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Nebraska
COOPERATIVE EXTENSION WORK
IN AGRICULTURE AND HOME ECONOMICS
U. of N. Agr. College & U. S. Dept. of Agr. Cooperating
W. H. Brokaw, Director, Lincoln

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SUGGESTIONS FOR PREPARING TO USE ELECTRICITY ON YOUR FARM

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Prepared by

W. E. White
Assistant Extension Agricultural Engineer.

SUGGESTIONS FOR PREPARING TO USE ELECTRICITY ON YOUR FARM

This circular is prepared for the purpose of making suggestions that will help the farm family, faced with the pleasant but perplexing problem of using electricity on their farm for the first time, to get started in such a manner that they may realize and enjoy the maximum benefits which electric service can provide.

No two farms are alike and no two farm families have identical desires. The selection, arrangement and use of appliances and equipment will vary greatly. For this reason, no specific outline can be followed in putting electricity to work on the farm. For the most part, it will be necessary for each farm family to work out its own problems. Careful planning then on the part of each farm family is necessary if its members are to get the greatest return from the money they spend for electrical conveniences.

The following outline suggests briefly some of the reasons why it is important to plan to use electricity on a farm.

Necessity of Making Plan to Use Electricity

1. Farmer must plan to know how he can use electricity to the best advantage now and to know how he will use it ultimately.

   A. Starting without enough uses for electricity often discourages rural user.

      (1) Realizes no profit or return.

      (2) Becomes dissatisfied because size of service bill is considered rather than the amount of service that is being received.

   B. Must know approximate cost of equipment.

      (1) Average rural user cannot buy everything at once.

      (2) Must buy equipment from which most benefit will be derived.

   C. Must know how he is going to use electricity before he can plan his wiring.

2. Farmer must plan before he can have his farmstead wired properly.

   A. Amount of wiring will depend upon extent of use of electricity.

   B. Expensive rewiring can be avoided if all future uses are considered and properly planned for.

C. No use putting in wiring that will never be used.

3. Farmer must plan before he can tell whether or not he can afford electricity.

A. Electrifying a farmstead requires a definite outlay of cash to pay for wiring, fixtures, equipment and cost of current.

(1) Farmer must be the one to decide whether or not he can afford to use electricity.

B. Cost will depend upon how far the farmer wishes to go in electrifying his farm.

(1) Should not use cheap and inferior quality materials and equipment.

C. Should have some idea of what his monthly service bills will be.

(1) Compare with old methods.

(2) If use is properly planned, the operating cost will be satisfactory.

(3) In many cases, a direct saving will result.

D. Only complete preliminary planning will disclose total costs connected with electrifying a farm.

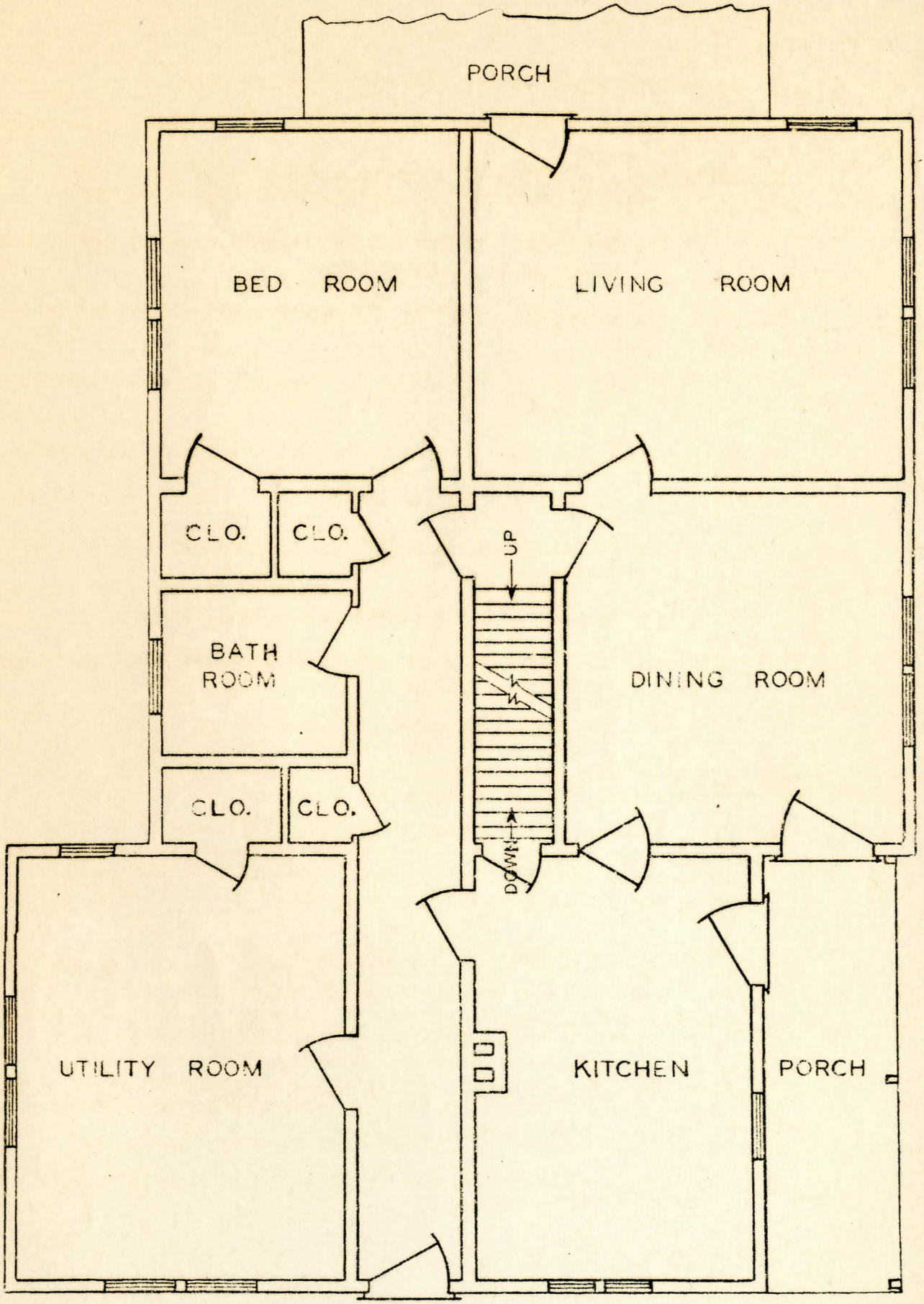
Suggestions for a Plan

1. Draw Sketches.

A. Draw a sketch of the floor plan of each building to be wired showing the location of each room and all possible places that electricity is likely to be used. Make all sketches large enough so that wiring requirements can be shown clearly.

