

Republic

From Long Lines Department
American Telephone and Telegraph Company
32 Avenue of the Americas
New York 13, New York

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San Pedro, Calif., July 12---The cables ship Monarch, grey hulled veteran of scores of deep-water ventures, was scheduled to leave here today on her biggest assignment---laying of the first undersea telephone link with Hawaii.

Monarch, her four cable tanks brimming with some 1,900 miles of armored cable, was playing the leading role in a multi-ship laying operation.

The vessel was to sail for a spot 10 miles off Point Arena, Calif., site of the eastern terminus of the underwater twin cable system. According to the Long Lines Department of American Telephone and Telegraph Company---Bell System unit in charge of the cable laying phase of the \$37,000,000 project---the cables ship would pick up the end of a shore section placed there earlier this year, splice it to the cable in her tanks and head for the Islands.

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Monarch will be paying out cable at approximately six knots as she steams along on her southwesterly course.

By this fall, both of the 2,400-mile cables for the new Pacific voiceway will be completed. These cables will be capable of carrying 36 simultaneous conversations. Featuring the dialing of calls between the mainland and Hawaii service is expected later this year, climaxing three years of planning and construction by Long Lines, the Hawaiian Telephone Company and The Pacific Telephone and Telegraph Company, participants in the project.

Two other vessels will be engaged in the precisely timed, summer-long laying operations. They are the cable-laying Ocean Layer, and the cable supply ship, Arthur M. Huddell. Long Lines said there would be virtually no interruption in round-trip cable operations between the mainland and the Hawaiian Islands. Laying is to follow this sequence:

- (1) From Pt. Arena westward, Monarch will lay the first 1,900 miles and buoy the cable end before proceeding to Honolulu.
- (2) Ocean Layer will rendezvous with Monarch at the buoy. She will take the cable end on board, make a splice and continue another 665 miles to the entrance of Hanauma Bay, on the island of Oahu. There, the east-west

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cable will be joined with one of the newly laid Hawaiian shore sections.

- (3) Both cables will then reload cable from the Huddell at Honolulu.

For the second cable (west to east), Ocean Layer will pick up the second Hawaiian shore section and lay some 800 miles eastward and buoy the end. Monarch will pick up the cable end and continue to Pt. Arena for the final mainland splice.

Long Lines pointed out that the compatibility between mainland and Hawaiian telephone facilities would enable an operator in Honolulu to dial, direct, to any number in an estimated 6,500 communities on the mainland. In like manner, mainland operators in hundreds of cities can dial any subscriber on the island of Oahu, where 95% of Hawaii telephones are located. This will be the first of A.T. & T.'s ocean cable systems to be equipped for operator dialing.

Long Lines said the Hawaiian cable system is similar in design and construction to the 2,250-mile Atlantic telephone cables extending between Newfoundland and Scotland, and the 900-mile Alaskan cables between Port Angeles, Wash., and Ketchikan, Alaska - both opened to service in 1956. The trans-atlantic cable system was the first deep-water voice link to cross an ocean.

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The Hawaiian cables will generally be in deeper water than either the Alaskan or Atlantic cables. At one point they will strike a depth of about three miles.

Cables are of the coaxial type, especially designed to withstand the tremendous pressures of the ocean bottom. And sturdy, flexible repeaters are built into the cable about every 40 miles to boost the strength of signals when they reach the fading point along their deep-sea course.

The Hawaiian cables will substantially augment the 14 radio circuits presently operating between these points.

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F A C T S H E E T

HAWAIIAN TELEPHONE CABLE

CABLE ROUTE

Hawaiian cable system consists of twin submarine cables extending 2,400 miles (2,100 nautical miles) between Point Arena, Calif., some 100 miles north of San Francisco, and Hanauma Bay, Oahu, which is some 12 miles east of Honolulu. Cables will lie as much as 25 miles apart on ocean floor, and at depths up to three miles.

CONNECTING FACILITIES

From Point Arena, a 130-mile radio relay route, constructed by The Pacific Telephone and Telegraph Company, will carry cable circuits to Oakland, Calif., where they will be fed into Bell System's U.S. network.

