Rural electrification handbook. 1929/1932

Duffee, F. W., 1893- (Floyd Waldo); Schaenzer, Joseph Peter, 1892-
Madison, Wisconsin: Agricultural Engineering Dept., College of Agriculture, University of Wisconsin, 1929/1932

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RURAL ELECTRIFICATION HANDBOOK

Agricultural Engineering Department
College of Agriculture
University of Wisconsin
Madison, Wis.

UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department

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RURAL ELECTRIFICATION - INFORMATION SHEET

The Department will send out new and pertinent information and illustrations from time to time in the form of loose leaves punched as per this specimen to fit a loose leaf note book.

Use tabbed index. It is suggested that the book be fitted with a tabbed index, using the index labels given on the index sheet accompanying this sheet.

F. W. DUFFIE
Department of Agricultural Engineering

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UNIVERSITY OF WISCONSIN
College of Agriculture
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INDEX

File under Cooking
4-29

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

RANGE SURVEY - 1928

A survey on the characteristics and uses of electric ranges was made in the territories of the Southern Wisconsin Electric Company and the Wisconsin Public Service Corporation by the Agricultural Engineering Department, College of Agriculture. Thirty-four answered the questionnaires sent out and the replies are tabulated below.

Questions Asked	Answers
1. Number and year ranges were purchased.	1901-1, '21-1, '22-1, '24-1, '25-4, '26-9, '27-17.
2. Average number cooked for.	From 4 to 6.
3. Number purchasing bakery goods.	16 some, 16 none, 1 all.
4. Number using range for heating dish water.	23 do, 6 do not, 5 some.
5. Number using range for canning.	22 do, 11 do not, 1 some.
6. Number having combination range.	5.
7. Number using pressure, fireless or waterless cookers.	26 none, 2-p, 1-f, 7-w
8. Number of ranges with 3,4,5 or 6 burners.	20-3 burners, 12-4b, 1-5b, 1-6b.
9. Number having open or closed burners.	26 open, 4 closed, 2 closed and open.
10. Number having oven on side, below or above.	29 side, 4 below, 1 above.
11. Preference of location of oven.	27 side, 2 below. Rest have no preference.
12. Number having oven with automatic temperature control.	23 have, 11 have not.
13. Reliability of automatic temperature control.	All say good.
14. Number with automatic clock control.	25 have, 8 have not.
15. Number believing clock worth extra cost.	9 do, 9 do not.
16. Number having convenience outlet.	31 have, 3 have not.
17. Changes and improvements suggested are;	Eliminate gas in oven thru ventilation. High back and shelf desirable. Better wire connections. Closed plate and better burners. Thermometer on oven. Convenience outlet. Larger oven.
18. Average number of months used in year	8.

File under Electro-Test Farms
1-31

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken during 1928 on the farm of Mr. Geo. Walters, Electro-Test Farm #20, Allenville, Wis. Mr. Walters is served by the Wisconsin Public Service Corporation.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights, iron, washer, soft water pump	Yard Water Pump	House Refrigerator	Range	Water Heater	5 HP Motor	Milking Machine	Light Poultry House
Jan. 23	176	$8.63	4.90¢	50	22		59			45	
Feb. 21	168	8.40	5.00	37	26		54			46	5
Mar. 26	208	9.54	4.59	35	30		84			53	6
Apr. 23	207	9.51	4.59	25	26		114			42	
May 23	304	12.27	4.04	21	28	31	182			42	
June 25	361	13.90	3.85	24	19	32	241			45	
July 25	354	13.70	3.87	20	19	45	233			37	
Aug. 28	524	18.54	3.54	27	21	58	239	134*		45	
Sept.22	356	13.76	3.86	35	13	33	167	61	25	22	
Oct. 23	407	15.21	3.74	43	22	38	173		83	48	
Nov. 21	290	11.89	4.10	49	19	29	147		7	39	
Dec. 21	310	12.44	4.01	52	25	24	123		34	40	12
TOTAL	3635	$147.79		418	270	290	1816	195	149	504	23
AVE.PER MO.	305.5	$12.31	4.03¢	35	22.5	36	151	97	37	42	8

NOTE: The first month started December 23, 1927.

*The 134 kw. hr. consumption for the water heater covers a period of 38 days.

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 20. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights, iron: washer, soft: water pump	Hard Water: Pump	House Refrig-: erator	Range	Water: Heater	5 HP: Motor	Milking: Machine	Light Poultry House
Jan. 23	176	$8.63	4.90¢	2.45	$1.08		2.89			$2.21	
Feb. 21	168	8.40	5.00	1.85	1.30		2.70			2.30	.25
Mar. 26	208	9.54	4.59	1.61	1.38		3.85			2.43	.27
Apr. 23	207	9.51	4.59	1.15	1.19		5.34			1.93	
May 23	304	12.27	4.04	.84	1.13	$1.25	8.35			1.70	
June 25	361	13.90	3.85	.93	.73	1.23	9.18			1.73	
July 25	354	13.70	3.87	.77	.74	1.74	9.02			1.43	
Aug. 28	524	18.54	3.54	.96	.74	2.05	8.46	$4.74		1.59	
Sept.22	356	13.76	3.86	1.35	.50	1.28	6.45	2.36	$.97	.85	
Oct. 23	407	15.21	3.74	1.60	.82	1.42	6.47		3.10	1.80	
Nov. 21	290	11.89	4.10	2.01	.78	1.19	6.02		.29	1.60	
Dec. 21	310	12.44	4.01	2.08	1.00	.97	4.93		1.37	1.60	.48
TOTAL	3665	$147.78		$17.60	$11.39	$11.13	$73.66	$7.10	$5.73	$21.17	$1.00
AVE. PER MO.	305.5	$ 12.31	4.03	$ 1.47	$ .95	$1.69	$6.14	$3.55	$1.43	$ 1.76	$ .33

The lights in the house and barn, the washer, iron, soft water pump, vacuum cleaner, and waffle iron, are all on one meter.

The hard water pump supplies water for both house and barn.

The house refrigerator has a capacity of 7 cu. ft.

The range is operated for a family of four constantly and it has a kitchen heater attached for wood or coal, which heats the kitchen. Many additional meals are served to guests and extra help.

The water heater is used when the furnace is not in operation.

The 5 HP motor was used to fill the silo in October; the other months it is used to cut cornstalks and grind feed.

