# AVAILABLE ELECTRICAL FARM EQUIPMENT: ITS USE, SUITABILITY, MANUFACTURERS, AND MARKETING

Thesis for the Degree of M. S.

MICHIGAN STATE COLLEGE
Vernon H. Baker

1949

This is to certify that the

thesis entitled

"AVAILABLE ELECTRIC FARM EQUIPMENT--

ITS USE , SUITABILITY, MANUFACTURERS AND MARKETING"

presented by

Vernon Hunter Baker

has been accepted towards fulfillment
of the requirements for

M.S. degree in Agricultural Engineering

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Major professor

Date March 14, 1949

M-795

# AVAILABLE ELECTRICAL FARM EQUIPMENT
# ITS USE, SUITABILITY, MANUFACTURERS, AND MARKETING

By

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A THESIS

Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Department of Agricultural Engineering

1949

THESIS

Acknowledgments

The author wishes to express sincere appreciation to the following:

Professor D. E. Wiant for advice and guidance in carrying out the project.

Mr. H. J. Gallagher, General Farm Service Supervisor, Consumers Power Company, for suggestions and help in obtaining information for the project.

The many manufacturers who forwarded material for the survey.

The Consumers Power Company for making possible the research fellowship which aided greatly in carrying out the project.

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# INTRODUCTION

## History

The expansion of electric power-line service to farmers is considered to be one of the greatest single factors in modern agricultural progress. Man's oldest industry is in the midst of a revolution, because farmers are now putting electricity to work in an effort to complete the mechanisation of agriculture.

In 1898, a farmer in Yuba City, California, was impressed with the possibilities of what electricity could do for him.[1] He had a two-mile power line built to his farm and began using electricity to pump water for irrigation and to operate a cider mill, a raisin stemmer, and a water pump for household use.

In 1906, one mile of rural line was constructed at Hood River, Oregon, to serve five farms. This was the dawn of rural electrification.[1]

In 1924, the eight and four-tenth mile Renner test line in South Dakota began operation, serving seventeen farms.[2]

In 1927, the seven-mile Mason-Dansville experimental electrical line, serving fourteen farms, was energized in Michigan.[3]

Experimental lines were built in Minnesota, Iowa, Nebraska, and other states. The idea of farm electric test and

experimental lines did not originate in any one state. It was started in a national movement by the Committee on the Relation of Electricity to Agriculture.[4] This committee knew that electricity could be put to work for the farmer, and was the pioneer in the promotion of the application of electricity to farm production equipment.

Private power companies have built thousands of miles of rural lines, and have spent millions of dollars in an effort to make electricity available to farmers. The R.E.A. made money available so that farmers could form electric co-operatives and build their own lines and generating plants.

In a brief period of about twenty-five years, the number of farms in the United States to which electric service had been made available increased from 177,560, or about 3 percent in 1923, to approximately 3,817,000 farms, or 61 percent, on January 1, 1948.*

On January 1, 1949, the total number of farms receiving electric service in the United States was approximately 4,369,100, or about 75 percent. In Michigan the number of farms served is above 165,000, representing about 95 percent. Michigan ranks fourth among the states in the total number of farms served, and tenth on a percentage basis.[5]

Some experts[6] say that agriculture is in for some of the

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*Statistics from Edison Electric Institute.

same efficiency of production methods that have been applied to industry in the past. This can be accomplished only by employing electrically-operated farm equipment in the right place at the right time.

Until the present time, the biggest emphasis on rural electrification has been social in character. Electricity in the business side of farming has been of secondary importance. Farmers have barely started to exploit the profitable uses of electricity that are available to them.

## Review of Literature

Literature suitable for listing in catalogue indexes, and applying directly to this survey, is very limited. Hundreds of two or three page pamphlets and bulletins applying directly to some specific part of the survey were reviewed, but it will not be possible to review or list them here. The Electricity on the Farm magazine was relied on for some of the basic information about specific equipment.

Three investigators are engaged in, or have carried out, studies similar to this survey. Kable[7], editor of Electricity on the Farm, states that

> we have tabulated volumes of material. The trouble of it is, that every manufacturer who builds fans will say he sells barn ventilation, poultry house ventilation, and hay driers, for example. The probabilities are that only a few of them are prepared to handle that type of installation. In other words, there is a lot of sifting still to be done before our compilation is worth anything....

> We are continuant with the making of our directory. Our purpose is primarily to have the information so that we can answer questions from farmers.

Gingles[8], former manager of the Farm Electrification Bureau, states that

> one of the blind spots with respect to electrically operated farm equipment is that there is no central clearing house for the distribution of information pertinent to this equipment.

In past years, information concerning this equipment was compiled and distributed by the C.R.E.A. This committee, which is no longer in existence, did an excellent job of coordinating research and collecting data on electrical equipment.

Watts[9], of The Farm Journal magazine, has issued a directory of electrically operated farm equipment manufacturers. This directory is not complete, but it has proved very valuable to rural electrification workers.

Surveys and directories have been issued by Montfort of Texas Agricultural and Mechanical College, the Tennessee Valley Authority, and others, but there is not, at the present time, a comprehensive survey available on electrically operated farm equipment.

## Reason for the Survey

It has been predicted by many authorities that by 1952 the job of building lines to carry electrical energy to farms will be substantially completed. The connection of farms

to power lines is only the beginning of farm electrification. If farmers are to maintain a level of maximum profit during the present period of high labor costs, it is imperative that electricity be utilized to the fullest economical extent. Even though a large percentage of the farms in Michigan have electric service, few farmers are making electricity work for them to the fullest extent in increasing production, lowering the cost of production, and raising the standard of living.

Possibly this is due to the fact that one of the weakest links in the farm electrification program of today is the lack of knowledge on the part of dealers and farmers about the various types of electrically operated equipment and where such equipment can be secured. As a result of war-time and post-war high prices, many farmers now find themselves in a good financial position to completely mechanize their farms with the new electrical farm production equipment which is being manufactured. This survey is being made so that farmers may benefit by knowing (1) what electrical farm production equipment is being manufactured, (2) what the equipment can do for them, and (3) where the equipment can be secured.

## Objectives of the Survey

A. Primary

1. To gather information as to the types of electric

farm production equipment now being manufactured.

2. To determine who manufactures this equipment.
3. To determine what this equipment can do for the farmer.
4. To collect application pictures of each piece of equipment.
5. To have the above information assembled so that it may be printed in a booklet by the Consumers Power Company, or some other organization, and distributed free to farm service personnel of electric power companies, dealers, county agricultural agents, and farmers, in order to promote the utilization of electrically operated equipment on farms.

B. Secondary

1. To determine how well the available equipment fills the needs of the farmer.
2. To determine some of the conditions that are "holding up" rural electrification development.
3. To list new trends in design.
4. To investigate the effectiveness of manufacturer's advertising.
5. To study sales and distribution problems.

## Methods of Procedure

The method of procedure will be described, and the steps numbered, in the order in which each item was accomplished.

1. In order to determine what types of electrically operated farm equipment were manufactured, a letter was written to the Rural Electrification Administration requesting this information. The list was not complete, but was used as a starting point. Additions were made from magazines, manufacturing indexes, and commercial literature, to complete it. Titles of the publications reviewed are given in the bibliography.

Over three hundred uses of electricity were listed. A number of these uses were over-lapping. Household equipment uses were omitted. This left less than two hundred types of electrically operated farm equipment which was being manufactured.

In order to carry out the study in parts, the uses of electricity on the farm were divided into the following eight sections:

General Farm ..... Section 1

Dairy..... Section 2

Crop Processing ... Section 3

Farm Shop ..... Section 4

Poultry ..... Section 5

Horticulture ..... Section 6

Livestock ..... Section 7

Insects ..... Section 8

The most important part of the method of procedure was the keeping of a complete and up-to-date progress chart. This

# PROGRESS CHART

## CONSUMERS POWER CO.— MICHIGAN STATE COLLEGE

## COOPERATIVE FARM ELECTRIFICATION PROJECT

| | TYPE OF EQUIPMENT | LETTERS: NO. OF COMPANIES FROM DIRECTORIES | LETTERS: NUMBER OF COMPANIES LETTER NO.1 MAILED TO | LETTERS: NUMBER OF FAVORABLE REPLIES LETTER NO.1 | LETTERS: NUMBER OF COMPANIES LETTER NO.2 MAILED TO | LETTERS: NUMBER OF FAVORABLE REPLIES LETTER NO.2 | PICTURES: CATALOG TYPE | PICTURES: ACTION | PICTURES: LINE DRAWING | WRITTEN ARTICLE: COMPLETED FIRST TIME | WRITTEN ARTICLE: REVISE | WRITTEN ARTICLE: APPROVED | FINAL SHEET FOR PRINTING: PICTURE TO USE: CATALOG | PICTURE TO USE: ACTION | PICTURE TO USE: LINE DRAWING | PICTURE APPROVED | WRITTEN ARTICLE | NUMBER OF MFG. | FINAL SHEET APPROV. FOR PRINTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GENERAL FARM | ALARMS | | | | | | | | | | | | | | | | | | |
| | Burglar | 11 | 11 | 2 | 2 | 1 | | | X | X | X | X | | | X | | | 3 | |
| | Fire & Temp. | 10 | 10 | 5 | 1 | 1 | | | X | X | X | X | | | X | | | 6 | |
| | Freezer (Power off) | 3 | 3 | 1 | 2 | | | | X | X | X | X | | | X | | | 7 | |
| | CONVEYORS | | | | | | | | | | | | | | | | | | |
| | General Farm | 8 | 8 | 2 | 1 | 1 | 1 | | | X | X | X | | | | | | 2 | |
| | Poultry Dropping | (See Poultry Elevator) | | | | | | | | | | | | | | | | | |
| | Screw (See Elevator) | | | | | | | | | | | | | | | | | | |
| | HEATING CABLE (Water pipe) | 3 | 3 | 3 | 1 | 1 | | | X | X | X | X | | | X | | | 5 | |
| | INTERCOMMUNICATION SYSTEM | 2 | 2 | 2 | 1 | 1 | | 5 | | X | | X | | X | | | | 3 | |
| | IRRIGATION PUMP | 9 | 8 | 5 | 2 | 1 | 2 | 2 | | X | X | X | | X | | | | 6 | |
| | LIGHTS | | | | | | | | | | | | | | | | | | |
| | Flood | | | | | | | 1 | | X | X | X | | X | | | | 3 | |
| | Yard Controls | | | | | | | | 1 | X | X | X | | | X | X | X | 3 | X |
| | MOTORS | 30 | 19 | 19 | 2 | 1 | | 2 | | X | | X | | X | | | | 19 | |
| | MOWER | 9 | 9 | 2 | 2 | 2 | | 2 | | X | X | X | | X | | | | 5 | |
| | PUMPS | | | | | | | | | | | | | | | | | | |
| | Water Systems | 63 | 62 | 49 | 2 | 2 | 3 | 4 | | X | X | X | | X | | | | 49 | |
| | Sump Pump | 35 | 27 | 17 | 2 | 1 | 1 | | | X | X | X | X | | | | | 19 | |
| | REFRIGERATION | | | | | | | | | | | | | | | | | | |
| | Cold Storage | | | | | | | | | X | | X | | | | | | 12 | |
| | Freezers | | | | | | | | | | | | | | | | | | |
| | Deep-type | 58 | 55 | 36 | 2 | 2 | | 5 | | X | | X | | X | | | | 36 | |
| | Upright | 9 | 9 | 4 | 2 | 1 | 7 | 5 | | X | X | X | | X | | | | 12 | |
| | Walk-in | | | | | | | | | | | | | | | | | | |
| | Low Temp. | 5 | 1 | 4 | 2 | 1 | | 4 | | X | X | X | | X | | | | 4 | |
| | Normal Temp. | 7 | 1 | 4 | 1 | 1 | | 1 | | X | X | X | | X | | | | 5 | |
| | RODENT EXTERMINATOR | 1 | | | | | | | | X | | X | | | | | | 1 | |
| DAIRY | BARN CLEANER | | | | | | | 1 | 1 | X | X | X | | | X | X | X | 5 | X |
| | CHURN | 12 | 8 | 4 | 2 | | | 2 | | X | | X | | X | | | | 5 | |
| | CREAM | | | | | | | | | | | | | | | | | | |
| | Cooler | | | | | | | 1 | | X | | X | | | | | | 1 | |
| | Separator | 24 | 20 | 9 | 3 | 3 | 7 | 5 | | X | X | X | | X | | | | 9 | |
| | FANS | (See Poultry) | | | | | | | | | | | | | | | | | |
| | Ventilating | 23 | 19 | 17 | 2 | 1 | 1 | 7 | | X | | X | | X | | | | 22 | |
| | HEATER | | | | | | | | | | | | | | | | | | |
| | Milkhouse | 15 | 9 | 9 | 4 | 1 | | | | X | X | X | | | | | | 10 | |
| | HOIST | | | | | | | | | | | | | | | | | | |
| | Milk Can | | | | | | | | | X | X | X | | | | | | 1 | |
| | ICE CREAM FREEZER | 10 | 7 | 2 | 2 | 1 | 4 | | | X | | X | X | | | | | 4 | |
| | LIGHTS | | | | | | | | | | | | | | | | | | |
| | Ultra-violet | 3 | 3 | 3 | 2 | 2 | 2 | 1 | | X | X | X | | X | | | | 6 | |
| | MILK COOLER | 35 | 25 | 18 | 2 | 2 | | 13 | | X | X | X | | X | | | | 18 | |
| | MILK REFRIGERATOR | 28 | 10 | 2 | 2 | 2 | | | | X | | X | | | | | | 2 | |
| | MILK MACHINES | 35 | 24 | 17 | 2 | 1 | | | | X | X | X | | | | | | 17 | |
| | Air-line | | | | | | 4 | 1 | | X | X | X | | X | | | | | |
| | Portable | | | | | | 4 | | | X | X | X | X | | | | | | |
| | PASTEURIZER (Home) | 6 | 4 | 3 | 2 | 2 | 12 | | | X | | X | X | | | | | 3 | |
| | PUMP, Sump | (See Gen. Farm) | | | | | | | | | | | | | | | | | |
| | SILO UNLOADER | (See Crop Processing) | | | | | | | | X | | X | | X | | | | 1 | |
| | STEAM CLEANER | | | | | | 1 | | | X | X | X | X | | | | | 2 | |
| | STERILIZER | | 2 | | | | | 1 | | X | X | X | | | | | | 3 | |
| | STOCK TANK HEATER | (See Livestock) | | | | | 3 | 5 | | X | X | X | | X | | | | 12 | |
| | WAGON UNLOADER | (See Crop Processing) | | | 1 | 1 | 1 | | | X | | X | X | | | | | 1 | |
| | WATER HEATER | | | | | | | | | | | | | | | | | | |
| | Dairy Pressure Heater | 17 | 9 | 7 | 2 | 1 | 2 | | | X | X | X | X | | | | | 10 | |
| | Pour-in Non Pressure | 8 | 6 | 5 | 2 | | 2 | | | X | | X | X | | | | | 5 | |
| | Immersion Type | 9 | 7 | 6 | 2 | 1 | 4 | | | X | X | X | X | | | | | 7 | |

chart made it possible to see at a glance what had been accomplished on the survey without having to review notes or refer to files.

It should be pointed out that throughout the entire survey a constant search was made for new uses of electricity on the farm.

2. The second part of the survey was to determine who manufactured equipment for the uses found in step one. First, a mailing list of companies that were listed as manufacturers of the equipment under step one was secured from the same sources as mentioned before; namely, magazines, manufacturer's indexes, and directories. (See bibliography for a complete list of references used.)

After a careful search was made through the literature, and a list of manufacturers found for each item, a letter was written to each company. This letter will be referred to as letter number one. (Letter number one appears in appendix.) This letter was a screening or a "weeding out" letter. Thousands of companies were listed in various commercial directories as manufacturers of electrically operated farm equipment. However, only those companies responding to letter number one are listed in the final manufacturer's index which is included in this survey.

3. Practically all of the companies responding to letter number one sent literature about their equipment. From this

literature, from magazines, and from other references listed in the bibliography, step three of the project was determined. That is, what will the available electrically operated equipment do for the farmer?

4. In order to gather information for steps four and five, letter number two (see appendix) was written for each item to two companies who had responded favorably to letter number one. The primary purpose of letter number two was to obtain action pictures and further technical information about each piece of equipment.

From the response to letter number two, it was soon realized that desirable pictures of each item could not be obtained, so the following additional steps, in the order listed, were used to obtain pictures:

a. The Consumers Power Company agreed to obtain, with the help of the Detroit Edison Company, as many of the remaining pictures as possible.

b. The Agricultural Engineering department of Michigan State College agreed to try to obtain any remaining pictures by photography or by making line drawings.

A complete filing system was set up, with a folder for each piece of equipment. The filing system was arranged in the same order as the equipment listed on the progress chart. All answers to letter number one and to letter number two, literature, photography, and other material received, were

filed.

5. All the material gathered under the previous steps of the primary objective was assembled as outlined under objective number five of this survey. In this report, the following procedure was followed in assembling the data for the booklet that is to be printed.

a. A typical page, similar to a page that is to appear in each of the eight sections of the final booklet, was made up and photographed. (See Illustrations one through eight.)

b. An alphabetical list of available electrically operated farm equipment was tabulated.

c. The companies responding to letter number one were compiled as the manufacturer's directory.

d. An informative article, listing some operating characteristics, was written about each piece of equipment.

6. In order to reproduce the final results of this survey in the form of a promotional or educational booklet, it will be necessary for the information listed above, together with photographs and other material collected, to be submitted to the Consumers Power Company, or some other organization, for final editing and printing.

# RESULTS

## AVAILABLE ELECTRICALLY OPERATED FARM EQUIPMENT

- Air Compressor
- Alarms
  - Burglar
  - Fire & Temperature
  - Freezer
- Animal Prod
- Bagging Machine
  - Fruits & Vegetables
- Barn Cleaner
- Battery Charger
  - Motor Generator
  - Trickle
  - Vacuum Tube
- Bee Keepers Equipment
  - Hive Heater
  - Honey Extractor
  - Honey Heater & Bottler
  - Uncapping Knife
- Branding Iron
- Brooders
  - Chicken
  - Lamb
  - Pig
- Bull Exerciser
- Caponizer
- Churn
- Cider Mill & Press
- Clippers
  - Animal
  - Hedge
- Concrete
  - Mixer
  - Vibrator
- Conveyors
  - General Farm
  - Poultry Dropping Cleaner
  - Screw (See Elevator)
- Corn
  - Corn Cob Crusher
  - Cracker
  - Drier
  - Grader & Sorter
  - Husker & Sheller
  - Sheller
- Cream
  - Separator
- Debeaking Equipment
- Dehydrator
- Driers
  - Fruit & Vegetable
  - Hay (See Fan)
  - Seed
- Drill
  - Portable
  - Post
  - Press
    - Floor
    - Bench
- Egg
  - Candler
  - Cleaner
  - Cooler
  - Grader
  - Washer
- Electrocutor
- Elevator
  - Auger Type (Grain)
  - Blower Type (Grain)
  - Freight
  - Mechanical Cup Type
  - Pneumatic Type

- Portable (Hay, ear corn, grain)
- Poultry Litter

Ensilage Cutter, Hay Chopper, Silo Filler

Fan
- Cooling
- Exhaust
- Hay Drying
  - Centrifugal
  - Propeller
- Ventilation
  - Dairy & Poultry

Feed
- Grinder
  - Burr Mill
  - Hammer Mill
  - Roller Mill
- Mixer

Fence

Flour Mill (Small type)

Forge Blower

Frost Prevention

Germinators (See Seed)

Glue Pots

Graders
- Fruits & Vegetables

Green House
- Heating
- Lights

Grinders (Emery Wheel)
- Bench
- Portable

Grinder (Feed)
- See Feed

Grindstones

Groomer

Hammer

Hay
- Chopper (See Ensilage Cutter)
- Drier (See Fan)
- Hoist (See Hoist)

Heater
- Milk House

Heating Cable
- Soil
- Water Pipe

Hedge Clipper (See Clipper)

Hoist
- Hay
- Milk Can
- Power

Hot Bed
- Soil Heating Cable
- Light Bulb Type
- Soil Sterilizer

Huller
- Alfalfa & Clover Seed
- Oats
- Pea, Bean

Ice Cream Freezer

Incubators
- Large
- Small

Insects
- Screens & Traps
- Sprayers (See Sprayer)

Intercommunication Equipment

Irrigation Pump (See Pump)

Lamb Docker

Lathes
- Metal
- Wood

- Lights
  - Flood
  - Germicidal & Ultra-violet
  - Infra-red
  - Trouble
  - Yard Controls
- Meat Processing
  - Grinder
  - Hoist (See Hoist)
  - Saw
- Milk Cooler
- Milk Machines
  - Air-Line
  - Portable
- Milk Refrigerator
- Molasses Heater
- Motors
- Mowers
- Pasteurizer
  - Home
- Picker
- Planer
- Pollinator
- Potato
  - Bag Tier
  - Grader
  - Washer
- Pump
  - Gasoline
  - Grease
  - Irrigation
  - Sump
  - Water System
- Refrigeration
  - Cold Storage
  - Freezers
    - Deep Type
    - Upright
  - Walk-in
    - Low Temperature
    - Normal Temperature
- Rodent Exterminator
- Sander
  - Bench
  - Portable
- Saw
  - Band
    - Metal Cutting
    - Wood Cutting
  - Circular
    - Cut-off
    - Hand Portable
    - Rip
  - Hack
  - Jig
- Scalder
- Seed
  - Cleaner & Grader (Fanning Mill)
  - Drier
  - Duster & Treater
  - Germinator
- Shaper
- Shears
  - Metal
  - Sheep
- Silo Unloader
- Singer
- Soil Sterilizer

Soldering
- Iron
- Pot

Sprayer
- Insecticide
- Orchard
- Paint

Steam Cleaner

Sterilizer (Dairy Utensils)

Stock Tank Heater & Deicer

Thermostats

Thermostat Wafers

Time Switches
- Dimming Devices

Vulcanizer

Wagon Unloader

Washer
- Egg (See Egg)
- Fruit & Vegetable

Water Heater
- Dairy Pressure
- Immersion Type
- Portable Pour-in

Waterer (for Livestock)

Water Systems (See Pumps)

Water Warmer
- Poultry

Waxer

Welder

# GENERAL FARM EQUIPMENT

## Section 1

## Section 1

## Electrically Operated General Farm Equipment


| | Information Page | Manufacturers Page |
|---|---|---|
| Alarms | 18 | 139 |
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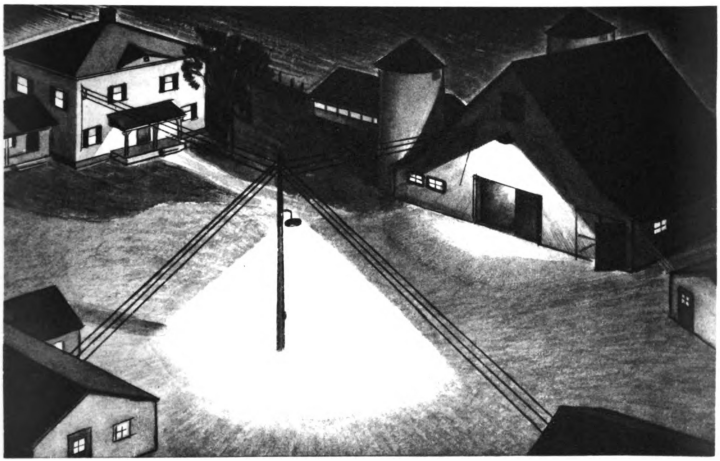
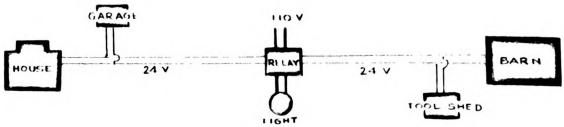
| Rodent Exterminator | 27 | 168 |

# FARM YARD *Lighting*

## BY REMOTE CONTROL






This new remote control yard lighting system permits considerable savings in wiring, and makes it possible to control one or more lights from a number of different places. The 24 volt relay is generally mounted near the light that is to be controlled. Small twisted bell or telephone wire and inexpensive push button switches are used on the 24 volt switching circuit. See diagram above. Refer to manufacturers' index for list of manufacturers.

Illustration 1
Showing a page from the General Farm Section

## ALARMS

There are four types of alarms that may be used on the farm. (1) The burglar alarm is used to ward off burglars from the poultry house and barn. (2) The fire or temperature alarm may be used to indicate the location of abnormal temperatures or fires. (3) The freezer alarm is connected to the deep-freeze in order to detect a rise in temperature. (4) The power-off alarm is used to indicate power interruptions in incubators, deep freezers, brooders, and other equipment.

One company is manufacturing a "Detecto Master" thermostat alarm unit that provides for protection in fifteen areas. The Detector unit may be mounted in the kitchen of the farm house. Thermostats are located at each control point. When any one of the thermostats detects an abnormal temperature, it instantly sends a warning to the detector unit. At once a bell starts to ring in the kitchen, and the indicator needle on the detector unit points to a number which indicates the exact area in which the trouble has occurred.

See Poultry for further information on alarms.

## CONVEYORS

### General Farm

The electric motor driven drag chain, belt, or roller type horizontal conveyor may be used on the farm to convey sacks of feed, grain and fertilizer, baskets of fruit, baled hay, and other materials.

## HEATING CABLE

### Water Pipe

The thermostatically controlled soil heating cable may be used to keep water pipes from freezing. Also, a special pipe heating cable or tape is being manufactured in desirable lengths, with thermostats, and is used in order to prevent hydrants and pipes in barns or other unheated buildings from freezing in cold weather. The cable consists of a small resistance wire insulated with a special plastic or other material. The thermostat is set for about 35° F. Power consumption is low.

## INTERCOMMUNICATION SYSTEM

A small, low cost intercommunications system between the farm house and other buildings will save time, and speed up operations by enabling members of the family and hired hands to keep in touch with each other.

## IRRIGATION PUMP

Irrigation pumps are generally of the turbine or centrifugal type. The single stage centrifugal pumps may be used on a lift head of about seventy feet. Two or more centrifugal sections may be coupled together for heads greater than seventy feet. The large irrigation type centrifugal pumps are different in design from the turbines used in shallow well systems. They are improved multi-staged pumps designed to pump large quantities of water against high heads. Some of the centrifugal units are small enough to fit down into a well casing, and are driven by shafts extending down into the well.

## FLOOD LIGHTS

A flood light will furnish light for working in the barn yard and for recreation in the home yard. It will also help guard against burglars.

The yard light may be controlled by a three-way or a four-way switch, or by means of a twenty-four volt relay. One relay will control a number of lights that are to be turned on and off at the same time, or one light may be controlled from several different places. The relay is economical in that it permits a considerable saving in wiring. See Illustration 1.

