SAN FRANCISCO CABLE RAILWAY

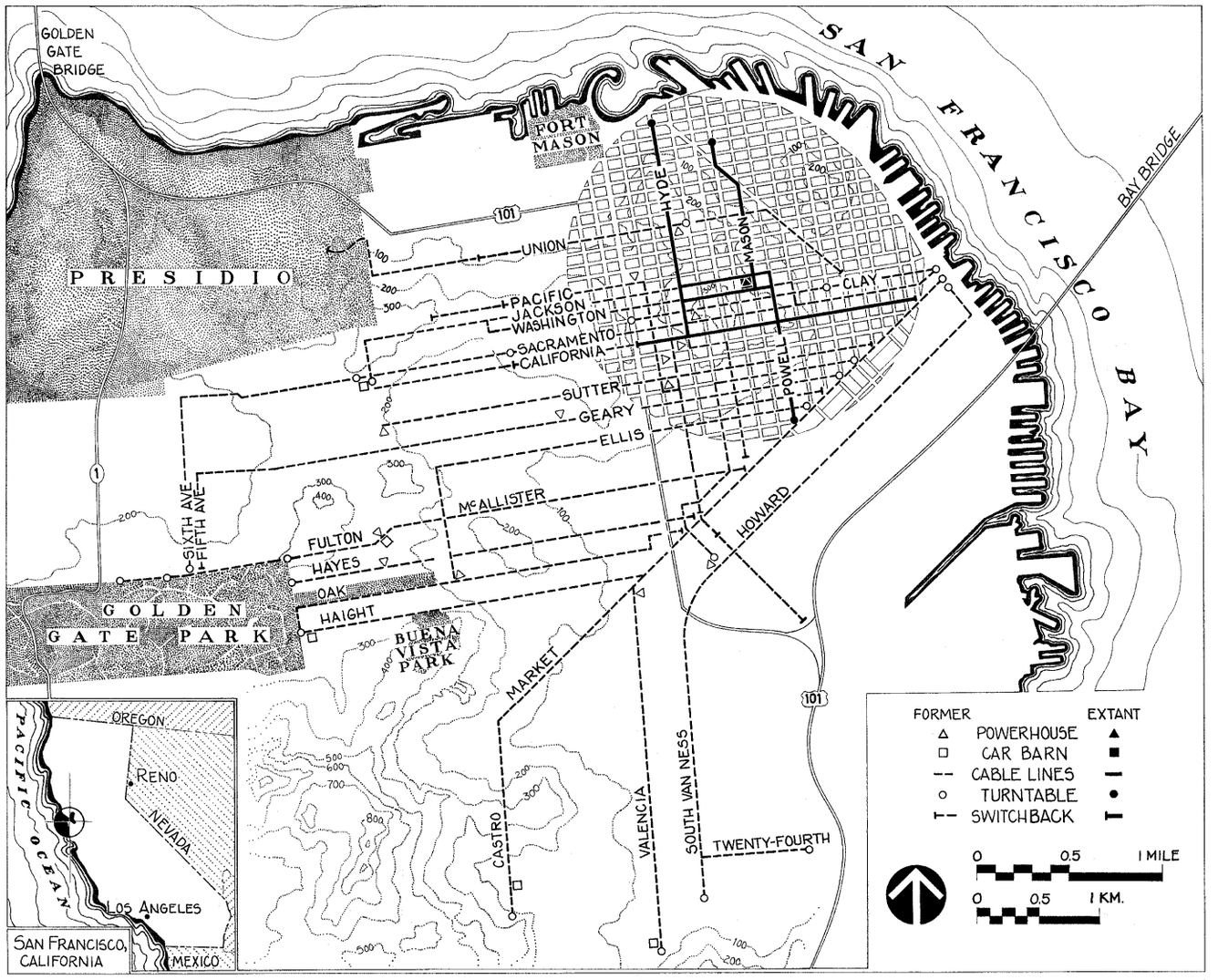
DURING THE TWENTY-YEAR HEYDAY OF THE CABLE CAR IN SAN FRANCISCO, EIGHT TRACTION COMPANIES BUILT A TOTAL OF 52.8 MILES OF CABLE RAILWAY. THE BASIC ELEMENTS OF THE 4.7 MILES THAT REMAIN OF THAT SYSTEM DIFFER LITTLE FROM THOSE USED IN THE FIRST LINE, ANDREW S. HALLIDIE'S CLAY STREET HILL RAILROAD, BUILT IN 1873.

HALLIDIE'S TIMELY DEVELOPMENT OF A RELATIVELY SIMPLE, MECHANICAL TRANSPORTATION SYSTEM MET SAN FRANCISCO'S GROWING NEED FOR EFFICIENT, DIRECT, AND ECONOMICAL MASS TRANSIT AS THE CITY'S POPULATION DOUBLED FROM 149,000 IN 1870 TO 350,000 BY 1895. THE CABLE LINES MULTIPLIED AS WELL, CRISS-CROSSING THE CITY AND HASTENING THE DEVELOPMENT OF SUCH AREAS AS THE MISSION AND WESTERN ADDITION. THE OMNIBUS RAILROAD & CABLE COMPANY AND THE MARKET STREET CABLE RAILWAY REACHED DEEP INTO THE MISSION, WITH THE LATTER FIRM ALSO BUILDING LINES AS FAR AS THE ENTRANCE TO GOLDEN GATE PARK AT HAIGHT AND STANYAN. FIVE ADDITIONAL COMPANIES, THE SUTTER STREET RAILROAD, CALIFORNIA STREET CABLE RAILROAD, GEARY STREET PARK & OCEAN RAILROAD, PRESIDIO & FERRIES RAILROAD, AND THE FERRIES & CLIFF HOUSE RAILWAY, ALL BUILT LINES STRETCHING INTO THE WESTERN ADDITION, SPURRING RAPID GROWTH IN THAT SECTOR, AND TRANSFORMING THE OVERALL STRUCTURE OF SAN FRANCISCO.

DESPITE THEIR INITIAL SUCCESS, AND THEIR PARTICULAR SUITABILITY TO SAN FRANCISCO'S HILLY TERRAIN, CABLE CARS QUICKLY GAVE WAY TO ELECTRIC STREETCARS AS THE PRIMARY MODE OF MASS TRANSPORTATION IN THE CITY. BEGINNING IN THE EARLY 1890'S, ELECTRIC STREET CAR LINES BEGAN REPLACING CABLE ROUTES IN THE CITY'S FLAT SECTIONS. AT THE SAME TIME, LARGE CORPORATIONS SUCH AS THE UNITED RAILROADS OF SAN FRANCISCO AND THE MARKET STREET RAILWAY ABSORBED THE SMALLER FIRMS.

THE CATASTROPHIC EARTHQUAKE AND FIRE OF 18 APRIL 1906 HASTENED THE TRANSITION FROM CABLE TO ELECTRIC TRACTION. RATHER THAN RECONSTRUCT RUINED CABLE LINES, THE COMPANIES REPLACED FULLY TWO-THIRDS OF THEIR CABLE MILEAGE WITH ELECTRIC TROLLEYS, RETAINING THE CABLES ONLY ON THE STEEPEST GRADES.

IN 1944 THE SAN FRANCISCO MUNICIPAL RAILWAY ASSUMED CONTROL OF THE REMAINING MARKET STREET RAILWAY CABLE ROUTE, AND IN 1952 IT ACQUIRED THE LAST INDEPENDENT CABLE COMPANY, THE CALIFORNIA STREET CABLE RAILROAD. THESE ACQUISITIONS PLACED THE THREE REMAINING CABLE LINES, POWELL-MASON, POWELL-HYDE, AND CALIFORNIA STREET, UNDER A SINGLE AUTHORITY. ALL THREE LINES PRESENTLY OPERATE OUT OF THE FORMER UNITED RAILROADS OF SAN FRANCISCO POWERHOUSE AT WASHINGTON AND MASON STREETS.



THIS RECORDING PROJECT IS PART OF THE HISTORIC AMERICAN ENGINEERING RECORD (HAER), A LONG-RANGE PROGRAM TO DOCUMENT HISTORICALLY SIGNIFICANT ENGINEERING AND INDUSTRIAL WORKS IN THE UNITED STATES. THE HAER PROGRAM IS ADMINISTERED BY THE NATIONAL ARCHITECTURAL AND ENGINEERING RECORD (NAER), A DIVISION OF THE NATIONAL PARK SERVICE, U.S. DEPARTMENT OF THE INTERIOR.

THE SAN FRANCISCO CABLE RAILWAY RECORDING PROJECT WAS COSPONSORED DURING THE SUMMER OF 1981 BY THE NATIONAL ARCHITECTURAL AND ENGINEERING RECORD UNDER THE GENERAL DIRECTION OF ROBERT J. KAPSCH, CHIEF, AND BY THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION (MUNI).

THE FIELD WORK, MEASURED DRAWINGS, HISTORICAL REPORTS, AND PHOTOGRAPHS WERE PREPARED UNDER THE DIRECTION OF DOUGLAS L. GRIFFIN, ASSISTANT REGIONAL DIRECTOR FOR CULTURAL PROGRAMS OF THE NPS WESTERN REGIONAL OFFICE; AND OF MARJORIE E. BAER, PROJECT DIRECTOR. THE RECORDING TEAM CONSISTED OF PATRICK W. O'BANNON, FIELD SUPERVISOR AND PRINCIPAL HISTORIAN; MARCIA A. OSTERHOUT, AND STEVEN PETROW, HISTORIANS; SCOTT DOLPH, MARIAN DOMBROSKI, AND H. ADAMS SUTPHIN, ARCHITECTURAL DELINEATORS. FORMAL PHOTOGRAPHY WAS DONE BY JET LOWE, NAER STAFF PHOTOGRAPHER.

DELINEATED BY: M. DOMBROSKI, 1981

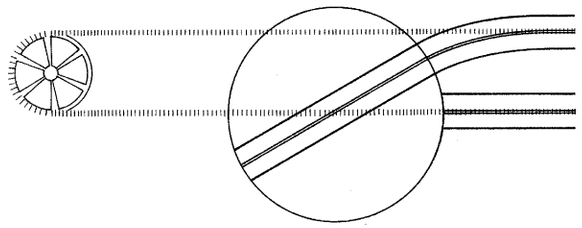
CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

