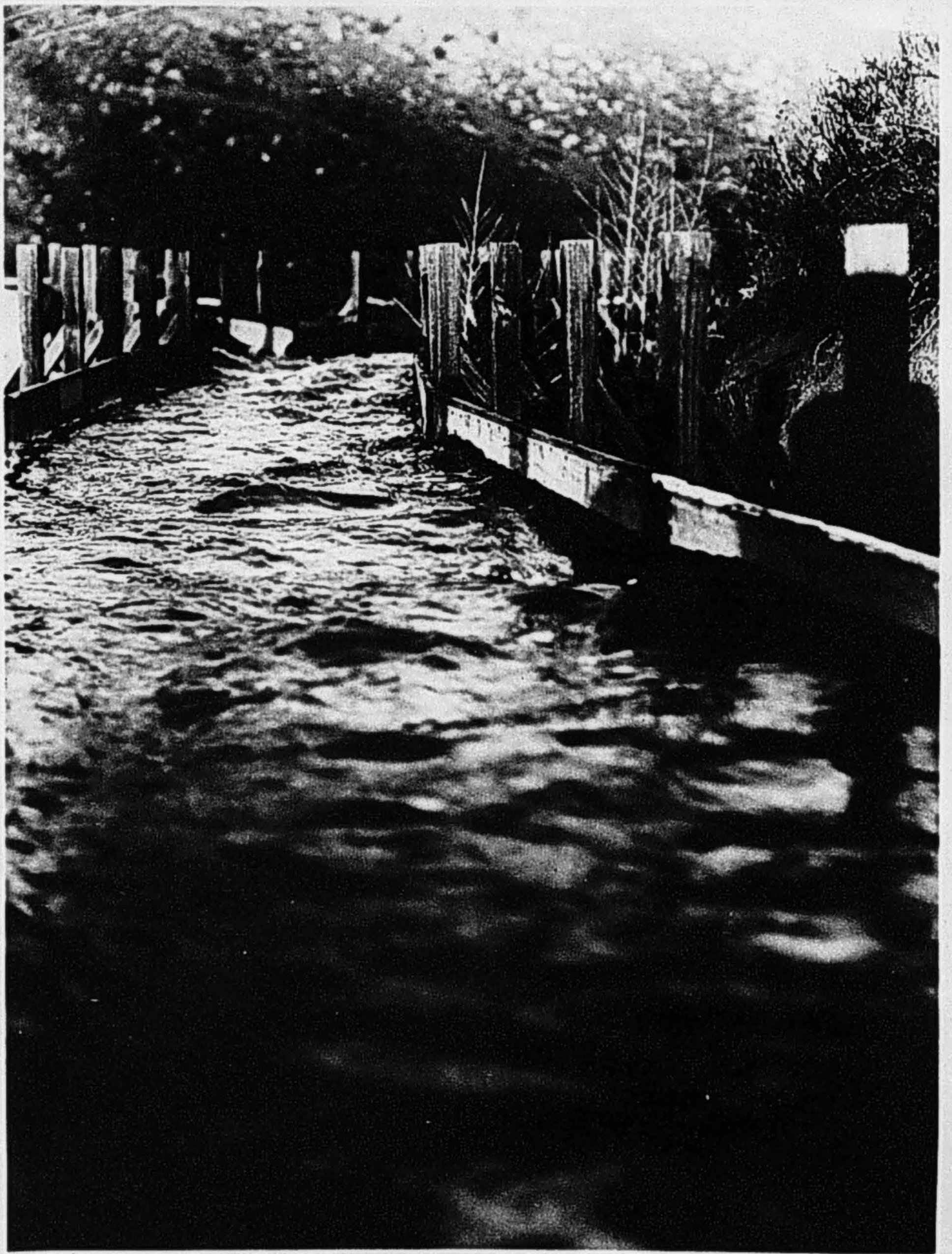
gallons daily.



No 25

San Diego Flume, lined with asphaltic roofing.
Capacity 2000 miners inches or 26,000,000 gallons.

February 25, 1914.



No 26

San Luis Rey River, Ocean side Bridge.

