THE CLIP-OIL

for Controlling Tobacco Suckers

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Department of Agricultural Engineering

North Carolina Agricultural Experiment Station

FOREWORD

Increased efficiency of production on the farm is one of the main goals of research at the North Carolina Agricultural Experiment Station. Through greater efficiency the cost of production is lowered, and the farmers' net income is increased.

This objective is being applied to research on the production of tobacco which presently requires approximately 322 man hours per acre. A method and tool for controlling suckers, presented in this circular, is the result of one phase of this research program.

While some of the tools developed for the tobacco farmer can be homemade, it is often more economical to have the tool produced by one spcialized in this art. The farmer should be served better by a team composed of the state and federal research engineers who develop the method and principles of operation and the farm equipment engineers who design and develop the tool for efficient manufacturing procedure. The two members of this team should combine their efforts in testing and continued improvement of the tool.

While the results of most agricultural research are disseminated directly to farmers through bulletins and other publications, the results of engineering research on a new tool are disseminated to the manufacturers of farm equipment who in turn make it available to farmers. Accordingly, this circular has been issued especially for the manufacturer of farm equipment.

In submitting a proposition for cooperating in further development, possible manufacture and sale of this tool, it is well to know that the North Carolina Agricultural Experiment Station is not interested in receiving a large royalty. One of modest size will repay a part of the cost of research. At the same time cooperation with industry in this manner will enable the Experiment Station to serve the state's agricultural interests by having contributed in making available a new tool at a reasonable cost.

G. W. Giles, Head
Department Agricultural Engineering

ACKNOWLEDGMENTS

Acknowledgment is made to North Carolina tobacco research and extension workers and particularly to Dr. D. B. Anderson, head of the Division of Biological Sciences, for his work on tobacco sucker control which has made this applicator possible. Ralph Greene, head research mechanic, and Zane Blevins, junior student in agricultural engineering, contributed suggestions and help in the development of the "Clip-Oil." Appreciation is expressed to the Visual Aids Department for assistance in preparing the illustrations.—R. W. Wilson.

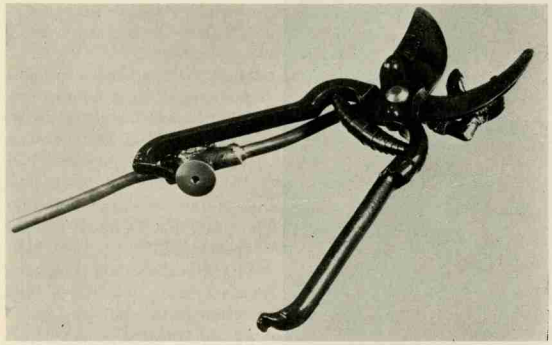


Figure 1.

The "Clip-Oil" For Controlling Tobacco Suckers

By
Robert W. Wilson[1]

Introduction

This circular has been prepared to furnish manufacturers with information on an experimental device for applying chemicals to control tobacco suckers. The device is under development by the North Carolina Agricultural Experiment Station.

The Experiment Station is not yet able to recommend the use of this chemical method for controlling tobacco suckers. Additional work is needed to determine which chemical formulation gives best control and least injury to the plant. When perfected this method, together with the applicator, can save up to 40 man hours of labor per acre in the topping and suckering operations.

It is proposed that several experimental models of the applicator described in this bulletin be placed in the field in 1951 so that in case the method can be recommended for the 1952 season, a tested production applicator can also be released.

The "Clip-Oil" as shown in Figure 1 is a small simple tool which

[1] Research Assistant Professor of Agricultural Engineering North Carolina Experiment Station.

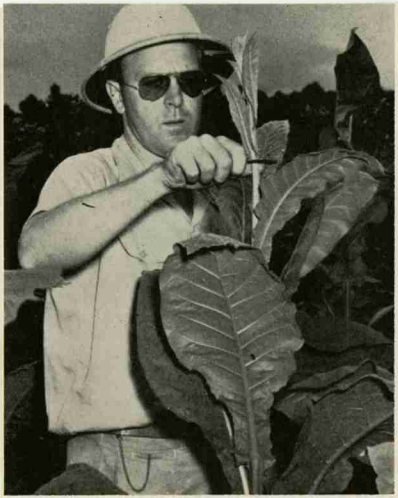


Figure 2. Topping tobacco with a knife. Breaking off the top is the most common method.

should be inexpensive to manufacture. It may be made a universal tool for various jobs as well as being useful to the large and small farmer alike.