SAN FRANCISCO CABLE RAILWAY: 1873-1981
SAN FRANCISCO CALIFORNIA

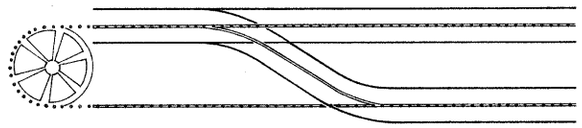
SHEET 1 OF 8

HISTORIC AMERICAN ENGINEERING RECORD CA-12

A. TYPICAL TURNTABLE



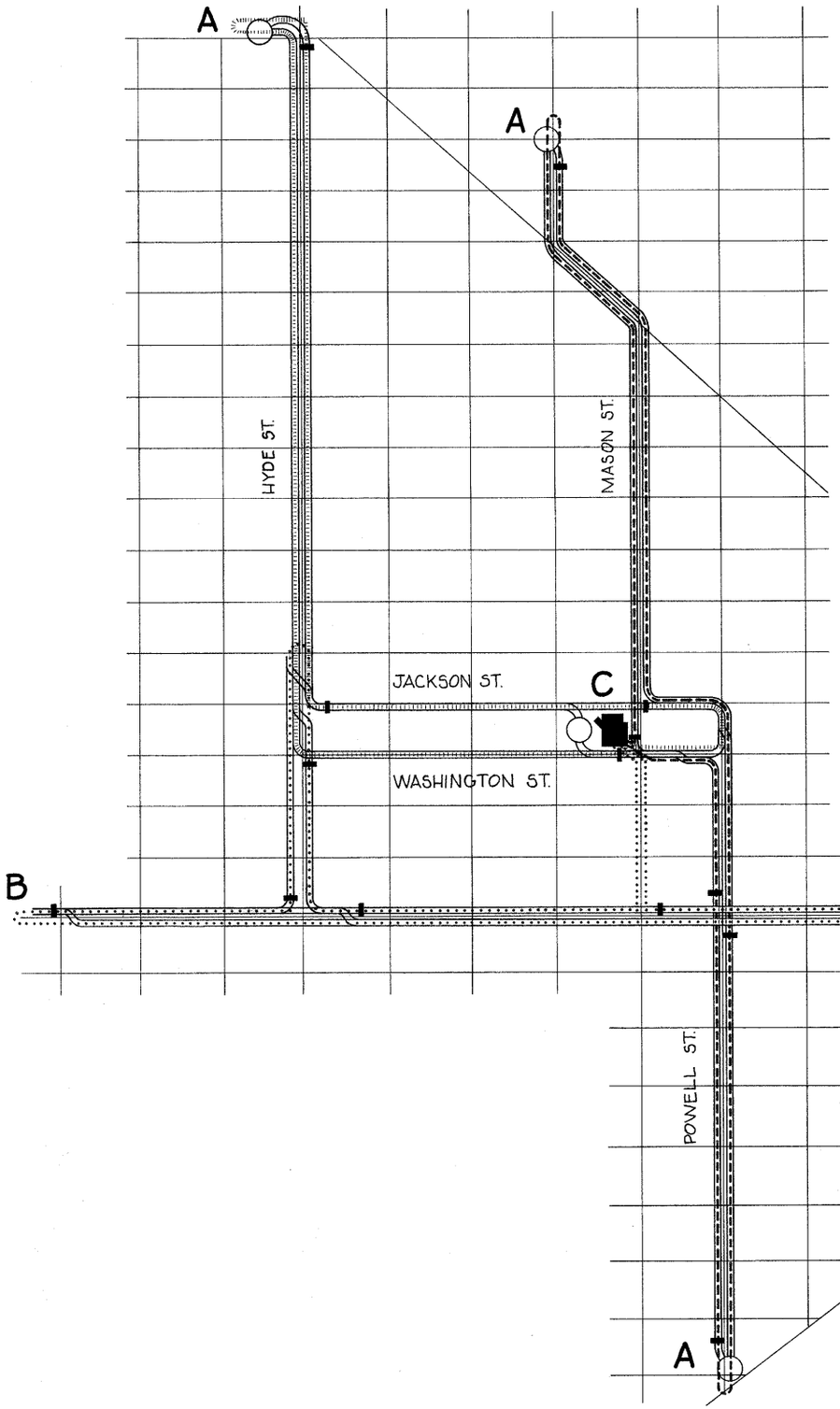
B. TYPICAL SWITCHBACK

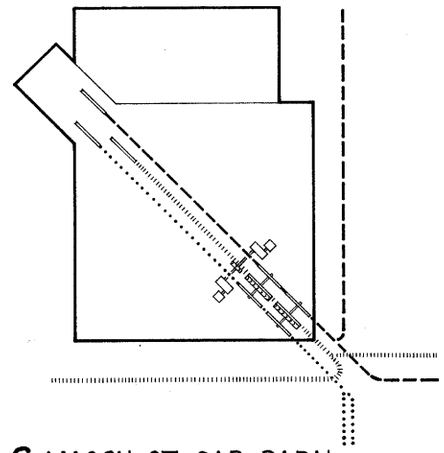


THE SAN FRANCISCO CABLE RAILWAY IS CURRENTLY COMPRISED OF THREE SEPARATE CABLES, WITH A TOTAL LENGTH OF 46,500 FEET, OR JUST UNDER NINE MILES. THE CALIFORNIA CABLE IS 21,500 FEET, THE HYDE CABLE 15,700 FEET, AND THE POWELL-MASON CABLE 17,600 FEET. TRACK AND CABLE USUALLY FOLLOW THE SAME COURSE, THOUGH THEY DIVERGE AT SEVERAL POINTS, MOST NOTABLY WHERE THE DEFLECTING SHEAVES BRING THE CABLES INTO AND OUT OF THE POWERHOUSE.

THE CABLES FORM CONTINUOUS LOOPS, DRIVEN BY THE WINDING MACHINERY IN THE POWERHOUSE, AND REVERSED IN DIRECTION BY SHEAVES AT THE TERMINI OF THE THREE LINES. AT CURVES IN THE TRACKWAY THE CABLES ARE DIRECTED AROUND BY EITHER LARGE SHEAVES OR THE SMALL HORIZONTAL PULLEYS IN THE PULL CURVES.

CARS ARE REVERSED AT THE TERMINI OF THE POWELL-MASON AND POWELL-HYDE LINES BY MANUALLY OPERATED TURNTABLES. THE DOUBLE-ENDED CALIFORNIA STREET CARS ARE SENT ONTO THE OPPOSITE TRACK BY A SIMPLE SWITCH, NO TURNTABLE BEING REQUIRED.





C. MASON ST. CAR BARN

TRACK
POWELL-MASON CABLE
CALIFORNIA CABLE
POWELL-HYDE CABLE
"LET-GO"

TRACK AND CABLE ROUTES

DELINEATED BY: SCOTT DOLPH, 1981

SAN FRANCISCO CABLE RAILWAY: TRACK and CABLE ROUTES 1977
SAN FRANCISCO CALIFORNIA
SHEET 2 OF 8
HISTORIC AMERICAN ENGINEERING RECORD CA-12

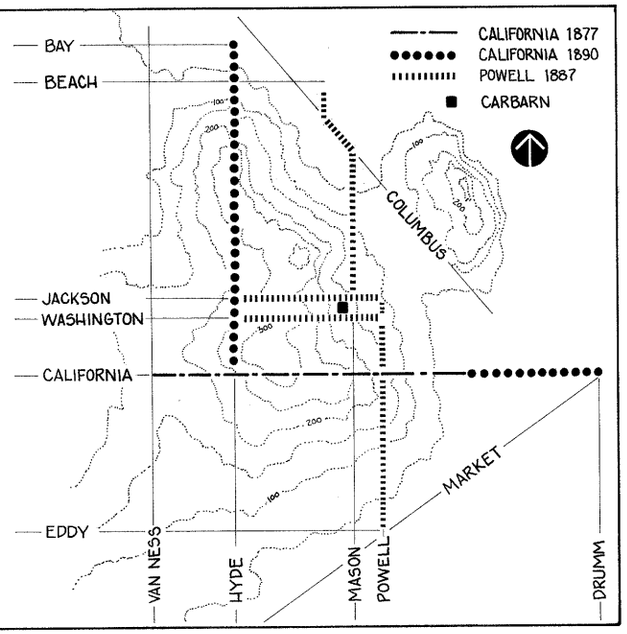
CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

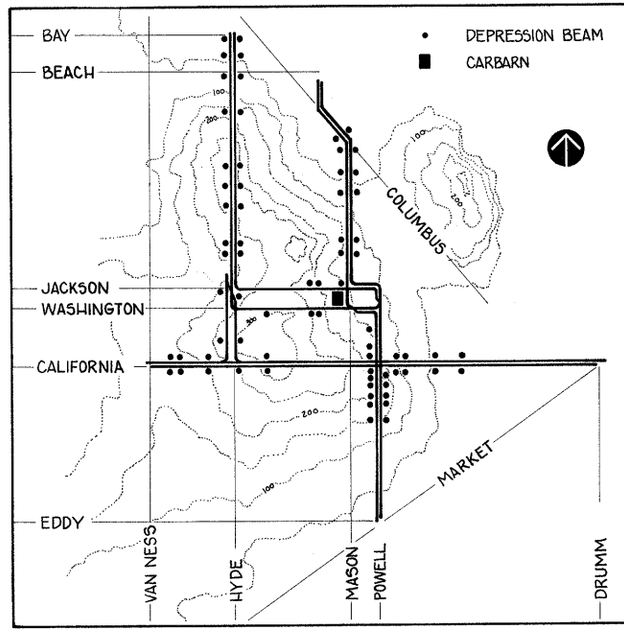
TRIM LINE

YOKES & RAILS

THE TRACK STRUCTURE OF A CABLE RAILWAY SUPPORTS BOTH THE CAR AND THE CABLE. THE CARS RUN ON RAILS SUPPORTED BY IRON YOKES SPACED AT REGULAR INTERVALS BENEATH THE STREET. THESE YOKES ALSO SUPPORT THE SLOT RAILS AND FORM THE BASIC SHAPE OF THE CONCRETE OR BRICK CONDUIT THROUGH WHICH THE CABLE RUNS.

THE VARIOUS TRACTION COMPANIES USED DIFFERENT YOKE AND RAIL DESIGNS IN THE CONSTRUCTION OF THEIR LINES. AT PRESENT THREE MAJOR TYPES OF YOKE REMAIN: THE 1877 CALIFORNIA-TYPE, THE 1890 CALIFORNIA-TYPE, AND THE 1887 POWELL-TYPE. THE EXISTING SYSTEM INCLUDES AT LEAST ELEVEN DIFFERENT TYPES OF RAIL, THE MOST COMMON BEING THE 50 LB. TEE AND THE 55 LB. TRILBY.





DEPRESSION BEAMS

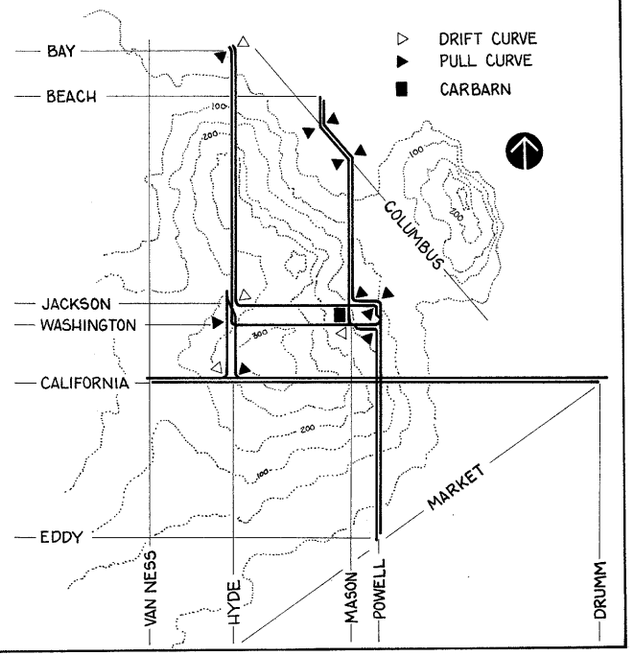
DEPRESSION BEAMS, LOCATED WHERE THE TRACK GRADE CHANGES AT THE FOOT OF A HILL, PREVENT THE CABLE FROM RISING INSIDE THE TUBE AND DAMAGING ITSELF AGAINST THE UNDERSIDE OF THE SLOT RAILS. IN ADDITION TO HOLDING THE CABLE DOWN, THE 71 BEAMS IN THE EXISTING SYSTEM PERMIT GRIPS TO PASS WITHOUT DROPPING THE CABLE.

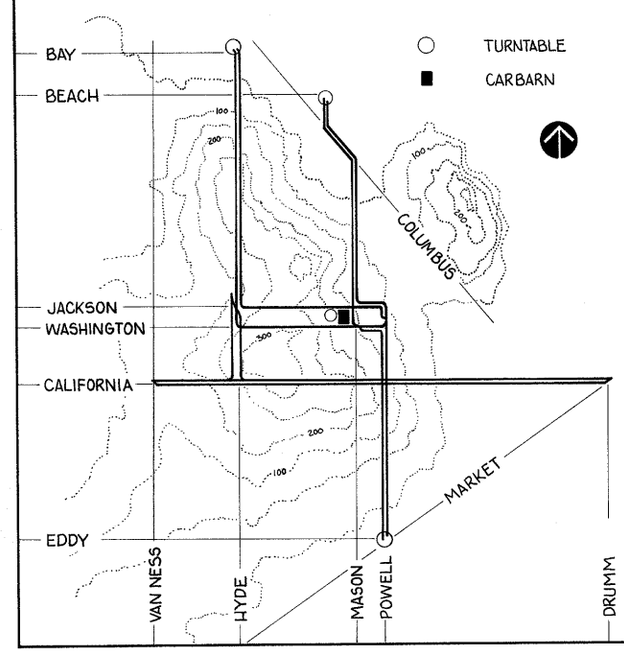
HALLIDIE'S CLAY STREET HILL RAILROAD, BUILT IN 1873, USED FIXED PULLEYS MOUNTED AT THE TOP OF THE TUBE TO PREVENT THE CABLE FROM RISING. TWO DIFFERENT TYPES OF DEPRESSION BEAM ARE REPRESENTED IN THE PRESENT SYSTEM. THE OLDER DESIGN, KNOWN AS THE CALIFORNIA-TYPE, IS FABRICATED OF OAK AND STEEL, AND USES EITHER A COUNTERWEIGHT OR A SPRING MECHANISM TO MOVE THE BEAM BACK INTO PLACE AFTER A GRIP PASSES. ON THE POWELL-MASON AND POWELL-HYDE LINES, AN ALL STEEL DEPRESSION BEAM, DESIGNED AND INSTALLED IN 1980, IS IN USE. THIS DESIGN OPERATES USING A BALL AND SOCKET JOINT.