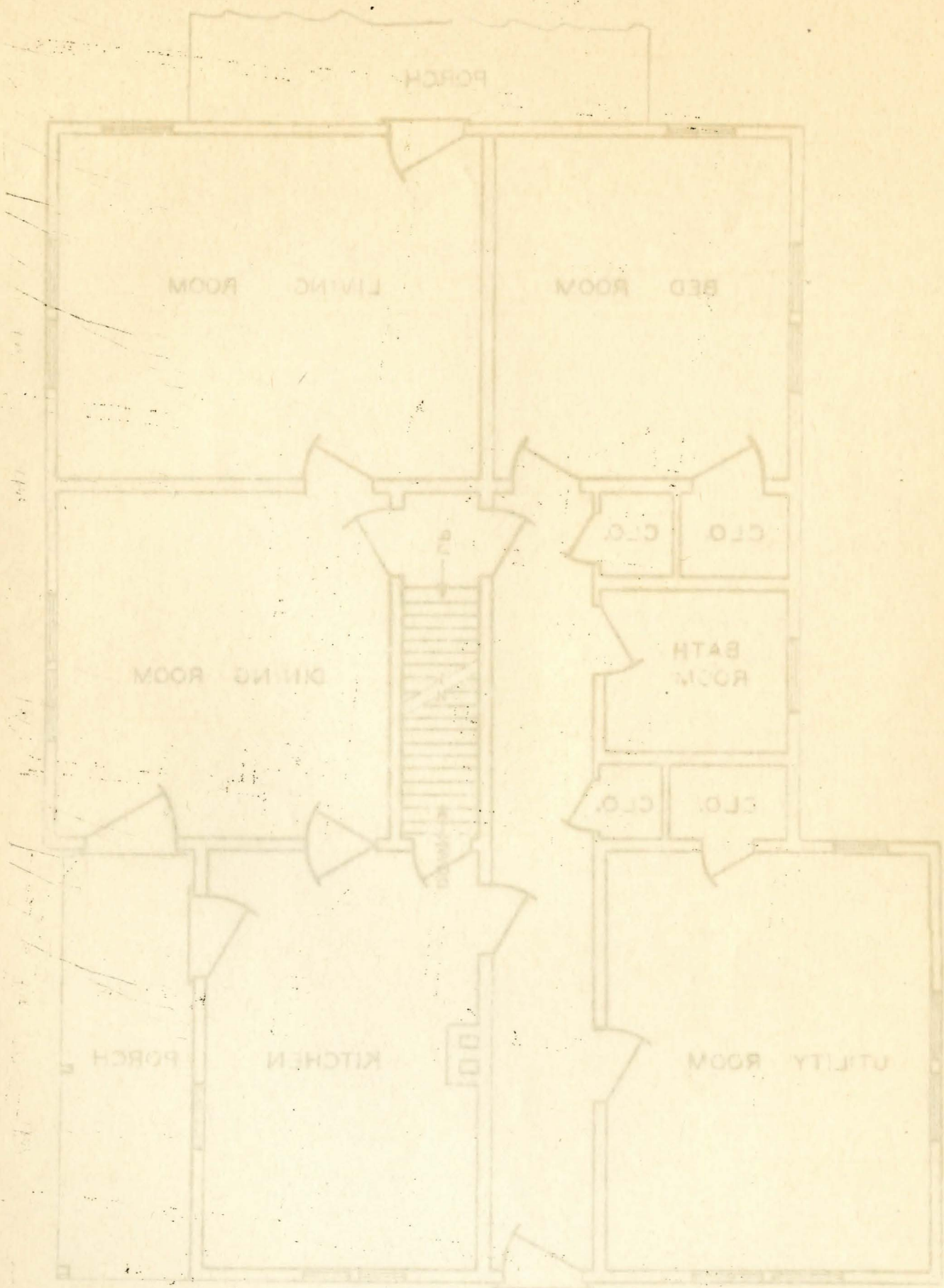
Drawings of a house and barn and an outline of a farmstead have been included here to indicate how the sketches should be drawn. Refer to Figures 1, 2, 3, and 4 on the following pages. Wiring requirements can be inserted on these drawings as a practice exercise in laying out a wiring system before starting on your own drawings. Although only sketches of the house and barn are shown here, similar sketches should be drawn for every major building on your farm including granary, hog house, poultry house, shop, etc.