February 21, 1914, Flowing 2,640,000.000

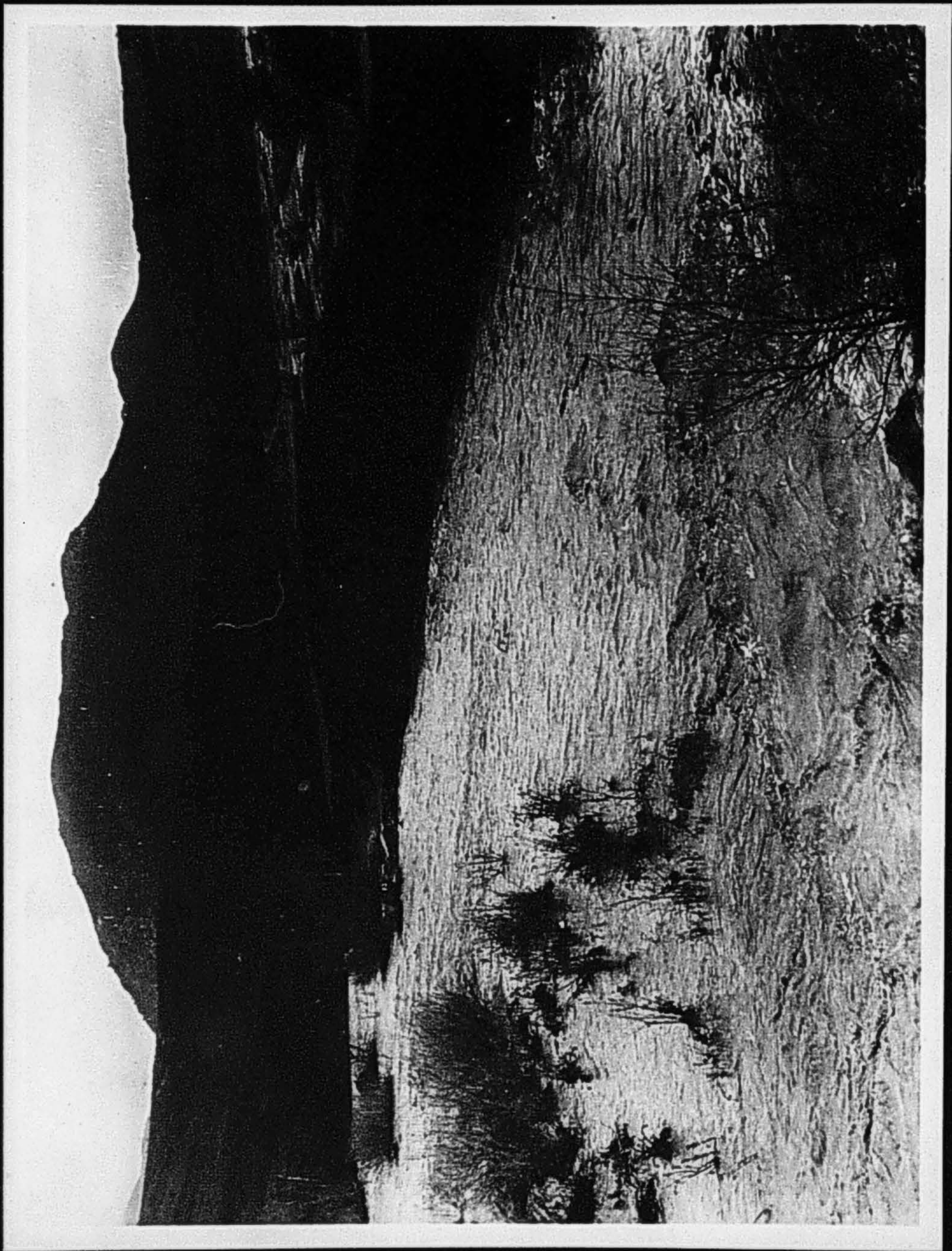
Gallons daily.