CURVES

THE TWO TYPES OF CURVES USED IN CABLE TRACTION ARE TERMED PULL AND DRIFT CURVES. THE PRESIDIO & FERRIES RAILROAD CONSTRUCTED THE FIRST DRIFT CURVE AT THE INTERSECTION OF UNION AND COLUMBUS IN 1880. PRIOR TO THIS TIME CABLE CARS WERE WIDELY CONSIDERED INCAPABLE OF NEGOTIATING ANY TYPE OF TURN, AND OPERATED ONLY ALONG STRAIGHT ROUTES. AT PRESENT THERE ARE FOUR DRIFT CURVES ON SAN FRANCISCO'S CABLE RAILWAY.

GEORGE DUNCAN INVENTED THE PULL CURVE IN 1881 FOR THE DUNEDIN & ROSLYN TRAMWAY IN DUNEDIN, NEW ZEALAND. PULL CURVES, MORE TECHNOLOGICALLY COMPLEX THAN DRIFT CURVES, PERMIT CABLE CARS TO NEGOTIATE TURNS REGARDLESS OF STREET GRADES. THE SUTTER STREET RAILROAD INTRODUCED THE PULL CURVE TO SAN FRANCISCO IN 1882. THE CITY'S EXISTING CABLE SYSTEM INCLUDES ELEVEN PULL CURVES.





TURNTABLES

SAN FRANCISCO'S CABLE RAILWAY PRESENTLY INCLUDES FOUR MANUALLY OPERATED TURNTABLES. THREE TABLES ARE USED TO TURN CARS AROUND AT THE ENDS OF THE POWELL-MASON AND POWELL-HYDE LINES, WHILE THE FOURTH, LOCATED AT THE POWERHOUSE, SPOTS INCOMING CARS ONTO THE BUILDING'S REPAIR AND STORAGE TRACKS, AND DIRECTS OUTBOUND CARS ONTO WASHINGTON STREET. THE HYDE STREET TABLE DATES FROM THE 1956-7 RECONSTRUCTION OF THAT LINE WHILE THE OTHERS, ALL ORIGINALLY INSTALLED PRIOR TO 1907, HAVE BEEN EXTENSIVELY REBUILT AND REPAIRED SINCE THEIR INITIAL CONSTRUCTION. THE DOUBLE-ENDED CARS USED ON CALIFORNIA STREET DO NOT REQUIRE A TURNTABLE AT THE END OF THE LINE. A SIMPLE SWITCH PERMITS THEM TO CROSS OVER ONTO THE OPPOSITE TRACK.

HISTORIC AMERICAN ENGINEERING RECORD
CA-12

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SAN FRANCISCO CABLE RAILWAY: MAJOR TRACKWAY ELEMENTS

SAN FRANCISCO CALIFORNIA

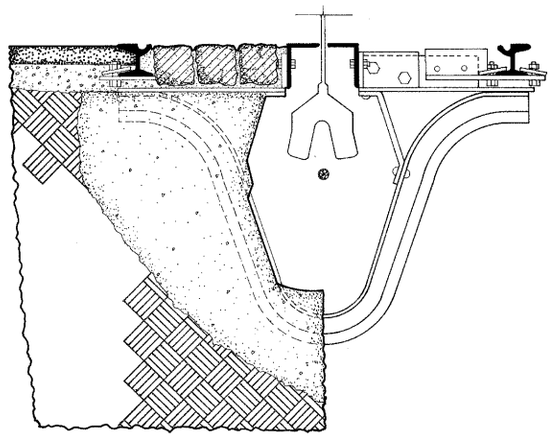
DELINEATED BY: H. ADAMS SUTPHIN, 1981

CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION & RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

SAN FRANCISCO

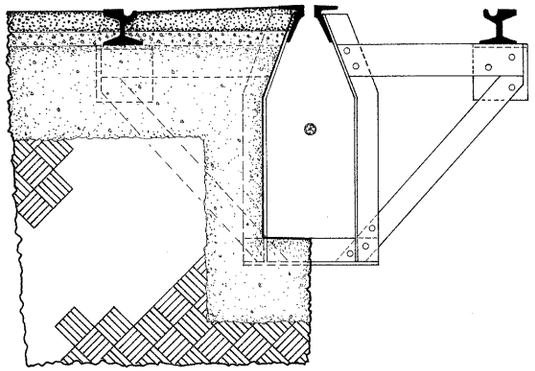
TRIM LINE

TRIM LINE



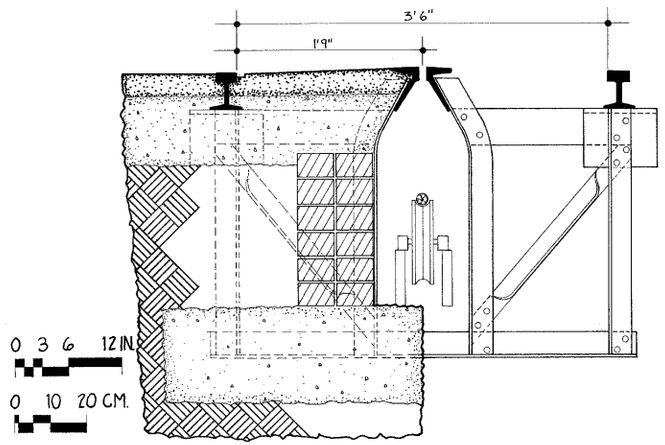
1877 CALIFORNIA-TYPE

HENRY ROOT DESIGNED THIS WROUGHT IRON YOKE FOR USE ON THE ORIGINAL CALIFORNIA STREET CABLE RAILROAD LINE, ELEMENTS OF WHICH PRESENTLY SURVIVE ALONG CALIFORNIA STREET WEST OF KEARNY. THE YOKES, 40 OR 50 LB. TEE RAILS BENT TO SHAPE, ARE ALMOST TOTALLY ENCASED IN THE CONCRETE WALLS OF THE CONDUIT. CONSTRUCTION OF THIS LINE MARKED THE FIRST USE OF CONCRETE IN CABLE CONDUITS. IN 1957 MODIFICATIONS TO THE SLOT RAILS SUPPORTED BY THESE YOKES PERMITTED THE USE OF THE BOTTOM GRIP PRESENTLY IN SERVICE.



1890 CALIFORNIA-TYPE

HOWARD C. HOLMES ADOPTED THIS STYLE OF YOKE WHEN HE ENGINEERED THE O'FARRELL-JONES-HYDE EXTENSION OF THE CALIFORNIA STREET CABLE RAILROAD IN 1890. THESE YOKES, CONSISTING OF SEVEN RIVET-CONNECTED WROUGHT IRON PIECES, MAY PRESENTLY BE FOUND ON CALIFORNIA EAST OF KEARNY, AND ALONG HYDE. LIKE THE EARLIER CALIFORNIA-TYPE YOKES, THESE ARE ALMOST FULLY ENCASED IN THE CONCRETE WALLS OF THE CONDUIT.



1887 POWELL-TYPE

HOWARD C. HOLMES, ALSO DESIGNER OF THE FERRIES & CLIFF HOUSE RAILWAY, ADOPTED THIS YOKE TYPE FOR THE LINE IN 1887. THE BOLT-CONNECTED WROUGHT IRON YOKE IS ENCASED IN 14-INCH THICK BRICK CONDUIT WALLS SET IN A CONCRETE FOUNDATION. PACKED EARTH IS ALSO USED IN THE CONSTRUCTION OF THE CONDUIT. THIS TYPE OF YOKE PRESENTLY EXISTS ON POWELL, MASON, WASHINGTON, JACKSON AND TAYLOR STREETS, AND ON COLUMBUS AVENUE.

55 LB. TRILBY

35 LB. TEE

96 LB. TRILBY

45 LB. TEE

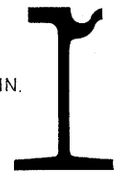
106 LB. TRILBY

50 LB. TEE

107 LB. TRILBY

60 LB. TEE

0 1 6 IN.
0 5 10 CM.



110 LB. TRILBY

75 LB. TEE

HISTORIC AMERICAN ENGINEERING RECORD CA-12

SHEET 4 OF 8

SAN FRANCISCO CABLE RAILWAY: YOKE AND RAIL TYPES

SAN FRANCISCO CALIFORNIA

DELINEATED BY: H. ADAMS SUTPHIN, 1981

CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION & RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

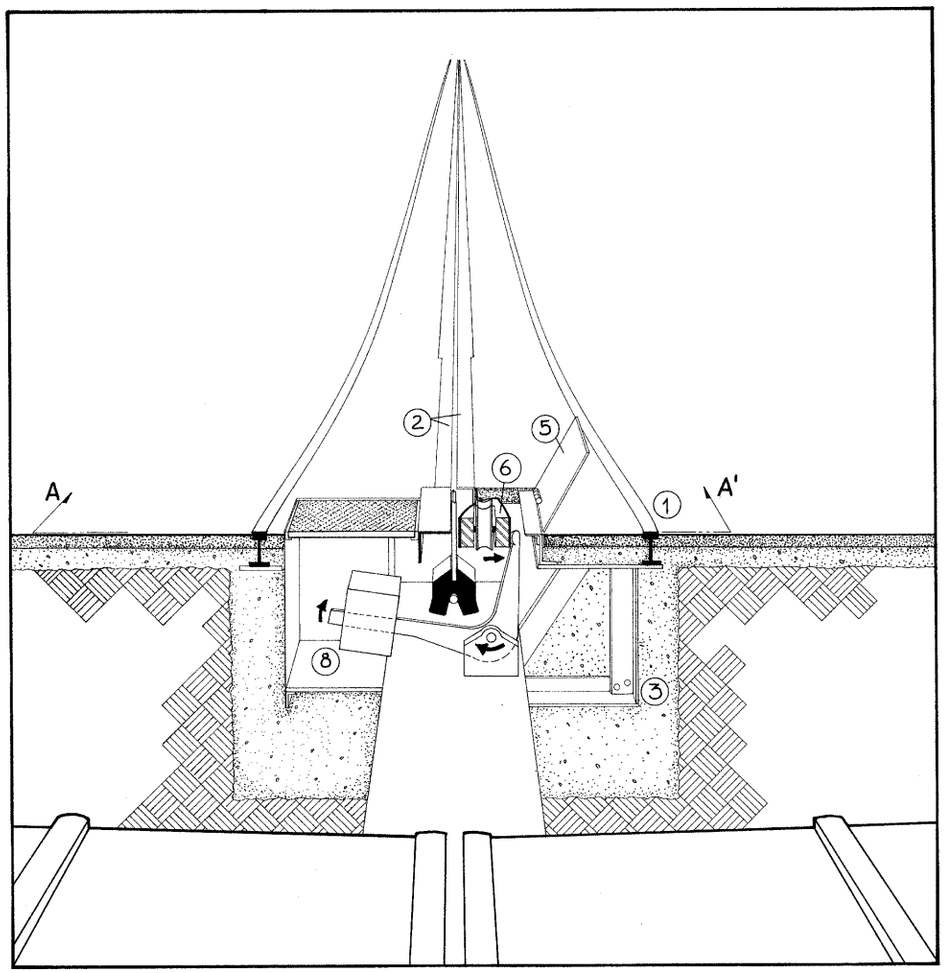
SAN FRANCISCO

TRIM LINE

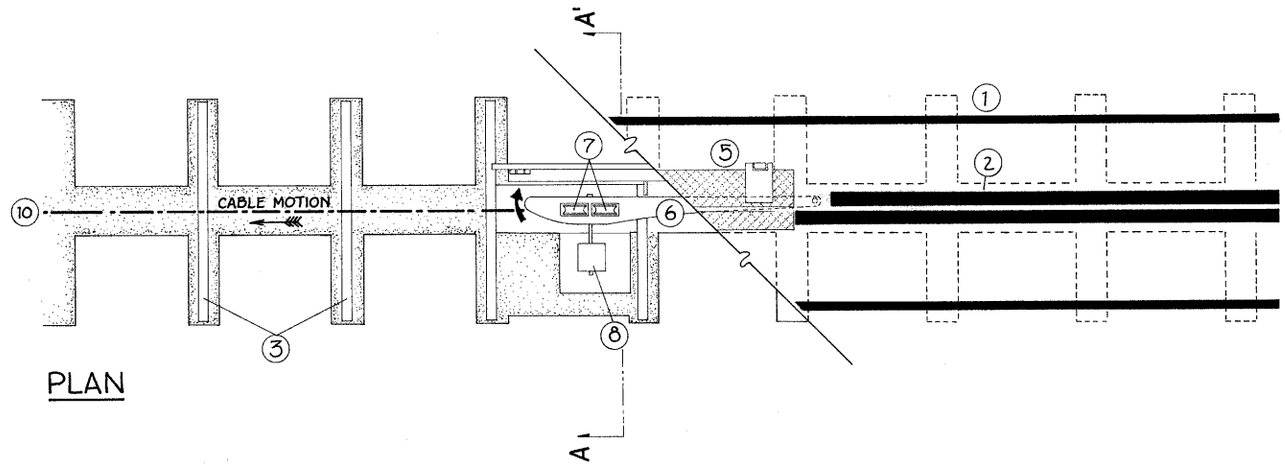
DEPRESSION BEAMS, LOCATED WHERE THE GRADE OF THE TRACK CHANGES AT THE FOOT OF A HILL, PREVENT THE CABLE FROM RISING INSIDE THE TUBE AND DAMAGING ITSELF AGAINST THE UNDERSIDE OF THE SLOT RAILS. IN ADDITION TO HOLDING THE CABLE DOWN AT THESE GRADE CHANGES, THE DEPRESSION BEAM ALSO PERMITS GRIPS TO PASS BY WITHOUT HAVING TO DROP THE CABLE.

