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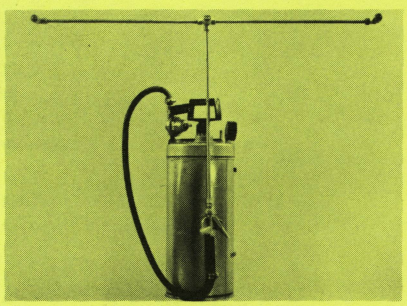
The Precision Sprayer How to Build It



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Proper application of a pesticide is important for controlling pests. To do an effective job, equipment must distribute the chemical uniformly and accurately over the desired area. Applying too much pesticide results in increased expenditures for chemicals, possible crop damage, increased hazard of excessive pesticide residue in the crop and possible pesticide residue carryover in the soil which may damage a susceptible crop in the rotation. Applying too little pesticide results in ineffective control and additional costs, either for reapplication or from excessive crop loss to the pest. Perhaps the most important aspect of uniform application is to insure that pesticide residues do not exceed the legal tolerance set by the Environmental Protection Agency (EPA).

Homeowners, fieldmen, extension agents, researchers, county weed supervisors and growers each have need for a small, accurate sprayer to apply herbicides, insecticides or fungicides in many situations. This publication illustrates the procedures for converting a conventional small pressure sprayer into a precision spraying unit with minimal expense and effort. The modifications have three purposes:

(1) to provide sturdy, low-maintenance equipment.

(2) to provide an easy, low-cost method for adding measurable air pressure to the spray tank.

(3) to provide a constant pressure at the nozzle tip which will permit the spray solution to be applied uniformly.

We recommend you start with a good-quality, 3-gallon, stainless steel tank with a self-sealing, quick release lid for convenience in cleaning and handling. The modification procedure is illustrated in steps 1 through 9 on the following pages. Necessary parts and materials are listed in the table on page 4.

Adding Air Pressure

Once the sprayer has been converted, you can choose one of several systems for adding propellant to the spray tank. Choices include:

(1) Air bombs, available from many service stations. These are generally inadequate because they do not have enough capacity.

(2) Spark plug attachment pumps. These are slow, inconvenient and not dependable.

(3) Engine-driven compressor run by gasoline or other fuels. This is an effective system but compressors are noisy, require regular repair and do constitute a fire hazard.

(4) Vehicle engine pumps. These are dependable but restrict you to the area of the vehicle and also require regular maintenance.

(5) Rechargeable CO_2 cylinders. These are highly dependable, low-cost, portable, safe and convenient, although they do require refilling by a dealer.

Do not use combustible gases such as oxygen, propane or acetylene. They are extremely dangerous.

Calibration

You must calibrate your sprayer so you will know precisely how much spray you are applying per unit area. To calibrate, follow this procedure:

(1) Mark out a square rod (16½ feet x 16½ feet).

(2) Put a known amount of water in the spray can; 2 quarts is usually enough.

(3) Pump the sprayer to approximately 80 pounds per square inch (psi) in the spray tank and adjust the pressure regulator to provide 40 psi pressure at the nozzle tips.

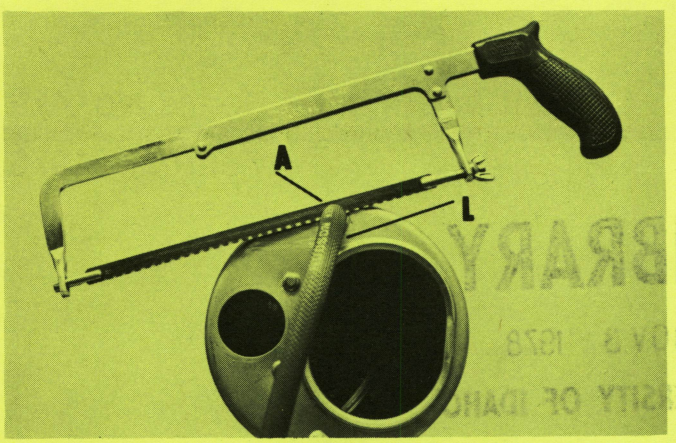
(4) Spray the square rod, walking at the same speed you plan to use in spraying the target area.

(5) Measure the water remaining in the spray can and subtract this amount from the original amount. Be as accurate as possible.

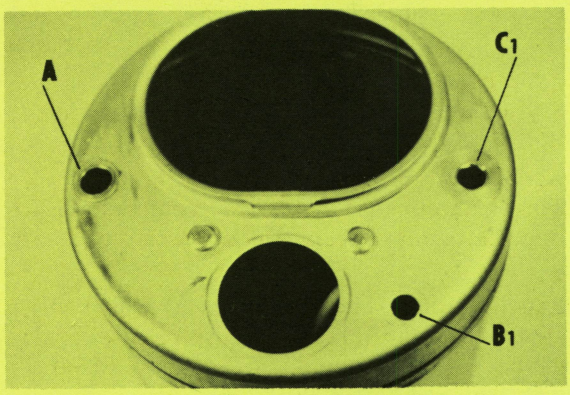
(6) Compute the rate of application per acre by the following formula:

gallons per acre = amount sprayed out (cups) x 10

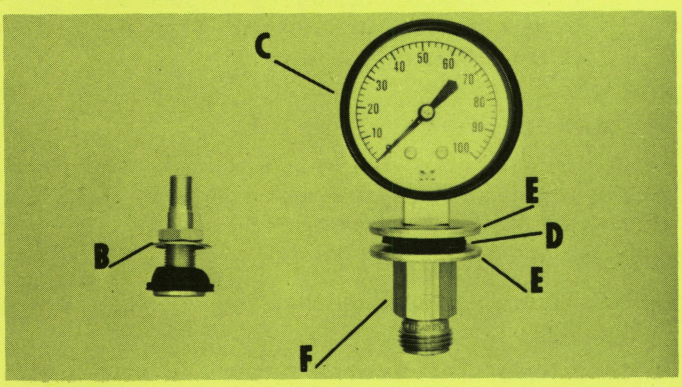
(There are 160 square rods per acre and 16 cups per gallon. The constant 10 in this formula is obtained by dividing 16 into 160.)



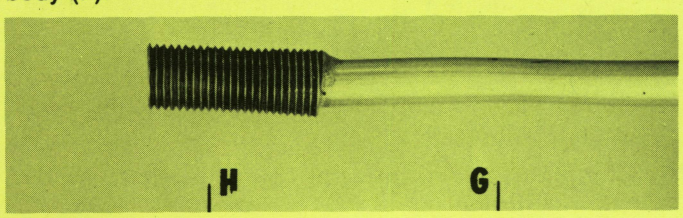
STEP 1 — Using a hack saw, remove the existing hose (L) flush with the tank. Smooth the opening (A) with a file.



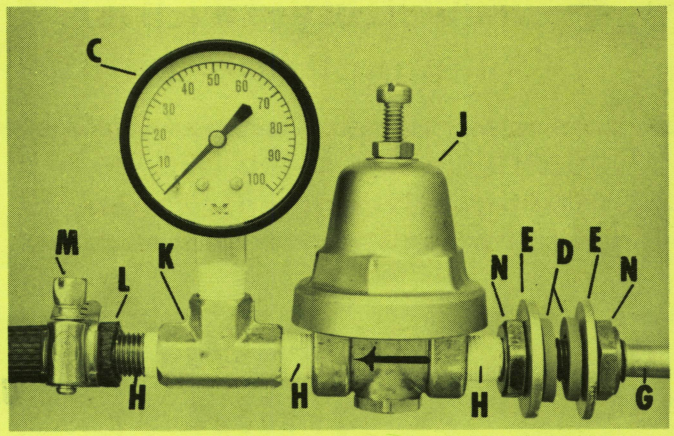
STEP 2 — Using a 9/16-inch metal bit, drill 2 more holes in the top of the can. The exact location of these holes is not important, but be sure to keep away from braces which may be on the inside of the can.



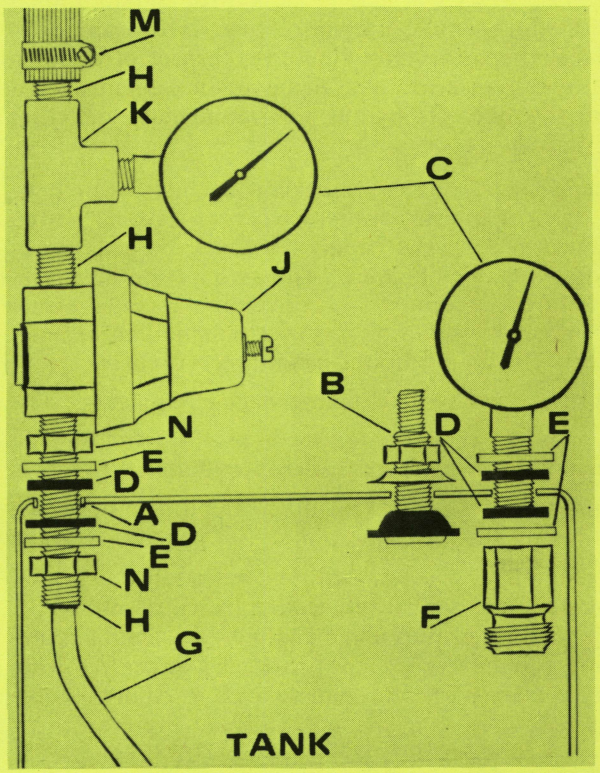
STEP 3 — Place truck tire valve (B) into hole B1. Into hole C1, place pressure indicating gauge (C), with hose and metal washers (D) and (E). Secure into place with spray nozzle body (F).



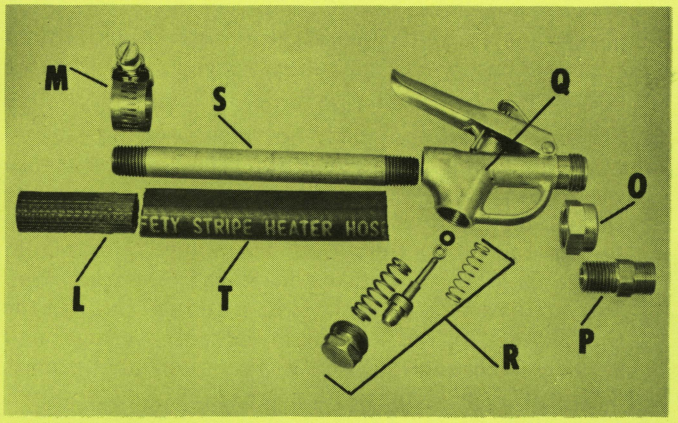
STEP 4 — Solder 17 inches of 5/16 copper tubing (G), into 2 inches of 1/4 inch threaded pipe (H). The end of the tubing may be split with a hack saw and inserted 1/4 inch into (H) for additional strength. The length of line (G) may be changed to accommodate other tank sizes (see Step 6).



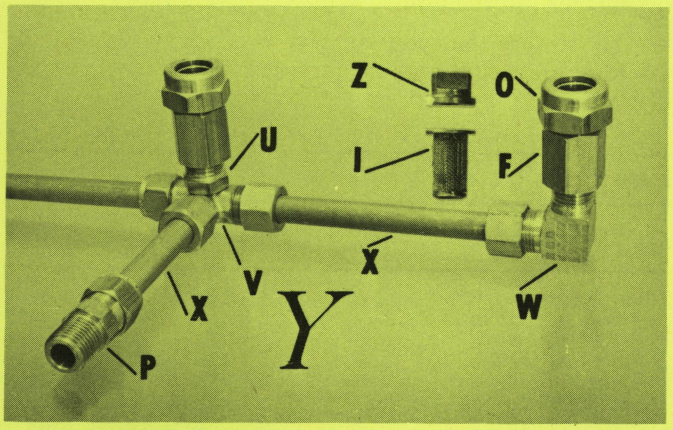
STEP 5 — Observing the direction of flow indicated on the regulator, connect soldered copper line (G&H) to pressure regulating valve (J). Connect (J) to brass "T" (K) with 3/4-inch length of threaded pipe (H). Connect pressure gauge (C) to (K). Place 1 1/2-inch length of threaded pipe (H) in the outflow end of (K) for attaching chemical resistant high pressure hose (L). You may need to heat the hose with hot water in order to force it over the pipe (H). Secure in place with hose clamp (M). Be sure that all threads are secured as tightly as possible.



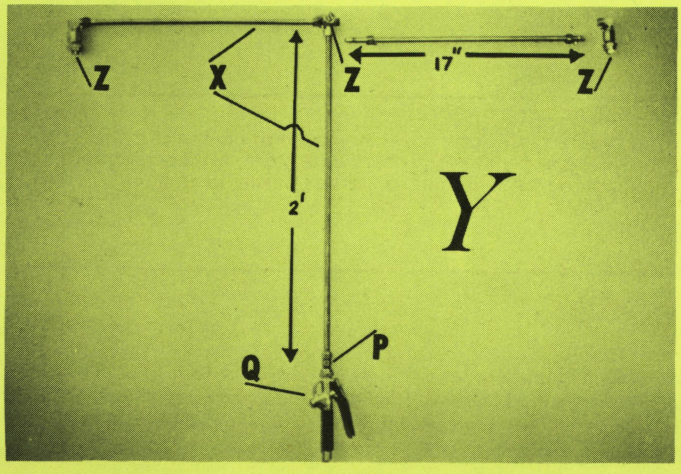
STEP 6 — Place lock nut (N), metal washer (E) and hose washer (D) on siphon line (H) as far as they will go. Insert siphon line, as assembled in Steps 4 and 5, through hole (A). Bend the copper siphon line (G) in a small "S" curve allowing it to come within 1/8 inch of the bottom at the center of the tank. Place washers (D) and (E) and lock nut (N) 1 inch up on threaded siphon line (H) on the inside of the tank. Tighten outside lock nut (N) securely against the top of the tank.

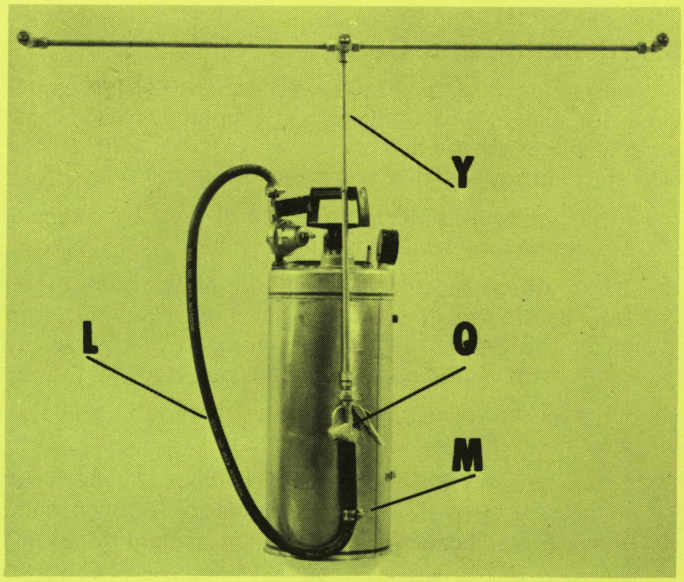


STEP 7 — Using a 1/4-inch 18 N.P.T., tap threads into retainer cap (O), to accept the 1/4-inch to 3/8-inch compression connector (P). Remove plunger assembly and springs (R) from trigger valve (Q), and solder (O), (P) and (Q) together. Install a 6-inch nipple of 1/4-inch galvanized pipe (S) into (Q) and cover with 5 inches of 1/2-inch heater hose (T). Push exposed threads of (S) into hose (L) and secure tightly with hose clamp (M).



STEP 8 — Silver solder 1/4-inch brass pipe plug (U) to compression "T" (V) and drill a 5/16-inch hole through (U) and (V). Attach compression "T" (V) to compression pipe elbow (W) with 17 inches of 3/8-inch O.D. thin wall aluminum tubing (X), and to compression pipe thread connector (P) with 2 feet of aluminum tubing (X). Insert strainer (I) and tip (Z) into spray head body (F) and secure in place with cap (O). Secure spray head bodies (Z) on pipe threads (U) and (W) to form spray boom assembly (Y).





STEP 9 — Attach spray boom assembly (Y) to spray tank by forcing hose (L) over galvanized pipe (S) of the trigger valve and secure tightly with hose clamp (M) (see Step 7).

NOTES

1. Wrap all exposed threads with pipe thread seal tape that is chemical resistant.
2. Check the tank for airtight integrity by using a paint brush and brushing soapsuds over the connections while the spray can is under normal working pressure.

Safety Suggestions

This spray-can modification complies with regulations for pressure vessels published by the Idaho Industrial Commission (Section 5, Paragraph 5A, 1976 Boiler Safety Code). In operation, never exceed the maximum working pressure listed by the manufacturer on the spray tank label. Normal operation should not require more than 80 pounds per square inch (psi) pressure in the tank with 40 psi working pressure at the spray nozzles.

Follow these general precautions:

(1) Read and follow all label instructions.

(2) Know and follow all pesticide safety precautions.

(3) Once a spray-can has contained herbicides, there can be no guarantee that a cleaning operation has removed all of the chemical. Therefore, do not use a herbicide sprayer to apply insecticide.

(4) Store your sprayer as well as supplies and properly labeled chemicals in a safe place so that they will not be used for other purposes.

(5) Exercise all reasonable care in the use and maintenance of spray equipment.

(6) Occasionally check the tank for airtight integrity by using a paint brush to spread soapsuds over the connections while the sprayer is under normal working pressure.

Maintenance and Care

A minimum of care should keep your sprayer in good working order. Most important, replace nozzle tips periodically to be sure that excessive wear does not increase rate of application. Other recommendations:

(1) Most sprayer malfunctions are caused by clogged nozzles so use clean water at all times.

(2) Clean all screens and nozzles thoroughly and flush the tank before using the sprayer. Never use metal objects to clean the nozzles as they can completely change the spray pattern and capacity of the tips.

(3) Keep all screens in place unless using wettable powders which will clog the screens.

(4) Clean sprayers thoroughly inside and out after each use to prevent corrosion and accumulation of chemicals. Never leave chemicals in the tank overnight or longer.

(5) When changing chemicals or when you have finished a spraying operation, clean the sprayer thoroughly both inside and out. A 10 percent solution of household cleaning ammonia will satisfactorily remove chemical residue. Recharge the sprayer and vent the ammonia solution through the boom system. Thoroughly rinse the entire can and boom with clean water to eliminate the ammonia solution. Some chemicals are particularly persistent in the sprayer and must be removed completely to prevent possible injury in other spraying operations.

(6) For proper cleaning at the end of the season, remove and clean all screens and tips in an ammonia solution using a soft brush. Also circulate this solution through the spray tank and flush it through the boom. Replace the screens and nozzle tips. Add 3 teaspoons of household ammonia in 1 gallon of water, place in the spray tank and circulate it through the system and out through the tip. Leave ¾ of the solution in the tank overnight and then run it through the nozzles the following morning. Then flush the system with a tank full of clean water.

(7) A small amount of kerosene placed in the tank and run through the system to coat all parts will help protect the unit from possible rust damage during storage. Store the tank upside down in a clean location with the lid removed to prevent accumulation of moisture.

(8) Be sure that all chemicals and cleaning water are disposed of according to EPA specifications. Contact your local extension agent or EPA representative for further information.

(9) To be sure that your sprayer is accurate, you should recalibrate it at regular intervals.

Sprayer Modifications Materials List

Item	Part no.	Quantity needed	Cost*	Possible source†
Stainless steel spray tank		1	74.05	
Pressure regulating valve, type A-31	J	1	6.00	
Liquid pressure indicating gauge	C	2	10.00	
High pressure chemical hose	L	1	‡	
Female connection spray nozzle body	F	4	1.92	1
100 mesh check valve strainer	I	3	3.60	1
3/4-inch spray tip retainer cap	O	4	1.44	1
Stainless steel spray tip	Z	3	7.50	1
Trigger valve	Q	1	5.00	1
1/4-inch Hollow brass hex head pipe plug	U	1	.45	2
3/8-inch brass compression "T"	V	1	2.16	2
1/4-inch brass female pipe "T"	K	1	1.58	2
3/8-inch compression x1/4-inch brass male pipe connector	P	1	1.16	2
3/8-inch compression x 1/4-inch brass male 90° pipe elbow	W	2	2.32	2
3/8-inch copper tubing	G	17"	.66	2
Hex head hose clamp	M	2	.30	2
1/2-inch heater hose	T	5"	.35	2
1/4-inch galvanized pipe nipple	S	6"	.50	3
3/8-inch standard flat metal washer#	E	3	.25	3
Rubber washer (can be made from innertube)	D	4	.10	3
Pipe thread seal tape	-	-	.80	3
1/4-inch threaded pipe	H	6"	2.50	4
3/8-inch O.D. x .035 aluminum tubing	X	5 ft.	3.00	4
1/4-inch standard pipe lock nut	N	2	.50	5
Tubeless truck tire valve	B	1	2.50	6
Total Cost			128.64	

*The costs are actual costs of materials used in September to convert one sprayer, but may not reflect current prices in your community.

†Spray tank, regulating valve and indicating gauges may need to be special ordered through a local merchant or chemical dealer. Other materials should be available through (1) spray systems supplier; (2) automotive supply store; (3) hardware store; (4) machine shop; (5) plumbing shop; (6) tire service center. Contact the authors for specific recommendations if materials aren't available locally.

‡Provided with spray tank.

#File hole in washer to accept 1/4-inch pipe.

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