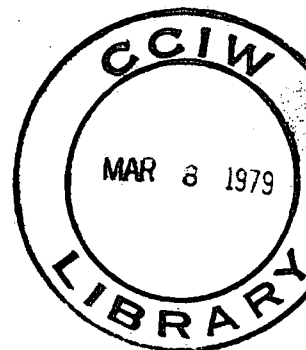


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1978 FIELD REPORT
PROJECT ARD-025
BACTERIA DIE-OFF RATE

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1978 FIELD REPORT
PROJECT ARD-025
BACTERIA DIE-OFF RATE

Submitted by:

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Technical Operations Section
Scientific Support Division
National Water Research Institute

1978 MICROBIOLOGY BACTERIA STUDY

ON DIE-OFF RATES

Submitted by:

G.J. Koteles
Technical Operations Section
Scientific Support Division
National Water Research Institute

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ILLUSTRATIONS OF A TYPICAL STATION INSTALLATION

- Figure 1 Assembly of chamber in preparation for injection of the bacteria medium.
- Figure 2 Bacteria medium being injected into the chamber.
- Figure 3 Mooring #7 ready for launching.
- Figure 4 Mooring with chain anchor being lowered.
- Figure 5 View of station #2 in place at Willow Pt., Hamilton Harbour.

SUMMARY

This program, ARD-025, has been undertaken to compare die-off rates of common bacteria types which may be hazardous to health. For instance, some sewage plants over-disinfect and thus have effected closure of normally good beach swimming areas.

It is now becoming more apparent that chlorination may be producing mutegenic and carcinogenic toxins in the water environment. Therefore, part of this program was carried out in a stream exclusively by Microbiology. This stream had no sewage treatment plants along its water course. Whereas ARD-025 was completed in the Hamilton Harbour area in which the water is quite polluted. Die-off rates of various bacteria were to be compared at the end of the year and studied to find out more about the effects on the water environment and bacteria, particularly of over-chlorination.

PREPARATION FOR THE DIE-OFF RATES IN BACTERIA STUDY

Similar experiments with bacteria die-off rates have been set up for rivers. Our work involved substituting available equipment at CCIW for use in the lake environment. Tests were performed using semi-suspended moorings to get the most rugged and yet flexible system possible. Note drawing, page 8,

As a result, we came up with a mooring having 6 - 10 feet of 1/2 inch chain for anchors. This was shackled to 1/16 inch braided wire rope onto a double plexiglass frame. This frame housed 2 .45 micron membrane filters. In effect, everything depended on the membrane filter paper standing up to the wave motion and physical handling in the field. With this system, the bacteria medium could be injected between the filters and water could pass freely across the chamber.

4180-1

14 June 1978

Mr. M.K. Helseth
Harbour Master
The Hamilton Harbour Commissioners
605 James Street North
Hamilton, Ontario
L8L 1J9

Dear Mr. Helseth:

We request your authorization to moor five (5) scientific moorings in Hamilton Harbour. These moorings will consist of a single polypropylene line attached to a cement clump and marked by an orange, 30-inch diameter poly float at the surface. Two sampling instruments will be attached to the polypropylene line at fixed depths.

We plan, with your approval, to install the moorings on July 10th and retrieve them on the week of August 14th. These moorings will be serviced frequently and any loss or premature retrieval of the moorings would be reported to your office immediately.

The mooring positions are:

<u>Latitude N.</u>	<u>Longitude W.</u>
43° 16' 34"	79° 51' 49"
43° 16' 33"	79° 52' 00"
43° 17' 08"	79° 52' 06"
43° 18' 20"	79° 49' 38"
43° 18' 24"	79° 48' 32"

The following mooring positions are in Lake Ontario North and South of Burlington Canal:

43° 18' 18"	79° 47' 30"
43° 17' 58"	79° 47' 12"

Attached please find a drawing showing approximate station locations.

We trust that this request will cause no problems.