No 27

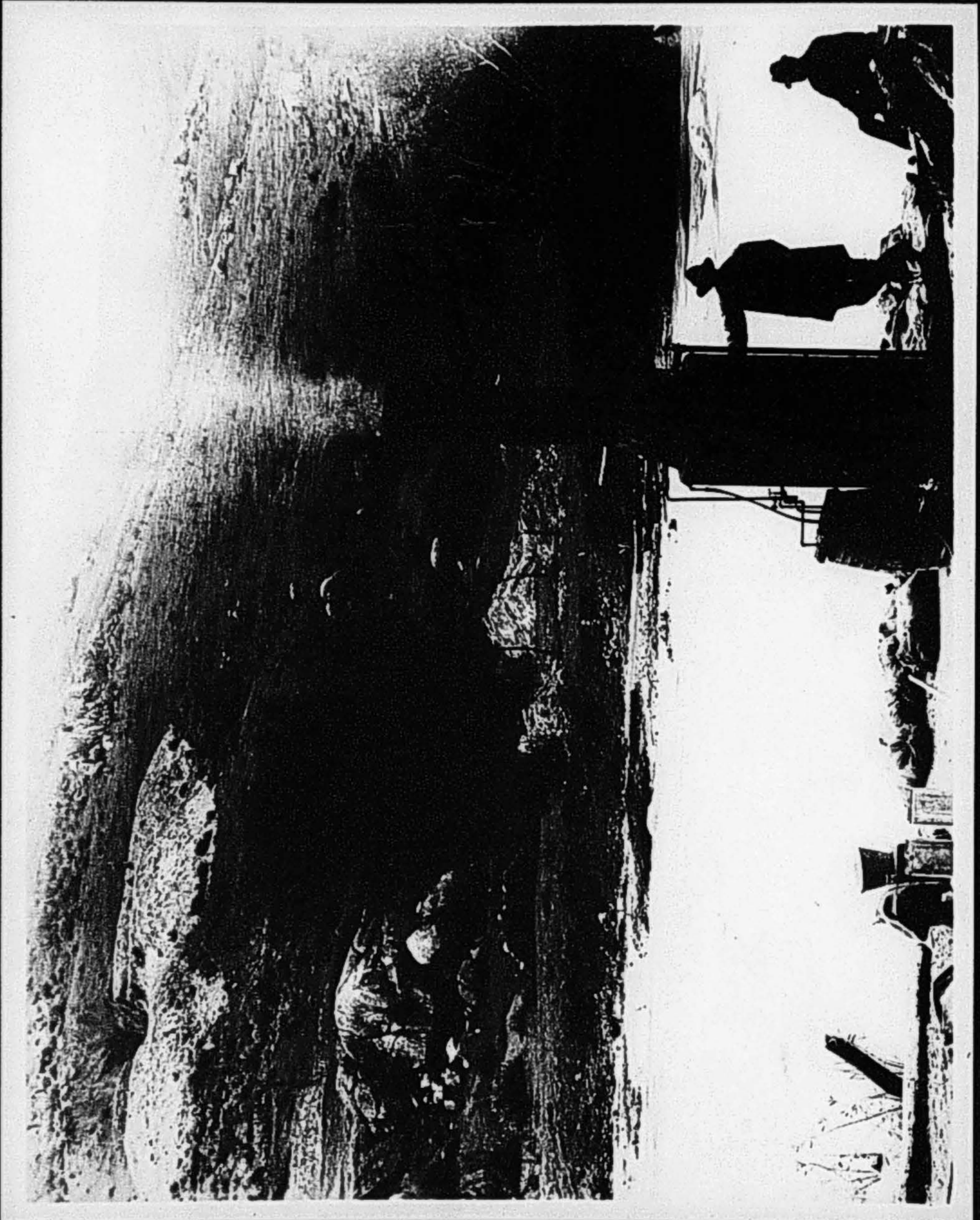
Pano River at Dammitte, February 21, 1914.

Flowing 1,140,000,000 gallons daily.



No 28

Pano Demsite with core drill at work.

