

Age

**Some Equipment
for
Mechanical Control
of
Aquatic Weeds**



Some Equipment for Mechanical Control of Aquatic Weeds

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NOTE

Inclusion in this publication does not constitute an endorsement of any item, firm, or company, nor should exclusion be interpreted as criticism by the International Plant Protection Center, Oregon State University, or the editor.



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INTRODUCTION

Technical literature has repeatedly chronicled the devastation wrought by aquatic weeds growing uncontrolled. Reservoirs become infested and lose significant water storage capacity; lakes are overrun and rapidly degenerate to near worthlessness; canals and ditches are clogged or choked restricting water flow; and water system pumping intakes become fouled and damaged. Aquatic weeds can also serve as a haven for disease carrying insects. Along with their dryland brethren, aquatic weeds unquestionably constitute a full-fledged pest—and often a threat—to man.

Total eradication of weeds is usually utopian and, in most cases, unnecessary. But control of weeds, that is reducing their presence to a manageable level and maintaining that state through periodic measures, is not only desirable, but imperative. The longer weeds are allowed to flourish uncontrolled, the greater the cost of control operations.

Aquatic weeds can be controlled by several methods: mechanical, chemical, biological, and cultural means. Each can be used successfully (alone and sometimes in combination), but economic, physical, or environmental aspects of a specific situation often eliminate several alternatives thereby limiting the technology that is feasible.

Mechanical control is generally regarded as the cutting or dislodging of aquatic weeds, often with subsequent removal of the resulting cut organic matter from the water body. Mechanical control can also include physical restraint of floating aquatic plant material.

A number of firms worldwide construct and market specialized equipment for cutting,

harvesting, or otherwise mechanically controlling aquatic weeds. The following pages are an attempt to briefly describe some of these units and provide addresses of the firms involved. Then, if additional information concerning a particular piece of equipment is needed, the proper firm may be contacted directly. Most reputable firms welcome inquiries and stand ready to supply details.

This report makes no pretense of being inclusive of all units available worldwide. However, the information represents most of those firms suggested by experts in aquatic weed control in a number of countries. Also, the equipment is, with a few exceptions, all designed to operate on the water surface. Ditch-bank weed cutters, mowers, and other land based equipment—such as used in drag chaining—have not been included, nor have dredges. In short, this is a partial view of highly specialized equipment designed expressly for mechanical control of aquatic weeds.

The text is divided into three categories: aquatic weed cutters and rakes; other equipment (including prototypes); and, list of companies. All companies that responded to inquiries (and their equipment) are listed alphabetically in respective sections.

The information presented is based on material supplied by the companies. Some firms provided a greater amount of detail and usable information than others and this tends to be reflected in the length of the description. The specifications listed are those furnished by the companies, but naturally are subject to change.

It is disconcerting to note that in every illustration supplied for the publication that included operating personnel, adequate marine safety equipment—a life jacket, or other device—was noticeably absent. There is also evidence of belt and shaft drives without shielding. Hopefully purchasers of machinery for mechanical control of aquatic weeds will be more safety conscious and take steps to provide appropriate safety gear to protect personnel.

A word of caution: some species of aquatic weeds thrive when cut and multiply even faster than when left alone. Therefore, a knowledgeable aquatic weed specialist should be consulted before undertaking any extensive cutting (or other mechanical control) programs or investing in any special control equipment.

The International Plant Protection Center at Oregon State University presents this report in hope that it can assist in the universal battle against noxious weeds. Comments and additional information will be most welcome •

ACKNOWLEDGMENTS

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Thanks, too, to all the firms that generously responded to inquiries by supplying information, literature, and photos.

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ABBREVIATIONS USED

m = meter

cm = centimeter

ft = foot (feet)

in. = inch

yd = yard

kg = kilogram

lb = pound

kph = kilometers per hour

mph = miles per hour

rpm = revolutions per minute

hp = horsepower

cu in. = cubic inch

cu ft = cubic foot

cu yd = cubic yd

cu m = cubic meter

lt = liter

AQUATIC WEED CUTTERS AND RAKES

Air-Lec Industries, Inc.

WC-10 Aquatic weed cutter
WR-20 Weed rake

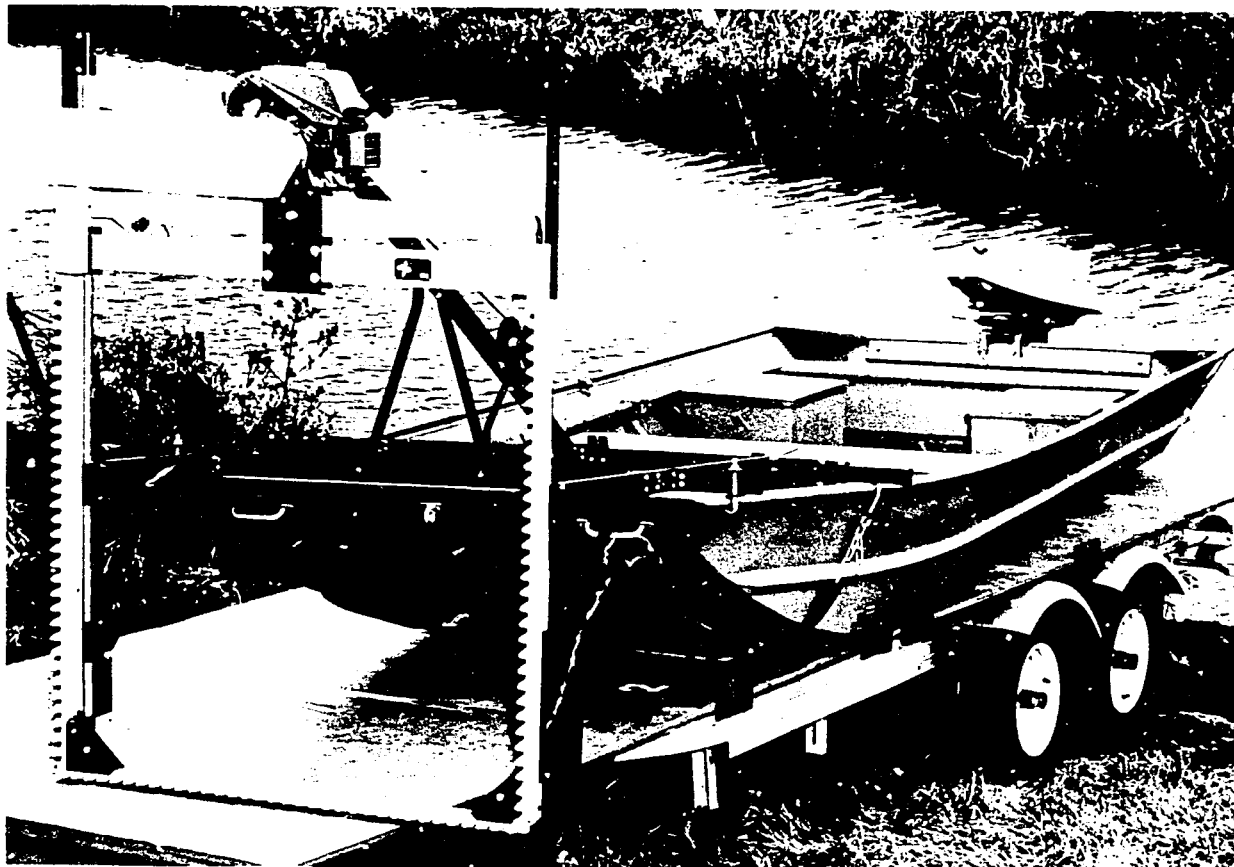
The WC-10 cutter consists of a steel mounting framework with brackets, reciprocating cutters, gasoline engine and drive mechanism, plus a winch and cable. The entire assembly, weighing 99 kg (218 lb), may be mounted on most boats measuring 4.5 m (15 ft) or longer. A flat bottom craft gives the most satisfactory performance. Bracket extensions are available that permit the cutter to be mounted on various width boats.

