

HISTORY
OF SHELL OFFSHORE SEISMIC OPERATIONS
IN THE UNITED STATES

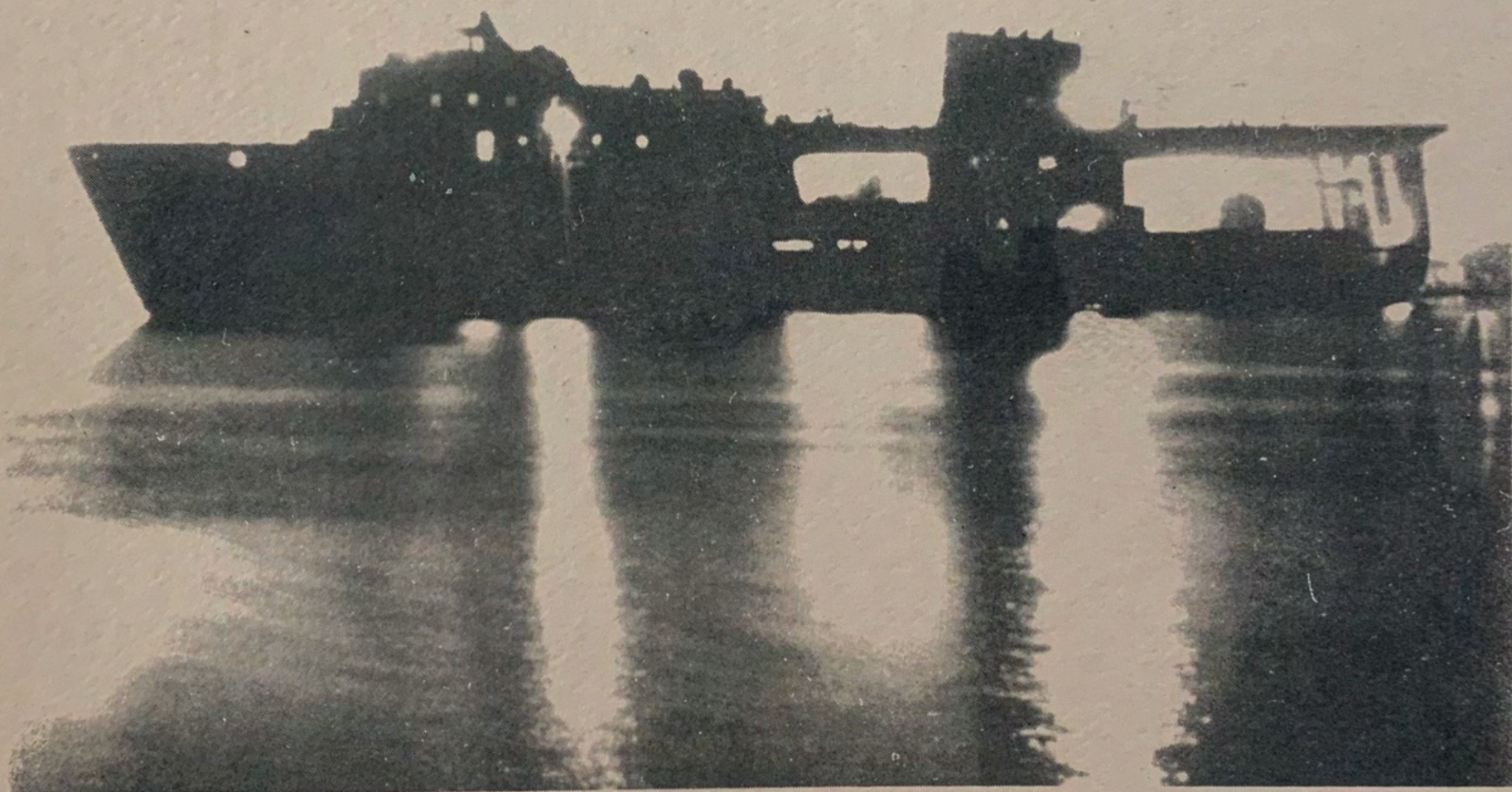


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Shell Oil Company

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Many of the people who started Shell's offshore seismic work have retired or are deceased, but a few who worked in the early days are still with Shell. Senior and younger personnel have supplied their recollections for the compiling of this history. They are acknowledged at the end of this introduction.

