

June 7, 1949.

G. S. HORNE

2,472,534

TOBACCO CURING APPARATUS

Filed Aug. 12, 1946

4 Sheets-Sheet 1

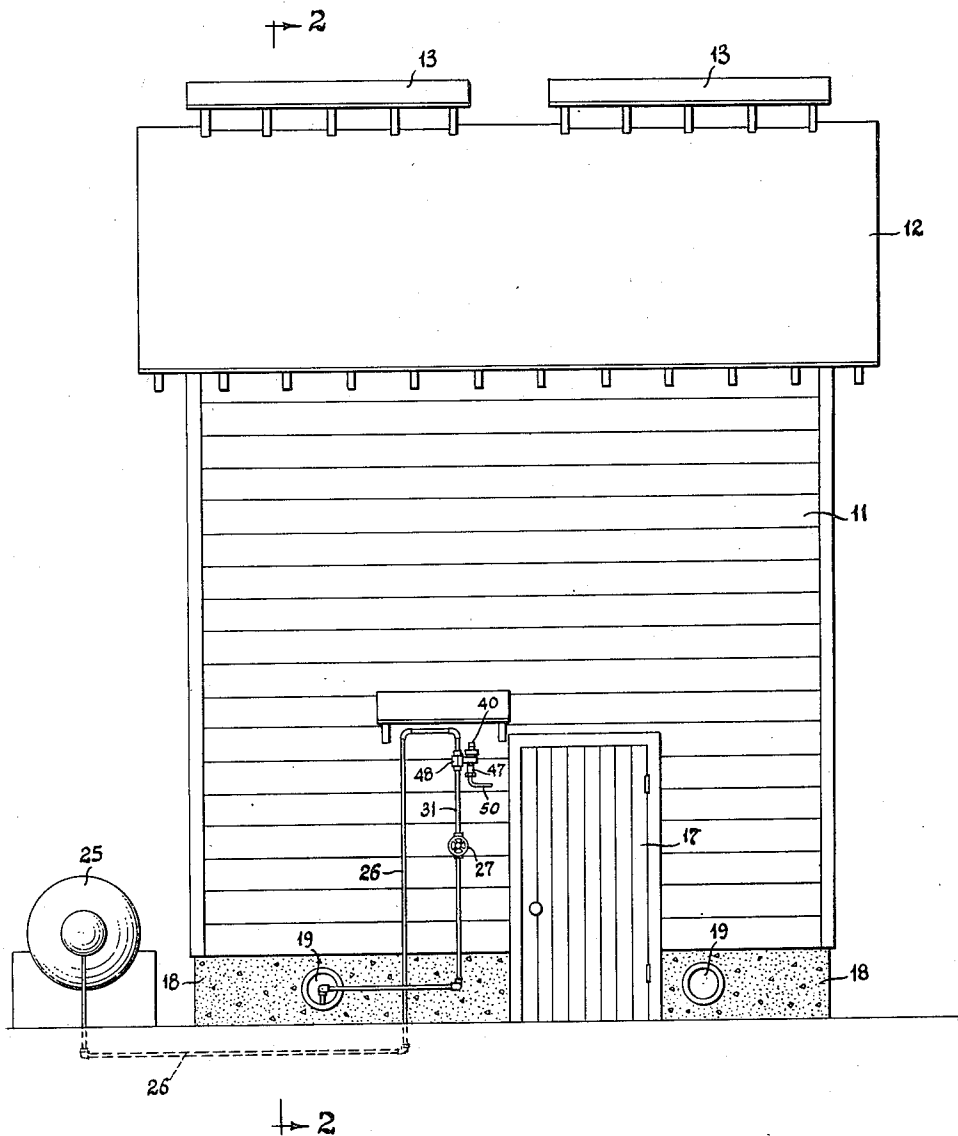


Fig-1

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June 7, 1949.