One horizontal and two vertical blades comprise the "U" shape cutter which mows a 107 cm (42 in.) wide swath. Depth of cut—down to approximately 107 cm (42 in.) depending on the free-board of the boat—is controlled from inside the boat. Adjustments can be made while the cutter is operating. Stabilizing fins are fitted to the two vertical blade guides.

The 2-cycle, 3 hp engine drives the cutting blades through 6-to-1 reducing gears. Capacity of the fuel supply tank permits approximately two hours of continuous operation. The crankshaft is counter weighted to reduce vibration.

A separate mounting frame is utilized for attaching the WR-20 weed rake, which clears an area 2.4 m (8 ft) wide on a single pass. The rake angle is adjustable from vertical to horizontal. According to the manufacturer, the rake is most effective when affixed to a separate boat, though the rake and cutter may be combined on the same boat.

The WC-10 (shown in photo) requires two people for operation: one person to tend the cutting



equipment and the other to control the boat. Weeds may be cut at speeds of 5-10 kph (3-6 mph) depending on the concentrations of plant matter •

American Waterweed Harvesting Co.

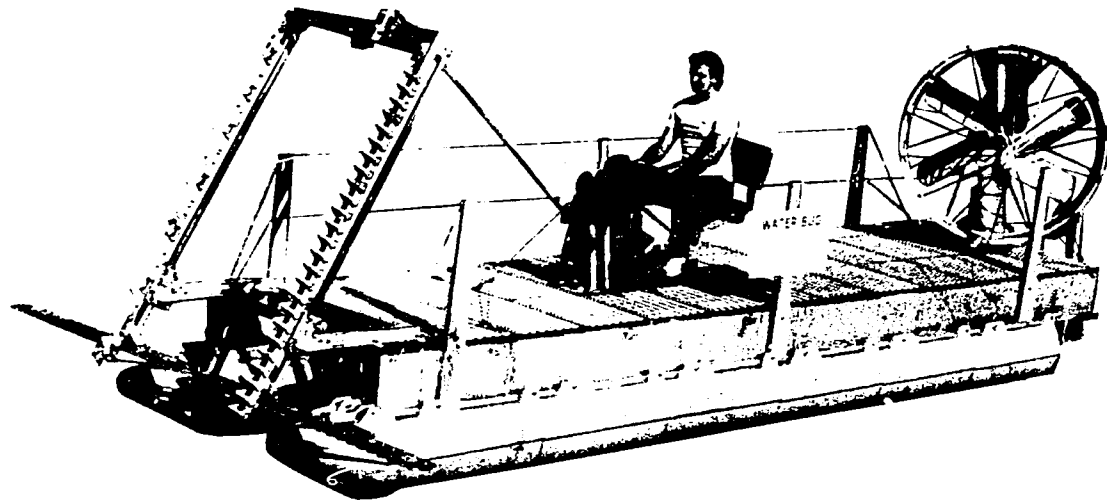
Water Bug Water weed harvester

The 6.1 m (20 ft) long Water Bug floats on two high impact polyethylene pontoons which support a metal platform. An operator's station is positioned amidships.

Two gasoline engines supply power: an 8 hp unit drives the rear mounted 1.2 m (4 ft) diameter air fan, with 360° degree horizontal rotation, that propells the craft. The other engine has 5 hp and connects to the reciprocating sickle cutter blades.

Two vertical blades and a 2.4 m (8 ft) horizontal blade comprise the cutter assembly. A 3.7 m (12 ft) horizontal blade is available as an option. Cutting can be accomplished to a depth of 1.2 m (4 ft) below water surface.

The Water Bug is 1.5 m (5 ft) wide and has 13 cm (5 in.) draft. All metal parts are either aluminum or galvanized for rust protection. The unit can travel at 8 kph (5 mph). A trailer is also available.

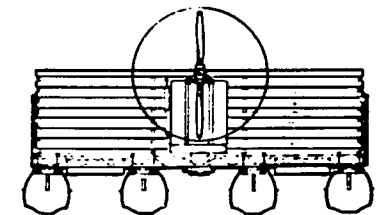
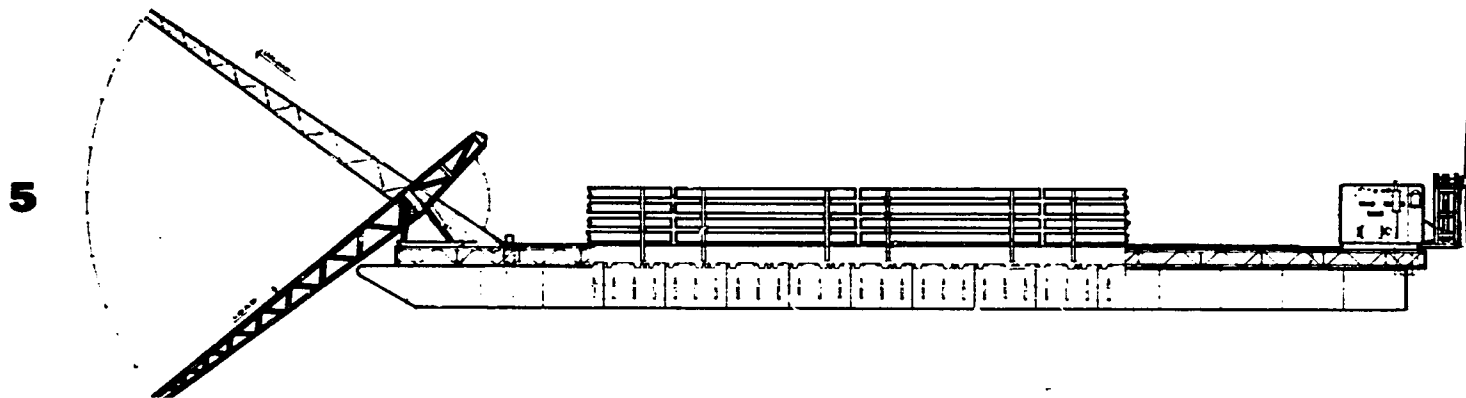


The Water weed harvester is intended for cutting and harvesting large amounts of marine vegetation. A 6.4 lt (391 cu in.) propane burning engine drives a rear mounted propulsion fan as well as an electric generator (or hydraulic pump). Overall the harvester measures 21 m (70 ft) long, 5.5 m (18 ft) wide, and draws 30.5 cm (12 in.) unloaded.

A 4.9 m (16 ft) wide sickle bar cutter capable of cutting material to a depth of 1.8 m (6 ft) is fitted to the leading edge of a powered conveyor. The conveyor may be raised for unloading operations.

As plant material is cut it travels up the conveyor and is deposited in a storage area in the center of the craft with a capacity of 60 cu m (77.8 cu yd). There is a second conveyor in the bottom of the storage area. The direction of movement for both conveyors is reversed for unloading.

