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Agricultural Experiment Station

BUREAU OF ANIMAL INDUSTRY

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Spraying Apparatus. Insecticides. Fungicides. Spraying Calendar.

Bulletins of this Station will be sent, upon application, free of charge, to any Farmer in the State.

KNOXVILLE TENNESSEE, U. S. A.

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THE AGRICULTURAL EXPERIMENT STATION

OF THE UNIVERSITY OF TENNESSEE.

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The Station has facilities for analyzing and testing fertilizers, cattle foods, milk and dairy products; seeds, with reference to their purity or germinating power; for identifying grasses and weeds, and studying forage plants; for investigating the diseases of fruits and fruit trees, grains and other useful plants.

The Station Bulletins and Reports will be sent, free of charge, to any farmer within the State.

Packages by express, to receive attention, should be *prepaid*.

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☞ The Experiment Station building, containing its offices, laboratories and museum, and the plant-house and horticultural department, are located on the University grounds, fifteen minutes walk from the Custom House in Knoxville. The Experiment farm, stables, milk laboratory, etc., are located one mile west of the University, on the Kingston pike. Farmers are cordially invited to visit the buildings and experimental grounds.

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*Died, May 12th, 1895.

SPRAYING APPARATUS.

R. L. WATTS, HORTICULTURIST.

The spraying of fruits and certain vegetables to prevent the ravages of various insects and fungous diseases has become a practice which is considered as necessary as pruning, cultivating and fertilizing. It is not many years since our fruit growers and gardeners doubted whether spraying is a profitable operation. But now, intelligent husbandmen who work for the best results are convinced that it pays to use insecticides and fungicides. Every fruit grown in our state is subject to the attack of one or more enemies, and unless these are destroyed or checked in their depredations the injury incurred is usually very serious.

What is the most satisfactory spraying outfit, is an inquiry frequently made. It is hoped that this Bulletin will help our farmers, gardeners and fruit growers to make an intelligent selection of a pump best adapted to their needs.

The material used in spraying machines should be of the best quality. Cheap pumps with iron cylinders and leather valves are of little value, as copper sulphate, which is so frequently employed as a fungicide, soon destroys or corrodes both of these materials. All high grade pumps are provided with rubber valves, brass cylinders, brass rods, and brass screw spouts for the attachment of the hose. The tanks of the knapsack sprayers are made of copper. None of the solutions commonly used will corrode or destroy the last named materials.

BUCKET PUMPS.

There has been an increasing demand from amateurs and those possessing small gardens and fruit plantations for a satisfactory but inexpensive pump. Most of the cheap forms are of little value for reasons already mentioned. But there is a class of bucket pumps, ranging in price from six to nine dollars, suitable for small gardens.

The "New Wonder" sprayer (Fig. 1), sold by P. C. Lewis Manufacturing Company, Catskill, New York, has been tested at the Experiment Station, and found to be an excellent cheap sprayer. All parts which

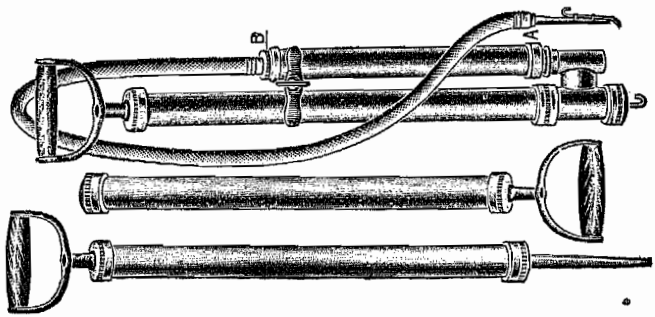


FIG. 1.

come in contact with the solution are made of brass. The pump may be used in a common wooden bucket, or in a barrel. This pump has several advantages which other cheap machines do not possess. The illustration shows the pump adjusted in three different ways. The upper one is used for ordinary spraying and is mounted on a barrel or a bucket. The middle section may be used as a syringe in combating insects in the field or greenhouse, and is also valuable in



FIG 2.

making kerosene emulsion. The lower adjustment is serviceable in throwing a solid stream. Two "Lewis Graduating" nozzles are

furnished with each pump, which throw quite a fine spray, but are not equal to the Vermorel in this respect. Of course the operator cannot produce such a constant spray as with pumps provided with air chambers.

The "Little Gem" pump, (Fig. 2) sold by the Field Force Pump Company, Lockport, New York, costing four dollars, is satisfactory for garden or greenhouse work. All the working parts are made of brass. It is provided with an air chamber and "Combination Vermorel" nozzle. The Vermorel attachment can be removed and a solid stream thrown. Nearly all manufacturers of spraying machines make pumps similar to this one which may be used in buckets.

KNAPSACK SPRAYERS.