OWNERSHIP AND COST

From Hanauma Bay, a land cable will carry circuits to Honolulu. The ocean cable system is jointly owned by the Long Lines Department of American Telephone and Telegraph Company and the Hawaiian Telephone Company. Hawaiian Company, which provides telephone service in Hawaiian Islands, has 15% ownership. Overall cost of project is \$37,000,000.

REASONS FOR CABLE

Radio transmission over long distance without relay stations is subject to atmospheric disturbances and fading. Number of frequencies available for additional circuits to provide for growth is limited. Hawaiian cable will

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offer greater reliability in telephone service to and from Islands. It will also provide about three times capacity of existing radio-telephone circuits. In addition, it will offer greater flexibility of communication in that two means of transmission will be available.

TERMINALS

Equipment providing electrical power for cable system will be located near Point Arena and Hanauma Bay. About 2,500 volts are required from each end to operate cable system. Both terminal buildings are equipped with self-generating emergency power supply in event of commercial power failure.

CONSTRUCTION

Laying of Hawaiian cable system is under supervision of Long Lines, long distance operating unit of Bell System. Long Lines builds, operates and maintains networks of trunk circuits that provide interstate long distance communications on the mainland and between the mainland and United States territories overseas. It also furnishes telephone service between the U.S. and more than a hundred countries throughout the world.

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LAYING

Laying of deep-sea cables will be undertaken during July, August and September of 1957. Laying of shore-ends was completed in April. Basil O. Lenoir, Army cableship, placed 12-mile shore-ends at Point Arena. Two-mile shore sections were placed by a barge in Hanauma Bay.

CABLE SHIPS

Two cable ships, the Monarch, world's largest cable-laying vessel, and the Ocean Layer, will place deep-sea portion of cables. H.M.T.S. Monarch, owned by British Post Office, measures 483 feet in length, has a displacement of 8,050 tons, and can carry over 1,600 nautical miles of deep-sea cable. The ship's crew numbers 135. Ocean Layer is owned by Submarine Cables, Ltd., of London, and measures 378 feet in length and has a displacement of 4,800. It can carry 1,000 nautical miles of submarine cable, and has a crew of 84. Monarch and Ocean Layer pay out cable at average rate of six knots. The Liberty Ship Arthur M. Huddell will serve as cable supply base at Honolulu and will transfer cable to Monarch and Ocean Layer for return trips.

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CABLE
DESCRIPTION

Through center of each cable runs copper conductor which transmits all voices simultaneously in one direction. Conductor is surrounded by waterproof insulating material (polyethylene) which, in turn, is covered with flexible overlapping copper tapes that serve as a return conductor for electrical current. Protecting these elements are layers of jute and steel armoring wire. Overall diameter of cable in deep-sea sections is 1-1/4 inches. It weighs about one pound per foot. Cable in shallow water, which has heavier armor to protect it from tide action, marine life and fishing trawlers, varies between 1.8 and 3.1 inches in diameter depending upon amount and size of armoring wire used. It weighs between 4 and 13-1/2 pounds per foot, depending on type of cable used.

AMPLIFIER
DESCRIPTION

It is the intricate, costly and precision-made electronic amplifier that makes possible telephone communications over deep-sea cables. Each amplifier used in submarine cables amplifies about 1,000,000 times the voice currents that pass through it. There are 57 amplifiers in each cable. Deep-sea amplifiers are spaced about 43 miles (38 nautical miles)

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apart. Each amplifier employs three vacuum tubes and some 60 other electrical components. These are housed in flexible copper tube about eight feet long and 1-3/4 inches in diameter. On inside of tube are steel rings which form a flexible structure that appears as a tapering bulge in cable. This design makes it possible for amplifiers to pass steadily through cables' gear, and also withstand as much as 8,000 pounds pressure per square inch. The amplifiers have a life expectancy of at least 20 years.

MANUFACTURE

Deep-sea cable was manufactured by Simplex Wire and Cable Company at Newington, N.H., and by Submarine Cables Ltd., of England. Deep-sea amplifiers were manufactured at Western Electric Company plant at Hillside, N.J.