Yours sincerely,

H.B. Macdonald
Head, Technical Operations Section
Scientific Support Division
Canada Centre for Inland Waters
867 Lakeshore Road, P.O. Box 5050
BURLINGTON, Ontario L7R 4A6

EQUIPMENT LISTING

- 6 - Lengths 10' x 1/2" diameter chain
- 30 - 1/4" Shackles
- 24 - 3/16" S.S. Bridles made up in the Technical Operations Shop
- 1 - 300' roll of 1/2" poly rope
- 6 - 1/4" S.S. wire rope 1 1/2' in diameter with sleeves
- 1 - Boston Whaler
- 1 - Boat hook for retrieval of moorings
- 12 - Plexiglass chambers equipped with membrane filter papers
- 2 - Syringes (50 cc)
- 3 - 2ℓ Van Dorn bottles
- 1 - Set tools
- 1 - Portable EBT and bucket thermometer

CHRONOLOGY OF EVENTS

- June 14 - Bacteria mooring placed in Hamilton Harbour for testing
- June 19 - New assembly made up for test
- June 21 - Surveillance of and continuation of test
- June 23 - Mooring filter membrane not strong enough, therefore, mooring removed and more durable filters ordered
- July 10 - Start of bacteria program. Six moorings placed and inoculated with bacteria medium
- July 16 - Monitor of the 6 stations, then moorings were removed
- August 18 - Moorings were placed in the Harbour and Ontario side of the Burlington Canal Piers for another trial
- August 21 - Monitor and removal
- October 3 - Placement and monitor
- October 5 - Monitor
- October 11 - Monitor
- October 18 - Final monitor and moorings taken out
- October 25 - Disassembly of moorings

OPERATION DESCRIPTIONS

By July 10th all of the membrane filter breakage problems had been rectified by the use of heavier filters. We then proceeded with four stations located in the Hamilton Bay and two on either side of the Burlington Canal Piers. Each station involved taking a temperature trace, a water sample at the depths of the filters and finally removing from 5 - 10 cc of the medium solution from within the filter chamber walls. The bacteria medium was then brought back to the lab at CCIW to be analysed for growth or die-off rate.

Completing the 6 stations involved one-half day's work for two people, as far as sample collection was concerned. Once every two weeks the samplers would be injected with a different concentration or type of bacteria. This was done to detect any unusual information which would explain growth in some areas and the lack of growth in other areas.

More time had been spent on this program than anticipated due to the breakage of the membrane filters and finding the correct adjustment of the bacterium for each test. Over a period of two months, there were fourteen 1/2 days allotted to this program. Results indicated a decrease in bacteria population at the bottom chamber. Also, the less polluted waters of Lake Ontario; namely: stations 5 and 6, had a tendency to die off at a faster rate.