At present there are no applicators available for this purpose. The "Clip-Oil" is an experimental unit in which the various working principles were tested. It is not a production model, but by following the principles developed and presented in this circular, such a model can be laid out quickly for the manufacturer's tools and facilities.

Economics of Topping and Suckering

Through years of experience and observation, tobacco farmers have found that topping and suckering as seen in Figures 2 and 3 increases the value of their crop. Experiments at various tobacco research stations have demonstrated the increasd value that results from topping and suckering. At Chatham, Virginia, results over a four-year span showed an increase in acre value of 24 per cent by topping and hand suckering over that which was neither topped nor suckered. Topping and chemical suckering at the Tobacco Research Station, Oxford, North Carolina, in 1949 gave an increased acre value of 34 per cent over that which was neither topped nor suckered. That which was topped and hand suckered at Oxford showed the same general increase.

This increase in acre value due to topping and suckering is often limited because of the large amount of labor required in the hand operation. Several trips through the field are usually required to completely sucker a tobacco crop. Many farmers are forced to let the tops and suckers grow because of labor shortages. Estimates on the labor required range between 25 and 50 man hours per acre. This would cost $12 to $25 per acre if the farmer were able to hire the work done at 50 cents an hour.

Several tests were made during 1950 with the "Clip-Oil" Sucker Controller. In these tests, the time to top and apply the chemical to an acre of tobacco was reduced to 3½ hours. It seems reasonable to assume that a farmer using a "Clip-Oil" can top and sucker an acre of tobacco in half a day. This will be a labor saving of 10 to 22 dollars an acre.

In 1949 635,000 acres of flue-cured tobacco were produced in North Carolina alone. The "Clip-Oil," together with chemical suckering, could have saved North Carolina farmers 13,700,000 man hours on this operation. The saving for the United States if applied to all flue-cured tobacco would have been a minimum of 19,200,000 man hours or $9,600,000 at 50 cents an hour. This saving in labor is very substantial, especially in times of manpower mobilization.

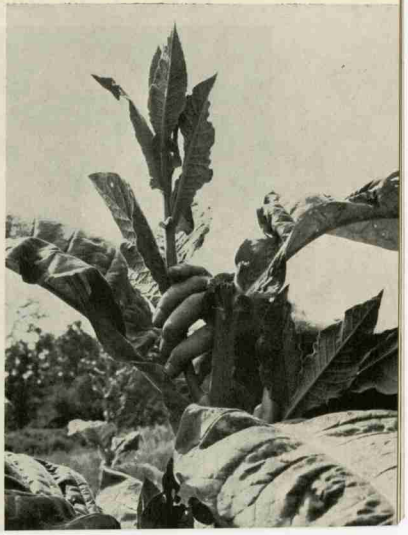
Controlling Tobacco Suckers with Mineral Oil

Since 1947 the North Carolina Experiment Station has been attempting to control the growth of tobacco suckers. Many different growth-regulating chemicals were used. Mineral oil proved to be one of the best carriers. In 1949 it was discovered that the mineral oil itself would kill the sucker buds if allowed to run down the stalk.

Mineral oil deposited in the leaf axils of the tobacco stalk either kills or stops the growth of the buds. If, however, oil should happen to drop on a leaf it will cause the area covered to burn and become a loss in harvesting. It has not been possible, as yet, to kill suckers which are over two inches in length. These suckers require hand pulling before the oil application.

The first oil used was a popular brand of household mineral oil. Other oils were tried during the 1950 season. Some look very promising and possibly will replace household

Figure 3. Hand Suckering



mineral oil. One of these promising oils can be sold for about 70 cents per gallon. Since about 1½ gallons are required per acre, the oil cost will be about $1.00 per acre. For better applicator coverage it is possible to dilute the oils to increase the gallonage applied per acre.

Several antibiotic materials are being tested in the oil to control diseases that may attack the dead bud tissue. It is also hoped that some insecticides can be used to help counteract hornworms and other tobacco pests.