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4 Sheets-Sheet 2

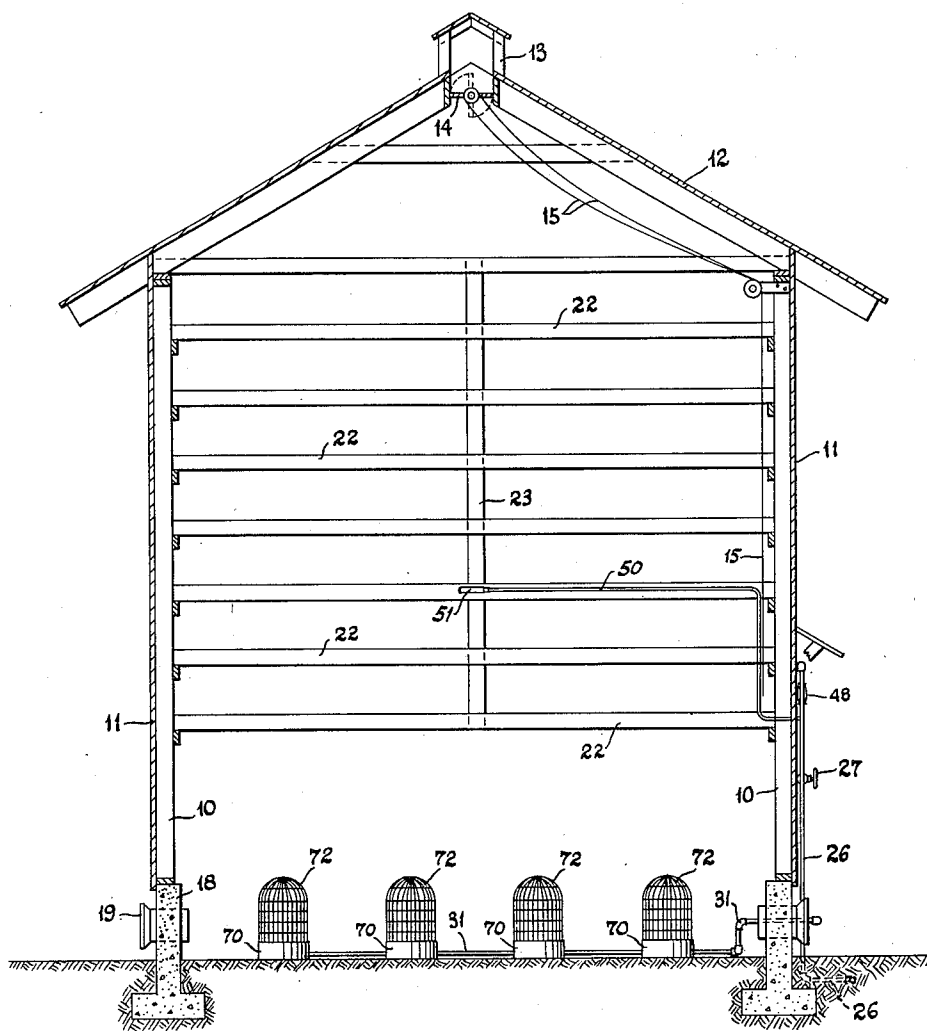


Fig-2

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4 Sheets-Sheet 3

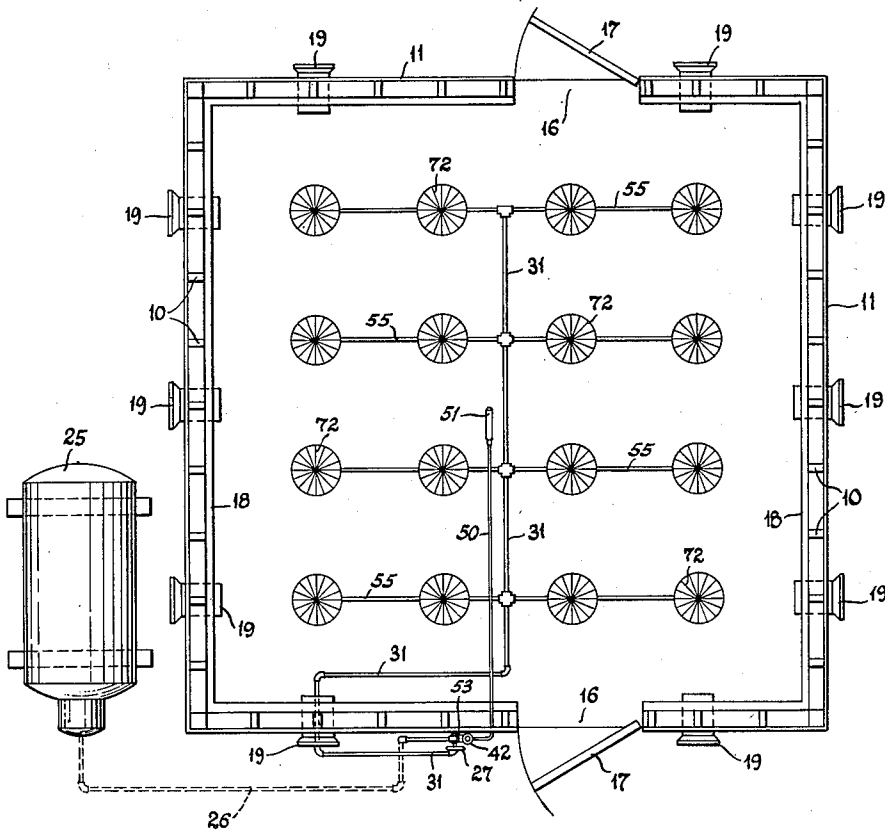


Fig-3

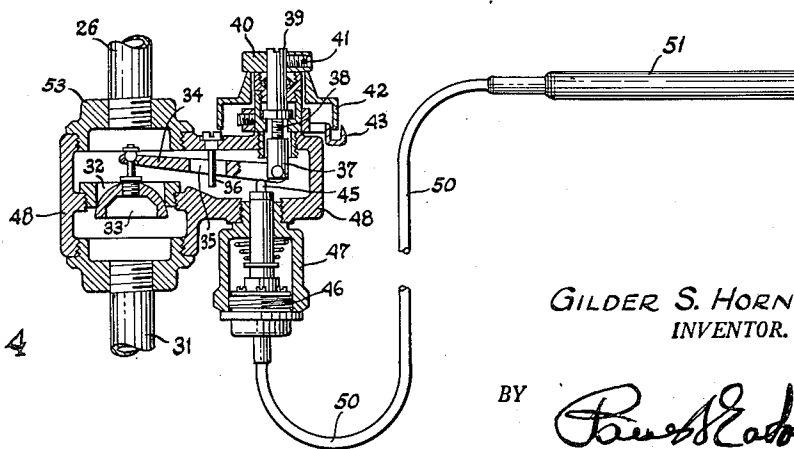


Fig-4

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4 Sheets-Sheet 4

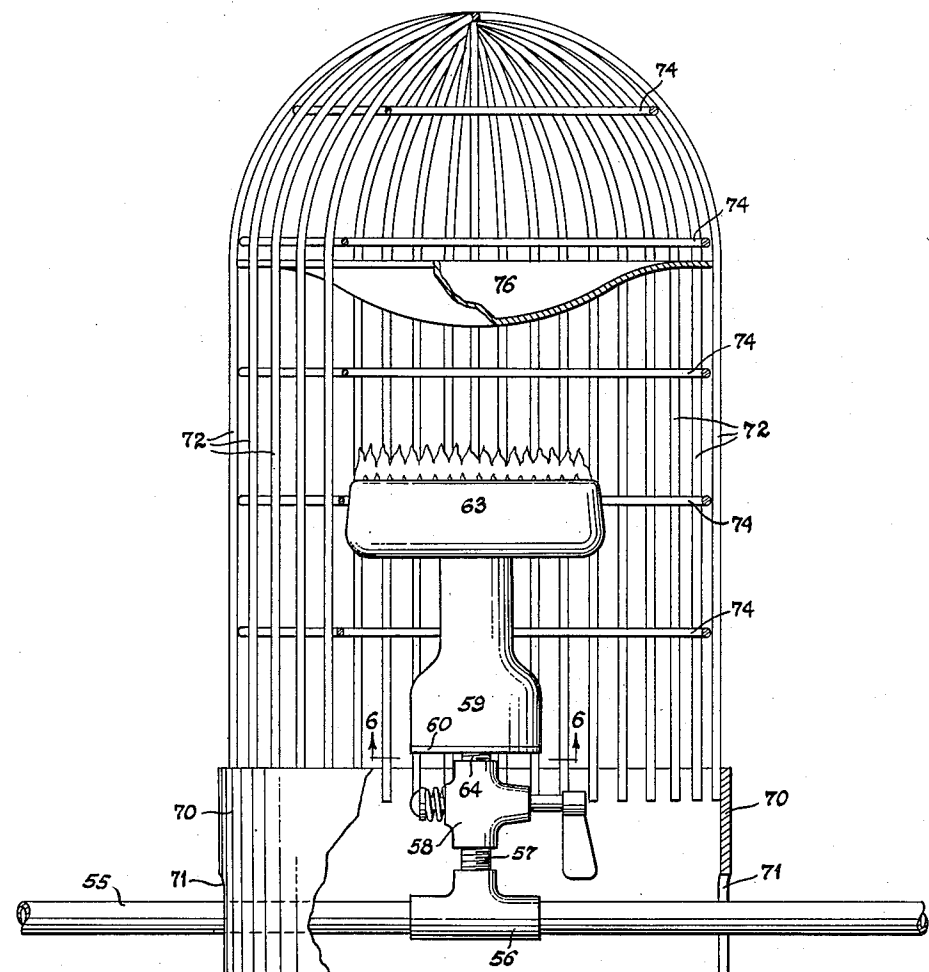


Fig- 5

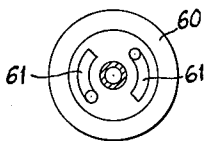


Fig- 6

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TOBACCO CURING APPARATUS

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5 Claims. (Cl. 263—40)

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This invention relates to an improved system and apparatus for curing tobacco in tobacco barns by providing a plurality of properly spaced gas burners within the barn and with pipes leading to the gas burners from a source of low pressure liquified petroleum gas stored in a suitable container on the exterior of the barn with automatic temperature regulating means, which will control the flow of gas according to the temperature within the barn. Natural or manufactured gas could also be used.