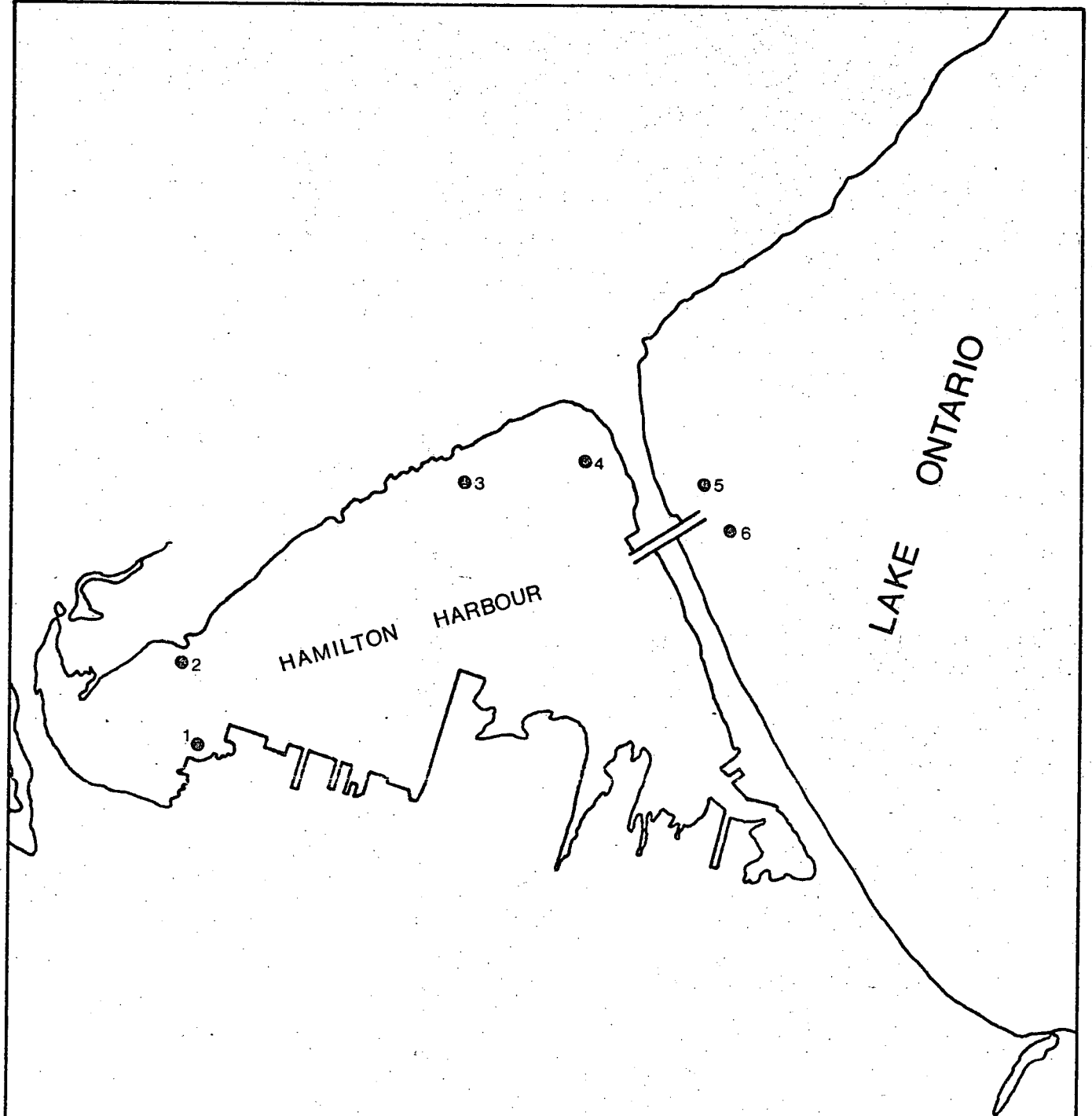
FINAL STATION POSITIONS

<u>Station Number</u>	<u>Latitude N.</u>	<u>Longitude W.</u>
1	43° 16' 33"	79° 52' 00"
2	43° 17' 06"	79° 52' 06"
3	43° 18' 20"	79° 50' 22"
4	43° 18' 24"	79° 48' 24"
5	43° 18' 18"	79° 47' 30"
6	43° 18' 00"	79° 47' 12"