Table 1 lists offshore seismic party chiefs who implemented the various technological advancements of the past fifty years. This list has been compiled from the memories of a number of people and therefore, like the rest of this history, may not be totally accurate or complete. We apologize for any errors or omissions. These party chiefs, their crews, R&D personnel, Head Office Field Engineering, management, and many other categories of personnel share credit for meeting the challenges of a new field in petroleum exploration.

INTRODUCTION

This document summarizes how Shell Oil Company has used seismology to find offshore petroleum, from the first operation in 1936 near Corpus Christi, Texas, to the present operations off all coasts of the U.S. mainland and Alaska.

Seismology, the science of using sound waves to determine what lies below the earth, was first tried in England in 1851. During World War I, the German army listened to earth vibrations in order to track gun batteries of the Allied army. Modern petroleum seismology began in 1920 when refraction techniques were applied to identify oil-containing geological structures near Hamburg, Germany. During 1923-1924, the same methods were used onshore, in Mexico and East Texas.

Shell's first operation offshore the United States took place in 1936. The work was an innovative and unauthorized extension of an onshore crew's program to continue tracking a promising structure into the water. They used small rented boats and adapted to the water techniques employed on land. The crew mapped a considerable area into 60-foot deep water. Chapter 1 tells about this first water operation.

The rest of Shell's offshore history is largely related in chronological order. It includes key people involved, as remembered by those who contributed to this history, and methods and equipment used, including a varied collection of boats and ships. These range from converted shrimp boats and World War II vessels in the early days, to modern ships designed specifically for seismic work beginning in 1965.

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Although the people, ships, and equipment have changed over the years, the basic principles of offshore seismology remain the same: to generate, receive, process, and interpret the strongest, best-controlled and most-well-defined seismic signals possible.

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1947: A New Fleet and Large-Scale Operations Offshore Louisiana

In the summer of 1947, Shell upgraded its seismic fleet by replacing the three shrimp boats with two World War II minesweepers, the *Ora Mae* and the *Edna S*. The minesweepers were modified and put into full operation by the winter of that year.

Figure 12 shows the *Ora Mae*, and Figure 13 shows several crew members aboard the *Edna S*. Figures 14-17 are of other boats used in the 1974 era: *Blue Chip*, *Tommy Nelson*, *Miss Ethel*, and *Young Nelson*.

Many details of the period from 1946 through 1947 are documented in *Transactions of the Geophysical Conference, Part I*, Shell Oil Company, Houston, January 27-30, 1948. In regard to the new larger-scale program, the transactions state that it was "especially desirable in view of the keen competition in offshore exploration, in which the company was a relatively late entrant."

At this time, the company began experiments with SHORAN* for navigation and with a new shooting method called continuous reflection profiling. Experiments with SHORAN navigation were begun under a contract with Offshore Navigation. The Geophysical Conference transactions report that visual surveying, radar, sonabuoys (a method using high-frequency sound waves in water), and SHORAN were tried, but that "SHORAN provides the most satisfactory surveying method . . . it is accurate and extremely rapid and flexible in operation." Shell rented boats for anchored SHORAN base stations offshore.

As recording equipment for continuous reflection profiling, the company chose a cable 3200 feet long with 16 sections, each 200 feet long. Gimballed seismometers were attached at 200-foot intervals, and the cable was dragged along the sea bottom. Hence the system was called a "gimbal bottom-drag cable."

The shooting boat was offset 100 feet away from the instrument boat which was towing the cable. The shot spacing was 1600 feet. Charges were Du Pont Nitramon explosive, set off 3-8 feet below the surface. Figure 18 diagrams three methods of continuous reflection profiling used then.

Marine parties kept up a continuous schedule with rotating shifts of 10 days on with 5 days off. One third of the crew was replaced every five days. Coverages of as much as 25 miles per day were reported.

The Geophysical Conference transactions commented: "This volume of work imposes a considerable burden on the interpretive and computing staff, especially since they are required to prepare cross sections with individual seismometer traces plotted in all cases. The computing problem can be handled by the use of a graphical method of plotting, described by J. G. Parker (1947, West Coast), which permits rapid, accurate computation of a great volume of reflection interpretation by a relatively small staff."

*SHORAN is a system of SHort-RANge Navigation employing two radio signals transmitted by a sender and returned by two stations.