SERVICE

Cable system will be placed in service in fall, 1957. It will provide 36 voice circuits. These will supplement 14 existing radiotelephone circuits. Telephone service between Hawaii and mainland has been provided by radio since service was opened with a single circuit on Dec. 23, 1931. Cable system will also be used for teletypewriter service and for transmission of programs for radio broadcasts.

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RATES

Cost of a three minute day call between Hawaii and mainland varies from \$7.50 on West Coast to \$9.00 on East Coast. Rates do not include Federal excise tax.

TELEVISION

Cable system will not be used for television. While system does offer a wide transmission band, it is far short of that required for television.

HISTORY

Approximately 1,100 calls were made between Hawaii and mainland during first year of telephone service. Rate was \$21 per three-minute call from San Francisco. Some 200,000 calls were completed in 1956. (The Bell System handled 1,400,000 overseas calls to all parts of the world in 1956 including the Hawaiian calls.)

OPERATOR
DIALING

When cable system goes into service operators in hundreds of mainland cities, will be able to dial direct to telephone subscribers on island of Oahu, where 95% of Hawaiian telephones are located. Conversely, Honolulu operators will be able to dial direct to telephones in 6,500 mainland communities.

PLACING SHORE ENDS
Hawaiian Telephone Cable

. . . dynamite and skin-divers, a helicopter, surf caster, Lyle gun and crewless sailing raft made shore operations unusual . . .

At Hanauma Bay on the island of Oahu, Hawaii, charges of dynamite were exploded in off-shore reefs. Geyser-like shafts of water rose 100 feet in the air. The job: trenching through razor-sharp coral to protect the twin shore sections of the mainland-Hawaii deep-sea telephone cable. To make sure the trench was deep and smooth, skin-divers searched for jagged edges that might injure cable armoring. The shore ends extending two miles out to sea were floated to the beach from a shallow barge.

At Point Arena, Calif., 2,400 miles away, mainland shore sections were placed in April, 1957 --- amid pounding surf, swift cross-currents and treacherous undertow. Several ingenious methods of beaching the cable ends were attempted. One plan involved floating a line ashore on a rubber raft from the cable barge Basil O. Lenoir. Another plan was to shoot cable-lines ashore with a Lyle gun from the Lenoir's

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work boat. At one time an expert surf caster volunteered to try picking up the line as it hit the surf. But nature--- in the form of howling winds and storm-swept sea thwarted all these plans. Finally, a helicopter picked up a towline from the beach and carried it above the surf to the work boat. Then the line was hauled in by hand, and later by tractor. The shore sections extend 10 miles seaward.

SHIP MOVEMENT
Hawaiian Telephone Cable

. . . in combined laying operations
for the Hawaiian telephone cable system,
three large cable vessels travel close to
80,000 miles---or more than three times
the distance around the world at the
equator . . .

Cables ship Monarch (with 1,200 miles of cable)
leaves England . . sails to Newington, N.H. for more cable . .
then down the Atlantic coastline, through the Panama Canal
up the coast of California . . lays cable toward Hawaii . .
reloads from Huddell . . lays in reverse direction to the
mainland . . sails back via Canal and across the Atlantic to
England . . total 27,000 miles.

Cables ship Ocean Layer (with 1,100 miles of cable)
sails from England across the Atlantic and through Canal . .
proceeds to Hawaiian waters for rendezvous with Monarch . .
lays cable to Honolulu . . reloads from Huddell . . lays more
cable . . returns via Canal to England . . total 26,000 miles.

Supply-ship Arthur M. Huddell charts ocean bottom
route of twin cable system in Autumn of 1956 . . following
Spring loads 2,100 miles of cable at Newington . . sails

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south and through Canal . . across to Hawaii . . stands by
for reloading . . and sails back to its home port of
Baltimore via Canal . . total 25,000 miles.

Shallow-draught cable barge Basil O. Lenoir sails
from Port Angeles, Wash., to Point Arena for placing two
12-mile shore sections . . and returns to Port Angeles . .
total 1,500 miles.

CABLE ROUTE
Hawaiian Telephone Cable

...uncharted underwater mountain
found during route selection.