CONCLUSIONS AND RECOMMENDATIONS

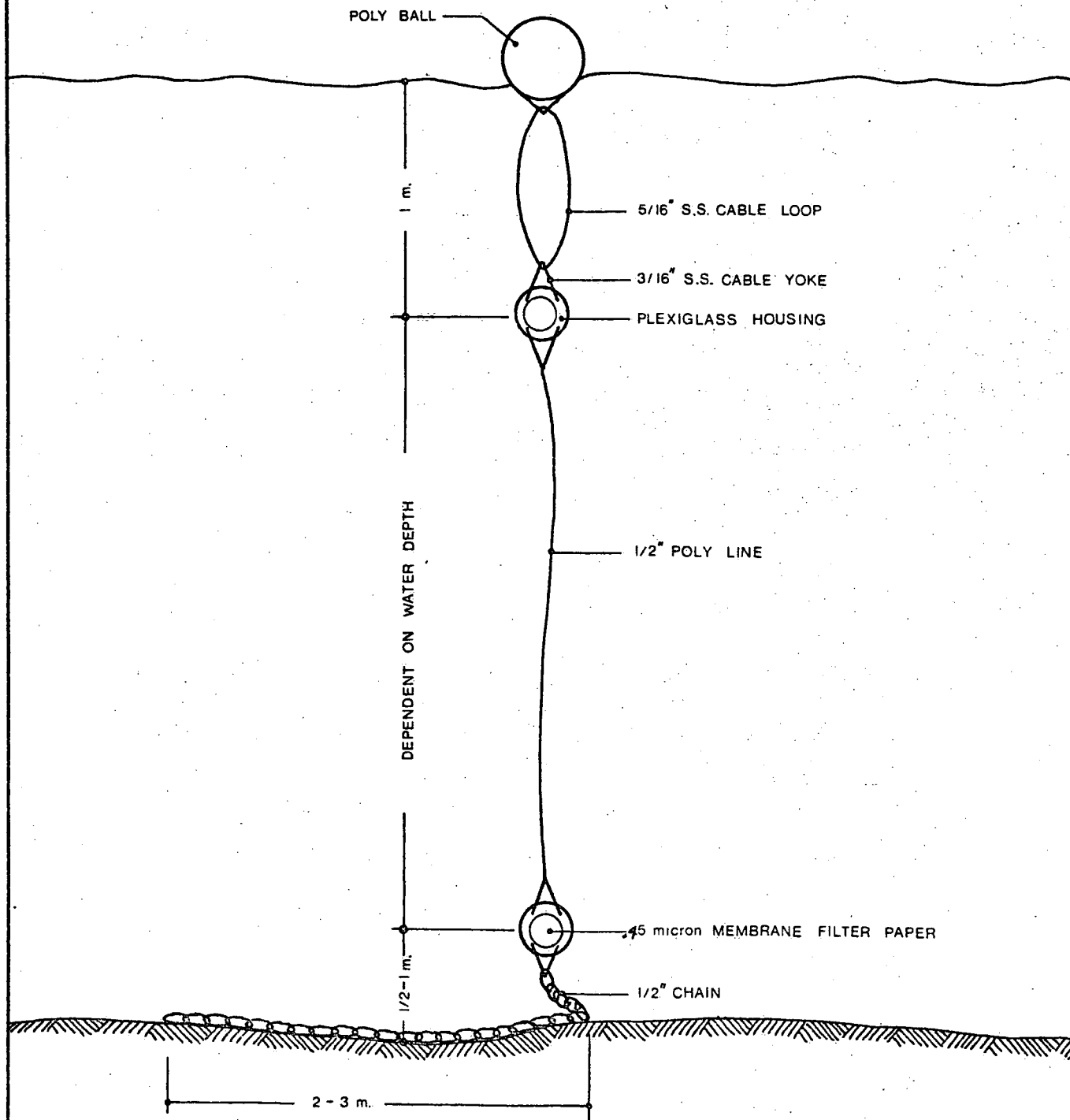
By the mid-point of summer, the experiment was well underway.

However, some time and effort could have been saved by pre-testing the experiment from the description as written for river work. Any extra effort in pre-testing experiments such as this from the CCIW dock area will quickly show up problems. This would eliminate the need for a Technologist and a boat. For the Lake Ontario stations, a longer length chain is recommended. With only 5 feet of length, both of these moorings drifted into the shallow beach area.