## MOTORS

### Single Phase

The electric motor is the farmers most versatile power supplier. There are four major types of motors that are used on the farm. These are the repulsion-induction, capacitor, split phase, and universal. The universal motor is generally used to turn hand drills and other variable speed machinery. The farmer will not have to bother with the application of the universal motor because this type of motor is built into tools that are factory built. The capacitor motor is the most widely used motor on the farm. All motors should be equipped with the proper overload protection and starting controls.

Characteristics and some of the applications of the repulsion-induction, the capacitor, and the split-phase motors are:

| CHARACTERISTIC | REPULSION-IND. | CAPACITOR | SPLIT PHASE |
|---|---|---|---|
| Starting current per hp | low | medium | high |
| Starting torque per hp | high | medium | low |
| Horsepower | 1/4 - 10 | 1/4 - 7 1/2 | 1/6 - 1/2 |

| CHARACTERISTIC | REPULSION-IND. | CAPACITOR | SPLIT PHASE |
|---|---|---|---|
| Applications & Horsepower | Water Pump 1/4 - 1/2 | Cornsheller 1/4 - 3 | Bottle washer 1/6 - 1/4 |
| | Irrigation Pump 1 up | Farm Shop 3/4 - 1 | Churn 1/4 |
| | Pump Jack 1/2 | Separator 1/4 | Separator 1/4 |
| | Feed Grinder 1 - 7 1/2 | Feed Mixer 1/4 - 1/2 | Drill Press 1/6 - 1/4 |
| | Ensilage Cutter 5 - 10 | Ens. Cutter 5 - 7 1/2 | Fruit-Egg Grader 1/4 |
| | Hay Curing 3 - 10 | Blower (Hay) 3 - 7 1/2 | Washing Machine 1/4 |
| | Hay Hoist 2 - 5 | Hay Hoist 2 - 5 | Grindstone 1/4 |
| | Irrig. Pump 1 - 10 | Irrig. Pump 1 - 7 1/2 | |

Other uses for the capacitor motor are:
Water Pump - 1/4 to 1/3 hp

Milking Machine - 1/4 to 1/3 hp

Elevators for feed and grain - 1/4 to 3 hp

Wood Saw - 3 to 5 hp

Grain and feed blower - 1 to 2 hp

See also Farm Shop.

## MOWER

Five companies are listed as manufacturers of electrically operated lawn mowers. The cutting mechanism of an electric mower is turned with a 1/4 to 1/2 hp electric motor. This type of mower is very convenient when there is an electrical outlet near. Extension cords may be obtained in various lengths in order to mow large yards and lawns.

## PUMPS

### Water Systems

From the pump manufacturers viewpoint, a water system consists of a pump, electric motor, pressure tank, and controls; but from the farmer's viewpoint, the water system consists of the bath room and other fixtures, the barn yard distribution system, storage tank, and septic tank.

Only available electrically operated pumps will be considered here. Pumps are divided into two groups: shallow well, and deep well. A shallow well pump is used where the distance to the permanent water level does not exceed 22 to 25 feet.

Based on design and principles of operation, there are four types of pumps.

Points about each type:

Reciprocating piston:

1. Applicable to shallow wells
2. Not necessary to place over well
3. Efficient
4. Water is lifted by suction of piston in shallow well
5. Water is lifted by piston in deep well application (Piston placed down in well)

Rotary Gear:

1. Two moving parts (gears)
2. Shallow well
3. Easily serviced
4. Pumps only clean water
5. Used more for oil, gasoline, etc., than for water

Centrifugal:

1. One moving part
2. Simple, rugged, low in cost
3. Pumps clean or dirty water
4. Pumps large quantities under low heads (shallow well)
5. Used widely for deep wells with jet or ejector
6. Used widely for irrigation, pumping into open tanks and for sump pumps
7. Not necessary for pump to be located over well

Turbine:

1. One moving part
2. Quiet operation
3. Used on shallow wells
4. Adapted to deep wells if jet is used
5. Not necessary to place over well

### Sump Pump

Sump pumps are used in cellars, milk houses, and other buildings that have no drain. They are generally centrifugal pumps which rest on the bottom of a sump and are driven by a directly connected 1/4 hp motor on a shaft extending above the water. The motor is controlled by a float switch.

## REFRIGERATION

### Cold Storage

Produce and fruit farmers have found that a cold storage plant designed to suit their needs is a money-maker. Vegetables may be cooled and held for a few days to avoid market gluts. Peaches may be stored for two to three weeks, while apples may be stored through the winter.

Manufacturers of refrigeration machinery and insulating material have information available on the design of cold storage plants. See Index for a list of manufacturers.

### Freezers

The home freezer is probably being accepted by the farmer faster than any of the new equipment that has been available in the last ten years. Home freezers of the deep type or of the upright reach-in type are available in sizes of from four to sixty cubic feet. The upright freezer is

preferred by many because it is more convenient. However, it is not the most popular.

The advantages of freezing food in home freezers are:

1. Home grown meats and produce may be preserved with original color and flavor.
2. They preserve vitamins and minerals in food.
3. Food is always available at home.

The advantages of the home freezing unit over the locker plant are:

1. The small quantity of food frozen in the home freezer at different intervals will not be frozen if only community locker service is used.
2. It is inconvenient to visit the locker daily or as often as food is desired.

## Walk-ins

There are two types of walk-in refrigerators; the normal storage cooler, 34 - 40 degrees F., and the below-freezing walk-in. Walk-ins may be designed for temporary storage or for freezing fruits, vegetables, beef, poultry, and pork, and for storing milk.

Many farmers want to build their own walk-in refrigerators. Information on how to construct a walk-in cooler or freezer may be obtained from the state colleges.

## RODENT EXTERMINATOR

An electric rat trap is now on the market. Cheese or some other bait is used to coax the rat into a special electrocution chamber. As the rat enters the trap chamber, a beam of light is broken and this causes a relay to apply 110 volts ac to two shocking plates. The shocking plates move into the center of the trap chamber and make contact with the rat. After the rat or mouse has been electrocuted, it is removed from the electrocution chamber to a collection box.

# DAIRY EQUIPMENT

## Section 2

## Section 2

## Electrically Operated Dairy Equipment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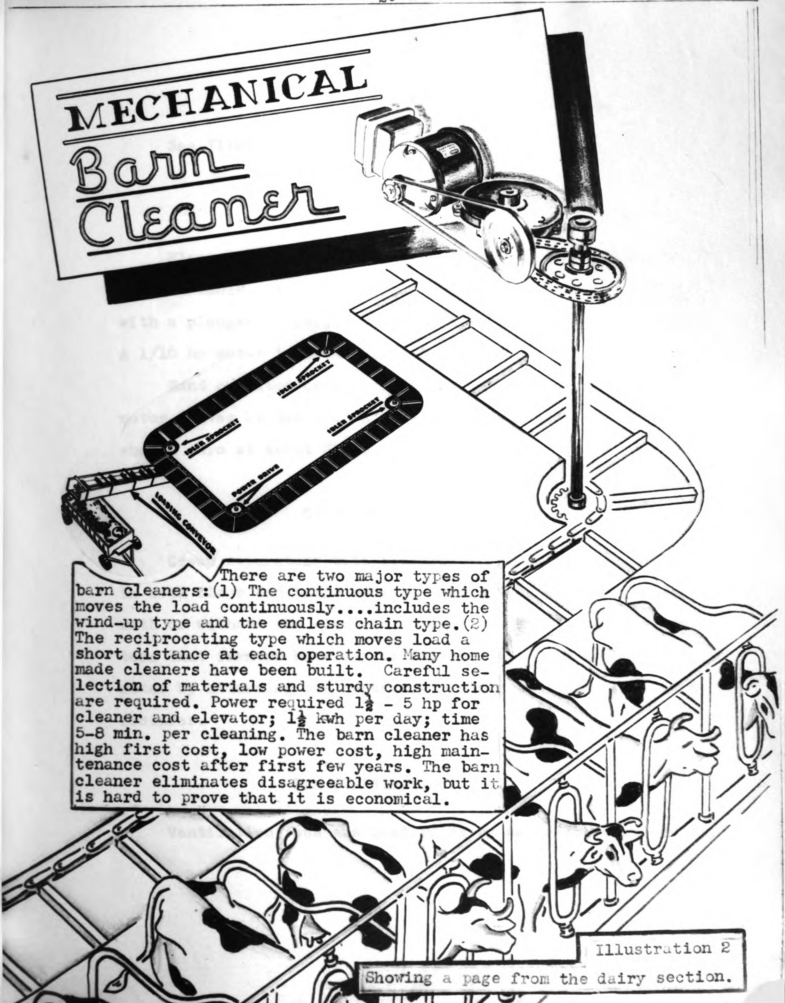


Illustration 2

Showing a page from the dairy section.

## BARN CLEANER

See Illustration 2.

## CHURNS

Electrically operated barrel, plunger, and dasher type churns are available. A popular type consists of a jar or milk can with a plunger or paddle mounted on a long motor drive shaft. A 1/10 hp motor is commonly used.

Hand operated barrel churns may easily be converted to motor drives by means of a gear speed reducer. The barrel should turn at about 50 to 60 rpm.

## CREAM SEPARATORS

Cream separators with electric motor drive are available in both floor and table models. Separators may be purchased with or without the electric motor. The hand powered separators that farmers have may be driven with a 1/4 hp electric motor by attaching the necessary parts furnished by the manufacturer.

## FAN (VENTILATION)

Ventilation fans are used in dairy barns to remove moist,

stale air from near the floor. Air intakes are designed so that air will be delivered upward against the ceiling without creating a draft. Fans may either by allowed to run constantly through the winter or be controlled by speed reducers or by thermostats.

Ventilation fans are generally driven by a 1/20 to 1/4 hp motor. The fan capacity should be about 60 cubic feet per minute per 1000 lb. cow, or six changes of air per hour, provided the barn houses its allotted number of cows. There should be about one intake for every four cows.

A well designed ventilation fan system will:

1. Provide a drier and a more healthful atmosphere for the cows.
2. Retard the decay of barn timbers and siding.
3. Save piping, paint, and wiring.
4. Provide more comfortable working conditions for the men.

## HEATER (MILK HOUSE)

In cold climates it is very desirable to have some form of heat in milk houses in order to keep the utensils above the frost point. A temperature of about 40 degrees F. is considered sufficient by some authorities.

The milk house may be heated by the following types of electrical heaters;

1. Plug-in radiant heater or fan type.
2. Heat lamp type.
3. Electric hot water radiator.

The portable electric plug-in type is most popular for small milk houses that are occupied for two or three hours each day. Several heat lamps may be mounted above the washing trays in order to keep the hands warm while washing utensils. The electric hot water radiator with circulating fan has been used with success. Hot water from the dairy hot water heater may be circulated through the radiator. The power company rural service advisor should be consulted before attempting an installation of this type.

Tests are presently being carried out to investigate the possibilities of heating the milk house by using the milk cooler refrigeration plant as a heat pump.

## HOIST (MILK CAN)

A vacuum operated hoist to be attached to the milker vacuum line is now being produced by a manufacturer of milking machines. Full milk cans may be lifted from milk coolers to a truck or a loading stand by the vacuum hoist. This hoist operates from the vacuum on the milker, and the rate of raising a can is controlled by a lever which controls the amount of pressure in the vacuum chamber of the hoist.

Electric power hoists are available which can be mounted on overhead tracks for removing full milk cans from the cooler to the truck or loading platform.

## ICE CREAM FREEZER

Ice cream freezers are being manufactured with a built-in motor mounted above the agitating mechanism. Most hand operated freezers may be driven with an electric motor by mounting a pulley on the shaft of the freezer, securing the freezer to a solid base, and connecting the electric motor to the freezer pulley with a "V" belt. The speed reduction may be obtained by using a large home-built plywood pulley.

## LIGHTS
### in the Dairy

The majority of dairies may be satisfactorily lighted with ordinary incandescent bulbs installed in reflectors. The average dairy barn is very poorly lighted. In most barns it is almost impossible to see if the cow's udder is clean. The operator usually milks in his own shadow. This condition can be improved by proper design of the lighting system.

There is some controversy over the effects of ultra-violet light in the dairy. Some authorities report favorable

results and others report no change. In the Coverall issue of "Electricity on the Farm", August - September, 1948, the following information appeared about ultra-violet light.

> Ultra-violet light with a wave length of 2537 Angstrom units has the greatest killing power. Germicidal and bactericidal lamps and sterilamps have demonstrated conclusively their ability to kill bacteria and molds in the air and on surfaces hit by the rays. The rays do not penetrate beneath the surface. At present the most effective use of the rays is in killing germs in the air and in providing a screen of rays which germs cannot pass alive. Germicidal rays produce painful but not permanent eye irritation in humans and animals. The rays should be shielded so that they will not enter the eyes directly.

## MILK COOLER

Milk coolers are available in the following types:

1. Coolers in which cans are immersed in mechanically cooled still or agitated water.
2. Coolers in which refrigerated water is sprayed over the cans.
3. Surface coolers in which milk passes over the cooler through which brine, refrigerated water, or a refrigerant is pumped.
4. The dry type of refrigerated compartment in which cans of milk are stored.

Desirable milk cooler specifications are:

1. Proper cooling of bacteria-laden top milk to below

50 degrees F. in two hours or less.

2. Ample water with agitation or ice capacity for quick cooling to below 50 degrees F. in two hours or less.
3. Storage capacity for both night and morning milk.
4. Unobstructed walls for cleaning and sanitation.

The wet, or immersion, coolers are made in sizes of from 1 to 16 cans, and the compressors vary from 1/4 to 2 hp. There are more immersion type coolers in use today than any other type. The agitation immersion cooler cools milk faster than the cooler in which the water remains still. Many farmers have installed agitators in their old coolers in order to circulate the water so that the cooling time will be reduced.

The spray cooler is being manufactured by one company. The milk is cooled by spraying refrigerated water over the cans in a front opening cabinet. The surface cooler is used mostly in dairies selling bottled milk. It is not generally recommended for the average dairy because it is difficult to keep clean and it is easy for the milk to become contaminated with foreign material while exposed to the air.

The electric milk cooler is one of the best paying investments on the farm because it cools milk quickly and holds it at a safe temperature (below 50° F.) until time to be sent to the milk plant. This enables the farmer to deliver a high quality milk with possible premiums.

## MILK REFRIGERATORS

Very few milk refrigerators are used on farms for cooling market milk. This is due to the fact that it takes a longer period of time to lower the temperature of milk in an air refrigerator than it does in the water immersion type of milk cooler. Walk-in refrigerators are used mainly for holding milk in dairies for short periods prior to pasteurisation or after pasteurization, and in retail dairy installations.

## MILKING MACHINES

Milking machines are available in two types - pipe line units and portable units.

The pipe-line milker consists of a milking unit and a vacuum pump connected to a permanently installed distribution piping system. A vacuum outlet is provided at each cow. As the milker is moved from cow to cow, a new outlet is used.

The portable milker consists of a vacuum pump and a milking machine made portable. A 120 volt outlet is necessary for each cow in order to provide power for the portable unit. A long cord makes few outlets necessary, but it is inconvenient and becomes soiled easily.

1. There are two types of pipe line milkers.

a. In the first type, milk is drawn into a single or double unit milking pail.

b. Milk Parlor type. The milk passes from the cow into a receiver, then through a pipe directly into the milk house.

2. There are two types of portable units.

a. One type has the pump, motor, and pulsator on top of the pail.

b. On the other portable milker, the motor and pump are on a cart that can be wheeled from one cow to another and plugged into 110 volt outlets.

The advantages of milkers are:

1. Savings of labor. They reduce the time of milking more than 50 percent.
2. Make it possible to increase size of herd with less labor costs.
3. Cleaner milk.
4. Eliminate difficulty of getting satisfactory hand milkers.

## PASTEURIZER (HOME)

Small electric home milk pasteurizers with a capacity of 1 to 2 gallons are now being manufactured. One type of unit pasteurizes milk in quart jars and the second type pasteurizes milk in 1 or 2 gallon cans. The milk is suspended in a water bath which is heated with thermostatically controlled

electric heating elements. The advantage of this is cleaner and safer milk since disease-producing bacteria which cause tuberculosis, typhoid fever, diphtheria, scarlet fever, septic sore throat, undulant fever and various intestinal disturbances, especially among children, are destroyed.

## STEAM CLEANER

The steam cleaner is now available for use in cleaning milk houses, milking parlors, and poultry houses. This cleaner is a steam vapor cleaning machine that produces a driving spray of saturated solution at effective temperatures and pressures to clean and sterilize. The specifications of one steam cleaner on the market are as follows:

Operating requirements: 75 gallon per hour water supply with 110 volt, 50 to 60 cycle single phase power supply, for pressure sprayer 1/4 hp motor.

Fuel: water is heated with fuel oil burner, 6 gallon tank capacity.

Solution tank: sufficient chemical solution to add to the water for 4 hours of operation.

Thermostatically controlled.

Operating pressure: 60 to 90 pounds.

## STERILIZER

The sterilizer is used to improve milk quality by eliminating most of the bacteria on the utensils. After thorough washing and rinsing in 180 degree F. water, the utensil is ready for sterilization.

## WATER HEATER

There are three major types of electric water heaters for use in the dairy: the pressure heater, the pour-in or no pressure type, and the immersion type heater.

1. The pressure type is the most popular. It is built much like the household hot water heater and is connected to the pressure water system. Dairymen have found that a 50 gallon to 100 gallon size off-peak heater insures that plenty of hot water will always be available. If a continuous current heater is installed, a 30 to 50 gallon tank will generally suffice.
2. The pour-in heater, or no pressure heater, is used where a pressure water system is not available. In order to get a bucket of water out of this heater, a bucket of cold water must be poured in at the top. The cold water is baffled at the bottom of the tank and it rises to the top when heated or

when another bucket of cold water is poured in. This type is usually built in 10, 20, and 30 gallon sizes.

3. The immersion type water heater is built in two types:

   a. The heating element is mounted on the wall. When a 3 gallon bucket of water is hung over the frame of the heater, a switch is turned on which turns on the heater. When the water is hot, the pail is removed and the switch is automatically turned off.

   b. The small hand-size 500 to 1500 watt heater may be immersed in a bucket or milk can. These units should be underwriters approved before buying.

# CROP PROCESSING EQUIPMENT

## Section 3

## Section 3

## Electrically Operated Crop Processing Equipment


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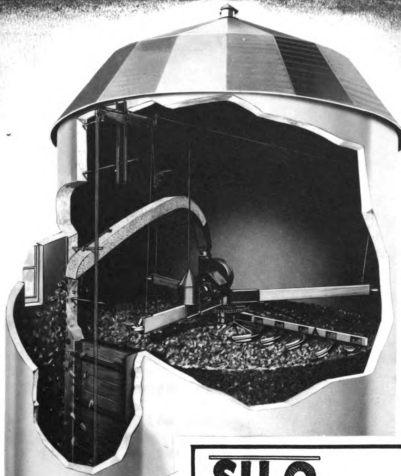
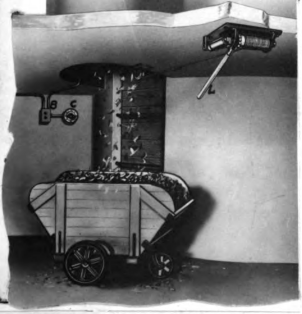


# SILO Unloader



The silo unloader will deliver silage from the top of a silo to a feed cart by merely pressing a button. The unloader is supported by cables as shown above. The rotating collector arm (A) delivers dry, wet, or frozen silage to the center where it is picked up and blown into the silo chute. The blower and scraper arm is operated by a 3 H. P. motor. The unloader is operated from the barn floor by switches (B) and (C), using lever (L) to lower the scraper mechanism as silage is removed. Occasional trips must be made into the silo in order to lower the delivery pipe. This labor-savor may be moved from silo to silo. Picture courtesy of Leach & Co., Oshkosh, Wisconsin.

Illustration No. 3
Showing a page from the Crop Processing Section

## CORN

### Corn and Cob Crusher

An ear corn crusher designed for electric drive is now on the market. The crusher has a capacity of about 400 pounds per hour and is driven by a 1 hp motor. The corn is completely shelled from the cob and the cob crushed to pieces. Very little of the corn is cracked. This machine may be used for shelling or making a cob orhusk litter. The shelled corn, crushed cobs, and litter are separated by a separating device.

It is possible to use the corn and cob crusher in conjunction with a small hammer mill. In this way the farmer could grind "ear" corn with small electrical equipment.

### Corn Cracker

The corn cracker is a feed mill designed to crack or crush corn into large pieces. When corn is cracked, better digestion results, and less undigested feed will pass through the animal.

### Corn Drier

Corn has been dried successfully by forced ventilation in slatted bottom bins and in cribs equipped with slatted

air ducts.

The forced ventilation is accomplished with motor-driven fans of the propeller and centrifugal type. If the outside temperature gets below 60 degrees F. and the relative humidity above 65 %, the use of supplemental heat is the surest and safest way of drying corn.

## Corn Grader

The corn grader is a machine consisting of a series of rotating or vibrating screens. Shelled corn is placed in the grader and the kernels fall through the different sized screens into separate compartments or sacks.

## Corn Husker and Sheller

Corn huskers and shellers are generally powered by tractors. Some special installations may use electric motors for power, 10 to 20 hp. This type of installation is limited to areas where 3 phase service is available. Corn with thehusk on is fed into the machine; the corn is husked, shelled, and cleaned. The cobs, husks, and shelled corn are all separated.

## Corn Shellers

The corn shellers for electric drive are of three types: the plate one and two hole hand shellers, the cylinder shellers, and the corn and cob crushers.

The hand type corn shellers may be driven with a 1/4 to 1/2 hp motor by converting the fly wheel to a V-pulley, or by placing a commercial V-pulley on the shaft of the sheller. Care must be taken in selecting a pulley because the converted sheller should be turned at the same speed as the hand sheller.

Cylinder shellers require from 3 to 5 hp. This type of sheller may be made semi-automatic due to the fact that ear corn may be fed from a hopper. See "Corn and Cob Crusher" for a description of this type sheller.

The corn sheller may be included in a feed grinding installation. It takes less power to shell and grind than to grind ear corn alone.

## DEHYDRATORS

The dehydrator came into some use during World War II. A number of farmers built their own by placing the fruit and vegetables on trays in a wooden cabinet and blowing electrically heated air over the product. Two companies are still manufacturing dehydrators for the farm and home.

The dehydrator was never very popular with farmers. The farm freezer is being used today to process a large amount of food on the farm.

## ELEVATOR

### Auger Type for Elevating Grain

A quick and simple method of loading and unloading small grain from bins or trucks is the auger type elevator. The auger extension pipe is placed in the grain that is to be elevated. Then the rotating action of the auger picks up and elevates the grain to the truck, wagon, or bins. This type elevator is available in different lengths.

### Blower Elevator

### For Grain, Chopped Hay and Ensilage

Blowers for elevating and conveying hay and grain are now available. The blower may be equipped with an auger feed arrangement so that grain or chopped hay, dumped from a wagon or truck, may be conveyed to the blower. Then the hay is blown into the mow or the grain into bins.

The hay blowers that are being manufactured have capacities of 2 to 5 tons of long dry hay per hour, or 10 to 20 tons of chopped hay. They require 10 to 20 hp for successful operation. Small 5 hp blowers are available

for elevating grain.

The blower type elevator is not so efficient for elevating grain as the cup type elevator.

## Freight Elevator

A few ingenious farmers have built freight elevators using a hoist winch, electric motor, and controllers. A factory-built elevator would be safer. The freight elevator would probably only be practical on big farms where large quantities of feed, seed, and equipment are moved from one story to another. A safe, economical farm freight elevator is badly needed - especially for 3 or 4 story poultry houses.

## Mechanical Cup Type Elevator for Grain

The cup-type elevator may be used to elevate grain in granaries, and to elevate ground grain in connection with feed grinding installations. Cup-type elevators are easy to install and require 1/4 to 1 hp motors. Equipment of various sizes and types is available.

## Pneumatic Elevator

The pneumatic elevator is generally used for elevating grain in large granaries and in large or small elevators.

Electric motors are used to turn blowers which create a vacuum in the elevating pipe. When unloading a truck load of grain, one end of a portable, flexible elevator pipe is submerged in the grain, and the suction created by the vacuum in the pipe causes the grain to be drawn up into the granary or elevator.

Portable Elevator for Baled Hay, Grain, and Ear Corn

The portable type elevator may be used on the farm for elevating ear corn, baled hay and straw, grain, potatoes, sacked feed and fertilizer, and other materials. Some portable elevators are made only to elevate small grain and ear corn, and others are made to elevate baled hay and sacked material. Many hours of back-breaking drudgery may be eliminated by using the electrically-operated elevator.

This type of conveyor is generally powered by a 1/4 to 1/2 hp electric motor. The majority of portable elevators are mounted on two rubber tired wheels so thay they may be towed by the farm tractor. The elevator can be raised to a maximum angle of 60 to 70 degrees, and in most cases, the elevating section may be lowered to a horizontal position.

## ENSILAGE CUTTER & SILO FILLER

The ensilage cutter and silo filler of the blower type are generally built into one unit. This type of machine may be used to chop green hay, corn, soybeans, and other forage crops that are used in making silage. The built-in blower generally has enough capacity to raise the chopped silage to the height of a standard silo. When operated by motors of 5 to 7 1/2 hp, it is imperative that the cutter knives be sharp, properly set, and operated at the optimum speed.

## FANS & BLOWERS

### for Drying Hay, Corn, and Other Crops

Characteristics of all fans and blowers:

1. The capacity varies with the speed.
   The capacity at any given speed decreases as the resistance or static pressure increases.
2. The static pressure against which the fan or blower can operate increases with the square of the rpm.
3. The power required to operate a fan or blower increases with the rpm cubed.
4. The noise level increases with an increase in speed.

1. Propeller type fan.
   a. Has a nearly constant load for any given speed. The load does increase slightly as the static pressure increases.
   b. Can be mounted in a relatively small space.
   c. Has a relatively high noise level.
   d. Has very satisfactory performance.
2. Centrifugal Blower
   a. With Backward Curved Blades.
      (1) Has a constant load for any given speed.
      (2) Is relatively large is size, heavy, and high in price.
      (3) Is relatively quiet.
      (4) Very satisfactory performance.
   b. With Forward Curved Blades.
      (1) Load varies inversely as the static pressure.
      (2) Is lighter in weight, cheaper, and runs at a slower speed than the centrifugal blower with backward curved blades.
      (3) Is reasonably quiet in operation.
      (4) In order to be satisfactory for drying hay where the static pressure varies, the discharge of air must be regulated by
         (a) a damper in the discharge.
         (b) the speed of the blower adjusted to the desired load.

## FEED GRINDER

### Burr Mill Type

The burr mill feed grinder can crack corn and other grain, or grind very fine. Grinding is accomplished by feeding grain into an opening between two burred grinding plates. One of the grinding plates is fixed and the other plate is turned by an electric motor of from 1/4 hp up.

