

HARVESTING & CURING BURLEY TOBACCO



Circular 600

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This circular replaces these Kentucky Cooperative Extension Service publications: Circular 496, "Heating Practices and Equipment for Curing Burley Tobacco," Circular 578, "Curing Burley Tobacco," Miscellaneous 292, "Proper Ventilation and Coke Fuel Use Will Increase Your Tobacco Profits," and Miscellaneous 294, "Gas Heat for Curing Tobacco-Burley."

Harvesting and Curing Burley Tobacco

By IRA E. MASSIE, GEORGE H. JENKINS, JR., and JONES H. SMILEY

A good cured burley crop depends on whether you cut your tobacco at the right time, house it correctly, practice good barn management, and bulk it properly. Curing burley is more than just drying the leaves. You must control temperature, humidity, and air circulation if you hope to market good tobacco.

Many fine crops are injured by improper handling, inadequate housing, and lack of control over curing conditions. Furthermore, proper harvesting and curing can often improve some of the poorer crops. Remember, the care and good management you used from plant bed to cutting time must be continued in the barn if burley is to return profits.

CUTTING

Ripening does much to improve the quality of your burley tobacco. Priming the lower leaves once or twice, if necessary, helps you obtain the highest acre-returns from burley. Cut when nearly all the upper leaves show a distinct yellow tinge (Fig. 1). It usually pays to delay cutting until nearly all the upper leaves are ripe even though you don't prime. Added growth and improved quality of the plant during ripening more than make up for the loss of lower leaves. In very humid harvest seasons if no priming is done, nothing is gained by delaying cutting beyond the time that the middle leaves show a distinct yellow tinge.

If late tobacco is cut, provide heat to speed up curing and prevent freezing in the barn. Put the plants directly on the sticks as they are cut, five or six plants to the stick. Leave the tobacco in the field on the standing stick (or on scaffold) long enough for it to wilt (your housing facilities will partly govern the length of time) but never longer than 3 days. Fully matured tobacco is not likely to sunburn. However, green tobacco, usually cut when temperatures are high, often sunburns. Sunburned tobacco should be left sticking in field for about 3 days so that the dew and sun can remove the damage.

HOUSING

Good housing practices are essential to control the curing of burley tobacco. Many crops that come from the field in fine condition are



Fig. 1.— Cut burley when nearly all the upper leaves show a distinct yellow tinge.

seriously damaged by poor housing facilities. One of the greatest building needs on Kentucky farms is the remodeling of tobacco barns.

Correct housing means filling each bent completely from top to bottom as the crop is put in the barn. Leave enough space under the lowest rails so you can use heat if necessary. Starting the fill on the southwest side of the barn takes advantage of air movements in the early stages of curing. *Always* spread the stalks on sticks (Fig. 2). Make sure that the leaves are hanging down, not doubled up. Also, tip leaves should fall in between lower sticks, not rest on the butts of stalks below. Never hang fresh-cut tobacco under tobacco harvested earlier and partially cured. Water evaporating from the fresh tobacco will cause partly cured tobacco to darken.

If you don't have enough tobacco to fill your barn, don't jam all of it into a small area. Space it throughout the barn so air can circulate evenly through the tobacco. Air seeks the level of least resistance. It will accumulate in empty parts of the barn, while filled portions will not receive full benefit of air curing.

BARN MANAGEMENT

Locate the barn on an open, well-drained area for best ventilation. The best location is on a ridge, hill, or a high point in the field (Fig. 3). Valleys tend to be foggy. You will get better ventilation if the barn is placed so that a side faces the direction of the prevailing winds.

Provided that one side, with its proper number of ventilator doors, faces the prevailing winds, the structure's length and height will not noticeably affect air circulation within the barn. Width is the most important dimension affecting ventilation. Width determines (1) the distance the air must move as it passes through the barn and (2) the quantity of tobacco through which the air must pass. The wider the barn, the slower the air moves through it when actually greater air movement is needed because of the increased capacity for tobacco. *This illustrates why a shed added to a barn always lowers efficiency in air-curing tobacco* (Fig. 4).

For economic reasons, barn dimensions must conform with sound construction practices and the the extra profit you can expect from better tobacco. A standard barn is 40 feet wide and 60 feet or more long with a sidewall 20 feet high and a gable roof of $\frac{1}{3}$ pitch. The