BACTERIA DIE-OFF STATIONS

BACTERIA DIE-OFF MOORING



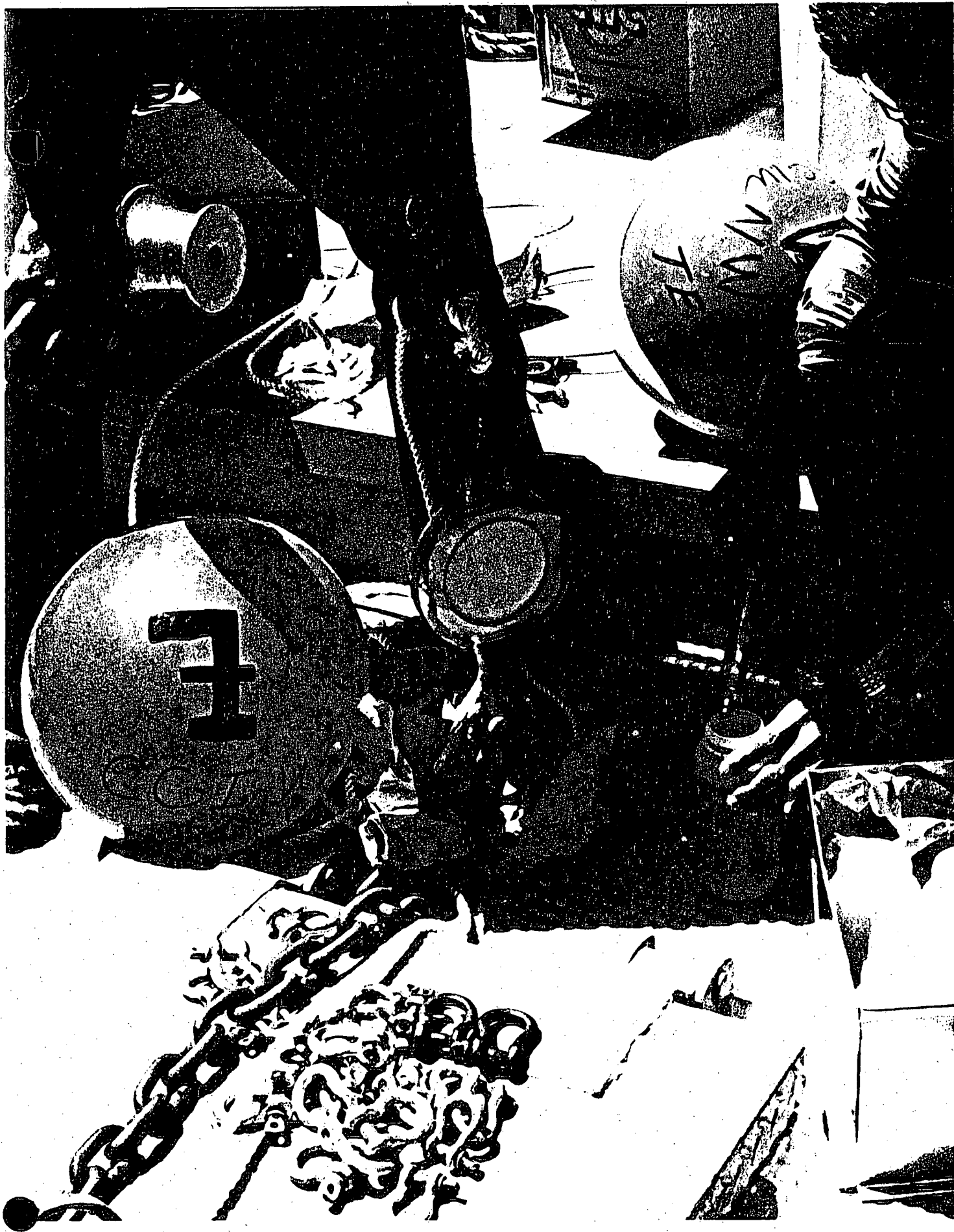


Figure 1: Assembly of chamber in preparation for injection of the bacteria medium