Disposed within the flue-cured tobacco belts of the United States, there are approximately three hundred thousand barns, in which tobacco is cured by the application of heat to the interior of the barn. This type of tobacco is ordinarily known as flue-cured tobacco, whether or not these conducting flues are disposed within the barn or not. In the beginning, the tobacco cured in this manner derived its name of "flue-cured," due to the fact that one or two furnaces were built in the wall of the barn having their openings on the exterior of the barn and extending into the barn, these furnaces being built of stone or brick and to the inner ends of the furnaces suitable metal flues were connected and led backwardly, laterally, and usually back through the front wall of the barn adjacent the furnaces. Ordinary wood was cut during the winter and stored near the barn and the furnaces were fired by hand, thus requiring from four to six days to cure a barn of tobacco and requiring day and night attention so that the farmer would have to sit up all night to tend the fires to maintain as near as possible a uniform heat within the barn. The heat, of course, from this early type of tobacco curing barn was radiated from the metal flues inside the barn to maintain as near as possible a constant temperature. This required frequent trips into the barn by the attendant to inspect a thermometer to see if the heat was rising or falling. When the heat is being raised so many degrees per hour after the yellowing process has been completed and the heat is to be raised to cure the leaves, if the rate of advance is too low, the stems of the tobacco will feed their fluids back into the leaves, and discolor the leaves, causing red streaks around the stems, which is called "running" and indicates that the heat is not being increased rapidly enough. Whereas, if the heat is increased too rapidly, scalded spots appear on the leaves of the tobacco, and this is known as "scalding" or "sponging."