Four high impact polyethylene pontoons support a steel structural frame. Overall weight of the craft unloaded is 7,257 kg (16,000 lb). Harvesting speed is 4.8 kph (3 mph). Provided tanks store enough propane for 24 hours of continuous operation •



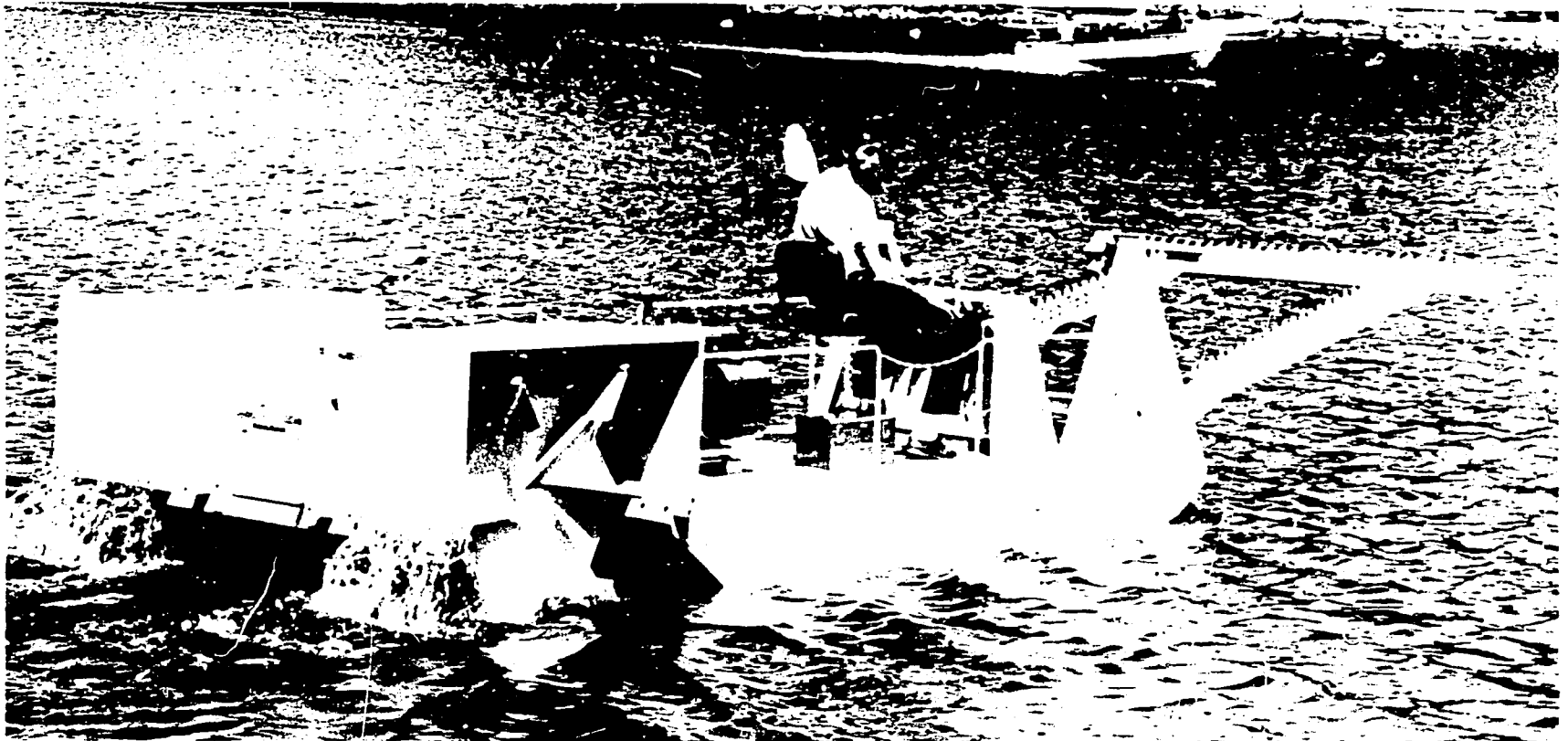
Aquamarine Corporation

Sawfish

An operator sitting at a console manipulates hydraulic valves to control cutting and raking functions as well as travel of this unit. One hydraulic pump, powered by a gasoline engine mounted on the metal deck, connects to the three hydraulic motors of the cutting assembly and to one motor in each of the two paddle wheels.

The cutting assembly has one horizontal and two vertical sickle blades in a "U" configuration. The unit cuts a swath 2.4 m (8 ft) wide down to a depth of 1.5 m (5 ft) below water surface. Sawfish can operate in water as shallow as 25.4 cm (10 in.).

The propelling paddle wheels are side mounted at the rear of the craft providing maneuverability and positive bite in areas of heavy weed concentration. A rake is available for attaching to the horizontal cutter bar •





G. Bouwmeester

Boat sweeper Boat trailer

Both a standard size boat, 3.5 m (11.5 ft) long, weighing 500 kg (1,100 lb), and a larger machine of 4.0 m (13 ft), weighing 675 kg (1,488 lb), are offered. Each draws 25 cm (10 in.) of water and will operate in waterways of approximately 1.4 m (4.6 ft) width.

Power is supplied by a 10 hp diesel engine with a reverse gear and electric starting. An anti-

fouling screw propeller is fitted. The boat sweeper is operated by one person seated behind the engine.

Special sweeping knives are provided for either size boat. In addition, a hydraulically actuated side cutter bar is available for the larger craft. Sweeping operations can be performed at 4-5 kph (2.5-3 mph) and cutting (with the side cutter bar) at a slower speed.

The manufacturers can also supply a specially designed transport trailer equipped with an extendable roller track, plus winch and cable for ease in launching and retrieving either size boat sweeper •

Hockney Company

HC-10 Complete under water weed cutter

HP-7 Portable under water weed cutter

The basis for either cutter is an all metal air tight pontoon that, as an option, may be foam filled. The HC-10 pontoon measures 3.7 m (12 ft) long, 1.2 m (4 ft) wide, by .3 m (1 ft) deep and draws approximately 13 cm (6 in.) of water. The HP-7 (not shown) is slightly narrower.