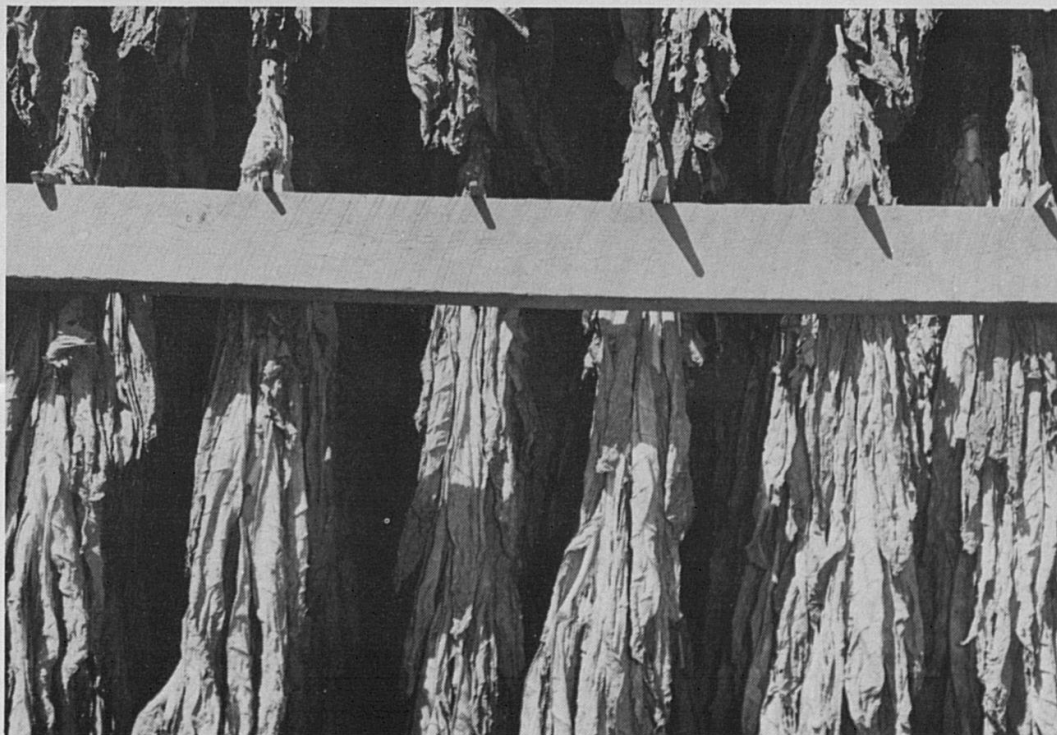


Fig. 2.— When sticks are spaced on a rail, air can move freely in and around the tobacco.

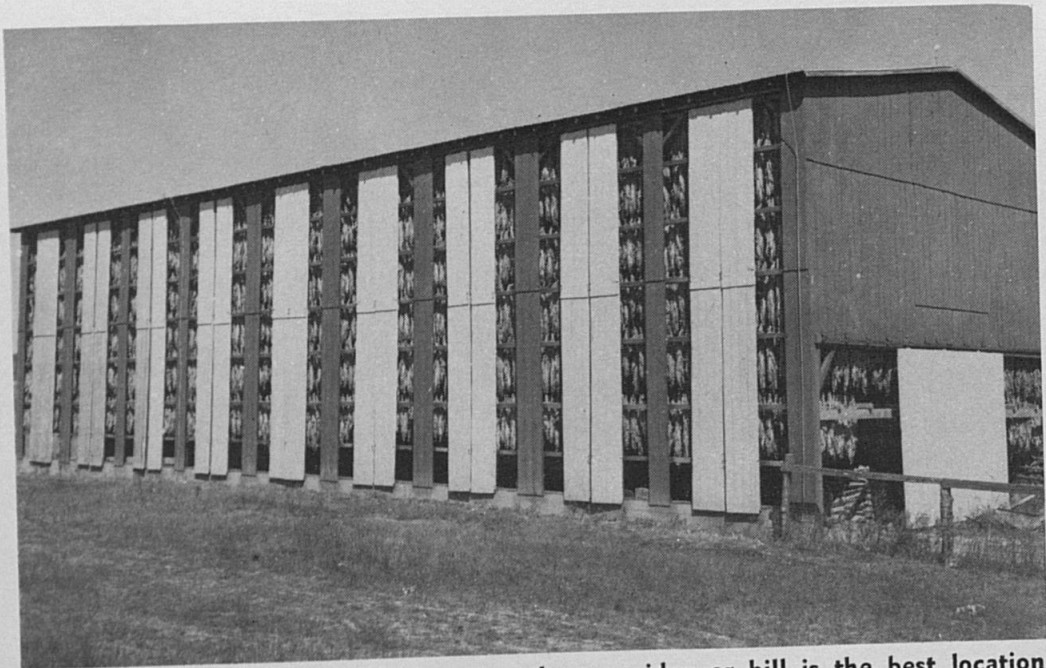


Fig. 3.— An open, well-drained area such as a ridge or hill is the best location for a curing barn.

only ventilators are full-length, sidewall vertical doors equivalent in area to at least one-third of the sides. Since larger tobacco now is being grown, some farmers are building barns with rails 6 feet apart vertically.