The knapsack sprayers, arranged to strap on the back, consists of a copper tank holding from four to six gallons, and a brass pump which is operated by a rod attached to the lever. These pumps are perhaps more generally used than any other style. They have advantages and disadvantages. The work can be done very efficiently because the operator can freely move about and direct the spray at will. For spraying on very steep hills and rough locations this form is indispensable. It would be impossible to use a barrel or power machine on some of our Tennessee hills, although these locations are generally well adapted to fruit culture. The knapsacks are not powerful enough for treating large trees, hence their use has been almost wholly confined to vineyards and low-growing plants, shrubs and trees. They are open to criticism because of the unpleasantness in carrying such a heavy weight on the back; the work cannot be performed very rapidly on account of the time required to fill the tank so frequently, and



FIG. 3.

because only one hose can be used. We do not recommend the use of knapsack sprayers for vineyards, young orchards or small fruit plan-

tations of even moderate acreage, unless the steepness or roughness of the land prevents the use of a barrel or power sprayer. Knapsack sprayers have been tried with satisfactory results at the Experiment Station. The "Excelsior" (Fig 3) manufactured by William Stahl, Quincy, Ill., and listed at twelve dollars, has given good results. Figure 4 represents the "Galloway" sprayer, with a kerosene attachment which was

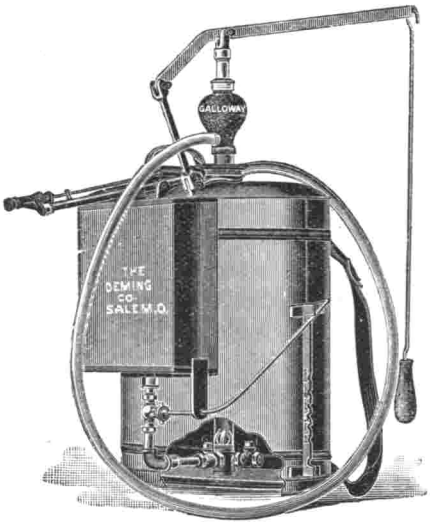


FIG. 4.

recently designed by Professor H. E. Weed of the Mississippi Experiment Station. It is sold by the Deming Company, Salem, Ohio. This apparatus has been tested by the entomologist of our station, who considers it an excellent pump. The kerosene attachment is a new feature in connection with knapsack sprayers. It is arranged so as to mix the kerosene with water while operating the machine. The attachment may be removed at will from the main pump.

CART AND BARREL SPRAYERS.

The cart and barrel sprayers are almost exclusively used in treating large plantations of orchard fruits, vineyards, small fruits, potatoes, etc. The tanks consist of tight boxes or, more commonly, barrels mounted on low sleds, carts or wagons, and drawn by hand or horse power. Pumps should have cylinders measuring at least two and one-half inches in diameter. They may be mounted on the top or, preferably, on the side of the barrels. This style is commendable on account of the powerful pump, large tank, ease in conveying the solution and operating the pump, and rapidity in applying the solution by

means of two lines of hose. If a Y attachment is employed (Fig. 5),

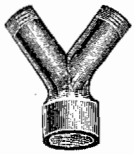


FIG. 5.

two nozzles may be used on one or both sides if desirable. A double Vermorel nozzle will secure the same results as the Y.

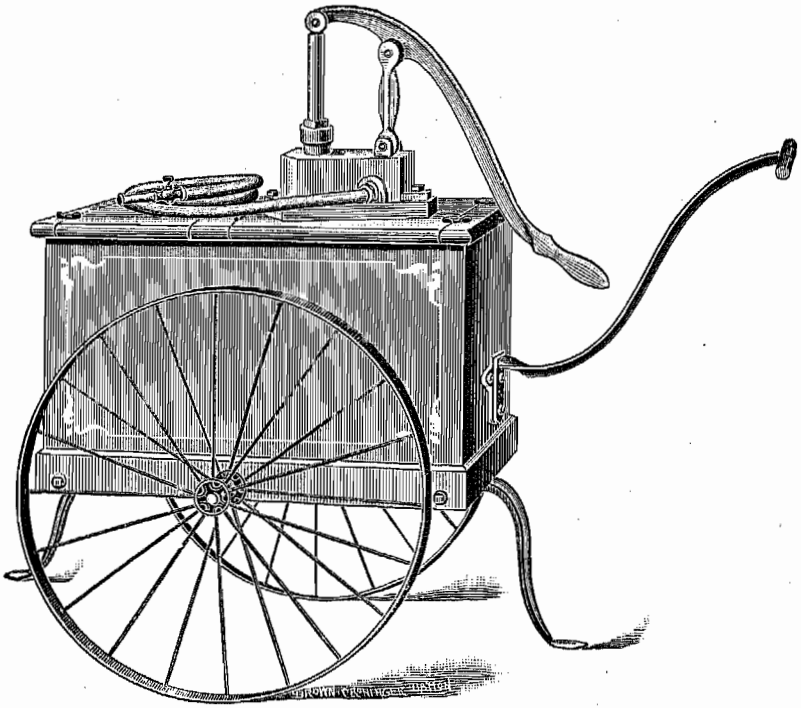


FIG. 6.