The burr mill requires more maintenance than the hammer mill, because the burrs wear fast and often become broken. Burr replacements will increase the cost of grinding.

The burr mill may be adapted to semi-automatic grinding, but is more subject to clogging and breakage than the hammer mill. It is also more efficient for coarse grinding than the hammer mill because of a more uniform product. There is always some fine material produced with the hammer mill.

### Hammermill

The hammermill is the most popular type of electrically operated feed grinder. Grain is pulverized by the impact of hammers rotating at high speeds. They will crack corn or grind flour, Hammermills are available in 1, 2, 3, 5, and 7 1/2 hp sizes. Larger sizes may be obtained for special installations.

Most of the mills have blowers which elevate the ground material to overhead bins. Some of the blowers may be used for elevating without grinding. It is possible to grind three or four grains at one time for a mixed feed.

A one hp electric grinder has sufficient capacity to grind feed for 50 or more cows. It will do this at low costs if the installation is made semi-automatic by feeding the grain to the grinder hopper from overhead bins. This requires little labor.

## Roller Mill

One horespower roller mill feed grinders are now available for rolling grain. Some farmers prefer the roller mill to the hammer mill because the hammer mill grinds some of the grain into wasteful dust. The rollers can be adjusted for any grain size with practically no dust.

## FEED MIXER

Feed mixers of the vertical screw conveyor type are the most common. They are made in capacities of up to 4000 pounds and are operated by motors of 1/2 to 7 1/2 hp. Ground feed, salt, and concentrates are generally fed to

the mixer through an opening at the bottom of the mixer. A batch of feed can be mixed in 10 to 15 minutes.

Homemade mixers have been built from rectangular wood boxes or from 50 gallon oil drums with shafts placed through the heads of the drums. They should be turned from 5 to 20 rpm. These mixers do an excellent job of mixing in a matter of 2 or 3 minutes, but are not easily adapted to automatic emptying.

## MILL

### For Flour and Meal

Some farmers grind their own wheat because they like whole wheat flour. Others grind corn into corn meal and crack wheat for cereal. The hammermill may be used on the farm to grind flour and meal; however, experience has shown that it is almost as economical and less trouble to exchange wheat and corn for flour and meal at the commercial mill.

## HAY HOIST

Hay hoists for electric operation are available in the single and double drum types and require from 1 to 5 hp for driving power. In order to be practical, the electric hay hoist should be installed so that it will save man labor,

horse labor, or tractor power at haying time.

The single driven type with the weighted pullback can be arranged so that it can be operated with ropes by the man on the load.

## HULLER

### Grain and Seed

The grain and seed huller may be used for cleaning and hulling alfalfa and clover seed, peas and beans, oats, and other grain.

Some of this equipment is custom built. Farmers who grow alfalfa, clover, peas, beans, and oats for seed, will find that a higher grade of seed will be obtained by processing with the huller.

## MOLASSES HEATER

The molasses heater is used to heat black-strap molasses when mixing feed. Some farmers mix molasses with roughage and silage. In cold weather it is especially desirable to have the molasses heated and mixed with water so that it may be mixed with the roughage easily.

## SEED CLEANERS AND GRADERS OR FANNING MILLS

The fanning mill or seed and grain cleaner cleans and grades small grains, soy beans, clover, and other farm seed. Grain and seed are generally separated into three divisions:

1. Large seed for planting.
2. Second grade containing halves and small seed.
3. Dirt, chaff, weed seed, and small pieces.

In a well designed farm granary, grain may be cleaned as it is combined, thereby eliminating foreign material which may cause spoilage.

A 1/4 hp motor will operate the usual farm-type cleaner and replace the man used to turn the cleaner by the old method.

## SEED DRIERS

Seed driers generally consist of a source of heat and a blower (fan) that forces hot air through the material being dried. The blower and heater are made portable by mounting them on a trailer. Heat is obtained from an oil or gas burner, and the blower is generally powered with an electric motor, 3 to 10 hp.

## SEED DUSTER AND TREATER

Most seed treating machines fall into three broad classes: rotary cylinder, gravity, and spiral conveyor. The rotary cylinder and the spiral conveyor are operated with electric motors.

The rotary treater is recommended for applying non-volatile disinfectants to seed. It may also be used in application of volatile powders. Powder and seed are placed in correct proportion inside a drum mounted on an axle. The drum is rotated with an electric motor until the seed is well coated with the powder.

In the spiral conveyor treater, the seed and dust are mixed together by means of a rotating spiral conveyor or by a series of small paddles mounted on a revolving shaft. As the seed is treated it is also carried forward to the sacking end of the machine.

## SEED GERMINATOR

The seed germinator is a device similar to an electric oven with automatic heat control. The equipment is used for testing seed corn, beans, wheat, and other seed, to determine the number of seed that will germinate in a given sample.

## SILO UNLOADER

See Illustration 3.

## WAGON UNLOADER

Many farmers build their own wagon unloaders by constructing the entire unit or by buying the unloading unit and adapting it to a particular wagon or truck bed. Home built units may consist of a canvas, spread out the length of the wagon or truck bed, and attached to a cylindrical roller driven by a motor and a spped reducing mechanism. As the canvas is rolled on the cylinder, the product to be unloaded is moved toward the end of the bed.

Two companies are now manufacturing a 1/3 to 1/2 hp motor driven conveyor that can be installed in the bottom of wagon or truck beds. These conveyors will transfer chopped hay, silage or grain to the hopper of an elevator.

# FARM SHOP EQUIPMENT

## Section 4

## Section 4

## Electrically Operated Farm Shop Equipment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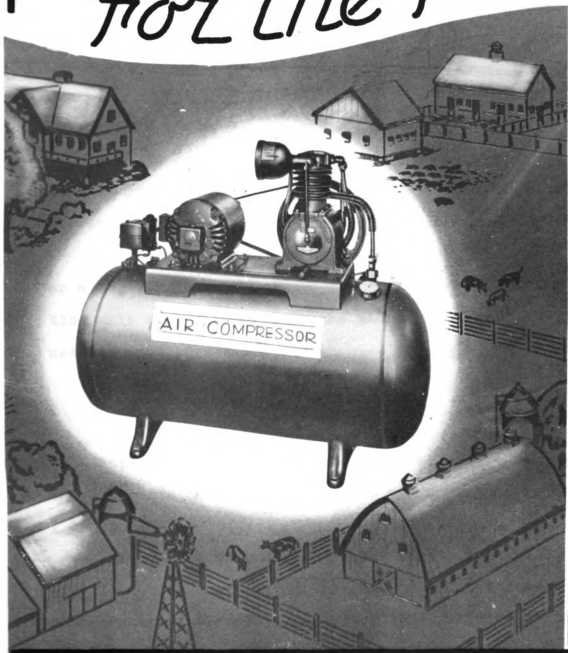
# AIR COMPRESSOR for the farm





TIRE INFLATION


LUBRICATION


PAINT SPRAYING


INSECTICIDE SPRAYING


CLEANING EQUIPMENT


AIR TOOLS

As shown above, compressed air can be used for inflating tires, lubricating equipment, paint and insecticide spraying, cleaning equipment, and operating air tools. Portable or stationary types are available with or without storage tanks. All air compressors should be equipped with safety valves, and those with tanks should have pressure gauges. It is desirable to have a pressure controlled switch to turn on and off the ½ hp electric motor which operates the compressor.

Picture of compressor, courtsey of American Brake Shoe Company.

Illustration 4

Showing a page from the farm shop section.

## AIR COMPRESSOR

The air compressor is used to compress air for inflating tires on cars, trucks, tractors, and other farm machines; for paint and insecticide spraying; and for cleaning farm equipment.

Farm air compressors are generally operated by 1/4 and 1/3 hp electric motors. Some small compressors may not require a pressure tank, but in most cases a pressure switch for starting and stopping the motor are desirable.

The compressor may be stationary or mounted on wheels or a truck for use about the farmstead. The power consumption will vary depending on the amount of compressed air used. See Illustration 4.

## BATTERY CHARGER

Battery chargers are used to charge car, truck, tractor, and other storage batteries (up to a hydrometer reading of 1.250 to 1.275).

Battery chargers may be of the vacuum tube rectifier type for quick charging, motor generator set for medium charging, or of the plate converter type for slow trickle charging.

The motor generator set may be constructed in the farm shop by using a 1/4 hp electric motor to drive a car generator

with a V-belt. An ammeter should be connected in series with the car generator in order to determine the rate of charging. If turned at normal speed, the ordinary car generator will generate current at the rate of fifteen amperes.

The rate of charge for the other two types of chargers may be obtained from the manufacturers.

## CONCRETE

### Mixer

The small electric motor-driven mixer may be used to mix mortar, fertilizer, and feed, and for seed treatment, as well as to mix concrete.

Farm concrete mixers are usually of the three cubic foot (1 sack) size. Most of these mixers can be driven with a 1/4 hp motor.

### Vibrator

The concrete vibrator is electrically-driven and is especially useful in concrete form work. After the freshly mixed concrete is poured into forms, the vibrator is moved about in the concrete. The rapid vibrations of the vibrator cause the concrete to settle into all parts of the form, and at the same time cause some of the fine particles of sand to work toward the edge of the form. This results in

a smoother finish on the outside of the concrete when the forms are removed.

## DRILL

### Portable

Portable electric drills are generally driven by universal motors and are of two types: low speed and high speed. These drills will operate on 110 volt ac or dc current. The high speed drills are built to take drill bits up to 3/8 inch in diameter. Drill bits from 3/8 inch to 1 inch may be used in the various slow speed portable drills.

### Drill Press

Drill presses may be obtained in the bench, floor, and wall or post types. Drill presses are rated according to the maximum size drill that the drill chuck will hold. These drills are generally driven with a 1/4 hp electric motor.

Hand operated post drills may be adapted to driving with a 1/4 hp electric motor by attaching a V-pulley to the flywheel.

## FAN

### Cooling and Exhaust

During the hot summer days when the temperature in the farm shop may be as high as 90 to 105 degrees F., a cooling or an exhaust fan will keep the shop cooled down to a comfortable working temperature.

An exhaust fan or blower could be installed in the wall or window near the forge in order to take out some of the forge gases and at the same time cool the shop.

A cooling fan could be placed on the working bench or above the working area.

## FORGE

The electric blower coal forge enables the farmer to keep a hot fire when he is heating metals for blacksmith work. The electric blower eliminates the old type of crank blower.

## GLUE POTS

Electrically heated glue pots, in which glue is maintained at a working temperature, are available. Hot glue is used to secure large pieces of wood, to repair furniture, and to construct other equipment on the farm.

## GRINDERS

### Emery Wheel

Emery wheel grinders may be obtained in the bench, the floor mount, or the portable type.

The bench grinder is the most commonly used grinder, and is generally driven by a 1/4 hp electric motor.

The floor-stand mounted type of grinder is the heavy duty 1/2 to 1 hp type of grinder, and is used for plow sharpening, grinding welded parts, machinery repair, and for wire brushing.

The portable electric grinder with flexible shaft is generally driven by a small universal electric motor. Various sizes and shapes of grinding tools may be used with the portable grinder to sharpen mower knife sections without removing the cutter-bar from the machine, to clean machinery for painting, and to do grinding operations on large farm machinery in places where the bench or floor-mounted grinder could not be used.

The surface speed of emery wheels should be 4000 to 6000 ft. per minute. At 4600 ft. per minute, a 4 inch wheel should turn about 4400 rpm, a 5 inch wheel about 3500 rpm, a 8 inch wheel about 2200 rpm, and a 10 inch wheel about 1750 rpm.

## GRINDSTONES

Grindstones driven by 1/4 hp electric motors are available. The old hand crank type of grindstone is easily converted to a motor driven unit by attaching a V-pulley of the correct diameter to the shaft of the grindstone.

The diameter of the V-pulley should be such that the surface speed of the wheel will be about 400 feet per minute. Grindstones of 12 to 24 inches diameter should be run at about 130 to 65 rpm.

## HAMMER

The electric hammer is a portable hand machine similar in shape to the portable electric drill. A small electric motor turns a mechanism in the hammer which causes the plunger or the hammer to vibrate very rapidly.

The electric hammer may be used to drive nails, spikes, and rivets, to drill holes in concrete and hard materials, and to chip masonry.

## HOIST

The electric hoist consists of a block and tackle geared to a push button stop and start electric motor.

This type of hoist could be used in the farm shop to

lift heavy objects such as the front or rear end of the tractor, or for lifting the motor out of the tractor.

## LATHES

There are two types of lathes that may be of great value in the farm shop where the farmer has special mechanical ability.

The bench or floor type metal lathe may be used to machine and repair parts of farm tools and machinery.

The bench type wood lathe is generally used on the farm to make tool handles, repair furniture, and to turn down wooden parts for farm machinery.

## LIGHTS

### Trouble

The trouble light is nothing more than an ordinary light bulb placed in a protective socket at the end of a special rubber-covered extension cord.

This type of light is very useful in the farm shop when work is being done on the tractor, combine, and other machinery when the ordinary ceiling lights will not give enough light for working inside the machine.

## MOTOR

The electric motor is one of the most valuable pieces of electrical equipment on the farm. The four major types of ac motors that are being manufactured today for farm use are the repulsion-induction, the capacitor, the split phase, and the universal type. Some manufacturers have stopped manufacturing repulsion-induction motors below 1 hp. The capacitor motor costs less per hp than the repulsion-induction motor, and is suitable for turning most farm equipment up to 10 hp.

Listed below is the type of motor that is recommended for some farm shop equipment:

| | |
|---|---|
| Air Compressor | Capacitor or Rep.-Ind. |
| Battery Charger | Capacitor |
| Concrete Mixer | Capacitor |
| Drill (Press) | Capacitor |
| Drill (Portable) | Universal |
| Fan(Cooling) | Split Phase |
| Fan (Exhaust) | Split Phase of Capacitor |
| Forge | Split Phase |
| Grinder (Bench) | Capacitor |
| Grinder (Portable) | Universal |
| Hoist | Rep.-Ind. or Capacitor |
| Lathes | Capacitor |
| Planer | Rep.-Ind. |
| Sander | Capacitor |
| Saws | Capacitor |
| Shears | Universal |
| Sprayer | Capacitor or Rep.-Ind. |

## PLANER

The small electric planer consists of an electric motor driven tool mounted in a planing table. The planer may be used in the farm shop in the side-line industries such as making tool handles, brooders, bee hives, trap nests, and furniture.

## PUMP

### Grease

The automatic compressed air grease pump may be used in conjunction with the farm shop air compressor. When machinery is lubricated with the compressed air grease gun, the lubricating grease will be forced to all parts of the friction areas. Greasing by this method is better and quicker than by the hand grease gun method.

### Gasoline pump

The gasoline or fuel pump with underground storage tank should be near the farm shop. Pumps registering in gallons only, or indicating gallons and dollars and cents are available.

The electric indicating fuel pump enables the farmer to fill machinery fuel tanks rapidly and at the same time have a cumulative record of the amount of fuel used, both in dollars and gallons.

## SANDER

Sanders may be obtained in two styles. The bench type sander that uses the rotary belt principle may be used to dress lumber and to clean metal tools and parts of machinery.

Probably the most valuable sander is the portable electric type. This sander is similar to the portable electric drill, except that various sanding attachments are used to clean rusty farm machinery, remove old paint from machinery, and to polish and do other cleaning jobs.

## SAWS

There are five types of electrically operated saws which can be used in or about the farm shop. These are the band, circular, hack, jig, and the portable electric type.

### Band Saw

The band saw consists of a set of rotating pulleys over which an endless flexible saw blade is driven. This saw is used to saw irregular shapes of metal, wood, and plastics.

### Circular Saw

Three general types of motor-driven circular saws are available for farmers.

1. The circular cut-off saw for cutting fire wood,

logs, etc.

2. The circular rip saw used in the shop for ripping and sawing lumber.
3. The portable hand circular saw used in carpentry work.

## Hack Saw

The power hack saw is very useful in the farm shop. The electric motor is geared to an eccentric, which causes the saw blade to oscillate in a horizontal plane.

The power hack saw may be used to cut the softer common metals such as brass, copper, iron, aluminum, and mild steel. Tool steel should be cut with an emery cutter or an acetylene torch.

## Jig Saw

The jig saw and the circular saw are used for about the same purposes. The jig saw consists of an electric motor connected to an eccentric which causes the saw blade to oscillate in a vertical plane. The blades of the jig saw are generally shaped like the ordinary hand hack saw blade, but in most cases are smaller in size.

The jig saw may be used to saw irregular shapes of wood and metal.

## SHAPER

### Metal

The metal shaper is a planing machine which is used to plane metals and plastics down to desired dimensions.

This type of machine is too expensive for use in the average farm shop. The shaper could possible be used in a community or co-operative shop where a number of farmers have their repair work done on a cooperative basis, or where they do their own work.

## SHEARS

### Sheet Metal

Electric sheet metal shears are available, or an attachment that may be used in conjunction with a portable electric drill may be obtained for the purpose of cutting sheet metal.

The electric sheet metal shears consist of two vibrating cutting jaws geared to a small portable universal electric motor.

Sheet metal shears may be used for cutting metal sheets to make brooders, ventilators, and other sheet metal equipment.

## SOLDERING

### Iron

The electric soldering iron is used to solder electrical

wire, to repair utensils, and to repair other farm parts and equipment. The common name for equipment of this type is "soldering iron", but actually the tip end of the soldering equipment is made of copper. Copper conducts heat better than iron.

### Soldering Pot

The soldering pot is used to melt quantities of solder or babbit. A quantity of hot molten solder which is placed in a cup or ladle, is necessary when soldering over-head electrical wires. Joints and splices are soldered by dipping them into molten solder in the solder pot.

The soldering pot can also be used to melt babbit or lead that is to be used in plumbing operations or for repairing farm machinery.

## SPRAYER

### Paint

The paint sprayer may be used in conjunction with the farm shop air compressor, or a small portable electrical sprayer may be obtained with a built-in air compressor, to paint farm machinery, farm buildings, automobiles, and trucks, and to spray insecticides. See Illustration 4.

## VULCANIZER

The electric vulcanizer is a very valuable piece of equipment to have in the farm shop. It is used to repair tires for tractors, trucks, automobiles, and other farm machinery. The farmer can save meney by vulcanizing his own tires in the farm shop.

## WELDER

The electric arc welder is becoming very popular with farmers today. Arc welders for rural lines may be obtained in 300, 200, and 150 ampere secondary current sizes. The 150 ampere size may be used on a distribution system that has a transformer capacity of 3 KVA or more.

The arc welder is used to weld, cut, braze, heat, and solder most of the thicknesses of metals that will be used in the farm shop or on the farm.

The arc welder permits making many repairs and reinforcing machines without taking down the machine or removing broken parts. It has also been used to make many home-built labor saving machines.

The farm service advisor of the local power company or REA Co-op. should be consulted before buying an arc welder. He will be able to advise if there is enough transformer capacity on the line to take care of an arc welder.

# POULTRY EQUIPMENT

## Section 5

## Section 5

## Electrically Operated Poultry Equipment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# POULTRY HOUSE VENTILATION

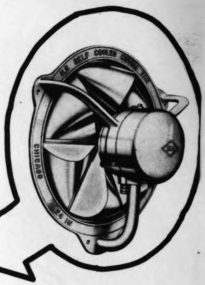
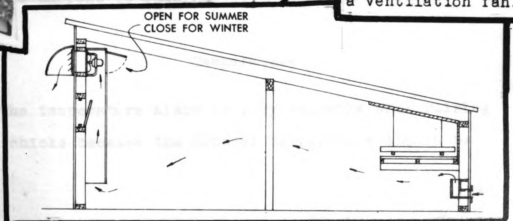


Illustration 5

A poultry house should be ventilated to remove the moist air as it is produced by the respiration of the birds in order to keep the litter and inside of the poultry house dry. With dry litter and house, fewer birds will be lost from disease and parasites. Dry air also prevents wood-rot and corrosion of metal. Air should enter the ventilation fan unit from near the floor and be discharged at the ceiling in order to prevent drafts. Refer to the drawing below for the correct location of a ventilation fan.



## ALARM

### Burglar

If the poultry house is located a great distance from the farm house, a burglar alarm system of the electric interruption type is good protection against thieves. These alarms can be set so, that when actuated, a bell will ring at the farm house and at the same time a flood light in the farm yard will be turned on automatically.

### Voltage or Current Interruption

The temperature alarm could probably serve to indicate voltage and current interruptions in brooders and incubators. However, if the alarm is connected so that it will ring as soon as the voltage is interrupted, then the operator will know immediately of the outage. If the temperature alarm were depended on to indicate voltage interruption, there would be a slight delay in the ringing of the signal, because the change in temperature would not be instantaneous.

The temperature alarm is especially valuable in the hatchery in order to indicate an increase in temperature when the current is interrupted and the fan stops.

### Temperature

The temperature alarm is very valuable when raising small chicks because the brooder temperature should be

maintained at about 95 degrees F. Experiments have shown that if the temperature falls below 95 degrees F. when the chicks are small, they are likely to have pneumonia and other diseases.

It is very desirable to have a temperature alarm device so that if the temperature falls below the ideal, the owner will be notified immediately. See (Brooders) for further information.

Temperature alarms may also be used in conjunction with incubators to indicate when the temperature is above or below normal.

## BROODERS

### Floor Type

There are dozens of kinds, styles, and sizes of the electric hover type brooder available. The floor type brooder is the most widely used by the average poultry raiser.

The important thing is to use properly the type of brooder you make or buy. Wiant and Davidson of Michigan State College suggest that a temperature of 95° F. is a good one at which to start chicks, but that many operators find it more satisfactory to be guided by the action of the chicks rather than by the brooder thermometer. If the temperature is too low, the chicks will "bunch up" and

refuse to come out; but if the chicks crowd near the curtain and refuse to go under the brooder, it is an indication that they are not comfortable under the brooder because of too high a temperature or insufficient ventilation.

Advantages of electric floor type brooder:

1. Automatic controls
2. Eliminates fuel problem.
3. Less fire hazard.
4. Better feathering of chicks.
5. More economical.
6. Keeps air fresh. Does not give off fumes.
7. It will not overheat the brooder house on warm days.
8. No chimney to put up or take down.
9. It makes cold room brooding practical.

Disadvantages of electric floor type brooder:

1. Litter more likely to become damp.
2. Possible loss of chicks in cold weather in case of power outage.

A good brooder should:

1. Be well insulated.
2. Provide from 7 to 10 sq. in. of space per chick.
3. Provide from 1 1/2 to 2 watts in heater capacity per chick.

## Types of Electric Brooders

1. The black heat or warm air brooder.

This type of brooder uses heating elements which consist of a fairly large quantity of low temperature heating wire

in coil form, or some type of heating unit such as the strip heater.

2. The radiant heat brooder.

The radiant heat brooder is heater with some form of lamp, generally of the reflector type. The radiant heat from the lamp heats the bodies of the chicks. The air temperature under this type of brooder will be less than under a black heat brooder of the same wattage. A thermometer will not give a true measure of the amount of heat the chicks actually receive.

## Ventilation of Brooders

1. Fan ventilated brooder.

A small fan, about three inches in diameter, is used to draw air down the brooder chimney and cause it to flow over the heating element. Then the air is forced out under the brooder curtain. Some brooders employ the fan to circulate the air under the brooder.

2. Gravity ventilation.

In the gravity ventilated electric brooder, the heated air rises through the chimney or ventilator, while fresh air enters under the brooder curtain.

## CAPONIZER SET

Electric caponizers are preferred by many poultry producers, because this instrument cauterizes the wound as the

testicles are removed.

## DEBEAKING EQUIPMENT

Poultrymen are using an electrical instrument to cut about 3/8 inch off the upper mandible of poultry in order to prevent birds from pecking each other (often referred to as cannabilism). It also helps to prevent waste of feed from feeders. Some poultrymen use this same instrument for clipping the wings of chicks. The operation of removing the beaks from poultry is safe because there is little bleeding due to the fact that the wound is cauterized as the beak is removed.

The Lyon Rural Electric Company pioneered in the development of debeaking equipment. The "Debeaker" is their trademark.

The Brower Manufacturing Company also has a debeaking instrument on the market called the "Debiller."

## EGG CANDLER

The egg candler consists of a viewing lens through which light shines from an enclosed incandescent bulb.

By placing an egg before the viewing lens one can tell if the egg is good or bad.

### Egg Cleaner

Electric motor driven egg cleaners are available in two styles:

1. The small buffer or abrasive wheel type connected to the shaft of a 1/8 or 1/4 hp motor. Each egg is cleaned and buffed separately.

2. The assembly line type where more than one egg is cleaned and buffed at the same time. Machines with capacities of up to 1500 eggs per hour may be obtained.

## Egg Cooler

The purpose of cooling eggs in hot weather is to remove the heat quickly and to hold the eggs at a temperature of about 55 degrees F. until marketed to avoid deterioration. If the eggs are cooled below 55 degrees F., they will probably sweat when removed from the cooler. This is objectionable.

Egg coolers may be either the evaporative type cooler with an air blast, or the electrically cooled refrigerator type. A number of farmers have constructed the blower type coolers. Galvanized egg pails with open screen bottoms are placed over holes in a special blower box. The fan which is placed inside the box draws the air through a wet excelsior pad and forces it up through the egg pails.

## Egg Grader

Motor driven egg grading machines separate eggs into different grades by weight. Some egg graders have built-in

candlers so that the grading and candling may be done in one operation.

These machines may be obtained in small sizes, or up to sizes that will grade twelve 30-dozen cases per hour.

### Egg Washer

Hot, clean water is flushed over each egg thereby lowering the possibility of bacteria spread. The egg washer may be used when extremely dirty eggs are encountered.

## ELECTROCUTOR

The electrocutor is an electrical shocking device used for killing poultry. The shock is reported to relax the muscles, thereby releasing the feathers so the birds are easier to pick.

## ELEVATOR

### Poultry Litter

One company manufacturers an elevator designed especially to remove poultry droppings and litter from the poultry house. Further information may be obtained on this equipment by writing the manufacturer listed in the directory.

## FEEDER (AUTOMATIC FOR CHICKS)

The automatic poultry feeder consists of a continuously operated motor driven endless belt that receives feed from a hopper. Chicks eat feed from the belt as it moves at a very slow speed.

## INCUBATORS

Electric incubators may be obtained from the snall size of 50 eggs up to mammoth sizes. Incubators with humidity controls and automatic turning devices make the incubation process almost entirely automatic. For better sanitation and more scientific control of hatching conditions, the eggs should be removed from the incubator and placed in an electric hatcher a few days before hatching time.

## LIGHTS
(In Poultry House)

There have been three types of electric lights used in the poultry house. These are the (1) Common incandescent light (2) Ultra-violet (3) Germicidal or sterilamps.

Many authorities believe that light produces a direct stimulation to the bird and that this causes an increase in egg production rather than the consumption of more feed in a longer day.