Mineral oil for controlling suckers on a large scale basis has not yet been recommended to tobacco growers by the Experiment Station and the North Carolina Extension Service. In 1950 it was suggested that the farmer limit his trials to about 20 plants. Some farmers have used it on much larger areas with satisfactory results. Indications are that mineral oil will be used on substantial acreages in the 1951 season.

Mechanizing Sucker Control

To control the suckers, the liquid must cover the leaf axils of the plant. The job would be very tedious if each of approximately 20 axils per plant required individual treatment. It is possible, however, to place the oil around the top of the stalk. This oil will run down the stalk (very rapidly on sunny days) and deposit itself in the leaf axils, killing the sucker buds.

Figure 4. A Cone Applicator in Field Operation

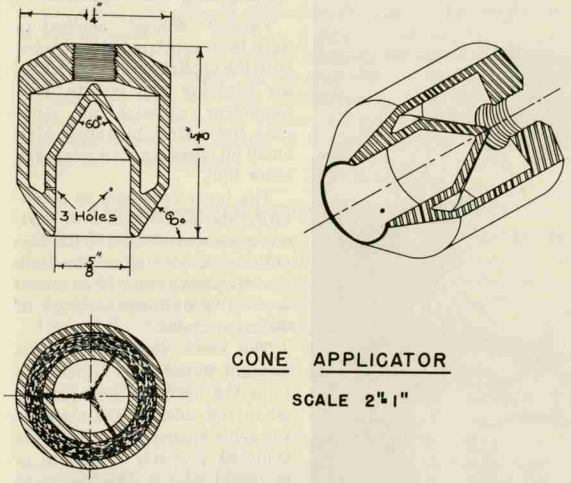


Figure 5. Cone Applicator

The present method of applying mineral oil, (between one and three c.c. per plant) is with a 1½-inch paint brush. The paint brush is dipped into the oil and wiped on the can edge to remove excess oil. Then the brush is wiped around the top of the broken off stalk above the uppermost leaf. This procedure is followed twice on each stalk, with oil then running down the stalk from leaf axil to leaf axil. Tobacco leaves are spirally located around the stalk. Thus, when the oil is placed around the stalk top it is guided by the leaf ribs from one leaf to the other down the stalk. This method is time consuming and occasionally results in oil dripping off the paint brush onto the leaves.

Experimental pressurized applicators have been constructed which increase the speed and accuracy of controlling suckers. These applicators, similar to the one in Figure 4, are placed over or around the topped stalk. Oil is forced under pressure onto the stalk through small openings. The shape of the applicators together with proper handling results in minimum leaf damage.

Figure 6. "Clip-Oil" and Equipment

Designing The Applicator

Various shaped applicators have been constructed and tried with the applicator shown in Figure 5 giving best results. This applicator contains an inner cone, inner straight walled skirt, small oil openings, and a tapered outer hull.

The inner cone acts as a centering device for stalks of various sizes and shapes. With this definite positioning of the stalk the oil openings may be so placed as to give uniform coverage of different stalks.

The cone connects with a straight-walled skirt which contains the openings for applying oil to the sides of the stalk. If for some reason the stalk is not centered properly a stream of oil might miss it. This causes no difficulty, however, as the oil will be stopped by the skirt on the oposite side thus preventing oil from hitting nearby tobacco leaves. The skirt also may be shaped so that the oil holes will not come into contact with the stalks. This permits the oil to flow freely and also prevents clogging of the holes.

The oil openings are approximately 3/64 inches in diameter, although a slightly smaller size may be available in some cases. When three of these openings in the skirt are placed 120° apart and directed to meet at the center of the applicator a very uniform coverage of the stalk results. An additional opening may be placed at the top of the cone to deliver oil directly on the top of the broken off stalk.