ON THE CALIFORNIA-TYPE DEPRESSION BEAM, ILLUSTRATED HERE, THE CABLE IS HELD DOWN BY TWO 5-INCH DIAMETER STEEL PULLEYS MOUNTED ON A TAPERED WOODEN ARM LOCATED AT THE TOP OF THE TUBE. AS A GRIP APPROACHES THIS ARM, IT PULLS THE CABLE AWAY FROM THE PULLEYS. THE FORWARD MOTION OF THE GRIP PUSHES THE ARM TO ONE SIDE, AND A COUNTERWEIGHT SNAPS IT BACK INTO ITS ORIGINAL POSITION AFTER THE GRIP PASSES. SOME CALIFORNIA-TYPE DEPRESSION BEAMS USE A SPRING MECHANISM TO RETURN THE ARM INTO PLACE.

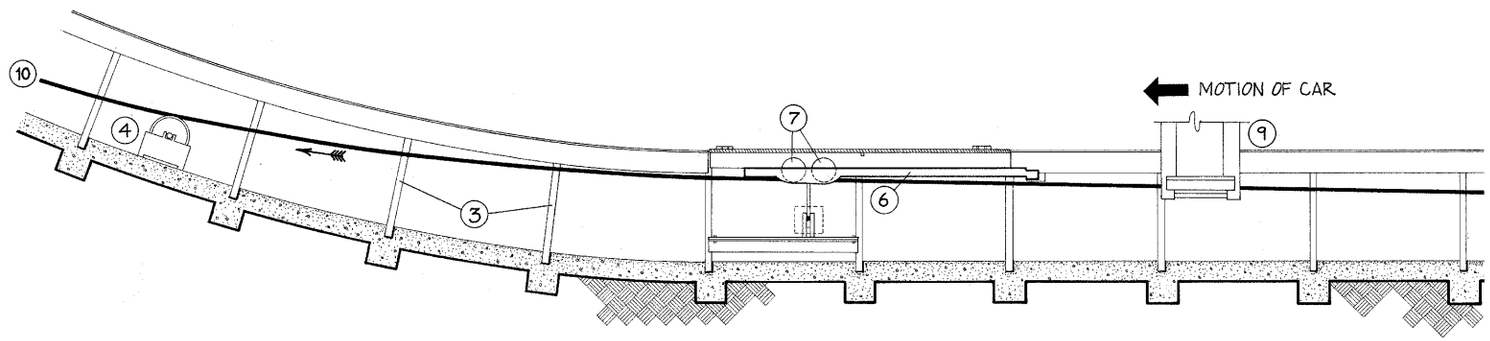
THE POWELL-MASON AND POWELL-HYDE LINES USE A STEEL DEPRESSION BEAM DESIGNED AND INSTALLED IN 1980. A UNIVERSAL JOINT ROTATES THESE BEAMS DOWN AND AWAY AS THE GRIP PASSES THROUGH, DISPENSING WITH THE COUNTERWEIGHTS AND SPRINGS OF THE CALIFORNIA-TYPE BEAMS.



SECTIONAL PERSPECTIVE A-A'



PLAN



0 1 3 FT.

0.1 .2 .5 1 M.

① TRACK RAILS
② SLOT RAILS
③ YOKE
④ CARRIER PULLEY
⑤ DEPRESSION BEAM COVER
⑥ BEAM
⑦ PULLEYS (5-INCH DIAMETER)
⑧ COUNTERWEIGHT
⑨ GRIP
⑩ CABLE

DELINEATED BY: H. ADAMS SUTPHIN, 1981

SAN FRANCISCO CABLE RAILWAY: CALIFORNIA-TYPE DEPRESSION BEAM
INBOUND ON CALIFORNIA STREET EAST OF HYDE STREET
SAN FRANCISCO CALIFORNIA

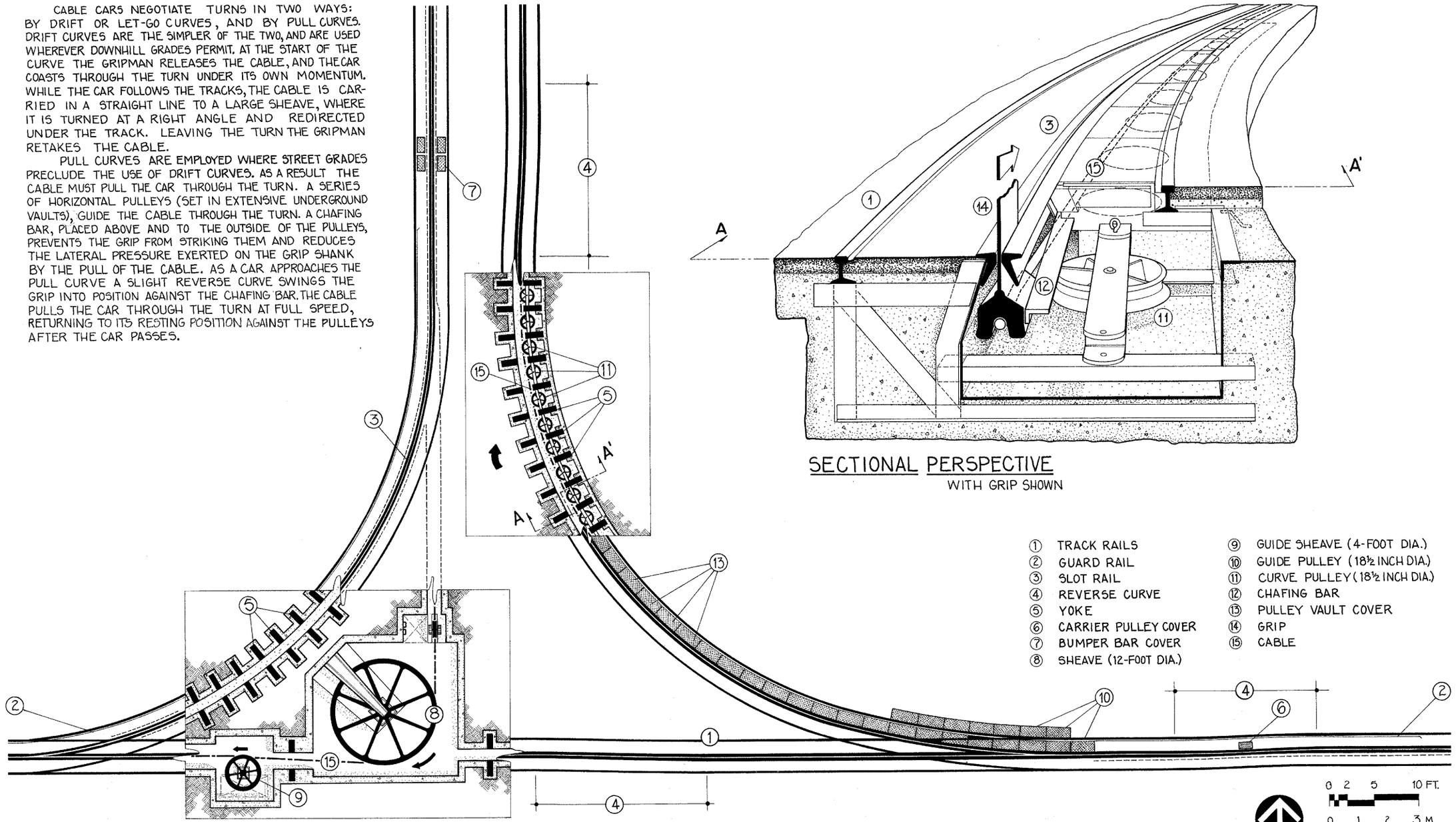
CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

SHEET 5 OF 8

HISTORIC AMERICAN ENGINEERING RECORD CA-12

CABLE CARS NEGOTIATE TURNS IN TWO WAYS: BY DRIFT OR LET-GO CURVES, AND BY PULL CURVES. DRIFT CURVES ARE THE SIMPLER OF THE TWO, AND ARE USED WHEREVER DOWNHILL GRADES PERMIT. AT THE START OF THE CURVE THE GRIPMAN RELEASES THE CABLE, AND THE CAR COASTS THROUGH THE TURN UNDER ITS OWN MOMENTUM. WHILE THE CAR FOLLOWS THE TRACKS, THE CABLE IS CARRIED IN A STRAIGHT LINE TO A LARGE SHEAVE, WHERE IT IS TURNED AT A RIGHT ANGLE AND REDIRECTED UNDER THE TRACK. LEAVING THE TURN THE GRIPMAN RETAKES THE CABLE.

PULL CURVES ARE EMPLOYED WHERE STREET GRADES PRECLUDE THE USE OF DRIFT CURVES. AS A RESULT THE CABLE MUST PULL THE CAR THROUGH THE TURN. A SERIES OF HORIZONTAL PULLEYS (SET IN EXTENSIVE UNDERGROUND VAULTS), GUIDE THE CABLE THROUGH THE TURN. A CHAFING BAR, PLACED ABOVE AND TO THE OUTSIDE OF THE PULLEYS, PREVENTS THE GRIP FROM STRIKING THEM AND REDUCES THE LATERAL PRESSURE EXERTED ON THE GRIP SHANK BY THE PULL OF THE CABLE. AS A CAR APPROACHES THE PULL CURVE A SLIGHT REVERSE CURVE SWINGS THE GRIP INTO POSITION AGAINST THE CHAFING BAR. THE CABLE PULLS THE CAR THROUGH THE TURN AT FULL SPEED, RETURNING TO ITS RESTING POSITION AGAINST THE PULLEYS AFTER THE CAR PASSES.



SECTIONAL PERSPECTIVE
WITH GRIP SHOWN

PLAN WITH CUTAWAY
CALIFORNIA & HYDE ST. CURVES

BASED ON DRAWINGS SUPPLIED
BY S.F. PUBLIC UTILITIES COMMISSION

① TRACK RAILS
② GUARD RAIL
③ SLOT RAIL
④ REVERSE CURVE
⑤ YOKE
⑥ CARRIER PULLEY COVER
⑦ BUMPER BAR COVER
⑧ SHEAVE (12-FOOT DIA.)
⑨ GUIDE SHEAVE (4-FOOT DIA.)
⑩ GUIDE PULLEY (18½ INCH DIA.)
⑪ CURVE PULLEY (18½ INCH DIA.)
⑫ CHAFING BAR
⑬ PULLEY VAULT COVER
⑭ GRIP
⑮ CABLE

0 2 5 10 FT.
0 1 2 3 M.