Artificial light is used to stimulate egg production, to bring pullets into laying faster, and to stimulate the

growth of chicks. The total hours of light should be 13 or 14. If the lights are used in the morning, no dimmer will be necessary. If used in the evening, some method of dimming the birds to the roost will be necessary.

A good poultry house lighting installation consists of 40 watt lamps in reflectors spaced about 10 ft. apart, 6 ft. high and half way between the front of the house and the front edge of the dropping boards.

The Nebraska and Michigan experiment stations have found that ultra-violet radiations from special lamps are equivalent to feeding Vitamin D in the form of Cod-Liver oil to the flock.

Bactericidal, germicidal, or sterilamps have been found to be effective in killing, and inhibiting, the growth of germs in the air and on surfaces. These lamps have a definite control on sanitation in the poultry house, but further investigations need to be carried out before complete recommendations can be made.

## PICKERS

The poultry picker consists of a number of flexible rubber fingers projecting from the outside of a motor driven drum.

The drum rotates at a speed of about 250 to 450 rpm causing the rubber fingers to rub the feathers off the scalded chicken.

Machines with 28 to 315 fingers and driven by 1/3 to 1 hp motors may be obtained. Electric pickers are used by practically all poultry dressing plants. The electric picker is practical for the farmer who sells dressed poultry.

## SCALDER

The electric scalder is valuable to anyone who dresses a number of chickens, ducks, or turkeys. A thermostatic control is set so that the temperature will be held at 128 - 130 degrees F. for scalding. This insures uniform scalding without injuring the skin.

The scalder consists of an insulated galvanized iron, steel, or copper tank, with a 1000 to 3000 watt thermostatically controlled heater in the bottom of the tank.

## SINGER

The electrical singer is a portable hand instrument consisting of a heated element. When the singer is waved over a dressed fowl, the pin feathers and hairs will be removed by singing.

## STEAM CLEANER

Steam cleaners consist of an oil or electric heater for changing water into steam.

See (Dairy) for a more complete description.

## THERMOSTATS & THERMOSTATIC WAFERS

Thermostats are used to regulate the temperature in brooders, incubators, food dehydrators, bee hives, hot beds, anti-pipe freezing installations, potato curing houses, etc.

The bi-metallic and the wafer are the two types of thermostats that are generally used on the farm.

The thermostat wafer consists of two contacts connected to a metal bellows. The bellows is generally filled with a fluid. As the temperature increases or decreases, the bellows will expand or contract, thus opening or closing the contacts.

The bi-metallic thermostat consists of two contacts. One is fixed to a metal base and the other to a metallic strip consisting of two dissimilar metals. As the temperature increases, the bi-metallic strip will bend away from the fixed contact and the contacts will open. When the temperature drops, the contacts will close.

## TIME SWITCHES AND DIMMING DEVICES

Electric time switches are available for controlling the lights in poultry houses. Time switches can be wired so that lights will be turned on or off, or dimmed automatically.

## WATER WARMER

Poultrymen are using electric water warmers to keep plenty of 50 degree F. water available for the flock. They have found that this prevents egg production from dropping because of a lack of drinking water in cold weather.

There are a number of types of water warmers that may be used:

1. The immersion heater (150 - 200 watts) with a thermostat.
2. Soil heating cable with a thermostat may be placed in long "V" watering troughs or wrapped around cylindrical waterers in order to keep the water from freezing.
3. A few water warmers have been made by placing a light bulb under an enclosed section beneath the water pans.

## WAXERS

The waxer may be used in place of the singer in the final cleaning of fowl. Wax is melted in a container surrounded by an electrically heated water bath. Picked birds are dipped in the melted wax, then immersed in cold water. When the solidified wax is "stripped off", the pin feathers and hairs come off with it.

# HORTICULTURE EQUIPMENT

## Section 6

## Section 6

## Electrically Operated Horticulture Equipment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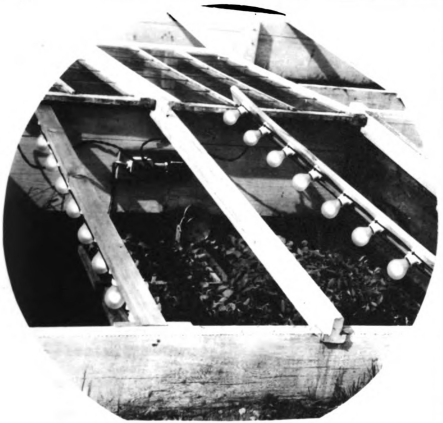
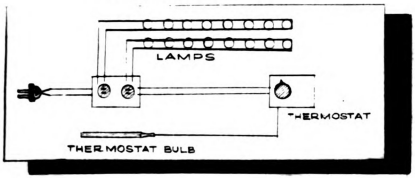
# ELECTRIC LAMP heated Hotbed






The electric lamp heated hotbed is easily constructed, economical to operate, and has proved to be one of the best method of supplying heat for producing early plants. The lamps are supported above the bed as shown in the picture. Reflectors may be used to direct the heat downward.

The schematic diagram shows how the lamps, thermostat, and thermostat bulb should be connected. The thermostat bulb is placed horizontally from one to two inches beneath the surface of the soil. As a result of the heat and light received from the lamps, plants may be ready for transplanting two to three weeks earlier than plants produced from the old method of manure heating. Electric lamps will protect the plants from freezing and frost.

Illustration 6

Showing a page from the horticulture section.

## BAGGING MACHINES

### Fruits and Vegetables

A bagging machine will enable the farmer to bag potatoes, apples, and other products, in bags of 5 to 100 pounds. Some machines are custom-built and include a grader, sorter, weigher, and tier. A commercial bagging machine will be economical only if the farmer has a large volume of products to be bagged. Possibly a home-built unit would be economical for a farmer with only a few hundred bushels to be bagged.

## CIDER MILL

Electrically operated cider mills are available. An electric motor is used to turn the apple grinder, which crushes the apples and opens the juice cells. The same motor operates the press which presses the pomace dry. Cider mills and presses may be used, not only for apples, but also for grapes and other fruits, for wines, jellies, and fruit juices.

## DRIER

Driers for use in drying potatoes, fruits, and vegetables after washing, are generally home-built. Custom units

may be purchased for a specific installation. The farm-built driers generally consist of a drying tunnel and a conveyor to carry the produce through the drier. Warm air from electric or oil heaters is blown through the drying tunnel by an electric fan.

## FROST PREVENTION

Some experimental work on frost prevention with electric heaters has been conducted by the Agricultural Engineering department at Michigan State College. This method can be made effective, but the cost is prohibitive over large areas. There has been some work done in California on preventing frost by suspending infra-red lamps in a reflector unit between fruit trees. A company by the name of Frost Lite Ltd., in Pasadena, California, owns the patents on the bulb type lights for frost prevention. By writing to Dr. F. A. Brooks, University of California Experiment Station, Davis, California, a full report may be obtained on infra-red lights for frost prevention.

## GRADERS

### Fruits and Vegetables

Electric motor-driven graders (1/4 to 1 hp) are used wherever potatoes, apples, and other farm products are prepared for marketing by size or grade. The grading is done

according to diameter or weight. In a processing plant the grader is generally combined with a conveyor and a washer, or with other cleaning equipment.

## HEDGE CLIPPER

The electric hedge clipper is a clipping device powered by an electric motor. Several different types are on the market; the oscillating and the saw type are the most common. The oscillating type is similar to the mowing machine and may have either one or two moving blades, and one stationary blade. The saw-type trimmer has an endless chain saw blade that is turned by an electric motor.

## PEACH DEFUZZER

The peach defuzzer is used on the fruit farm, in conjunction with grading and sorting, in order to remove some of the fuzz on peaches. Grade A and Fancy peaches have more color if some of the fuzz has been removed. An electric motor is used to turn the defuzzing or cleaning machine. The Food Machinery Corporation manufacturers a peach defuzzer.

## POLLINATOR

The pollinator is a portable battery-operated device. it is designed to create vibrations in order to agitate the

air near flowering plants so that pollen will fall from one flower to another.

## SOIL HEATING

### Cable and Lamps

There are two methods of heating hot beds with electricity: soil heating cable, and electric lamps. Authorities disagree on which is the best method to use.

(1) Soil is heated by burying a resistance cable made of insulated heating wire, covered with a lead or plastic sheath, three to four inches beneath the surface of hot beds. The temperature is controlled by a soil thermostat. Information: available in 60 foot sections, 400 watts, 115 volts. Covers 36 square feet, power consumption about 2 Kwh per day per 60 foot section. The soil heating hot bed can be constructed at home.

(2) The electric lamp hot bed is simple and is easily constructed at home. Small bulbs with reflectors beneath the sash are supported from 8 to 12 inches above the soil. See Illustration 6 for a picture and further details.

## SOIL STERILIZER

The soil sterilizer is used to destroy weed seed, insects, spores, and soil organisms that are harmful to the

growth of plants. Two designs are available. One consists of a metal box, holding 1/2 cu. yd. of soil, with electric heating elements distributed through the center of the box. The second design consists of a 1/4 cu. yd. flat metal box with sections divided by metal plates. Voltage is applied to these plates which causes current to flow through the soil. The current flowing through the resistance of the soil causes the soil to heat, thus sterilizing the soil. Energy consumption is about 1.25 Kwh per cu. ft. of soil sterilized, with an average wattage of about 3 Kw per one-half cu. yd.

## SPRAYERS

Most electric motor-driven sprayers(portable) are designed for use in the green house or in other places where electrical outlets are available; few are used in orchards. The electric motor drives a pump which places the spray solution under pressure in the spray storage tank. The spray solution is released through a nozzle at the end of a spray hose.

Electric motors are used to operate stationary spray pumps that are mounted on a firm base at some central location in the orchard. The spray solution is carried to the points of distribution through underground pipes.

## TIER

There are two types of tiers available: the bag tier and the vegetable tier.

(1) The bag tier is used on the farm to tie bags of vegetables of 5 to 100 pounds. A tier is a good investment if produce is sacked for sale in large volumes on the farm.

(2) Vegetable tiers are available for typing bundles of carrots, rhubarb, celery, and other vegetables.

## WASHER

### Fruits & Vegetables

The Federal Government prescribes the limits of the amount of poison that is allowed on saleable fruits and vegetables, which makes washing equipment mandatory. Washers generally consist of a mechanical agitator and brushing device that cleans the fruit in a solution of warm water. Washers may be constructed on the farm by using power from an electric motor for agitation and brushing, and electric heaters to heat the cleaning water. Commercial washers are available,

# LIVESTOCK EQUIPMENT

## Section 7

# Electrically Operated Livestock Equipment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# STOCK-TANK DE-ICER

De-icer

The de-icer keeps a drinking hole in the ice that forms in stock tanks during freezing weather. It consists of a 110-volt a.c.,300 watt thermostatically controlled heating element mounted in a water proof float. Livestock simply nose the float down or to the side in order to drink. Power consumption is low because power is not wasted by trying to keep the whole tank of water warm or the entire surface free of ice.

The de-icer is easy to install. It may be placed in any size or shape tank and plugged into a 110 - volt outlet. The outlet may be mounted on the side of the tank and current supplied by overhead or underground wires. (Picture courtesy of General Electric Company.)

Illustration 7

Showing a page from the Livestock Section

## ANIMAL PRODS

The electric prod consists of a battery-operated vibrating mechanism which generates a voltage sufficiently strong to shock a bull, cow, or other livestock. Small dry cells are mounted at the end of the prod, which is about the length of an ordinary walking cane. The shock or sting will not harm animals and has proved valuable in controlling unruly livestock.

## BRANDING IRONS

Electric brainding irons are similar to soldering irons, except that the heated element is generally shaped to conform with some special markings which the farmer desires to have branded on his livestock.

## BROODERS

### Lamb and Pig

Lamb brooders are generally constructed on the farm, and are usually made be mounting a 150 watt bulb with reflector in a large wooden box, or in an enclosed corner in a building. Heat from the lamp bulb keeps the brooder warm, and prevents new born lambs from chilling.

Pig brooders are manufactured by several companies. The commercial brooders are similar to poultry brooders.

Successful pig brooders may be constructed on the farm by enclosing a corner of a farrowing pen and mounting a 100 to 150 watt lamp in a reflector so that it can be raised or lowered in order to vary the heat intensity. The heat from the lamp keeps the pigs warm and dry. Tests at Purdue University show that by using pig brooders an average of 30 percent more pigs were living at weaning time. The operating cost of a pig brooder is very low.

## BULL EXERCISER

Two companies are listed as manufacturers of bull exercisers. In a cold climate where bulls are kept indoors practically all winter, in order to maintain a high level of vigor it is essential that the animals receive exercise at regular intervals.

The bull exerciser is similar to a merry-go-round. The bull is hitched to a radial lever arm that is fastened to an upright rotating shaft, geared to an electric motor. The animals follow the lever around in a circle.

## ANIMAL CLIPPERS

Farmers who wish to keep their livestock well groomed will find that the electric animal clipper is invaluable. Animal clippers are generally powered by a small universal electric motor and consume little power.

## ELECTRIC FENCE

The electric fence needs no introduction to most farmers, but considerable education is needed to prevent use of unsafe types of fence controllers. For safety reasons a farmer should never attempt to build his own electric fence.

A number of different styles and designs are available. Some farmers prefer the 110 volt ac electric fence controller, and others prefer the 6 volt storage battery type. The battery type is portable and may be used in the "back 40" for hogging off corn, etc. The 110 volt ac controller requires less attention and is considered safe if approved by the Underwriters Laboratory. The battery controller can be equipped with a trickle charger which will keep the storage battery charged and insure that voltage will be regularly applied to the fence.

## LAMB DOCKER

The electric lamb docker operates on the same principle as poultry debeaking equipment. Electric heating elements heat cutting blades which are used for severing the tails of lambs. The electric lamb docker cauterizes as it cuts, and, to a considerable extent, prevents bleeding.

## MEAT PROCESSING

### Saw and Grinder

Farmers who process their own meat will find that the electric meat grinder and saw will save time and insure smoother cuts and more uniform sausage. Electric motor-driven grinders and saws are available in small sizes and are economical for the farmer to own.

## SHEARS

### Sheep

Sheep shears are available in two types:

1. The professional heavy duty shears are of the jointed shaft type driven by a 1/4 hp electric motor.

2. The self contained shears, with motor built into the handles, are suitable for small flocks of sheep. An interchangeable head may be used with this type of shears for clipping farm animals.

## STOCK TANK HEATER AND DE-ICER

Three types of stock tank heaters and de-icers are in general use: the heated drinking cup; the de-icer; and the water warmer.

1. Thermostatically controlled drinking cups. This cup is similar to the barn drinking bowl except that it is

electrically heater with 115 volts ac. The drinking bowl is encircled by a heating unit, and the incoming water is protected from freezing by a heating cable. To drink, livestock simply nose down a treadle in the base of the bowl, causing water to flow automatically. The height of the drinking cup may be adjusted for sheep, hogs, cattle, or horses. 1 1/3 Kwh energy is consumed in one day in the coldest weather.

2. The de-icer. The de-icer consists of a thermostatically controlled heater, about 300 to 500 watts, that floats on top of the water. The thermostat is set at about 36° F., just enough above freezing to keep the top of the tank from freezing over. Livestock nose the float down or to the side in order to drink.

3. The water warmer or tank heater. The water warmer consists of a thermostatically controlled heating element, about 1000 watts, mounted down in the watering tank. This heater keeps the volume of water in the tank above freezing and provides a supply of warm water for livestock throughout the winter.

## WATERER (LIVESTOCK)
## with Heater

The automatic electric livestock waterer, or the electrically heated stock drinking cup, consists of an insulated

tank heated with a thermostatically controlled heating element. Cylindrical or rectangular models are available. The height of the tank is adjusted for different livestock by burying part of the tank for sheep and hogs, or elevating it for cattle.

## GROOMER

Livestock men use the electric groomer to clean the coats of show animals. The groomer is powered with a small universal motor and operates very much like a vacuum cleaner. It tends to brush the coat of the animal, and at the same time removes dirt by suction.

# INSECT EQUIPMENT

## Section 8

## Section 8

## Electrically Operated Insect Equipment


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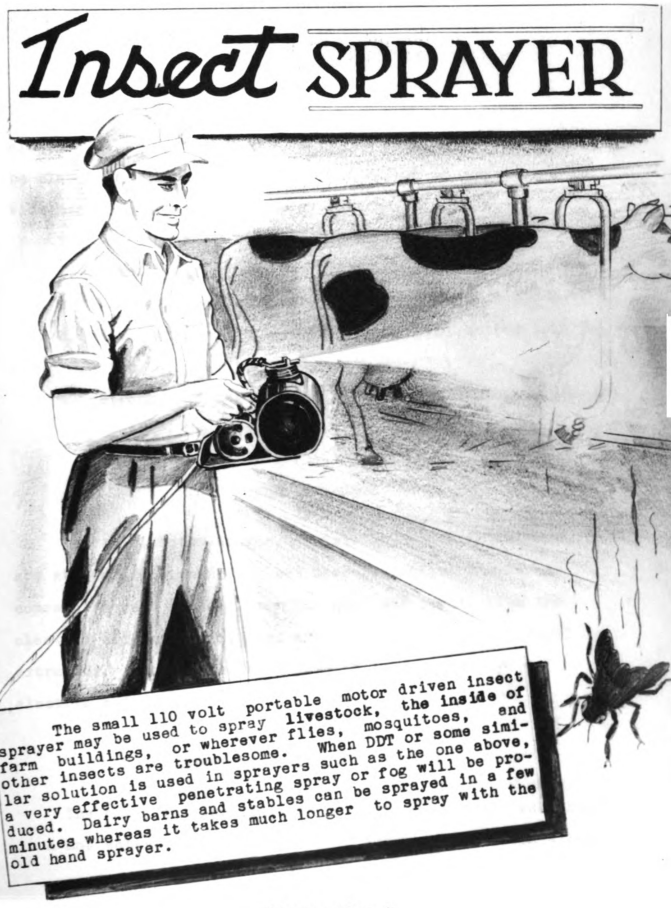


Illustration 8

Showing a page from the insect section.

## BEE-HIVE HEATER

The bee-hive heater consists of a low wattage heating element, generally under 100 watts, and a heat control to be placed in the hive. This type of heater is used to provide heat for bee-hives in cold climates.

The advantages of the hive-heater are:

1. Elimination of chilled broods.
2. With supplemental heat, honey will be produced earlier.
3. With the hive heater, less honey will be required for the bee's winter food.
4. Strong colonies can be divided successfully if supplementary heat is added.

## HONEY EXTRACTOR

Electric, motor-driven, centrifugal honey extractors are standard equipment for bee keepers. After the honey cones have been removed from the hive and capped with the electric capping knife, they are placed in the centrifugal extractor. The extractor is powered by a 1/4 to 1/2 hp electric motor.

## HONEY LIQUEFIER AND BOTTLER

The honey bottler consists of a 50 gallon drum submerged in a hot water bath in an insulated water tank, heated with

5 Kw immersion heaters. Honey is placed in the drum, heated, drawn out through a faucet, strained and bottled. This unit is generally home built.

The honey liquefier for liquefying sugared honey consists of an insulated plywood oven with galvanized iron lining. Containers of sugared honey are placed in the oven and maintained at 140 - 160° F. until all granules of sugar are melted.

## UNCAPPING KNIVES

Electrically heated knives are used for removing caps from honey cones so that the honey may be removed with a centrifugal honey extractor.

## INSECT SCREENS AND TRAPS

The electric insect screen consists of a metal wire screen attached to a high voltage, low current transformer. Sugar, or some other material that attracts flies and insects, is placed behind the screen. As insects attempt to fly through the screen, they are electrocuted immediately. In some cases a bushel basket full of flies has been electrocuted in a few days.

Some electric screens are built around electric light bulbs that are used to attract night-flying insects. This type of insect electrocutioner has been used successfully on

porch lights for homes and cottages. This type of insect killer may also be used to destroy insects that are harmful to fruits and vegetables.

DDT spraying solution is a competitor of the electric screen. Many farmers have reported better results by using DDT than by using the screen. However, dairy farmers have used the electric fly screen to good advantage in dairy barns.

# DISCUSSION

Discussion of Available Equipment and Manufacturer's Index

The large list of available electrical equipment may seem impressive at first glance, but actually no one type farm would ever use all of this equipment; few farms would use any significant number of them. In order to get a more comprehensive picture of the types of equipment that are available to any particular farmer, the information and equipment was divided into the following eight sections: general farm, dairy, crop processing, farm shop, poultry, horticulture, livestock, and insects. If a person is interested in any of these sections, he can find a list of available equipment under the above divisions.

The illustrations in this report are not to be construed as being the best possible advertising or promotional method of presenting information. The eight illustrations are actually a start at a method of presenting information about all of the available electrically operated farm equipment. Enough information has been collected to make up a one page illustration for each piece of equipment, and it is expected that this idea will be completed by the Consumers Power Company or some other organization.

The manufacturer's index is part of the information found from this survey. There are thousands of companies who manufacture electrical farm equipment. It would be

almost impossible to include every manufacturer of electrical farm equipment in this index. In cases where only a small number of companies manufacture a particular item, considerable effort was made to list all manufacturers of the item in question. In all cases only those companies that responded to letter number one were listed. Any manufacturer that is not listed will be added in future revisions of this directory on request.

## Does Present Equipment Fill Farmer's Needs?

Judging from the large number of electrical machines found to be available from this survey, one might conclude that the farmer is well satisfied and his needs are filled. This is far from the truth. True, if all the equipment found available were properly designed and built of the right materials, the farmer would be a satisfied entrepreneur.

The job of filling all the farmer's needs for efficient, productive equipment will probably never be completed. However, from this study we have concluded that there are enough types of electrical equipment on the market to fill most of the farmer's basic needs, provided the equipment is properly designed and constructed. Based on the results of this survey, and on those of a study made by Fortune[1] magazine, some of the major complaints of farmers and others against

modern farm equipment were determined.

From coast to coast a dismal chorus of complaints about farm electrical equipment and power machinery comes from agricultural engineers, farm managers, consultants, industrialists, and most of all from farmers. The major complaint concerns mechanical failures, breakdowns, and high repair costs. Replacement parts cost roughly three to four times as much, on a per pound basis, as new machines.

Many farmers complain that industry lets the farmer do the pioneering and inventing, then industry attempts to produce equipment that the farmer has invented. Also some farmers say that very often a piece of equipment is so poorly designed that it has to be strengthened before it will do satisfactory work.

Industry does not take these complaints sitting down. They know that they have done a good job on a number of items. They also realize that the companies that have manufactured poor farm equipment have hurt the reputation of the good producers.

Many of the farmer's complaints can be laid at his own door step. Farmers often overload, misuse, and fail to maintain their equipment properly. The farmer's reluctance to buy new equipment with new ideas has held back the development of certain types of machines.

Industry admits that there has not been enough research and development work carried out in the electrical farm equipment field. This is due to the fact that the average rate of return for the farm equipment manufacturer's capital investment has not been large enough to afford elaborate engineering staffs and research laboratories. Some of the larger industrial manufacturers are becoming interested in the farm market and are putting their engineering staffs and research laboratories to work on new electrical farm equipment.

Conditions That Are Holding Up Rural Electrification

| Farmer | Manufacturer |
|---|---|
| 1. Low income. | 1. Manufacturer creating seller's market. |
| 2. Reluctance to change to something new. | 2. Few farm machines have a mass market, so cannot be produced at low price. |
| 3. Inability to operate certain equipment. | 3. Do not tend to educate farmer enough concerning equipment. |
| 4. Inadequate wiring and transformer capacity. | 4. Lack of initiative in research and development. |
| 5. Lack of product education. | 5. Some manufacturers have sold a lot of poor machinery which has hurt the good producers. |
| 6. Inadequate buildings (construction and type.) | |
| 7. Cannot see paying a high price unless quick return is obtained. | |
| 8. Cost of replacement parts too high. | |

## Trends in Design

Farmers are demanding better and more efficient equipment. The different groups, working together to improve old, and develop new electrical farm equipment, include equipment manufacturers, State Colleges, government agencies, and agricultural associations. Some of the present trends in design are listed below:

1. Designers are now determining first what the functional requirements are for a machine; then they build the machine.
2. There is a trend toward making equipment more compact and streamlined.
3. Safety is being stressed more and more. Dangerous moving parts are being covered. More complete instructions are given for complex machinery.
4. Simplification and efficiency are being stressed. A simple machine can easily be adapted to mass production techniques.
5. Compromises on the design of equipment are being made so that a specific piece of equipment may be designed to serve for more than one purpose.
6. New overload and protection devices are being developed for electric motors.
7. Designers are striving to make electrically operated

farm equipment more fully automatic so that farmers may reduce the manpower required on the farm.

8. "Eye appeal" is being stressed by most manufacturers. They realize that farmers take pride in how their machines look as well as how the equipment performs.

## Ineffectiveness of Advertising

If the advertising literature of a particular item of electrical farm equipment from a number of companies were placed before a farmer, he would be confused in that he would not know which to believe. The advertising people do not give the farmer enough information in sales literature. Instead of trying to sell relief from chore drudgery, lower operating costs, and increased farm production, advertisers still try to sell their equipment by trying to convince the farmer that their equipment is better than anybody elses. This, from the seller's viewpoint, is one of the best ways of overcoming competition, but the modern farmer is getting wise to this type of selling.

Farmers are constantly increasing their knowledge of equipment and farming conditions, and it is time that the manufacturers realize that they cannot pull the wool over the farmer's eyes any longer. Farmers are demanding more and more information about a piece of equipment before they buy. Among the hundreds of advertisements that were reviewed

for this survey, a few were outstanding in that they did put across to the farmer what he actually wants to know. Certainly there are some companies that make very extensive efforts to list characteristics of their equipment, based on field tests, but there is plenty of room for improvement. It is surprising that a large number of companies do not have pictures of their equipment taken in operation on the farm. It is believed that an action picture of a piece of equipment taken on the farm will do more toward selling an article than an ordinary catalogue picture.

In some of the literature released by one manufacturer of farm shop equipment, it was obvious that the advertising people did not put in any great effort in making up their advertisement. For instance, pictures were taken of new electrical shop equipment in an old dilapidated farm shop building which was about to collapse. It was obvious that there was not any electrical service in the building. There was a picture of a tractor in the foreground and the farmer standing near the tractor was working on horse drawn equipment.

One manufacturer of a water pipe heating cable released pictures of the proper installation of their product. Anyone with a critical eye could see that the heating cable, as shown, would not keep the faucet from freezing.

Any number of advertisers still try to appeal to the farmer's emotions. Perhaps there is a place in the advertising and selling field for emotional advertising. Some farmers

are very conservative, and are rather slow to accept new ideas. However, American farms would probably not be so fully mechanized as they are today if emotional advertising methods were not used.

## Sales and Distribution

The dealers of farm electrical equipment do most of the selling. Many private utilities and R.E.A. co-operatives follow up their promotional and educational work by selling electric farm equipment, but independent dealers handle the majority of electrically operated equipment.