The milking machine takes care of an average of 17.2 cows which produce an average of 9734 lbs. of milk per month.

During February and March, 75 head of poultry were lighted for 189 hours. During December, 75 hens were lighted for a total of 150 hours.

HARD WATER PUMP RECORDS ON ELECTRO-TEST FARM NO. 20

1928	Kw. Hrs.	Cost	Cu. Ft. Water Pumped
Jan. 23	22	$1.08	5601
Feb. 21	26	1.30	7220
Mar. 26	30	1.38	8150
Apr. 23	26	1.19	8570
May 23	28	1.13	9290
June 25	19	.73	5540
July 25	19	.74	Meter
Aug. 28	21	.74	out
Sept.22	13	.50	of
Oct. 23	22	.82	order
Nov. 21	19	.78	
Dec. 21	25	1.00	
Total	270	$11.39	44,371 (6 mo.)
Ave. per mo.	22.5	.85	7395

The hard water pump furnishes water for drinking, cooking, and toilet flushing tank besides 4 horses, 25 head of cattle, and 20 hogs.

MILKING MACHINE RECORDS ON ELECTRO-TEST FARM NO. 20

1928	Kw. Hrs.	Ave. Cost per Kw. Hr.	Cost	Cows Milked	Milk
Jan. 23	45	4.90¢	$2.21	18	9,755#
Feb. 21	46	5.00	2.30	18	9,482
Mar. 26	53	4.59	2.43	20	11,550
Apr. 23	42	4.59	1.93	15	10,500
May 23	42	4.04	1.70	16	10,200
June 25	45	3.85	1.73	17	11,050
July 25	37	3.87	1.43	17	10,890
Aug. 28	45	3.54	1.59	18	10,280
Sept.22	22	3.86	.85	16	8,174
Oct. 23	48	3.74	1.80	18	10,122
Nov. 21	39	4.10	1.60	16	7,180
Dec. 21	40	4.01	1.60	17	7,630
Total	504		$21.17	206	116,813
Ave. per mo.	42	4.03¢	$1.76	17.2	9,734#

The average cost for milking 1000 pounds of milk is 18.1 cents.

File under Electro-Test Farms
3-30

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken during 1929 on the farm of Mr. George Walters, Electro-Test Farm #20, Allenville, Wisconsin. Mr. Walters is served by the Wisconsin Public Service Corporation.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Hard Water Pump	House Refrigerator	Range	Water Heater	5 HP Motor	Milking Machine	Light Poultry House
Jan. 21	324	$ 12.84	3.96¢	52	29	25	101		65	40	12
Feb. 23	396	14.90	3.76	61	46	24	122		99	34	10
Mar. 22	398	14.95	3.76	40	28	21	98		176	28	7
Apr. 18	428	15.81	3.69	44	25	30	150	7	130	42	
May 20	435	16.01	3.68	41	26	31	203		84	50	
June 20	481	17.32	3.60	28	33	41	169	125	37	48	
July 22	456	16.61	3.64	20	29	54	201	80	20	52	
Aug. 21	445	16.29	3.66	29	28	60	242	1	36	49	
Sept.21	557	19.48	3.50	28	28	36	164	97	144	60	
Oct. 21	416	15.47	3.72	43	25	36	207	10	41	54	
Nov. 20	389	14.70	3.78	76	35	30	181		2	53	12
Dec. 22	391	14.75	3.77	89	36	23	119		59	52	13
TOTALS	5116	$189.13		551	368	411	1957	320	893	562	54
AVE. PER MO.	426	$ 15.76	3.70¢	46	31	34	163	64	74	47	11

General information

The first month started December 21, 1928.
Size of transformer, - 5 kva.
Number in family, - 4.
Home, - modern.
Stock, - 5 horses, 25 head of cattle, 15 hogs, 125 chickens.

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm #20. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw.Hr.	Lights and Misc.	Hard Water Pump	House Refrigerator	Range	Water Heater	5 HP Motor	Milking Machine	Light Poultry House
Jan. 21	324	$12.84	3.96¢	$2.06	$1.15	$ .98	$4.00		$2.58	$1.59	$ .48
Feb. 23	396	14.90	3.76	2.29	1.73	.90	4.59		3.74	1.28	.37
Mar. 22	398	14.95	3.76	1.50	1.05	.79	3.68		6.62	1.05	.26
Apr. 18	428	15.81	3.69	1.63	.92	1.11	5.54	$1.26	4.80	1.55	
May 20	435	16.01	3.68	1.51	.96	1.14	7.47		3.09	1.84	
June 20	481	17.32	3.60	1.01	1.19	1.48	6.08	4.50	1.33	1.73	
July 22	456	16.61	3.64	.73	1.05	1.97	7.32	2.92	.73	1.89	
Aug. 21	445	16.29	3.66	1.06	1.02	2.20	8.86	.04	1.32	1.79	
Sept.21	557	19.48	3.50	.98	.98	1.26	5.74	3.39	5.03	2.10	
Oct. 21	416	15.47	3.72	1.60	.93	1.34	7.70	.37	1.52	2.01	
Nov 20	399	14.70	3.78	2.87	1.32	1.14	6.84		.08	2.00	.45
Dec. 22	391	14.75	3.77	3.36	1.36	.86	4.49		2.25	1.96	.49
TOTALS	5116	$189.13		$20.60	$13.66	$15.17	$72.31	$11.48	$33.07	$20.79	$2.05
AVE.PER MO.	426	$ 15.76	3.70¢	$ 1.72	$ 1.14	$ 1.26	$ 6.03	$ 2.30	$ 2.76	$ 1.73	$ .41

Miscellaneous under Lights includes the washing machine, iron, soft water pump (1/6 HP), vacuum cleaner, waffle iron, curling iron, AC radio, Theronoid health coil and corn popper.

The hard water pump furnishes water for a modern home, including toilet flushing tank, bath, laundry and cooking purposes, and also 5 horses, 25 head of cattle, 15 hogs and 125 chickens. An air power water supply system is installed and operated with a one horsepower motor.

The house refrigerator has a capacity of 7 cubic feet.

The range is used for an average of five people. It has a kitchen heater attached for wood or coal which is used for heating the kitchen during the winter months.

The water heater is 15 gallons in size and is used for heating water for the kitchen, laundry and bath when the furnace is not in use.

The 5 horsepower motor is portable and used for a large variety of work (See another sheet for details.)