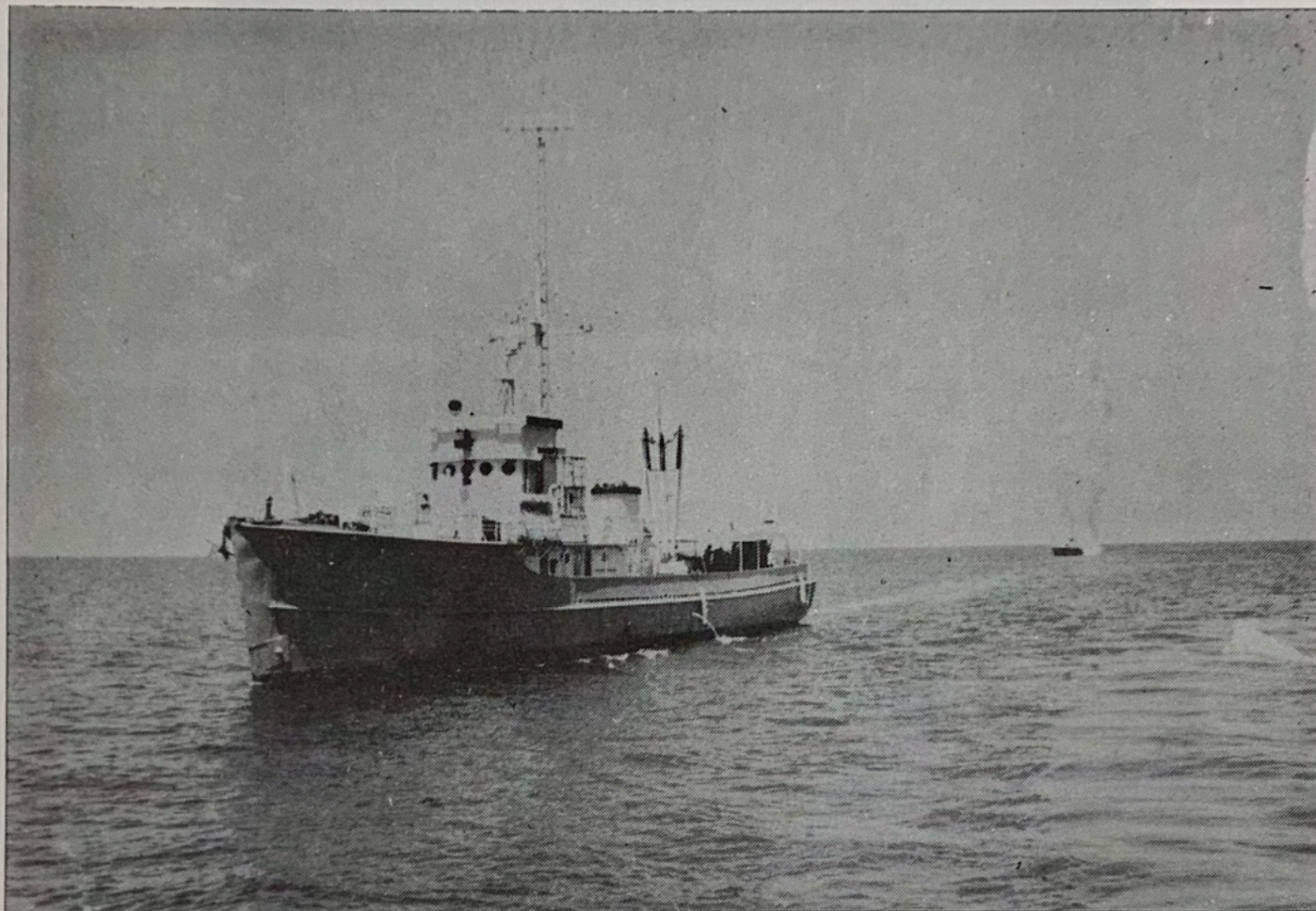


Figure 12 - 1947: M/V *Ora Mae* - 136-foot wood-hull minesweeper used as an instrument boat; the other boat is the *Wilma*, a shooting boat.