B. Make sketch of farmstead showing location of all the buildings in relation to each other.



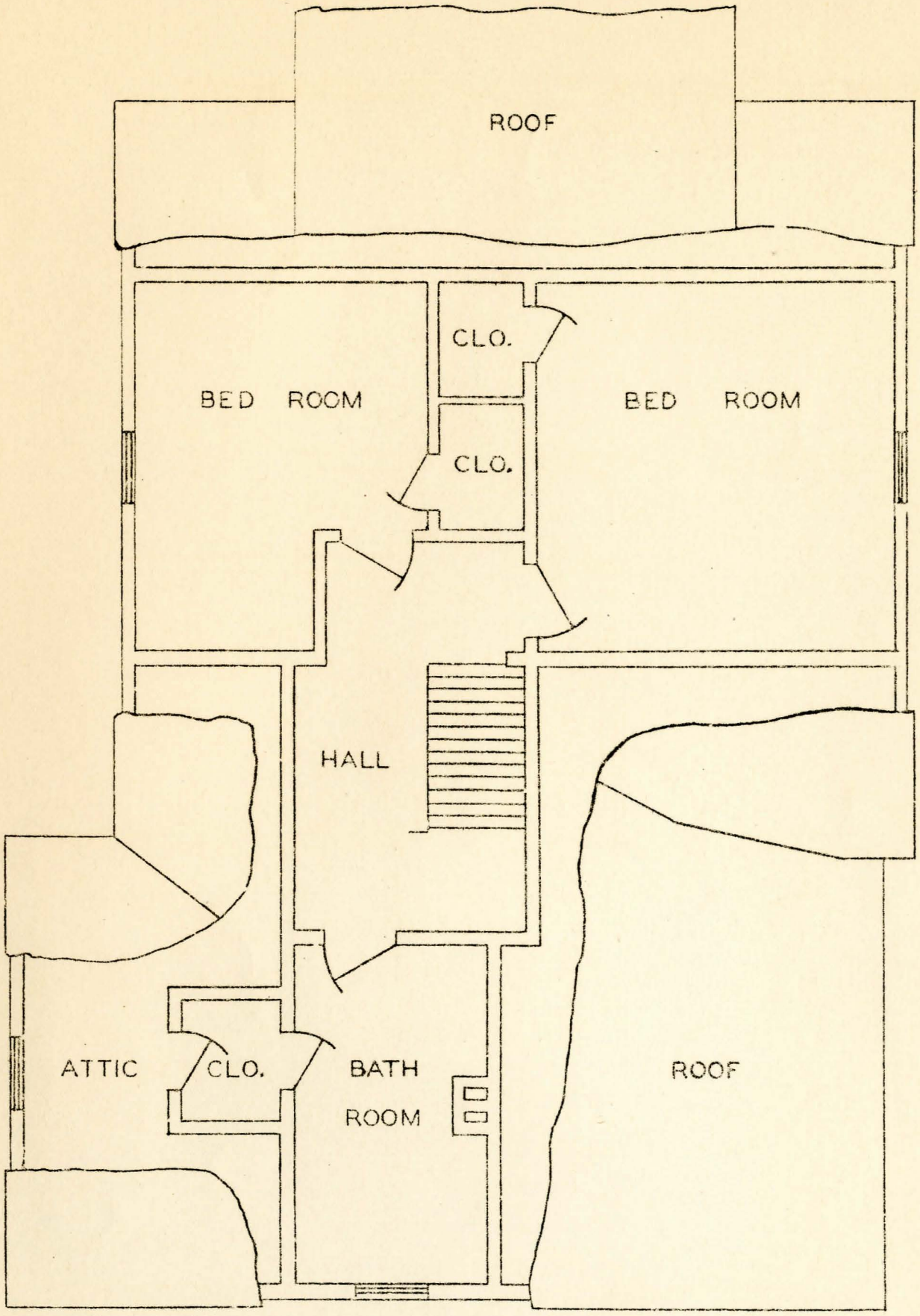
FIRST FLOOR PLAN

FIG. 1 SKETCH OF HOUSE



FIRST FLOOR PLAN

FIG. 1 SKETCH OF HOUSE



SECOND FLOOR PLAN

FIG. 2 SKETCH OF HOUSE

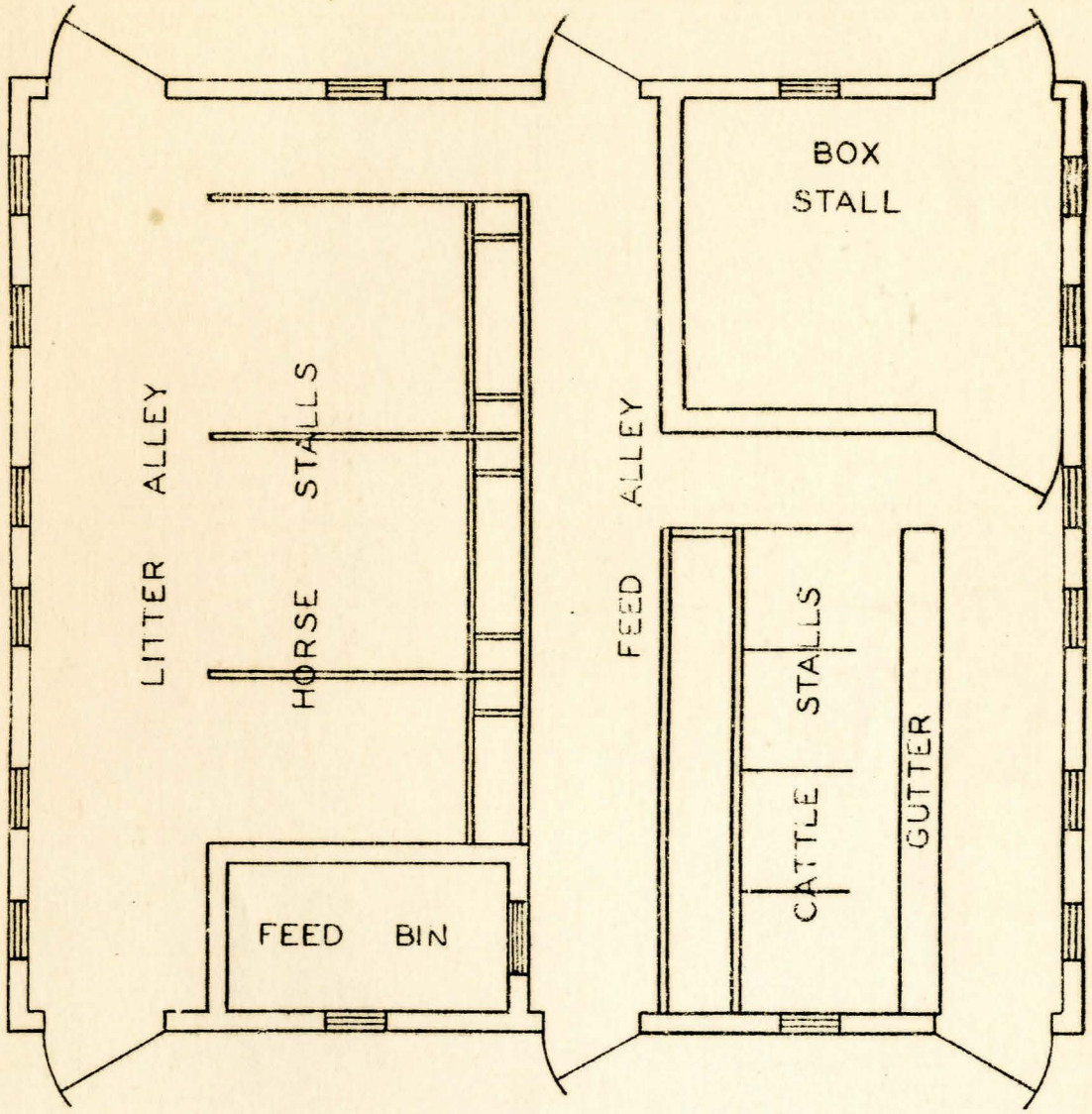


FIG 3 SKETCH OF BARN

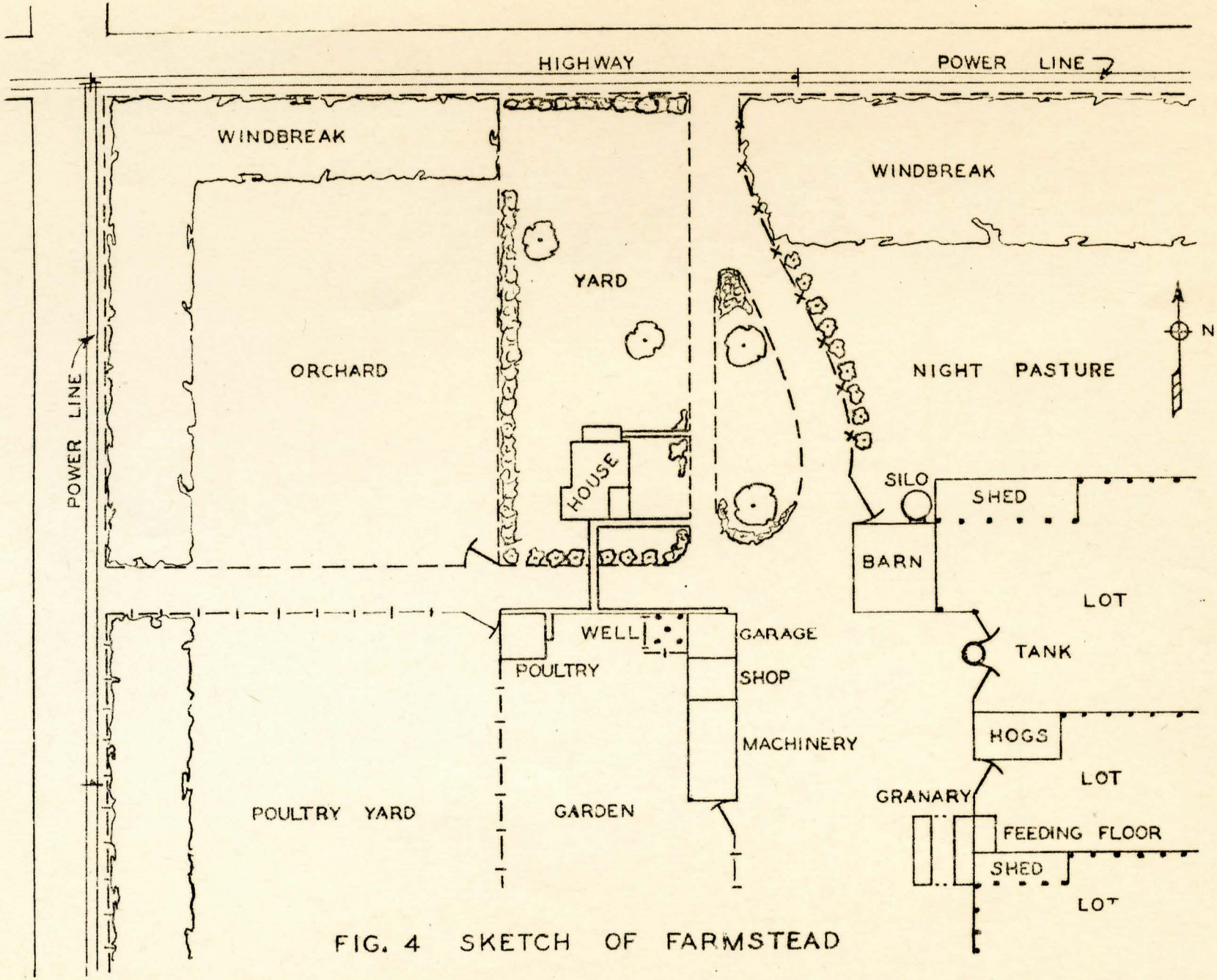


FIG. 4 SKETCH OF FARMSTEAD

SUMMARY OF USES OF ELECTRICITY ON THE FARM

Equipment	Motor Required (H. P.)	Approximate Demand (Watts)	Time to Consume 1 Kw.-Hr. (Hours)	Estimated Energy Consumption: Per Month (Kw.-Hr.)	Estimated Energy Consumption: As shown below
Air Conditioner	$\frac{1}{4}$ - 5	340 - 4900	2.9 - 0.2	*	
Apple Grader	$\frac{1}{4}$ - 3	340 - 2900	2.9 - 0.3		$\frac{1}{2}$ to $1\frac{1}{2}$ kw.-hr. per 100 bu.
Battery Charger	---	100 - 750	10.0 - 1.3	*	
Bone Grinder	5	4900	0.2	*	
Bottling & Capping (Dairy)	1/8-3/4	200 - 900	5.0 - 1.1		1 kw.-hr. per 1,000 bottles
Bottle Washer	1/8-3/4	200 - 900	5.0 - 1.1		$\frac{1}{4}$ to $\frac{1}{2}$ kw.-hrs. per 1,000 bottles
Brooder	---	200 - 1000	5.0 - 1.0		$\frac{1}{2}$ to 1 kw.-hr. per 6 weeks
Burglar Alarm	--	10 - 60	100.0 - 16.7	*	
Casserole	--	100 - 600	10.0 - 1.7	*	
Chafing Dish	--	160 - 600	6.3 - 1.7	*	
Churn	1/16-$\frac{1}{2}$	100 - 600	10.0 - 1.7	1 - 3	
Cider Mill	$\frac{1}{2}$ - 5	600 - 4900	1.7 - 0.2		1 kw.-hr. per 10 bu. apples
Circular Saw (Shop)	1/6 - $\frac{1}{2}$	260 - 600	3.8 - 1.7	*	
Clock	--	2 - 10	500.0 - 100.0	1 - 8	
Coffee Maker	--	450 - 750	2.2 - 1.3	*	
Concrete Mixer	$\frac{1}{4}$ - 5	340 - 4900	2.9 - 0.2		$\frac{1}{2}$ kw.-hr. per cubic yard
Corn Popper	--	200 - 660	5.0 - 1.5	*	
Corn Sheller	$\frac{1}{4}$ - 5	340 - 4900	2.9 - 0.2		$\frac{1}{2}$ to 1 kw.-hr. per 5 bu. corn
Corn Shredder	5	4900	0.2		5 kw.-hr. per ton
Cream Separator	1/6-1/3	260 - 440	3.8 - 2.3		$\frac{1}{2}$ kw.-hr. per 1,000 lbs. milk
Curling Iron	--	12 - 250	83.3 - 4.0	*	
Dairy Equipment Sterilizer	--	1000 - 6000	1.0 - 0.2		$3\frac{1}{2}$ - $7\frac{1}{2}$ kw.-hr. per day
Dishwasher	1/6-1/3	260 - 440	3.8 - 2.3	2 - 3	
Drill Press	1/8 - $\frac{1}{2}$	200 - 600	5.0 - 1.7	1 - 5	
Egg Candler	--	50 - 100	20.0 - 10.0	*	
Egg Poacher	--	350 - 600	2.9 - 1.7	*	
Emery Wheel	1/8 - 1	200 - 1100	5.0 - 0.9	1 - 5	
Engine Heater	--	100 - 1000	10.0 - 1.0	*	
Ensilage Cutter	5	4900	0.2		1 - $1\frac{1}{2}$ kw.-hrs. per ten
Fan	--	40 - 340	25.0 - 2.9	*	
Fanning Mill	$\frac{1}{4}$ - $\frac{1}{2}$	340 - 600	2.9 - 1.7		$\frac{1}{2}$ - 2 kw.-hrs. per 100 bu.
Feed Grinder	$\frac{1}{2}$ - 5	600 - 4900	1.7 - 0.2		3 - 20 kw.-hrs. per ton

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CHART NO. 1

Chart No. 1 Cont'd.