The "Little Giant," sold by the Nixon Nozzle and Machine Company, Dayton, Ohio, has been used in most of our work. It is neatly mounted on iron wheels and may be drawn by hand, or placed on a wagon to spray large trees. This is a satisfactory pump in every particular, if the ground is not too rough and hilly. Provision is made for the attachment of two lines of hose. The pump has a large air chamber and a satisfactory agitator. Fig. 6 represents the New Progress which is sold by the same firm. It is of recent introduction, resembles the Little Giant, but claimed to be superior to it for garden and orchard spraying.

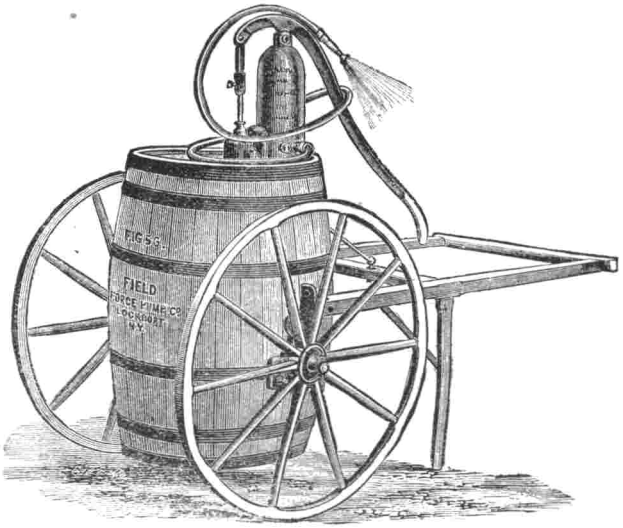


FIG. 7.

Figure 7 shows an outfit with the barrel mounted for pushing by hand. It is sold for nineteen dollars by the Field Force Pump Com-

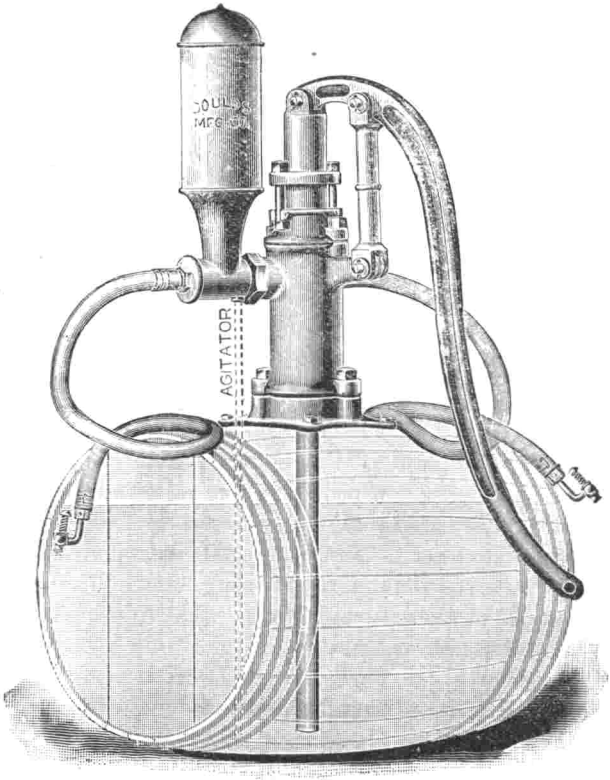


FIG. 8.

pany, Lockport, New York. A serviceable sprayer, although not so neat in appearance as the "Little Giant."

Figure 8 represents a pump mounted on the side of a barrel. Pumps of this general style are made by nearly all manufacturers of spraying machinery. The one shown above is sold by the Gould Manufacturing Company, Seneca Falls, New York. Pumps of this class range in price from eight to sixteen dollars. They are easily mounted on clean tight barrels. If such a large tank is not desired, use a half barrel, The barrel is commonly placed on a low cart or wagon. One man should drive the horse and operate the pump, and it is economy to have a man for each line of hose to direct the spray on both sides of the wagon.

POWER MACHINES.

Power machines are geared so that the horse not only draws the apparatus, but operates the pump. These sprayers are not satisfactory