The milking machine is used on an average of 16.3 cows per month. (See another sheet for details)

The poultry house is lighted from November to March inclusive. 100 head of poultry were lighted for a period of about four hours each day. The lights are operated by hand.

RECORDS OF 5 HORSEPOWER MOTOR ON ELECTRO-TEST FARM #20

Date of Reading	Total Kw.Hrs.	Cost	Average Cost per Kw.Hr.	Pounds of Corn Ground	Pounds of Oats Ground	Pounds of Barley Ground	Pounds of Rye Ground	Chick Mash Ground	Total Grain Ground
Jan. 21	65	$ 2.58	3.96¢	1500	3000				4500
Feb. 23	99	3.74	3.76	1500	3000	2000			6500
Mar. 22	176	6.62	3.76	1500	3000				4500
Apr. 18	130	4.80	3.69	1600	3200	2000	2000		8800
May 20	84	3.09	3.68	500	2000	1000		1000	4500
June 20	37	1.33	3.60		1000	1000		1000	3000
July 22	20	.73	3.64					1000	1000
Aug. 21	36	1.32	3.66					2000	2000
Sept.21	144	5.03	3.50					2000	2000
Oct. 21	41	1.52	3.72	3600				2000	5600
Nov. 20	2	.08	3.78		500				500
Dec. 22	59	2.23	3.77	2500	3500			1000	7000
TOTALS	893	$33.07		12,700	19,200	6000	2000	10,000	49,900
AVE. PER MO.	74	$ 2.76	3.70¢	1058	1600	500	167	833	4158

January and February - Ground up 2200 pounds of horse meat.

March - Husked 1100 baskets of corn with 4 roll husker.

April - Ground up 400 pounds of bone. Sawed 15 cords of stove wood. Cut 6 tons of sweet clover hay and 2 tons of cornstalks with ensilage cutter.

July - Operated emery wheel for grinding sickles and later silo filler knives. Neighbors used it also.

August -Operated emery wheel.

September - Operated cement mixer and emery wheel. Elevated and blew 1000 bushels of oats from threshing machine to granary. 150 tons of ensilage were cut with a cylinder ensilage cutter, and elevated into a 44 foot silo, using 100 kilowatt hours.

December - Ground up 1100 pounds of horse meat. Cut 5 tons of cornstalks.

Ground a total of 49,900 pounds of small grains during the year.

File under Electro-Test Farms
5-29

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken during 1928 on the farm of W. G. Marshall, Electro-Test Farm No. 3, Whitewater, Wis. in cooperation with the Wisconsin Gas and Electric Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw.Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Soft Water Pump	Hard Water Pump	Vacuum Sweeper	Milking Machine and Pump
Jan. 23	327	$13.18	4.03¢	103	160	1	3	2	58
Feb. 23	289	11.92	4.13	81	144	1	2	2	59
Mar. 23	251	10.65	4.24	61	125	1	3	1	60
Apr. 24	265	11.12	4.20	42	147	1	2	1	72
May 23	249	10.59	4.25	22	153	2	3	2	67
June 23	241	10.32	4.28	12	191	1	2	2	33
July 23	225	9.57	4.25	3	182	2	4	2	32
Aug. 23	238	10.01	4.21	6	193	1	4	1	33
Sept.24	285	11.57	4.06	21	230	1	3	2	28
Oct. 23	317	12.63	3.98	38	242	1	5	1	30
Nov. 23	289	11.70	4.05	76	172	2	4	2	33
Dec. 23	312	12.47	4.00	87	171	1	3	2	48
TOTALS	3288	$135.73		552	2110	15	38	20	553
AVE. PER MO:	274	11.31	4.13¢	46	176	1.3	3	1.7	46

NOTE: The first month started December 23, 1927.

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 3. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs	Total Bill	Average Cost per Kw.Hr.	Lights and Misc.	Range	Soft Water Pump	Hard Water Pump	Vacuum Sweeper	Milking Machine & Pump
Jan. 23	327	$13.18	4.03¢	$4.15	$6.45	$.04	$.12	$.08	$2.34
Feb. 23	289	11.92	4.13	3.34	5.95	.04	.08	.08	2.43
Mar. 23	251	10.65	4.24	2.59	5.30	.04	.13	.04	2.55
Apr. 24	265	11.12	4.20	1.77	6.17	.04	.08	.04	3.02
May 23	249	10.59	4.25	.94	6.51	.08	.13	.08	2.85
June 23	241	10.32	4.28	.51	8.18	.04	.09	.09	1.41
July 23	225	9.57	4.25	.12	7.74	.09	.17	.09	1.36
Aug. 23	238	10.01	4.21	.25	8.12	.04	.17	.04	1.39
Sept.24	285	11.57	4.06	.85	9.34	.04	.12	.08	1.14
Oct. 23	317	12.63	3.98	1.52	9.63	.04	.20	.04	1.20
Nov. 23	289	11.70	4.05	3.08	6.96	.08	.15	.06	1.34
Dec. 23	312	12.47	4.00	3.48	6.83	.04	.12	.08	1.92
TOTALS	3288	$135.73		$22.60	$87.18	$.61	$1.57	$.82	$22.95
AVE. PER MO.	274	$ 11.31	4.13¢	$ 1.88	$ 7.27	$.05	$ .13	$.07	$ 1.91

Miscellaneous under Lights includes washing machine, iron, electric radio, toaster, curling iron, waffle iron, soldering iron and poultry house lighting.

The range is used to cook for an average of 2.5 people. Water is also heated on it to wash and sterilize all dairy equipment. This is a 6000 watt range.

The soft and hard water systems are used for pumping cistern and well water respectively, for the house only.

The milking machine and water system for pumping water for the stock are operated by one motor and metered together. (See next sheet)

Milking Machine and Gravity Water Supply System Records on Electro-Test Farm No. 3.