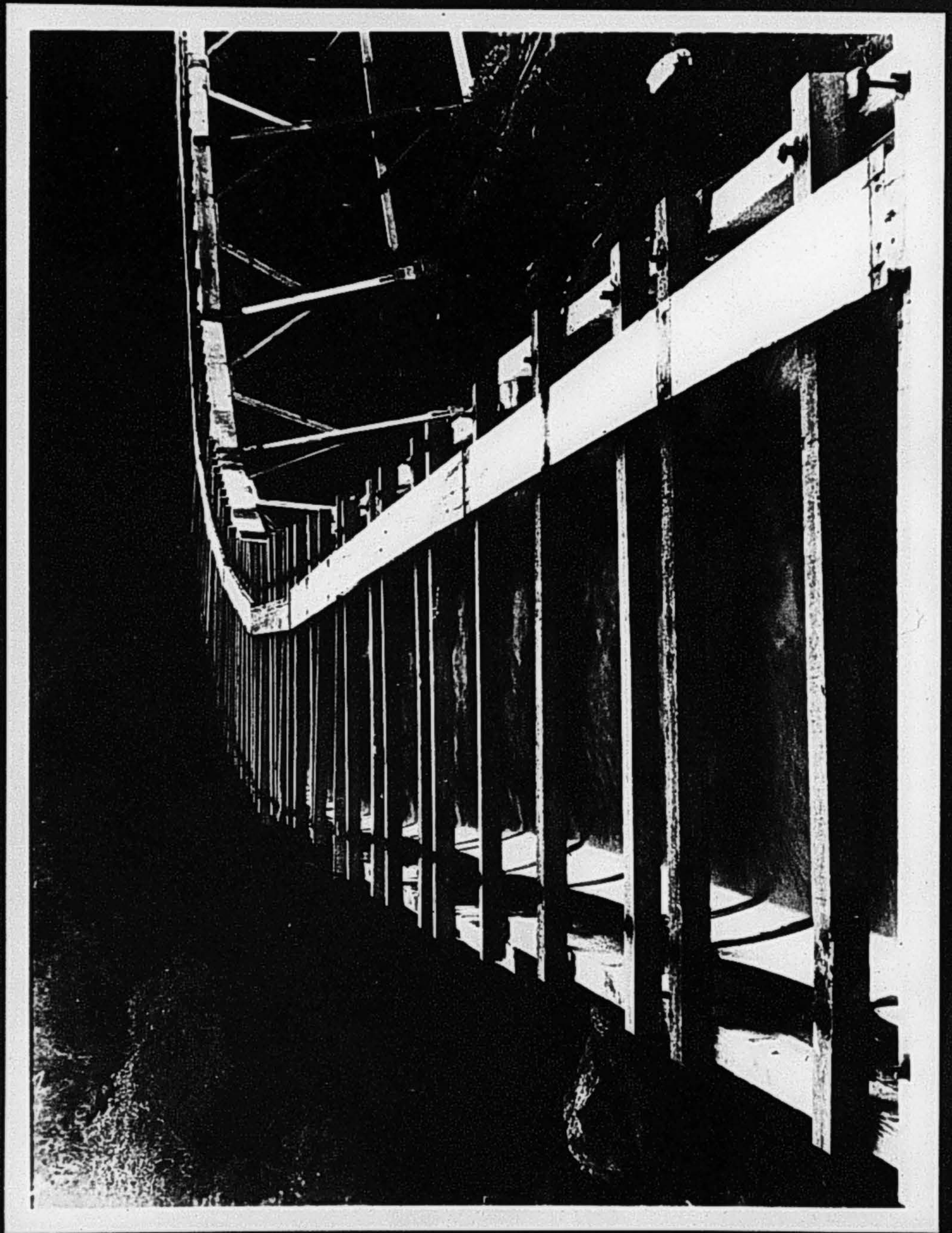


No 29

How Construction Steel Flume,

Cuyamaca Syatom,

on San Diego River.



No 51

San Luis Roy River, February 21, 1914.

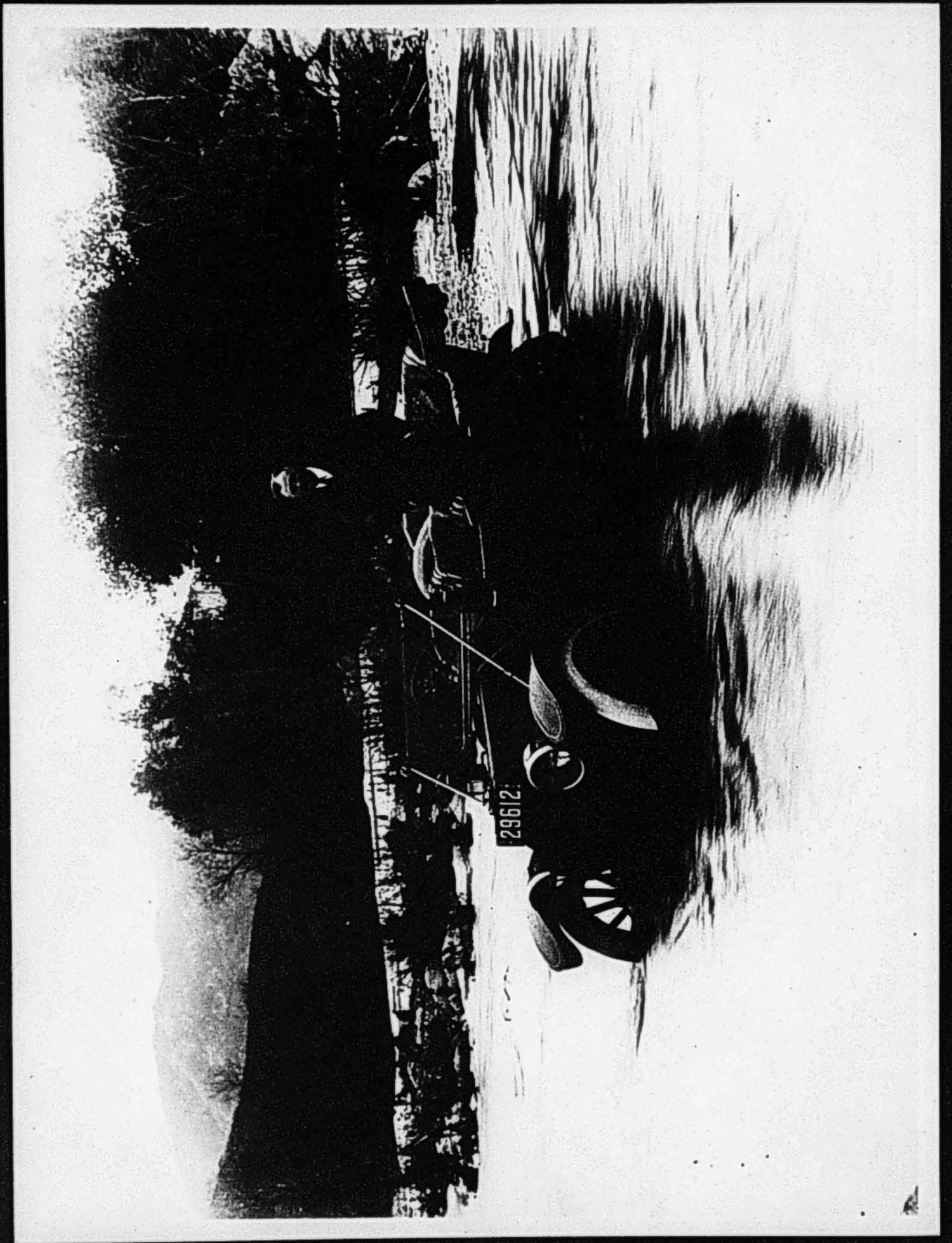
Flowing 2,130,000,000 gallons daily.