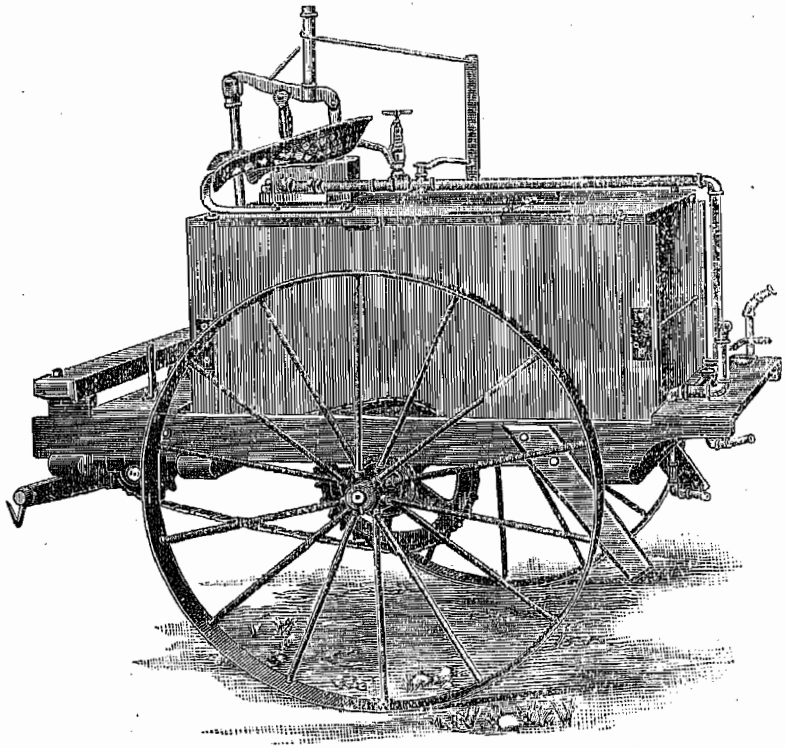


FIG. 9.
PRICE, $75. WITHOUT GEARING, $60.

to treat large trees because the solution can not be evenly distributed nor applied in sufficient quantity. They have, however, proven excel-

lent machines for the treatment of vineyards, nursery stock, small fruits, and are largely employed by the extensive grape growers of the United States. With these machines, the labor required in the application of the solution is reduced to a minimum, since only one man and a horse are necessary to operate four nozzles. Nearly all manufacturers of spraying apparatus make one or more forms of power machines.

The "Climax Orchard and Vineyard Cart," (Fig. 9), sold by the Nixon Nozzle and Machine Company, Dayton, Ohio, is used with entire satisfaction in the large vineyard of William Jenkins, near Knoxville. The pump is worked by means of sprocket wheels or may be thrown out of gear and operated by hand. The nozzles are attached on either side. List price with gearing is seventy-five dollars.

AGITATORS.

Many sprayers are provided with agitators to keep the solution well stirred while the application is being made. These are very useful and necessary in treating with Bordeaux mixture, which at present is more largely employed than any other fungicide. A paddle, varying in size and shape, which is operated by the lever of the pump, is used in some sprayers. This is the most satisfactory method of keeping the solution stirred, but requires too much power. A return hose, which is often used, also requires too much power, and agitates only a portion of the solution. If the pump has no agitator, frequent stirring with a broad paddle will accomplish the same results.

THE HOSE.

A four- or five-ply hose of superior quality, measuring one-half or three-fourths in diameter should be used. It should be about five feet long for bucket and knapsack forms, and from eight to thirty-five feet for spraying orchards.

EXTENSION RODS.

In the treatment of large trees, it is necessary to use an extension rod to support the nozzle near the higher branches. It should be from eight to fifteen feet long. Any kind of a pole will answer the purpose, the hose being securely attached with twine. A bamboo extension

SPRAY PUMP BAMBOO EXTENSION.



GOULD. FIG. 10.

rod, as shown in figure 10, may be purchased. This consists of a brass tube inside of bamboo, with brass stop cock for one-half or three-fourths inch at one end, and the other end is cut to connect with the nozzle.

NOZZLES.

Next in importance to a good pump is a satisfactory nozzle. There are so many different kinds manufactured that the fruit grower who has had no experience in spraying is frequently unable, from catalogue descriptions to determine which is the best nozzle for his special purpose. For spraying low plants the nozzle should produce, with considerable force, a very fine mist-like spray. To treat large trees successfully the nozzle should be made so it can be adjusted to produce a broad fine spray or throw the solution in a finely divided state for a distance of ten feet or more. The Experiment Station has carefully tested all of the following makes which are most largely sold, with a view to assisting our fruit growers and gardeners in making an intelligent selection of this important part of the spraying outfit:

MASSON.—A good nozzle, but inferior to the Vermorel. When the spray is made sufficiently fine, not enough liquid passes the orifice.

EXCELSIOR.—Produces a fan-shaped spray which is not fine enough. Can be adjusted to throw a solid stream three-eights of an inch in diameter.

CALLA.—This differs from the Excelsior only in form of barrel.

BORDEAUX.—A largely sold nozzle, but we consider it inferior to the Vermorel. The fan-shaped spray is thought an advantage by some.

SENECA.—Produces a fan-shaped discharge. We consider it an inferior nozzle for either vineyard or garden work.