Date of Reading	Kw.Hrs.	Ave.Cost per Kw. Hr.	Cost of Milking	Cost of Pumping Water	No. cows Milked	Pounds Milked
Jan.23:	58	4.03¢	$1.17	$1.17	22	19,000
Feb.23:	59	4.13	1.21	1.22	22	18,000
Mar.23:	60	4.24	1.28	1.27	25	21,000
Apr.24:	72	4.20	1.51	1.51	25	19,000
May 23:	67	4.25	1.42	1.43	24	24,000
June 23:	33	4.28	1.41	Not used	24	21,000
July 23:	32	4.25	1.36	" "	20	15,000
Aug. 23:	33	4.21	Not used	1.39	Not used	
Sept.24:	28	4.06	"	1.14	"	"
Oct. 23:	30	3.98	"	1.20	"	"
Nov. 23:	33	4.05	"	1.34	"	"
Dec. 23:	48	4.00	"	1.92	"	"
TOTALS	553		$9.36	$13.59	162	137,000
AVE. PER MO:	46		$1.34	$ 1.36	23.1	19,571

These two pieces of equipment are requiring approximately the same amount of energy so the monthly bills are divided equally between them for the first five months.

A 2 HP motor is used to pump the water into a gravity tank and operate the milking machine. No water was pumped during the months of June and July as the stock had enough water in the pasture. Water is pumped for an average of 45 head of cattle, 5 horses and 300 head of poultry at an average cost of $1.36 per month.

The use of the pipe line milking machine was discontinued on August 1. He averaged 23.1 cows per month at an average cost of $1.34 per month, or 5.8 cents per cow per month. The average cost of milking 1000 pounds of milk is 6.8 cents.

File under Electro-Test Farms
1-31

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken during 1929 on the farm of W. G. Marshall, Electro-Test Farm No. 3, Whitewater, Wisconsin, in cooperation with the Wisconsin Gas and Electric Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading 1929	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Soft Water Pump	Hard Water Pump	Vacuum Sweeper	Gravity Water System
Jan. 22	382	$14.80	3.88¢	95	212	1	4	1	69
Feb. 25	343	13.49	3.93	44	224	1	4	1	69
Mar. 20	221	9.44	4.27	57	135	1	2	3	23
Apr. 19	244	10.21	4.19	32	160	2	3	1	46
May 20	260	10.74	4.13	19	179	1	4	4	53
June 20	161	7.44	4.62	8	125	1	4	1	22
July 20	221	9.44	4.27	9	182	1	4	2	23
Aug. 21	278	11.34	4.08	10	229	1	5	3	30
Sept.21	298	12.00	4.03	17	235	2	4	2	38
Oct. 21	269	11.03	4.10	32	211	1	4	2	19
Nov. 20	398	15.33	3.85	74	254	1	5	2	62
Dec. 20	343	13.49	3.93	90	160	2	4	5	82
TOTALS	3418	$138.75		487	2306	15	47	27	536
AVE. PER MO.	285	$11.56	4.06¢	41	192	1.3	4	2.3	45

The first month began December 23, 1928.

General Information:

Size of transformer--5 kva. (Rate based on 8 active rooms.)
Number in family--2.5
House--modern
Stock--5 horses, 42 cattle, and 200 poultry.

File under Electro-Test Farms
12-30

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 3, It also includes the totals for 1929 and monthly averages.

Date of Reading 1929	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Soft Water Pump	Hard Water Pump	Vacuum Sweeper	Gravity Water System
Jan. 22	382	$14.80	3.88¢	$3.68	$8.21	$.04	$.16	$.04	$2.67
Feb. 25	343	13.49	3.93	1.73	8.81	.04	.16	.04	2.71
Mar. 20	221	9.44	4.27	2.43	5.77	.04	.09	.13	.98
Apr. 19	244	10.21	4.19	1.34	6.70	.08	.13	.04	1.92
May 20	250	10.74	4.13	.78	7.39	.04	.17	.17	2.19
June 20	161	7.44	4.62	.37	5.78	.05	.18	.05	1.01
July 20	221	9.44	4.27	.38	7.78	.04	.17	.09	.98
Aug. 21	278	11.34	4.08	.41	9.35	.04	.20	.12	1.22
Sept.21	298	12.00	4.03	.68	9.47	.08	.16	.08	1.53
Oct. 21	269	11.03	4.10	1.31	8.66	.04	.18	.08	.78
Nov. 20	398	15.33	3.85	2.85	9.78	.04	.19	.08	2.39
Dec. 20	343	13.49	3.93	3.54	6.29	.08	.16	.20	3.22
TOTALS	3418	$138.75		$19.50	$93.99	$.61	$1.93	$1.12	$21.60
AV.PER MO.	285	$11.56	4.06¢	$1.63	$7.83	$.05	$.16	$.09	$1.80

Miscellaneous under Lights includes washing machine, iron, electric radio, toaster, curling iron, waffle iron, soldering iron and poultry house lighting.

The range is used to cook for an average of 2.5 people. Water is also heated on it to wash and sterilize all dairy equipment. This is a 6000 watt range.

The soft and hard water systems are used for pumping cistern and well water respectively, for the house only.

A two horsepower motor is used on the gravity water supply system. This motor was formerly used to operate the milking machine and pump jack at the same time. Water was pumped for an average of 42 head of cattle, 5 horses, and 200 head of poultry.

File under Electro-Test Farms
5-29

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT.

ELECTRO-TEST FARM RECORDS

These records were taken during 1928 on the farm of Mr. J. W. Stone, Electro-Test Farm No. 2, Whitewater, Wis. in cooperation with the Wisconsin Gas and Electric Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost Per Kw. Hr.	Lights and Misc.	Hard Water Pump	Range	Hammer Mill	Milking Machine
Jan. 15	361	$14.09	3.90¢	78	16	189	26	52
Feb. 14	336	13.26	3.95	61	24	154	28	69
Mar. 13	324	12.87	3.97	41	17	153	43	70
Apr. 13	353	14.16	3.90	37	19	189	40	78
May 15	426	16.26	3.82	35	17	265	31	78
June 14	337	13.30	3.95	33	17	216	8	63
July 13	279	11.37	4.08	34	17	165	6	57
Aug. 14	283	11.50	4.06	25	29	185	—	44
Sept.14	328	13.00	3.97	31	25	214	6	52
Oct. 12	232	9.81	4.23	29	24	127	19	33
Nov. 13	304	12.20	4.01	50	15	154	36	49
Dec. 15	459	17.30	3.77	106	21	227	42	63
TOTALS	4032	159.12		560	241	2238	285	708
AVE. PER MO.	336	13.26	3.95	47	20	187	24	59

NOTE: The first month started December 15, 1927.