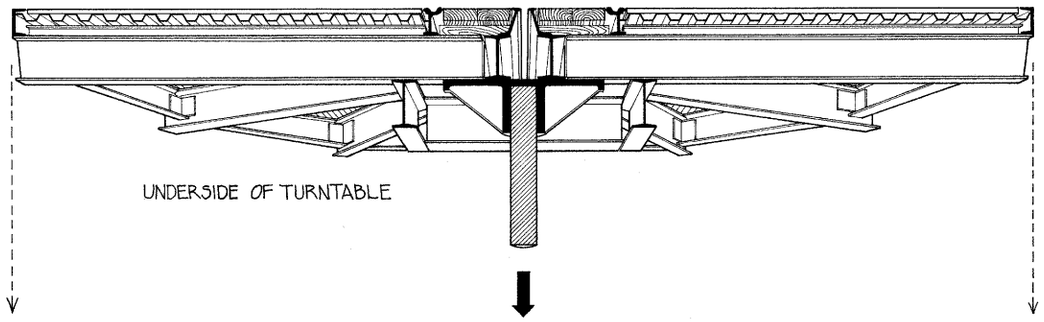
DELINEATED BY: M. DOMBROSKI, 1981

CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

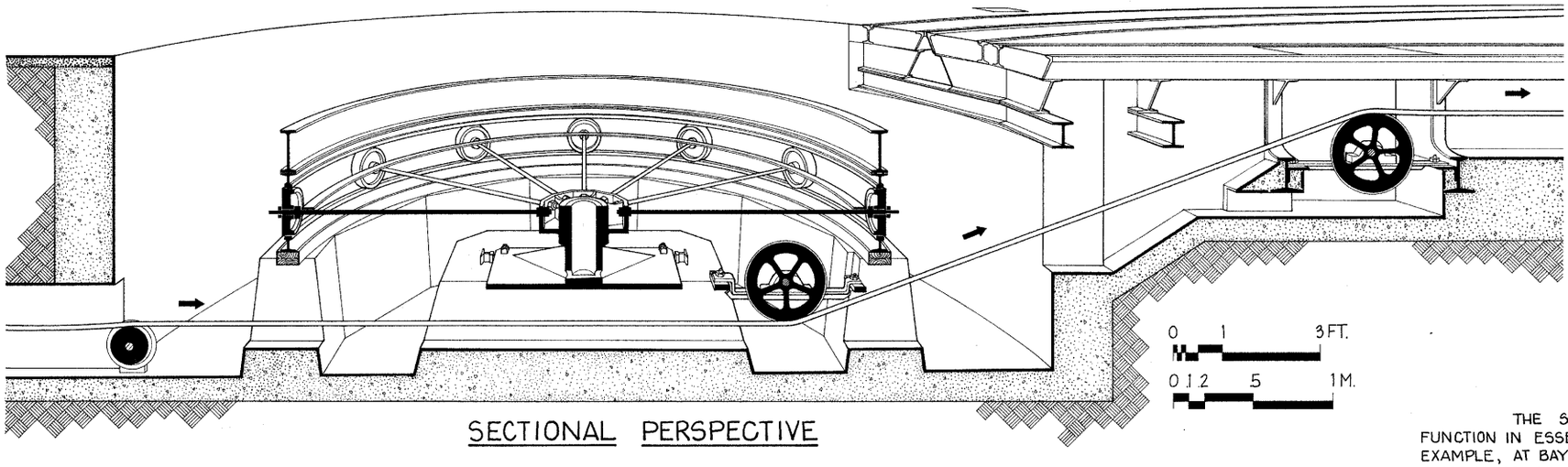
SAN FRANCISCO CABLE RAILWAY: DRIFT and PULL CURVES
CALIFORNIA AND HYDE STREETS
SAN FRANCISCO
SAN FRANCISCO CALIFORNIA

SHEET 6 OF 8

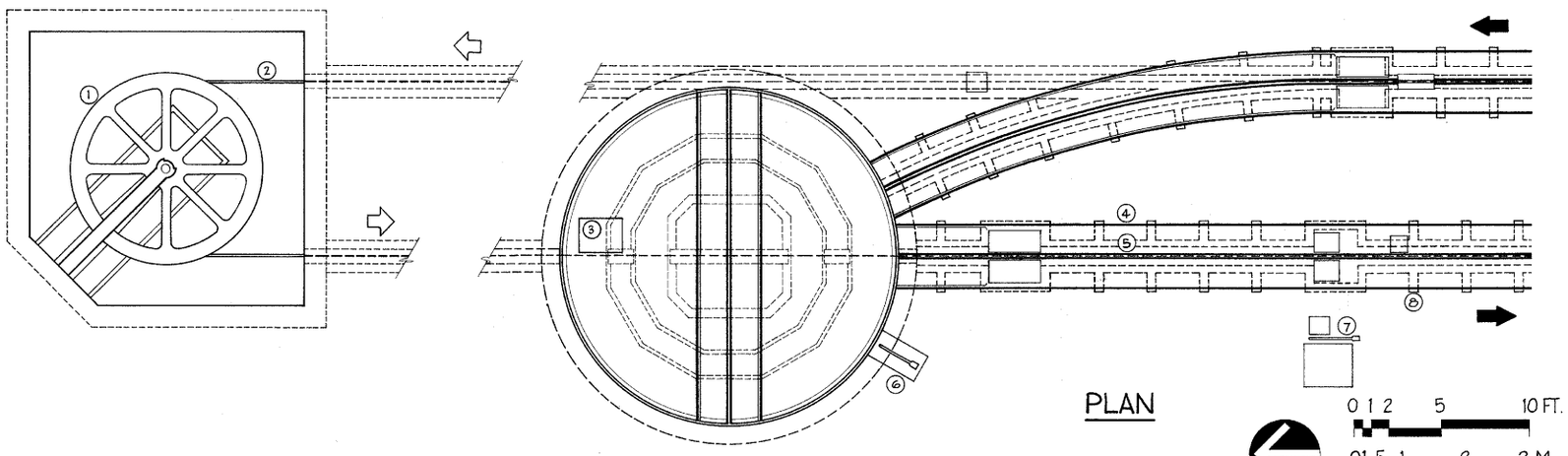
HISTORIC AMERICAN ENGINEERING RECORD CA-12



1. REVERSING SHEAVE - 10 FOOT DIAMETER
2. CABLE
3. TURNTABLE ACCESS HATCH
4. TRACK RAILS
5. SLOT RAILS
6. SAFETY LATCH
7. TAKE-ROPE GYPSY
8. YOKE

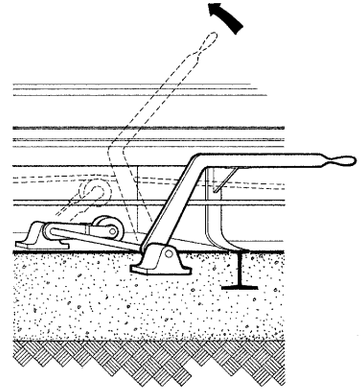


SECTIONAL PERSPECTIVE



PLAN

SCHEMATIC VIEW OF TAKE-ROPE GYPSY



(BASED ON DIAGRAM ON PAGE 53 OF ANATOMY OF THE SAN FRANCISCO CABLE CAR by FRANK PARKER (STANFORD UNIVERSITY: 1946).

THE SYSTEM'S FOUR TURNTABLES ALL FUNCTION IN ESSENTIALLY THE SAME MANNER. FOR EXAMPLE, AT BAY AND TAYLOR, ILLUSTRATED HERE, PASSENGERS GET OFF THE CAR SHORT OF THE TERMINUS. THE CAR PROCEEDS FORWARD TO A "LET-GO" POINT, RELEASES THE CABLE, AND COASTS ONTO THE 19'-7" DIAMETER TABLE. THE CABLE PASSES BENEATH THE TURNTABLE TO A 10' DIAMETER REVERSING SHEAVE WHICH RETURNS IT TO TAYLOR MOVING IN THE OPPOSITE DIRECTION. AFTER BEING MANUALLY ROTATED ON THE TURNTABLE, THE CAR IS ROLLED OFF THE WOODEN DECKING TO A POINT WHERE THE CONDUCTOR RAISES THE CABLE INTO THE GRIP JAWS WITH A TAKE-ROPE GYPSY.

THE OPERATION IS CONDUCTED IN THE SAME MANNER AT THE OTHER TWO TERMINI TURNTABLES, THOUGH BOTH USE A STREET DEPRESSION TO BRING THE CABLE INTO THE JAWS. THE POWERHOUSE TURNTABLE ALSO OPERATES IN THIS FASHION, EXCEPT THAT NO CABLE PASSES BENEATH IT.

HISTORIC AMERICAN ENGINEERING RECORD CA-12

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SAN FRANCISCO CABLE RAILWAY : TURNTABLE

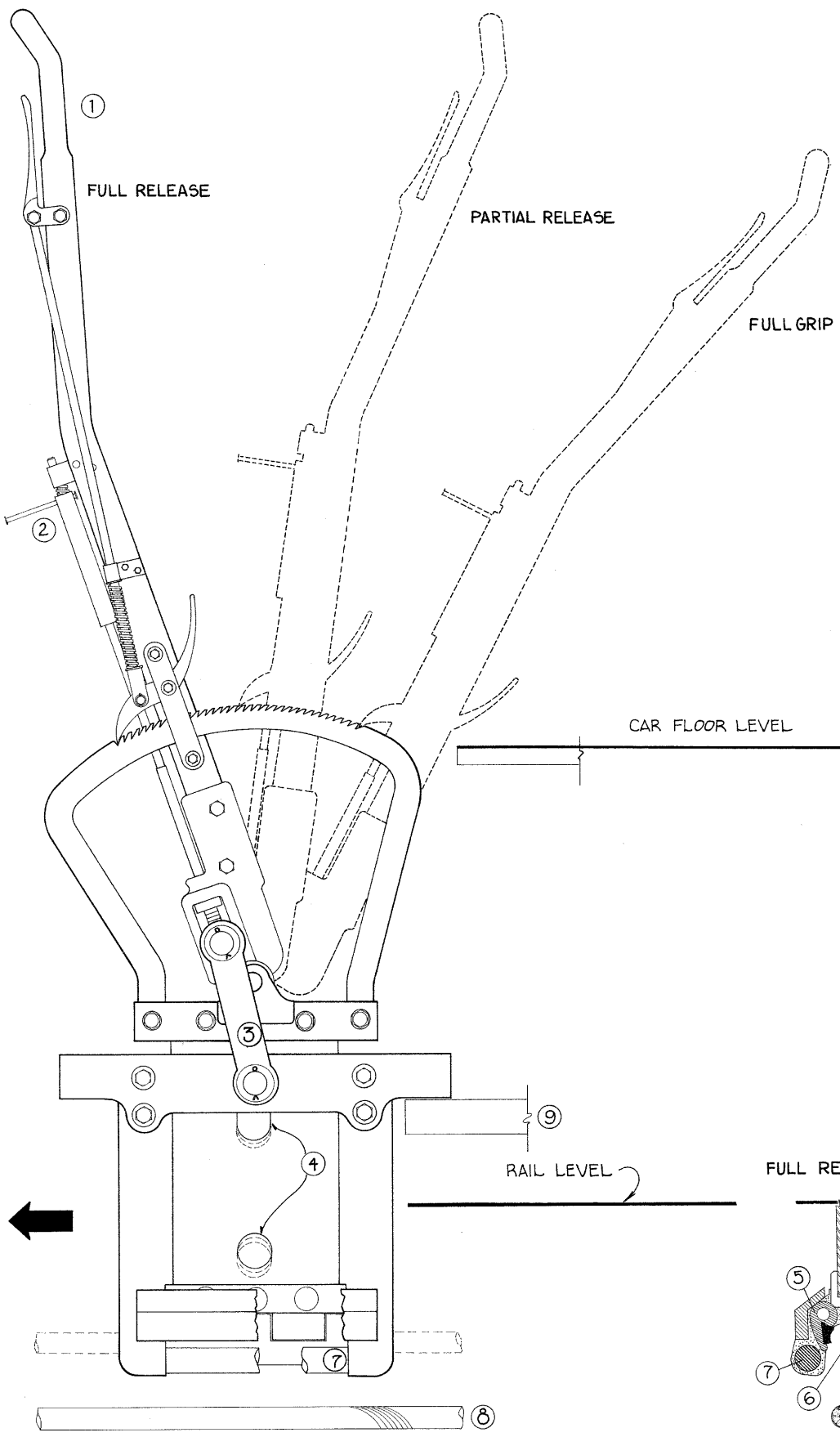
BAY AND TAYLOR STREETS
SAN FRANCISCO

CALIFORNIA

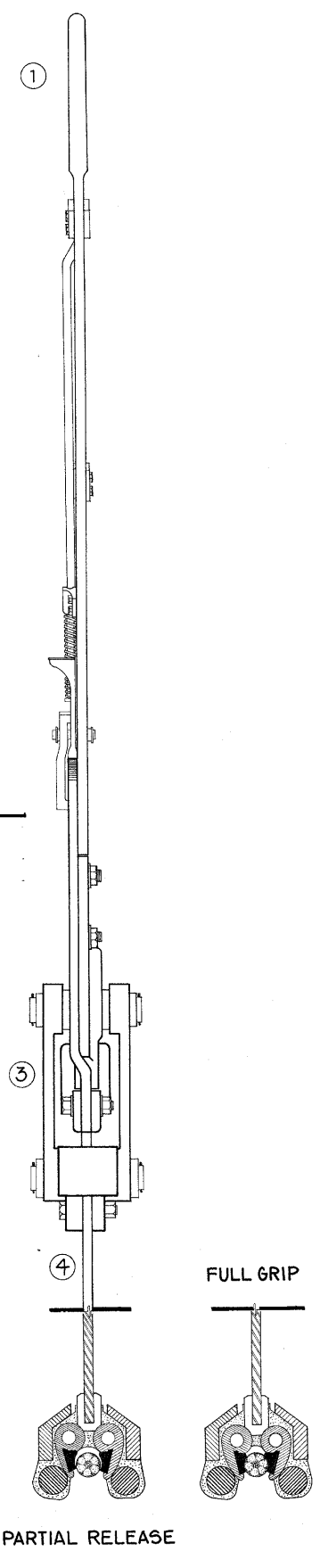
SAN FRANCISCO CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