Equipment	Motor Required (H. P.)	Approximate Demand (Watts)	Time to Consume 1 Kw.-Hr. (Hours)	Estimated Energy Consumption: Per Month (Kw.-Hr.)	Estimated Energy Consumption: As shown below
Feed Mixer	¼ - 5	340 - 4900	2.9 - 0.2		½ - 2 kw.-hr. per 1,000 lbs.
Fence (Electric)	--			3 - 6	
Fly Electrocutor	--	50 - 250	20.0 - 4.0	*	
Food Chopper	--	100 - 500	10.0 - 2.0	*	
Food Mixer	--	100 - 500	10.0 - 2.0	*	
Forge Blower	1/10-¼	150 - 340	6.7 - 2.9	1 - 5	
Furnace Control	--	30 - 100	33.3 - 10.0	5 - 20	
Furnace Stoker	1/10-½	150 - 600	6.7 - 1.7	15 - 40	
Grain Elevator	2 - 5	2000 - 4900	0.5 - 0.2		1 - 8 kw.-hr. per 1,000 bu.
Grain Grader & Cleaner	¼ - ½	340 - 600	2.9 - 1.7		½ to 2 kw.-hr. per 100 bu.
Grind Stone	¼ - 1/3	340 - 440	2.9 - 2.3	*	
Hair Dryer	--	35 - 550	28.5 - 1.8	*	
Hay Baler	5	4900	0.2		2 - 4 kw.-hr. per ton
Hay Hoist	3 - 5	2900 - 4900	0.3 - 0.2		1/3 kw.-hr. per ton
Heat Lamp (Infra red)	--	35 - 1500	28.5 - 0.7	*	
Heating Pad	--	35 - 150	28.5 - 6.7	*	
Hot Plate	--	500 - 2000	2.0 - 0.5	*	
Iron	--	550 - 1000	1.8 - 1.0	5 - 8	
Ironing Machine	--	1250 - 1500	0.8 - 0.7	8 - 10	
Irrigation (garden)	¼ - 5	340 - 4900	2.9 - 0.2		½ to 4 kw.-hr. per acre-foot per foot lift
Jig Saw	¼ - 1/3	340 - 440	2.9 - 2.3	*	
Juice Extractor	--	100 - 500	10.0 - 2.0	*	
Lathe	1/8 - 1	200 - 1100	5.0 - 0.9	*	
Lights (Household)	--	200 - 1000	5 - 1.0	15 - 30	
Lights (Yard & Barns)	--	100 - 500	10 - 2.0	10 - 15	
Milk Cooler	¼ - 5	340 - 4900	2.9 - 0.2		½ - 2 kw.-hr. per 10 gallons
Milking Machine	1/6 - 3	260 - 2900	3.8 - 0.3		1½ - 3 kw.-hr. per cow per month
Oil Burner	1/6-1/3	260 - 440	3.8 - 2.3	20 - 40	
Paint Sprayer	¼ - ½	340 - 600	2.9 - 1.7		1 kw.-hr. per 250 sq. ft.
Percolator	--	300 - 660	3.3 - 1.5	5 - 10	
Potato Grader	½ - 1	600 - 1100	1.7 - 0.9		1 - 2 kw.-hr. per 1,000 lbs.
Poultry Lighting	--	40 - 160	25.0 - 6.3		4 - 5 kw.-hr. per mo. per 100 hens
Poultry Water Warmer	--	50 - 700	20.0 - 1.4		1 - 2 kw.-hr. per day
Radio	--	45 - 150	22.2 - 6.7	3 - 15	
Range	--	5000 - 10,000	0.2 - 0.1		1 kw.-hr. per person per day
Razor	--	6 - 15	167.0 - 66.7	Under 1	

Equipment	Motor Required (H. P.)	Approximate Demand (Watts)	Time to Consume 1 kw.-hr. (Hours)	Estimated Energy Consumption: Per Month (Kw.-Hr.)	Estimated Energy Consumption: As shown below
Razor Blade Sharpener	--	10 - 30	100.0 - 33.3	Under 1	
Refrigerator (Dairy)	$\frac{1}{4}$ - 5	340 - 4900	2.9 - 0.2		3/4 - 1 kw.-hr. per 10 gal. per day
Refrigeratior (Household)	--	200 - 440	5.0 - 2.3	10 - 50	
Roaster	--	800 - 1600	1.3 - 0.6	*	
Room Heater	--	550 - 1250	1.8 - 0.8	*	
Sandwich Grill	--	660 - 1000	1.5 - 1.0	*	
Sausage Grinder	1/16-$\frac{1}{2}$	100 - 600	10.0 - 1.7		4 kw.-hr. per 100 lb. meat
Sewing Machine	--	30 - 100	33.3 - 10.0	$\frac{1}{2}$ - 2	
Sheep Shearing	$\frac{1}{4}$ - $\frac{1}{2}$	340 - 600	2.9 - 1.7		1 - 2 kw.-hr. per 100 sheep
Soil Heating Cable (60' on 115v.)	--	400	2.5	*	
Soil Heating (hotbed 6' x 6')	--	400	2.5		$\frac{1}{2}$ - 3 kw.-hr. per 3'x6' sash per day
Soldering Iron	--	60 - 500	16.7 - 2.0	*	
Sun lamp (Ultra violet)	--	60 - 500	16.7 - 2.0	*	
Tank Heater (Livestock)	--	400 - 1600	2.5 - 0.6	*	
Toaster	--	400 - 1200	2.5 - 0.8	5 - 15	
Vacuum Cleaner	--	100 - 340	10.0 - 2.9	$\frac{1}{2}$ - 2	
Vibrator	--	20 - 100	50.0 - 10.0	Under 1	
Waffle Iron	--	300 - 1320	3.3 - 0.8	*	
Washing Machine	1/6-1/3	260 - 440	3.8 - 2.3	2 - 6	
Water Heater (Dairy)	--	500 - 6000	2.0 - 0.2		15 - 35 kw.-hr. per 100 gal. milk
Water Heater (Household)	--	150 - 5000	6.7 - 0.2	100 - 600	2 - 4 kw.-hr. per person per day
Water System (Deep Well)	$\frac{1}{2}$ to 1	600 - 1100	1.7 - 0.9	20 - 40	
Water System (Shallow well)	$\frac{1}{4}$ - 1/3	340 - 440	2.9 - 2.3	5 - 15	
Welder	--	1000 - 5000	1.0 - 0.2	*	
Wood Saw	3 - 5	2900 - 4900	0.3 - 0.2		1 - 3 kw.hr. per cord

* Data not shown because of wide variation in uses.

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CHART NO. 1 (Cont'd.)

2. Plan Uses.

A. Study carefully the summary of uses of electricity on the farm given in Chart No. 1 on pages 7, 8, & 9 of this circular. With your sketches and this summary as a guide, make a list of all the electrical equipment that is likely to be used on your farm in the years to come. This list will be used as a guide for planning the wiring of your farmstead and, for that reason, care should be taken that all practical uses are listed. Even though some of the uses may have a remote possibility of ever being used, it is best to include them in this list. Make your list in the following manner.