File under Electro-Test Farms
5 - 29

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 2. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost Per Kw. Hr.	Lights and Misc.	Hard Water Pump	Range	Hammer Feed Mill	Milking Machine
Jan. 15	361	$14.09	3.90¢	3.04¢	$.63	$7.37	$1.02	$2.05
Feb. 14	336	13.26	3.95	2.41	.95	5.08	1.10	2.72
Mar. 13	324	12.87	3.97	1.63	.68	5.07	1.71	2.78
Apr. 13	363	14.15	3.90	1.45	.74	7.37	1.56	3.01
May 15	426	16.26	3.82	1.33	.65	10.12	1.18	2.98
June 14	337	13.30	3.95	1.30	.67	8.53	.31	2.49
July 13	279	11.37	4.06	1.59	.69	6.73	.24	2.32
Aug. 14	283	11.50	4.06	1.02	1.18	7.51	--	1.79
Sept.14	328	13.00	3.97	1.23	.99	8.49	.23	2.06
Oct. 12	232	9.81	4.23	1.33	1.01	5.37	.80	1.40
Nov. 13	304	12.20	4.01	2.01	.60	6.18	1.34	1.97
Dec. 13	459	17.30	3.77	4.00	.79	8.56	1.58	2.37
TOTAL	4032	$159.12		$22.04	$9.58	$88.38	$11.17	$27.95
AVE. PER MO.	336	13.26	3.95¢	1.84	.80	7.36	.93	2.33

Miscellaneous under Lights includes washing machine, iron, soft water pump, vacuum sweeper, battery charger for radio, curling iron and poultry house lighting.

The hard water pump furnished water for drinking, cooking and toilet flushing tanks besides 45 head of cattle, 7 horses and 600 chickens. This is a hydro-pneumatic system operated with a 1/2 H.P. motor. The total water lift is 25 feet. The capacity of the pump is 550gallons per hour. The capacity of the tank is 350 gallons.

The range is used to cook for an average of 4 people. Water is also heated on it daily to wash and sterilize all dairy equipment. The total watts of the range is 10,350.

The hammer type feed mill is operated with a 5 HP motor. It grinds all the grain used in the dairy ration. (See next sheet).

The milking machine is used on an average of 18.3 cows producing an average of 14,350 pounds per month. (See next sheet).

Feed Grinding Records on Electro-Test Farm No. 2

Date of Reading	Kw. Hrs.	Ave. Cost: Per Kw.Hr:	Cost:	Pounds & Kind of Grain Ground: Barley	Oats	Corn
Jan. 15	28	3.90¢	$1.02:	2400	1750	
Feb. 14	28	3.95	1.10:	1240	855	895
Mar. 13	43	3.97	1.71:	1940	2320	100
Apr. 13	40	3.90	1.55:	2825	3210	520
May 15	31	3.82	1.18:	525	1775	1170
June 14	8	3.95	.31:		735	1335
July 13	6	4.08	.24:			3000
Aug. 14	Not in use					
Sept.14	6	3.97	.23:	344	380	
Oct. 12	19	4.23	.80:	1050	1100	
Nov. 13	36	4.01	1.44:	2235	1245	
Dec. 13	42	3.77	1.58:	2870	1740	
TOTALS	285		$11.17:	15,529	15,110	7020
AVE.PER MO:	24		$ .93:	1,294	1,259	585

The cost of grinding feed is 59¢ per ton. The average amount of the various grains ground per month is 3138 pounds.

A hammer type feed mill is used and operated with a 5 HP motor.

Milking Machine Records on Electro-Test Farm No. 2

Date of Reading	Kw. Hrs.	Ave. Cost Per Kw. Hr.	Cost	No. cows Milked	Pounds Milk
Jan. 15	52	3.90¢	$2.03	18	16,500
Feb. 14	69	3.95	2.72	24	18,350
Mar. 13	70	3.97	2.78	23	18,500
Apr. 13	78	3.90	3.04	23	20,500
May 15	78	3.82	2.98	23	17,540
June 14	63	3.95	2.49	22	15,000
July 13	57	4.08	2.32	17	13,600
Aug. 14	44	4.06	1.79	15	10,000
Sept.14	52	3.97	2.06	13	9,000
Oct. 12	33	4.23	1.40	10	8,000
Nov. 13	49	4.01	1.97	14	10,000
Dec. 13	63	3.77	2.37	18	15,200
TOTALS	708		$27.95	220	172,190
AVE. PER MO.:	59		$ 2.33	18.3	14,350

The average cost to milk 1000 pounds of milk is 16.2 cents. It costs an average of 12.7 cents to milk one cow one month. A pipe line machine, eleven years old, is used on this farm. A 3/4 H.P. motor operates two double units.

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken during 1929 on the farm of Mr. J. W. Stone, Electro-Test Farm No. 2, Whitewater, Wis., in cooperation with the Wisconsin Gas and Electric Company.

Table giving monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading 1929	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Hard Water Pump	Range	Milking Machine	5 HP Motor	
								Feed Grinding	Elevating Grain
Jan. 15	501	$18.75	3.74¢	112	23	238	85	43	
Feb. 11	364	14.20	3.90	73	17	167	74	33	
Mar. 13	388	14.99	3.86	66	24	166	92	40	
Apr. 12	356	13.93	3.91	42	22	157	77	58	
May 14	331	13.09	3.95	42	21	129	85	54	
June 15	290	11.74	4.05	29	20	156	79	6	
July 12	238	10.01	4.21	27	27	122	55	7	
Aug. 14	271	11.10	4.10	31	27	136	56	21	
Sept.12	326	12.93	3.97	45	29	185	46	11	10
Oct. 11	341	13.43	3.94	23	24	209	52	33	
Nov. 14	475	17.88	3.76	71	25	253	57	69	
Dec. 11	451	17.08	3.79	60	20	237	64	59	11
TOTALS	4332	$169.13		621	279	2155	822	434	21
AVE.PER MO.	361	$14.09	3.90¢	52	23	180	69	36	

General Information

The first month started December 13, 1928.
Size of transformer,- 3 k.v.a. (Rate based on 8 active rooms.)
Number in family,- 2
House,- modern
Stock,- 6 horses, 54 cattle, 400 poultry.

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 2. It also includes the totals for 1929 and monthly averages.