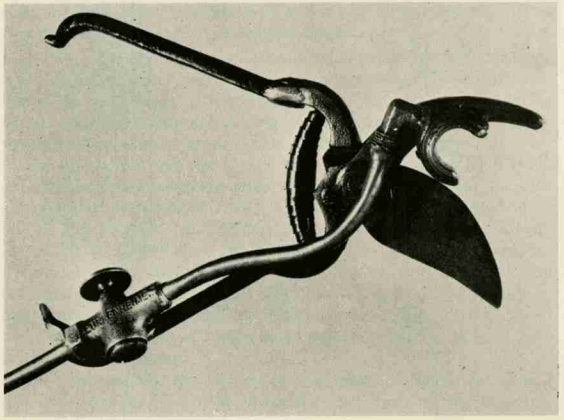
The applicator itself is small in size to permit ease in handling and to allow its placement on the stalk top without touching the top leaves of the plant. The lower portion of the outer hull is tapered to the inside. Any excess liquid which may be on the applicator falls off the bottom of the skirt close to the stalk resulting in no leaf damage.

Description and Design of the "Clip Oil"

The "Clip-Oil" was designed and constructed to sever the top of the tobacco stalk and apply the oil in one operation by one operator. Various models have been constructed and tested in the field with the final result being the "Clip-Oil" as seen in Figure 6.

The results of the cone applicator were used as a basis for designing and constructing the "Clip-Oil." It consists of a clipper in the form of pruning shears to which is attached a U-shaped oiler as shown is Figure 7.

Figure 7. Bottom View of "Clip-Oil"



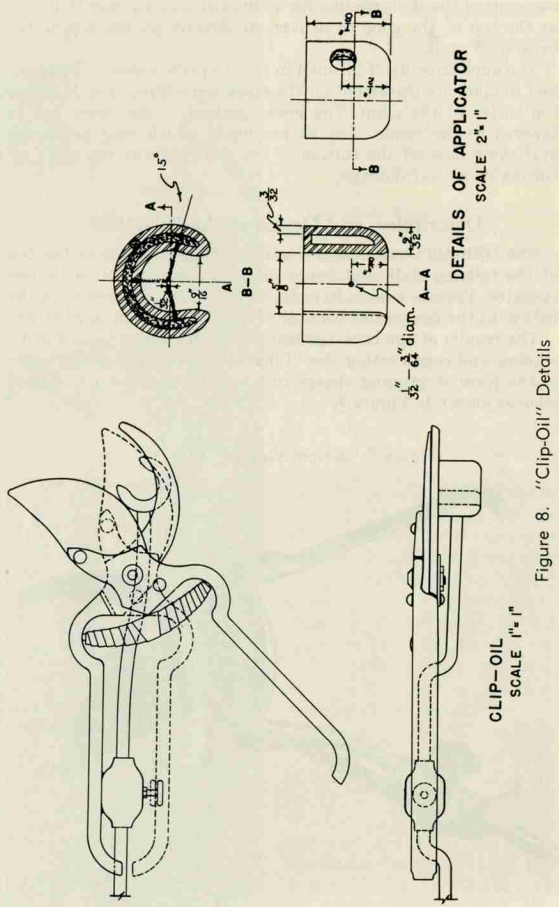


Figure 8. "Clip-Oil" Details

The clipper used in testing was a popular brand pruning shears which was not changed except for the handles. The handles as originally designed did not allow the clippers to open wide enough for large stalks of tobacco and still permit grasping of the handle. Also, since the applicator is set back from the end of the clipper, there was no need for the clipper to close entirely to completely sever the stalk. Figure 8 shows the clipper with the re-shaped handles.

The applicator is U-shaped and mounted directly below the cutting edge. It is similar in principle to the cone applicator except that the skirt comprises the entire unit as seen in Figure 8. The oil inlet is in the side, and the three small openings are spaced so that the oil emitted will cover the stalk completely. The rear opening is the only one which could send its stream of oil on to adjacent tobacco leaves. This is prevented, however, by either one or both of the side streams hitting this stream. The details of the application in Figure 8 shows the three streams of oil hitting at a single point. The outside of the applicator is tapered down toward the inside skirt to keep dripping next to the stalk.

The location of the applicator is such that the stalk will pass directly between the clipper blades into the "U." The "U" is turned slightly to prevent the stalk from slipping out during the clipping operation. A large stalk when placed in position will be forced into the "U" by the clipper blade.

A drop catcher was placed on some of the first models, but none were satisfactory. Several units with portions of the oiler attached to both parts of the clipper were also used. This permits equal spacing of the oil openings around the stalk and helps in centering the stalk. Figure 9 shows one of these clipper-oilers.