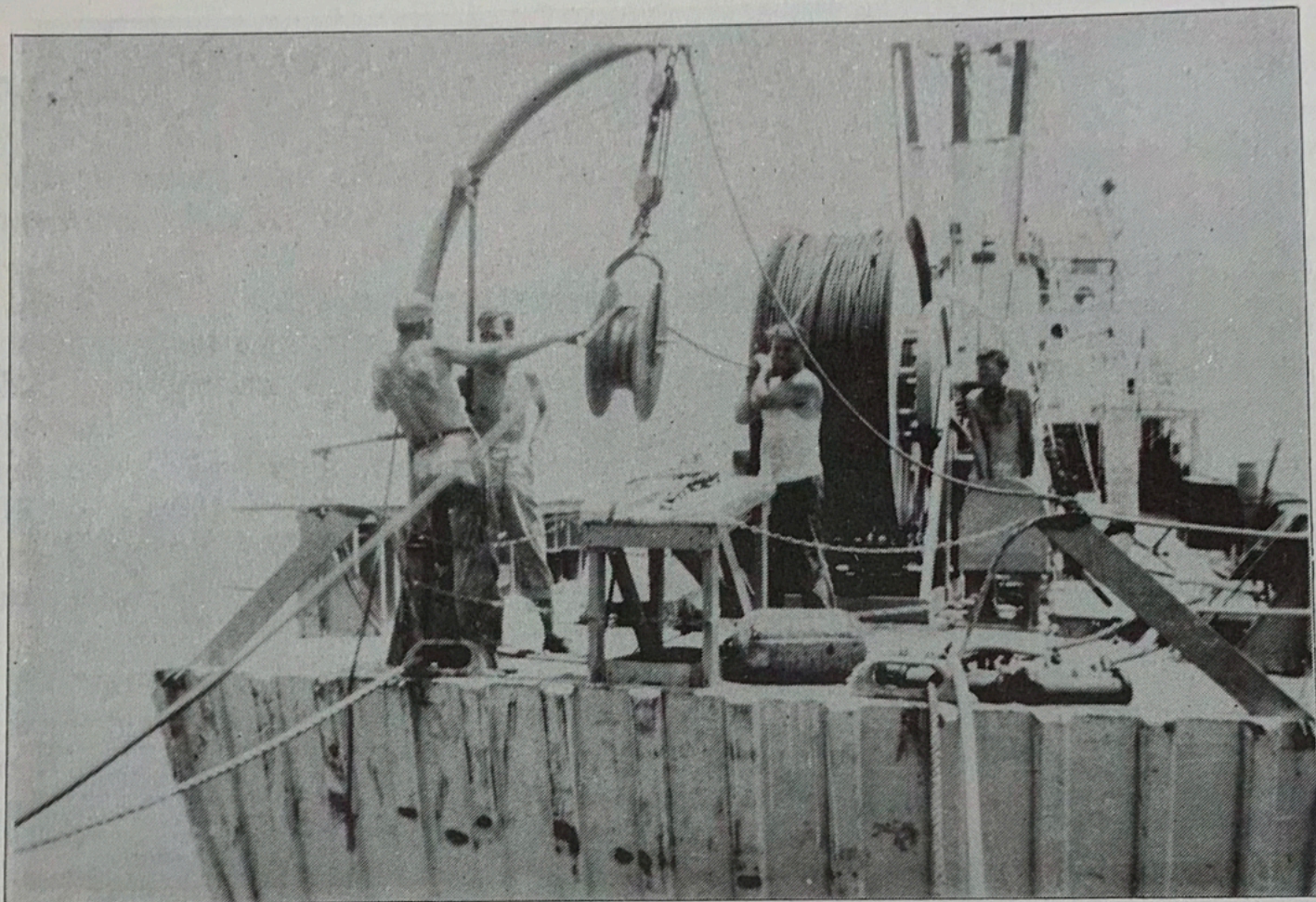


Figure 13 - 1950: Aboard the minesweeper *Edna S* are left to right and facing camera, Ray Powell, _____ Hudson, and J. B. Green.

