The SINGLE Chemical Control

for the major TURF diseases

Dyrene is formulated expressly for park superintendents, golf course superintendents, greens keepers, managers and other professionals engaged in the care and maintenance of lawns and turf.

Dyrene's broad spectrum effect combats or prevents all major turf diseases. When used as recommended, it controls leaf spot, copper spot, rust, dollar spot, brown patch, snow mold (*Typhula* spp.).

Eradicant or Preventive—Under normal weather conditions, apply Dyrene at the rate of 4 oz. per 1,000 sq. ft. every 7-10 days. During weather particularly favorable for disease, such as high temperature and humidity, Dyrene may be applied more frequently (5-7 day) or at higher dosages (6-8 ozs. per 1,000 sq. ft.) to keep disease under control with no injury to fine turf grasses. Some golf course and park superintendents use a Dyrene program of 3-4 ozs. per 1,000 sq. ft. of turf on a 12-14 day schedule. This has resulted in disease-free turf all season. When using Dyrene to clean up a disease condition in turf, use 6-8 ozs. per 1,000 sq. ft. for best results. For complete instructions, read the label or send for folder DY4.

Easy to Use—Dyrene is a 50% wettable powder that provides a good suspension in water and is suitable for use in all common types of spray equipment. The formulation is dyed green to blend with turf and eliminate the unsightly appearance of spray deposits on treated areas. Once dried, dye does not stain shoes or fabrics. Dyrene will not harm spray equipment, clog nozzles or corrode metal parts of the sprayer. 365

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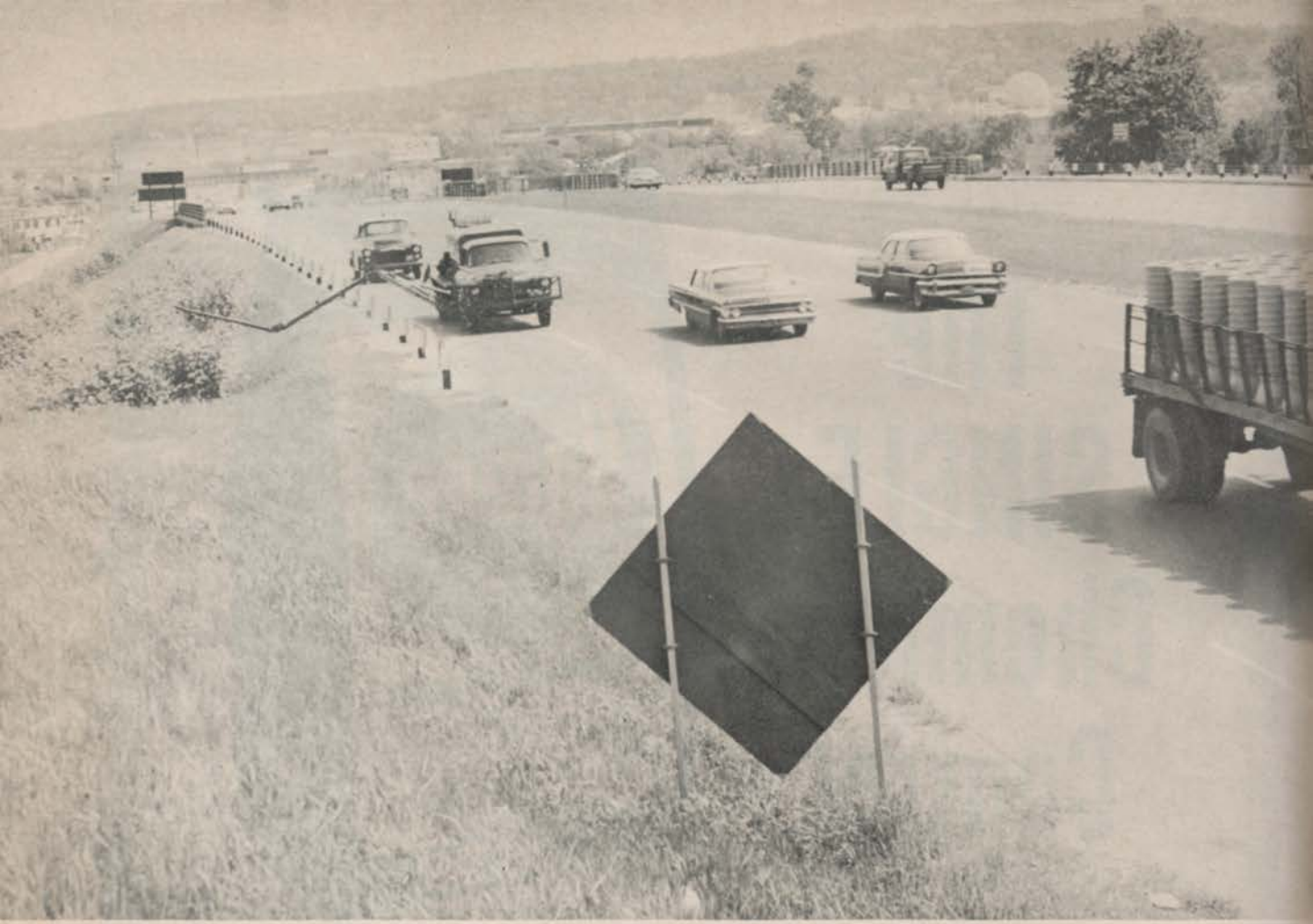