The oil for coating the top of the stalk is supplied by a pressurized tank. Immediately after the stalk is severed the handles actuate the oil valve. In the "Clip-Oil" this valve is attached to one of the handles. As the handles approach a closed position, contact is made between the handle and the valve, compressing the valve. This releases oil to the applicator, and the stalk top becomes coated. It is possible that a more convenient design of this valve can be worked out which would reduce its cost and weight. One suggestion would be to make the handle and oil tube one and the same unit.

The pressure for the "Clip-Oil" has been supplied by a hand operated sprayer tank carried on the operator's back. However,

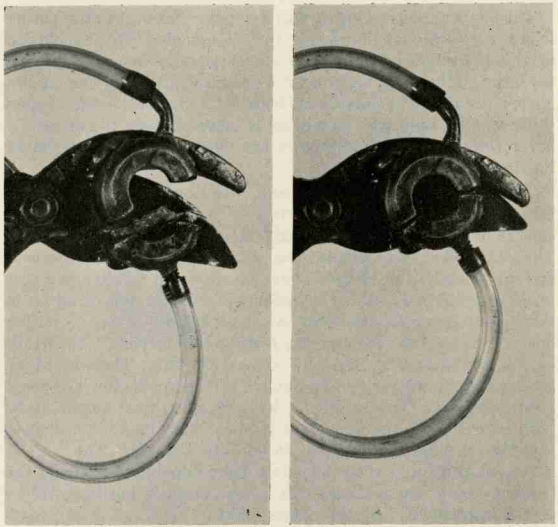


Figure 9. Experimental Clipper-Oiler (open and closed)

other means may be used to furnish the operator with oil under pressure. For large scale operation, an oil supply could be carried on a high clearance machine. Operators riding the machine using "Clip-Oils" would be able to cover ten or more acres a day. These "Clip-Oils" could be operated from a tractor so that the operator would merely position the "Clip-Oil." The rest would be automatic.

Field Operation

Figures 10 through 13 show the clipper being positioned, the actual clipping and application of the oil. There are two operations which are performed by the operator as he proceeds on down the field. They are:

1. Hand compresses handles cutting stalk and applying oil.
2. Hand raises "Clip-Oil" from treated stalk and places it in cutting position for next stalk, at the same time the handles are released, opening the clipper blade.

Operation 2 is a continuous motion with the handles being released at the same time the "Clip-Oil" is being carried to the next plant. A slight raising of the hand in this operation will also prevent any oil on the applicator from dropping off between plants.

Performance

Producing a high-quality, high-yielding leaf with as little labor and expense as possible is the prime objective in developing the "Clip-Oil." Tests indicate that with proper handling, dripping onto tobacco leaves is insignificant. The oiler using three oil openings gave an almost 100 per cent kill of the suckers. A channelling of the oil occurs on some stalks. This, however, did not diminish the effectiveness of the sucker control.

Observations indicate that the "Clip-Oil" and a suckering liquid will reduce the labor requirements for topping and suckering from an average of 22 seconds to two seconds per plant. The old time of 22 seconds required several trips through the field to accomplish satisfactory suckering while the two-second time with the "Clip-Oil" is approximately the time now required to top only.

Additional Uses and Market Possibilities

"Clip-Oil" is made up of two units, namely a clipper and an applicator. It would be possible to construct these units in two pieces which can be assembled and disassembled by the user. A grower could thus use the clipper for pruning work independently of the applicator as well as for making repairs and cleanings easier. The container for the oil could also be used in other farm jobs. It is believed, however, that a dual purpose "Clip-Oil" will not be demanded to any great extent over a single purpose unit.

The "Clip-Oil" has been used only with tobacco. However, there are other sucker-bearing crops and it may be possible that some of these same principles can be used. This, however, will require study by investigators in those fields.

It is difficult to estimate the sales potential for the "Clip-Oil." There are, however, 150,000 tobacco farms in North Carolina alone. Use of the "Clip-Oil" will be limited until the Experiment Station recommends the use of mineral oil or a similar material for unlimited use by growers. This would bring about widespread demand for the "Clip-Oil."