In the old type of tobacco curing barn, the initial cost of the furnace, the flues, high labor

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and upkeep and replacement costs were not so great in the early days, but under present conditions, they are almost prohibitive. It is also impossible to maintain the proper uniformity of temperature within the barn equipped in this old manner. Furthermore, many times the first few feet of the flue extending from the furnace, especially during the time of killing out the stems, that is applying a temperature of around 190° to the interior of the barn to dry out the stems of tobacco after the leaves have been cured, represents an extreme fire hazard in that if a leaf of tobacco or hand of tobacco or a stick filled with tobacco leaves should become displaced in the barn and fall on this red hot flue, it will result in a flash of fire and consequently destruction of the barn and its entire contents.

Later there was developed a system of using a coal stoker for firing into a brick furnace to maintain a greater uniformity of heat. This coal stoker type of heating also had metal flues in the same manner as the wood furnaces for distributing the heat through the barn. This installation represented a high initial cost of stoker and also requiring electric current to operate the same, and as is well known, many tobacco barns are located in the fields and remote from electric current, because it is desirable to have the tobacco barns isolated from the other farm buildings on account of fire hazards and also it is desirable to have the tobacco barns isolated from each other, so as to prevent the burning of one barn from destroying an adjacent barn. In this type of stoker fired furnace, there was a high upkeep cost, expensive replacement expense, a need for uninterrupted continuous electric current to operate the mechanism, and in case the power company cut off the current from the system for a few hours to make repairs, it would result in stoppage of the stoker, and, therefore, ruining of the barn of tobacco, due to the lack of maintaining the proper temperature. This system also resulted in an irregular control of heat and an irregular heat distribution and it still had the possibility of fire or smoke damage due to a hole in the flue, or due to the dropping of tobacco leaves onto the heated flues, as above explained in a wood fired furnace.

Recently there has been developed a new system of curing tobacco wherein fuel oil or kerosene systems have been employed. There are many types of these oil fired systems and apparatus, one of which is having an oil burner within the furnace but this entails explosion hazards and also fire hazards due to heating of

the flues when converted from the wood or coal burner type. Also in using this type of burner within the furnace there has been a high fuel cost and lack of storage space for sufficient fuel to complete the curing in the barn of tobacco.

The oil fired systems which use vent stacks and no flue system have difficulties in providing adequate control of temperature and poor distribution of heat, wasted heat by venting the hot products of combustion and danger from inadequate fuel storage systems and the introduction of liquid fuel into the barn.

Some types of liquid fuel curing apparatus have used tanks or a plurality of kerosene burners disposed within the barn with all the products of combustion allowed to enter the barn. Poor temperature control and poor distribution of heat, fire hazards from bringing liquid fuel into the barn, difficulty in keeping all burners and lines level and in adjustment so that they will turn out the same amount of heat, tendency of fully adjusted burners to flare up with attendant fire hazards, and kerosene fumes affecting the tobacco flavor and lowering its market price, have resulted from this type of system.

In the present system it is proposed to conduct a system of pipes into the barn running along the floor of the barn and have connected thereto a plurality of gas burners with a suitable sloping top cage over the top thereof to protect the burner from falling leaves of tobacco and with a suitable liquid holding apparatus, which apparatus is adapted to be filled with water to provide the proper amount of moisture within the barn and to also exercise a cooling effect on the cages and preventing the falling of tobacco leaves on the tops of the cages from becoming ignited from the heat arising from the gas burners. In this system a source of gas is necessary, such as low pressure liquified petroleum gas, disposed on the outside of the barn and the gas is conducted through a suitable metering or regulating device into the barn and this metering or regulating device is controlled by a temperature actuated control disposed within the barn and extending to the regulator disposed on the exterior of the barn.