DELINEATED BY: SCOTT DOLPH, 1981

SIDE VIEW



FRONT VIEW



WILLIAM EPPELSHEIMER'S 1880 BOTTOM GRIP IS CURRENTLY USED ON ALL SAN FRANCISCO CABLE CARS. THE CABLE, NORMALLY RUNNING BENEATH THE GRIP, IS BROUGHT INTO THE JAWS FROM BELOW BY EITHER A DIP IN THE ROADBED OR A TAKE-ROPE GYPSY. WHEN THE GRIPMAN PULLS BACK ON THE GRIP LEVER A LINKAGE FORCES THE CENTER PLATE DOWN PRESSING TWO JAWS AGAINST FIXED ROLLERS WHICH SQUEEZE THEM INWARD AGAINST THE CABLE. WHEN THE JAWS' STEEL DIES FIRST TOUCH THE CABLE THE GRIP IS IN PARTIAL RELEASE, THE CABLE MOVING FREELY THROUGH THE JAWS. PULLING BACK FARTHER ON THE GRIP LEVER INCREASES THE PRESSURE OF THE DIES UPON THE CABLE, SETTING THE CAR IN MOTION. AN ADJUSTMENT ROD ALLOWS THE GRIPMAN TO COMPENSATE FOR THE CONSTANT WEARING OF THE DIES, WHICH HAVE A USEFUL LIFE OF ABOUT FOUR DAYS.

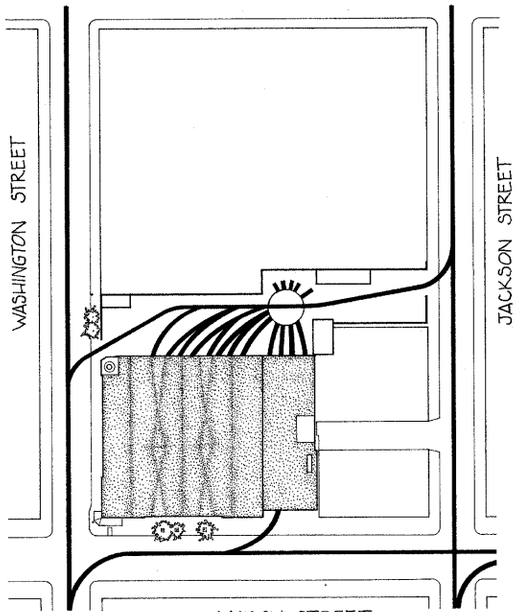
① GRIP LEVER
② ADJUSTMENT ROD
③ LINK
④ CENTER PLATE
⑤ JAW
⑥ DIE
⑦ ROLLER
⑧ CABLE
⑨ TRUCK FRAME

0 1 6 12 IN.
0 5 10 20 CM.

DELINEATED BY: H. ADAMS SUTPHIN, 1981

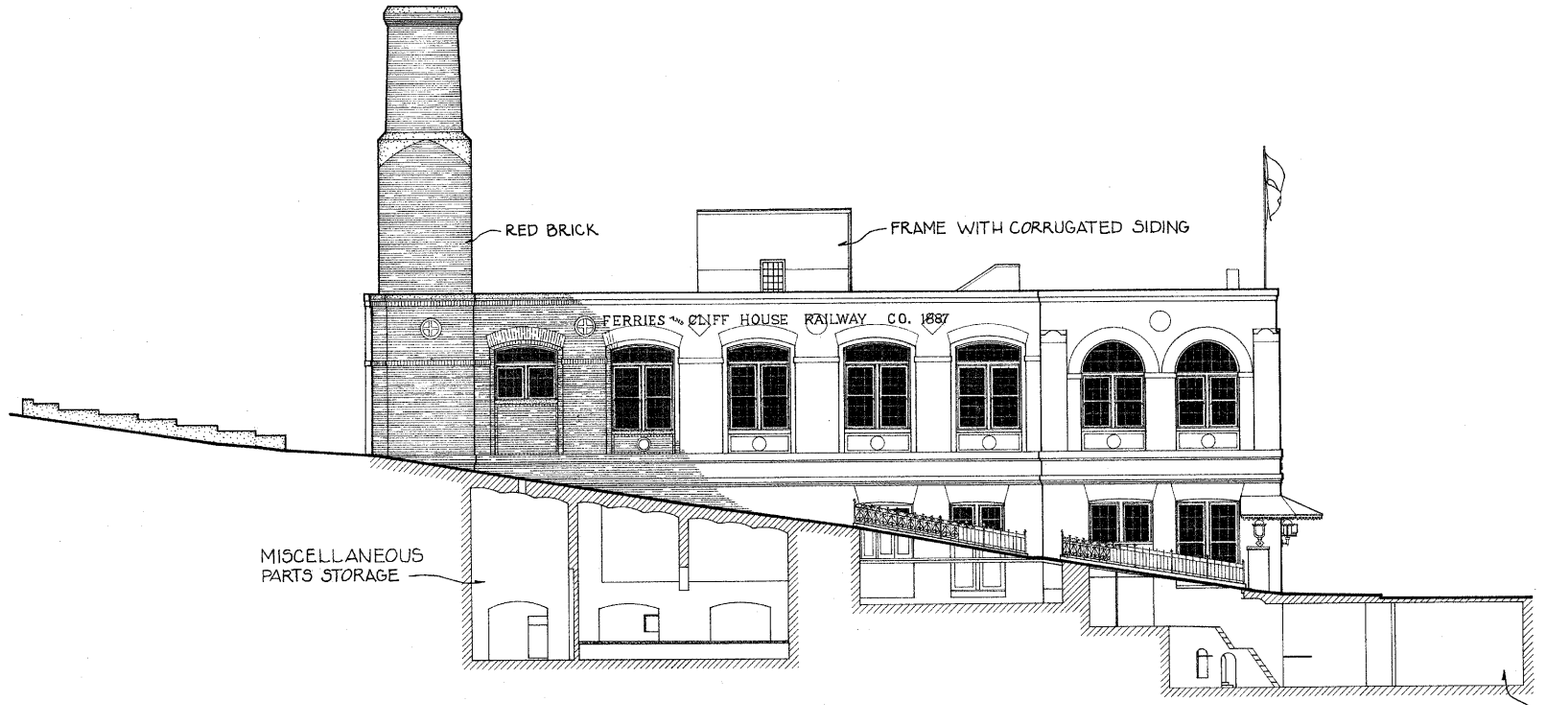
CABLE CAR RECORDING PROJECT OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION HERITAGE CONSERVATION AND RECREATION SERVICE UNITED STATES DEPARTMENT OF THE INTERIOR	SAN FRANCISCO CABLE RAILWAY: EPPELSHEIMER BOTTOM GRIP 1906-1981 SAN FRANCISCO SAN FRANCISCO CALIFORNIA	SHEET 8 OF 8	HISTORIC AMERICAN ENGINEERING RECORD CA-12	LIBRARY OF CONGRESS INDEX NUMBER

FERRIES AND CLIFF HOUSE RAILWAY CO.
POWERHOUSE AND CAR BARN



SITE PLAN

0 50 100 FT.
0 3 10 30 M.



WASHINGTON STREET (SOUTH) ELEVATION

0 5 10 20 FT.
0 1 2 5 M.

SAN FRANCISCO'S THREE SURVIVING CABLE CAR ROUTES ALL OPERATE OUT OF THIS TWO-STORY BRICK BUILDING. ERECTED IN 1907-08, THIS STRUCTURE REPLACED A THREE-STORY BRICK POWERHOUSE AND CAR BARN BUILT IN 1887-89 BY THE FERRIES & CLIFF HOUSE RAILWAY AND DESTROYED BY THE EARTHQUAKE AND FIRE IN APRIL 1906. THE PRESENT EDIFICE, CONSTRUCTED AT A COST OF $ 75,000, WAS BUILT ON THE FOOTINGS AND FOUNDATIONS OF THE ORIGINAL BUILDING.

THE FIRST FLOOR HOUSES THE WINDING MACHINERY FOR THE THREE CABLES AND THEIR ASSOCIATED DRIVE MOTORS, CONVERTED FROM STEAM TO ELECTRICITY IN 1911. A MACHINE SHOP IS ALSO LOCATED ON THIS FLOOR. THE CABLES ENTER AND EXIT THE BUILDING THROUGH A SHEAVE VAULT LOCATED UNDER THE SIDEWALK AT THE SOUTHEAST CORNER OF THE BUILDING. TRACKS FOR CAR STORAGE AND REPAIR, THREE CAR REPAIR PITS, AND OFFICES OCCUPY THE SECOND FLOOR. THE POWERHOUSE IS BUILT INTO THE SLOPE OF A HILL, SO THAT THE REAR OF THE SECOND FLOOR OPENS ONTO A YARD WITH SEVERAL OUTBUILDINGS, A TURNTABLE, AND A NUMBER OF TRACKS. THE TURNTABLE IS USED TO SPOT INCOMING CARS ONTO THE REPAIR AND STORAGE TRACKS, AND TO DIRECT OUTBOUND CARS ONTO THE STREET. THE ORIGINAL BUILDING HANDLED CARS BY MEANS OF TRANSFER TABLES ON THE TWO UPPER FLOORS INSTEAD OF WITH A TURNTABLE.

THE BUILDING HAS UNDERGONE FEW MAJOR STRUCTURAL CHANGES SINCE 1907. IN 1956-7, WHEN THE OPERATION OF THE CALIFORNIA STREET CABLE WAS INCORPORATED INTO THE BUILDING, A CONCRETE SLAB WAS POURED OVER THE FORMER BOILER PITS ALONG THE SOUTH WALL OF THE FIRST FLOOR. INCORPORATION OF A MUSEUM AND VISITOR'S GALLERY IN 1967 REQUIRED CONSTRUCTION OF A MEZZANINE ALONG THE BUILDING'S SOUTH WALL. THIS WORK ALSO INCLUDED THE CONVERSION OF THE SOUTHERNMOST WINDOW ON THE MASON STREET FACADE INTO A DOORWAY PROVIDING ACCESS TO THE MEZZANINE. OTHER ALTERATIONS MADE AS A RESULT OF THE MUSEUM INCLUDE A DECORATIVE CANOPY AT THE BUILDING'S SOUTHEAST CORNER, THE FLAGPOLES ON THE ROOF, AND VARIOUS SIGNS AND FITTINGS INTENDED TO CONVEY A SENSE OF THE BUILDING'S AGE AND FUNCTION.