The more cracks and ventilators in the side of the barn, the more air that will pass through the housed tobacco and the closer tobacco can be spaced. Your curing barn, therefore should have enough side ventilators for rapid exchange of air. Few old barns have enough side ventilators for best curing.

When repairing old barns or building new ones, provide ample ventilators on the sides (Figs. 5 and 6). In barns 36-40 feet wide, hinge at least one-third of the boxing or siding to permit opening and closing. Wider barns need even more ventilation. To make a third of the side in ventilators, start at one end and nail four boards, hinge two, nail four, hinge two across the side of the barn. To have half of the side open, nail two boards, hinge two, nail two, hinge two across the side.

Ventilators are not needed at the ends of burley barns unless prevailing winds strike the end of the barn and tier rails run parallel with the width.

If prevailing winds strike the side of the barn and tier rails are parallel to width, the barn should be remodeled and tier rails changed

to run parallel to the length of the barn (Fig. 7). Ventilators should then be provided on the sides. Research at the Kentucky Agricultural Experiment Station has shown that ventilators in the roof are almost useless.

Because of reduced acreages, the smaller, 32-foot wide pole-type barns are becoming popular and practical. Plans for these lower-cost barns are available (see page 16).

CURING

Curing occurs when temperature, humidity, and air bring about desirable changes in the chemical composition of the leaf. Curing is more than just drying. It is a living process during which respiration takes place, using up the plant's food reserves. Color and quality develop in the leaf during curing.



Fig. 4.— You have little control over curing conditions in a barn such as this. Sheds placed on the sides of a burley barn cut off ventilation completely. Also, ridge ventilators are useless.

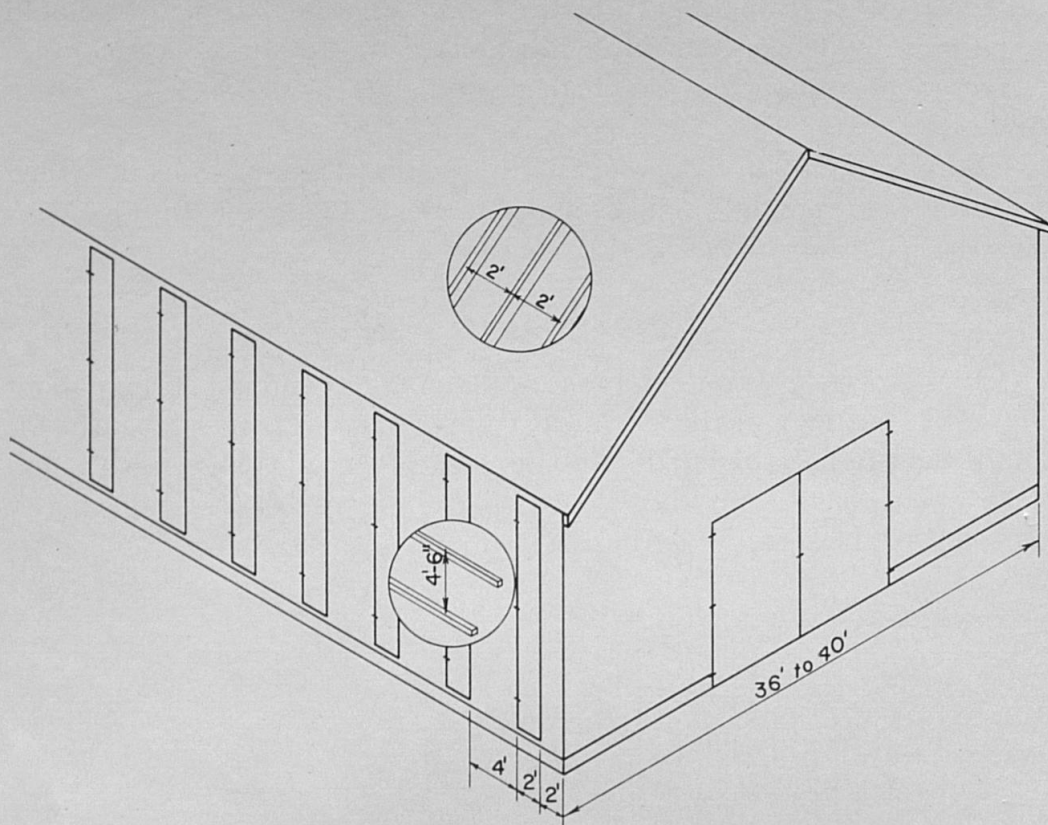


Fig. 5.— A well-built barn with these dimensions, adequately ventilated, and properly located can improve curing conditions.



Fig. 6.— This old barn was remodeled to give maximum control over curing conditions.