This new system has many advantages in that it requires no furnace, requires no flue system to become overheated or to have holes burned therein and let blazes enter the interior of the barn, it requires no vent pipes or stacks, requires no electric service, requires no labor or attention as it can be adjusted and left in that position as long as desired, has no liquid fuel being conducted into the barn to constitute a fire hazard, and does not have to be kept accurately adjusted to level or grade in order to function properly as gas flows in a different manner from a liquid, can be installed complete in any barn in less than one hour's time.

Briefly, the system hereinafter explained comprises a plurality of symmetrically spaced gas burners manifolded on piping placed directly on the first floor of the barn. Each burner has an individual valve control. The entire manifold has a manual single valve control in addition thermostatic flow control with a fixed bypass to maintain minimum flame setting on each burner. Each burner has a small heat deflector and screen to eliminate any chance from fire as a result of tobacco leaves dropping onto the burners or the heat deflectors.

The system is also extremely useful in that under extreme conditions, where a strong cool

wind is blowing against one side of the barn, or where there are air leaks in one side of the barn, the operator may not wish to have identical amounts of heat rising from each of the plurality of symmetrically spaced gas burners. Any individual burner or sets of burners may be lowered or turned off and on at will without interfering with the operation of the remainder. Thus, any spacing of heat input is immediately available to the operator. When desirable to increase humidity without lowering heat, water may be poured into the pans in the burner cages or protectors to evaporate into the barn.

Gas fuel supply is piped from a tank nearby, which may also be supplying other barns, the farm home for cooking, water heating, refrigeration, space heating, and for fueling tractors, or for supplying heat for drying cotton in the gin. The operator in the barn merely turns on and lights the burners at the start of each curing. No liquid fuel leaves the tank, only low pressure gas is piped to the burners and there will be no fumes or odors from the gas system units. Tobacco flavor will not be adversely affected because better cure, better grades, higher prices will result. No labor is necessary in preparing the heating equipment for use and no labor or a constant attending is required in operating this equipment.

It is, therefore, an object of this invention to provide means for heating the interior of buildings, such as tobacco barns, comprising a source of gas, such as low pressure liquified petroleum gas, and with a pipe leading from the source of gas to the interior of the building and having a plurality of branch pipes extending therefrom, with gas burners mounted on the pipes for creating heat within the barn with automatic temperature control means for regulating the amount of gas allowed to flow to the burners, and means for protecting the burners from falling leaves of tobacco.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which:

Figure 1 is an elevation of a tobacco barn showing a portion of my invention applied thereto;

Figure 2 is a vertical sectional view through a tobacco barn and taken substantially along the line 2—2 in Figure 1;

Figure 3 is a horizontal section view through a tobacco barn and omitting the tiers, and other portions, and showing my invention installed therein;

Figure 4 is a vertical sectional view through the temperature control valve for regulating the flow of gas to the burners;

Figure 5 is an enlarged detail view showing parts in section and parts in elevation, of one of the burners and the cage surrounding same;

Figure 6 is a sectional view taken substantially along the line 6—6 in Figure 5.

Referring more specifically to the drawings, the numeral 10 indicates the vertical frame members of a tobacco barn having a suitable sheet covering 11 secured thereto, and with a suitable roof structure 12 having ventilating portions 13 at its top and suitable vanes 14 manipulated from ropes or cables 15 for regulating the amount of air allowed to pass out of the top of the barn. These ropes 15 extend down to one of the sides of the barn to where it can be seized by an attendant to regulate the position of the vane 14

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to regulate the amount of air which is allowed to escape through the ventilator 13.