Date of Reading 1929	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Hard Water Pump	Range	Milking Machine	5 HP Motor Feed Grinding	5 HP Motor Elevating Grain
Jan. 15	501	$18.75	3.74¢	$4.19	$ .86	$8.91	$3.18	$1.61	
Feb. 11	364	14.20	3.90	2.85	.66	6.51	2.89	1.29	
Mar. 13	388	14.99	3.86	2.55	.93	6.41	3.55	1.55	
Apr. 12	356	13.93	3.91	1.65	.86	6.14	3.01	2.27	
May 14	331	13.09	3.95	1.66	.83	5.10	3.36	2.14	
June 15	290	11.74	4.05	1.17	.81	6.32	3.20	.24	
July 12	238	10.01	4.21	1.14	1.14	5.13	2.31	.29	
Aug. 14	271	11.10	4.10	1.27	1.11	5.57	2.29	.86	
Sept.12	326	12.93	3.97	1.79	1.15	7.34	1.82	.43	$.40
Oct. 11	341	13.43	3.94	.91	.95	8.23	2.05	1.29	
Nov. 14	475	17.88	3.76	2.67	.94	9.52	2.15	2.60	
Dec. 11	451	17.08	3.79	2.27	.76	8.98	2.42	2.23	.42
TOTALS	4532	$169.13		$24.12	$11.00	$84.16	$32.23	$16.80	$.82
AVE.PER MO.	361	$14.09	3.90¢	$2.01	$ .92	$7.01	$2.69	$1.40	

Miscellaneous under Lights includes washing machine, iron (7 mo.), soft water pump, vacuum sweeper, battery charger and eliminator for radio, curling iron, and poultry house lighting.

The hard water pump furnished water for drinking, cooking, and toilet flushing tanks, besides 54 head of cattle, 6 horses, and 400 chickens. This is a hydro-pneumatic system operated with a 1/2 HP motor. The total water lift is 25 feet. The capacity of the pump is 550 gallons per hour. The capacity of the tank is 350 gallons.

The range is used to cook for an average of 4 people. Water is also heated on it daily to wash and sterilize all dairy equipment. The total connected load of the range is 10,350 watts.

The milking machine is used on an average of 19.9 cows producing an average of 17,602 pounds per month. (See next sheet.)

The 5 HP motor is used to operate a hammer type feed mill. It grinds all the grain used in the dairy ration and is also used for elevating grain into overhead bins in the granary. (See next sheet.)

FEED GRINDING RECORDS ON ELECTRO-TEST FARM NO. 2

Date of Reading 1929	Total Kw. Hrs.	Average Cost per Kw. Hr.	Cost	Pounds of Grain Ground			
				Barley	Oats	Corn	Total
Jan. 15	43	3.74¢	$1.61	3500	2550		6050
Feb. 11	33	3.90	1.29	2150	1400		3550
Mar. 13	40	3.86	1.55	2665	2070	135	4870
Apr. 12	58	3.91	2.27	200	1850	4840	6890
May 14	54	3.95	2.14		4500	1800	6300
June 15	6	4.05	.24	800	25		825
July 12	7	4.21	.29		960	260	1220
Aug. 14	21	4.10	.86		722	1865	2587
Sept.12	11	3.97	.43	750	840		1590
Oct. 11	33	3.94	1.29	800	2480		3280
Nov. 14	69	3.76	2.60		2176	5050	7226
Dec. 11	59	3.79	2.23		1583	2616	4199
TOTALS	434		$16.80	10,865	21,156	16,566	48,587
AVE. PER MO.	36	3.90¢	$ 1.40	905	1,763	1,381	4,049

A hammer type feed mill is used for the grinding and operated with a five orsepower motor.

The cost of grinding feed is at the rate of 69.2 cents per ton. The cost of rinding is ten cents higher per ton than in 1928. Using a fan to elevate the round feed into overhead bins perhaps accounts for this increase.

The fan of the feed mill was also used to elevate 564 bushels of oats into verhead bins so that it could be fed back into the mill by gravity for grinding. his operation required a total of 21 kilowatt hours at a cost of 82 cents, or 2.3 ilowatt hours at 9 cents per ton.

MILKING MACHINE RECORDS ON ELECTRO-TEST FARM NO. 2

Date of Reading 1929	Total Kw. Hrs.	Average Cost per Kw. Hr.	Cost	Number of Cows Milked	Pounds of Milk
Jan. 15	85	3.74¢	$3.18	24	23,250
Feb. 11	74	3.90	2.89	24	22,750
Mar. 13	92	3.86	3.55	24	23,750
Apr. 12	77	3.91	3.01	22	23,500
May 14	85	3.95	3.36	22	18,780
June 15	79	4.05	3.20	23	18,128
July 12	55	4.21	2.31	20	18,000
Aug. 14	56	4.10	2.29	14	9,111
Sept.12	46	3.97	1.82	12	9,350
Oct. 11	52	3.94	2.05	12	10,800
Nov. 14	57	3.73	2.15	15	12,438
Dec. 11	64	3.79	2.42	27	21,370
TOTALS	822		$32.23	239	211,227
AVE. PER MO:	68.5	3.90¢	$ 2.69	19.9	17,602

It cost an average of 13.5 cents to milk one cow one month. The average ost to milk 1000 pounds of milk is 15.3 cents. A pipe line machine, twelve years ld, is used on this farm. A 3/4 horsepower motor operates two double units.

File under Electro-Test Farms
1-31

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken from August 1928 to August 1929 on the farm of Mr. A. F. Smith, Ripon Experimental Line, Ripon, Wisconsin. Mr. Smith is served by the Wisconsin Power and Light Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Ave. Cost per Kw. Hr.	Lights and Misc.	Refrig-erator	Milking Machine
Sept.18	136	$9.08	6.68¢	33	94	9
Oct. 18	119	8.57	7.20	42	67	10
Nov. 16	105	8.15	7.76	64	30	11
Dec. 18	55	6.65	12.09	43		12
Jan. 18	60	6.80	11.33	45		15
Feb. 18	70	7.10	10.14	55		15
Mar. 20	71	7.13	10.04	56		15
Apr. 19	47	6.29	13.38	34		13
May 20	47	6.29	13.38	32		15
June 18	91	7.73	8.50	23	58	10
July 17	130	8.90	6.84	52	78	Removed
Aug. 19	165	9.95	6.03	56	109	
TOTALS	1096	$92.64		535	436	125
Ave.PER MO.	91	$7.72	8.46¢	45	73	12.5

The first month started August 20, 1928.

General Information

Size of transformer--1.5 k.v.a.
Number in family --9
House--not modern
Stock--6 horses, 28 cattle, 21 hogs, and 175 chickens.