Most electric farm equipment flows from the factory to the wholesaler or jobber, then to the retailer or dealer, and finally to the farmer. It is easy to see that with this type of distribution system, the manufacturer could loose control of his equipment. What then can be done to further promote farm electrical equipment? Slattery[10] states that "education of the farmer and dealer is the primary need."

One of the biggest problems facing promoters of farm electrification is the setting up and expanding of wholesale and retail outlets.[11] The manufacturers have not forgotten this, and they are constantly trying to set up educational facilities and adequate marketing systems for their products. Some of the largest manufacturers of electrically operated farm equipment are very much concerned over this matter.

# ESTIMATED ANNUAL SALES OF FARM ELECTRIC EQUIPMENT OVER FIVE-YEAR PERIOD

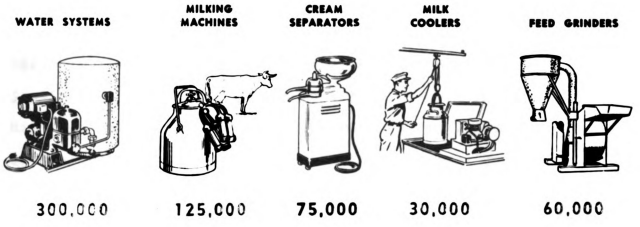


**Fig. 1**

Showing typical items of farm electric equipment and estimated annual sales for them during a five year period based on market estimates by The Electrical World Magazine. The estimates assume that the specified five year period will begin when manufacturing is no longer hampered by shortages and an adequate distribution set-up has been organized.

Better qualified dealers must be found. One authority says that the traditional farm equipment dealers often lack the special knowledge and interest that are necessary to promote and sell much of the new farm electrical equipment.

Some electrical utilities consider that a ratio of one agricultural engineer to every two thousand customers is justified. The engineer acts in a purely advisory capacity. His responsibilities include research and development in farm electrification, working with dealers, salesmen, and farm organizations, advising customers on wiring and equipment, surveying for line extensions, and keeping records.

If the dealer is to sell equipment and do his part in farm electrification, he should work closely with the agricultural engineer. He should not sit in his office and wait for business. The easy selling is a thing of the past and real salesmanship will be necessary from now on.[12]

If the farms in the United States are to be fully electrified, the dealer, manufacturer, and wholesaler, the power supplier, and the State Colleges should work together with a program of education and development. The dealer should know thoroughly the things he sells, and he should supply adequate service and repair facilities. The manufacturer and wholesaler should keep closer contact with equipment after it reaches the consumer, and promote the establishment of better farm and home dealers in rural areas. The power

supplier should give the best possible uninterrupted service and install sufficient transformer capacity, and State Colleges should set up research projects to help solve some of the farmer's electrical problems.

Successful Farming magazine made a survey of 11,533 farms served by forty-seven R.E.A. systems, largely in the Mid-West and South. The information obtained will give some idea of the distribution of electrical farm equipment in these areas.

| Type of Equipment | Percent of Farms Owning Equipment | Percent of Farms Planning to Buy Within Two Years After Availability |
|---|---|---|
| Food freezing storage cabinet | 0.2 | 1.4 |
| Cream separators | 17.7 | 3.8 |
| Feed grinders | 2.1 | 5.3 |
| Electric fence | 14.9 | 5.8 |
| Milk coolers | 2.7 | 2.2 |
| Milking Machines | 10.3 | 4.2 |
| Motors up to 1 hp | 24.4 | 5.4 |
| Motors 1 hp and over | 4.8 | 5.5 |
| Electric water pumps | 36.9 | 17.8 |
| Electric waterheaters | 5.5 | 11.7 |

These figures have probably changed considerably since the survey was made, but they do show that the task of farm

electrification has barely started, even though approximately 70 percent of U. S. farms can get, or have, electric service.

## Summary and Conclusions

From this study it has been concluded that there are enough types of electrical equipment on the market to fill most of the farmer's present needs, provided the equipment is properly designed and constructed. If the farmer is to progress and have full access to the production benefits of electricity, this survey shows that many problems need to be solved.

A. The primary objective

1. The primary objective of this survey has been accomplished. Enough information on available electrically operated farm equipment, including names of manufacturers, photographs, and operating data, has been obtained to warrant publication in the form of a booklet to be used for educational purposes.
2. Enough manufacturers are listed under most items in the index to give the farmer a rather wide selection of manufacturers from which to choose a particular piece of equipment.

B. Secondary objective

Complaints of farmers and industry's defense of available electrical farm equipment.

1. Complaints of farmers

a. The major complaint concerns mechanical failures and breakdowns. Repairs cost priceless time and money, and cause crop loss.

b. Awkward engineering means that one small broken part may require a major tear-down job. Very often a piece of farm equipment is so carelessly designed that it has to be strengthened before it will do satisfactory work.

c. A number of farmers complain that their transformers do not have sufficient capacity to take care of their load.

d. Replacement parts cost roughly three to four times as much, on a per pound basis, as new machines.

e. Lack of initiative of equipment makers to make improvements is also a factor. Some of the improvements needed are so obvious that the farmers make them themselves.

f. Many farmers complain that industry lets the farmer do the pioneering and inventing, then industry attempts to produce the item.

2. Industry's defense

a. Many of the farmer's complaints can be laid at his own door-step.

(1) The farmer often overloads and misuses his equipment.

(2) Farmers do not maintain and check their equipment as they should.

b. The variety of tools required by the farmer does not allow mass production techniques. Semi-custom production methods must be used, which will naturally increase costs.

c. Industry's defense rests mainly on two historic facts.

(1) Due to the relatively low income of the farmer, industry must build machinery of the materials and workmanship that the farmer can afford.

(2) The farmer's reluctance to buy new equipment with new ideas has held back the development of certain types of machines.

C. Trends in Design

1. Safety, simplification, and efficiency are being stressed by manufacturers.
2. Designers are trying to make equipment more streamlined, compact, and fully automatic.
3. Compromises on the design of equipment are being made so that a specific piece of equipment may be designed to serve morethan one purpose.

D. Manufacturer's Advertising

1. Some manufacturers are loosing contact with their equipment after it reaches the farmer.
2. Advertisements tend to be misleading in that not enough concrete information is given.
3. A number of manufacturers still try to sell their equipment rather than sell what the equipment will do.
4. It was evident that people with engineering training did not check all pictures and data that were released in sales and advertising literature.
5. Some advertisers are not willing to cooperate with public institutions that are trying to promote their equipment.
6. Some advertisers are still attempting to appeal to the farmer's emotions rather than citing

examples of performance and case histories.

E. Sales and distribution

1. The dealer should:
   a. Know thoroughly the things he sells, including how each is used on the farm.
   b. Realize that his goods require selling in the field.
   c. Supply adequate service and repair facilities, with special emphasis on replacement parts.
   d. Be a wiring contractor himself, or work with the agricultural engineer to see that his customers have adequate wiring.
2. Manufacturer and wholesaler should:
   a. Keep closer contact with equipment after it reaches consumer.
   b. Promote the establishment of farm and home dealers in rural trading areas.
   c. Provide more education through effective advertising, films, booklets, and lectures.
   d. Extend credit where possible.
3. Power supplier should:
   a. Give the best possible uninterrupted service to the farm.
   b. Employ agricultural engineers to work with farmers.

c. Install transformers with sufficient capacities.

4. State colleges and universities should:
   a. Set up research programs to solve some of the farmer's problems that industry is not prepared to solve.
   b. Educate the farmer, through the extension service, about farm safety and the proper and most economical utilization of farm electrical equipment.

## Problems Recommended for Further Study

1. This survey should be published in the form of a booklet so that the information gathered can be sent to farmers and others interested.
2. Since a survey has been made on the type of electrically operated equipment that is being manufactured, future investigations in the gathering, designing, and compiling of information as to the types of equipment that a farmer can build on the farm would be very valuable.

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# PROGRESS CHART

## CONSUMERS POWER CO.— MICHIGAN STATE COLLEGE

## COOPERATIVE FARM ELECTRIFICATION PROJECT

CROP PROCESSING

| TYPE OF EQUIPMENT | LETTERS | | | | | PICTURES | | | WRITTEN ARTICLE | | | FINAL SHEET FOR PRINTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO. OF COMPANIES FROM DIRECTORIES | NUMBER OF COMPANIES LETTER NO.1 MAILED TO | NUMBER OF FAVORABLE REPLIES LETTER NO.1 | NUMBER OF COMPANIES LETTER NO.2 MAILED TO | NUMBER OF FAVORABLE REPLIES LETTER NO.2 | CATALOG TYPE | ACTION | LINE DRAWING | COMPLETED FIRST TIME | REVISE | APPROVED | PICTURE TO USE: CATALOG | PICTURE TO USE: ACTION | PICTURE TO USE: LINE DRAWING | PICTURE APPROVED | WRITTEN ARTICLE | NUMBER OF MFG. | FINAL SHEET APPROV. FOR PRINTING |
| CORN | | | | | | | | | | | | | | | | | | |
| Corn & Cob Crusher | | | 1 | | | | | | X | | X | | | | | | 1 | |
| Cracker | 2 | 2 | 2 | 1 | | | | | X | X | X | | | | | | 2 | |
| Drier | 3 | 2 | 2 | 1 | 1 | | | | X | X | X | | | | | | 2 | |
| Grader & Sorter | 6 | 5 | 2 | 4 | 1 | 1 | | | X | X | X | X | | | | | 4 | |
| Husker & Sheller | 8 | 5 | 1 | 3 | | 1 | | | X | X | X | X | | | | | 2 | |
| Sheller | 26 | 22 | 13 | 4 | 1 | | 5 | | X | X | X | | X | | | | 15 | |
| DEHYDRATOR | 6 | 4 | 2 | 3 | 1 | | 1 | | X | | X | | X | | | | 2 | |
| ELEVATOR | | | | | | | | | | | | | | | | | | |
| Auger Type | 5 | 4 | 4 | 2 | 2 | | | | X | X | X | | | | | | 9 | |
| Blower Type | | | 7 | 1 | 1 | | | | X | | X | | | | | | 7 | |
| Freight | 3 | 1 | 3 | 2 | 1 | 1 | | | X | X | X | X | | | | | 4 | |
| Mechanical Cup | | 1 | 1 | 1 | 1 | 4 | 1 | | X | X | X | | X | | | | 8 | |
| Pneumatic for Grain | 22 | 18 | 2 | 2 | | | 1 | | X | | X | | | | | | 2 | |
| Portable for Hay, Ear Corn & Grain | 15 | 13 | 8 | 2 | 2 | | 8 | | X | X | X | | X | | | | 11 | |
| ENSILAGE CUTTER & SILO FILLER | 22 | 14 | 4 | 3 | 1 | | 3 | | X | X | X | | X | | | | 6 | |
| FANS (for drying hay, etc.) | 15 | 13 | | | | | | | | | | | | | | | | |
| Centrifugal | | | 3 | 2 | 1 | | 2 | | X | X | X | | X | | | | 3 | |
| Propeller | | | 3 | 2 | 1 | | 2 | | X | X | X | | X | | | | 3 | |
| FEED GRINDERS | | | | | | | | | | | | | | | | | | |
| Burr | 25 | 12 | 3 | 1 | | | | | X | | X | | | | | | 4 | |
| Hammer Mill | 63 | 27 | 25 | 2 | 2 | 2 | 2 | | X | X | X | | X | | | | 29 | |
| Roller Mill | | | | | | | | | X | | X | | | | | | 1 | |
| FEED MIXER | 27 | 6 | 11 | 4 | 1 | | 5 | | X | X | X | | X | | | | 12 | |
| FROST PREVENTION | (See Horticulture) | | | | | | | | | | | | | | | | | |
| FLOUR MILL | 5 | 2 | 1 | | | | | | X | | X | | | | | | 1 | |
| HAY | | | | | | | | | | | | | | | | | | |
| Chopper | (See Ensilage Cutter) | | | | | | | | | | | | | | | | | |
| Drier | (See Fan) | | | | | | | | | | | | | | | | | |
| Hoist | 50 | 35 | 3 | 4 | 1 | | 4 | | X | X | X | | X | | | | 3 | |
| HOIST, Power | (See Farm Shop) | | | | | | | | | | | | | | | | | |
| HULLER | | | | | | | | | | | | | | | | | | |
| Alfalfa & Clover Seed | (See Seed Cleaner) | | | | | | | | | | | | | | | | | |
| Oats | 1 | 1 | 1 | 1 | | | | | X | | X | | | | | | 2 | |
| Pea, Bean | 9 | 3 | 1 | | | 4 | | | X | X | X | | | | | | 2 | |
| MOLASSES HEATER | 2 | 2 | 1 | | | | | | X | | X | | | | | | 1 | |
| POTATO | | | | | | | | | | | | | | | | | | |
| Bag Tier | 1 | 1 | 1 | (See also Hort.) | | | | | X | | X | | | | | | 1 | |
| Grader (See Hort.) | 14 | 11 | 2 | 2 | 1 | | 4 | | X | X | X | | X | | | | 6 | |
| Seed Cutter | 11 | 4 | | | | | | | X | X | X | | | | | | | |
| Washer | (See Hort.) | | | | | | | | X | | X | | | | | | 3 | |
| SEED | | | | | | | | | | | | | | | | | | |
| Cleaner & Grader (Fanning Mill) | 31 | 18 | 5 | 2 | 2 | | 4 | | X | X | X | | X | | | | 5 | |
| Drier | | | | | | | | | X | X | X | | | | | | 2 | |
| Duster & Treater | 14 | 3 | 6 | 1 | 1 | 2 | 2 | | X | | X | | X | | | | 6 | |
| Germinator | 4 | 2 | 2 | 1 | | | | | X | | X | | | | | | 2 | |
| SILO UNLOADER | 1 | | | 1 | 1 | | 5 | | X | X | X | | X | | X | X | 1 | X |
| WAGON UNLOADER | 1 | | | 1 | 1 | 1 | | | X | | X | X | | | | | 1 | |

# PROGRESS CHART

## CONSUMERS POWER CO. — MICHIGAN STATE COLLEGE

## COOPERATIVE FARM ELECTRIFICATION PROJECT

FARM SHOP

| TYPE OF EQUIPMENT | LETTERS | | | | | PICTURES | | | WRITTEN ARTICLE | | | FINAL SHEET FOR PRINTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | PICTURE TO USE | | | | | | |
| | NO. OF COMPANIES FROM DIRECTORIES | NUMBER OF COMPANIES LETTER NO.1 MAILED TO | NUMBER OF FAVORABLE REPLIES LETTER NO.1 | NUMBER OF COMPANIES LETTER NO.2 MAILED TO | NUMBER OF FAVORABLE REPLIES LETTER NO.2 | CATALOG TYPE | ACTION | LINE DRAWING | COMPLETED FIRST TIME | REVISE | APPROVED | CATALOG | ACTION | LINE DRAWING | PICTURE APPROVED | WRITTEN ARTICLE | NUMBER OF MFG. | FINAL SHEET APPROV. FOR PRINTING |
| AIR COMPRESSOR | 32 | 31 | 18 | 3 | 1 | 3 | 8 | | X | X | X | | X | | X | X | 18 | X |
| BATTERY CHARGER | 21 | 13 | 5 | 2 | 2 | | | | | | | | | | | | | |
| Motor Generator | | | | | | | 1 | | X | X | X | | X | | | | | |
| Trickle | | | | | | 7 | 6 | | X | X | X | X | | | | | 6 | |
| Vacuum Tube | | | | | | 4 | 1 | | X | X | X | | X | | | | 9 | |
| CONCRETE | | | | | | | | | | | | | | | | | | |
| Mixer | 15 | 13 | 9 | 2 | 1 | | 8 | | X | | X | | X | | | | 10 | |
| Vibrator | 12 | 10 | 5 | 2 | 1 | 4 | | | X | X | X | | X | | | | 6 | |
| DRILL | | | | | | | | | | | | | | | | | | |
| Portable | 27 | 13 | 13 | 2 | 2 | | 2 | | X | X | X | | X | | | | 16 | |
| Post | | | 1 | | | | 2 | | X | | X | | X | | | | 3 | |
| Press | 18 | 15 | 11 | 3 | 1 | 1 | | | X | X | X | | X | | | | 12 | |
| Floor | | | | | | 3 | | | X | X | X | | | | | | | |
| Bench | | | | | | 1 | | | X | | X | | | | | | | |
| FAN (Cooling & Exhaust) | (See Dairy) | | | | | | | | | | | | | | | | 8 | |
| FORGE BLOWER | 11 | 11 | 2 | 2 | 1 | 4 | | | X | | X | X | | | | | 5 | |
| GLUE POTS | 4 | 4 | 3 | 2 | 1 | | | | X | X | X | X | | | | | 4 | |
| GRINDERS | | | | | | | | | | | | | | | | | | |
| Bench | 37 | 13 | 21 | 2 | 1 | | 3 | | X | X | X | | X | | | | 21 | |
| Portable | 22 | 1 | 8 | 2 | | 4 | 3 | | X | X | X | | X | | | | 9 | |
| GRINDSTONES | 14 | 2 | 5 | 2 | 1 | 5 | | | X | X | X | | X | | | | 5 | |
| HAMMER | 16 | 4 | 8 | 2 | 1 | 4 | 4 | | X | | X | | X | | | | 9 | |
| HOIST | 7 | 5 | 2 | 2 | | | | | X | | X | | | | | | 2 | |
| LATHES | | | | | | | | | | | | | | | | | | |
| Metal | 17 | 5 | 5 | 2 | 1 | | 3 | | X | X | X | | X | | | | 6 | |
| Wood | 10 | 7 | 5 | 2 | 1 | 4 | | | X | | X | | | | | | 6 | |
| LIGHTS (Trouble) | 13 | 11 | 6 | 2 | | | | | X | X | X | | | | | | 6 | |
| MOTORS | (See Gen. Farm.) | | | | | | | | | | | | | | | | | |
| PLANER | 11 | 9 | 6 | 2 | 1 | | | | X | X | X | | | | | | 7 | |
| PUMP | | | | | | | | | | | | | | | | | | |
| Gasoline | 10 | 7 | 3 | 4 | | | 5 | | X | X | X | | X | | | | 3 | |
| Grease | 6 | 3 | 3 | 3 | | | 2 | | X | | X | | X | | | | 4 | |
| SANDER | 8 | 2 | 15 | | | | | | | | | | | | | | 15 | |
| Bench | | | | | | 5 | | | X | X | X | | | | | | | |
| Portable | | | | | | 5 | | | X | | X | | | | | | | |
| SAW | | | | | | | | | | | | | | | | | | |
| Band | | | | | | | | | | | | | | | | | | |
| Metal | 8 | 7 | 4 | 2 | | | | | X | | X | | | | | | 7 | |
| Wood | 7 | 3 | 6 | 2 | 1 | | | | X | | X | | | | | | 6 | |
| Circular | | | | | | | | | | | | | | | | | | |
| Cut-off | 5 | 5 | 4 | 2 | | | 3 | | X | X | X | | X | | | | 6 | |
| Hand Portable | 4 | | 3 | | | | 2 | | X | X | X | | X | | | | 5 | |
| Rip | 9 | 4 | 1 | | | | 1 | | X | | X | | X | | | | 2 | |
| Hack | 6 | 3 | 4 | 3 | 1 | 1 | | | X | X | X | | | | | | 5 | |
| Jig | 13 | 5 | 2 | 2 | 1 | | | | X | X | X | | | | | | 3 | |
| SHAPER (Metal) | 9 | 5 | 3 | 2 | 1 | 1 | | | X | X | X | | | | | | 7 | |
| SHEARS (Sheet Metal) | 10 | 5 | 3 | 2 | 1 | 1 | | | X | | X | | | | | | 3 | |
| SOLDERING | | | | | | | | | | | | | | | | | | |
| Iron | 30 | 23 | 10 | 2 | 1 | 4 | | | X | X | X | X | | | | | 12 | |
| Pot | 7 | 3 | 2 | 2 | | 6 | | | X | | X | X | | | | | 2 | |
| SPRAYER (Paint) | 18 | 7 | 16 | 2 | 2 | 1 | 6 | | X | X | X | | X | | | | 17 | |
| VULCANIZER | 7 | 7 | 3 | 2 | 2 | | 1 | | X | X | X | | X | | | | 3 | |
| WELDER | 39 | 33 | 20 | 1 | 1 | | 7 | | X | X | X | | X | | | | 20 | |

# PROGRESS CHART

## CONSUMERS POWER CO.— MICHIGAN STATE COLLEGE

## COOPERATIVE FARM ELECTRIFICATION PROJECT

| | TYPE OF EQUIPMENT | LETTERS: NO. OF COMPANIES FROM DIRECTORIES | LETTERS: NUMBER OF COMPANIES LETTER NO.1 MAILED TO | LETTERS: NUMBER OF FAVORABLE REPLIES LETTER NO.1 | LETTERS: NUMBER OF COMPANIES LETTER NO.2 MAILED TO | LETTERS: NUMBER OF FAVORABLE REPLIES LETTER NO.2 | PICTURES: CATALOG TYPE | PICTURES: ACTION | PICTURES: LINE DRAWING | WRITTEN ARTICLE: COMPLETED FIRST TIME | WRITTEN ARTICLE: REVISE | WRITTEN ARTICLE: APPROVED | FINAL SHEET FOR PRINTING: PICTURE TO USE: CATALOG | PICTURE TO USE: ACTION | PICTURE TO USE: LINE DRAWING | PICTURE APPROVED | WRITTEN ARTICLE | NUMBER OF MFG. | FINAL SHEET APPROV. FOR PRINTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POULTRY | ALARMS | (See Gen. Farm.) | | | | | | | | | | | | | | | | | |
| | BROODERS | 25 | 24 | 20 | 3 | 3 | 5 | 14 | | X | X | X | | X | | | | 21 | |
| | CAPONIZERS | 1 | 1 | 1 | 1 | 1 | 1 | | | X | | X | X | | | | | 1 | |
| | DEBEAKING EQUIPMENT | 3 | 2 | 2 | 2 | 2 | | 8 | | X | | X | | X | | | | 2 | |
| | EGG | | | | | | | | | | | | | | | | | | |
| | Candler | 7 | 5 | 8 | 2 | 2 | | 1 | | X | X | X | | X | | | | 8 | |
| | Cleaner | 8 | 2 | 3 | 2 | 2 | 3 | | | X | | X | X | | | | | 4 | |
| | Cooler | | | | | 1 | | 1 | | X | X | X | X | | | | | 3 | |
| | Grader | 2 | 2 | 2 | 2 | 1 | 5 | | | X | | X | X | | | | | 2 | |
| | Washer | 3 | 1 | 2 | 1 | 1 | 4 | 4 | | X | X | X | | X | | | | 3 | |
| | ELECTROCUTOR | | 1 | | | | | | | X | | X | | | | | | 1 | |
| | FAN | (See also Dairy) | | | | | | | | | | | | | | | | | |
| | Ventilation | 8 | 7 | 7 | 2 | 2 | | 3 | | X | X | X | | X | | X | X | 22 | X |
| | FEED | | | | | | | | | | | | | | | | | | |
| | Grinder | (See Crop Processing) | | | | | | | | | | | | | | | | | |
| | Mixer | | | | | | | | | | | | | | | | | | |
| | FEEDER (Automatic) | 1 | | | | | | | | | | | | | | | | | |
| | INCUBATORS | 16 | 16 | | | | | | | X | | X | X | | | | | | |
| | Large | | | 2 | 2 | 1 | | | | | | | | | | | | 2 | |
| | Small | | | 10 | 1 | 1 | 8 | | | | | | | | | | | 10 | |
| | INTERCOMM. EQUIPT. | (See Gen. Farm.) | | | | | | | | | | | | | | | | | |
| | LIGHTS | | | | | | | | | | | | | | | | | | |
| | Incandescent | | | | | | | | | | | | | | | | | | |
| | Ultra-violet | 8 | 1 | 2 | 1 | 1 | 1 | | | X | X | X | X | | | | | 9 | |
| | PICKER | 8 | 6 | 8 | 2 | | | 1 | | X | X | X | | X | | | | 8 | |
| | SCALDER | 2 | 2 | 5 | 2 | 1 | | | | X | | X | X | | | | | 5 | |
| | SINGER | 1 | 1 | 1 | 1 | 1 | | | | X | | X | | | | | | 1 | |
| | STEAM CLEANER | 1 | 1 | 1 | 1 | | 1 | | | X | | X | X | | | | | 2 | |
| | THERMOSTATS | 23 | 4 | 11 | 2 | | | | | X | X | X | | | | | | 11 | |
| | THERMOSTAT WAFERS | 18 | 1 | 8 | 2 | | | | | X | | X | | | | | | 8 | |
| | TIME SWITCHES | 12 | 9 | 9 | 2 | 1 | 4 | | | X | | X | | | | | | 8 | |
| | WATER WARMER | 16 | 16 | 13 | 3 | 1 | 5 | | | X | X | X | | X | | | | 14 | |
| | WAXER | 3 | 1 | 1 | 1 | 1 | 1 | 3 | | X | X | X | | | | | | 1 | |
| | ELEVATOR(litter) | 1 | | | | | | | | X | | X | | | | | | 1 | |
| | | | | | | | | | | | | | | | | | | | |
| HORTICULTURE | BAGGING MACHINES | 2 | 2 | 2 | 2 | 2 | | 4 | | X | | X | | X | | | | 2 | |
| | CIDER MILL & PRESS | 8 | 8 | 2 | 1 | 1 | 3 | | | X | X | X | X | | | | | 2 | |
| | COLD STORAGE | (See Gen. Farm.) | | | | | | | | | | | | | | | | | |
| | DEHYDRATORS | (See Crop Proc.) | | | | | | | | | | | | | | | | | |
| | DRIERS | 11 | 11 | 2 | 1 | 1 | (Generally built locally) | | | | | | | | | | | 2 | |
| | FROST PREVENTION | | | | | | | 1 | | | | | | | | | | 1 | |
| | GERMINATORS | (See Crop Proc.) | | | | | | | | | | | | | | | | | |
| | GRADERS | 13 | 12 | 6 | 2 | 1 | 2 | 4 | | X | X | X | | X | | | | 6 | |
| | HEDGE CLIPPER | 6 | 6 | 6 | 2 | 2 | 4 | 1 | | X | X | X | | X | | X | X | 7 | X |
| | HOT BEDS | (See Soil Heating) | | | | | | | | | | | | | | | | | |
| | IRRIGATION PUMP | (See Gen. Farm.) | | | | | | | | | | | | | | | | | |
| | PEACH DEFUZZER | 1 | 1 | 1 | | | | | | X | | X | | | | | | 1 | |
| | POLLINATOR | | | | | | | | | X | X | X | | | | | | | |
| | SOIL HEATING CABLE | 2 | | 1 | | | | 1 | | X | X | X | | | | | | 3 | |
| | SOIL STERILIZER | 2 | 2 | 2 | 1 | 1 | | | | X | X | X | | | | | | 2 | |
| | SPRAYER | | | | | | | | | | | | | | | | | | |
| | Portable | 10 | 10 | 7 | 2 | 1 | 3 | | | X | X | X | | X | | | | 7 | |
| | Stationary | 4 | 4 | 2 | 2 | | 1 | | | X | X | X | | X | | | | 2 | |
| | TIER | | | 1 | | | | 1 | | X | | X | | X | | | | 1 | |
| | WASHER | 2 | 2 | 1 | | | | | | X | X | X | | | | | | 5 | |