The barn has suitable openings 16 closed by doors 17 and it is usually built on a concrete or brick foundation 18 having a plurality of air inlet pipes 19 secured therein. These air inlet pipes may be closed by any suitable means, not shown, to regulate the amount of fresh air allowed to enter the barn. The barn also has a plurality of tier poles 22 disposed thereacross which may be suitably braced by vertical members 23, if desired. On the tier poles 22 a plurality of sticks having tobacco leaves properly secured thereto are adapted to be hung for the curing operation.

Instead of having furnaces and flues for supplying heat to the interior of the tobacco barn, I provide a cylinder of liquified petroleum gas, such as butane, propane or a mixture of the same, said tank being indicated by reference character 25. From this tank 25 a pipe 26 is connected which extends downwardly, laterally, upwardly and then laterally to the wall of the barn, where it extends upwardly and is connected to an opening in a plug 53 of the automatic gas flow control means. An exit pipe 31 leads from the other side of said automatic control means. The automatic control means is conventional, but it comprises an opening 32 adapted to be closed by a valve 33 secured on one end of a lever 34 having a vertically disposed slot 35 therein, penetrated by a pin 36 and the other end of the lever 34 is pivotally secured to the lower end of a sleeve 37, which has fixedly secured thereto and extending therefrom a threaded portion 38 which is adapted to be engaged by a threaded sleeve 39 threadably mounted in a cap 40 and held in position by a set screw 41. Extending from cap 40 is a graduated dial 42 which operates with a pointer 43 so as to regulate the setting of the amount of gas allowed to flow through the apparatus. The lever 34 is adapted to be moved by a pointed portion 45 forming a part of a conventional heat control element which is screwed, as at 46, into a hollow member 47 secured to the housing 48 of the apparatus. Extending from this portion 46 is a capillary tube 50 which has a heat responsive element 51 on its outer end, and this tube 50 can be of any desired length to place the heat responsive element 51 in any desired portion of the tobacco barn, where the heat at that point will be representative of the entire barn. This heat control element 51 operates the mechanism as above described to regulate the amount of opening between opening 32 and valve 33 to regulate the flow of gas into the pipe 31.

The pipe 31 extends downwardly out of the gas control apparatus. The pipe 26 extends into the upper portion of the heat control apparatus and through a plug 53, while the pipe 31 extends downwardly and has the manually operable valve 27 therein, then the pipe 31 extends through one of the openings 19 into the interior of the barn, where it is bent laterally and extends across the barn, and has a plurality of branches 55 extending therefrom. In each of these branches one or more tees 56 are secured and extending from these tees are nipples 57 having a manually operable valve 58 therein to the upper end of which is connected a nipple 64 which screws into a conventional gas burner base 59 having a disc 60 rotatably mounted therein and provided with arcuate slots or openings 61, as is conventional in gas burners, as on stoves and ranges to regulate the mixture of air with gas going to the upper

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portion 63 of the burner which is perforated in a conventional manner.

The apparatus would work to advantage and just as well as thus far described without any protection for the burner, but in order to prevent falling leaves of tobacco, which are thoroughly dried, from becoming ignited and setting fire to the contents of the barn, I provide a suitable protecting member over each burner. This protecting member comprises a base portion 70 having a plurality of openings 71 therein through which the pipe 55 is passed and secured to the upper edge of this annular base portion 70 is a plurality of vertically disposed wires 72 which are inverted U-shape and have their lower ends spot welded or otherwise secured to the annular base portion 70 and cross each other at their upper portions. Also spot welded to the interior of the inverted U-shaped members 72 is a plurality of annular wires or bands 74, which maintain the wires 72 in proper spaced relation. Also if desired, there may be welded to the interior surfaces of vertically disposed portions of the U-shaped members 72 a pan like member 76 into which water may be poured for creating moisture in the barn, if desired. This member 76 also deflects the heat.