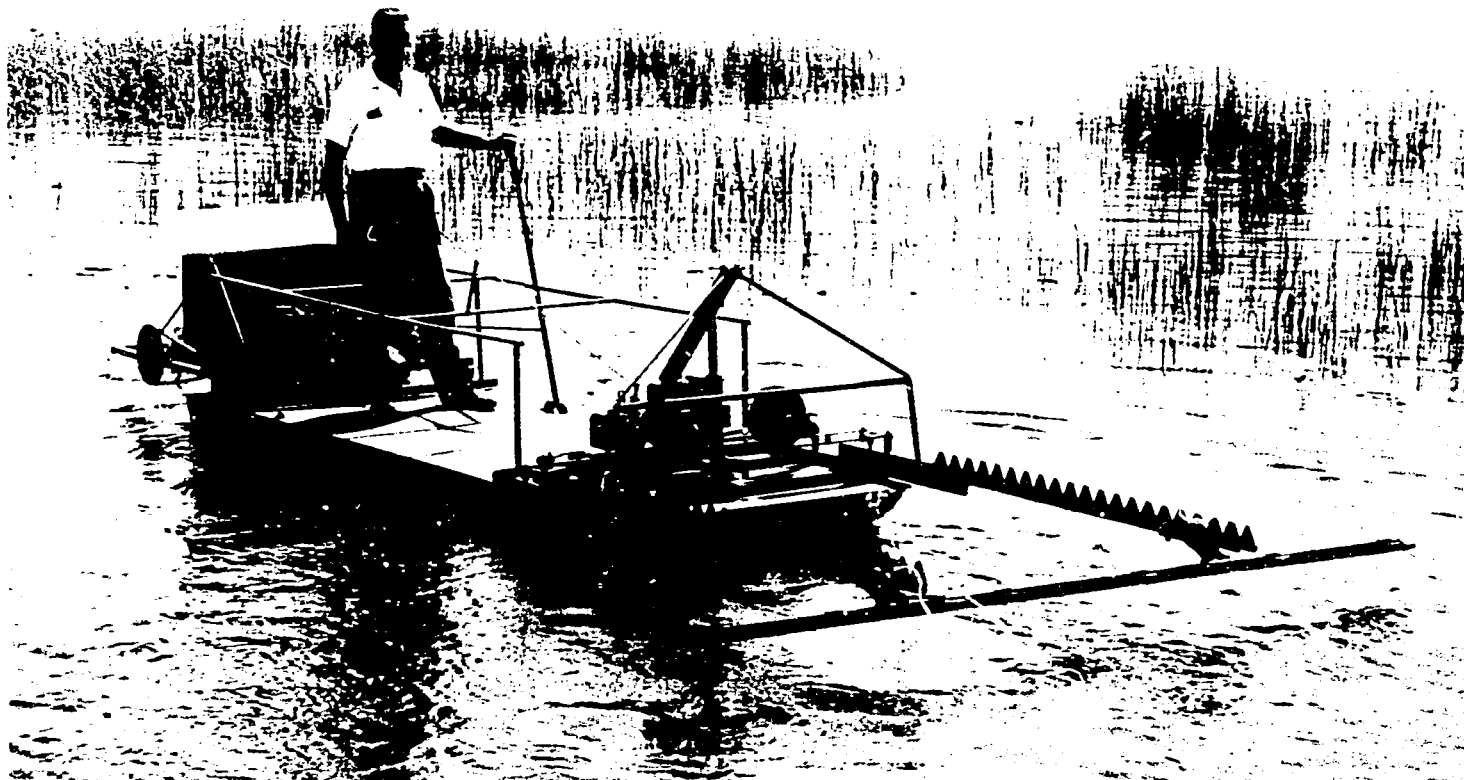
Both units come equipped with a single 4 hp gasoline engine that drives the cutting equipment and a hydraulic pump. The larger machine includes an additional 4 hp engine powering a crank paddle propulsion unit through a gear reduction box. The manufacturer also offers 5 hp engines as an option.

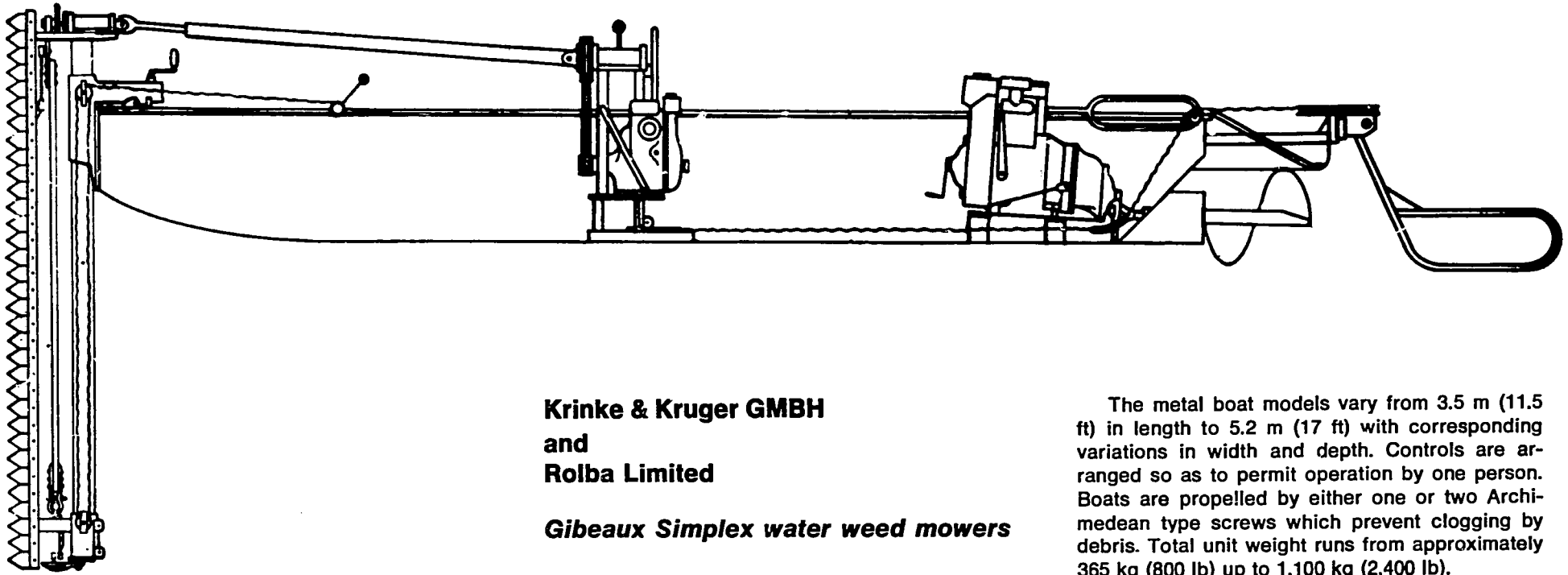
The cutting assembly consists of the main horizontal sickle bar plus two vertical bars. The main blade is 3 m (10 ft) wide on the HC-10 and 2.1 m (7 ft) wide on the HP-7. Cutting depth ranges from 13 cm (6 in.) down to 1.5 m (5 ft) for the HC-10. A

hydraulic cylinder lifts and lowers the complete cutting assembly.

Respective weights for the two machines are 454 kg (1,000 lb) and 136 kg (300 lb). On the HC-10, the operator stands and controls direction of travel through a rudder lever. Average travel speed while cutting is 6.4 kph (4 mph).

The HP-7 is available without pontoon, in which form it is suitable for fitting to a flat bottom boat or scow. There is also an optional rake attachment as well as a recently developed cutter clutch. An over-the-road trailer can also be ordered to accommodate either unit •





**Krinke & Kruger GMBH
and
Rolba Limited**

Gibeaux Simplex water weed mowers

A full range of boat-mounted or self-contained models is offered, powered by either gasoline or diesel engines. Larger units utilize a pair of engines, one for propulsion and a second to drive the cutter, whereas the smaller machines rely on a single engine for both functions.

The basic cutting assembly is composed of one vertical and one horizontal sickle bar in an inverted "T" configuration. The assembly is raised and lowered by winding gear with an automatic locking device. Cutters can be operated at various depths below water surface down to 1.5 m (4.8 ft) and may be adjusted while running. The cutter blades can be folded for transport. A side offset or "L" shaped cutter that may be angled for mowing sloping canal banks is also available.

Two models of self-contained weed cutting units including cutter, 1.5 or 2.5 hp engine, and belt drive are available for mounting on boats in the 4-5 m (13-16.5 ft) length range. These will cut swaths 1.5-1.8 m (4.8-5.9 ft) wide down to 1.0 m (3.3 ft) below the water surface.

The metal boat models vary from 3.5 m (11.5 ft) in length to 5.2 m (17 ft) with corresponding variations in width and depth. Controls are arranged so as to permit operation by one person. Boats are propelled by either one or two Archimedean type screws which prevent clogging by debris. Total unit weight runs from approximately 365 kg (800 lb) up to 1,100 kg (2,400 lb).

Other features include choice of shaft or belt drive, torque limiting safety device on the cutter drive, and reversing gear. Options besides the bank cutter include a blade sharpener and a transport/launching trailer •

John Wilder (Engineering) Ltd.

Wilder water weed cutter

A double skin fiber glass hull with flip-up ends, independently driven propulsion paddles, and total hydraulic operation are among the features of this machine.

The "U" shaped cutter bar incorporates flexible reciprocating blades sliding against a fixed blade. Cutting takes place along the entire length of the curved bar. A hydraulic orbital motor, which can be reversed to free jams, drives the cutter at up to 250 strokes per minute.

A pair of hydraulic ram cylinders control depth of cut down to 1.7 m (5.5 ft) while a second pair activates cutter bar tilt permitting bank clearing and working on sloping contours. Maximum swath cut per pass is 3.5 m (12 ft). The complete cutting assembly may be flipped 180° to work ahead of, or behind, the boat as warranted by weed conditions.

A single 15 hp air cooled diesel engine drives gear pumps which supply hydraulic pressure to various components. Water in which the cutter operates is utilized to cool the hydraulic system by contacting an oil reservoir built into the hull. All hydraulic circuits are protected by both micron and suction filters as well as suitable relief and overload valves.

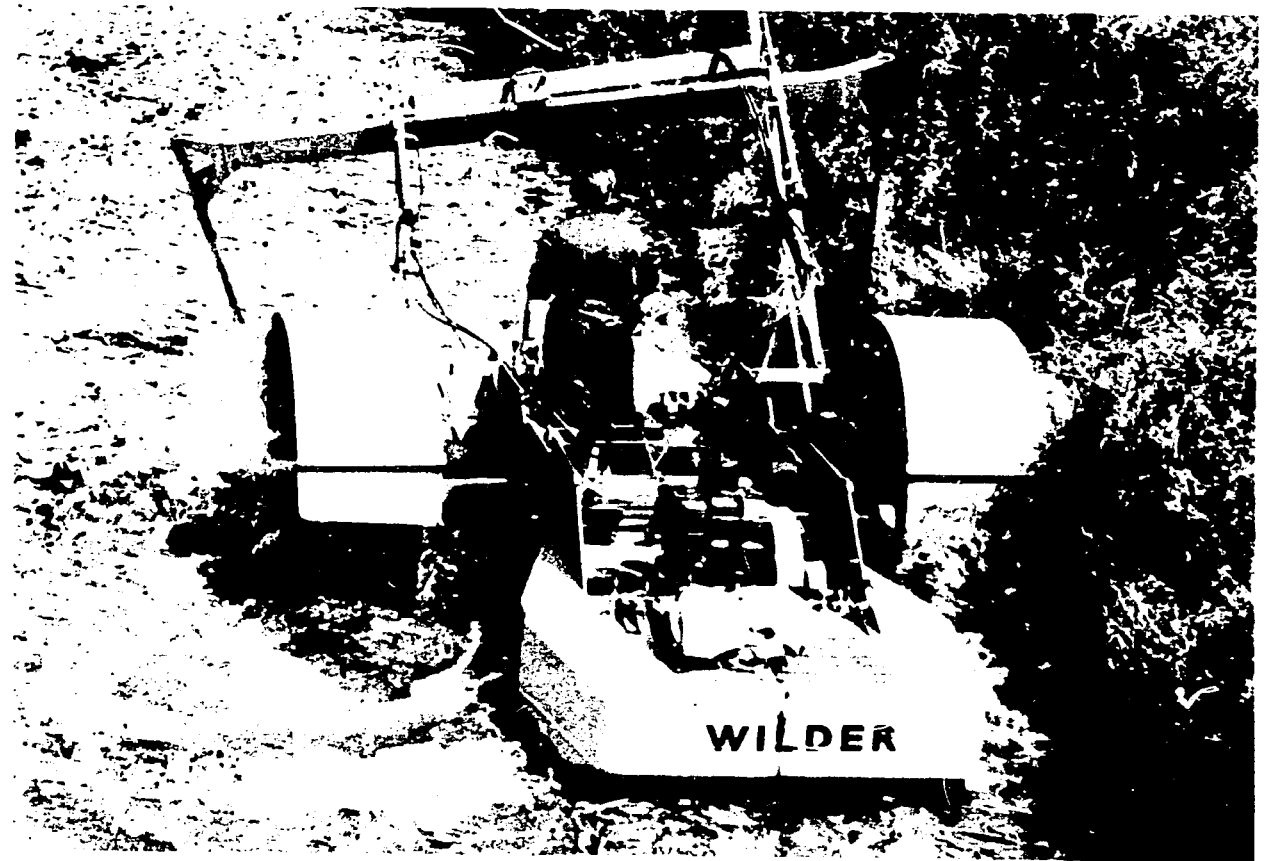
Each paddle wheel drive consists of a variable delivery reversible axial piston pump supplying pressure to an orbital motor in a paddle hub. Paddle speeds are infinitely variable up to 60 rpm, rotating in either direction. Paddles are made of marine plywood and are available in two diameters. They are capable of "walking" over heavy weed growth without becoming fouled, and serve

to turn the craft around in its own length. They may also be independently extended or retracted on their axes.

Turning in narrow waterways and transport are abetted by flip-up hull ends. Overall length, ends down, is 5 m (16.5 ft). The hull is foam plastic sandwiched between inner and outer fiber glass shells, with wooden framing. The craft is said to be virtually unsinkable.

A steel transport trailer with sliding extension and 2-speed manual winch is available to launch and load the 1,230 kg (2,700 lb) cutter.

To remove cut weed material from the water, a rake/foreloader accessory is offered. The unit fits on in place of the cutter bar and uses the same hydraulic system to collect, lift, and deposit debris well back from the water's edge. Rake width is 1.8 m (6 ft), or 3.6 m (12 ft) with end extensions •



OTHER EQUIPMENT

AOA Research and Development, Inc.

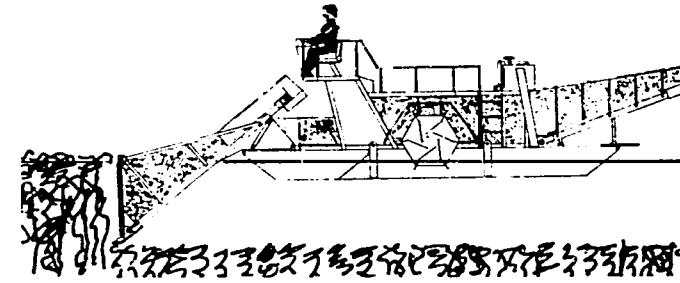
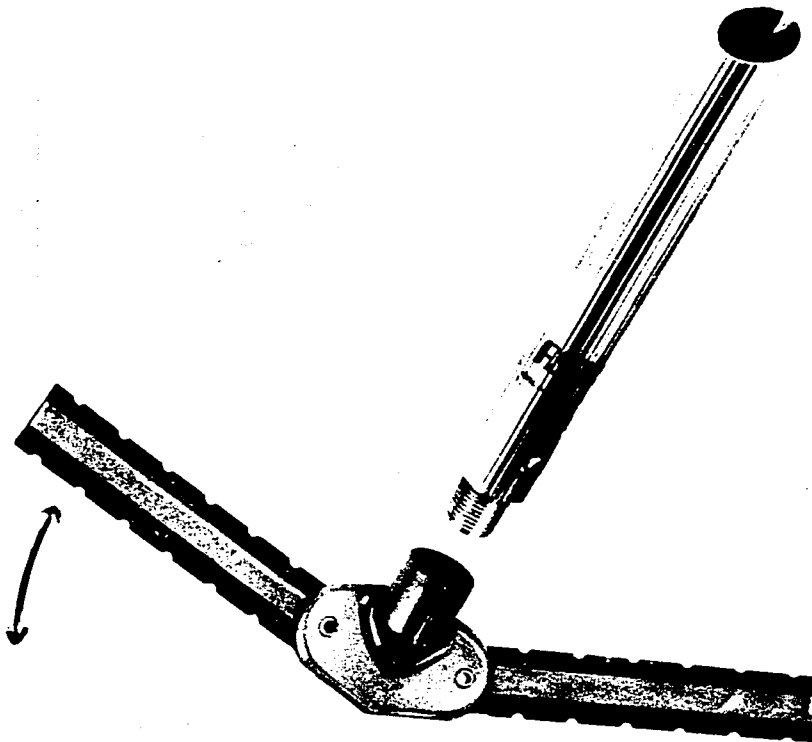
Underwater weed cutter

This manually operated device features two double-edged, heat treated spring steel blades that pivot in an unbreakable plastic housing attached to a tubular aluminum handle.

The handle and a handle extension both have a fluted exterior finish and are each 1.5 m (5 ft) long. When joined together they allow the cutter to be used well below water surface. A vinyl hand grip and heavy duty threaded couplers are provided. Total weight, including handle and extension, is approximately 1.1 kg (2.5 lb).

The chisel shaped, serrated blades are each 2.5 cm (1 in.) wide and 15 cm (6 in.) long. They automatically swing through a horizontal arc of approximately 35° to facilitate a maximum raked effect on both forward and backward strokes. Cutting is thereby enhanced and fouling minimized.

A cutter was subjected to a test of 10,000 mechanically actuated forward and backward strokes with sudden 30-40 pound thrust against each stroke. The manufacturer reports no concerning wear or damage to the cutter housing or spring pins. All materials and workmanship are unconditionally guaranteed •



Aquamarine Corporation

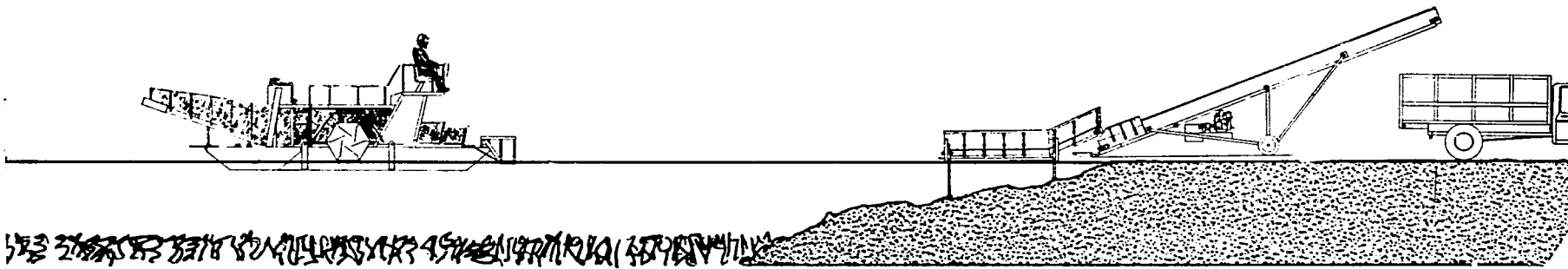
Aqua trio: H-650 Harvester T-650 Transport S-650 Shore conveyor

The three units are designed to function as an integrated aquatic plant cutting, harvesting, and disposal system for clearing large bodies of water. All three are provided with either transport carriage, or detachable mobilizer assemblies that permit towing from site to site.

The harvester and transport share the same basic features. They are comprised of a compartmented barge measuring 7.3 m x 2.4 m x 61 cm (24 x 8 x 2 ft), an elevated discharge conveyor, dual paddle wheels, and an operator's station with control console.

The storage hold in each unit has a capacity of 18.4 cu m (650 cu ft) and is equipped with a live bottom bed which can empty the storage area in 70 seconds. The infinitely variable speed paddle wheels are reversible and capable of propelling the units through beds of thick plant growth.

The harvester includes a combination elevating conveyor and cutter assembly. The latter includes one 2.4 m (8 ft) horizontal cutter bar and two 1.5 m (5 ft) vertical bars in a "U" configuration. The cutter bars, as well as the elevator, are hydraulically actuated including raising and low-



ering of the entire assembly. Maximum depth of cut below water surface is 1.5 m (5 ft) and swath width is 2.4 m (8 ft).

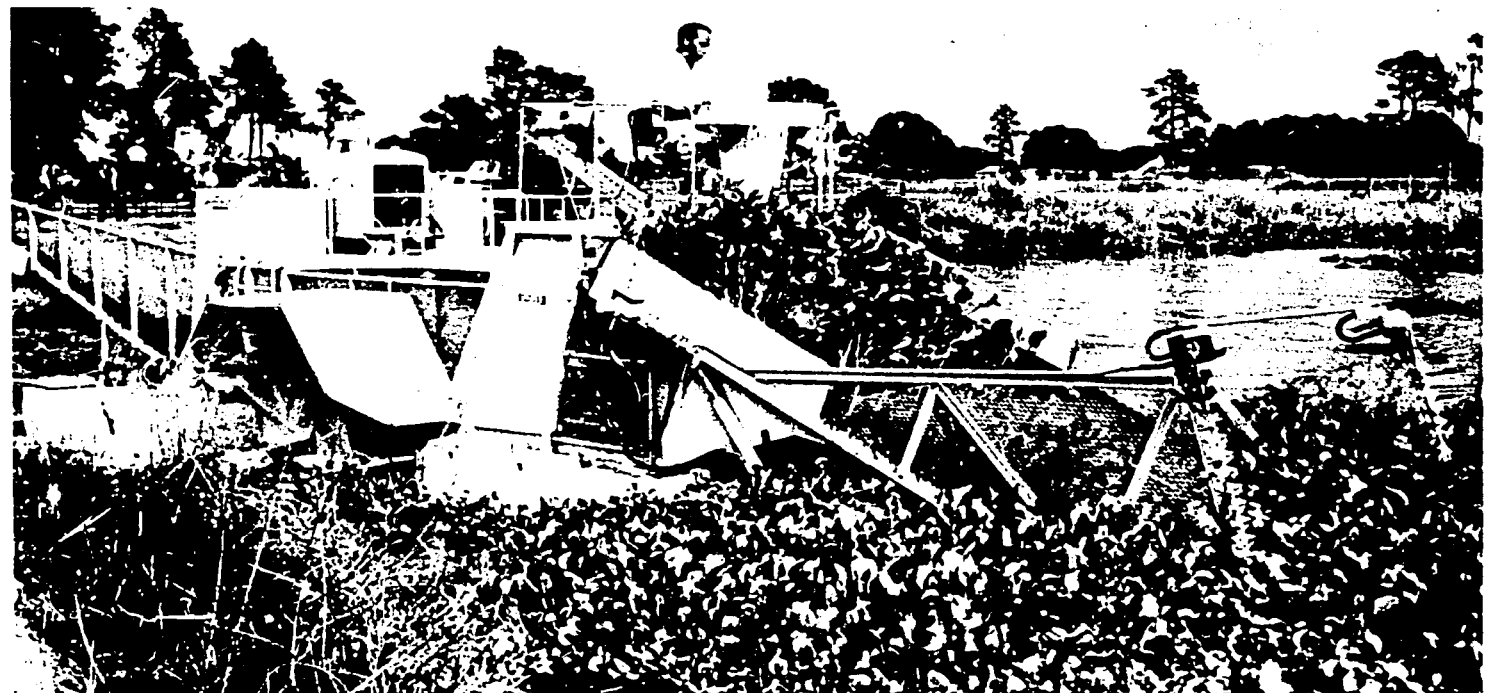
A 28 hp water cooled industrial type gasoline engine on the harvester drives three hydraulic pumps. The transport utilizes an 11 hp engine powering a single hydraulic pump. Both units have snap lock couplers for mating while transferring cut plant material from harvester to transport,

or from either unit to the shore conveyor. The harvester can fulfill both harvest and transport functions where distances from site of cutting to site of unloading are not great. Each machine is controlled by a single operator.

The shore conveyor has a 9.8 m (32 ft) by 91 cm (3 ft) inclined conveyor that delivers plant material to an elevation of 3.4 m (11 ft). There is also a 5.3 m (14 ft) input conveyor leg that mates and

locks with either the harvester or transport unit during transfer.

A 16.8 hp air cooled gasoline engine drives a single hydraulic pump that provides power to both conveyors. An over-the-road undercarriage supports a framework with adjustable height legs. A towing hitch is also included •



L-R-S Corporation

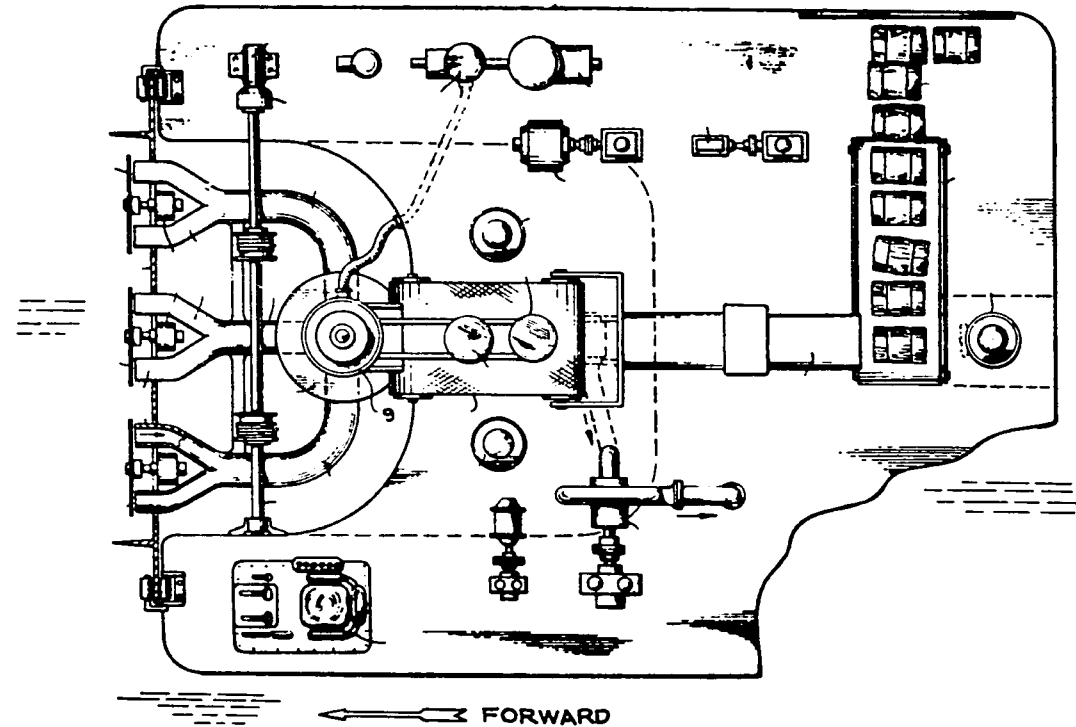
Hydro-mechanical aquatic harvester (experimental)

Several patents have been obtained for mobile, floating machines that cut aquatic growth at a selected depth below the water surface and suck the cut plant material into a system that transforms it into a dried, baled product.

Multiple circular blades contact and cut the aquatic growth. Pump suction is then utilized to draw the chopped pieces into the processing system. The chopped material is screened out of the conveying water, which returns to the water body being cleared. Next, the organic material is compressed, further dewatered, heat sterilized, and partially dried. Preservative, fortifying, and/or other material can be added as desired, and the final treated product baled.

Plastic bands can be used for containing the bales, or the cut, processed, and treated end product can be removed from the harvester in bulk form. A secondary barge unit can be employed to haul the baled or bulk product to shore enabling the harvester to operate continuously.

Power equipment, overall harvester size, and other mechanical features vary depending on specific design. Packages include propulsion and steering mechanism, plus a control station •

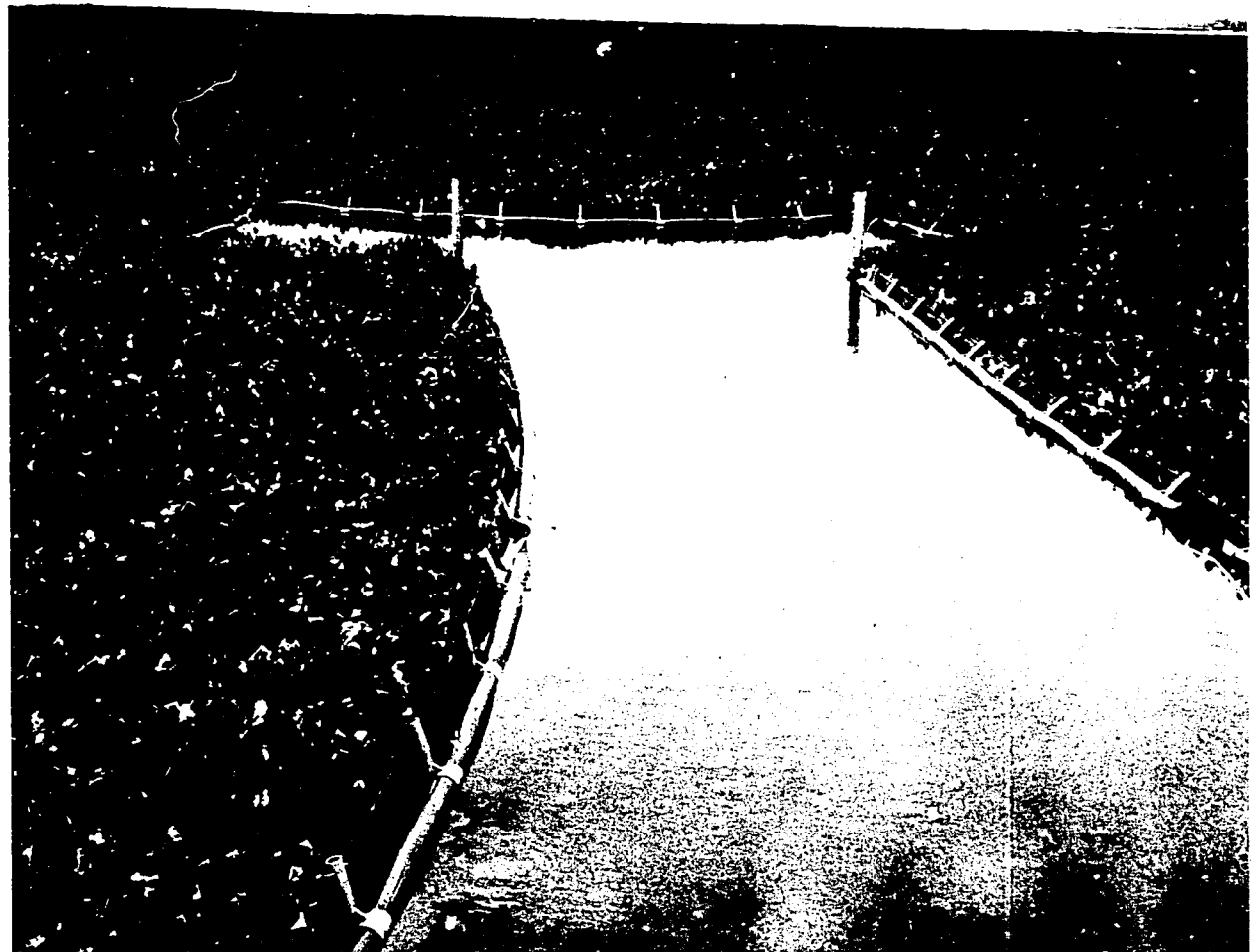


Sea Guard, Inc.

N-Bar floating barrier system

An articulated, floating, inflatable boom combined with an underwater fence is utilized to restrain movement and drift of aquatic plant material. The barriers permit passage of water and conform to wave and wind action while screening out solids.

The inflatable rubber, tube-shaped boom is encased in a sleeve of polyester fabric coated with synthetic rubber and held in place with clamps. Sections of 15.2 m (50 ft) long plastic coated metal mesh, 1.2 m (4 ft) high, are attached to risers of polyethylene pipe using nylon tie-wraps. The mesh extends 30.5 cm (1 ft) above



water surface. The clamps securing the polyester sleeve also hold the risers in place.

The barrier can be towed into position and anchored with nylon lines to either pilings or concrete blocks. During periods when the barrier is not needed it can be released from its anchors, deflated, and rolled up in sections for storage.

The synthetic rubber exterior of the boom sleeve is a bright orange color serving as a navigational warning of the barrier's presence. An additional 1.2 m (4 ft) wide section of mesh may be added to create a barrier with a total depth of 2.4 m (8 ft). Components of the system are said to have long life and resistance to damage from water, chemicals, sunlight, and weathering •

Taussig-Tomb & Associates

Weed Witch (prototype)

Water under positive pressure is utilized to dislodge aquatic plants from the floor of a water body by this patented design. Areas are said to thus be kept free of weeds until actual reseeding takes place.

The prototype employs two 4-cylinder gasoline engines, each driving one centrifugal pump, to generate hydraulic pressure. Jets of water emerge from nozzles at the ends of vertical pipes affixed in series to a variable depth boom.

The engines, pumps, and piping are mounted on a plywood hull. However, the assembly can also be used with almost any fiber glass or aluminum craft or floating platform. A single pump and engine set of required capacity could be substituted for the current twin units.

The prototype is propelled by a gasoline powered outboard motor. The Weed Witch can be operated by one person from a position at the stern of the craft •



LIST OF COMPANIES

Air-Lec Industries, Inc.
3306 Commercial Avenue
Madison, WI 53714 / USA

American Waterweed Harvesting Co.
6538 West 70th Street
Shreveport, LA 71109 / USA

AOA Research & Development, Inc.
P.O. Box 7152
Orlando, FL 32804 / USA

Aquamarine Corporation
Box 616
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G. Bouwmeester
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Sappemeer / Netherlands

Hockney Company
913 Cogswell Drive
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Krinke & Kruger GMBH
POB 142, Hubertusstrasse 15
3012 Langenhagen-Hannover / W. Germany

L-R-S Corporation
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Rolba Limited
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Suite 1440
300 Delaware Avenue
Wilmington, DE 19801 / USA

Taussig-Tomb & Associates
Suite 906
1625 Eye Street, N.W.
Washington, DC 20006 / USA

John Wilder (Engineering) Ltd.
36 St. Mary's Street
Wallingford, Berks / England

OTHER PUBLICATIONS

MANUAL OF PESTICIDE APPLICATION EQUIPMENT

A unique, illustrated reference covering 30 categories of pesticide application equipment, the Manual should interest agronomists, agriculturalists, researchers, teachers, industrial and governmental representatives, or any person concerned with application of pesticides.

The book lists products from 253 firms worldwide. Each of the 30 product classifications includes names of all known manufacturers of that item. A second section contains each firm's name/address and a cross reference to specific categories.

Hand operated and engine powered applicators—for dust, granules, and/or liquid—as well as pumps, nozzles, tanks, hose, valves, strainers, spray guns, and other components, plus operator safety gear, are included.

A special Featured Products Section with more than 200 photos and drawings presents an illustration and brief technical description for units representative of each classification.

The Manual is believed to be among the first such collections of technical information published. The introduction and headings are printed in English, Spanish, and French. Content emphasizes, but is not limited to, equipment suited for smaller operations (aerial application equipment, for example, is not covered).

Paperback, 130 pages (with each section printed on a different color paper), plastic spiral bound, 8½ x 11 inches (22 x 28 cm), 1972. Cost per copy, \$4.00 surface post paid •

TROPICAL WEEDS / MALEZAS TROPICALES

During several years of a cooperative weed research program, scientists collected, photographed, and identified a broad spectrum of tropical weeds. This volume presents 150 of the most economically important species accompanied by detailed descriptions in both Spanish and English as well as a full color, full page plate for each.

Information covers family, genus, species, and common names (bilingual), plus habitat, type of root, stem, leaves, inflorescence, fruit, seed, and other characteristics.

Weed identification is the first step toward designing sound weed control methods to combat specific weed problems. This publication is intended to provide a practical reference for the identification of weeds by visual comparative methods.

Paperback, 352 pages, 4½ x 8 inches (11 x 20 cm), 1972. A bibliography and glossary (bilingual) are included. Cost per copy, \$3.50 surface post paid •

MALEZAS ACUATICAS / AQUATIC WEEDS

This guide to aquatic weeds is a useful companion to TROPICAL WEEDS (left). It contains 50 full color plates of common and noxious aquatic weeds with detailed descriptions plus common names (in both Spanish and English). Family, genus, and species are also noted for each example.

A bibliography and glossary (bilingual) are included. Paperback, 116 pages, 4½ x 8 inches (11 x 20 cm), 1972. Cost per copy, \$1.50 surface post paid •

COMMON WEEDS OF CENTRAL AMERICA

This publication is in the final pre-publication stages (as of Winter 1974), and is expected to roughly follow the same format as the foregoing publications by presenting data in Spanish and English to complement full color plates of nearly 300 weed species found in Central America.

Early 1975 is the anticipated date of availability •

Note

Single copies of publications are available without cost only to non-commercial weed researchers, governments, and educational institutions in developing nations. Requests should be made on official letterhead clearly identifying the requester and the intended use of the publication. Send requests, where appropriate, or prepaid orders otherwise, to:

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Corvallis, OR 97331 / USA