# PROGRESS CHART

## CONSUMERS POWER CO.— MICHIGAN STATE COLLEGE

## COOPERATIVE FARM ELECTRIFICATION PROJECT

| | TYPE OF EQUIPMENT | LETTERS | | | | | PICTURES | | | WRITTEN ARTICLE | | | FINAL SHEET FOR PRINTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NO. OF COMPANIES FROM DIRECTORIES | NUMBER OF COMPANIES LETTER NO.1 MAILED TO | NUMBER OF FAVORABLE REPLIES LETTER NO.1 | NUMBER OF COMPANIES LETTER NO.2 MAILED TO | NUMBER OF FAVORABLE REPLIES LETTER NO.2 | CATALOG TYPE | ACTION | LINE DRAWING | COMPLETED FIRST TIME | REVISE | APPROVED | PICTURE TO USE: CATALOG | PICTURE TO USE: ACTION | PICTURE TO USE: LINE DRAWING | PICTURE APPROVED | WRITTEN ARTICLE | NUMBER OF MFG. | FINAL SHEET APPROV. FOR PRINTING |
| LIVESTOCK | ANIMAL PRODS | 12 | 12 | 1 | 2 | 1 | 1 | | | X | | X | X | | | | | 2 | |
| | BRANDING IRON | 8 | 8 | 3 | 2 | 2 | 1 | | | X | X | X | X | | | | | 3 | |
| | BROODERS | | | | | | | | | | | | | | | | | | |
| | Lamb (Bulletins) | 3 | | | | | | | | | | | | | | | | | |
| | Pig | 2 | 1 | 3 | 2 | 2 | | 1 | | X | | | | X | | | | 3 | |
| | BULL EXERCISER | 2 | 2 | 1 | | | | | | X | X | X | | | | | | 2 | |
| | CLIPPERS | 7 | 6 | 4 | 2 | 1 | | 5 | | X | X | X | | X | | | | 4 | |
| | FENCE | 40 | 38 | 18 | 3 | 2 | 6 | 10 | | X | | X | | X | | | | 18 | |
| | LAMB DOCKER | | | | | | | | | | | | | | | | | | |
| | MEAT PROCESSING | | | | | | | | | | | | | | | | | | |
| | Grinder | 4 | 4 | 2 | 1 | | | 1 | | X | | X | | X | | | | 3 | |
| | Hoist | (See Farm Shop) | | | | | | | | | | | | | | | | | |
| | Saw | 12 | 12 | 3 | 1 | 1 | | | | X | X | X | | X | | | | 3 | |
| | SHEARS | | | | | | | | | | | | | | | | | | |
| | Sheep | 3 | 2 | 1 | 1 | 1 | | 5 | | X | | | | X | | | | 4 | |
| | SPRAYERS | | | | | | | | | | | | | | | | | | |
| | (See also Insects) | 2 | 1 | 3 | | | | | 1 | X | X | X | | | X | | | 3 | |
| | STOCK TANK HEATER & DEICER | 20 | 14 | 12 | 3 | 3 | 3 | 5 | | X | X | X | | | X | X | X | 12 | X |
| | WATERERS | | | | | | | | | | | | | | | | | | |
| | Hog (with Heater) | 9 | 6 | 3 | 1 | | 3 | 1 | | | | | | | | | | 3 | |
| | GROOMER | 1 | 1 | 1 | | | | | | | | | | | | | | 1 | |
| INSECTS | BEE KEEPERS EQUIPMENT | 3 | 3 | 1 | 1 | | | | | | | | | | | | | 1 | |
| | Hive Heater | | 1 | 1 | | | | | | X | | X | X | | | | | 1 | |
| | Honey Extractor | 1 | 1 | 1 | | | | | | X | X | X | | | | | | 2 | |
| | Honey Liquefier & Bottler | | | | | | | | | | | | | | | | | | |
| | Uncapping Knife | | | | | | | | | X | | | X | | | | | 1 | |
| | INSECTS | | | | | | | | | | | | | | | | | | |
| | Screens & Traps | 15 | 15 | 8 | 2 | 2 | 15 | 6 | | X | X | X | X | | | | | 8 | |
| | Sprayers | 13 | 12 | 9 | 3 | 1 | 1 | | | X | | X | | | X | X | X | 10 | X |

# APPENDIX

MICHIGAN STATE COLLEGE
EAST LANSING

SCHOOL OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL
ENGINEERING

September 20, 1948

Commercial Vice President
The XYZ Corporation
Chicago, Illinois

Attention: Sales Department

Dear Sir:

For a number of years there has been a growing need among dealers, farm service advisors of electric power companies, and county agricultural agents, for a comprehensive list of manufacturers who make electrically operated farm equipment.

The Rural Electrification Division of the Agricultural Engineering Department, Michigan State College, is preparing an Electrically Operated Farm Equipment Manufacturers Index.

We would like to include the name of your company in this index.

We are especially interested in knowing if you manufacture electrically-operated potato seed cutters.

Very truly yours,

Vernon H. Baker

Letter No. 1

MICHIGAN STATE COLLEGE
EAST LANSING

SCHOOL OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL
ENGINEERING

October 13, 1949

Commercial Vice President
The XYZ Corporation
Chicago, Illinois

Dear Sir:

Thank you for your letter of September 25. Surveys reveal that one of the weakest links in the farm electrification program today is the lack of knowledge on the part of dealers and farmers about the various types of electrically operated farm equipment that is being manufactured and where such equipment can be secured.

To help remedy this condition, the Agricultural Engineering Department of Michigan State College has undertaken as one of its main projects the tremendous job of preparing a booklet that will illustrate representative uses of electrically operated equipment and list alphabetically the names and addresses of leading manufacturers.

This booklet will then be given free of charge to dealers by the Farm Service Personnel of electric power companies in this area who are serving over 165,000 farm customers. These farm service representatives will also use the booklet in their promotional work out in the field with farmers.

We would like to include your equipment as representative of one of the major companies manufacturing electrically operated potato seed cutters. For this reason, we are most anxious to secure 4 identical action photographs of your potato seed cutter taken on the farm.

As we have already mentioned, there are over 165,000 electrified farms in Michigan and power companies in this area are eagerly awaiting our booklet. They have assured us that it will be most valuable and it will have wide usage possibly on a national as well as a state level.

Your early reply will be greatly appreciated.

Yours very truly,

Vernon H. Baker

Letter No. 2

## Preface to Manufacturer's Index

No attempt has been made in this index to list all of the possible manufacturers of electrically operated farm equipment. However, considerable effort was made to include a representative list of manufacturers under each item. The literature or advertisement of each company was reviewed in order to insure that each company listed was a manufacturer of electrically operated farm equipment. Household equipment is not included in this index.

Revision of this directory will be made as names of other manufacturers are discovered. Manufacturers, whose names are not listed in this directory, will be added in future issues on request.

# ELECTRICALLY OPERATED FARM EQUIPMENT MANUFACTURERS

## AIR COMPRESSOR

American Brake Shoe Co.
Rochester, N. Y.

Binks Mfg Co.
Chicago, Ill.

Brunner Mfg Co.
Utica, N. Y.

Champion Pneumatic Machy Div.
Chicago, Ill.

Curtis Pneumatic Machy Div.
Curtis Mfg Co.
St. Louis 20, Mo.

DeVilbiss Co.
Toledo, Ohio

Electric Milking Mach. Co.
Westchester, Pa.

General Electric Co.
Schenectady 5, N. Y.

Ingersoll-Rand Co.
11 Broadway
New York City

Montgomery Ward Co.
Chicago 7, Ill.

Power Air Corp.
Chicago, Ill.

Quincy Compressor Co.
Quincy, Ill.

Takheim Oil Tank & Pump Co.
Ft Wayne, Ind.

United States Air Compressor Co.
Cleveland, Ohio

The Wayne Pump Co.
Ft. Wayne, Ind.

Westinghouse Air Brake Co.
Wilmerding, Pa.

Worthington Pump & Machy Co.
Harrison, N. Y.

## ALARMS

### Burglar

Edwards & Co., Inc.
Norwalk, Conn.

Gardenhour Mfg Co.
Waynesboro, Pa.

Lyon Rural Electric Co.
San Diego, Calif.

### Fire & Temp.

Autocall Co.
Shelby, Ohio

Edwards & Co.
Norwalk, Conn.

Faraday Electric Corp.
Adrian, Mich.

General Detroit Corp.
Roosevelt Park Annex Stn.
Box 263
Detroit 32, Mich.

Lord-Taber Co., Inc.
Canandaigua, N. Y.

Lyon Rural Electric Co.
San Diego, Calif.

### Freezer

Faraday Electric Corp.
Adrian, Michigan

ANIMAL PROD

Electric Service System
1330 Quincy St., N. E.
Minneapolis, Minn.

International Electric Co.
1836 W. North Ave.
Chicago, Ill.

BAGGING MACHINE
Fruits & Vegetables

King-Wyse Mfg Co.
Elmira, Ohio

Paramount Mfg Co.
P. O. Box 1117
Stockton, Calif.

BARN CLEANER

Acorn Brand Mfg Co.
Stevens Point, Wis.

Benzmiller Co.
101 W. Francis St.
Stevens Point, Wis.

Eagle Mfg Co.
Appleton, Wis.

Eau Claire Equip. Co.
Eau Claire, Wis.

Marathon Fdy & Mach. Co.
Wausau, Wis.

BATTERY CHARGER
Motor Generator
Usually built at home.
Trickle

Electric Service Systems, Inc.
Minneapolis, Minn.

General Electric Co.
Schenectady 5, N. Y.

Koeler Mfg Co., Inc.
Murlbor, Mass.

P. R. Mallory & Co., Inc.
Indianapolis, Ind.

Sears Roebuck
Chicago, Ill.

Westinghouse Electric Corp
E. Pittsburg, Pa.

Vacuum Tube

Allen Electric Equipment Co.
Kalamazoo, Mich.

Baldor Electric Co.
St. Louis, Mo.

Electric Service Systems, Inc
Minnepolis, Minn.

General Electric Co.
Schenectady 5, N. Y.

P. R. Mallory & Co., Inc.
Indianapolis, Ind.

Marquette Mfg Co.
Minneapolis, Minn.

Westinghouse Electric Corp.
E. Pittsburg, Pa.

Willard Storage Battery Co.
Cleveland, Ohio

BEE KEEPERS EQUIPMENT

Standard Churn & Mfg Co.
Wapakoneta, Ohio

Hive Heater

Lyon Rural Electric Co.
San Diego, Calif.

Honey Extractor

Montgomery Ward
Chicago 7, Ill.

Standard Churn & Mg Co.
Wapakoneta, Ohio

Honey Heater & Bottler

Unable to find Manufacturer

Uncapping Knife

Macy Electric Knife Co.
1239 S. Locena St.
Los Angeles 23, Calif.

BRANDING IRON

Burning Brand Co.
1400 W. Fulton St.
Chicago, Ill.

Vulcan Electric Co.
600 Broad St.
Lynn, Mass.

Waage Electric Co.
54 Park Place
New York 7, N. Y.

BROODERS
Chicken

Anerson Box Co.
700 W. Morris St.
Indianapolis, Ind.

Beacon Steel Products Co.
Manchester Rd.
Westminster, Md.

Brower Mfg Co.
213 N. 3rd St.
Quincy, Ill.

Budkeye Incubator Co.
Springfield, Ohio

Bussey Products Co.
6000 W. 51st St.
Chicago 38, Ill.

Chewalls Sanitary Brooder Co.
Holly Springs, Miss.

The H. D. Hudson Co.
589 I. Illinois St.
Chicago, Ill.

International Electric Co.
908 W. VanBuren St.
Chicago, Ill.

Keen Equipment Co.
Vineland, N. J.

Klein Mfg Co.
Burlington Ia.

Lyon Rural Electric Co.
San Diego, Calif.

Macomb Steel Products Co.
Macomb, Ill.

Montgomery Ward
Chicago 7, Ill.

National Elec. Appliance Co.
1330 - 40 W. 117th St.
Cleveland, Ohio

National Ideal Co.
914 Summit St.
Toledo, Ohio

Oakes Mfg Co.
Tipton, Ind.

Rau Mfg Co.
Route 6, Box 293
Tacoma, Wash.

Royal Mfg Co.
Bowling Green, Ohio

H. M. Sheer Co.
419 Payson Ave.
Quincy, Ill.

Trumbull Electric Mfg Co.
Plainville, Conn.

Lamb

Usually Homemade

Pig

H. D. Campbell Co.
Rochelle, Ill.

General Electric Co.
Schenectady 4, N. Y.

International Electric Co.
910 W. VanBuren St.
Chicago, Ill.

BULL EXERCISER

C. M. Dickinson
7408 W. E. 32nd Ave.
Portland, Ore.

P & C Hand-Forged Tool Co.
Portland, Ore.

CAPONIZER

Mr. George Bevoey
Cedar Vale, Kansas

Simplex Elec. Caponizer Co.
6044 S. Ingleside Ave.
Chicago, Ill.

CHURN

Alabama Mfg Co.
Birmingham, Ala.

General Electric Co.
Schenectady 5, N. Y.

Montgomery Ward
Chicago, Ill.

Standard Churn & Mfg Co.
Wapakonata, Ohio

CIDER MILL & PRESS

A. B. Farquhar Co.
York, Pa.

New Jersey Agric. Works
Trenton, N. J.

CLIPPERS
Animal

Andis Clipper Co.
Racine, Wis.

Montgomery Ward
Chicago 7, Ill.

John Oster Mfg Co.
Racine, Wis.

Sunbeam Corp.
5600 Roosevelt Rd.
Chicago, Ill.

Hedge

Kaufman Mfg Co.
Manitowoc, Wis.

National Ideal Co.
Toledo 4, Ohio

Porter Cable Machine Co.
Syracuse 8, N. Y.

Roberton Div.
King Pneumatic Tool Co.
2717 N. Asnland Ave.
Chicago 14, Ill.

Schartow Iron Prod. Co.
Racine, Wis.

Skilsaw, Inc.
5033 N. Elston Ave.
Chicago, Ill.

Sunbeam Corp.
5600 Roosevelt Rd.
Chicago 50, Ill.

CONCRETE
Mixer

Construction Mach. Co.
Waterloo, Iowa

Eastern Tractor Mfg Corp.
Kingston, N Y.

General Electric Co.
Schenectady 5, N. Y.

Gilson Bros Co.
Fredonia, Wis.

Hawkeye Steel Prod. Co.
Waterloo, Iowa

Hertler & Zook Co.
Belleville, Pa.

Knickerbocker Co.
Jackson, Mich.

Lansing Co.
Lansing, Mich.

Montgomery Ward
Chicago 7, Ill.

New Holland Machine Co.
New Holland, Pa.

Vibrator

Electric Tamper & Equip. Co.
Ludington, Mich.

Marvel Equip. Co.
228 S. Michigan Ave.
Chicago, Ill.

Master Vibrator Co
126 Davis
Dayton, Ohio

Viber Co.
Burbank, Calif.

White Mfg. Co.
Elkhart, Ind.

Wyzenbeck & Staff, Inc.
838 W. Hubbard St.
Chicago 22, Ill.

CONVEYORS

General Farm

Baughman Mfg Co.
Jerseyville, Ill.

Harry J. Ferguson
115 West Ave.
Jenkintown, Pa.

Poultry Dropping Cleaner

James Mfg Co.
Ft Atkinson, Wis.

Screw

(See Elevator)

CORN

Corn Cob Crusher

J. S. Bloom
Independence, Ia.

Crackers

Munsun Mill Machy Co.
Utica, N. Y.

Sidney Grain Machy Co.
Sidney, Ohio

Drier

Unable to find manufacturer

Grader & Sorter

Cleland Mfg Co.
2800 Washington Ave.
N. Minneapolis, Minn.

New Holland Machine Co.
New Holland, Pa.

Sidney Grain Mach. Co.
Sidney, Ohio

Universal Hoist & Mfg Co.
Cedar Falls, Iowa

Husker & Sheller

A. K. Robbins & Co.
713 - 729 E. Lombard St.
Baltimore 2, Maryland

Rosenthal Corn Husker Co.
8229 W. Greenfield Ave.
Milwaukee 14, Wis.

Sheller

Barnard & Leas Mfg Co.
Cedar Rapids, Iowa

Belle City Mfg Co.
Racine, Wis.

John Deere & Co.
Lansing 4, Mich.

Duplex Mill & Mfg Co.
Springfield, Ohio

Eastern Tractor Mfg Co.
Kingston, N. Y.

Fairbanks, Morse & Co.
600 S. Michigan Ave.
Chicago, Ill.

Harvey Mfg Co.
Racine, Wis.

International Harvester Co.
Chicago, Ill.

Messinger Mfg Co.
Tatamy, Pa.

Minneapolis-Moline Power Imp. Co.
Minneapolis, Minn.

New Holland Machine Co.
New Holland, Pa.

New Idea, Inc.
Colwater, Ohio

Red Cross Mfg Co.
Bluffton, Ind.

Scottdel, Inc.
Swanton, Ohio

Sidney Grain Machy Co.
Sidney, Ohio

CREAM

Cooler

Experimental Model
Michigan State College
East Lansing, Mich.

Separators

American Separator Co.
Bainbridge, N. Y.

Associated Mfg. Co.
Waterloo, Iowa

DeLaval Separator Co.
165 Broadway
New York, N. Y.

Galloway Co
Waterloo, Ia.

General Electric Co.
Schenectady 5, N. Y.

International Harvester Co.
Chicago, Ill.

The Massey-Harris Co.
Racine, Wis.

Montgomery Ward
Chicago 7, Ill.

United Dairy Equip. Co.
Westchester, Pa.

DEBEAKING EQUIPMENT

Brower Mfg Co.
Box 3632
Quincy, Ill.

Lyon Rural Electric Co.
San Diego, Calif.

DEHYDRATOR

H. J. Kaufman Co.
13215 Roselawn Ave.
Detroit 4, Mich.

L. M. Miller Denydrator Co.
256 Bethel Dr.
Eugene Ore.

Write to State Colleges
(Most of them are home built)

DRIERS

Fruit and Vegetable

John Bean Co.
Lansing, Mich.

Proctor & Schwartz, Inc.
Seventh St. & Tabor Rd.
Philadelphia 20, Pa.

Hay

See Fan

Seed

Campbell Dryer Co.
Des Moines 4, Iowa

Despatch Oven Co.
Minneapolis, Minn.

DRILL

Portable

Black & Decker Mfg Co.
Towson 4, Md.

Duro Metal Products Co.
Chicago 39, Ill.

Independent Pneumatic Tool Co.
Chicago 6, Ill.

Louisville Electric Mfg Co.
31st and Magazine Sts
Louisville, Ky.

Millers Falls Co.
Greenfield, Mass.

Milwaukee Electric Tool Co.
Milwaukee, Wis.

Montgomery Ward
Chicago 7, Ill.

Sears Roebuck
Chicago, Ill.

Skilson, Inc.
Chicago 30, Ill.

Snap-on Tools Corp.
Kenosha, Wis.

Speedway Mfg Co.
Cicero 40, Ill.

Stanley Electric Tool Div.
Stanley Works
New Britain, Conn.

Syntron Co.
Homer City, Pa.

United States Elec. Tool Co
Cincinnati, Ohio

VanDoran Electrical Tool Co
Towson, Md

Wodack Electric Tool Co.
Chicago, Ill.

Post

Buffalo Forge Co.
Buffalo, N. Y.

Champion Blower & Forge Co.
Lancaster, Pa.

National Agr. Supply Co.
Ft. Atkinson, Wis.

Press

Floor
Bench

Atlas Press Co.
Kalamazoo, Mich.

Black & Decker Mfg Co.
655 Pennsylvania Ave.
Towson 4, Md

Buffalo Forge Co.
Buffalo, N. Y.

Canedy-Otto Mfg Co.
Chicago Heights, Ill.

Champion Blower & Forge Co.
Lancaster, Pa.

Delta Mfg Co.
651 E. Vienna Ave.
Milwaukee, Wis.

Millers Falls Co.
Greenfield, Mass.

Sears Roebuck
Chicago, Ill.

South Bend Lathe Works
South Bend, 22, Ind.

Speedway Mfg Co.
Cicero, Ill.

Stanley Electric Tool Div.
Stanley Works
New Britain, Conn.

Wodack Electric Tool Co.
Chicago, Ill.

EGG

Candler

Albright Co.
110 N. Franklin St.
Chicago 6, Ill.

Browers Mfg Co.
Quincy, Ill.

"Jiffy Way" Prod. Co.
723 - 725 W. Lake St.
Minneapolis 8, Minn.

Keen Equipment Co., Inc.
Vineland, N. J.

Macomb Steel Products Co.
Macomb, Ill.

Montgomery Ward
Chicago 7, Ill.

Otto Niederer Sons, Inc.
Titusville, N. J.

H. M. Sheer Co.
419 Payson Ave.
Quincy, Ill.

Cleaner

Co-op G. L. F. Farm Supplies
Ithaca, N. Y.

H & P Egg Cleaner Co.
Sebastopol, Calif.

Keen Equipment Co., Inc.
Vineland, N. J.

Otto Niederer Sons, Inc.
Titusville, N. J.

Cooler

Esco Cabinet Co.
205 W. Miner St.
Westchester, Pa.

Haverly Electric Co., Inc.
1970 W. Fayette
Syracuse, N Y.

Zero Mfg Co.
Washington, Mo.

Grader

Brower Mfg Co.
213 N. 3rd St.
Quincy, Ill.

Bussey Products Co.
6000 51st St.
Chicago 38, Ill.

Washer

The Albright Co.
110 N. Franklin St.
Chicago 6, Ill.

Co-op G.L.F. Farm Supplies
Division of Co-op Grange
League Federation Exchange
Ithaca, N. Y.

Gordon Johnson Co.
1012 Baltimore Ave.
Kansas City, Mo.

ELECTROCUTOR

The Barker Equipment Co.
Ottumwa, Ia

ELEVATOR

Auger Type (Grain)

Carter-Miller Mill Fur. Co.
N. 1324 Ash St.
Spokane 12, Wash.

Cherokee Mfg Co., Inc.
Cherokee, Okla.

Harvey Mfg Co., Inc.
Racine, Wis.

Link Mfg Co.
Fargo, N. Dak.

Montgomery Ward
Chicago 7, Ill.

J. I. Owens Corp.
970 Berry Ave.
St. Paul 4, Minn.

Smalley Mfg Co.
507 York St.
Manitowoc, Wis.

Freight

Kimbal Bros. Co.
Council Bluff, Ia

Otis Elevator Co.
Otis Bldg
260 Eleventh Ave.
New York 1, N. Y.

Sidney Grain Elevator
Sidney, Ohio

Warner Elevator Mfg Co.
Cincinnati, Ohio

Mechanical Cup Type

Carter-Miller Mill Fur. Co.
N. 1324 Ash St.
Spokane 12, Wash.

G & D Mfg Co.
Streator, Ill.

B. F. Gump Co.
431 - 437 S. Clinton St.
Chicago 7, Ill.

J. W. Hance Mfg Co.
Westerville, Ohio

Link*Belt Co.
Chicago 8, Ill.

Meyer Mfg Co.
Morton, Ill.

Portable Elevator Mfg Co.
620 Grove St., East
Bloomington, Ill.

Universal Hoist & Mg Co.
Cedar Falls, Ia

Pneumatic Type

Brady Conveyor Corp.
20 W. Jackson Ave.
Chicago 4, Ill.

Dracco Corp.
Cleveland 5, Ohio

Portable (Hay, Ear Corn, Grain)

J. S. Bloom Co.
Independence, Ia

Echart Mfg Co.
842 Seal St.
St. Paul 4, Minn.

The Galloway Co., Inc.
Waterloo, Ia

Harvey Mfg Co., Inc.
Racine, Wis.

Industrial Eng. & Mfg Co.
Brimfield, Ind.

Kewanee Machy & Conveyor Co.
Kewanee, Ill.

Meyer Mfg Co.
Morton, Ill.

Montgomery Ward
Chicago 7, Ill.

Sam Mulkey Co.
1621 Locust St.
Kansas City, Mo.

J. I. Owens Corp.
970 Berry Ave.
St. Paul 4, Minn.

Portable Elevator Mfg Co.
620 E. Grove St.
Bloomington, Ill.

ENSILAGE CUTTER, HAY CHOPPER, SILO FILLER

Blizzard Mfg Co.
1413 Tuscarawas St., W.
Canton 2, Ohio

J. I. Case
Racine, Wis.

Dellinger Mfg Co.
Lancaster, Pa.

Gehl Bros Mfg Co.
West Bend, Wis.

Letz Mfg Co.
Crown Points, Ind.

Papec Machine Co.
Shortsville, N. Y.

FAN

Cooling

Diehl Mfg Co.
Somerville, N. J.

General Electric Co.
Schenectady 6, N. Y.

The Lau Blower Co.
Dayton 7, Ohio

Monitor
Riverdale-on-Hudson
New York 63, N. Y.

Sears Roebuck
Chicago, Ill.

Signal Electric Mfg Co.
Menominee, Mich.

F. A. Smith Mfg Co.
Rochester 2, N. Y.

Westinghouse Electric Corp.
653 Page Blvd.
Springfield 2, Mass.

Exhaust

The Cleveland Heater Co.
2310 Superior Ave.
Cleveland 14, Ohio

Diehl Mfg Co.
Somerville, N. J.

Marting Fan & Blower Co.
4643 W. 21st St.
Chicago 60, Ill.

Monitor
Riverdale-on-Hudson
New York 63, N. Y.

Signal Electric Mfg Co.
Menominee, Mich.

Hay Drying
Centrifugal

American Blower Corp.
8111 Tireman Ave.
Detroit, Mich.

Buffalo Forge Co.
Buffalo 5, N. Y.

Champion Hay Drying Blower
Lancaster, Pa.

Propellor

Airovent Fan Co.
818 N. Jenison Ave.
Box 636
Lansing 4, Mich.

Buffalo Forge Co.
Buffalo 5, N. Y.

Robinson Vent. Co.
Zelienople, Pa.

Ventilation
Dairy & Poultry

Acorn Brand Mfg Co.
Stevens Point, Wis.

Aerovent Fan Co.
Lansing, Mich.

Brower Mfg Co.
213 N. 3rd St.
Quincy, Ill.

Buffalo Forge Co.
490 Broadway
Buffalo, N. Y.