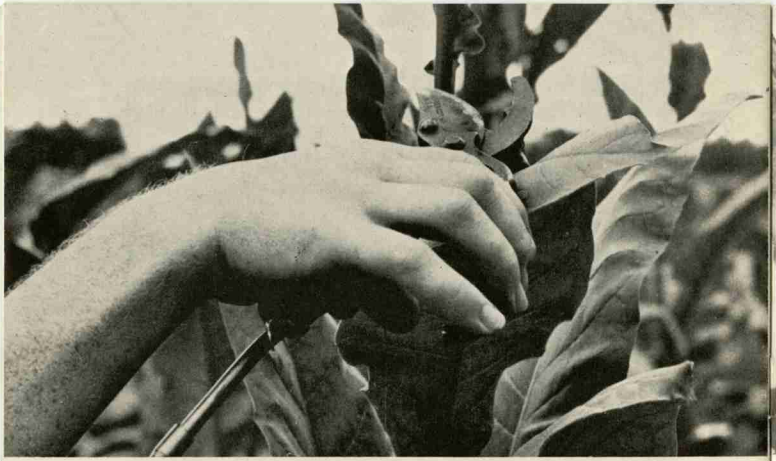


Figure 10. Here the "Clip-Oil" is being placed in position for clipping. The blades are open wide enough so that no probing is necessary to get the stalk located.

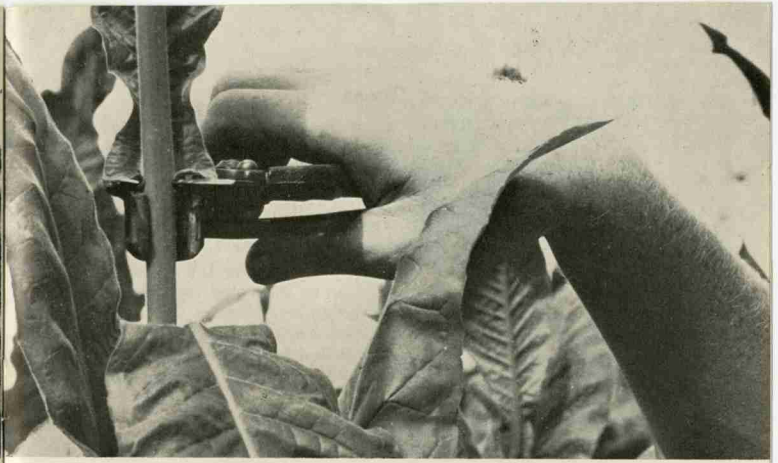


Figure 11. After the blades reach the stalk, they form a guide. On pressing the handles the stalk is further centered in the "U" oiler.

Figure 12. The stalk begins to topple after being severed. The severed stalk is heavy enough so that it falls away from the plant and down to the ground, thus requiring no handling.

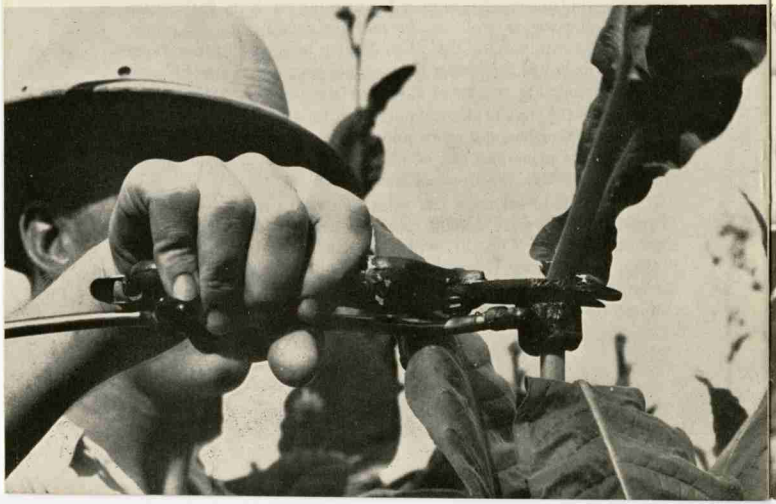


Figure 13. The suckering oil is applied immediately after topping. An additional squeeze of the handle releases the oil to the stalk top. This picture also shows some of the oil starting down the stalk. In actual operation, the operator would be on his way to the next plant before the oil gets this far down.