Specially adapted booms like the one in top left portion of picture help highway supervisors and contract applicators apply rights-of-way herbicides.

What Highway Supervisors Want From the Contract Applicator

By JOSEPH L. BEASLEY

Highway Landscape Supervisor,
Department of Public Works
The Commonwealth of Massachusetts, Boston

HISTORY is in the making and there is an opportunity, specifically, for the chemical and equipment industries, and contract applicators, to participate directly in the greatest road building program the world has ever witnessed.

This program will require vast specialized services to an extent that may not now be readily visualized.

The development of materials, equipment, and construction methods for roadside projects must keep pace with those of the road building industry at large.

This expanded highway program will provide an additional outlet for the knowledge and abilities of chemical and equipment suppliers and contract applicators. And there are many problems that may be solved by constructive criticism and complete cooperation of all concerned.

Since 1951 Massachusetts has been using and experimenting with chemical weedkillers in an effort to reduce mowing and maintenance costs.

We have applied 2,4-D; 2,4-D+T; 2,4,5-T; maleic hydrazide; Telvar D.W.; diuron; Ureabor and Urox. All have been used with varying degrees of success. We have learned that each has its place in maintenance as a useful tool. Herbicides in themselves are not a "cure-all" for roadside maintenance problems. When properly used, however, in combination with other roadside operations, the result is a more pleasing roadside appearance at a considerable saving financially. But, to make such materials more economically feasible, their effectiveness must be increased, their cost of application reduced, and their purchase price decreased.

Attacked Poison Ivy First

Massachusetts' first use of chemicals along the roadsides was directed against poison ivy,

at the time an extremely serious problem. Through the use of 2,4-D plus 2,4,5-T, this condition has been practically eliminated. This fact not only has been reassuring to the 3,500,000 people who enjoy our 375 roadside rest areas each season, but, has greatly reduced the duration of time lost by Department employees who are engaged in roadside work.

The Massachusetts Department of Public Works has been making valuable contributions to highway safety with the aid of chemicals, (2,4-D plus 2,4,5-T, 50-50 concentrate of low-volatile esters) by making a concerted effort to increase sight distance on the highways. These herbicides, also, assist in controlling brush at our roadside rest areas and vistas, behind guard rails, and in our selective clearing program.

Not only has the general appearance of the roadsides been improved, but in our opinion, clean roadsides are a major factor in highway safety.

In our program of selective control of weeds, we have used MH-30 in combination with 2,4-D as part of our constant effort to reduce the number of annual mowings. During this operation we found that certain weed growths are less responsive than others, particularly in dry seasons.

We have, also, been applying 2,4-D in combination with urea (45% nitrogen) fertilizer to certain areas requiring rejuvenation. This two-in-one combined application has proven to be economical.

Mass. First to Contract Mow

It is noteworthy that Massachusetts, in addition to being the first state to do all roadside mowing by contract, is among the first to apply fertilizer in combination with 2,4-D spray.