Bussey Prod. Co.
6000 51st St.
Chicago 38, Ill.

Champion Blower & Forge Co.
Lancaster, Pa.

Clay Equip. Corp.
Cedar Falls, Ia

Cleveland Heater Co.
1933 W. 114th St.
Cleveland, Ohio

DeVilbiss Co.
3000 Phillips Ave.
Toledo, Ohio

Emerson Electric Mfg Co.
St. Louis, Mo.

Gardenhour Mfg Co.
Waynesboro, Pa.

Holcombe Hoke Co.
Indianapolis, Ind.

H. D. Hudson
589 E. Illinois St.
Chicago, Ill.

Ilg Electric Vent. Co.
2850 N. Crawford Ave.
Chicago, Ill.

James Mfg Co.
Ft. Atkinson, Wis.

Macomb Steel Prod. Co.
Macomb, Ill.

Merchant & Evans Co.
Philadelphia 46, Pa.

Montgomery Ward
Chicago, Ill.

National Electric App. Co.
1330-40 W. 117th St.
Cleveland, Ohio

Olson Mfg Co.
Albert Lea, Minn.

Propellair Inc.
Lagonda & Hunt Sts
Springfield, Ohio

Robbins & Meyers, Inc.
Springfield, Ohio

Westinghouse Electric Corp.
E. Pittsburg, Pa.

FEED

Grinder

Burr Mill

M. P. Bowsher Co.
South Bend, Ind.

Davis Mfg, Inc.
1521 McLean Blvd
Wichita 12, Kansas

Fairbanks, Morse & Co.
Chicago, Ill.

Meadows Mill Co.
N. Wilkesboro, N. Car.

Hammer Mill

Buffalo Hammer Mill Corp.
27 Washington St.
Buffalo 3, N. Y.

Brower Mfg Co.
Quincy, Ill.

J. I. Case Co.
Racine, Wis.

John Deere
Moline, Ill.

Duplex Mill & Mfg Co.
Springfield, Ohio

Fairbanks, Morse & Co.
Chicago, Ill.

Gehl Bros Mfg Co.
West Bend, Wis.

Greundler Crusher & Pulverizer
St. Louis, Mo.

International Harvester Co.
Chicago, Ill.

Iowa Portable Mill Co.
Oelwein, Iowa

Meadows Mill Co., Inc.
N. Wilkesboro, N. Car.

Miller Mfg Co.
Stratton, Neb.

Montgomery Ward
Chicago 7, Ill.

Myers-Sherman Co.
Streator, Ill.

New Holland Machine Co.
New Holland, Pa.

Papec Machine Co.
Shortsville, N. Y.

Prater Pulverizer Co.
Chicago, Ill.

Rapids Machinery Co.
Marion, Iowa

J. B. Sedberry Co.
Franklin, Tenn.

Sidney Grain Machy Co.
Sidney, Ohio

Smally Mfg Co.
Manitowoc, Wis.

Sparks-Worthington Co.
Jackson, Mich.

Stedmans Fdy & Mach. Works
Aurora, Ind.

Viking Mfg Co.
Manhattan, Kansas

Western Land Roller Co.
Hastings, Neb.

Wetmore Pulverizer & Machy
Tonkawa, Okla.

Williams Patent Crusher &
Pulverizer Co.
St. Louis 6, Mo.

John W. Williamson & Sons
5715 Atlantic Blvd.
Maywood, Calif.

W. W. Grinder Corp.
Wichita, Kansas

Roller Mill

Bernal Machine Co.
18622 Mt. Elliott Ave.
Detroit, Mich.

FEEDER (Automatic for chicks)

Automatic Poultry Feeder Co.
Zeeland, Mich.

MIXER

Brower Mfg Co.
Quincy, Ill.

Construction Machy Co.
Waterloo, Ia

The Duplex Mill & Mfg Co.
Springfield, Ohio

General Electric Co.
Schenectady 5, N. Y.

Gilson Bros Co.
Fredonia, Wis.

Montgomery Ward
Chicago 7, Ill.

Prater Pulverizer Co.
1829 55th St.
Chicago, Illl.

Rapids Machy Co.
Marion, Ia

Scottdel, Inc.
Swanton, Ohio

H. M. Sheer Co.
Quincy, Ill.

Sidney Grain Machy Co.
Sidney, Ohio

Sprout, Waldron & Co.
Muncy, Pa.

FENCE

Accessories Mfg Co.
4554 Broadway
Chicago 40, Ill.

Babson Bros Co.
2843 W. 19th St.
Chicago 23, Ill.

Central Equipment Corp.
Toledo, Ohio

Coburn Mfg Co.
Whitewater, Wis.

Diller Electric Co.
Kokomo, Ind.

Electric Service Systems
Minneapolis, Minn.

Farmers Eng. & Mfg Co.
Pittsburg, Pa.

Gardenhour Mfg Co.
Waynesboro, Pa.

Gardner Mfg Co.
Horizon, Wis.

Guaranteed Products Corp.
Wellington, Ohio

Guard-It Mfg Co.
1501 Laflin St.
Chicago 8, Ill.

International Fence Co.
908 W. VanBurne
Chicago, Ill.

Montgomery Ward
Chicago 7, Ill.

Prime Mfg Co.
1669 S. First St.
Milwaukee, Wis.

Red Devil Tools, Inc.
Irvington 11, N. J.

Twin Draulic, Inc.
Laurens, Iowa

Winpower Mfg Co.
Newton, Ia

FLOUR MILL (SMALL TYPE)

Sprout, Waldron & Co.
Muncy, Pa.

FORGE BLOWER

Champion Blower & Forge Co.
Lancaster, Pa.

Electric Blower Co.
352 Atlantic Ave.
Boston, Mass.

Montgomery Ward
Chicago 7, Ill

National Agr. Supply Co.
Ft. Atkinson, Wis.

Starr Drilling Machine Co.
Akron, Ohio

FROST PREVENTION

Experimental with electricity
Michigan State College
East Lansing, Michigan

GERMINATORS

See Seed

GLUE POTS

Black & Decker Mfg Co.
Towson, Md.

General Electric Co.
Schenectady, N. Y.

VanDorn Electric Tool Co.
Twoson, Md.

GRADERS
Fruit & Vegetable

John Bean Mfg Co.
Lansing, Mich.

Bloom Systems
6630 Wagner
Detroit, Mich.

Friend Mfg Co.
Gasport, N. Y.

Huntley Mfg Co.
Brocton, N. Y.

Parma Water Lifter Co.
Parma, Idaho

Trescott Co., Inc.
Fairport, N. Y.

GREEN HOUSE
Heating

See Soil Heating Cable

Lights

General Electric Co.
Schenectady 5, N. Y.

Westinghouse Corp.
E. Pittsburg, Pa.

GRINDERS (EMERY WHEEL)
Bench

Atlas Press Co.
Kalamazoo, Mich.

Baldor Electric Co.
4353 Duncan St.
St. Louis, Mo.

Black & Decker Mfg Co.
Towson 4, Md.

Champion Blower & Forge Co.
Lancaster, Pa.

Delta Mfg Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.

The Dunmore Co.
14th and Racine Sts
Racine, Wis.

Independent Pneumatic Tool
Chicago 6, Ill.

Marvel Equipment Co.
224 S. Michigan Ave.
Chicago 4, Ill.

Millers Falls Co.
Greenfield, Mass.

Milwaukee Electric Tool Co.
106 N. Water St.
Milwaukee, Wis.

Montgomery Ward
Chicago 7, Ill.

Sears Roebuck
Chicago , Ill.

Sherman Products, Inc.
Royal Oak, Mich.

Skilsaw, Inc.
Chicago 30, Ill.

Snap-On Tools Co.
Kenosha, Wis.

Speedway Mfg Co.
1834 S. 52nd Ave.
Cicero 50, Ill.

Stanley Electric Tool Div.
Stanley Works
New Britain, Conn.

United States Electric Tool
Cincinnati, Ohio

VanDoran Electric Tool Co.
Towson, Md.

Walker-Turner Co., Inc.
Plainfield, N. J.

Wuzenbeck & Staff, Inc.
838 W. Hubbard St.
Chicago 22, Ill.

Portable

Black & Decker Mfg Co.
Towson, Md.

Dunmore Co.
92 14th St.
Racine, Wis.

Duro Metal Prod. Co.
2651 N. Kildare
Chicago 39, Ill.

Independent Pneumatic Tool
600 W. Jackson Blvd.
Chicago 6, Ill.

Louisville Electric Mfg Co.
31st & Magazine Sts
Louisville, Ky

Millers Falls Co.
Greenfield, Mass.

Skilsaw, Inc.
Chicago 30, Ill.

United States Elec. Tool Co.
Cincinnati, Ohio

VanDoran Electric Tool Co.
Towson, Md.

GRINDER (FEED)

See Feed

GRINDSTONES

Carbornudum Co.
Niagara Falls, N. Y.

Cleveland Quarries Co.
Cleveland, Ohio

Eastern Tractor Mfg Corp.
Kingston, N. Y.

Speedway Mfg Co.
1844 S. 52nd Ave.
Cicero 50, Ill.

Wodack Electric Tool Co.
Chicago, Ill.

GROOMER

Dairy-Vac Co.
Plymouth, Wis.

HAMMER

Black & Decker Mfg Co.
Towson, Md

Champion Blower & Forge Co.
Lancaster, Pa.

Independent Pneumatic Tool
600 W. Jackson Blvd.
Chicago 6, Ill.

Millers Falls Co.
Greenfield, Mass.

Milwaukee Electric Tool Corp
Milwaukee 8, Wis.

Stanley Electric Tool Div.
Stanley Works
New Britain, Conn.

Syntron Co.
Homer City, Pa.

VanDoran Electric Tool Co.
Towson, Md.

Wodack Electrical Tool Corp.
Chicago, Ill.

HAY
Chopper

See Ensilage Cutter

Drier

See Fan

Hoist

See Hoist

HEATER
Milk House

Plug-in

Sta-Warm Electric Co.
151 N. Chestnut
Ravenna, Ohio

Edwin L. Weignad Co.
7500 Thomas Blvd
Pittsburg 8, Pa.

Westinghouse Electric Corp.
E. Pittsburg, Pa.

Space Heaters

Chicago Electric Mfg Co.
6333 W. 65th St.
Chicago, Ill.

Cutler-Hammer, Inc.
1341 W. St.Paul Ave.
Milwaukee 1, Wis.

Eagle Electric Mfg Co.
23-10 Bridge Plaza South
Long Island City, N. Y.

General Electric Co.
Schenectady 4, N. Y.

Monitor Home Appliances
Riverdale-on-Hudson
New York 63, N. Y.

Edwin L. Weigand Co.
7500 Thomas Blvd.
Pittsburg, 8, Pa.

Westinghouse Electric Corp.
E. Pittsburg, Pa.

HEATING CABLE
Soil and Water Pipe

General Electric Co.
Schenectady, N. Y.

"Gro-Quick"
340 W. Huron St.
Chicago 10, Ill.

Smith Gates, Corp.
Plainfield, Conn.

Westinghouse Electric Co.
Pittsburg, Pa.

HEDGE CLIPPER

See Clipper.

HOIST
Hay

Bennett-Ireland Co.
Norwick, N. Y.

John Farrel & Sons
Newton, N. J.

Marvel Equipment Co.
224 S. Michigan Ave.
Chicago 4, Ill.

Universal Hoist & Mfg Co.
Cedar Falls, Ia

Milk Can

DeLaval Co.
165 Broadway
New York City, N. Y.

Power

Coffing Hoist Co.
Danville, Ill.

HOT BED

Soil Heating Cable

See Heating Cable

Light Bulb Type

See Illustration 6

Sterilizer

See Soil Sterilizer

HULLER

Alfalfa & Clover Seed

S. Howes Co., Inc.
Silver Creek, N. Y.

J. L. Owens & Co.
970 Berry Ave.
Westerville, Ohio

Universal Hoist & Mfg Co.
Cedar Falls, Iowa

See also Seed Cleaner

Oats

Cleland Mfg Co.
2800 Washington Ave.
N. Minneapolis, Minn.

Duplex Mill & Mfg Co.
415 Sigler
Springfield, Ohio

Pea, Bean

Huntley Mfg Co.
Beocton, N. Y.

J. L. Owens Corp.
970 Berry Ave.
St. Paul 4, Minn.

ICE CREAM FREEZER

Alaska Freezer Co., Inc.
Winchendon, Mass.

Chicago Electric Mfg Co.
6333 W. 55th St.
Chicago, Ill.

Montgomery Ward
Chicago 17, Ill.

Reynolds Electric Co.
2650 W. Congress Ave.
Chicago, Ill.

INCUBATORS

Large

The Buckeye Incubator Co.
P. O. Box 420
Springfield 99, Ohio

Chick Master Incubator Co.
3212 W. 25th St.
Cleveland 9, Ohio

Small

American Lincoln Incubator
645 Somerset St.
New Brunswick, N. J.

Brower Mfg Co.
213 N. 3rd St.
Quincy, Ill.

Bundy Incubator Co.
Springfield, Ohio

Chick Master
3212 W. 25th St.
Cleveland 9, Ohio

The Electric Hotpack Co.
Philadelphia, Pa.

Macomb Steel Products Co.
Macomb, Ill.

Montgomery Ward
Chicago 7, Ill.

New Madison Incubators, Inc.
17 Washington St.
Ipswich, Mass.

Oakes Mfg Co.
Tipton, Ind.

H. M. Sheer Co.
Quincy, Ill.

INSECTS
Screens & Traps

See also Traps

Detjen Corp.
303 W. 42nd St.
New York, N. Y.

Electric Fly Screen Co.
430 W. Hoffman Ave.
Lindenhurst, L. I., N. Y.

Gardenhour Mfg Co.
Waynesboro, Pa.

Gardner Mfg Co.
Horizon, Wis.

International Elec. Fence Co.
908 W. VanBuren
Chicago, Ill.

Lyon Rural Electric Co.
San Diego, Calif.

Reynolds Electric Co.
2650 W. Congress St.
Chicago, Ill.

INTERCOMMUNICATION EQUIPMENT

Seedburo Equipment Co.
223 W. Jackson Blvd.
Chicago 6, Ill.

Stromberg-Carlson Co.
Rochester 3, N. Y.

Webster Electric Co.
Chicago, Ill.

IRRIGATION PUMP

See Pump

LAMB DOCKER

No manufacturer found.

LATHES
Metal

Atlas Press Co.
1819 N. Pitcher St.
Kalamazoo, Mich.

Logan Engineering Co.
Chicago 30, Ill.

Oliver Machy Co.
Grand Rapids, Mich.

Sears Roebuck
Chicago, Ill.

Sheldon Machine Co., Inc
5260 N. Knox Ave.
Chicago 41, Ill.

South Bend Lathe Works
181 E. Madison St.
South Bend, Ind.

Wood

Brodhead-Garrett Co.
Cleveland, Ohio

Delta Mfg Co.
651 E. Vienna Ave.
Milwaukee, Wis.

Mattison Machine Works
230 Blackhawk Pk Ave.
Rockford, Ill.

Oliver Machinery Co.
1028 Voldbrood St., N. E.
Grand Rapids, Michigan

Sears Roebuck
Chicago, Ill.

Wallace & Co.
2800 Wilcox St.
Chicago, Ill.

LIGHTS

Flood

Appleton Electric Co.
1701-59 Wellington Ave.
Chicago 13, Ill.

General Electric Co.
Schenectady 4, N. Y.

Westinghouse Electric Co.
Pittsburg, Pa.

Germicidal & Ultra-violet

Brower Mfg Co
213 N. 3rd St.
Quincy, Ill.

General Electric Co.
Schenectady 5, N. Y.

Macomb Steel Products Co.
Macomb, Ill.

Tru-Air Ultraviolet Prod. Co.
Los Angeles, Cal.

Trumbull Electric Mfg Co.
Plainville, Conn.

Westinghouse Electric Co.
Sterilamp Division
Pittsburg, Pa.

Infra-red

General Electric Co.
Schenectady, N. Y.

Montgomery Ward
Chicago 7, Ill.

Webster Electric
Racine, Wis.

Westinghouse Electric Co.
Pittsburg, Pa.

Trouble

Appleton Electric Co.
1745 Wellington Ave.
Chicago 13, Ill.

Black Mfg Co.
304 Vine St.
Philadelphia 6, Pa.

Eagle Electric Co.
23-10 Bridge Plaza, South
Long Island City, N. Y.

Ericson Mfg Co.
5209 Euclid Ave.
Cleveland, Ohio

McGill Mfg Co., Inc.
95 Grand Ave.
Pawtucket, R. I.

Yard Control

DresslerElectric Co.
942 E. Larned St.
Detroit 7, Mich.

General Electric Co.
Schenectady, N. Y

Touch Plate Distributors
2038-42 Bay St.
Los Angeles 21, Calif.

Westinghouse Electric Co.
Pittsburg, Pa.

MEAT PROCESSING

Grinder & Saw

Guendler Crusher & Pulverizer
1911-1915 N. Market
St. Louis 6, Mo

Reynolds Electric Co.
2650 W. Congress St.
Chicago, Ill.

Smith's Sons
50 Broadway
Buffalo, N. Y.

Hoist

See Hoist

Saw

Johnson Mfg Co.
Chippewa Falls, Wis.

The S & W Sales Co., Inc.
Delaware, Ohio

Vaugh Co.
730-40 N. Franklin
Chicago 10, Ill.

MILK COOLER

Ben H. Anderson Mfg Co.
Madison 3, Wis.

Aug. G. Barkow Mfg Co.
2723 S. 31st St.
Milwaukee 7, Wis.

Carrier Corp.
300 S. Geddes St.
Syracuse, N. Y.

Empire Milking Machine Co.
Westchester, Pa.

Esco Cabinet Co.
Westchester, Pa.

Frigidaire Division
General Motors Corp.
Dayton 1, Ohio

International Harvester Co.
Chicago, Ill.

LaCrosse Cooler Co.
LaCrosse, Wis.

Master-Bilt Ref. Mfg Co.
1825 Arsenal St.
St. Louis, Mo.

Montgomery Ward
Chicago 7, Ill.

Norge Division
Borg-Warner Corp.
670 W. Woodbridge St.
Detroit 26, Mich.

Perfection Mfg Corp
2125 E. Hennepin Ave.
Minneapolis 13, Minn.

Sargent-Roundy Corp.
Randolph, Vt.

Schultz Bros.
Saginaw, Mich.

Starr Pump & Cooler Corp.
St. Louis 6, Mo.

Emil Steinhorst & Sons, Inc
612-614 South St.
Utica, N. Y.

Wilson Cabinet Co.
Smyrna, Del.

Universal Milking Machine Div.
129 Barstow St.
Waukesha, Wis.

Westinghouse Elec. Co.
653 Page Blvd.
Springfield, Mass.

Refrigerators

Starr Pump & Cooler Co.
St. Louis, Mo.

Victor Products Corp.
Hagerstown, Md

Spray Type

Arctic Jet Co.
Randolph, Vermont

Surface

Starr Pump & Cooler Co.
St. Louis, Mo.

MILK MACHINES

American Separator Co.
Bainbridge, N. Y.

Ben H. Anderson Mfg Co.
51 N. Dickson St.
Madison, Wis.

Conde Milking Machine Co.
Sherrill, N. Y.

Dairy Equipment Co.
819 Kalamazoo
Lansing, Mich.

Decker Mfg Co.
Janesville, Wis.

DeLaval Separator Co.
165 Broadway
New York, N. Y.

Empire Milking Machine Co.
Westchester, Pa.

Bobson Bros. Co.
2443 West 19th St.
Chicago, Ill.

Esco Cabinet Co.
Westchester, Pa.

International Harvester Co
180 N. Michigan Ave.
Chicago, Ill.

Klein Mfg Co.
Deerfield, Wis.

McCartney Mfg Co.
Lansing, Mich.

Milker Supply Co.
Box 369
Madison, Wis.

Montgomery Ward
Chicago 7, Ill.

Page Milking Machines
Milwaukee, Wis.

Perfection Mfg Corp.
2125 E. Hennepin Ave.
Minneapolis 13, Minn.

Starbrand Corp.
Box 5127
Brightwood Stn
Indianapolis 18, Ind.

Universal Milking Machines
129 Barstow St.
Waukesha, Wis.

Winpower Mfg Co.
Newton, Ia

Portable

DeLaval Separator Co.
165 Broadway
New York, N. Y.

Empire Milking Machine Co.
Westchester, Pa.

McCartney Mfg Co.
Lansing, Mich.

Milker Supply Co.
Box 369
Madison, Wis.

Page Milking Machines
Milwaukee, Wis.

Perfection Mfg Corp.
2125 E. Hennepin Ave.
Minneapolis 13, Minn.

MOLASSES HEATER

Edwin L. Wiegan Co.
7506 Thomas Blvd.
Pittsburg, Pa.

MOTORS

Allis-Chalmers Mfg Co.
Milwaukee, Wis.

Atlas Press Co.
819 N. Pitcher St.
Kalamazoo, Mich.

Baldor Electric Co.
4351-67 Duncan Ave.
St. Louis 10, Mo.

J. S. Bloom Mfg Co.
Independence, Ia

Burke Electric Co.
Erie, Pa.

Centruy Electric Co.
1806 Pine St.
St. Louis 4, Mo.

Emerson Electric Mfg Co.
1824 Washington Ave.
St. Louis, Mo.

General Electric Co.
Schenectady, N. Y.

Kimble Electric Co.
2011 W. Hastings St.
Chicago, Ill.

Kingston-Donlet Electric Co.
c/o Hoover Co.
N. Canton, Ohio

King-Wyse Inc.
Archbold, Ohio

Leland Electric Co.
1501 Webster St.
Dayton, Ohio

Master Electric Co.
126 Davis Ave.
Dayton, Ohio

Robbins & Myers
1245 Lagonda Ave.
Springfield, Ohio

Signal Electric Mfg Co.
1915 Broadway
Menominee, Mich.

Wagner Electric Corp.
6400 Plymouth Ave.
St. Louis, Missouri

Westinghouse Electric Corp.
E. Pittsburg, Pa.

John W. Williamson & Sons
5715 Atlantic Blvd
Maywood, Calif.

MOWERS

McCartney Mfg Co.
Box 1116
Lansing, Mich.

Marvel Equipment Co.
224 S. Michigan Ave.
Chicago 4, Ill.

Robertson Division
King Pneumatic Tool Co.
2717 N. Ashland Ave.
Chicago 14, Ill.

Rotary Mower Corp.
Omaha, Neb.

Steiner Products Corp.
2554 N. Grand Blvd.
St. Louis 6, Mo.

PASTEURIZER
Home

Guard-It Mfg Co.
1501 S. Laflin
Chicago 8, Ill.

Montgomery Ward
Chicago 7, Ill.

Walter Conley, & Co.
Rochester, Minn.

PICKER

Anderson Box Co.
Indianapolis, Ind.

Albright Co.
110 N. Franklin St.
Chicago 6, Ill.

Brower Mfg Co.
Quincy, Ill.

dyna-pik
P. O. Box 5531
Cleveland, Ohio

Greenbrier Co.
629 Euclid Ave.
Cleveland 14, Ohio

Gordon Johnson Co.
2519 Madison Ave.
Kansas City 8, Mo.

Montgomery Ward
Chicago 7, Ill.

Pickwick Co.
Cedar Rapids, Ia

Superior Mfg Co.
Delaware, Ohio

PLANER

Boice-Crane Co.
930 W. Central Ave.
Toledo, Ohio

Crescent Machine Div.
Rockwell Mfg Co.
Letonia, Ohio

Delta Mfg Division
Rockwell Mfg Co.
651 E. Vienna Ave.
Milwaukee, Wis.

Milwaukee Elec. Tool Corp
Milwaukee, Wis.

Newman Machine Co.
Greensboro, N. C.

Sears Roebuck
Chicago, Ill.

Yates-American Machine Co.
Beloit, Wis.

POLLINATOR

No manufacturer found.

POTATO
Bag Tier

Felins Typing Machine Co.
2950 N. 14th St.
Milwaukee 6, Wis.

A. Galloway Machine Shop
Rockford, Mich.

Grader

John Bean Co.
Lansing, Mich.

Boggs Mfg Co.
Atlanta, N. Y.

Friend Mfg Co.
Gapport, N. Y.

King-Wyse, Inc.
Archbold, Ohio

Noffsinger Mfg Co.
Greeley, Colo.

Paramount Mfg Co.
P. O. Box 1117
Stockton, Calif.

Seed Cutter

No manufacturer found.

Washer

John Bean Mfg Co.
Lansing, Michigan

Felins Tying Machine Co.
2950 N. 14th St.
Milwaukee 6, Wis.

Paramount Mfg Co.
Post Office Box 1117
Stockton, Calif.

PUMP

Gasoline

Erie Meter Systems
Box 559
Erie, Pa.

Neptune Meter Co.
50 W. 50th St.
New York City

Wayne Pump Co.
513 Tecumseh St.
Ft. Wayne, 4, Ind.

Grease

Aero Equipment Corp.
Bryan, Ohio

John W. Hobbs Corp.
Springfield, Ill.

Louisville Elec. Mfg Co.
31st & Magazine Sts
Louisville, Ky.

Power Aire Corp.
223 S. Michigan Ave.
Chicago 4, Ill.

Irrigation

Carver Pump Co.
1046 Hershey Ave.
Muscatine, Ia

Fairbanks, Morse & Co.
600 S. Michigan Ave.
Chicago, Ill.

Hale Fire Pump Co.
Conshohocken, Pa.

Layne & Bowler, Inc.
P. O. Box 215
Hollywood Stn
Memphis 8, Tenn.

Montgomery Ward
Chicago 7, Ill.

Shur-Rane Irrigation Co.
Arcadia, Calif.

Sump

Aurora Pump Co.
Aurora, Ill.

Blackmer Pump Co.
1904 Century Ave.
Grand Rapids 9, Mich.

Cherry-Burrell Corp.
Detroit 6, Mich.

Dempster Mill Mfg Co.
Beatrice, Neb.

Duro Co.
Dayton, Ohio

Fairbanks, Morse & Co.
Fairbanks-Morse Bldg
Chicago, Ill.

Gorman-Rupp Co.
333 N. Bowman St.
Mansfield, Ohio

Imperial Brass Mfg Co.
1200 W. Harrison St.
Chicago 7, Ill.

Jabsco Pump Co.
2031 N. Lincoln St.
Burbank, Calif.

Jacuzzi Bros., Inc.
Berkeley, Calif.

F. E. Myers & Bros. Co.
Ashland, Ohio

Pringle Electric Co.
Northbook, Ill.

Red Jacket Mfg Co.
Davenport, Ia

M. Shelter & Sons Co.
317 Railway St.
Clio, Mich.

Sta-Rite Products, Inc.
Delavan, Wis.

Union Steam Pump Co.
Battle Creek, Mich.

Weinman Pump Mfg Co.
292 Spruce St.
Columbus 8, Ohio

Woodruff & Edwards, Inc.
Elgin Windmill Division
Elgin, Ill.