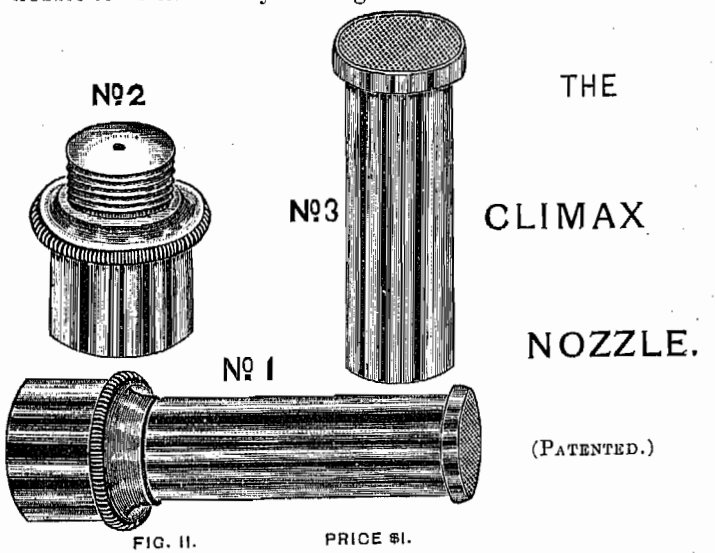
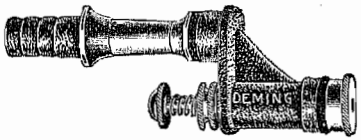


FIG. II. PRICE $1.

CLIMAX.—(Fig. 11). One of the most popular nozzles used and very simple in its construction. However, we have not found it equal to the Vermorel.

VERMOREL.—The Station has tried several forms of Vermorel nozzles, and we consider them the best for all kinds of work except for the treatment of large trees.

THE "DEMING-VERMOREL" SPRAY NOZZLE.



(Patented) FIG. 12.

Figure 12 represents the Deming-Vermorel nozzle sold by the Deming Company, Salem, Ohio.

DOUBLE VERMOREL.

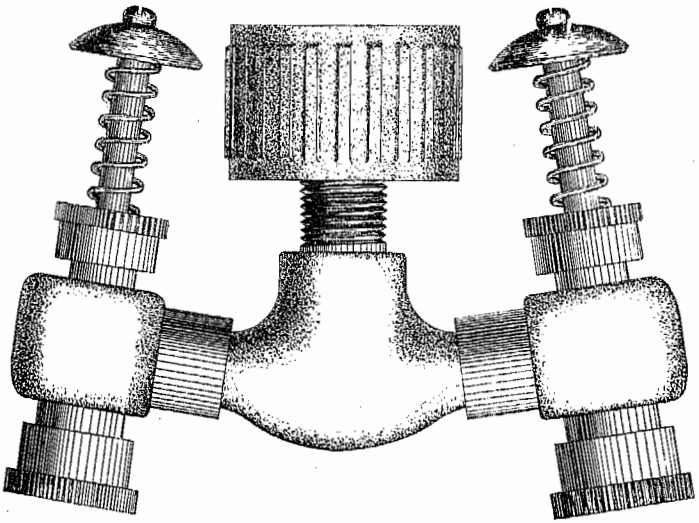


FIG. 13.

The Double Vermorel nozzle is shown in figure 13. It may be purchased of Morrie and Morley, Benton Harbor, Michigan. This is an excellent nozzle.

LEWIS GRADUATING.—This was mentioned in connection with the "New Wonder" pump. The spray is not fine enough.

MCGOWEN.—(Fig. 14.) The best nozzle for the treatment of large trees. The spray may be thrown with a good pump in a finely divided state to the distance of twelve to fifteen feet. It is well constructed and highly efficient. Manufactured by John McGowen, Ithaca, New York.

The CYCLONE and MYER'S produce a spray quite similar to the Vermorel, but are not as good nozzles.

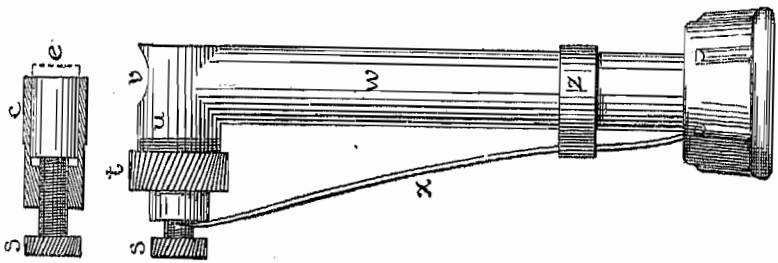


FIG. 14.

POWDER MACHINES.

Powder machines are useful for the application of fungicides or



FIG. 15.

insecticides in the dry form. Figure 15 illustrates "Leggett's Paris Green or Dry Powder Gun," manufactured by Leggett and Brother, 301 Pearl Street, New York. The Experiment Station has used this gun with entire satisfaction in the treatment of potato vines. Other small bellows forms are valuable for use in the garden and greenhouse.

THE CARE OF SPRAYERS.

After using, all parts of the pump should be thoroughly cleaned. Keep the machine well oiled while operating and preserve the woodwork by painting when necessary.