Massachusetts has approximately 2500 miles of state highway, which includes 10,640 acres of grass and 9,550 acres of non-grassed areas such as native woodland growth and ledges. In our attempts to modify turf management costs through chemicals, the Department has combined sprayings of various-purpose chemicals and has advised private enterprise to provide special applicators to accomplish this work:

(1) For median strips up to 40 feet, roadsides, outer edges of interchanges, and narrow divider islands, a 1,000-gallon tank, with booms for 20 feet range: and

(2) For wide median strips and divider islands over 40 feet wide, lobes, bowl areas of interchanges, and other "hard-to-reach" areas, four-wheel-drive Jeep with mounted 250-gallon tanks, fixed horizontal and vertical booms, and a manually operated boom.

While these new applicators are sufficient for the above-mentioned purposes, of necessity, with the vast increase in construction of both state and interstate highways, they will soon become obsolete.

Grass and weed control, through the proper use of chemicals and advanced models of applicators, is most important in all categories of economical roadside maintenance.

Manufacturers should have on their designing boards plans for larger, more efficient applicators. For example, we need a piece of equipment, possibly a belt-type applicator with supercharged power, to spread pellets or heavy granular fertilizers a distance of approximately 100 to 200 feet; such equipment could then reach plant materials on cut slopes and other difficult-to-reach areas from the highway.

Another type of applicator

Private companies which contract for roadside weed and brush control, fertilization, mowing, etc., will find author Beasley's catalog of what he and his colleagues want from contractors and from the chemical and equipment industries useful and interesting. Mr. Beasley is well known among professional vegetation maintenance and control personnel.

This contract application spray rig is a precision-engineered, completely outfitted machine tailored to the unique requirements of roadside vegetation work.

Rear view of this spray rig operated by Worthy Maintenance of Springfield, Mass., reveals the complexity of pumps, tanks, hoses, and other quality equipment necessary for competent contractual work for highway roadside spraying.

should be designed to spread wood chip mulch uniformly, without any decrease in size of the mulch, over any reasonable given area and distance, again from the highway.

Need Bigger, Better Sprayers

Larger and more powerful spraying equipment is needed. Especially important is size of hoses and nozzles for spraying further distances with more accuracy (also from the highway).

It is of paramount importance that all operators of these anticipated new and powerful types of equipment be thoroughly trained and be considered experts in this forward approach in highway landscaping techniques.

The following items are submitted for research by the chemical, equipment, and contract applicator industry.

1. A balanced liquid fertilizer which can be sprayed and will accelerate the growth of seedling pines, evergreens, woody shrubs, low-bush blueberry, bearberry, sods and vines.

2. Chemicals with a faster action and longer effectiveness for grass retardation, ground fertilization, and soil sterilization.

3. A synthetic mulch with lasting qualities and with a resistance to weed growth, as a substitute for present costly hay or wood chips.

4. A synthetic which will augment water retention in plants and grass thereby enhancing their resistance to drought.

5. A safe chemical sufficiently selective and easy to handle to eliminate grass or weed growth, but, without injury to tree or shrub plantings.

6. A less expensive chemical to retard the growth of grass.

7. A chemical or synthetic hormone to break the dormancy and increase the fertility of natural-growth seeds of native pines, low growing woody shrubs, low-bush blueberry, bearberry, sweetfern, and woodbine.