DELINEATED BY: SCOTT DOLPH, 1981

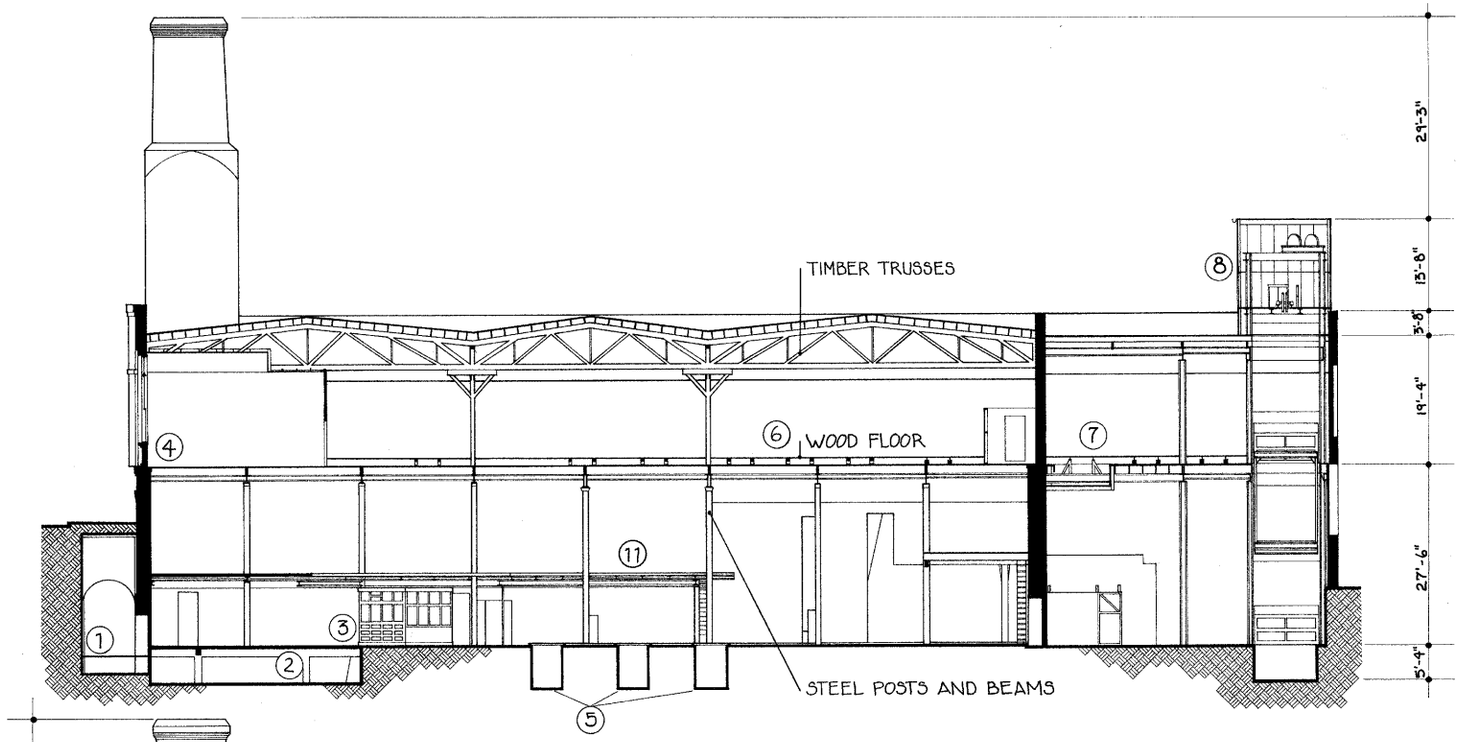
CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

SAN FRANCISCO CABLE RAILWAY: (UNITED RAILROADS of SAN FRANCISCO): CABLE CAR POWERHOUSE and BARN
1201 MASON STREET
SAN FRANCISCO CALIFORNIA

SHEET 1 of 5

HISTORIC AMERICAN ENGINEERING RECORD
CA-12A

TRIM LINE



1. MISCELLANEOUS PARTS STORAGE
2. FORMER BOILER PITS COVERED WITH CONCRETE SLAB (1956)
3. ENGINEER'S OFFICE
4. OPERATORS' LOCKER ROOM
5. CABLE PITS
6. REPAIR & CAR STORAGE TRACKS
7. REPAIR PIT
8. ELEVATOR HEAD HOUSE
9. MAIN SHEAVE PIT
10. FORMER FUEL OIL STORAGE
11. MUSEUM GALLERY MEZZANINE (1967)

SECTION A-A' LOOKING WEST

MASON STREET (EAST) ELEVATION

0 5 10 20 FT.
0 1 2 5 M.

DELINEATED BY: SCOTT DOLPH AND H. ADAMS SUTPHIN, 1981

CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HISTORIC AMERICAN ENGINEERING RECORD
UNITED STATES DEPARTMENT OF THE INTERIOR

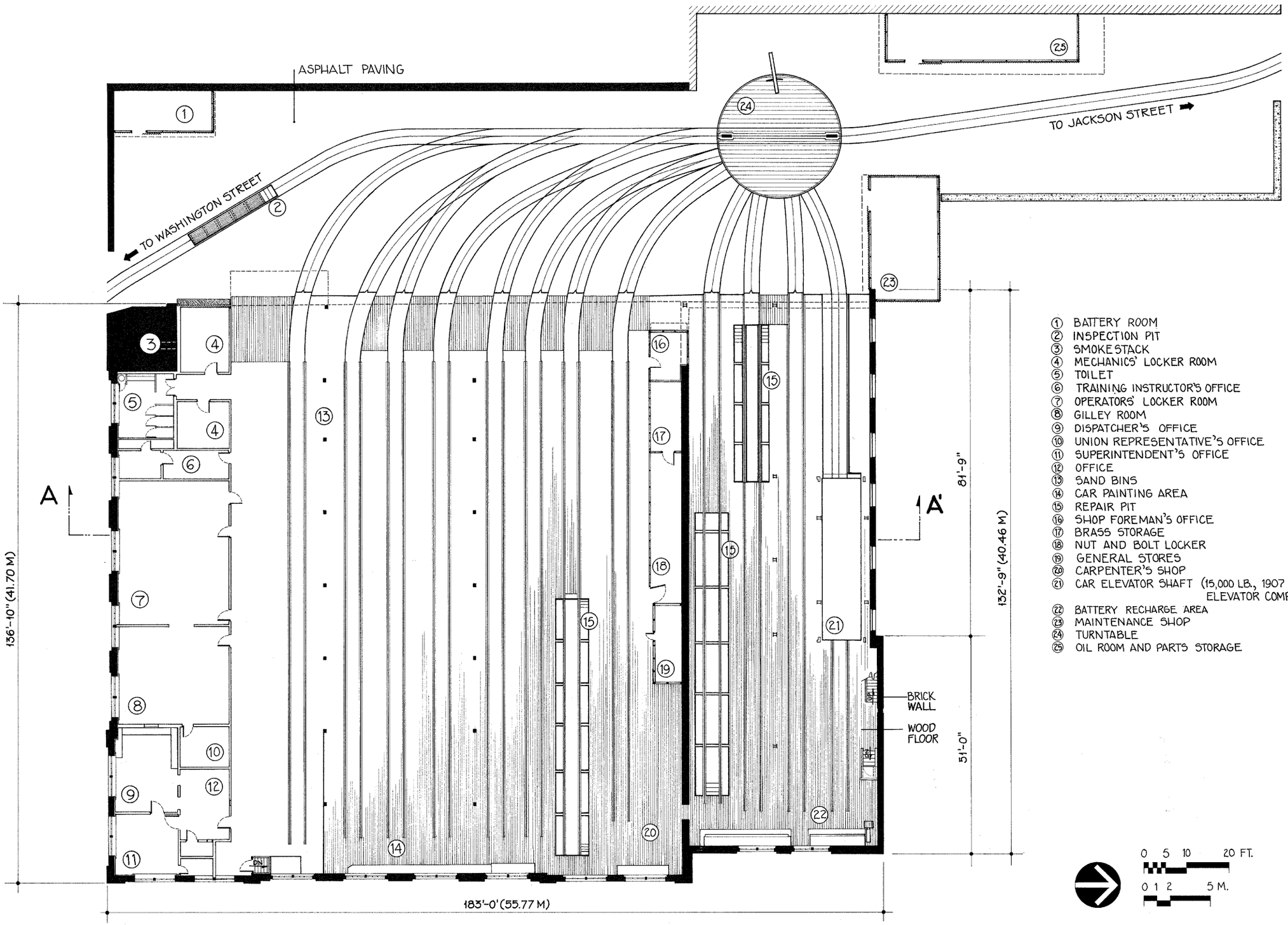
SAN FRANCISCO CABLE RAILWAY: (UNITED RAILROADS of SAN FRANCISCO): CABLE CAR POWERHOUSE and BARN
1201 MASON STREET
SAN FRANCISCO CALIFORNIA

SHEET 2 of 5

HISTORIC AMERICAN ENGINEERING RECORD
CA-12A

TRIM LINE

TRIM LINE



1. BATTERY ROOM
2. INSPECTION PIT
3. SMOKE STACK
4. MECHANICS' LOCKER ROOM
5. TOILET
6. TRAINING INSTRUCTOR'S OFFICE
7. OPERATORS' LOCKER ROOM
8. GILLEY ROOM
9. DISPATCHER'S OFFICE
10. UNION REPRESENTATIVE'S OFFICE
11. SUPERINTENDENT'S OFFICE
12. OFFICE
13. SAND BINS
14. CAR PAINTING AREA
15. REPAIR PIT
16. SHOP FOREMAN'S OFFICE
17. BRASS STORAGE
18. NUT AND BOLT LOCKER
19. GENERAL STORES
20. CARPENTER'S SHOP
21. CAR ELEVATOR SHAFT (15,000 LB., 1907 OTIS ELEVATOR COMPANY)
22. BATTERY RECHARGE AREA
23. MAINTENANCE SHOP
24. TURNTABLE
25. OIL ROOM AND PARTS STORAGE

DELINEATED BY: M. DOMBROSKI, 1981

CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

SAN FRANCISCO CABLE RAILWAY: (UNITED RAILROADS of SAN FRANCISCO): CABLE CAR POWERHOUSE and BARN
SAN FRANCISCO CALIFORNIA

SHEET 3 of 5

HISTORIC AMERICAN ENGINEERING RECORD
CA-12A

TRIM LINE

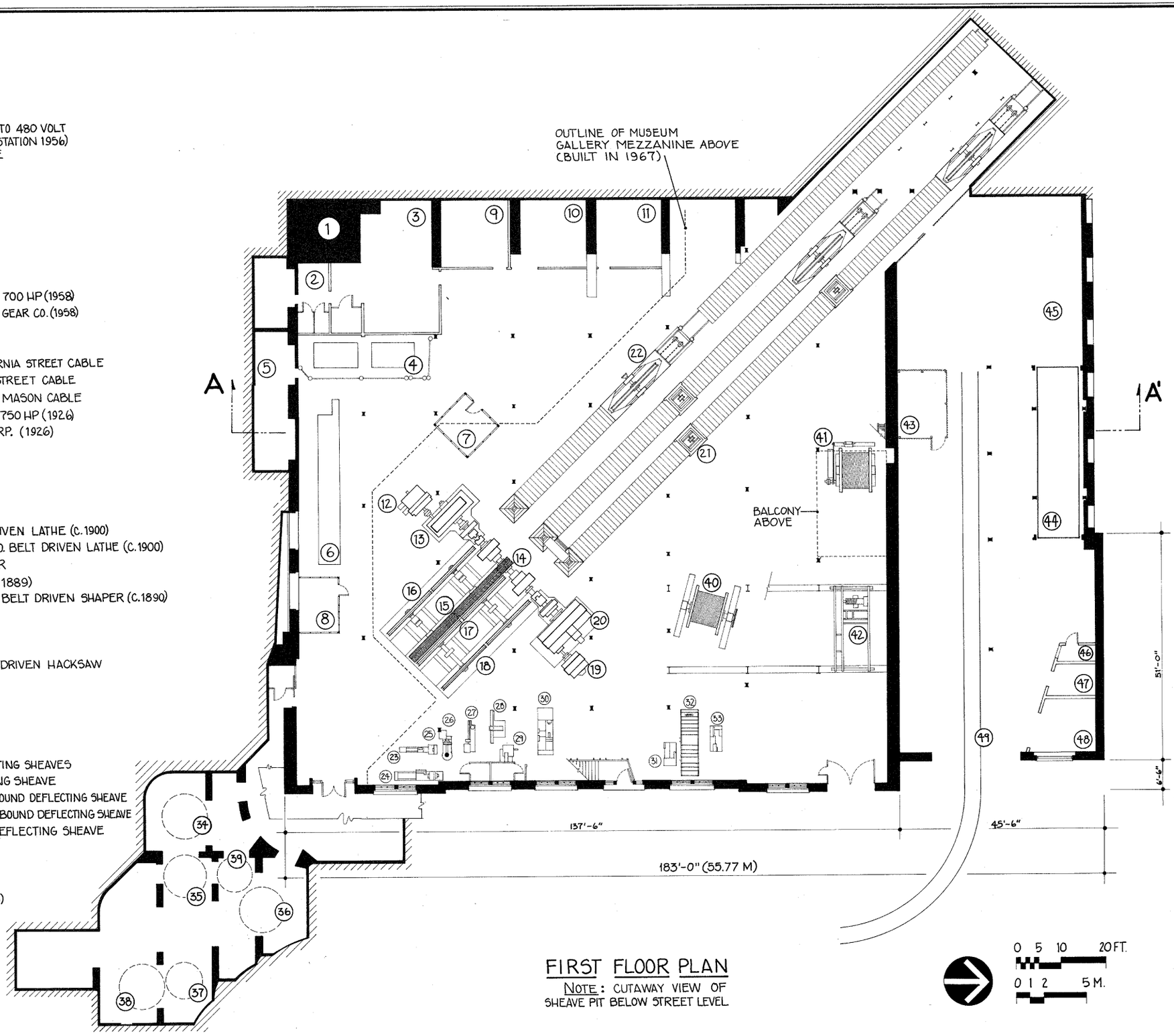
TRIM LINE

① SMOKESTACK
② TOILET
③ LOCKER ROOM
④ RESISTOR BANK
⑤ MISCELLANEOUS PARTS STORAGE
⑥ ITE. CIRCUIT BREAKER CO. (12,000 TO 480 VOLT SUBSTATION 1956)
⑦ STATIONARY ENGINEER'S OFFICE
⑧ SUPERVISOR'S OFFICE
⑨ LUNCHROOM
⑩ TRACK FOREMAN'S OFFICE
⑪ CABLE SPLICERS' ROOM