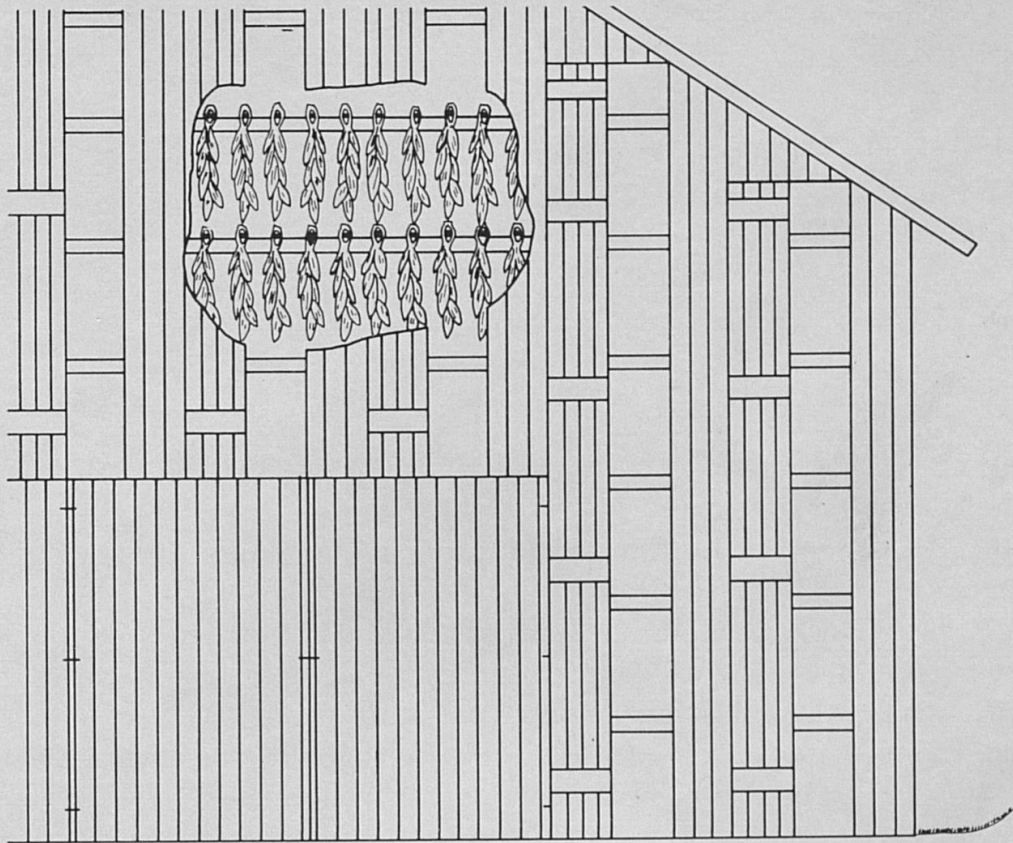


Fig. 7.— This drawing shows how to remodel a barn when tiers run parallel to width and prevailing winds hit the end of a barn.

The final quality of cured burley tobacco is determined very largely by moisture conditions which prevail inside the tobacco barn during the curing period. High moisture causes tobacco to cure too slowly, producing red or houseburned leaf and heavy losses in weight. When tobacco stays in "brittle case," it cures too fast, causing a greenish tinge, mottled, or piebald leaf with heavier yields of less useful tobacco. In fact, the characteristics on which buyers judge air-cured burley are severely altered by fast curing.

For good barn management you must know the approximate relative humidity inside the barn. Cured tobacco leaves are very sensitive to changes in the moisture content of surrounding air. They come in and go out of case as a result of such changes. Since "case" or "order" of cured tobacco is interpreted by the way the leaf feels, the relative humidity at various locations in a barn can be determined fairly closely by checking the condition or "feel" of cured leaf samples. Table 1 gives a satisfactory scale of moisture in the leaf. You can check relative humidity this way at any time during the curing season.

Table 1.— Feel of Cured Tobacco Flyings in Relation to Relative Humidity^a

Feel of Cured Leaf	Relative Humidity (Percent)
High case	90 to 100
Medium to high case	85 to 90
Medium case	80 to 85
Low to medium case	75 to 80
Low case	70 to 75
Dry to low case	65 to 70
Dry	60 to 65
Dry to brittle	55 to 60
Brittle	50 to 55
Fragile	0 to 50

^a From Kentucky Agricultural Experiment Station Bulletin 501, "Principles of Burley Tobacco Barn Operation."

When the samples feel "dry to low case," the humidity is about right for best curing.

Moisture can be controlled in burley barns fairly well through proper use of ventilators, plus careful use of heat in humid weather. Burley cures favorably when the temperature inside the barn ranges between 60° and 90°F provided relative humidity averages 65-70 percent in the barn over a 24-hour period. In normal weather during the tobacco-curing season in Kentucky, the outdoor temperature seldom goes above 90° or below 60°F for any great length of time. Therefore, favorable curing conditions depend largely on whether relative humidity can be kept around 65-70 percent.

Air Curing

Curing conditions in the barn may be varied by management practices. How well you cure your crop depends largely on how well you regulate humidity, how close you space sticks, width of your barn, size of tobacco, and amount of ventilation.

Small plants permit closer spacing than large ones. With the same amount of side ventilation, a narrow barn will safely hold more tobacco per rail than a wider barn. Barns 36-40 feet wide are best for housing tobacco.

During some periods every year, relative humidity cannot be controlled by ventilators, and heat should be used. Whenever tobacco remains in case for more than 24 hours, houseburning will start.

WHEN TO OPEN OR CLOSE THE VENTILATORS

During August and September the air is usually dry during the day and moist at night. Generally, therefore, open the ventilators as soon as the dew dries in the morning and close them in late afternoon.

If you are not sure whether to open or close the curing barn, put

a few cured leaves in a sheltered place such as an open shed near the tobacco barn. When these leaves are damp and hang limp, the air is high in moisture, and the barn should be closed. In general, whenever these leaves feel drier than the tobacco inside the barn the ventilators should be opened. But when the tobacco inside the barn feels drier than those leaves outside, then keep the barn tightly closed (see Table 1).

During cool periods open the barn to get the benefit of the warmer outside air. In cool weather the temperature may be 10° lower in a closed barn than outside because of cooling from evaporation. If no fire is used in curing, provide as much ventilation as possible until curing is nearly complete.

If the weather is very dry and your tobacco is curing too fast, close the barn in the daytime, and open it at night. This method traps the cool, moist night air and keeps the drier, daytime air out of the barn.

If you primed, usually the primed leaves will need some heat in curing.

USE OF FANS

The use of fans in the present procedure of curing tobacco seems to be limited. Do not attempt to use fans for general air or heat distribution in the barn. When improper stick spacing or undesirable construction or location of the barn causes poor curing in limited sections within the barn, you might use fans to supplement the natural ventilation in these sections. Locate the fans to blow the air directly through the section of tobacco that is curing poorly. The locations and size of the fans are important, for too strong an air movement will bruise or shatter the tobacco. Operate the fans only long enough to overcome the curing stresses.

Controlling Humidity with Heat

Heat is used primarily to control humidity or moisture content of the air surrounding the tobacco in the barn. If too much heat is added, the moisture level of the air becomes too low, resulting in too fast a cure. If the weather dries the cured leaves each day without fire, then firing is a waste of fuel and time.

Always practice care and good management when using supplementary heat. Control the rate of heat to keep the temperature 85-90°F directly above the burner at the lowest level of tobacco. You should use enough burners so that the temperature does not vary more than 15 degrees throughout the barn. Make all temperature measurements at the lowest level of the tobacco.

Normally, the side ventilators of the barn are closed when heat is being used. As the warm, dry air rises through the tobacco, it absorbs moisture released by the tobacco. The moist air must not be allowed to remain in the barn; therefore, *some ventilators will have to be partially opened to allow the moist air to escape*. It may be best to open the ventilators on the leeward side of the barn rather than the windward side. This will help prevent moist outside air from entering the barn, yet allow the moist inside air to escape.

FUELS AND STOVES

Coke long has given good results when used properly. The first precaution with coke is to be sure it has a low sulfur content—not more than 1 percent by laboratory analysis. The dealer selling coke for tobacco curing should provide a statement concerning the sulfur content of the fuel.

The next precaution is to use enough stoves with low or moderate fires rather than a few stoves burning with high fires (Fig. 8). This will distribute the heat better and minimize hot spots. Do not use large coke stoves made from 55-gallon oil drums. They release too much heat near the stove, cause hot spots, and result in green or “off” colors being set in the tobacco.

Although coke is an inexpensive fuel, considerable labor is required to tend a coke-fired barn properly. Coke stoves must be started outside the barn and then moved in after the fires are started. They require attention at least twice a day. Shaking out ashes and refilling the stoves are rather hard work. Heat output is difficult to control and not uniform. Coke stoves usually burn the hottest shortly after being tended, then taper off to a rather small heat output before being tended again.

When properly used, 1 ton of coke on the average, will cure 1 acre of tobacco. Follow these suggestions:

1. Extremely hot fires will destroy the stoves and cause poor heat distribution.
2. After the curing season, remove the ashes and coke from the stoves. Coat them thoroughly with crankcase oil inside and out and store in a dry place. Coke stoves when properly cared for will last 10 years or longer.

Natural gas is an excellent fuel for use in tobacco barns. All natural gas supplied through commercial pipelines is safe for use in tobacco barns. Harmful impurities have been removed from the gas at scrubbing plants. Gas from most private wells is also pure enough for use in tobacco barns. The harmful impurity in natural gas is



Fig. 8.— Use enough coke stoves to distribute heat better and reduce hot spots.

sulfur, usually in the form of hydrogen sulfide which is easily detected by its foul odor. Gas with as little as one part per million of hydrogen sulfide will have a foul odor. Therefore, any gas that smells "sweet" is safe for tobacco, and even some gas that has a slight odor is safe.

Natural gas, where it is available, will supply heat to the tobacco barn for less cost than any other non-solid fuel that has proved satisfactory for tobacco.

Propane gas or LP gas contains practically no sulfur and is being used successfully as a fuel for heating tobacco barns. It costs slightly more than natural gas or coke, but the heat content is higher than that of natural gas. Propane, like natural gas, lights instantly, is easily controlled, and is a constant and uniform source of heat (Table 2).

Venting of propane gas stoves is not necessary under ordinary firing. Labor requirements for firing with propane are comparable to those for natural gas and both of them are much lower than coke.

Table 2.— Combustion Data of Fuels Used for Heating Burley Tobacco Curing Barns

Fuel	Heating Value (B.t.u./Unit)	Water Released in Combustion (Pounds Per Pound of Fuel)	Fuel Cost	B.t.u.s for 1 Cent
LP Gas	92,000 B.t.u./gal	1.64	15¢/gal	6,150
Natural Gas	1,000 B.t.u./cu ft	2.25	80¢/1,000 cu ft	12,500
Coke	12,900 B.t.u./lb	0.22	\$25/ton	10,320

When properly used, gas stoves will last 10 years or longer. However, after the curing season, store the stoves in a cool, dry place and the hoses in a *dark*, cool, and dry place.

GAS EQUIPMENT

Two types of gas burners, shown in Figs. 9 and 10, will operate on either natural or LP gas. They require different orifices when using natural gas—check with your gas dealer.

The small gas unit (Fig. 9) has a maximum heat output of 30,000 B.t.u. per hour. Each stove will cure an area in the barn of about 12 X 12 feet. The larger unit (Fig. 10) has a maximum output of 75,000 B.t.u. per hour and will cure an area in the barn about 12 X 40 feet.

Automatic controls, available for all gas heaters, are very helpful in adjusting relative humidity in the barn. Hygrometers or humidistats will also help you determine relative humidity in the barn. These tools, used as guidelines, ought to be used since they will help in curing your tobacco.

DISTRIBUTION OF HEAT

Heat distribution is a factor to be considered. Hot spots will frequently occur in localized areas directly above the stoves. These hot spots indicate poor heat distribution which, in turn, cause green or "off" colors in the tobacco. Hot spots are usually caused by burning too few stoves too hard. The result is too much heat immediately around and above the stove and not enough heat in the rest of the barn. Moving the stoves from place to place in the barn does not solve the problem. The hot spots are not eliminated, and the tobacco that was near a stove and has dried out may absorb moisture from wet tobacco in another part of the barn when the stove is moved.

You get uniform heat distribution only by using an adequate number of stoves, each burning at a moderate rate. If you use coke,



Fig. 9.—This small gas unit has a maximum heat output of 30,000 B.t.u. per hour.

put at least two stoves per bent and sometimes three to a bent in an average-width barn (36-44 feet wide). In this manner, you will get enough heat and good distribution without having to burn the stoves too hard. In addition to better heating of the barn, the stoves will last longer when they are burned at a moderate rate. All stoves should have some sort of heat spreader.

When using the small gas burner (Fig. 9), you will need three stoves per bent in a barn 36-40 feet wide. Distribution of heat is regulated by the number of stoves per bent.

When using the larger gas burner (Fig. 10), use one stove per bent. Each arm is slotted so that heat will escape at the proper intervals, giving good heat distribution.

To check the heat distribution in the barn, use thermometers, Hygrometers, and/or humidstats, and the method described on controlling humidity with heat (see page 9).