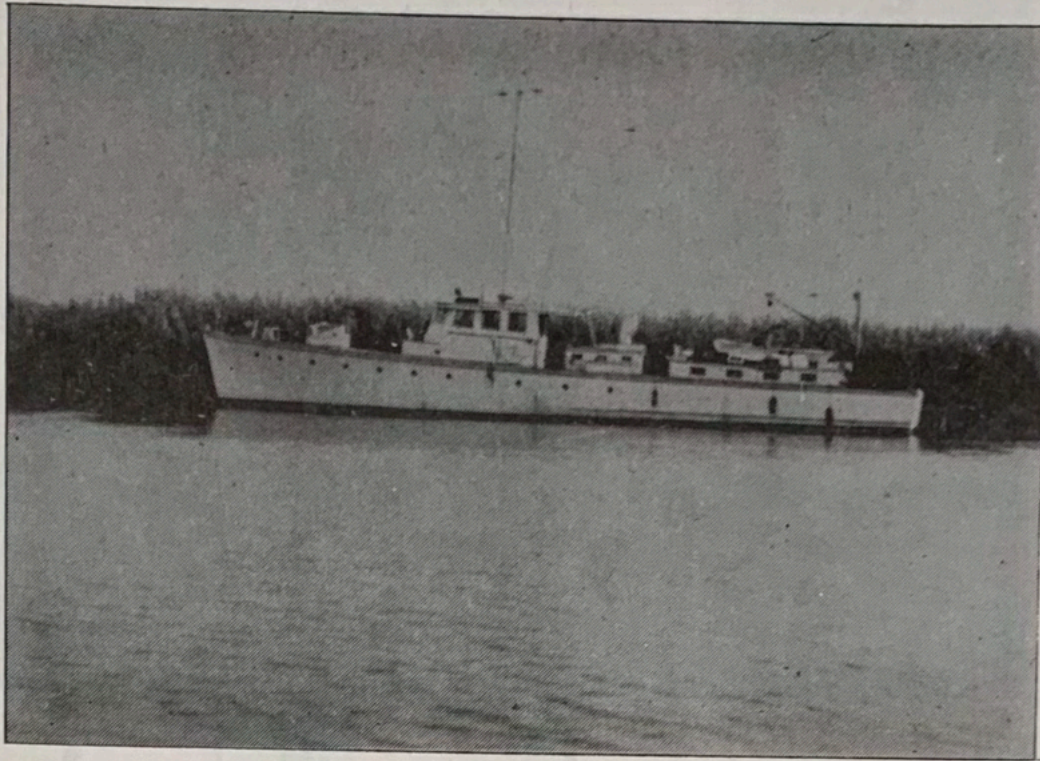


Figure 14 - 1947: *Blue Chip*, 104-foot air/sea rescue boat, used as a base station boat.



Figure 15 - 1947: The *Tommy Nelson*, 85-foot supply boat.