Discovering an unknown mountain beneath the sea was an unexpected adventure for Long Lines men aboard the Liberty Ship, Arthur M. Huddell.

The 11,000-foot peak, about the size of Mt. Hood, was located last September when telephone engineers were plotting the route for the Hawaiian telephone cable system. They were charting the topography of the ocean bottom with a device called a depth-recorder, which bounces sound waves off the bottom. Precise timing of a bounce determines the ocean depth.

The survey was made because little was known about the ocean bed beyond the continental shelf. The route had to avoid steep slopes, often subject to submarine landslides, which could snap the cable. It also had to avoid crossing canyons where cables might be exposed to abrasion by ocean currents.

The Huddell travelled the route of the south cable on her westerly course, and the north cable on her return trip. One night an engineer on duty was startled when the

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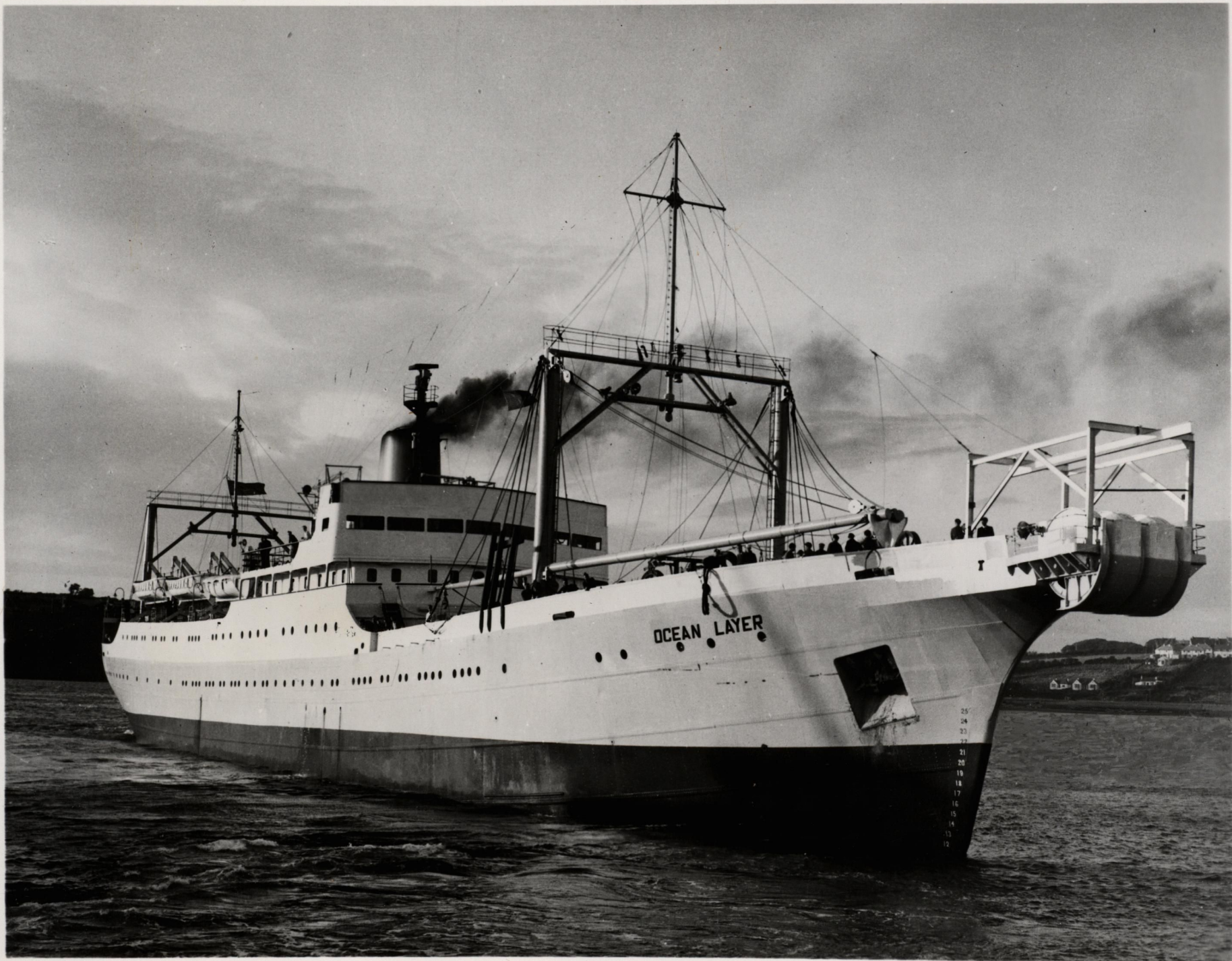
stylus of the depth-recorder rose so sharply and swiftly that it left the paper. It jerked off the paper five times. It was a mountain that had never been charted. The crew dubbed it "Mount Huddell".