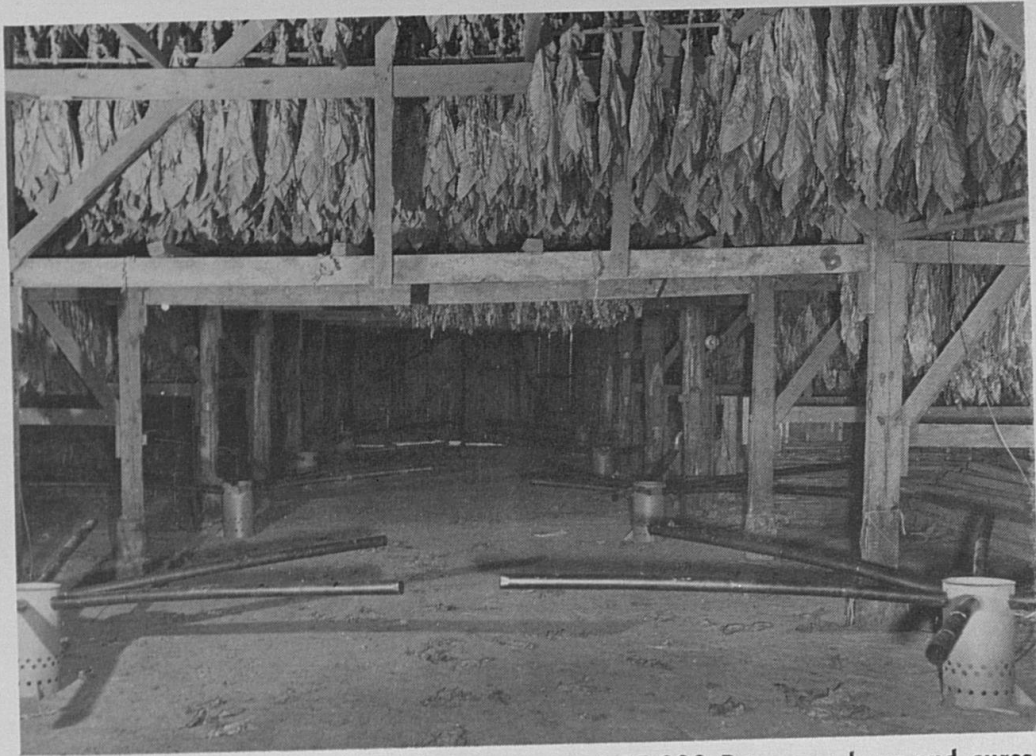


Fig. 10.— The larger gas unit has an output of 75,000 B.t.u. per hour and cures an area about 12 x 40 feet in the barn.

BULK TOBACCO AS SOON AS FULLY CURED

To prevent darkening of the leaf, bulk tobacco as soon as it is fully cured.

In warm weather, however, don't bulk tobacco in high order; mold and rot may severely damage such tobacco. Also, in warm weather, make only small bulks. If the tobacco stalks are not fully dry, it is unsafe to leave tobacco in the bulk beyond 48 hours. Moisture from the stalk may enter the stem, causing stem rot.

PROGRESS IN CURING

Rapid progress should be made in curing burley tobacco during the next decade. Research being conducted at the National Tobacco Research Center of the University of Kentucky, Lexington, should result in new handling and curing methods in the near future. You will probably see new methods of handling tobacco from the field to the barn. More mass handling will reduce the labor involved. New shapes and construction of curing barns, designed for mechanical handling, will make tobacco movement easier and more efficient. There will be more control of the air that comes in contact with the tobacco. In the near future, you may house your tobacco, start your

automatic curing system and, with a daily check on the progress of the curing, forget about the tobacco. You will have more time for other farm chores and be assured of a consistent, high-quality cure each year. The barns of the future will be smaller and not so tall as the present-day barns. This will reduce the labor involved in handling the tobacco. As research uncovers new knowledge, many new advances in tobacco handling and curing will be seen.



Fig. 11.— A high-boy, converted to drop sticks, saves labor and prevents leaf breakage. Some high-boy operators will do this job on a custom basis.



Fig. 12.— A conventional barn was converted to a curing barn by sealing it and installing a large fan and LP gas unit. On a trial basis, it has worked successfully in a 2-year test.