INSECTICIDES.

CHAS. E. CHAMBLISS, ENTOMOLOGIST.

For killing insects which eat the external parts of plants, the surest and simplest remedy is the use of poisons which will adhere to the parts attacked, and be swallowed by the insect with its food. The two substances which are in common use for such purposes are Paris green and London purple.

PARIS GREEN is a chemical combination of arsenic and copper called arsenite of copper, containing about 55–60% of arsenic. It is practically insoluble in water, but is a much stronger insecticides and less liable to burn foliage than London purple.

LONDON PURPLE is a by-product obtained in the manufacture of aniline dyes. It contains about the same percentage of arsenic as Paris green, but owing to its more finely powdered condition, it is more easily suspended in water, and consequently more liable to injure foliage.

The above arsenicals can be applied either wet or dry. In the preparation of these poisons for spraying, they should be made into a thin paste in a small quantity of water, and to this should be added an equal amount of quick lime, which will take up the free arsenic and remove or lessen the danger of scalding. Before using the poison, it should be carefully pulverized and strained. In applying either of these in form of a spray, they should be used at the rate of one pound to 100 to 250 gallons of water, or one ounce to 6 to 15 gallons. For general purposes, one pound of poison to 150 gallons of water is a good strength.

In the dry application of these poisons, they should be diluted at least with ten parts of flour or lime, and preferably applied in the early morning, when the dew is on, in order that the poison may adhere well to the foliage. Unless a large area is to be treated, it is an advantage to apply the arsenicals by the wet method instead of the dry.

Succulent vegetation which has been thoroughly saturated by a

strong arsenical solution can be employed for baiting cutworms and wireworms. To protect these baits from drying, they should be covered with boards or stones.

Both of the above arsenicals can be used with Bordeaux mixture, but Paris green is preferable,because it is less liable to burn the foliage. The Bordeaux mixture takes the place of the water, and the arsenical should be added to it at the same rate per gallon as when water is used. In fighting a fungus and an insect at the same time and on the same tree, it is labor saved to use this combination of a fungicide and insecticide.

To kill insects that use the juices of the inner parts of plants for food, substances must be employed that will serve to smother them by closing their breathing pores.

KEROSENE EMULSION is the insecticide commonly used for such insects. It is prepared in the following manner:—one half a pound of whale oil soap is finely divided by means of a knife and then completely dissolved in one gallon of water, by boiling. This solution while hot is added, away from the fire, to two gallons of kerosene and violently churned or agitated, preferably by means of a small force pump, until the whole mixture assumes the consistency of cream, which usually takes ten minutes of continuous work. If the emulsion is perfect, it will keep indefinitely. It should be diluted with cold water only when needed.

THE KEROSENE AND SOAP EMULSION FORMULA.

Kerosene	2 gallons.
Whale oil soap (or one quart soft soap)	½ pound.
Water	1 gallon.

In limestone regions, rain water should be used; for the soap will combine with the lime or magnesia in the water and more or less of the oil will be freed.

For most plant lice and other soft bodied insects, dilute the emulsion with from 15–20 parts of cold water.

For scale insects, the larger plant bugs, larvæ and beetles, dilute the emulsion with from 7–9 parts of cold water. To destroy scale insects during the winter, when the trees are in a dormant and leafless condition, pure emulsion can be used without injury to the tree. The pure emulsion cannot be sprayed, but can be applied with brush or sponge.

For the root-louse of apple, root maggots and white grubs in strawberry patches, dilute the emulsion 15 times with cold water. In applying it to the roots of trees, excavations two or three feet in diameter and six inches deep should be made about the base of trunk, into which should be poured five gallons of the wash. This treatment should be made in early spring, when rains are frequent in order that the diluted emulsion can be washed down, but in case the spring should be dry, or the application made late in the season, the diluted emulsion can be carried down by five gallons of water.

For white grubs and root maggots enough of the wash should be placed at the base of the plant to wet the soil for an inch or more. This application should be followed in course of an hour with an equal amount of water.

THE KEROSENE AND MILK EMULSION FORMULA.

Kerosene ..... 2 gallons.
Milk (sour) ..... 1 gallon.

Without heating, this mixture can be churned into a creamy mass within five minutes. This emulsion can be used instead of the kerosene and soap emulsion, but must be used immediately, which is a disadvantage; for it will ferment in a week unless stored in an air-tight jar.

KEROSENE AND WATER. By means of the knapsack sprayer with kerosene attachment, kerosene can be mechanically mixed with water for use as an insecticide. For treatment of ordinary insects, the following proportions are recommended, (Weed);

Plant-lice, of all kinds, 1–20.
Caterpillars or other larvæ exposed on leaves, 1–15.
Scale insects on leaves, 1–10.
Scale insects on bark, summer treatment, 2–10.