Basement
- Air conditioning
- Furnace stoker
- Lights
- Oil burner
- Washing machine
- Water heater
- Water system

Bath Room
- Curling iron
- Hair dryer
- Lights
- Razor
- Room heater
- Sun lamp
- Vibrator

Bed Rooms
- Air conditioning
- Clock
- Curling iron
- Fan
- Hair dryer
- Heat lamp
- Heating pad
- Lights
- Radio
- Sewing machine
- Vacuum cleaner

Dining Room
- Casserole
- Chafing dish
- Clock
- Fan
- Lights
- Radio
- Sandwich grill
- Toaster
- Vacuum cleaner
- Waffle iron

Hallways
- Lights
- Vacuum cleaner

Kitchen
- Casserole
- Chafing dish
- Churn
- Clock
- Coffee maker
- Corn popper
- Cream separator
- Dishwasher
- Egg poacher
- Fan
- Food chopper
- Lights
- Percolator
- Radio
- Range
- Refrigerator
- Roaster
- Sandwich grill
- Toaster
- Waffle iron

Living room
- Clock
- Fan
- Lights
- Radio
- Vacuum cleaner

Porch
- Churn
- Cream separator
- Fan
- Lights

Utility Room
- Cream separator
- Egg candler
- Fan
- Hot plate
- Iron
- Ironing machine
- Lights
- Radio
- Sausage grinder
- Washing machine
- Water heater

Barn
- Elevator
- Ensilage cutter
- Fan
- Feed grinder
- Feed mixer
- Fly electrocutor
- Hay hoist
- Lights
- Milking machine
- Paint sprayer
- Sheep shears
- Tank heater

Dairy Barn
- Bottling and capping
- Bottle washer
- Equipment sterilizer
- Ensilage cutter
- Fans - ventilating
- Feed grinder
- Feed mixer
- Fly electrocutor
- Grain elevator
- Hay hoist

Dairy Barn (Cont'd.)
- Lights
- Milking machine
- Milk cooler
- Refrigeration
- Tank warmer
- Water heater

Garage
- Engine heater
- Lights

Granary and Crib
- Burglar alarm
- Corn sheller
- Feed grinder
- Grain elevator
- Grain grader and cleaner
- Lights

Poultry and Brooder House
- Brooder
- Lights
- Water warmer

Shop
- Battery charger
- Circular saw
- Drill press
- Emery wheel
- Fan
- Forge blower
- Grind stone
- Jig saw
- Lathe
- Lights
- Soldering iron
- Welder

The above list of equipment suggests possible places of using different kinds of equipment and can be used for checking your own list for completeness.

B. In outlining the uses of electricity on your farm, it would be well to seek the advice of someone familiar with wiring problems and general use of electricity. This advice could be secured from your County Agricultural Agent, an agricultural representative of the utility company supplying the service or a reliable and qualified electrical contractor. Discuss the various uses of electricity with this adviser and give his suggestions proper consideration.

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C. Now refer to your sketches. Picture your family making use of each of the different pieces of equipment you have listed and begin to plan the outlets that will best take care of the uses you and your family will have for that equipment. Mark plainly the location and type of each outlet with some kind of symbol as you go along. The symbols suggested below are not complicated and will be sufficient for your part of the wiring detail.

Symbols for Indicating Outlets

Ceiling Outlet	-	An accessible opening in a wiring system for supplying electricity to a lighting fixture suspended from the ceiling.
Wall Bracket Outlet	-	An accessible opening in a wiring system provided for supplying electricity to lighting fixtures hung on side walls.
Convenience Outlet	-	An accessible opening in a wiring system for supplying electricity for operating portable electric appliances such as radios, toasters, vacuum cleaners, floor lamps, etc.
Special Purpose Outlet	-	An opening provided for supplying electricity to major appliances and equipment such as ranges, water heaters, large motors or other special applications. Such outlets are usually installed on individual circuits and the use will determine the type and size of outlet. (Label each special outlet on sketch.)
S_1 Single Pole Switch	-	Switch used in a lighting fixture circuit when it is desired to turn the light on and off at one place.
S_3 Three Way Switch	-	Switch necessary in controlling a light from two different places. Two such switches are necessary in one circuit.
S_4 Four Way Switch	-	Switch necessary in controlling a light from three or more places. Four-way switches are used in conjunction with three-way switches. Two three-way switches are used and as many four-way switches as there are additional places of control.

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C. (Cont'd.) Suggestions for minimum outlet requirements are given in Chart No. 2 on page 18. Figures 5, 6, and 7 on the following pages indicate how your sketches should look when you are ready to ask a wireman what your wiring is going to cost.

D. Designate on the farmstead sketch where the center of distribution should be and show desired location of service wires, taking into consideration accessibility from main line, appearance of farmstead and center of future load. See Figure 8. If underground service wires are desired, this should be noted and planned for.

3. Plan the Wiring

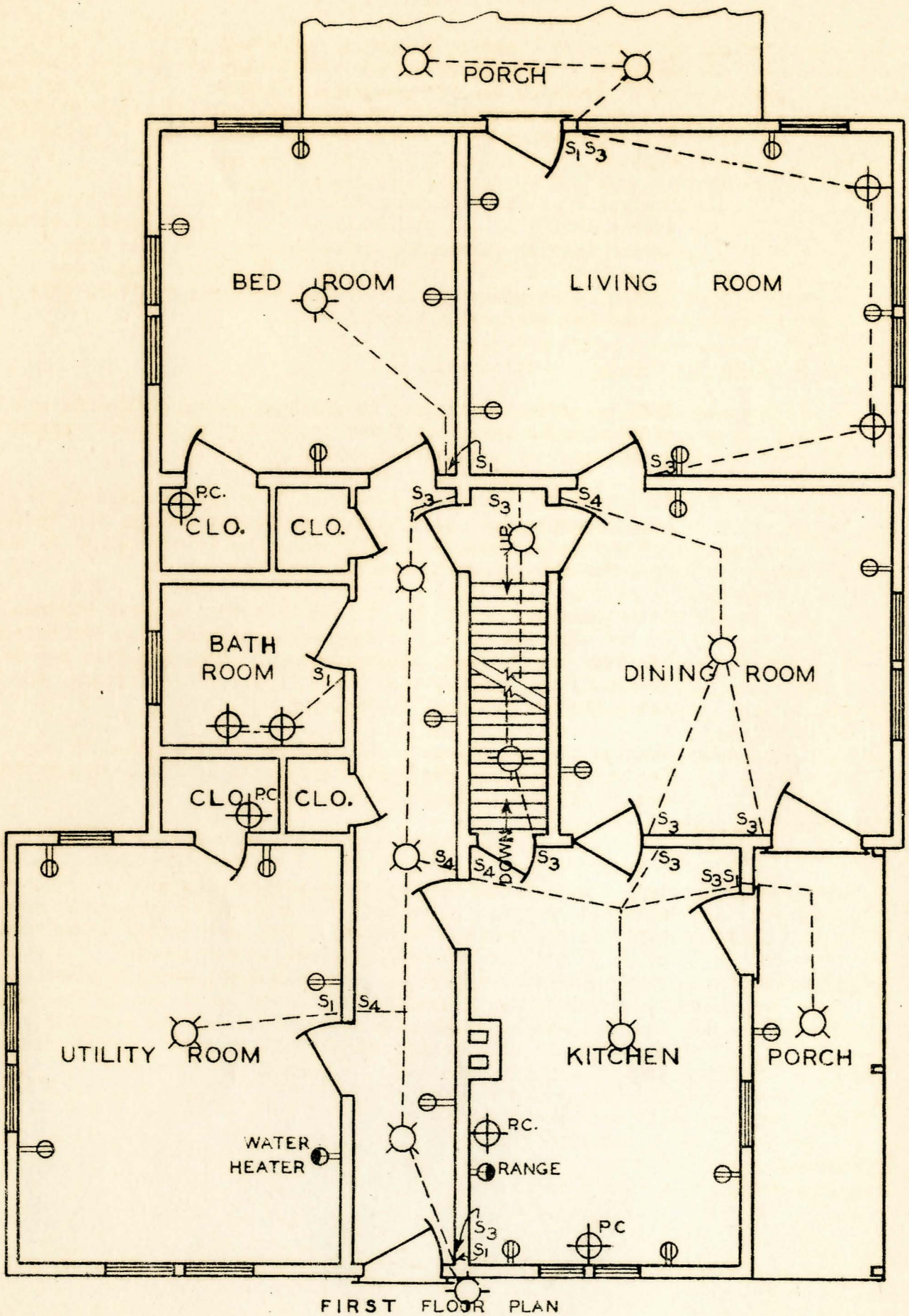
A. When the uses are planned as outlined above, it should not be difficult for the electrician to furnish an accurate estimate on the cost of a completed wiring job.

B. Wiring of the farmstead should be done by a qualified and reliable electrician. It should never be referred to the "would be" wireman. Beware of the wireman who is willing to do the work for less money in order to get the job.

C. It is usually a good plan to get bids from several wiremen. Insist that the wiring be done in accordance with the current issue of the National Electric Code, a copy of which may be obtained from the National Board of Fire Underwriters, 222 West Adams Street, Chicago, Illinois.