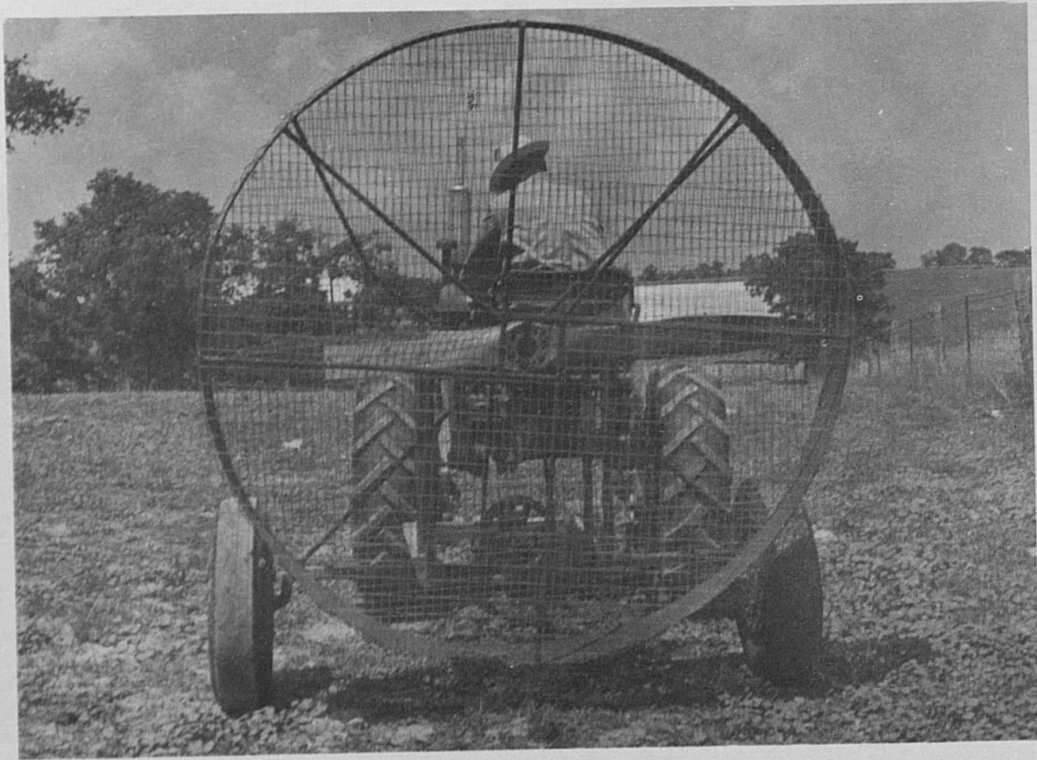


Fig. 13.— The use of fans in curing is becoming popular. However, you must be careful, for a fan such as this airplane propeller stirs up strong currents and dirt which may shatter dry tobacco (see page 9).

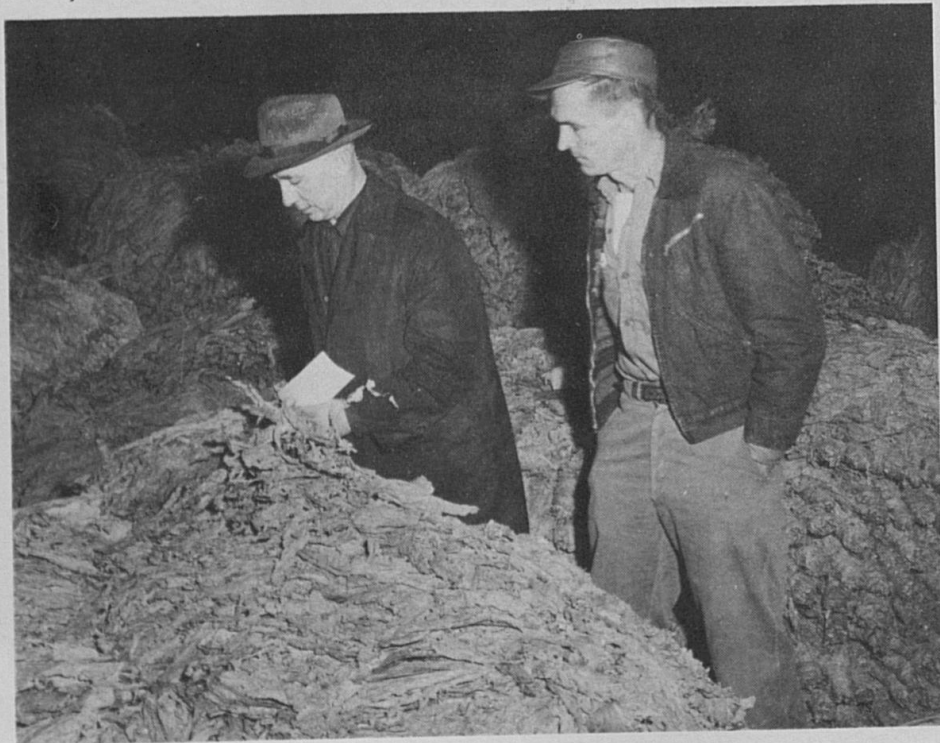


Fig. 14.— Be present when your tobacco is graded and sold. The grader, usually a farmer, is interested in seeing that you get all that is coming to you. **DO NOT** mix your grades.

TOBACCO BARN PLANS AVAILABLE

Tobacco Barn A (Plan 735-26). This barn is 32 feet wide and has two driveways. Posts are placed on concrete piers that extend above the ground. This plan gives a choice of distances to use between tier rails, 4 feet, 4½ feet, or 5 feet.

Tobacco Barn B (Plan 735-27). This barn is 40 feet wide and has three driveways. Posts are placed on concrete piers that extend above the ground. The plan gives a choice of distances to use between tier rails of 4 feet, 4½ feet, or 5 feet.

Tobacco Barn C (Plan 735-28). This barn is 32 feet wide and has two driveways. It is built with pressure-treated poles which are stabilized by being placed 5 feet in the ground. The plan gives a choice of distances between tier rails of 4 feet, 4½ feet, or 5 feet.

Tobacco Barn D (Plan 735-29). This barn is 40 feet wide and has three driveways. It is built of pressure-treated poles which are stabilized by being placed 5 feet in the ground. The plan gives a choice of distances between tier rails of 4 feet, 4½ feet, or 5 feet.

ORDER FROM:

Plan Service
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University of Kentucky
Lexington, Kentucky 40506

or see your county extension agent.

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