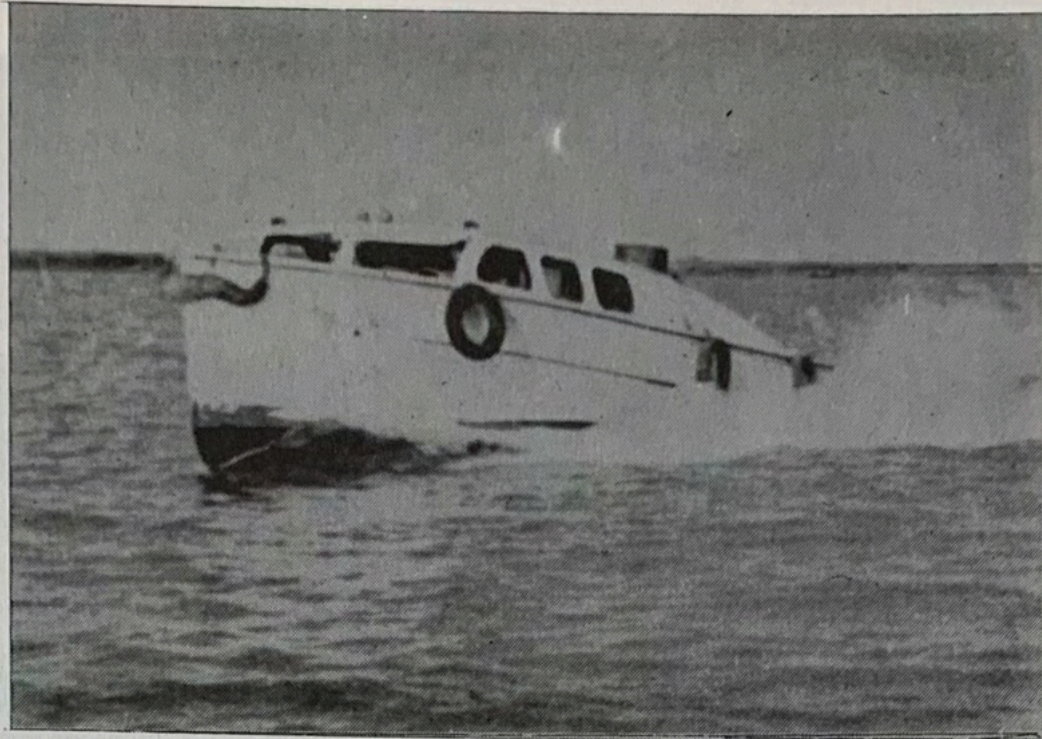
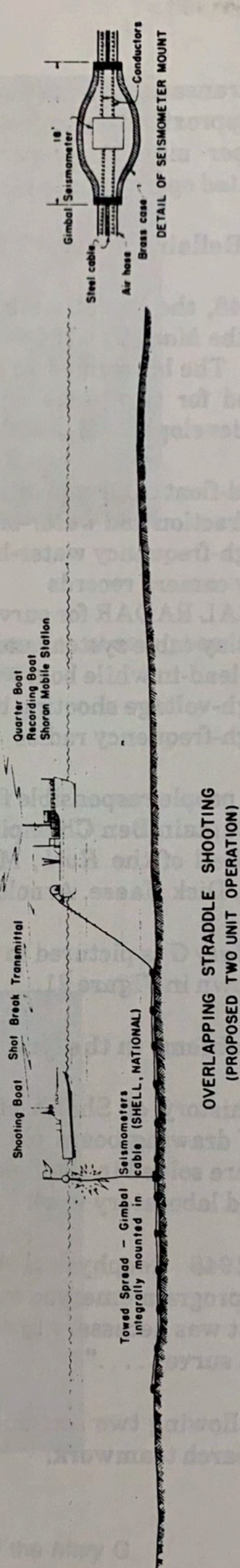
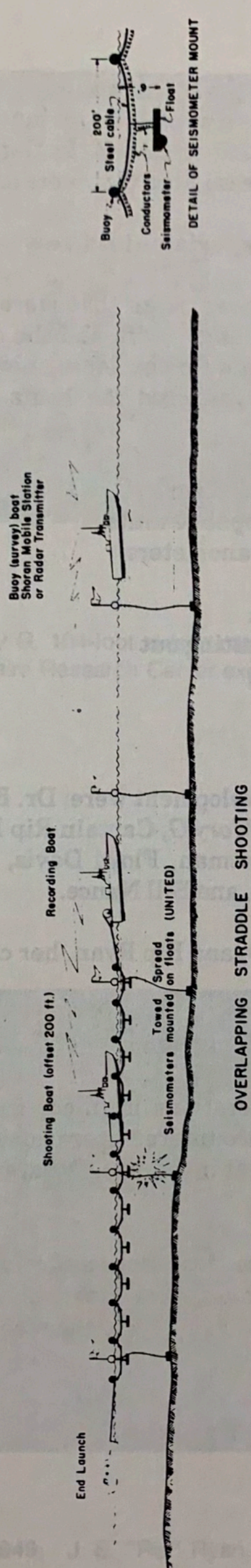
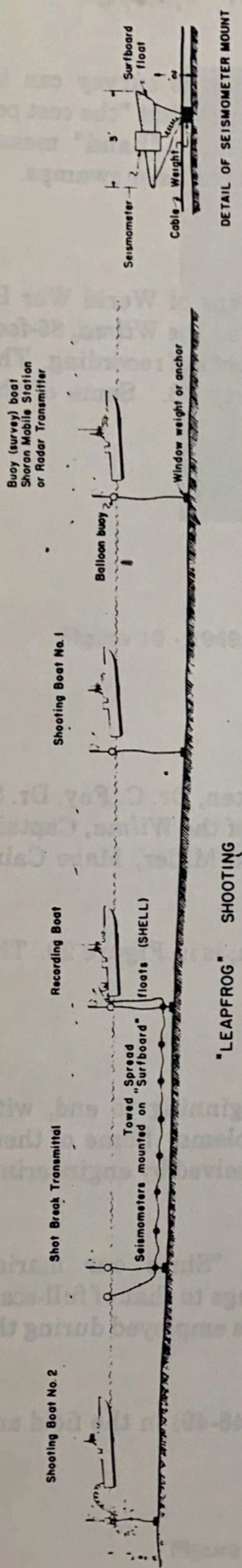


Figure 16 - 1947: *Miss Ethel*, used as a shallow-water instrument boat.



Figure 17 - 1947: *Young Nelson*, used as a shooting boat.



SCHEMATIC DIAGRAM
OF
OFFSHORE SHOOTING METHODS-CONTINUOUS REFLECTION PROFILE

Figure 18 - 1947: Three methods of continuous reflection profiling.