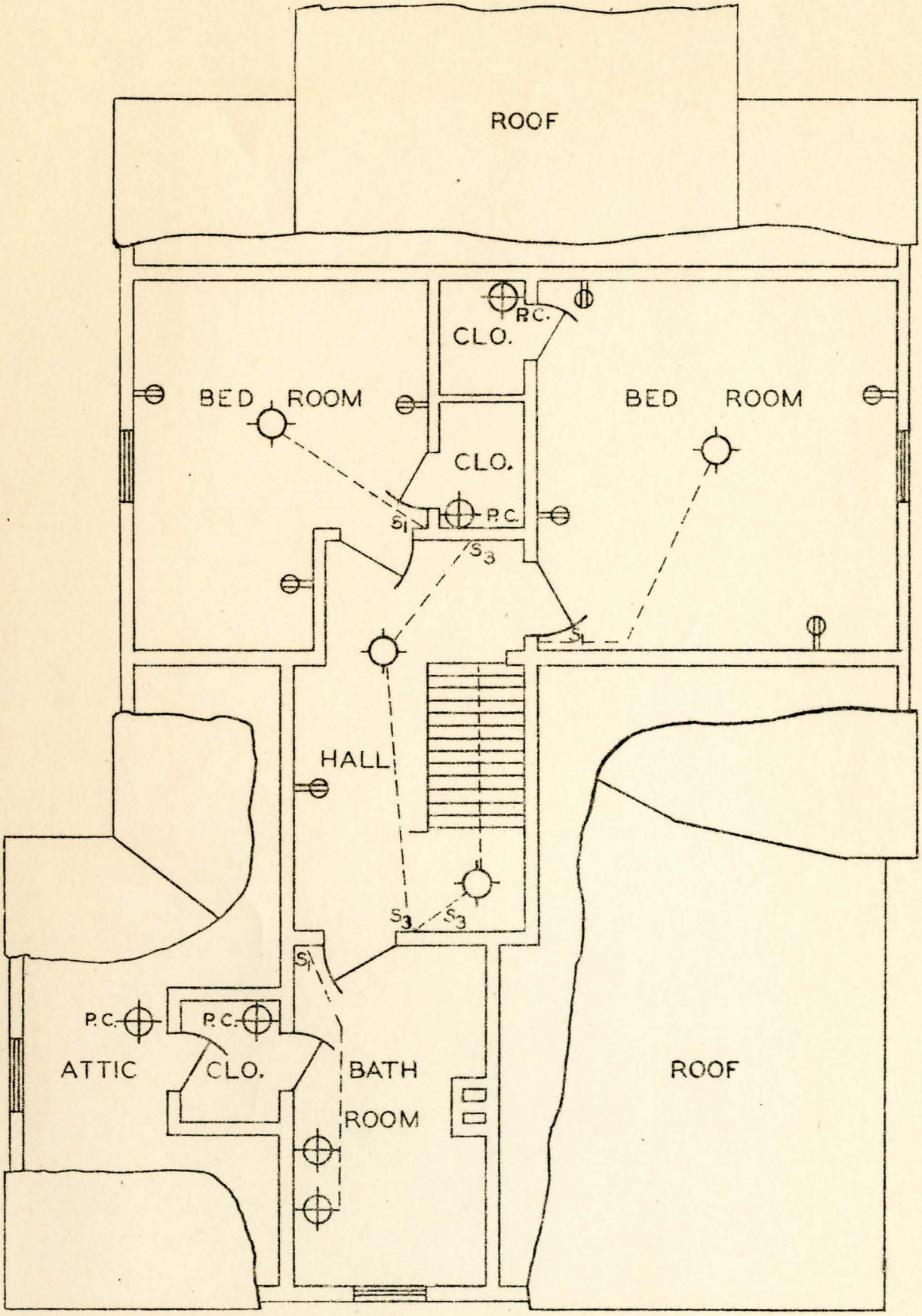
D. Arrange to have the completed wiring job inspected by an inspector from the State Fire Marshal's office before making the final payment to the wireman.

E. The wiring agreement for a complete farm wiring job should be made in writing regardless of the parties involved. The agreement should include location of property, a complete and detailed schedule of outlets for the entire farmstead, necessary services and service entrances, kind of material to be used, price to be paid, terms of payment, understanding of inspection, date for completion of work and any special considerations involved. The agreement should be signed by the party responsible for having the wiring done and the party doing the wiring. Written agreements help to avoid misunderstandings.