No. 32

Santa Ysabel River at Sutherland Dam site.

February 21, 1914, flowing 710,000,000
gallons daily.



No. 34

San Diego River at Lakeside

February 21, 1914.

Flowing 700,000,000 gallons

daily.



No. 35

Boulder Creek Reservoir Site.

Capacity 1,030 acre-feet.



No 36

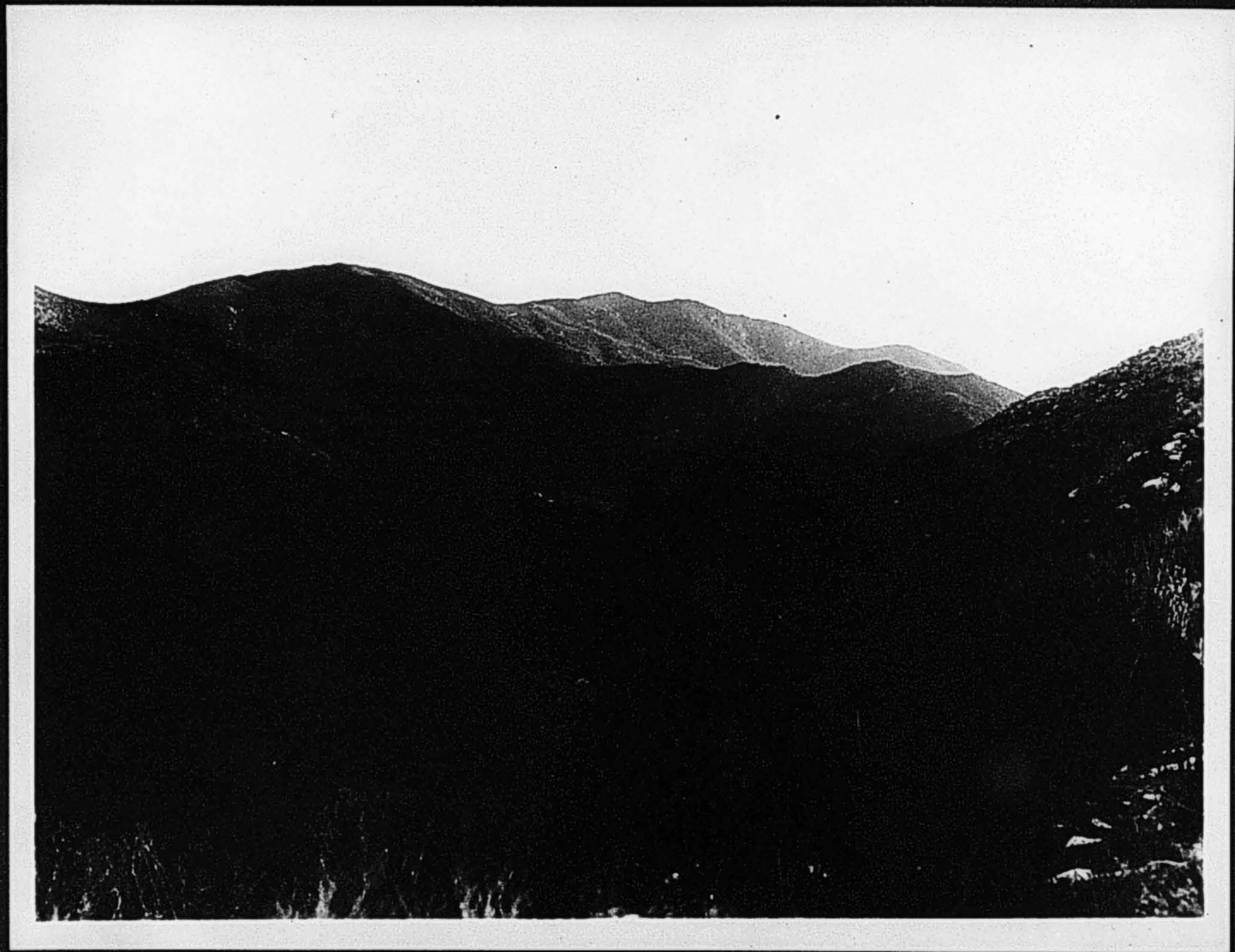
Boulder Creek Reservoir Damsite



No 37

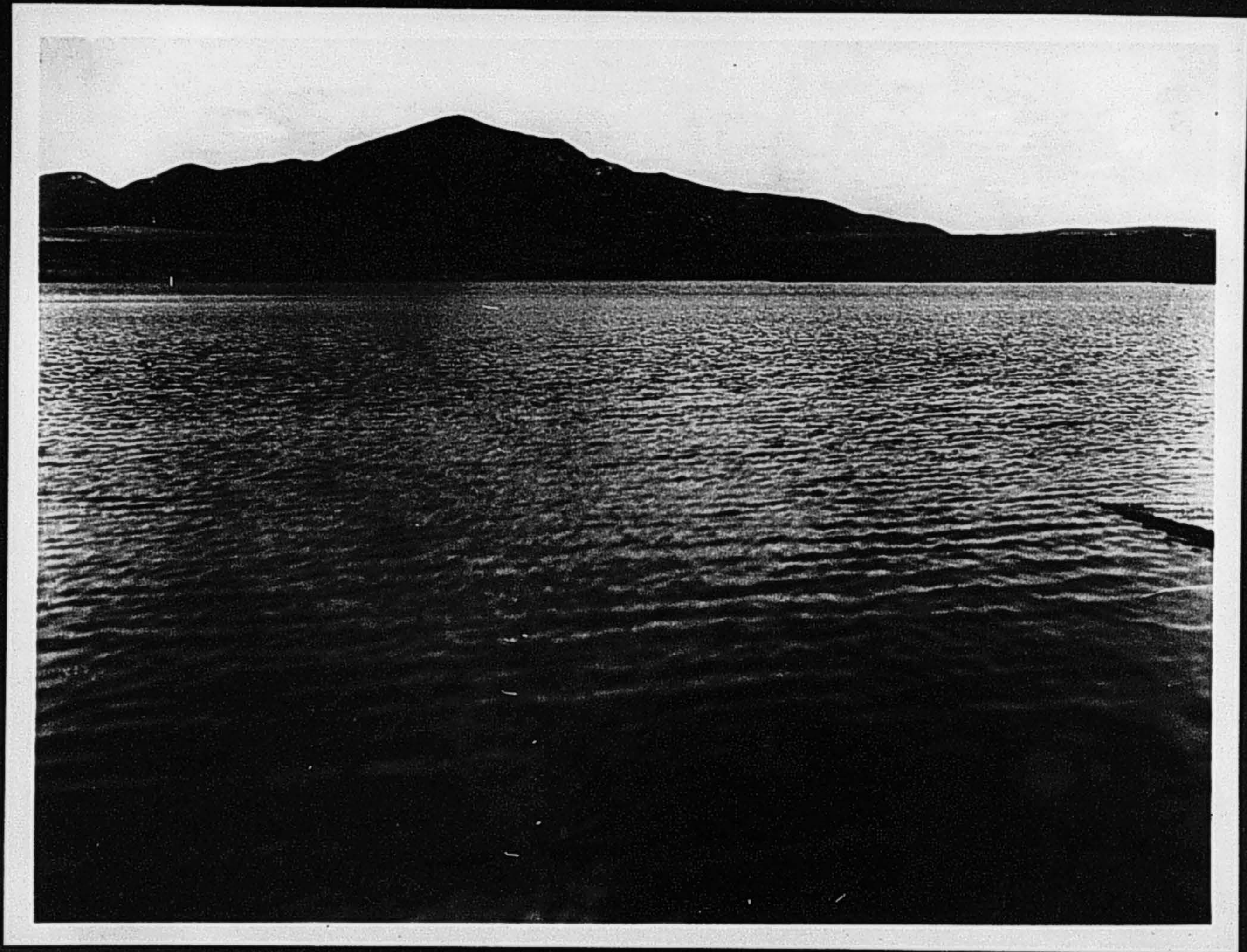
Poverty Gulch Reservoir Site.