⑫ MOTOR NO. 1 FAIRBANKS-MORSE, 700 HP (1958)
⑬ REDUCTION GEAR NO. 1 WESTERN GEAR CO. (1958)
⑭ VÖEST PINION GEAR (1965)
⑮ VÖEST BULL GEAR (1965)
⑯ VÖEST WINDING SHEAVES - CALIFORNIA STREET CABLE
⑰ VÖEST WINDING SHEAVES - HYDE STREET CABLE
⑱ VÖEST WINDING SHEAVES - POWELL-MASON CABLE
⑲ MOTOR NO. 2 GENERAL ELECTRIC 750 HP (1926)
⑳ REDUCTION GEAR NO. 2 FALK CORP. (1926)
㉑ CABLE SUPPORT PEDESTALS
㉒ TENSION CARRIAGES

㉓ MONARCH MACHINE TOOL CO. BELT DRIVEN LATHE (C. 1900)
㉔ LODGE & SHIPLEY MACHINE TOOL CO. BELT DRIVEN LATHE (C. 1900)
㉕ 5 HP GENERAL ELECTRIC MOTOR
㉖ BELT DRIVEN DRILL PRESS (C. 1889)
㉗ CINCINNATI SHAPER CO. 24-INCH BELT DRIVEN SHAPER (C. 1890)
㉘ MILLING MACHINE
㉙ BAND SAW/ WELDER
㉚ LATHE
㉛ RACHINE TOOL MACHINE CO. BELT DRIVEN HACKSAW
㉜ GRIP BENCH
㉝ BAND SAW

㉞ CALIFORNIA STREET CABLE: DEFLECTING SHEAVES
㉟ HYDE STREET: INBOUND DEFLECTING SHEAVE
㊱ POWELL-MASON STREETS CABLE: INBOUND DEFLECTING SHEAVE
㊲ POWELL-MASON STREETS CABLE: OUTBOUND DEFLECTING SHEAVE
㊳ HYDE-STREET CABLE: OUTBOUND DEFLECTING SHEAVE
㊴ UNUSED SHEAVE
㊵ CABLE UNWINDER
㊶ CABLE REWINDER
㊷ 30-TON OVERHEAD CRANE (1956)
㊸ WELDER'S SHED
㊹ CAR ELEVATOR SHAFT
㊺ PULLEY STORAGE
㊻ TOILET
㊼ OIL STORAGE
㊽ PARTS CLEANING ROOM
㊾ UNUSED TRACKS



FIRST FLOOR PLAN
NOTE: CUTAWAY VIEW OF SHEAVE PIT BELOW STREET LEVEL

0 5 10 20 FT.
0 1 2 5 M.

DELINEATED BY: H. ADAMS SUTPHIN, 1981

CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HISTORIC AMERICAN ENGINEERING RECORD
UNITED STATES DEPARTMENT OF THE INTERIOR

SAN FRANCISCO CABLE RAILWAY: (UNITED RAILROADS of SAN FRANCISCO): CABLE CAR POWERHOUSE and BARN
1201 MASON STREET
SAN FRANCISCO
CALIFORNIA

SHEET 4 of 5

HISTORIC AMERICAN ENGINEERING RECORD
CA-12A

IF REPRODUCED, PLEASE CREDIT: HISTORIC AMERICAN ENGINEERING RECORD, HERITAGE CONSERVATION & RECREATION SERVICE, NAME OF DELINEATOR, DATE OF THE DRAWING

TRIM LINE

SAN FRANCISCO'S CABLE RAILWAY USES A FIGURE-EIGHT SYSTEM, APPARENTLY INTRODUCED BY THE SUTTER STREET RAILROAD IN 1877, TO DRIVE ITS THREE CABLES. TWO ELECTRIC MOTORS, ONLY ONE OF WHICH IS USED AT A TIME, DRIVE THE WINDING MACHINERY. THE 710 RPM MOTOR SHAFTS ARE CONNECTED TO REDUCTION GEARS SO THAT THE PINION SHAFT TURNS AT 78 RPM. THE 42-INCH DIAMETER, HERRINGBONE TOOTHED PINION GEAR DRIVES TWO INTERMESHED, 14-FOOT DIAMETER BULL GEARS. THESE TWO GEARS ARE MOUNTED ON THE WINDING SHEAVE SHAFTS, WHICH TURN AT ABOUT 19 RPM, AND EACH CARRY THREE 14- FOOT DIAMETER WINDING SHEAVES.

THE CABLES ARE DEFLECTED INTO THE POWERHOUSE THROUGH THE MAIN SHEAVE PIT UNDER THE BUILDING'S SOUTHEAST CORNER BY 8 TO 10-FOOT DIAMETER SHEAVES. EACH CABLE IS THEN WRAPPED AROUND ITS TWO WINDING SHEAVES IN A FIGURE-EIGHT PATTERN, FROM WHICH THE DRIVE SYSTEM TAKES ITS NAME, AND PASSES BACK TO THE TENSION SHEAVES. AFTER A HALF TURN AROUND THE TENSION SHEAVE THE CABLES PASS UNDER THE WINDING SHEAVES AND ARE DEFLECTED BACK UNDER THE STREET THROUGH THE MAIN SHEAVE VAULT.

EACH TENSION SHEAVE SITS IN A BEARING FRAME MOUNTED ON A MOVABLE CARRIAGE. HEAVY CHAINS CONNECT THE FRAME WITH A COUNTERWEIGHT SUSPENDED IN A PIT BELOW THE CARRIAGE. THE WEIGHT PULLS THE BEARING FRAME AND SHEAVE BACK ON THE CARRIAGE, COMPENSATING FOR LOAD VARIATIONS ON THE CABLE AND TAKING UP ITS DAILY STRETCHING. WHEN THE SHEAVE AND FRAME REACH THE LIMIT OF THEIR TRAVEL A BLOCK AND TACKLE IS USED TO MOVE THE CARRIAGE BACK ON ITS RAILS, RAISING THE COUNTERWEIGHT AND MOVING THE BEARING FRAME TO THE FRONT OF THE CARRIAGE, WHERE THE ENTIRE PROCESS IS REPEATED. AFTER A CARRIAGE REACHES THE LIMIT OF ITS TRAVEL ITS CABLE IS REPLACED, AND THE CARRIAGE RESPOTTED AT THE NEAR END OF THE TENSION RUN.

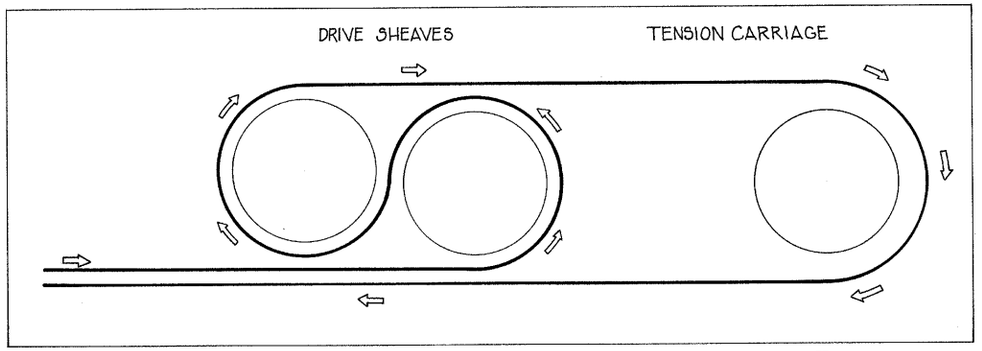
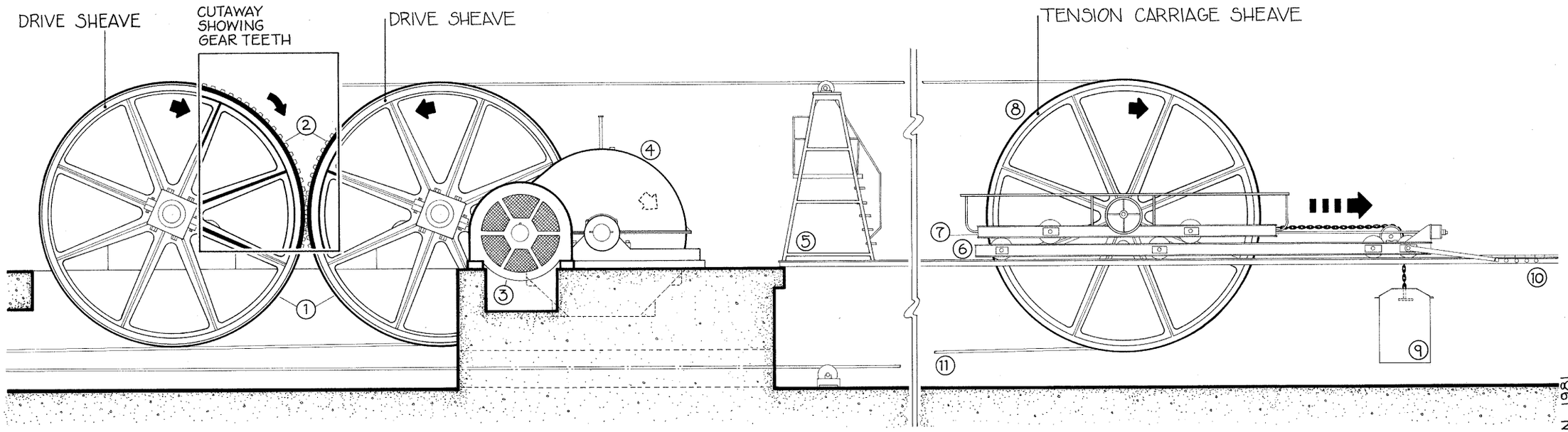


FIGURE-EIGHT DRIVE SYSTEM



1. POWELL-MASON 14-FOOT DIAMETER SHEAVES, FABRICATED BY VÖEST OF AUSTRIA (1965)
2. 14-FOOT DIAMETER, 132 TOOTHED HERRINGBONE BULL GEARS VÖEST (1965)
3. MOTOR NO. 2 750 H.P GENERAL ELECTRIC MOTOR (1926)
4. REDUCTION GEAR NO. 2 712 TO 78 RPM FALK CORP. SINGLE REDUCTION GEAR (1926)
5. CABLE SUPPORT PEDESTAL
6. TENSION CARRIAGE
7. BEARING FRAME
8. 14-FOOT DIAMETER TENSION SHEAVE
9. COUNTERWEIGHT
10. TENSION CARRIAGE RACK
11. POWELL-MASON CABLE (APPROX. 19,300 FEET LONG)

WINDING MACHINERY ELEVATION

NOTE: PART OF WINDING SHEAVE REMOVED TO EXPOSE BULL GEAR

0 1 2 5FT.

0.1 .5 1 2 M.

DELINEATED BY: H. ADAMS SUTPHIN, 1981

CABLE CAR RECORDING PROJECT
OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
HERITAGE CONSERVATION AND RECREATION SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

SAN FRANCISCO CABLE RAILWAY: WINDING MACHINERY 1926-1967
1201 MASON STREET
SAN FRANCISCO
SAN FRANCISCO CALIFORNIA

SHEET 5 OF 5

HISTORIC AMERICAN ENGINEERING RECORD
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