The fourth day out, she reached the Murray Fracture Zone, a trough four miles wide running 1,200 miles east to west. Engineers had to search around until they found a slope gentle enough to accept the cable. The next problem they faced was to locate the best way through the "Moonless Mountains", which stretch 1,000 miles north to south and rise two miles above the ocean floor.



H.M.T.S. Monarch, world's largest cable-laying ship, will play vital role in laying of 2,400-mile submarine telephone cable system this summer that will link Hawaii with the States. Capable of carrying some 1,900 miles of cable, Monarch laid transatlantic submarine telephone cable system from Newfoundland to Scotland in 1955 and 1956, the first voice cable to span an ocean. Project is joint undertaking of American Telephone and Telegraph Company and the Hawaiian Telephone Company.

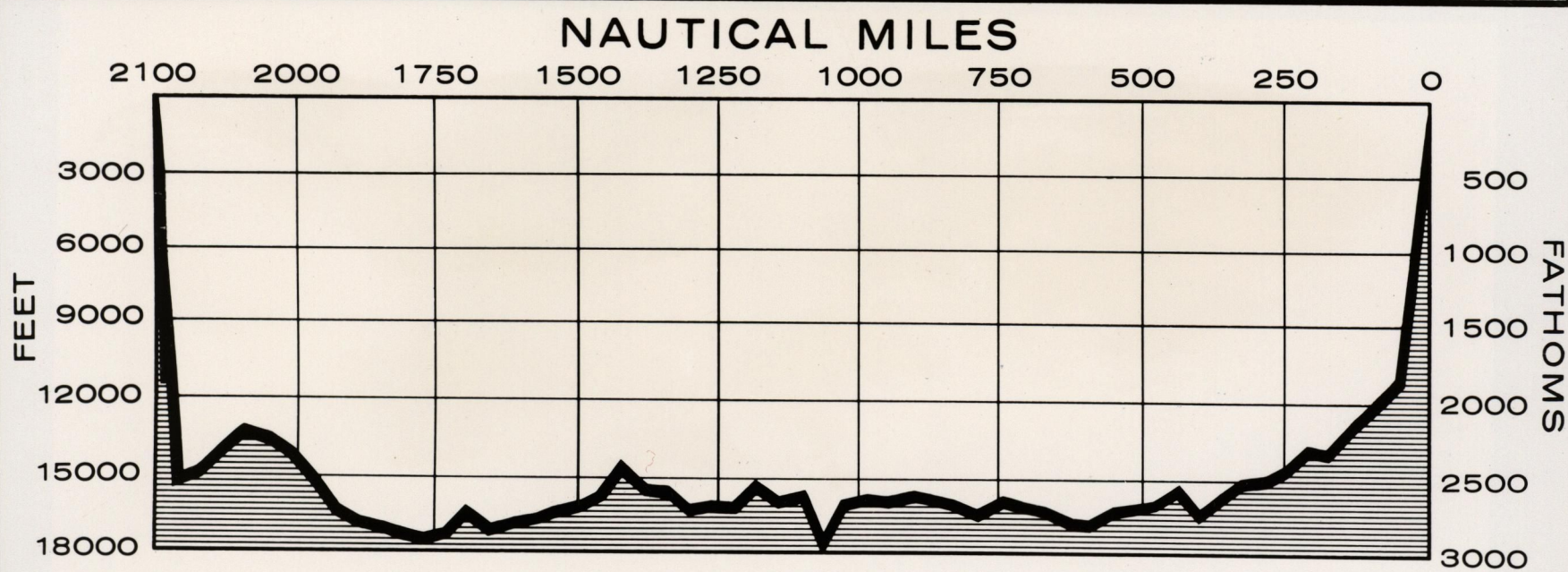
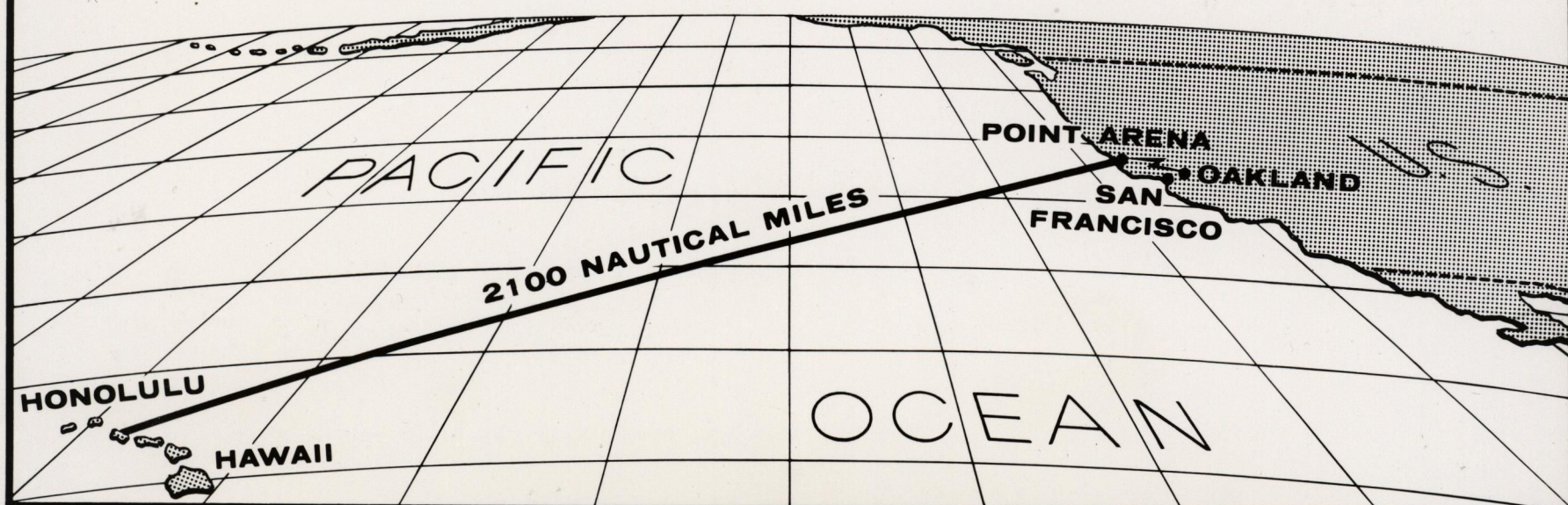
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Cableship Ocean Layer (above) will assist Monarch in laying of twin submarine telephone cables from U.S. mainland to Hawaii this summer. Bell Telephone System and Hawaiian Telephone Company are building underwater cable system which will go into service this fall. In addition to Ocean Layer and Monarch, a third vessel - the supply ship Arthur M. Huddell - will be used in the cable-laying operation. Cost of project is \$37,000,000.

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HAWAIIAN TELEPHONE CABLE ROUTE



Overall route of Hawaiian submarine telephone cable system reaches from Point Arena, Calif., to Honolulu, Hawaii. Segments include 130-mile radio relay route from Oakland, Calif., to Point Arena; 2,100 nautical (2,400 statute) mile Pacific cable, and 12-mile land cable between landing site on island of Oahu and Honolulu.

Lower sketch shows varying depths of Pacific floor over which cable will be laid this summer (1957).

Participating in project are the Long Lines Department of American Telephone and Telegraph Company, Hawaiian Telephone Company, and The Pacific Telephone and Telegraph Company.

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