Capacity 1,500 acre-feet.



No 96

La Mesa Dam looking north - May 1914.



No 98

La Mesa Dam looking south, May 1914.



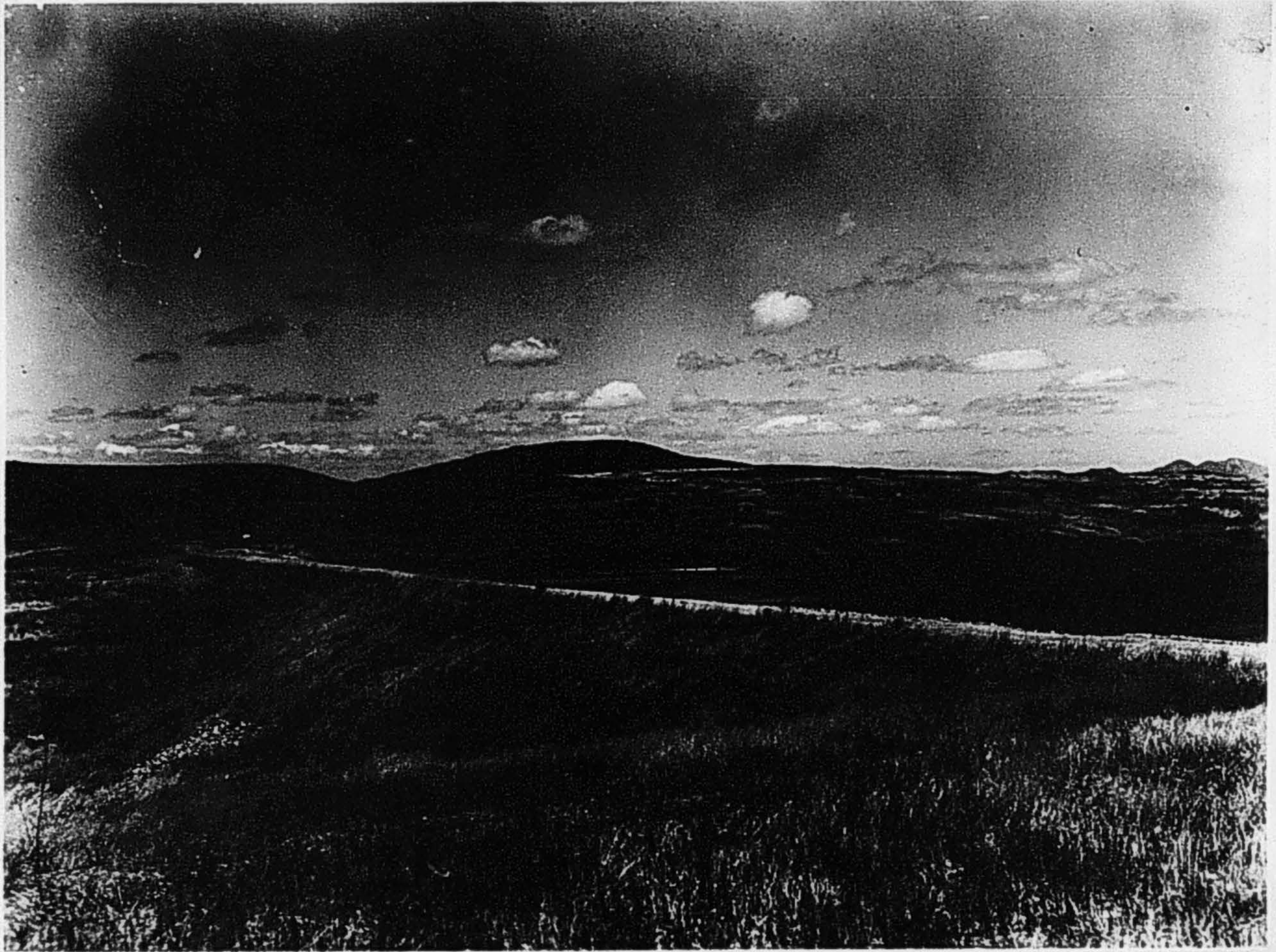
No 99

Eucalyptus Reservoir - May 1914.