File under Electro-Test Farms
12-30

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on the farm of Mr. A. F. Smith, Ripon Experimental Line, Ripon, Wisconsin. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights & Misc.	Refrig-erator	Milking Machine
Sept. 18	136	$9.08	6.68¢	$2.20	$6.27	.61
Oct. 18	119	8.57	7.20	3.03	4.82	.72
Nov 16	105	8.15	7.76	2.33	4.97	.85
Dec. 18	55	6.65	12.09	5.20		1.45
Jan. 18	60	6.80	11.33	5.10		1.70
Feb. 18	70	7.10	10.14	5.58		1.52
Mar. 20	71	7.13	10.04	5.63		1.50
Apr. 19	47	6.29	13.38	4.55		1.74
May 20	47	6.29	13.38	4.28		2.01
June 18	91	7.73	8.50	1.95	4.93	.85
July 17	130	8.90	6.84	3.56	5.34	Removed
Aug. 19	165	9.95	6.03	3.38	6.57	
TOTALS	1096	$92.64		$46.79	$32.90	$12.95
AVE. PER MO.	91	$7.72	8.48¢	$3.90	$5.48	$1.29

Miscellaneous under Lights includes washing machine, iron, toaster, curling iron, battery charger for the radio, room heater, soldering iron, cream separator and emery wheel.

The household refrigerator has a capacity of six cubic feet.

The portable milking machine operated with a 1/2 HP motor is used to milk an average of 13.4 cows at a cost of somewhat less than 10 cents per cow per month.

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken from August 1928 to August 1929 on the farm of Mr. Geo. Stellmacher, Ripon Experimental Line, Ripon, Wis. Mr. Stellmacher is served by the Wisconsin Power and Light Co.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights & Misc.	Range	Refrigerator	Water Supply	Battery Charger	Incubator	5 HP Motor
Sept.18	195	$ 10.85	5.66¢	70	40	72	9			4
Oct. 18	213	11.39	5.35	83	50	58	5	13		4
Nov. 16	216	11.48	5.37	101	55	45	4	7		4
Dec. 18	222	11.66	5.25	125	61	21	3	9		3
Jan.	230	11.90	5.18	153	36	26	3	12		
Feb.	255	12.65	4.96	177	36	26	4	12		
Mar. 20	255	12.65	4.96	150	36	26	4	12	20	7
Apr. 19	161	9.83	6.10	40	33	27	7	8	43	3
May 20	230	11.30	5.38	50	63	36	6	2	47	6
June 18	194	10.52	5.72	59	60	55	9			1
July 17	205	11.15	5.44	58	65	72	6			4
Aug. 19	319	11.57	5.28	60	64	70	25			
TOTALS	2565	$156.95		1130	599	534	85	75	110	36
AVE. PER MO.	214	11.41	5.32¢	94	50	44.5	7	9	37	4

The first month started August 20, 1928

General Information

Size of transformer - 1.5 k.v.a.
Number in family - 4
Home - modern
Stock - 25 cattle, 80 hogs, 6 horses

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on the farm of Mr. Geo. Stellmacher, Ripon Experimental Line, Ripon, Wis. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights & Misc.	Range	Refrigerator	Water Supply	Battery Charger	Incubator	5 HP Motor
Sept.18	195	$ 10.85	5.56¢	$ 3.89	$ 2.23	$ 4.00	$ .51			$ .22
Oct. 18	213	11.39	5.35	4.44	2.67	3.10	.27	$ .70		.21
Nov. 16	216	11.48	5.32	5.37	2.93	2.39	.21	.37		.21
Dec. 18	222	11.66	5.25	6.56	3.21	1.10	.16	.47		.16
Jan.	230	11.99	5.18	7.92	1.86	1.35	.15	.62		
Feb.	255	12.65	4.96	8.78	1.79	1.29	.20	.59		
Mar. 20	255	12.65	4.96	7.44	1.79	1.29	.20	.59	$ .99	.35
Apr. 19	161	9.83	6.10	2.44	2.01	1.65	.43	.49	2.63	.18
May 20	210	11.30	5.38	2.69	3.39	1.94	.32	.11	2.53	.32
June 18	184	10.52	5.72	3.37	3.43	3.15	.51			.06
July 17	205	11.15	5.44	3.15	3.53	3.92	.33			.22
Aug. 19	217	11.57	5.28	3.17	3.38	3.70	1.52			
TOTALS	2565	$136.95		$59.22	$32.22	$28.88	$4.61	$3.94	$6.15	$1.93
AVE.PER MO.	214	$ 11.41	5.32¢	$ 4.93	$ 2.68	$ 2.41	$ .38	$ .49	$2.05	$ .21

Miscellaneous under Lights includes washing machine, iron, vacuum cleaner, curling iron, cream separator, soft water system and fanning mill.

The range is used for baking only.

The refrigerator has a capacity of five cubic feet and is operated by a $\frac{1}{4}$ HP motor.

A deep well hydro-pheumatic water supply system furnishes water for the home and to a stock tank for the cattle and horses. A $\frac{1}{2}$ HP motor is used.

The battery charger is used in connection with the radio.

The incubator is a 270 egg size. It was set twice and hatched 400 chicks.

The 5 HP portable motor is used for grinding feed, sawing wood, mixing cement and on the emery wheel.

File under Electro-Test Farms
12-30

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken from August 1928 to August 1929, on the farm of Mr. Albert Badtke, Ripon Experimental Line, Ripon, Wisconsin. Mr. Badtke is served by the Wisconsin Power and Light Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Water Supply	Frying Pan and Cooker
Sept. 18	69	$7.07	10.25¢	38	27	4
Oct. 18	69	7.07	10.25	46	23	
Nov. 16	77	7.31	9.50	57	19	1
Dec. 18	101	8.03	7.95	80	21	
Jan. 19	150	9.50	6.33	115	35	
Feb. 23	109	8.27	7.59	71	35	3
Mar. 20	82	7.46	9.10	54	22	6
Apr. 19	69	7.07	10.25	39	26	4
May 20	50	6.50	13.00	32	18	
June 18	50	6.50	13.00	25	20	5
July 17	40	5.80	14.50	20	20	
Aug. 19	45	6.15	13.65	26	19	
TOTALS	911	$86.73		603	285	23
AVE. PER MONTH	76	$7.23	9.51¢	50	24	4

NOTE: The first month started August 20, 1928.