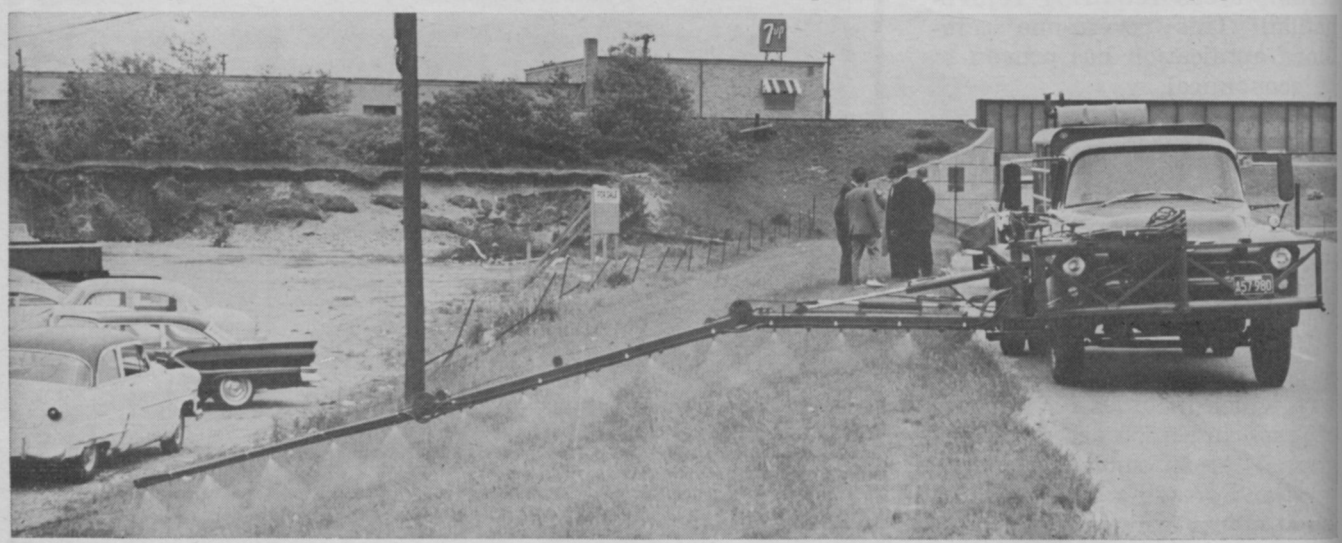
8. A brush-growth retarder which will not brown out the areas where control for sight distance is at a costly premium.

These are but a few, but coupled with many other problem areas in roadside management, are considered to merit a concentrated effort in research because they offer sufficient practical marketing potential.

Educate Public

The industry at large should, also, assist in the education of the general public on chemicals. Many misconceptions relative to chemicals now in roadside use, regarding their effect on birds, animals, and other plants, lead to unnecessary agitation by certain private businesses and various groups dedicated to the preservation of plants and wildlife. Advice to these groups, to allay

(Continued on page 26)



Extended boom has variety of controls allowing operator to adjust spray pattern.

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Not when you rely on CYTROL®.
Other chemicals and oils may act faster, but they can't match CYTROL's systemic action in killing *roots and all* to provide truly *long-lasting* weed control.

With CYTROL, you don't have to spray as frequently. There's no worry about regrowth.

And for truly season-long control, merely add a soil sterilant to keep weed seeds that are already in the soil from germinating.

What's more, when you rely on CYTROL, you get the additional advantages of no mess, no fire hazard.

CYTROL is easy to apply with any conventional spray equipment. It is not dangerous to handle. When you are through, simply flush out the applicator with plain water.

CYTROL is decidedly economical because of its long-lasting effectiveness. CYTROL keeps on killing weeds long after you apply it. It is the sure way to control hard-to-kill broadleaf and grassy annual and perennial weeds around buildings, along railroad rights-of-way, along highways, or any other type of industrial application.

Clip and send in this coupon today to get complete information about CYTROL for your industrial weed control problem.

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How to Diagnose Turfgrass Problems

PART ONE

By RALPH W. WHITE, JR.

General Manager
Ousley Sod Company
Pompano Beach, Florida

LAWN PROBLEMS, resulting from insect damage, fungus disease, and drought, are a common occurrence in the South. These problems are due largely to the long growing season, the ideal climate for disease and insect reproduction, the uneven rainfall distribution, and the poor moisture retention of most soils. Many lawns have built-in problems caused by poor soil structure, buried debris, grass of poor quality, or variety of grass not suited to the area. Improper maintenance practices are also one of the largest contributors to lawn troubles.

Solving lawn problems is one of the most important phases of lawn management. Early and accurate diagnosis is essential if the problem is to be corrected before it becomes too serious. Common lawn problems, such as drought, improper mowing, and insect damage are relatively easy to diagnose and correct. The more difficult problems, which usually involve a combination of factors, normally require analysis by someone with a good technical background and much practical experience. The commercial applicator can do a good job of diagnosing and solving lawn problems, provided he considers all the facts before making his conclusion. The following factors are essential for proper diagnosis:

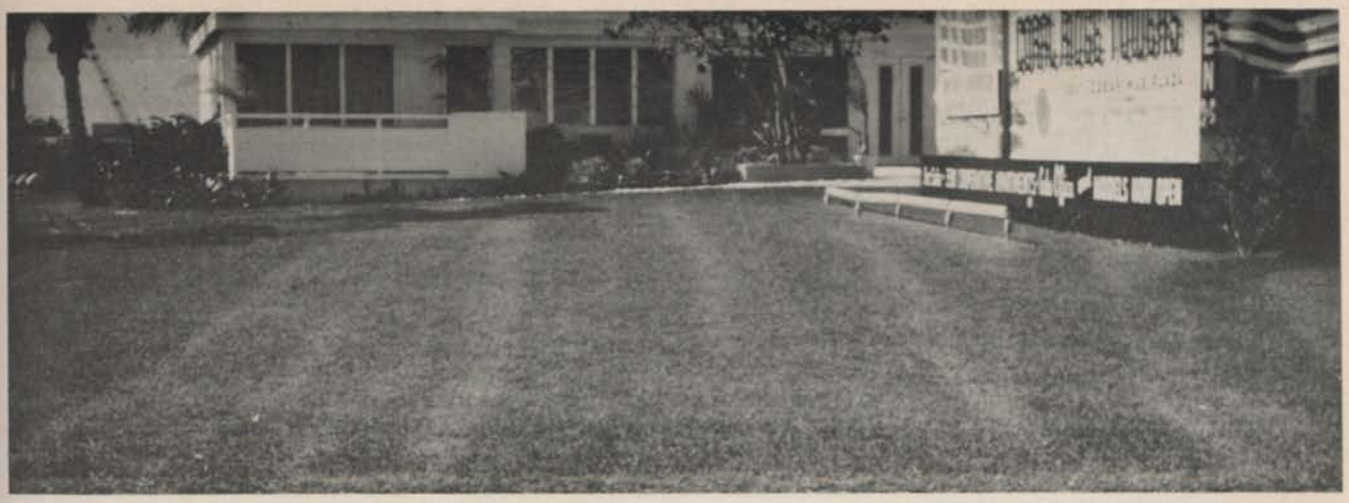
1. Complete maintenance records and history of lawn.
2. Awareness of periods when insects and diseases are prevalent.
3. Frequent, careful observations.
4. Knowledge of common symptoms.
5. Conclusion through process of elimination.

Complete Maintenance Records and History of Lawn

Maintenance records should include the date, rate, and kind of fertilizer applied; the mowing frequency and height of cut; the irrigation frequency and amount of water applied during each watering; and the kind and rate of different pesticides that were applied. A record sheet on which to jot down this information keeps these important facts from slipping from the memory.

History of the lawn should give information about when and how it was established, including any special preparation that was done. If certain areas of the lawn have been known to be trouble spots, year in and year out, it is well to note these locations, also. Such information as when, where, and how spots occurred is important as it often relates to insect and disease pests. Disease is known to occur in the same area of the lawn, year after year, and usually has the same type of pattern. Insects, on the other hand, often occur in different locations from one year to the next.

While author White has used his native Florida as the basis for most of his observations in this article, the techniques he enumerates for diagnosing turfgrass ailments will be invaluable to turf managers from Maine to California. Photographs are by the author, from slides he uses to illustrate his frequent lectures before turfgrass enthusiasts and professionals. This is a two-part article; conclusion will appear next month. Ed.



Skilled detection of turf ailments takes training. Above are streaks caused by improper fertilizing of st. augustinegrass. Below, improper mowing (scalping) of bermudagrass. These symptoms, Mr. White says, are caused by not mowing often enough and by using a rotary-type mower.

Quick diagnosis is possible when certain insects or diseases are known to be prevalent. For example, in south Florida, worm infestations usually begin about the middle of May and last throughout November. On the other hand, chinch bugs are more prevalent from February until October. Brown patch fungus is worse during the late fall and early spring. Therefore, if brown spots occur in the lawn in early January, there is a good possibility that it would be fungus and not chinch bugs or worms, even though the symptoms may look similar.

Frequent, Careful Observations

Frequent, careful observations of the entire lawn will reveal many problems in the early stages, thus allowing for prompt corrective measures. Make mental notes about the color of the grass, the amount of shade and wear, the overall condition of the grass, the presence of any species of weeds, or signs of mismanagement practice, such as improper mowing. Note whether there are brown spots present and if so, if they form any type of pattern or streak, or if there is a general thinning of the grass, because each pattern can usually be related to a cause.

Knowledge of Common Symptoms

Any type of *patch* may indicate the presence of insects or

(Continued on page 22)

New Ways to Apply Aquatic Herbicides

PART II

This is the second of two articles prepared by the Phelps Dodge Information Service on the various types of equipment in current use for application of copper sulfate and other common chemicals for control of algae and aquatic weeds. The first installment appeared in February.—Ed.

Helicopters

PROBABLY the newest technique involves the use of helicopters. The East Bay Municipal Water District, Oakland, California, undertook some experiments at San Pablo Lake in 1963. The work was done under the general supervision of G. L. Laverty, Supervising Sanitary Engineer, Cali'copters of Stockton, California.

The equipment used by Cali-'copters is basic agricultural dry-chemical feeding apparatus, consisting of a Bell 47G-2 Helicopter, two 250-lb.-capacity saddle hoppers, automatic gates, blowers, and ducts. The system is capable of putting out 2,000-2,500 lbs./hour. On all but one of the treatments, the effectiveness of the helicopter was superior to that of the boat-and-sack method on the basis of biweekly plankton samples which were routinely taken from the lakes. Analysis of these samples indicated that East Bay could anticipate fewer treatments during the year using a helicopter rather than a boat. The one treatment which was unsuccessful involved using powdered $CuSO_4$ in an effort to find an acceptable grind. The criteria for the $CuSO_4$ grind are (1) it must be compatible with the feeding equipment, (2) dissolve in the top 10 feet of the water, (3) create a minimum drift problem, and (4) be commercially available at an economical price.

The calculation of the total dosage is based on the amount of water in the lake in the top 10 feet for a given elevation. To this total amount of water was added $CuSO_4$ in the proportion of 4 lbs. per million gallons. For calibration of the feed equipment these total pounds can be converted to pounds-per-acre with the aid of area capacity tables for the lake. The pounds-per-acre will be virtually constant for the deeper parts of the lake and will be less for the shallower regions.

Exact calibration of the feed can be made by relating helicopter heights and speed to hopper opening for the required dose. The hopper opening is set by making a catch of material with the blowers turned on for a given length of time and weighing it. Usually, however, the pilot, equipped with the knowledge of the pound/acre dose and the lake area, or the total pounds for each lake, adjusts his hopper settings based on experience.

The $CuSO_4$ does not leave an immediate trail by coloring the water which the pilots could use as a guide, and, therefore, there have been some alignment problems. However, permanent shore markers would be a possible solution.

Airboat

Another possibility involving the use of equipment that can be purchased rather than made is the airboat. One of the newest developed utilizes ducted fans rather than an open propeller. This particular equipment is manufactured by Aquanautics, 966 Commercial Street, Palo Alto, California, under the trade name of the "Swamp."

The Swamp (Shallow Water Aero Marine Propulsor) class equipment (Swampcat and Swampfox) are moderate-sized planing hulls constructed for operations in shallow water, marshes, and swamps. There are no under-the-hull protrusions to limit their passage and they are propelled by a ducted fan system.

The ducted fan delivers nearly twice as much thrust as an open propeller. When used as a distributing means for liquids or powders it provides a controlled and directed beam, allowing uniform distribution of the material.

The equipment can be fitted with bogie wheels which can be raised and lowered by hand for ease in going in and out of water and for highway trailering. Twin tiltable water rudders are provided for steering.

Two methods of material distribution can be provided. Solid particle material is delivered to the back side of the ducted fan by a pneumatic blower system with its own power source. Liquids are pumped to a small nozzle system mounted behind the ducted fan. Provision can be made to inject powders into the liquid system to reduce airborne loss or unwanted distribution.

(For other airboat suppliers, see *WTT*'s Suppliers Guide in the December 1964 issue—Ed.)

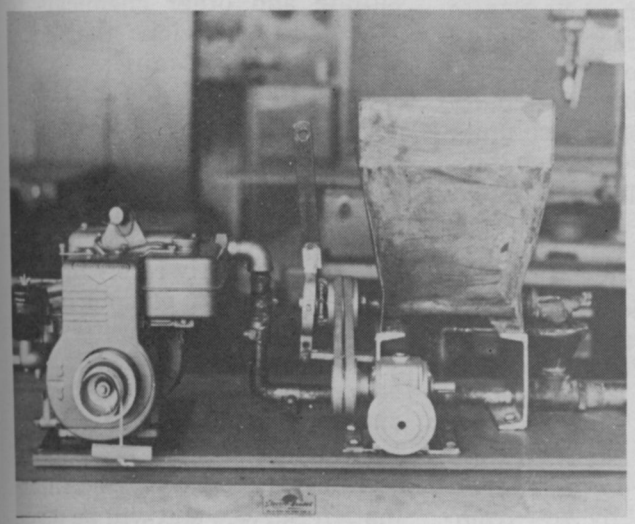
Underwater Delivery

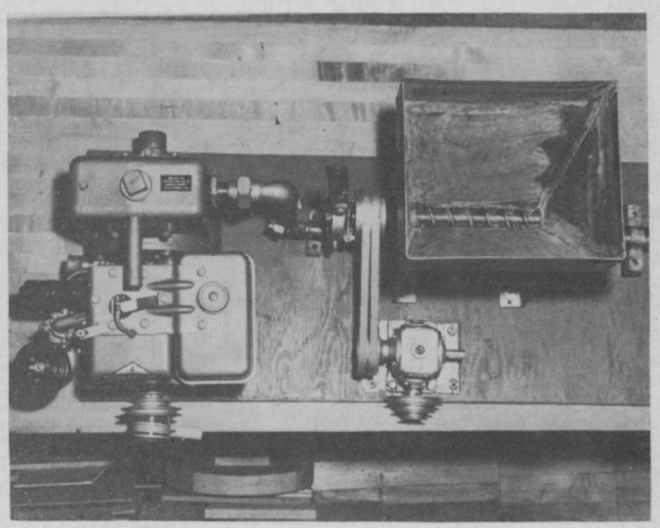
Although the majority of applications are concerned with the upper levels of water there are occasions where conditions dictate depositing a concentration of algicide within 6″ of the lake bottom. This is particularly desirable when controlling the snails and cercariae responsible for swimmer's itch.

The State of Michigan Water Resources Commission has developed equipment to release a slurry just above the lake floor.

The equipment consists of a Briggs & Stratton air-cooled gas motor coupled directly to a pump. This pump not only serves as an intake but the discharge is passed through a venturi to generate the pressure needed to carry the subsequent slurry to the outlet hoses. These

From basic boat-and-hopper outfits to such sophisticated rigs as those mounted on helicopters, aquatic weed controllers have a wide choice when deciding how to apply weed control chemicals. Above is equipment designed by the Michigan Water Resources Commission for combatting swimmer's itch. Helicopters, such as the one at right, are finding their way into the aquatic arsenal, although this particular unit is rigged for land use. Below are two views of a device built by the Michigan Water Resources Commission to deliver copper sulfate slurry to underwater outlets. Side view is at left, top view on the right of the page below. In this system, copper sulfate crystals are fed from hopper by worm drive to flushing cone where they are mixed with water and passed into a discharge pipe. A jet nozzle and venturi in the discharge line build up the necessary pressure to deliver the slurry under water. Water used in this process is drawn from the lake by a Homelite pump. Other methods were discussed in the first part of this article which appeared in February '65 WTT, page 18.





hoses are adjustable to serve a depth of 3′ to 12′. By means of a V-Belt, gear reducer and clutch, the motor also drives a worm-screw feed in the bottom of a hopper. This hopper is located over the discharge line.

The hopper is filled with granular material which is fed into the water discharge line by means of the worm.

The complete rig is mounted on two pieces of ¾″ marine plywood and clamped to the boat. A "Y"-connection on the discharge line leads two hoses to a seven-outlet pipe across the stern of the boat.

The rate of application is 2 lbs. per 1,000 sq. ft. of a mixture of 8 parts granular-grade copper sulfate with 1 part hydrated lime. The slurry is released subaqueously just above the beach floor which results in a concentration of 32 ppm in the first foot of water over the lake bottom, or 87 pounds per acre.

Belt Conveyor

Frequently it is desirable to utilize large crystals of copper sulfate penetrating to a greater depth before dissolving, particularly if deep water growths of weeds and algae are a problem. Conversely, at certain periods of the year, the fine grind is needed to combat microscopic organisms near the surface or in shallow areas.

The Department of Light and Power of the City of Los Angeles has designed and built a belt conveyor distributor which provides great flexibility.

By a minor adjustment of the feed slot the belt conveyor machine allows the operator a range of from 1.2 pounds to 200 pounds per minute in the feed of the chemical used. It is a light machine of approximately 120 pounds in weight and is in two sections, making it possible for one operator to transfer the machine from a truck to a boat if required. The belt conveyor feed operates very evenly. It drops the chemical into the propeller wash of the boat and the distribution of the chemical is not wholly dependent on weather conditions. The hopper is very low, 28″ from the boat deck, which means a minimum of effort required to fill the hopper with chemical. The belt conveyor trough is adjustable in height, and will fit the stern of practically any boat. This machine, after the initial adjustment of chemical feed, requires very little attention from the water-treatment operator. This allows the operator more time for directing the boat operations to get the required distance between boat lanes and full coverage of the reservoir.

Continuous Feed Solution

When it is necessary to maintain a constant copper (or other chemical) residual in a body of water, or when it is desirable to treat water being drawn from a stream, continuous feed equipment frequently will serve the purpose.

This is the second and final article on equipment available to contract applicators for application of chemicals to aquatic areas. Part I appeared in the February issue.—Ed.

Pondweed and duckgrass growths are controlled in reservoirs of the Los Angeles Water and Power Company using continuous flow equipment.

The solution feed units range in capacity from 1,200 to 15,000 pounds and are of sufficient size to hold a minimum of five days' supply of large copper sulfate crystals. This allows the operator to visit the installation on a semiweekly basis. These units consist of a redwood storage tank and a water supply tank. On opposite sides of the redwood tank 4″ by 6″ screenboxes are constructed extending the full depth of the tank. The lower section of each box is perforated with a number of ¼″ diameter holes. These are large enough to allow the free flow of inlet water and outlet solution but will restrict the large copper sulfate crystals (1″ by ½″) from clogging the inlet and outlet lines. The water supply is furnished by a constant level tank, and the flow is regulated by an adjustable outlet. All pipe fittings on the copper sulfate solution side are of hard rubber or plastic. The water level in the bottom of the redwood tank is maintained at a depth of about 12″. The rate of feed is determined by the flow of water from the adjustable head box through the tank, and the concentration of the copper sulfate in the saturated or nearly saturated solution is dependent upon the temperature of the water.

For treating water drawn from a river, the system developed by the Terre Haute Water Works is inexpensive to construct and requires no attention except for replenishment of the chemical.

The copper sulfate is added at a receptacle made out of a concrete tile, 18″ in diameter and 24″ in length, set on a concrete base, with a perforated copper ring installed at the bottom of the tile. An inlet line delivers the water supply to the copper ring, furnishing a jet action inside the tile, where copper sulfate is placed, resulting in the copper sulfate solution feeding continuously from the outlet, through a 2″ plastic pipe.

Flow of water from inlet line to copper ring is regulated to control feeding rate of the solution.

While this article has touched on some of the varied types of equipment used to apply copper sulfate and other chemicals to water, it is obvious that local conditions frequently dictate modifications of the machines and changes in operating procedures.

The Phelps Dodge Refining Corporation Information Service at 300 Park Avenue, New York City, is constantly receiving data on systems and equipment developed and used by waterworks and commercial applicators. The advent of advanced techniques and new developments relating to water treatment are part of continuing studies by the Information Service and will be made available to those concerned with water management.