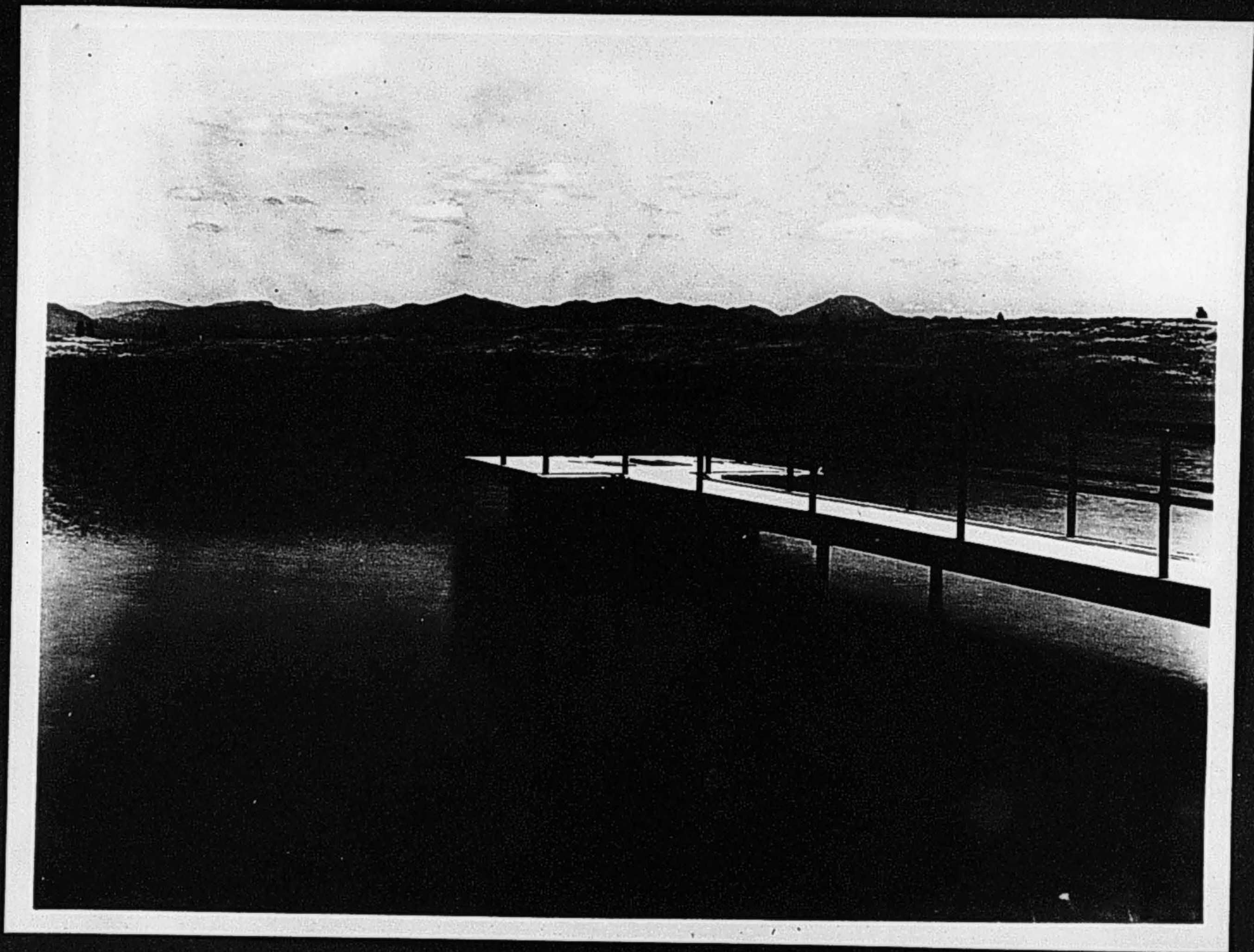
No. 101

Murray Hill Dam - May 1914.



No 102

Murray Hill Reservoir, May 1914.



Ed Fletcher Papers

1870-1955

MSS.81

Box: 41 Folder: 1

Business Records - Reports - Post, W.S - "Reports on Water Systems and Projects in San Diego County"



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