FIRST FLOOR PLAN

FIG. 5 SKETCH OF HOUSE COMPLETED



SECOND FLOOR PLAN

FIG. 6 SKETCH OF HOUSE COMPLETED

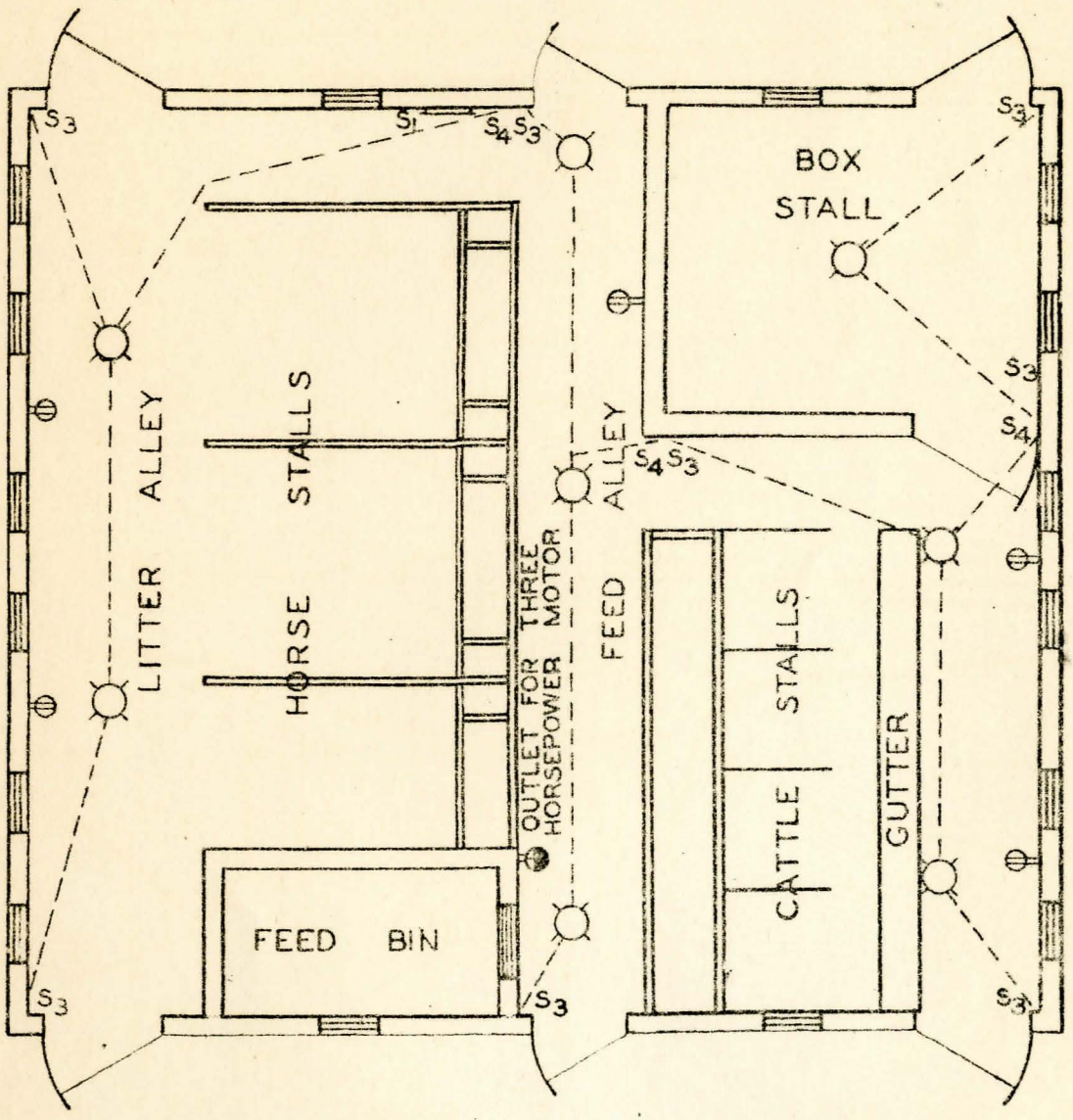


FIG. 7 SKETCH OF BARN COMPLETED

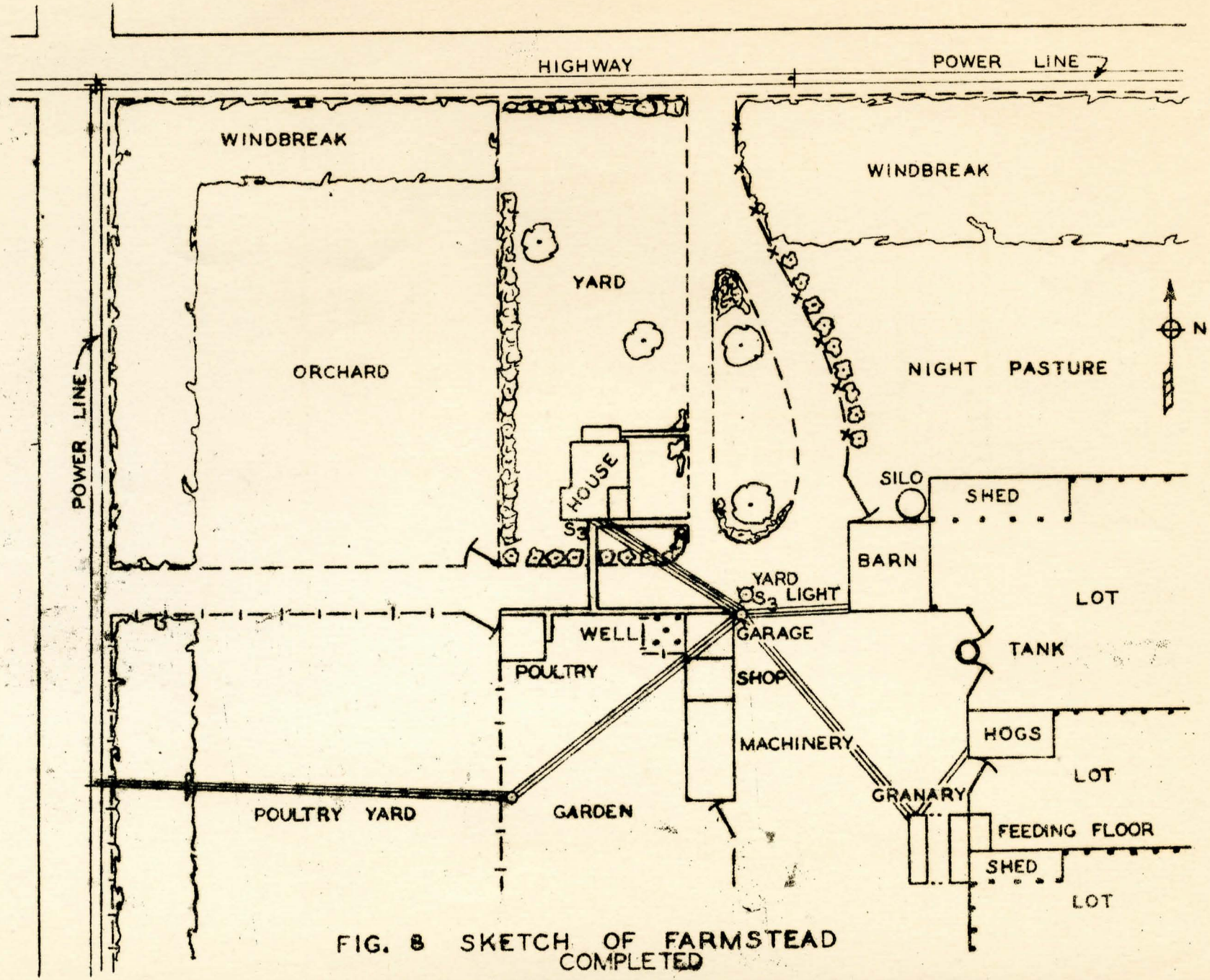


FIG. 8 SKETCH OF FARMSTEAD COMPLETED

MINIMUM RECOMMENDATIONS FOR OUTLETS AND SWITCHES

Place	Outlets for Lights	Switch Location	Convenience Outlets
Front or side porch	One overhead or two on either side of door.	Inside door	One weatherproof outlet for appliances used on porch.
Back porch	One overhead or two on either side of door	Inside kitchen door, also at barn & garage	One weatherproof outlet if appliances are used on porch.
Hallway or stairway	One ceiling light	Inside hall door and at head of stairs	Outlet for vacuum cleaner
Closets	One over door	Pull chain	None
Living Room	One ceiling light - side lights as desired	Each main door	One for each wall space but not farther than 12 feet apart
Dining room	One ceiling light	Each main door	One accessible from dining table
Kitchen	One ceiling - supplemented with necessary bracket lights over range and sink	Each main door	Heavy duty for range and outlets for appliances, refrigerator and clocks.
Pantry	One ceiling light	Outside pantry door	One outlet for appliances
Bath Room	One on either side of mirror	Locate switch at door	One outlet for electric razor
Bedroom	One ceiling outlet	Switch at door	Outlets for bed lamps & dresser
Attic	At least one ceiling light	Switch at bottom of stairs	None
Basement	One ceiling outlet for each 200 sq. ft. of floor area or each separate room	Switch at head of stairs	Outlets for work shop and laundry room as needed
Garage	One over hood of each car	At door	Between cars at front
Yard Light	Outdoor type on pole	At house, barn, garage	None
Poultry House	One outlet for each 200 sq. ft. of floor area	At each door	Every 20 feet.
Cow Barn	Porcelain socket swung by heavy duty cord for every 100 sq. ft. of floor area	At each door	Every 20 feet.
Silo	One in top of silo well	At entrance	None
Granary	Ceiling light	At entrance	Special outlet for motor
Hay Loft	Flood light near entrance	At entrance	
Horse Barn	One light for each 200 sq. ft. floor area	At entrances	Special outlets for motor to operate hay hoist, grinder & other equipment
Shop	One light for every 10 ft. of bench length	At entrance	Outlet for each piece of power driven equipment
Pump House	One light in outlet box receptacle	Pull chain	Pump wired in.

CHART NO. 2

4. Plan the Cost.

A. The cost of electricity from central station lines for the farm involves the cost of wiring the farm, the cost of the equipment and the cost of operating the equipment. Occasionally it is necessary for the farm owner to pay part of the cost of the line extension. If this is the case, the amount involved must of course be included in the cost figures.

B. Cost of Wiring

There is a minimum amount of wiring that should be installed and it is unwise to try to go below this amount. The difference in cost between a good wiring job and a cheap wiring job is so small it will soon be accounted for either in current savings, added convenience or the cost of revamping a wiring system. For the most part, the judgment of one or more reliable and qualified electricians should be accepted in determining the cost of wiring.

The following figures may be used as a basis for making a rough estimate of the cost of a wiring installation.

Meter loop with 60 ampere main switch	$14.00
Service entrance each major building	8.00
Wiring between buildings per foot	.08
Yard pole - 25 feet	5.00
Light, switch and convenience outlets each	2.50
Range outlet	15.00
Home water heater outlet	6.00
Large motor outlets 3 or 5 H. P.	9.00
Yard light	5.00

C. Cost of Equipment.

In considering the cost of equipment, the farm family should plan to buy equipment in the order in which they feel they will realize the most benefit. Here the problem of choosing between price and quality presents itself. Inferior quality equipment may be purchased or good quality equipment may be purchased. Ordinarily, equipment of good quality sells for more money than equipment of inferior quality. This statement should not be taken to mean that all high priced equipment is the equipment to buy. It does mean that care must be exercised in selecting the equipment to be used.

The safest method of buying electrical equipment is to buy standard, tested and proven equipment that is made by a reputable manufacturer and sold by a reliable dealer. For additional security, seek the advice of a non-interested party capable of judging the merits of electrical equipment.

Refer to Chart No. 3, page 21, for the probable range of prices of electrical equipment commonly used on farms.

Lighting fixtures are items of electrical equipment and their selection usually presents a definite problem to most farm families. Large sums of money need not be spent in order to have good lighting fixtures. Elaborate fixtures are not necessary. A set of fixtures to provide general lighting for an ordinary five room home can be purchased for less than $25. These fixtures would not be elaborate but would provide just as good lighting as some fixtures that might cost two or three times this amount. A set of good quality fixtures for an ordinary five room house can be purchased for less than $50. Fixtures for large or small houses will cost more or less according to the number and kind of rooms supplied with fixtures. It would be wise for the family not familiar with methods of good lighting to seek the advice of a reliable, competent, and unbiased adviser before buying their fixtures.

D. Cost of Operating Equipment.

A plan for using electricity on the farm is not complete until the operating cost is known. Electricity will replace many present methods of doing work on the farm and these present methods involve certain costs. The actual cost of using electricity will be the difference between the cost of present methods and the cost of doing the same work with electricity.

Chart No. 5 on page 23 can be used as a guide in estimating present costs if these costs are not known.

Chart No. 6 on page 24 suggests a method for estimating the cost of using electricity.