Figure 2: Bacteria medium being injected into the chamber

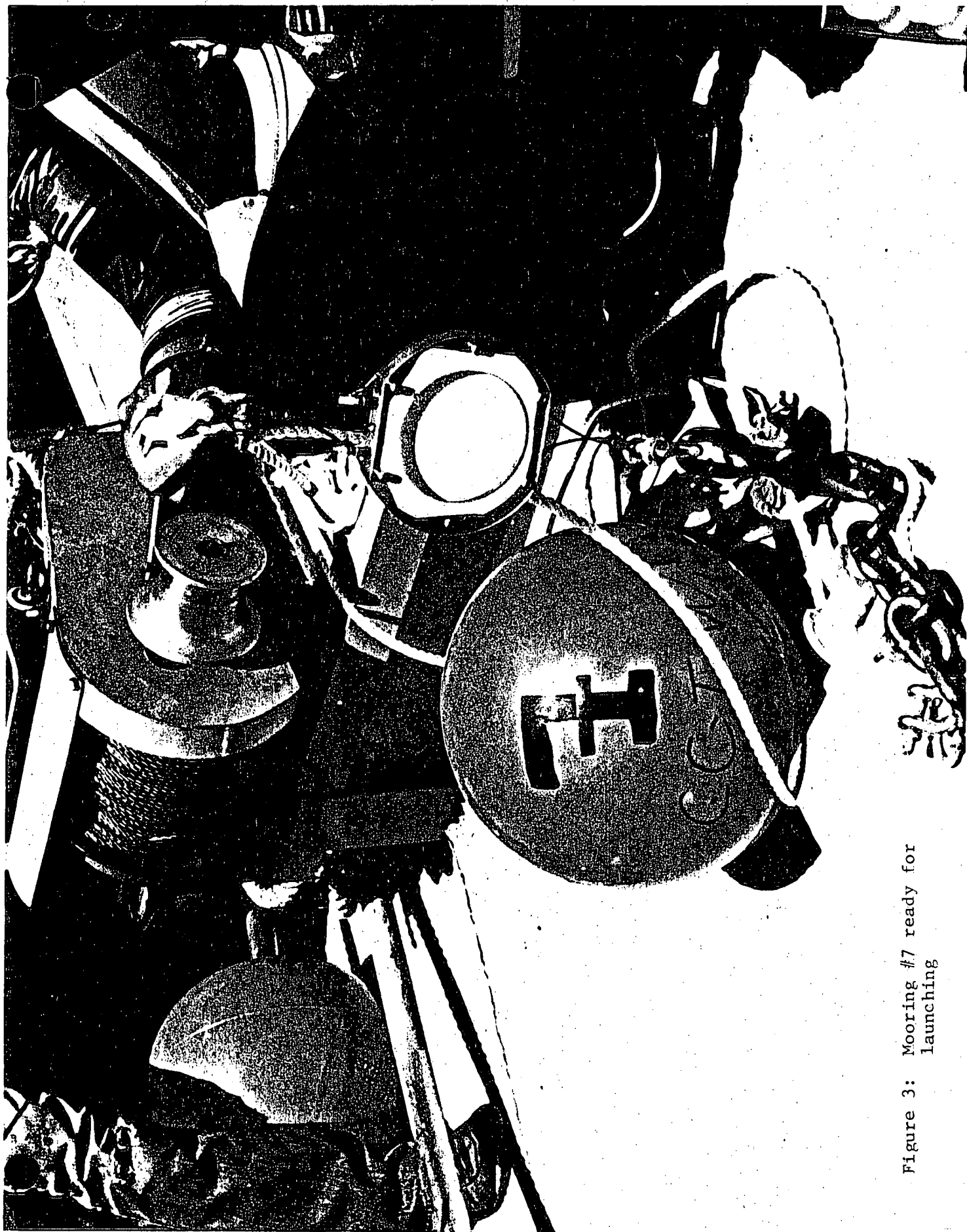


Figure 3: Mooring #7 ready for launching