Patent

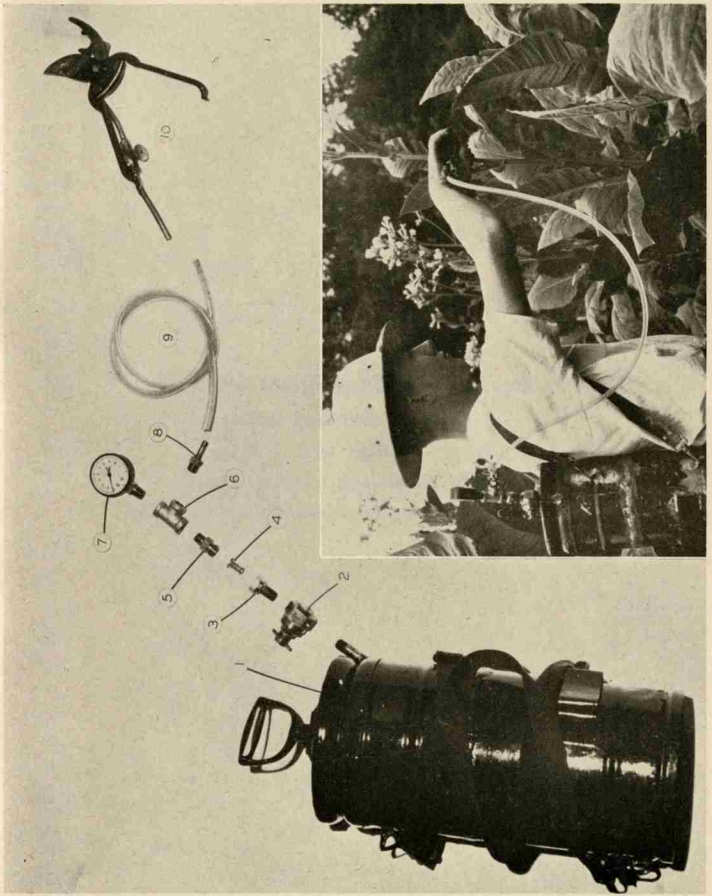
A patent application "Control of Suckers in Tobacco Plants" has been filed to cover the control of suckers in tobacco with oils. A patent application also has been filed in the Patent Office to cover the "Clip-Oil" and its principle of operation.

Construction Details

The equipment layout and description on the following two pages is for the 1950 "Clip-Oil." It is included for the manufacturer's study and to aid in making up an estimated cost. No attempt has been made, as yet, to design a production unit. It is assumed that the company or companies who are awarded the manufacturing rights will alter this design in order to get the best production method based on the equipment and processes used in their plant.

Parts Making Up 1950 Test Equipment

	Description	Comments
1.	Hand Operated Spray Tank	Other methods for supplying oil possible, such as factory pressurized bomb containing sucker control liquid.
2.	Pressure Regulator Watts #502	Not necessary for farmer operation. Reasonably constant pressure (20#) unit built into system a possibility.
3.	"TeeJet" Body Type ¼TT	Used for convenience in 1950 testing.
4.	"TeeJet" Strainer Type ¼ TT—100 mesh screen	Used for convenience in 1950 testing. Some type of easily cleaned strainer is a necessity. (Strainer cleaned once in 1950 testing.)
5.	"TeeJet" Cap & ⅜" Nipple Type ¼ TT	Used for convenience in 1950 testing.
6.	⅜" Pipe Tee	Used for convenience in 1950 testing.
7.	Pressure Indicator 0-100 # range	Used for convenience in 1950 testing. Would be of benefit to some farmers.
8.	¼" Hose Adapter	Used for convenience in 1950 testing.
9.	Translucent Plastic Tube ¼" dia.	Any light weight oil-resistant flexible tubing permissible.
10.	"Clip-Oil" Clipper—Quaker City No. 106 Oiler—Ag. Eng. made Valve—Lukenheimer Bronze Air Nozzle	Experimental model. Production model may be made to suit manufacturing facilities. Adjustable constant quantity valve would be desirable if not too expensive. Unit should be lightweight, sturdy and pleasing to eye.



Agricultural Experiment Station

North Carolina State College

Raleigh, N. C.

R. W. Cummings, Director of Research

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