Lighting the Farm Home

Modern Science has made possible the installation of a unit Electric Light Plant in the farm home, which, after the first cost, will give clean, sure, safe illumination at a very reasonable price

The use of small unit electric light plants, suitable for illuminating farm homes and buildings, has only been made possible during recent years. The cleanliness, safety and convenience of electricity has long been recognized, but the chief obstacle to small plants was the high cost of a suitable storage battery and the inefficiency as light producers of carbon filament lamps. About eight years ago a great advance was made in the discovery of a substitute for carbon called tantalum, which gave, with a given amount of energy, a greater amount of light than the carbon filament. This improvement was rapidly followed by the introduction of the metal tungsten as a lamp filament, and lamps of this kind gave, with the same amount of electrical energy, about three times as much light or candle power as would be produced by the ordinary carbon filament lamp. The importance of this discovery is evident when it is remembered that with such a lamp it will take about a third as much energy to give the same amount of light and consequently the size of the storage battery as source of supply can be cut down by over a half.

Besides being cheaper to operate than the carbon filament lamps, tungsten lamps will burn a greater number of hours. It is unnecessary to go into details in an article of this kind, but it might be noted that besides burning longer, the rate at which the lighting efficiency of these lamps decreases is also much less. From all these facts it will be seen that the possibility of small unit systems being used extensively dates back to the invention of the tungsten electric lamp.

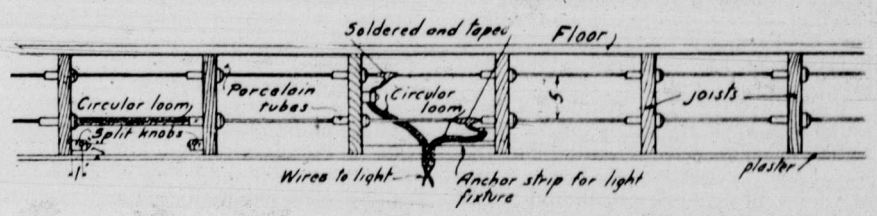
Number of Lights Required

The first consideration in planning to install an electric lighting system in a farm house is to figure out how many lights will be required to properly illuminate the place and then the number of hours which these lights will be required to burn each day. This calculation will give the number of lamp hours required and from it can be figured the size of the plant to be installed. The standard voltage or pressure in the ordinary city electric systems is 110 volts. It is not practicable in a small isolated electric light plant to keep this up since it will necessitate too large a storage battery being installed. High voltage systems can be put in with direct coupled dynamos, but these are not generally offered for the ordinary farm requirements. Each storage cell will deliver an average of 2 volts, so that to deliver 110 volts it would be necessary to have from 55 to 60 of these cells. Since they cost from $8.50 to $12.50 apiece, it would make the cost of the system altogether too high. The ordinary small plant now on the market is a 30 to 35 up to a 60 volt system, and the lamps will be made, of course, for this low voltage. This is an important point to remember, because after a small outfit has been installed, any new lights bought must be for a system having the same voltage; the ordinary city system lamps cannot be used. The number of lamp hours necessary to light an ordinary farm house should next be figured out. A house having three rooms on the ground floor, a cellar, three bedrooms, and five or six lights in the barn will require about 36 lamp hours. Now one tungsten lamp will permit one ampere of current to flow, hence the size of the battery necessary will be a 36 ampere hour storage battery, the ampere hour being the unit by which manufacturers rate storage batteries. The nearest commercial size to this rating is a 40 ampere hour battery. The next consideration is the size of the dynamo which will be required to generate the energy to supply the storage battery. Without going into detail as to how the size is arrived at, a 45 volt machine will be required to operate properly against the maximum pressure or voltage of the 15 to 17 cell storage battery. But besides forcing the electrical energy thru the resistance of the battery and wiring, a certain definite amount of energy, spoken of as amperage, has to be produced and stored up in the cells for use for illuminating purposes. Now, it was decided that a 40 ampere hour battery was required. The normal rate of charging a storage battery is based upon the amount of current in amperes required to charge it from an almost discharged condition in eight hours. Thus the normal rate for the system in question would be 40 divided by 8 or 5 amperes. Allowing for emergencies, however, it is generally reckoned that from 8 to 9 amperes should be developed.

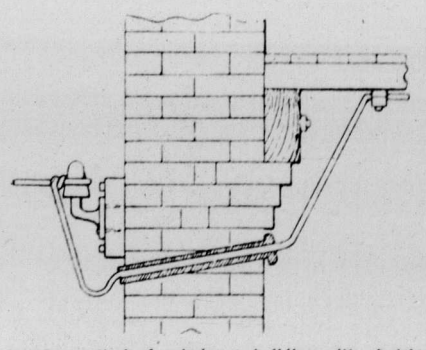
A dynamo is rated by the kilowatts of energy it will produce. A kilowatt is a thousand watts and a watt is the product of the number of volts of pressure and the amperes of current. Thus the dynamo required should develop 45 volts pressure multiplied by a 9 ampere current, or 405 watts, nearly half a kilowatt. Hence this is the size dynamo required. A kilowatt is equal to 1.34 horse power, so that, making allowance for the general high rating of gasoline engines and possibilities of low operating efficiency, the dynamo will require a two horse power engine to run it under all conditions.

The foregoing will give some idea of the way in which to figure out the size of the plant required on any farm. Today, several firms make a specialty of supplying unit electric lighting systems and all that an intending purchaser requires to do is to send in the general plan of his house and barns in order to get the size of the outfit required.

To summarize, the plant will consist of (1) an engine, with 50 per cent. more power than is calculated as necessary to drive the generator; (2) a generator, to be of such size that it will light the whole installation; (3) a storage battery, with a number of cells larger by one than half the voltage of the system installed; (4) a switch-board to control the working of the system, and (5) the wiring and general fittings.



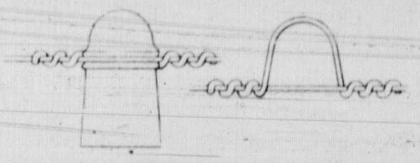
Knob and tube installation of electric wires in joists. Extra protection is provided where one wire crosses another and an outlet take-off thru the plaster



Showing method of entering a building with electric wires to prevent water from following the wire thru

Installation of Fittings

The outfit of the proper size will be supplied complete and if desired most of the installation and wiring can be done by the farmer himself. Thru the house or inside of the barns a No. 14 wire is used. The installation should be carefully made so that proper protection or insulation is obtained. The accompanying cuts will give some general idea of the proper way to install the wires. Wires between the power plant and distant buildings should be No. 10 or No. 12 weatherproof. Now, how much will this outfit cost? It is almost impossible to answer this question. The storage cells will cost from $8.50 to $12.50 apiece. The generator from $125 up, the engine from $125 up and the fittings, etc., another $100 to $125. On most farms now-a-days a small gasoline engine is used to do odd jobs. This could, of course, be used to run the dynamo and would reduce the first cost to a certain extent. It might be said in this connection, however, that in some outfits the lights are run directly off the dynamo, only a small storage battery being used for starting purposes. In outfits of this kind, and in fact, with all outfits, the nearer the engine runs at a constant speed, the better will be the service given. Hence the engine used should be one having a finely adjusted throttle governer, the ordinary hit and miss type, varying as it does in speed, causes the lights when run direct off the dynamo, to increase and decrease in intensity, thus raising and lowering the light.



Method of attaching feed wire to glass insulators on pole

The cost of operation, too, is a question upon which very little definite information is available. Some claim that electricity can be made for as low as 3½ to 4 cents per unit (kilowatt). Of course, the chief cost springs from the cost of running the engine. With gasoline at 25 cents a gallon, a two-horse power engine running at full load will use up about 7 cents worth of gasoline per hour. The engine has only to work at about 1-3 load to drive the dynamo used in the calculation made above, so that 3 cents per hour is all that it will cost under ordinary working conditions for gasoline. Oil is needed for lubrication purposes and once in a while a little sulphuric acid to replenish the supply in the cells. The batteries will cost about $10 per year to look after the plates and then general depreciation and breakages thruout the system will have to be taken into consideration. On the whole it is granted that by far the largest expense is incurred in the installation of an electric lighting system. The subsequent upkeep of a properly balanced and installed system is well within the means of any prosperous farmer. When not charging the batteries or running the lights, the engine can be used to operate any other household conveniences. Care should be taken when buying an outfit that a firm is chosen which is making a specialty of the unit electric light plant. The operation of these is very simple and scarcely ever causes any trouble, but the chief care lies in the installation and it is far better to pay a little more in the first place to obtain a really reliable outfit, which can be properly installed, rather than to be constantly worried with flickering lights or other operating troubles which sometimes attend the installation of a comparatively cheap system. With the small farm unit electric lighting system—30 to 35 volt systems—usually installed, no motors for running pumps, fanning mills or other outside machinery can be run. The voltage from such a system is so low that a large loss is unavoidable in transmission over the wires and hence the efficiency is very low. The engine used for driving the dynamo should be so placed in relation to a lineshaft that it can be used to run the other very necessary labor-saving devices either when charging the battery or at another time when the dynamo is disconnected by throwing off the belt. If, however, it is desired that enough energy be generated to drive motors to do farm work at points over the farm, larger powered outfits are on the market. Most of these are direct drive dynamos, coupled directly up to the engine which has special heavily made fly wheels and a finely adjusted electric automatic throttle governer, so as to ensure as perfectly even running of the outfit as possible.

Some of these outfits are so finely adjusted that merely the turning on of a light will start the engine going and, when the storage battery becomes fully charged, it will automatically cut out and stop the engine. All the outfits can be started from the switchboard by closing the circuit breaker and running the dynamo as a motor to start the engine.

As has been stated before, the operation of these outfits is simple. Very little is likely to go wrong with a good outfit and it is only necessary to keep gasoline in the tank and lubricating oil around the bearings. The largest factor is the first cost and, when that is provided for, the comfort, convenience, cleanliness and safety which such a system provides will make up many times over the cost of upkeep.

SPECIAL NOTICE

Occasionally subscribers to The Guide are sending in their renewals along with subscriptions to other papers at the clubbing rates which were given a year ago. These clubbing rates have been discontinued entirely, and we are giving this notice that henceforth all money sent in for clubbing subscriptions will be applied to The Guide subscription only. We are not clubbing with any other papers.

GRAIN GROWERS' GUIDE.

EXPERIENCE WITH AN ELECTRIC PLANT

What prompted me to fit up my farmstead with an electric light and power plant? I answer, first, that I detested the odor of the kerosene lamp. Secondly, I could not but see that the electric light was much safer, especially for use in the barn, where we were obliged to use a lantern. Thirdly, the electric light is always ready, and lights up a room "in a flash." Fourthly, the electric is beyond comparison the better light.

In locating the lights, I placed one in the front yard, one in the back yard and eighteen in the house, cellar and barn. Our parlor, dining-room and sitting-room are furnished with chandeliers; all the rest of the lights are drop-cord lights.

I installed seven switches—one for lighting the hayloft; one at the front door of the barn, for lighting the hallway; one by the door where we go in to milk the cows, the use of which prevents the needless turning on of all the barn lights; one, with a chain-pull, on the horses' side of the barn; one to control the yard light; one for the porch light; one for the cellar-way, and one for the stairway in the house.

Continued on Page 33