"RAUPENLEIM" is a crude petroleum product. This substance is very viscid and sticky, and when exposed will remain for a long time unaffected by sun and rain, which properties recommend it as a good material for coating trees against the attack of borers. It can be applied to trees with a paddle and distributed by means of a stiff brush so as to form an absolutely complete and continuous coat of any desired thickness. A coating of this material at least 3-16 inch thick to the trunks of trees from ground to branches after scraping off the loose bark, would offer a surface which no insect would care to alight upon, and be so absolutely impenetrable that no larva could possibly penetrate it to get into the trunk, nor could any emerge that were already within the trunk. (Smith).

COST OF THE MATERIALS USED IN THE ABOVE INSECTICIDES:

Whale oil soap, 10 cents per pound.
Paris green, 30 cents per pound.
London purple, 20 cents per pound.

Discount on large quantities. They can be obtained from any seedsman.

"Raupenleim" or "Ermisch's Caterpillar Lime," Owl Trident brand can be obtained from Messrs. Wm. Menzel & Son, 64 Broad St., New York, at a cost of $3.75 per keg of 25 pounds.

FUNGICIDES.

SAMUEL M. BAIN, BOTANIST.

In applying fungicides for any plant disease it is well to remember that we cannot cure the disease after it has become established; we can only prevent the fungus from spreading to other plants and to other parts of the same plant. Fungi are plants just as truly as the hosts on which they feed. When they have once gained entrance into the tissues of any plant there is no way of removing them. They have their own organs of reproduction, *spores*, corresponding to the seeds of higher plants, which we may prevent from developing,or completely destroy. The benefit of spraying for certain fungous diseases is no longer an experiment, but a demonstrated fact. In the most progressive fruit growing sections of our country spraying is considered as much a part of cultivation as plowing or fertilizing.

Spraying must begin early in the season for most diseases. Read carefully all that is said about mixing the fungicides.

BORDEAUX MIXTURE.—This is the most efficient fungicide for most purposes. The formula is

6 pounds Copper Sulphate, (bluestone).
4 pounds unslacked Lime.
1 barrel Water, (40 or 50 gallons).

The chemicals should be dissolved in a wooden or earthenware vessel, because the copper compounds attack iron or tin vessels. Dissolve the copper sulphate in 4 or 5 gallons of water. This may be done either in hot water, or in cold water by suspending the bluestone in a sack at the upper level of the water. Slack the lime by pouring on a small quantity of water at a time.

After the lime has thoroughly slacked mix it with the bluestone solution in a barrel, then add water enough to fill the barrel. Strain this mixture before using, unless your sprayer has a seive attachment. The mixture thus made should have a deep sky-blue color. Apply soon after mixing.

Do not use any but fresh, unslacked lime, which will readily combine with water giving off heat. *Never use air-slacked lime.*

Where a large amount of spraying is to be done, separate stock

solutions of bluestone and of slacked lime may be kept on hand, and mixed when needed. For this purpose dissolve 100 pounds of copper sulphate in twenty-five gallons of water, each gallon of which will then contain four pounds of the sulphate. Slake 100 pounds of lime and add water enough to make fifty gallons. When required for use add two gallons of the milk of lime to one and one-half gallons of the sulphate solution in a barrel, then fill the barrel with water.

ALKALINE BORDEAUX.—When the Bordeaux mixture is to be applied to peach trees, use twice as much lime in its preparation; that is, for each six pounds of copper sulphate add eight pounds of lime.

COPPER SULPHATE SOLUTION.—This is made by dissolving one pound of bluestone in fifteen gallons of water. This is applied to trees before the buds put out, in order to destroy any fungus spores that may be lodged about them.

AMMONIACAL COPPER CARBONATE.—One quart of the strongest ammonia (26°) is added to two gallons of water. To this add by degrees, thoroughly stirring meanwhile, carbonate of copper until a considerable quantity remains undissolved. Allow to settle, and pour off two gallons of the clear liquid into enough water to make a barrel. The undissolved copper carbonate, which settled to the bottom, may be used again. This fungicide is used for the same purpose as the Bordeaux mixture. Although it is some cheaper it is not considered as efficient a fungicide as the latter. It must, however, often be used in the last one or two sprayings to avoid disfiguring ripe fruit, which occurs when the Bordeaux mixture is used.

COST OF SUPPLIES.

Copper Sulphate, 8 cents per pound.
Copper Carbonate, 60 cents per pound.
Ammonia, 14 cents per pound.
Wholesale rates cheaper.

SPRAYING CALENDAR.

CHAS. E. CHAMBLISS AND SAMUEL M. BAIN.