Example for Figuring Cost of Using Electricity

Consider the lights to be used on your farm. Referring to column 3 of Chart No. 1 on pages 7, 8, & 9, if your farm is an average farm you will probably use in the neighborhood of 360 kilowatt hours each year or thirty kilowatt hours per month for lighting. If the farm is large and the family is large and inclined to use a great deal of light, the monthly consumption for lights may be 50 or more kilowatt hours. By inserting these figures on a form similar to the one on page 25 and proceeding in a similar manner for all the probable uses that you have listed, it is possible to determine the approximate cost of using electricity. Such an analysis will also disclose the cost of each use.

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USE	Range of Price	Average Yearly kw.-hr. Consumption	Power Required (Watts)	Voltage Required
FARM:				
Battery Charger	$15 - $50	60	100 - 750	115 - 230
Bottle Washer	5 - 15	15	200 - 900	115 - 230
Chicken Brooder	25 - 50	250 (500 chicks)	200 - 450	115
Chore Motors:				
Stationary 2-3-5 H.P.	75 - 150		2000 - 4900	230
Portable 3-5 H.P.	230 - 275	(See Chart #4)	2900 - 4900	230
Churn	10 - 25	12	100 - 600	115
Cream Separator	20 - 100	25	260 - 440	115
Farm Shop	10 - 250	36	260 - 2000	115 - 230
Incubator	20 - 100	150 (500 chicks)	250 - 400	115
Lighting Fixtures	25 - 300	360	300 - 2500	115
Milk Cooler	250 - 500	720	340 - 4900	115 - 230
Milking Machine (Portable)	50 - 300	96	260 - 440	115
Refrigeration (Dairy)	200 - 500	1000	340 - 4900	115 - 230
Sausage Grinder	25 - 100	5	100 - 600	115
Sheep Shears	25 - 100	5 (200 sheep)	340 - 600	115
Soil Heating	15 - 50	60	400 (2 frames)	115
Tank Heater	8 - 25	250	400 - 1600	115
Water System (Entire farm)	50 - 500	150	340 - 1100	115 - 230
HOME:				
Clocks	$ 3 - $20	24	2 - 10	115
Dishwasher	150 - 400	28	260 - 440	115
Fans	5 - 40	75	40 - 340	115
Heating Pad	3 - 9	36	35 - 150	115
Iron	3 - 8	84	550 - 1000	115
Ironing Machine	40 - 130	108	1250 - 1500	115
Oil Furnace	100 - 800	300	260 - 440	115
Radio	15 - 150	120	45 - 150	115
Range	85 - 300	1500	5000 - 10,000	115 - 230
Refrigerator	140 - 300	500	200 - 440	115
Sewing Machine	10 - 100	10	30 - 100	115
Small Appliances	3 - 25	150	300 - 1200	115
Vacuum Cleaner	40 - 90	18	100 - 340	115
Washing Machine	40 - 100	48	260 - 440	115
Water Heater	50 - 150	2500	150 - 5000	230

CHART NO. 3

This chart is included in this circular to serve as a guide for selecting electrical equipment for an ordinary farm.

Column 1 suggests some of the more common uses of electricity on farms.

Column 2 indicates the range of prices that can be anticipated and can be used in estimating probable equipment cost.

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Column 3 shows the average yearly kilowatt consumption to be expected from ordinary use of the respective equipment. This data can be used in figuring probable operating costs.

Column 4 lists the range of power required to operate the various kinds of equipment. This information must be taken into consideration in planning a wiring system.

Column 5 shows the voltage at which each kind of equipment is usually operated.

FARM EQUIPMENT
ADAPTED TO PORTABLE ELECTRIC MOTORS

Machine	Range of Size of Motor Required	Average Kw. Hr. Consumption
Concrete mixer	1/4 - 5 H. P.	½ kw. hr. per cu. yd.
Corn sheller (1-2 holes)	1/4 - 2 H. P.	1 kw. hr. for 5 bu.
Shredder (4-8 rolls)	5 - 25 H. P.	5 kw. hr. per ton
Grain elevators	2 - 7½ H. P.	3 kw. hr. per 1,000 bu.
Ensilage cutters	5 - 40 H. P.	1 kw. hr. per ton
Fanning mills	1/4 - 7½ H. P.	1 kw. hr. per 100 bu.
Feed grinders:		
Burr-stone type	3 - 30 H. P.	1/10 to 3 kw. hr. per 100 lbs.
Burr type	1/4 - 25 H. P.	Feed ground depending on
Hammer type	1 - 200 H. P.	fineness, kind of feed and machinery.
Feed mixers	1/4 - 7½ H. P.	1 kw. hr. per ton
Hay hoists	3 - 10 H. P.	1 kw. hr. for 3 tons
Hay baler	5 - 15 H. P	3 kw. hr. per ton
Wood saw	3 - 5 H. P.	1 to 2½ kw. hr. per cord
Irrigation (surface)	5 - 125 H. P.	3 kw. hr. per acre foot

CHART NO. 4

Chart No. 4 is inserted as a supplement to the preceding chart. It suggests some common uses for electric motors, the sizes of motors required to do the work, different kinds of work. The chart indicates very wide range of motor sizes for some of the work. This is included to emphasize the necessity of careful selection of equipment. Use of motors larger than 5 H. P. should not be anticipated for farm use unless special arrangements are made with a representative of the power source for using them.

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ESTIMATING COST OF PRESENT METHODS

Items	Cost of Equipment	Fuel, oil, etc. used per month	Cost per Month
Lamps and Lanterns	$28.00	Kerosene & gasoline	$1.25
Battery radio	65.00	Charging battery	.75
Washing Machine	100.00	2 gals. gasoline © 20 cents	.40
Windmill and Water Supply Tank	110.00	Maintenance & oil	.54
Brooding chickens	20.00	Kerosene	1.00
Ice Box	25.00	750 lbs. @ 50 cents per 100 lbs.	3.75
Grinding feed		2 tons custom grinding @ $1.50	3.00
Range (gasoline)	60.00	10 gal. gasoline @ 20 cents	2.00
		TOTAL MONTHLY COST	$12.69

CHART NO. 5

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ESTIMATING AVERAGE MONTHLY COST OF ELECTRICITY
FOR A FARM

Use	Equipment Cost	1st Block 40 KWH 3.50	2nd Block 40 KWH 4 cts.	3rd Block 120 KWH 2½ cts.	4th Block 1⅓ cts.	Cost of Each Use
Lighting Entire Farm	$75.00	30				(
Radio	50.00	10				($3.50
Washing Machine	80.00		3			.12
Iron	7.00		6			.24
Water System	100.00		13			.52
Small Appliances	25.00		12			.48
Chicken Brooder	35.00		6	14		.59
Cream Separator	20.00			2		.05
Farm Shop	50.00			4		.10
Refrigerator	195.00			40		1.00
Feed Grinder	75.00			34		.85
Electric Clocks	12.00			4		.10
Range	120.00			22	108	2.17
				TOTAL COST OF CURRENT		$9.72

CHART NO. 6

Because of the investment necessary to provide power facilities, the cost of the first kilowatt hours delivered to a service connection is comparatively high. As more electricity is used under the same conditions of demand, the cost per kilowatt hour gradually decreases. Electric rates are generally set up on this basis. In checking electric rates with the utility supplying your service, you will more than likely find the rate divided into blocks or steps. The first block or step comes at a comparatively high price per kilowatt hour, the next block comes at a lower price per kilowatt hour and so on until the lowest price per kilowatt hour is reached. Consequently, greater use of electricity automatically reduces the cost of electricity on a unit basis.

The rate used in the above example is a typical rural rate in Nebraska and serves as a good illustration for power costs.

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A SPECIFIC PLAN

Use	Cost of Eqpt.	1st Block	2nd Block	3rd Block	4th Block	Cost of each use

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SUMMARY

Cost of Line Extension _____

Cost of Wiring Farmstead _____

Probable cost of electrical equipment:

(List equipment and cost below)

1. Lighting Fixtures _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

TOTAL _____

INITIAL INVESTMENT CONTEMPLATED _____

SALVAGE VALUE OF PRESENT EQUIPMENT _____

Monthly cost of doing work by present methods _____

Estimated monthly cost of doing work with electricity _____

Difference in favor of _____ per mo.

_____ per yr.

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SUMMARY

Cost of Line Extension _____

Cost of Wiring Premises _____

Probable cost of electrical equipment:

(List equipment and cost below)

1. Lighting Fixtures _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

TOTAL _____

INITIAL INVESTMENT SCHEDULE _____

SAVINGS VALUE OF PRESENT EQUIPMENT _____

Monthly cost of doing work by present methods _____

Estimated monthly cost of doing work with electricity _____

Difference in favor of _____ for me.

_____ for us.

COSTS: