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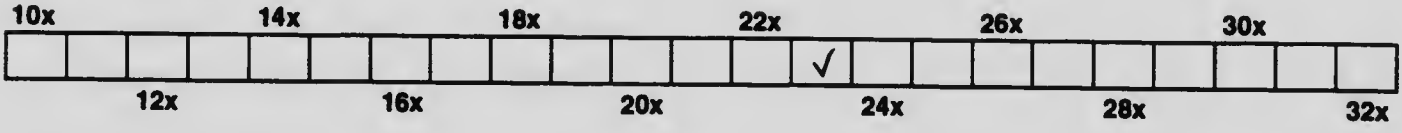

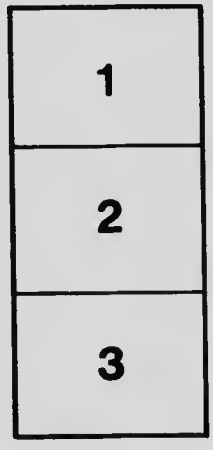

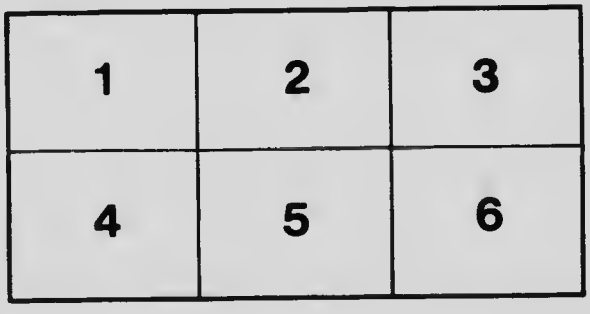

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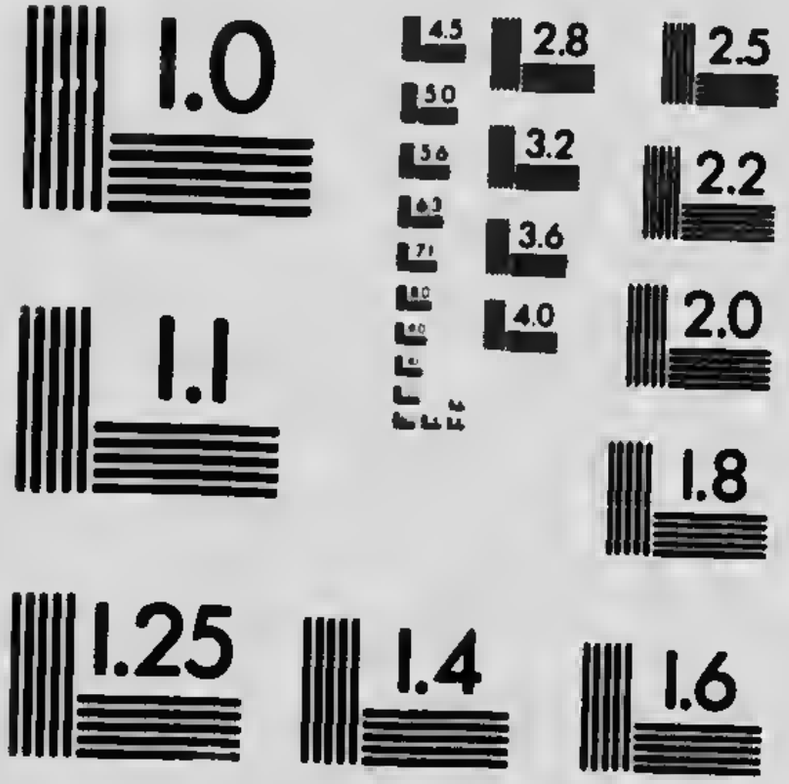

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THE ELECTRIC HOTBED

Its Construction and

Operation

with General Information on

ELECTRIC SOIL HEATING

Preparing the electric hotbed, showing how the heating cable is laid.

Issued by the

B. C. Electric Railway Company Ltd.

LIGHT AND POWER SALES DEPT.
HEATING DIVISION

Bulletin No. 100

8-32 2500-N.

The Electric Hotbed

The value of the electric hotbed as the most convenient form of ground or bottom heat, producing better results than any other method, has been demonstrated in British Columbia and the interest aroused and the many requests for information prompt the issue of this bulletin.

The electric hotbed is of benefit to commercial and amateur growers alike. Its ready adaptability to automatic temperature control of either soil or air, within very close limits, increases its usefulness beyond the scope of ordinary hotbeds.

Manure for hotbeds is becoming increasingly difficult to obtain, due to the motorization of farms and industries, and substitutes have been much sought after. Electric heat seems to have solved the problem, and at the same time introduced many advantages over the older method.

ADVANTAGES: These may be briefly outlined as follows:

(1) Electric heating can be quickly installed, while it takes much time and labor to prepare a manure bed.

(2) Electric hotbeds can be turned off or on depending upon the outside weather conditions, whereas manure heating is continuous.

(3) A pure heat prevails in the air and soil of the electric hotbed. Manure heat is steamy and causes gases that are harmful in large quantities to plant growth.

(4) The electric hotbed is more flexible. The grower may force or retard growth at will, thereby fixing with greater accuracy the time of field planting.

(5) By simply shutting off the current, the bed can be used as a cold frame.

(6) The equipment can be used for several years and placed in operation at any time by merely turning a switch.

(7) The electric hotbed may be used for fall plantings, when maximum heating is needed at the end of the growing period. Manure loses its heating value in four to six weeks.

(8) Automatic control may readily be used to keep the soil or air at any predeterminated temperature.

(9) These advantages improve the working conditions for the grower, and make plant raising a more interesting occupation.

CONSTRUCTION: One of the most convenient forms in which electric heat may be applied to the hotbed is by the use of insulated lead covered heating cable buried about six inches in the soil. The cable consists of a No. 19 nichrome resistance wire covered with asbestos insulation and enclosed in a lead sheath. The total thickness or diameter of the cable is slightly less than ¼ inch. The cable is quite pliable and easily laid. Some manufacturers use a copper sheath.

It is recommended that the electric bed be located similiarly to any other hotbed. A southern slope, protected from cold winds, and good underdrainage, are important. When so located, hotbeds show the best results in economical operation and plant growth.

Dig a pit about fifteen inches deep and about one and a half feet wider and longer than the bed frame. Fill in with about eight inches of cinders or other heat insulating material. Place the frame in the centre of the pit, and fill around the frame with insulating material. Place one inch of soil or sand on top of the insulating material inside the frame, and lay the cable. Cover the cable with another inch of soil, and over this place a divider, such as screen wire or canvas. On top of the divider fill with five inches or six inches of rich soil. See Fig. 1 for complete specifications of this bed.

Many variations in the type of bed construction may be made to suit the material, available, but in all cases every effort should be made to conserve the heat generated. Attention to this detail reduces the consumption of electric current and therefore the operating cost. We suggest that the following points receive consideration:

(1) Joints should be tight so that the wind cannot blow into the bed.

(2) Fit the sashes closely to the frames and see that there are no openings through broken or poorly fitting glass.

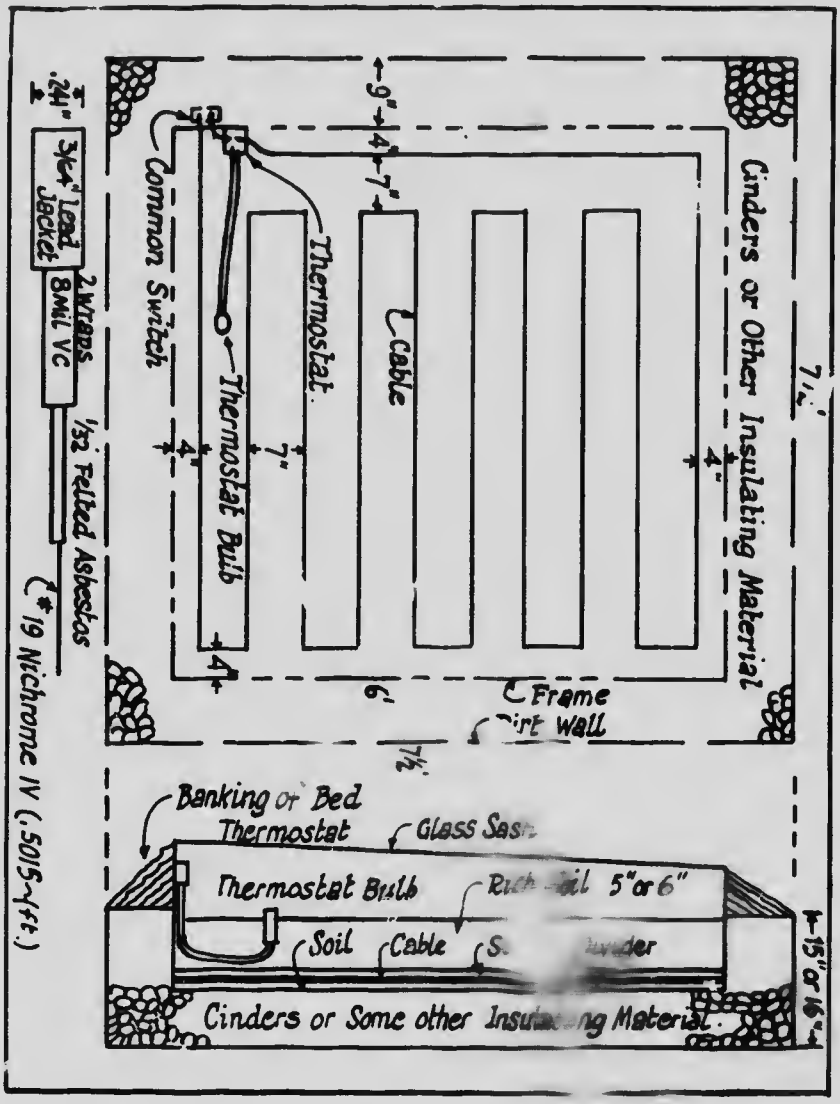

FIGURE 1.

Specifications of an efficient electric hotbed containing 36 sq. ft. ... showing the general construction of the bed and the manner in which ... and.

(3) Frames should not be any higher above the soil in the bed than is necessary for the growth of plants. When so constructed less heat will be required and a smaller part of the bed will be shaded from the sun.

(4) The cinders (not ashes) or charcoal under the bed improves drainage and prevents some loss of heat. Some growers prefer two or three inches of peat, moss, or sand. B. C. Electric cinders obtainable from the company's coke department are excellent for this purpose and have been used with good success. Where there is no danger of damage to the cable from hand tools or cultivating equipment the divider or screen is not necessary.

HEAT CONTROL: The temperature may be controlled manually or automatically. A thermostat reduces labor and attention, and may result in a considerable saving of electricity, particularly during the warmer weather.

A most satisfactory thermostat is available which has a range of from 40° F. to 110° F. and will closely maintain the temperature of the soil or air in the bed at any heat desired within its range. It has a flexible capillary tube about two feet long and a 6½ inch bulb. The bulb may therefore be located at almost any desired spot in the air or soil of the hotbed.

OPERATION—VENTILATION—WATERING: Ordinary hotbeds require considerable ventilation to get rid of steam and ammonia fumes. If the grower is careful to water electric hotbeds (when needed) in the early part of the day so that the surface of the bed will be dry before the cool night temperatures strike it, there should be very little need of ventilation, except to keep down excessive temperatures under a bright sun. Reducing ventilation in this manner helps to keep the bill for electrical energy down.

Canvas, burlap, mats, boards, or other coverings placed over the sashes during cold nights will help to conserve the heat.

The beds may be started about a week later than manure beds to mature about the same time.

Some plants require different temperatures from others. By controlling the temperature to suit the plants the best results are obtained.

SOIL TEMPERATURES FOP PLANT GROWTH: Forty-five to seventy degrees are the soil temperatm usually commended for hotbeds. Use lower temperatures for growing cabbage, c Lnower and lettuce plants, a medim range for tomatoes, and the higher tempera'ures for peppers. Celery should be grown at about 60 degrees. Peas and radishes grow well at 50 to 60 degrees, and cucumbers at 70 to 80 degrees. When automatically controlled the thermostat should be set for these temperatures. Temperatures may be regulated downward after t·· or three weeks, to harden plants. To protect the plants from frost only ,l.. the thermostat bulb in the air just above the soil and set the thermosta ·· ' above freezing temperature.

ELECTRIC WIRING: All wiring necessary to connect up the hotbed cable to the existing light meter should be installed in a safe manner, and in accordance with Municipal and Provincial regulations. The cost of wiring will depend upon the capacity available in the present wiring of premises and upon the distance of the hotbed from the source of supply. Any electrical contractor will gladly quote a price on this work.

The heating cable most generally used has a wattage of 6 2/3 watts per foot and 60 feet of it must be used across 115 volts, which is the average lighting voltage. This length of cable is sufficient for a six by six foot hotbed and has a capacity of approximately 400 watts.

OPERATING COST: Many factors govern the consumption of electrical energy such as the efficiency of the bed construction, soil temperature maintained, outside temperature, and method of operating the bed. For these reasons it is difficult to accurately estimate the operating cost. During the months of March and April, 1932, some six by six foot beds averaged less than 3 K.W.H. per day, while others of poorer construction ranged up to 5 K.W.H. per day. These were cool months and soil temperatures were kept at 65 degrees F. The consumption of energy is easily kept low if the grower exercises care ' construction and operation.

Electric Soil Heating

Electric soil heating possibilities are not confined to hot beds. We find that many growers are more interested in other uses for the heat.

Looking into a cutting bench with heating cables in place and spaced 6 inches apart. Note the thermostat control box on the outside of the bench, and the capillary tube and bulb extending into the bench soil.

PROPAGATING BENCHES; SEED GERMINATORS: Electric heat may be used in heated greenhouses where higher soil temperatures are desired to promote rooting of cuttings. In unheated greenhouses during the Spring, Summer or Fall, when the steam heating plant is not being operated, electric heat in the soil will be found advantageous. Germination of seeds may be hastened. The following merits are claimed for the use of electric heat in greenhouses:

(1) Automatic control for each bed, provides uniform heat at definite temperatures and saves labor.

(2) Ten to fifty per cent increase in the number of cuttings rooted.

(3) Increase in the percentage of seeds germinated.

(4) From ten to twenty-five per cent reduction in time necessary to root cuttings and start seeds.

(5) More vigorous plants due to continuous natural growth.

(6) Makes Summer and Fall propagation possible.

(7) Reduces amount of fuel and labor for firing heating plant.

COLD FRAMES: Electric heat may be used in cold frames to protect plants from possible injury during short periods of low temperature. The sun furnishes the heat for growing. It permits earlier planting of seeds and insures plants against frost injury. The power consumption for this purpose is low.

For this use the hotbed cable may be supported along the inside of the frame. Heat may be controlled by hand or by a thermostat set at 35 degrees to 40 degrees F., with the bulb placed just above the soil.

OPEN SOIL HEATING: Investigations have been conducted in producing earlier vegetables and flowers in the open by placing electric heating cable in the soil under the rows. The resulting growth was quite satisfactory and much earlier results were obtained. The economy of this scheme depends largely upon the price obtained for the product.

GENERAL: There are many other uses for electric soil heat than those mentioned in this bulletin. Refer your soil heating problems to the company's Light and Power Sales department, corner Carrall and Hastings Streets, Vancouver, or the local representative in your district, and they will receive prompt attention without obligation on your part.

Interesting Comments On, and Experiences With, Electric Soil Heating

"The electric hotbed is a commercial success and should be given a trial by all growers. My success with the electric hotbed induced me to equip one of my greenhouses with electric soil heat for growing cucumbers: In one and one half months from time of planting in the greenhouse I had cucumbers on the Vancouver market. In addition I was able to operate the greenhouse at ten degrees lower air temperature, thus saving fuel. The soil heat appears to speed up the action of fertilizer. The cost of electric current was slightly over half a cent. per cucumber."

* * *

"In order that the bed might be thoroughly tested from the economical standpoint, seeds costing approximately ten cents per packet were planted. Germination was rapid, the plants having strong stems and vigorous roots with uniform growth. When it is considered that the experiment has been carried on during unfavorable weather conditions, the results are remarkable. From one package of seed the yield was 60 dozen cabbage plants. Owing to the roots being strong and virile the removal from the bed occasioned no set back. One dozen packets of flower and vegetable seeds were planted and the total yield was 80 flats averaging 8 dozen plants per flat. There has been an entire absence of weeds, the growth of which it is impossible to avoid when ordinary manure is used."

* * *

"I might say that I have given this (the electric hotbed) personal supervision and am convinced that it is a commercial success."

* * *

"Due to the rapid rate of growth I find many of the vegetables from the electric hotbed are of superior flavor."

* * *

"Rootings of rhododendrons and azaleas increased from 45 per cent, the previous average, to 90 per cent using electric soil heat. They were brought into the market one year earlier."

* * *

"Formerly 45 per cent of phlox was rooted in three months' time. With electric heat 95 per cent was rooted in 15 days with soil temperatures of 72 degrees to 75 degrees F."

Cucumber vines in a Vancouver greenhouse. The plants on the right show the effect of electric soil heat. Production was secured one month earlier from the plants provided with soil heat.