Plant.	Fungus—Insect	First Application.	Second Application.
Apple	Scab	Copper sulphate solution before buds start.	After blossoms have formed, but before they open, Bordeaux.
	Codling moth, Leaf-eating larvæ		
	Aphides	When aphides appear, kerosene emulsion, diluted 15 times with cold water.	Repeat, 7 days later.
	Scale Insects	During the 2d week of May, kerosene emulsion, diluted 9 times with cold water.	Repeat, 7 days later.
	Borers	During the 3d week of May, coat trunks of trees with *Raupenleim* to thickness of $\frac{3}{16}$ in.	
Bean	Antracnose. Rust. Flea beetles.	When blossoms appear, Bordeaux and Paris green.	Repeat, 10 days later.
Cabbage	Worms and aphis	When worms and aphis first appear, kerosene emulsion, diluted 15 times with cold water.	Repeat when necessary, if plants are not heading.
Cherry	Rot	Before buds start, copper sulphate.	When fruit has set, Bordeaux and Paris green.
	Curculio, slugs and other leaf-eating larvæ	When foliage is well started, Paris green.	
	Aphis	When aphis appears, kerosene emulsion, diluted 15 times with cold water.	If necessary, repeat 7 days later.
Currant and Gooseberry	Mildew, worms.	When leaves expand, Bordeaux and Paris green.	10-14 days later, Bordeaux and Paris green.
Grape	Fungous diseases	Before buds open, copper sulphate.	When leaves are small and before blossoms open, Bordeaux and Paris green.
	Flea beetles and leaf-eating larvæ.		
	Aphis	When aphis appears, kerosene emulsion, diluted fifteen times with cold water.	Repeat when necessary.
Melons	Beetles	Apply refuse tobacco powder to hills, which will serve as a repellent.	

SPRAYING CALENDAR.

Third Application.	Fourth Application.	Fifth Application.
When blossoms have fallen, Bordeaux and Paris green. Repeat when necessary.	10-14 days later, Bordeaux and Paris green.	10-14 days later, Bordeaux and Paris green.
Repeat, 14 days later.	Repeat when necessary.	
Repeat when necessary, if plants are not heading.		
10-14 days later, Bordeaux and Paris green. Repeat when necessary.	10-14 days later, ammon. copper carbonate.	
If fruit near ripening, ammon. copper carbonate.		
When flowers have fallen, Bordeaux and Paris green.	10-14 days later, Bordeaux and Paris green.	10-14 days later, if any disease appears, Bordeaux. Further application of ammon. copper carbonate, if necessary.

SPRAYING CALENDAR.

Plant.	Fungus—Insect	First Application.	Second Application.
Peach, Apricot, Nectarine,	Rot	Before buds swell, copper sulphate solution.	Just before flowers open, Bordeaux.
	Curculio & leaf-eating larvæ.	When foliage is well started, Paris green.	
	Borers	During 3d week of May coat trunks of trees with *Raupenleim* to thickness of $\frac{3}{16}$ inch.	
Pear	Scab	When buds begin to swell, copper sulphate.	Just before blossoms open, Bordeaux.
	Codling moth, leaf-eating larvæ		
Plum	Fungous diseases	When buds begin to swell Bordeaux. Cut out and burn black knot when found.	When fruit has set, Bordeaux and Paris green.
	Curculio and leaf eating larvæ.	When foliage is well started Paris green.	
Potato	Scab and blight.	Soak seed for scab in corrosive sublimate solution (2 oz. in 16 gallons water) 90 minutes	When vines are two-thirds grown, Bordeaux.
	Beetles	When beetles or their larvæ appear Paris green. Apply wet.	Repeat whenever necessary.
Raspberry, blackberry & dewberry.	Anthracnose and rust.	Before buds break, copper sulphate. Cut out and burn badly diseased canes.	During summer, if rust appears on leaves, Bordeaux.
Strawberry	Leaf blight. Flea beetles.	Just before blossoms open, Bordeaux and Paris green.	When fruit has set, Bordeaux and Paris green.
	Aphis, White grub	When they appear. kerosene emulsion, diluted 15 times. For white grub, wet the ground thoroughly.	
Tomato	Rot, blight	When first fruits have set, Bordeaux.	Repeat if diseases are not checked.
	Larvæ (worms)	Hand picking is the most effective remedy.	
Squash	*Anasa tristis*. (Squash bug)	Hand picking is the most effective remedy for the adults, when they first appear.	For the young, kerosene emulsion, diluted 15 times.

SPRAYING CALENDAR.

Third Application.	Fourth Application.	Fifth Application.
As soon as fruit has set, alkaline Bordeaux and Paris green.	When fruit is nearly grown alkaline Bordeaux. Paris green 7 days later, if there has been a rain since last application.	5–10 days later, alkaline Bordeaux, which can be repeated when necessary.
When blossoms have fallen, Bordeaux and Paris green.	10–14 days later, Bordeaux and Paris green.	10–14 days later repeat, make another application when necessary.
10–12 days later, repeat Bordeaux. Paris green 7 days later, if there has been a rain since last application.	Repeat Bordeaux, when necessary.	
Repeat when necessary.		
Repeat if necessary.	(Orange rust is best treated by destroying the affected plants, root and branch.)	
As first fruits are ripening, ammon. copper carbonate.	When last fruits are harvested, Bordeaux.	Repeat when necessary.
Repeat when necessary.		