Yeomans Brother Co.
1416 Dayton St.
Chicago, Ill.

**Water System**

American March Pump, Inc.
60 Capitol Ave., N. E.
Battle Creek, Mich.

Baker Mfg Co.
Evansville, Wis.

Berkeley Pump Corp.
Berkeley, Calif.

J. S. Bloom Mfg Co.
Independence, Iowa

Blue Star Mfg Co.
Galva, Ill.

Butler Co.
Butler, Ind.

C. E. Cook, Inc.
Lawrenceburg, Ind.

Dayton Pump & Mfg Co.
500 N. Webster St.
Dayton, Ohio

Dean Hill Pump Co.
Indianapolis, Ind.

Decatur Pump Co.
2750 Nelson Park Rd.
Decatur, Ill.

Delco Appliance Division
General Motors Corp.
Rochester 1, N. Y.

Deming Co.
Salem, Ohio

Dempster Mill Mfg Co.
Beatrice, Neb.

Duplex Mfg Co.
Superior, Wis.

Electric Heat Appliances Co.
Adrian, Mich.

Everit Pump & Mfg Co.
Lancaster, Pa.

Fairbanks, Morse & Co.
600 S. Michigan Ave.
Chicago 5, Ill.

Fairbury Windmill Co.
Fairbury, Neb.

Flint & Walling Mfg Co.
Findallville, Ind.

Galloway Co.
Waterloo, Ia

Gorman-Rupp Co.
Mansfield, Ohio

Goulds Pump, Inc.
Seneca Falls, N. Y.

Heil Co.
3000 W. Montana St.
Milwaukee, Wis.

Ingersoll-Rand
11 Broadway
New York 4, N. Y.

Jacobsen Mfg Co.
747 Washington Ave.
Racine, Wis.

Jacuzzi Bros, Inc.
Berkeley, Calif.

Kewanee Private Utilities Co.
Kewanee, Ill.

L. R. H. Labaw & Co.
Belle Mead, N. J.

A. Y. McDonald Mfg Co.
Dubuque, Ia

Monarch Eng. Co.
Dayton, Ohio

Montgomery Ward
Chicago 7, Ill.

F. E. Myers & Bros. Co.
Ashland, Ohio

National Water Lift Co.
1611 Portage St.
Kalamazoo, Mich.

Parma Water Lifter Co.
Parma, Idaho

Paul Pumps, Inc.
Ft. Wayne 7, Ind.

Peerless Pump Division
Food Machinery Corp.
1250 Camden Ave., S. W.
Canton, Ohio

Perfection Mfg Corp,
2125 E. Hennepin Ave.
Minneapolis 23, Minn.

Red Jacket Mfg Co.
P. O. Box 270
Davenport, Ia

Rocklin Mfg Co.
Grand Ave. & Jenning Sts
Sioux City 7, Ia

Shelter-Calkins Co.
Clio, Mich.

Sta-Rite Products Inc.
Delavan, Wis.

Templeton, Kenly & Co.
1020 S. Central Ave.
Chicago 44, Ill.

Trupar, Inc.
420 Linden Ave.
Dayton 3, Ohio

Uniflow Mfg Co.
Erie, Pa.

U. S. Challenge Co.
Batavia, Ill.

Winpower Mfg Co.
Newton, Ia

Woodmanse Mfg Co.
Freeport, Ill.

Woodruff & Edwards, Inc.
Elgin, Ill.

REFRIGERATION

Cold Storage

Insulation

Armstrong Cork Co.
Lancaster, Pa.

Johns Manville
New York, N. Y.

Pacific Lumber Co.
(Polco Wool)
Chicago, Ill.

Universal Zonolite Insul. Co.
135 S. LaSalle St.
Chicago, Ill.

Wood Conversion Co.
360 N. Michigan Ave.
Chicago, Ill.

Refrigeration

Carrier Corp.
Syracuse, N. Y.

Frick
Waynesboro, Pa.

Frigidaire
Dayton, Ohio

Lehigh Valley Refrig. Co.
302 Hamilton St.
Allentown, Pa.

Refrigeration Eng. Corp.
2024 Market St.
Philadelphia, Pa.

Tecumseh Products Co.
Tecumseh, Mich.

York Corp.
York, Pa.

Freezers

Deep Type

Amana Society
Amana, Ia

American Ref. & Mach., Inc.
2700 University Ave., N. E.
Minneapolis 13, Minn.

Ben-Hur Mfg Co.
634 E. Keefe Ave.
Milwaukee 12, Wis.

The Brewer-Titchener Corp.
Binghamton, N. Y.

Corvallis Refrigeration, Inc.
Box 610
Corvallis, Ore.

The Cooleration Co.
Duluth, 1, Minn.

Deep Freezer Motor Prod. Co.
2301 Davis St.
North Chicago, Ill.

DeLaval Separator Co.
427 Randolph St.
Chicago 6, Ill.

Esco Cabinet Co.
Westchester, Pa.

Fogel Refrigerator Co.
5420 Edom St.
Philadelphia 37, Pa.

Frigidaire Division
General Motors Corp.
Dayton, Ohio

General Electric Co.
Schenectady, N. Y.

General Refrigerator Corp.
678 Broadway
New York 12, N. Y.

Hotpoint, Inc.
5600 W. Taylor St.
Chicago 44, Ill.

International Harvester
180 Nl Michigan Ave.
Chicago 1, Ill.

Jacobs Wind Elec. Co.
Minneapolis, 11, Minn.

Jordan Ref. Co., Inc.
58th & Grays Ave.
Philadelphia 53, Pa.

Magic Freezer Servbe
6631 Stuart Ave.
Richmond, Va.

Marquette Appliances, Inc.
307 E. Hennepin Ave.
Minneapolis 14, Minn.

Master-Bilt Ref. Mfg Co.
920 Ralon St.
St. Louis 7, Mo.

Master Freeze Corp.
Sister Bay, Wis.

Maytag
Newton, Ia

Wilson Cabinet Co.
Smyrna, Del.

Monitor
Riverdale-on-Hudson
New York 63, N. Y.

Perfection Mfg Co.
Minneapolis, Minn.

C. L. Perveal Co., Inc.
Boone, Ia

Revco, Inc.
Deerfield, Mich.

Sanitary Ref. Co.
Fond Du Lac, Wis.

Schafer, Inc.
Minneapolis 1, Minn.

Simplex Mfg Co.
1135 Third St.
Oakland, Calif.

Emil Steinhorst & Sons, Inc.
612-616 S. St.
Utica 3, N. Y.

Tyler Fixture Corp.
Niles, Mich.

Victor Products Corp.
Hagerstown, Md

White Horse Cabinet Co.
Harleysville, Pa.

Whiting Corp.
33 S. Clark St.
Chicago 3, Ill.

Wintink & Co.
Grand Rapids, Mich.

Upright

Aug. G. Barkow Mfg Co.
2723 S. 31st St.
Milwaukee 7, Wis.

The Revco Co.
3110 N. Eleventh St.
St. Louis 7, Mo.

Carrier Corp.
300 S. Geddes St.
Syracuse 1, N. Y.

Erie Cooling Co.
W. Fifth & Marian
Winona, Minn.

Monitor
Riverdale-on-Hudson
New Yrok 63, N. Y,

Portable Elevator Mfg Co.
Refrigerator Division
Bloomington, Ill.

Simplex Mfg Co.
4135 Third St.
Oakland, Calif.

Stoddard Mfg Co.
617 4th St., S. W.
Mason City, Ia

Tyler Fixture Corp.
Niles, Mich.

United Refrigerator Co.
St. Paul 1, Minn.

Victor Products Corp.
Hagerstown, Md.

Wilson Refrigeration, Inc.
Div. of Wilson Cabinet Co.
Smyrna, Del.

Walk-in
Low Temperature

Fogel Ref. Co.
5400 Eadom St.
Philadelphia, Pa.

United Ref. Co.
350 Robert St.
St. Paul 1, Minn.

Victor Products Corp.
Hagerstown, Md.

Wilson Refrigeration, Inc.
Smyrna, Del.

Normal Temperature

American Ref. & Mac., Inc.
2700 University Ave., N. E.
Minneapolis 13, Minn.

Fogel Ref. Co.
5400 Eadom St.
Philadelphia, Pa.

Masterfreezer Corp.
Sister Bay, Wis.

Uniter Ref. Co.
350 Robert St.
St. Paul 1, Minn.

Wilson Refrigeration, Inc.
Smyrna, Del.

RODENT EXTERMINATOR

Lec Corporation
65 Broad St.
Rochester 4, N. Y.

SANDER
Bench & Portable

American Floor Surfacing Co.
Toledo 3, Ohio

Black & Decker Mfg Co.
Towson, Md

Clarke Sanding Mach. Co.
Muskegon, Mich.

Milwaukee Elec. Tool Corp.
Milwaukee 8, Wis.

Porter-Cable Machine Co.
Syracuse 8, N. Y.

Sears Roebuck
Chicago, Ill.

Woodworkers' Tool Works
222 S. Jefferson St.
Chicago 6, Ill.

SAW

Band

Metal Cutting

Boice Crane Co.
930 W. Central Ave.
Toledo 6, Ohio

Burrill Saw & Tool Works
400 E. Main St.
Ilion, N. Y.

Delta Mfg Div.
Rockwell Mfg Co.
650 E. Vienna Ave.
Milwaukee, Wis.

Machine Tool Div.
Kalamazoo Tank & Silo Co.
Kalamazoo, Mich.

Montgomery Ward
Chicago 7, Ill.

Sears Roebuck
Chicago, Ill.

Wells Mfg Corp.
1938 Ash St.
Three Rivers, Mich.

Wood Cutting

Boice Crane Co.
930 W. Central Ave.
Toledo 6, Ohio

Burrill Saw & Tool Works
400 E. Main
Ilion, N. Y.

Crescent Mach. Div.
Rockwell Mfg. Co.
Letonia, Ohio

J. C. Fay & Egan Co.
Cincinnati, Ohio

Sears Roebuck
Chicago, Ill.

Chas A. Strelinger Co.
139 E. Larned St.
Detroit 26, Mich.

Circular

Cut Off

Aspergren Mfg Co., Inc.
1612 Webster Ave.
New York 51, N. Y.

Bennett-Ireland, Inc.
Norwich, N. Y.

J. A. Fay & Egan Co.
Cincinnati, Ohio

Mattison Mach. Works
230 Blackhawk Pk
Rockford, Ill.

New Holland Mach. Co.
New Holland, Pa.

Wells Mfg Corp.
Three Rivers, Mich.

Hand Portable

Independent Pneumatic Tool
Aurora, Ill.

New Holland Mach. Co.
New Holland, Pa.

Sears Roebuck
Chicago, Ill.

Stanley Elec. Tools Div.
Stanley Works
New Britain, Conn.

Van Dorn Electric Tool Co.
700 E. Joppa Rd.
Towson 4, Md

Rip

Delta Mfg Co.
651 E. Vienna Ave.
Milwaukee, Wis.

Sears Roebuck
Chicago, Ill.

Hack

Champion Blower & Forge Co.
Lancaster, Pa.

Keller Power Hack Saws
2364 University Ave.
St Paul 4, Minn.

Louisville Elec. Mfg Co.
31st & Magazine Sts
Louisville, Ky.

Peerless Machine Co.
1603 Junction Ave.
Racine, Wis.

Sears Roebuck
Chicago, Ill.

Jig

Boice-Crane Co.
930 W. Central Ave.
Toledo 6, Ohio

Delta Mfg Co.
651 E. Vienna Ave.
Milwaukee, Wis.

Porter-Cable Mach. Co.
Syracuse, N. Y.

Sears Roebuck
Chicago, Ill.

SCALDER

Anderson Box Co.
Indianapolis, Ind.

Albright Co.
110 N. Franklin St.
Chicago 6, Ill.

Greenbrier Co.
629 Euclid Ave.
Cleveland 14, Ohio

Gordon Johnson Co.
2619 Madison Ave.
Kansas City 8, Mo.

Pen-Mar Mfg Co.
Doylestown, Bucks Co., Pa.

SEED

Cleaner & Grader

Exolon Co.
900 E. Niagara St.
Tonawanda, N. Y.

A. T. Ferrell & Co.
Saginaw, Mich.

Hance Mfg Co.
Westerville, Ohio

Leach Bros Mfg Co.
Brownwood, Tex.

Pioneer Fanning Mill Co.
Minneapolis, Minn.

Seedburo Equipment Co.
618 W. Jackson Blvd
Chicago 6, Ill.

Drier

Campbell Dryer Co.
DesMoines 4, Ia

Despatch Oven Co.
Minneapolis, Minn.

Duster & Treater

A. T. Ferrell & Co.
Saginaw, Mich.

Judson Co.
Linden, Mich.

Keck-Gonnerman Co.
601 W. Fourth St.
Mt Vernon, Ind.

Messinger Mfg Co.
Tatamy, Pa.

Seedburo Equipment Co.
618 W. Jackson Blvd.
Chicago 6, Ill.

Auger Type

Calkins Mfg Co.
Spokane, Wash.

Ben Gustafson Seed Mach. Co.
Fargo, N. Dak.

Germinator

National Agr. Supply Co.
Ft. Atkinson, Wis.

Seedburo Equipment Co.
223 W. Jackson Blvd
Chicago, Ill.

SHAPER
Metal

Atlas Press Co.
1829 N. Pitcher St.
Kalamazoo, 13, Mich.

Baxter D. Whitney & Sons, Inc.
Winchendon, Mass.

J. C. Fay & Egan Co.
Cincinnati, Ohio

General Engineering & Mfg Co.
417 Oeatha Ave.
St. Louis 16, Mo.

Rockford Mach. Tool Co.
2506 Kishwaukee St.
Rockford, Ill.

Western Mach. Tool Works
Holland, Mich.

Woodworkers Tool Works
222 S. Jefferson St.
Chicago, Ill.

SHEARS
Metal

Black & Decker Mfg Co.
700 Pennsylvania Ave.
Towson 4, Md

Hendly & Whitmore Co.
Beliot, Wis.

VanDorn Elec. Tool Co.
700 E. Joppa Rd.
Towson 4, Md.

Sheep

Montgomery Ward
Chicago 7, Ill.

National Agr. Supply Co.
Ft. Atkinson, Wis.

Sheepshearers Merch. and Comm.
Box 1992
Butte, Mont.

Sunbeam Corp.
1600 W. Roosevelt Rd.
Chicago 50, Ill.

SILO UNLOADER

Marathon Foundry & Mach. Co.
Wausau, Wis.

J. C. Leach Co.
Oshkosh, Wis.

SINGER

Morton Gregory Corp.
518 Jefferson Ave.
Toledo, Ohio

SOIL STERILIZER

General Electric Co.
Schenectady, N. Y.

L. N. Roberson
1540 E. 102nd St.
Seattle, Wash.

SOLDERING
Iron

American Electrical Heater Co.
6110 Dass Ave.
Detroit, Mich.

Cole Radio Works
86 Westville Ave.
Caldwell, N. J.

Drake Elec. Works
3656 Lincoln Ave.
Chicago, Ill

General Electric Co.
Bridgeport, Conn.

Hexacon Electric App. Corp.
161 W. Clay Ave.
Key 271
Roselle Park, N. J.

Ideal Commutator Dresser Co.
Sycamore, Ill.

Insuline Corp. of America
25 Park Pl.
New York City

Jackson Elec. Corp.
625 Broadway
New York City

Link Mfg Co.
Newton Lower Falls, Mass.

Peerless Novelty Co.
105 Fulton
Grand Haven, Mich.

Post Electric Co.
Andover, N. J

Vulcan Electric Co.
600 Broad St.
Lynn, Mass.

Pot

Sta-Warm Electric Co.
151 N. Chestnut St.
Ravenna, Ohio

Westinghouse Elec. Co.
E. Pittsburg, Pa.

SPRAYER
Insecticide

Babson Bros Co.
2834 W. 19th St.
Chicago 23, Ill.

General Electric Co.
Schenectady 4, N. Y.

H. D. Hudson Mfg Co.
589 E. Illinois St.
Chicago , Ill.

Ideal Industries, Inc.
Sycamore, Ill.

Lowell Mfg Co.
Chicago 11, Ill.

Montgomery Ward
Chicago 7, Ill.

F. E. Myers & Bro. Co.
Ashland, Ohio

Poweraire Corp.
332 S. Michigan Ave.
Chicago 4, Ill.

Spray Corp. of America
1712 Payne St.
Evanston, Ill

Tanglefoot Co.
Grnad Rapids, Mich.

Orchard

John Bean Mfg Co.
Lansing, Mich.

Binks Mfg Co.
3114-20 Carroll Ave.
Chicago 12, Ill.

H. D. Hudson Mfg Co.
589 E. Illinois
Chicago, Ill.

F. E. Myers & Bros Co.
Ashland, Ohio

National Agr. Supply Co.
Ft Atkinson, Wis.

Poweraire Corp.
332 S. Michigan Ave.
Chicago 4, Ill.

Sprayer Corp. of America
1712 Payne St.
Evanston, Ill.

Stationary Sprayer

A. B. Farquhar Co.
York, Pa.

Friend Mfg Co
Gasport, N. Y.

Paint

American Brake Shoe Co.
Kellogg Division
Rochester, N. Y.

Binks Mfg Co.
3114 Carroll Ave.
Chicago 12, Ill.

W. R. Brown Corp.
5719 Armitage St.
Chicago, Ill.

Brunner Mfg Co.
Utica, N. Y.
DeVilbiss,
300 Phillips Ave.
Toledo 1, Ohio

Electric Sprayit Co.
220 N. Broadway
Milwaukee, Wis.

General Electric Co.
Schenectady 5, N. Y.

H. D. Hudson Mfg Co.
589 E. Illinois St.
Chicago, Ill.

Ideal Industries Inc.
Sycamore, Ill.

Lowell Mfg Co.
589 E. Illinois St.
Chicago 11, Ill.

F. E. Myers & Bros Co.
Ashland, Ohio

Montgomery Ward
Chicago 7, Ill.

National Agr. Supply Co.
Ft. Atkinson, Wis.

Paasche Airbrush Co.
1909 Diversey Pkwy
Chicago 14, Ill.

Saylor-Beall Co.
Lansing, Mibh.

Sears Roebuck
Chicago, Ill.

Sharpe Mfg Co.
1224 Wall St.
Los. Angeles, Calif.

STEAM CLEANER

Brower Mfg Co.
213 N. 3rd St.
Quincy, Ill.

Wexis Electric Heater Co.
Wexis Bldg
San Francisco, Calif.

STERILIZER (DAIRY UTENSILS)

Ben H. Anderson Mfg Co.
51 N. Dickson St.
Madison, Wis.

Esco Co.
Westchester, Pa.

Gerton Mfg Co.
Millville, Pa.

Victor Products Corp.
Hagerstown, Md

STOCK TANK HEATER

H. D. Campbell Co.
Rochelle, Ill.

General Electric Co.
Schenectady, N. Y.

Hawkeye Steel Products Co.
Waterloo, Ia

H. D. Huson Mfg Co.
589 E. Illinois St.
Chicago, Ill.

International Electric Co.
910 W. VanBuren St.
Chicago, Ill.

National Elec. Appliance Co
1330 W. 117th St.
Cleveland, Ohio

National Ideal Co.
Toledo, Ohio

Ritchie Mfg Co.
Conrad, Ia

Rocklin Mfg Co.
Grand Ave. at Jenning St.
Sioux City 7, Ia

Siebring Mfg Co.
George, Ia

Smith Gates Corp.
Plainfield, Conn.

Westinghouse Electric Co.
Pittsburg, Pa.

Winpower Mfg Co.
Newton, Ia

De-icer

General Electric Co.
Schenectady, N. Y.

Smith Gates Corp.
Plainfield, Conn.

Westinghouse Elec. Co.
Pittsburg, Pa.

THERMOSTATS

American Lincoln Incubator Co.
745 Somerset St.
New Brunswick, N. J.

Brower Mfg Co.
213 N. 3rd St.
Quincy, Ill.

Buckeye Incubator Co.
Springfield, Ohio

National Farm Equipment Co.
581 6th Ave.
New York 11, N. Y.

Oakes Mfg Co.
Tipton, Ind.

Penn Electric Switch Co.
Goshen, Ind.

Sampel Time Control, Inc.
6000 N. Strong Ave.
Spring Valley, Ill.

H. M. Sheer Co.
Quincy, Ill.

Edwin L. Weigand Co.
7500 Thomas Blvd
Pittsburg, Pa.

Wexis Electric Heater Co.
Wesix Bldg
San Francisco, Calif.

Westinghouse Electric Corp.
E. Pittsburg, Pa.

THERMOSTAT WAFERS

American Lincoln Incubator Co.
645 Somerset St.
New Brunswick, N. J.

Beacon Steel Products Co., Inc.
Westminster, Md

Brower Mfg Co.
213 N. 3rd St.
Quincy, Ill.

Buckeye Incubator Co.
Springfield, Ohio

Klein Mfg Co.
Burlington, Ia

National Elec. Appliance Co.
1330-40 W. 118th St.
Cleveland, Ohio

Oakes Mfg Co.
Tipton, Ind.

H. M. Sheer Co.
Quincy, Ill.

TIME SWITCHES
Dimming Devices

General Electric Co.
Bridgeport, Conn.

Montgomery Ward
Chicago 7, Ill.

Paragon Electric Co.
405 S. Dearborn St.
Chicago, Ill.

Sangamo Electric Co.
11th & Converse Sts
Springfield, Ill.

Tork Clock Co., Inc.
1 Grove St.
Mt. Vernon, N. Y.

Trumbull Electric Mfg Co.
Plainville, Conn.

Wadsworth Elec. Mfg. Co.
1941 Wadsworth Ave.
Conington, Ky.

Wesix Electric Heater Co.
Wesix Bldg
San Francisco, Calif.

VULCANIZER

Dill Mfg Co.
700 E. 82nd Ave.
Cleveland 8, Ohio

Inland Rubber Corp.
First National Bank Bldg
Chicago 3, Ill.

Schrader's Son
470 Vanderbilt Ave.
Brooklyn, N. Y.

WAGON UNLOADER

The Fine Mfg Co.
1356 Glen Ave.
Columbus, Ohio

Smalley Mfg Co.
Manitowoc, Wis.

WASHER

Egg

See Egg

Fruit & Vegetable

John Bean Mfg Co.
Lansing, Mich.

Huntley Mfg Co.
Brocton, N. Y.

Noffsinger Mfg & Supply Co.
Fifth to Sixth St. on 6th Ave.
Greeley, Colo.

Paramount Mfg Co.
1615 E. Main St.
P. O. Box 1117
Stockton, Calif.

Parma Water Lifter Co.
Parma, Idaho

WATER HEATER

Dairy Pressure

Ben H. Anderson Mfg Co.
Madison 3, Wis.

DeLaval Separator Co.
1 6 S. Broadway
New Yrok City

Frigidaire Division
General Motors
Dayton, Ohio

General Construction Corp.
St. Petersburg, Fla.

Guard-It Mfg Co.
1501 S. Laflin St.
Chicago 8, Ill.

Modern Water Equipment Co.
Cnicago, Ill.

Montgomery Ward
Chicago 7, Ill.

Universal Milking Machine 6
Waukesha, Wis.

U. S. Motors Corp.
Oshoksh, Wis.

Westinghouse Electric Co.
Pittsburg, Pa.

Immersion Type

Cutler-Hammer, Inc.
Milwaukee, Wis.

General Electric Co.
Schenectady 5, N. Y.

Industrial Engineering & Equ
711 S. Theresa Ave.
St. Louis, Mo.

Lux Co.
Elkhart, Ind.

National Ideal Co.
Toledo 4, Ohio

Smith Gates Corp.
Plainfield, Conn.

Watlow Electric Mfg Co.
1320 N. 23rd St.
St. Louis 6, Mo.

Edwin L. Wiegand
7500 Thomas Blvd
Pittsburg, Pa.

Portable Pour-in

Ben H. Anderson Mfg Co.
Madison, Wis.

Guard-It Mfg Co.
1501 S. Laflin St.
Chicago 8, Ill.

A. L. Smith Corp.
Chicago 4, Ill.

United State Motors Corp.
Oshkosh, Wis.

D. Whitehead Mfg Co.
Trenton, N. J.

WATERERS
(with Heater)

Hawkeye Steel Products Co.
Waterloo, Ia

Klein Mfg Co.
Burlington, Ia

Ritchie Mfg Co.
Conrad, Ia

WATER SYSTEMS

See Pump

WATER WARMER
Poultry

Anderson Box Co.
700 W. Morris St.
Indianapolis, Ind.

Beacon Steel Prod. Co.
Westminster, Md.

Brower Mfg Co.
213 N. Third St.
Quincy, Ill.

Buckeye Incubator Co.
Springfield, Ohio

General Electric Co.
Schenectady 5, N. Y.

H. D. Hudson Mfg Co.
589 E. Illinois St.
Chicago, Ill.

Keen Equipment, Inc.
Vineland, N. J.

Lyon Rural Electric Co.
2075 Moore St.
San Diego, Calif.

National Elec. Appliance Co.
581 Sixth Ave.
New York City

National Ideal Co.
914 Summit St.
Toledo, Ohio

Oakes Mfg Co.
Tipton, Ind.

H. M. Sheer Co.
Quincy, Ill.

Smith-Gates Corp.
Plainville, Conn.

Trumbull Electric Mfg Co.
Plainville, Conn.

WAXER

American-Lincoln Incubator Co.
645 Somerset St.
New Brunswick, N. J.

WELDER

Alloy Rods Co.
York, Pa.

Chicago Precision Machine Co.
922 S. Michigan Ave.
Chicago 2, Ill.

Ergolyte Mfg Co.
3672 N. Lawrence St.
Philadelphia, Pa.

General Electric Co.
922 S. Michigan Ave.
Chicago 2, Ill.

Glenn Roberts Co.
Oakland, Calif.

Harnischieger Corp.
Milwaukee, Wis.

Hobart Bros Co.,
Hobart Square
Troy, Ohio

Hollup Corp.
4700 W. 19th St.
Chicago, Ill.

K. O. Lee Co.
Aberdeen, S. Dak.

Lincoln Electric Co.
12818 Coit St.
Cleveland, Ohio

Marquette Mfg Co.
Minneapolis, Minn.

Miller Electric Mfg Co.
Appleton, Wis.

Montgomery Ward
Chicago 7, Ill.

Patent Specialties, Inc.
76 Cedar Lane
P. O. Box 150
Westwood, N. J.

A. O. Smith Corp.
3533 N. 27th St.
Milwaukee, Wis.

U. S. Elec. Welder Corp.
1224 W. Bancroft St.
Toledo, 6, Ohio

Westinghouse Elec. Corp.
E. Pittsburg, Pa.

Will-Weld Mfg Co., Inc.
60 E. 42nd St.
New York City

Sears Roebuck
Chicago, Ill.

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