It is thus seen that I have provided an apparatus for the curing of tobacco by providing a plurality of gas burners within the barn with a pipe provided with branch pipes connected to a source of liquified petroleum gas and to the various burners for supplying gaseous fuel to the same, and with manually operable valves for controlling the amount of flame on each individual burner and with temperature controlled means for controlling the amount of gaseous fuel which is allowed to enter the barn and flow to all the burners, together with moisture creating means associated with each of the burners whereby the desired moisture content of the air within the barn may be regulated.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A tobacco curing system for curing tobacco hung in a barn comprising a plurality of gas burners disposed within the barn, a source of gas disposed on the exterior of the barn and a piped connection between the source of gas and the burners, said piped connection comprising a main pipe extending along the barn and having branch pipes extending from opposed sides thereof, each branch pipe being connected to an individual burner, the burners being disposed a substantial distance from the walls of the barn, means associated with each of the burners for regulating the flow of gas thereto, a control valve in the piped connection and temperature controlled means disposed within the barn and connected to said control valve for partially opening or closing the valve to thereby regulate the flow of gas to the burners in accordance with the temperature within the barn.

2. Apparatus for heating a tobacco barn for curing tobacco disposed therein comprising a plurality of gas burners disposed within the barn a substantial distance away from the walls of the barn, a source of gas on the exterior of the barn, a main pipe leading from the source of

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gas along a central portion of the barn, individual branch pipes leading from the main pipe to each of the burners, a flow control valve disposed in said pipe and temperature responsive means disposed within the barn and extending to said valve for partially opening or closing the valve to thereby control the flow of gas through the pipe to the burners, and a perforated cage member disposed over each of the burners.

3. Apparatus for heating a tobacco barn for curing tobacco disposed therein comprising a plurality of gas burners disposed within the barn and spaced a substantial distance away from the walls of the barn, a source of gas on the exterior of the barn, a main pipe leading from the source of gas along a central portion of the barn, individual branch pipes extending from both sides of the main pipe to the burners, a flow control valve disposed in said main pipe and temperature responsive means disposed within the barn and extending to said valve for controlling the size of the opening in the valve to thereby control the flow of gas through the pipe to the burners, a perforated cage member disposed over each of the burners, a pan disposed within each of said cage members and above said burners for holding water to be evaporated by the heat from the burners.

4. A tobacco curing system for curing tobacco hung in a barn comprising a plurality of gas burners disposed within the barn and spaced a substantial distance away from the walls of the barn, a source of gas disposed on the exterior of the barn and a piped connection between the source of gas and the burners, means associated with each of the burners for regulating the flow of gas thereto, a control valve in the piped connection and temperature controlled means disposed within the barn and connected to said valve means for controlling the size of the opening in the valve to thereby control the flow of gas to the burners in accordance with the temperature within the barn, and a perforated cage member disposed on the floor of the barn and com-

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pletely enclosing said burners to shield them against a falling tobacco leaf lodging thereon, said piped connection comprising a main pipe, and each burner having a branch pipe connected to the burner and to the main pipe.

5. A tobacco curing system for curing tobacco hung in a barn comprising a plurality of gas burners disposed within the barn a substantial distance from the walls of the barn, a source of gas disposed on the exterior of the barn and a piped connection between the source of gas and the burners, said piped connection comprising a main pipe disposed substantially centrally of the barn, and each burner having a branch pipe connected to the burner and to the main pipe, means associated with each of the burners for regulating the flow of gas thereto, a control valve in the piped connection, temperature controlled means disposed within the barn and connected to said control valve for controlling the size of the opening in the control valve for regulating the flow of gas to the burners in accordance with the temperature within the barn, and a perforated cage member disposed on the floor of the barn and completely enclosing said burners to shield them against a falling tobacco leaf lodging thereon, each of said cage members having a pan in the top portion thereof into which water is adapted to be placed to be evaporated by the heat from the burners.

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