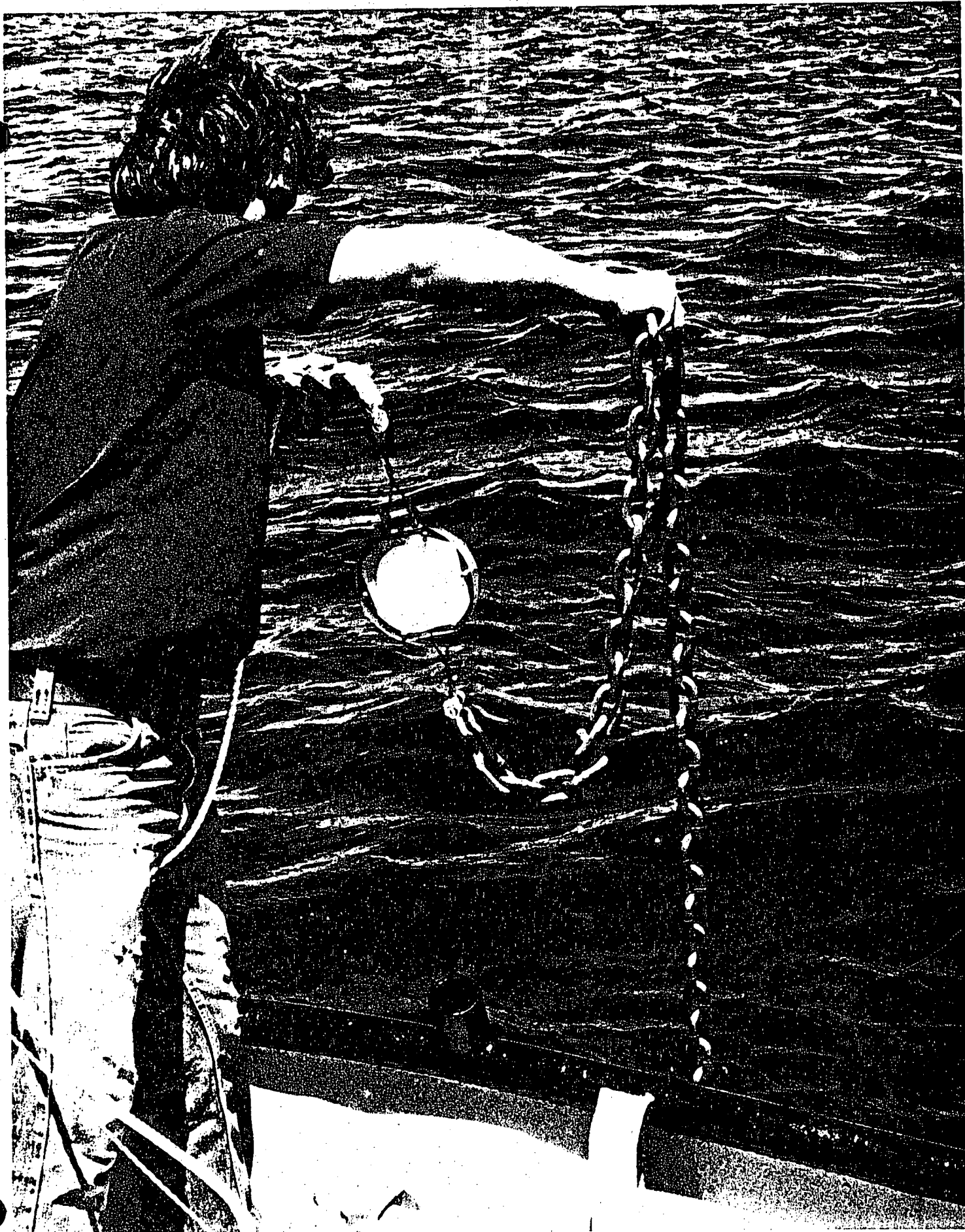


Figure 4: Mooring with chain anchor being lowered

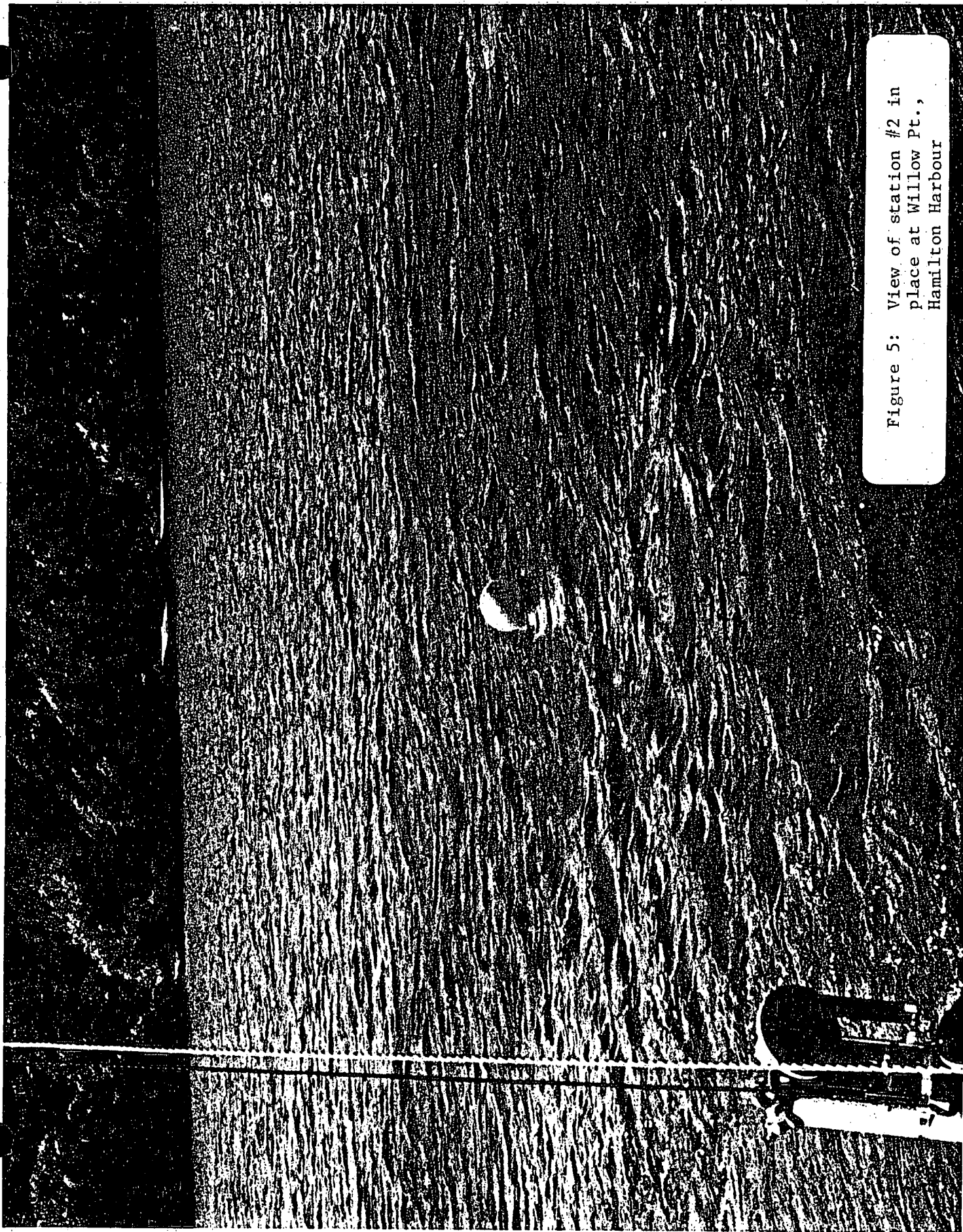


Figure 5: View of station #2 in
place at Willow Pt.,
Hamilton Harbour

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