GENERAL INFORMATION

Size of transformer - 1.5 k.v.a.
Number in family - 5
Home - modern
Stock - 21 cattle, 13 hogs, 3 horses, 2 sheep, 125 poultry.

File under Electro-Test Farms
1-31

UNIVERSITY OF WISCONSIN
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AGRICULTURAL ENGINEERING DEPARTMENT

ELECTRO-TEST FARM RECORDS

These records were taken from August, 1928 to August, 1929 on the farm of Mr. Wm. F. Stoltz, Ripon Experimental Line, Ripon, Wisconsin. Mr. Stoltz is served by the Wisconsin Power and Light Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights & Misc.	Milking Machine
Sept.18	59	$ 6.77	11.48¢	27	32
Oct. 17	84	7.52	8.95	35	49
Nov. 16	139	9.17	6.60	90	49
Dec. 18	178	10.34	5.81	122	56
Jan. 19	182	10.46	5.75	118	64
Feb. 19	178	10.34	5.81	107	71
Mar. 20	135	9.05	6.70	84	51
Apr. 18	102	8.06	7.90	52	50
May 20	122	8.66	7.10	74	48
June 16	92	7.76	8.44	31	61
July 17	92	7.76	8.44	39	53
Aug. 19	111	8.33	7.50	55	56
TOTALS	1474	$104.22		834	640
AVE.PER MO.	123	$ 8.69	7.07¢	70	53

The first month started August 20, 1928.

General Information

Size of transformer--1.5 k.v.a.
Number in family--5
Home--Modern
Stock--4 horses, 50 cattle, 65 hogs, and 300 chickens

File under Electro-Test Farms
12-30

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on the farm of Mr. Wm. Stoltz, Ripon Experimental Line, Ripon, Wis. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Milking Machine
Sept.18	59	$6.77	11.48¢	$3.10	$3.67
Oct. 17	84	7.52	8.95	3.13	4.39
Nov. 16	139	9.17	6.60	5.94	3.23
Dec. 18	178	10.34	5.81	7.09	3.25
Jan. 19	182	10.46	5.75	6.78	3.68
Feb. 19	178	10.34	5.81	6.22	4.12
Mar. 20	135	9.05	6.70	5.63	3.42
Apr. 18	102	8.06	7.90	4.11	3.95
May 20	122	8.66	7.10	5.25	3.41
June 16	92	7.76	8.44	2.62	5.14
July 17	92	7.76	8.44	3.29	4.47
Aug. 19	111	8.33	7.50	4.13	4.20
TOTALS	1474	$104.22		$57.29	$46.93
AVE.PER MO.	123	8.69	7.07¢	4.77	3.91

Miscellaneous under Lights includes washing machine, iron, vacuum sweeper, radio, cream separator, and deep well hydro-pneumatic water system since November.

A pipe line milking machine operated by a 1.5 HP motor is used to milk an average of 20 cows, at a cost of 20 cents per cow per month. Two double units are used.

UNIVERSITY OF WISCONSIN
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Electro-Test Farm Records

These records were taken from August 20, 1928 to August 19, 1929 on the farm of Mr. George Tabbert, Ripon Experimental Line, Ripon, Wisconsin. Mr. Tabbert is served by the Wisconsin Power and Light Company.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Water Heater - House	Water Heater - Dairy	Water System	Milking Machine	Feed Grinding
Sept. 18	103	$ 9.09	8.83¢	37	15	4	6	21	20
Oct. 18	143	10.29	7.20	68	2	21	5	42	5
Nov. 16	218	12.54	5.76	86		39	5	76	12
Dec. 18	266	13.98	5.26	96		45	4	89	32
Jan. 18	279	14.37	5.16	71		42	5	97	64
Feb. 18	285	14.55	5.11	77		42	4	97	65
Mar. 20	286	14.58	5.10	76		43	5	97	65
Apr. 19	281	14.43	5.14	55		75	4	48	99
May 20	219	12.57	5.74	54	4	31	5	77	48
June 18	128	10.14	7.55	57		10	5	54	12
July 17	151	10.53	6.97	22	4	49	7	48	21
Aug. 19	188	11.64	6.19	65	27	27	7	30	32
TOTALS	2557	$148.71		764	52	428	62	776	475
AVE. PER MO.	213	12.39	5.82	64	10	36	5	65	40

The first month started August 20, 1928.

General Information

Size of transformer - 3 k.v.a.
Number in family - 4
Stock - 30 cattle, 5 horses, 65 hogs, 125 poultry.

File under Electro-Test Farms
1-30

ELECTRO*-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on the farm of Mr. George Tabbert, Ripon Experimental Line, Ripon, Wis. It also includes totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Water Heater--House	Water Heater--Dairy	Water System	Milking Machine	Feed Grinding
Sept. 18	103	$ 9.09	8.83¢	$ 3.27	$ 1.32	$ .35	$ .53	$ 1.85	$ 1.77
Oct. 18	143	10.29	7.20	4.90	.14	1.51	.36	3.02	.36
Nov. 16	219	12.54	5.76	4.95		2.24	.29	4.37	.69
Dec. 18	266	13.98	5.26	5.05		2.36	.21	4.68	1.68
Jan. 18	279	14.37	5.15	3.66		2.16	.25	5.00	3.30
Feb. 18	285	14.55	5.11	3 93		2.14	.20	4.96	3.32
Mar. 20	286	14.58	5.10	3.88		2.19	.25	4.95	3.31
Apr. 19	281	14.43	5.14	2.83		3.85	.20	2.46	5.09
May 20	219	12.57	5.74	3.10	.23	1.78	.29	4.42	2.75
June 18	138	10.14	7.35	4.19		.73	.37	3.97	.88
July 17	151	10.53	6.97	1.53	.28	3.42	.49	3.35	1.45
Aug. 19	188	11.64	6.19	4.03	1.67	1.67	.43	1.86	1.98
TOTALS	2557	$148.71		$45.32	$3.64	$24.40	$3.87	$44.89	$26.59
AVE. PER MO.	213	$ 12.39	5.82	$ 3.78	$ .73	$ 2.03	$ .32	$ 3.74	$ 2.22

Miscellaneous under Lights includes washing machine, iron, vacuum cleaner, toaster, curling iron, radio and cream separator.

The water heater for the house is used only during the summer months for heating water for the bath. Size - 2000 watts.

The water heater for the dairy is used for heating water to wash dairy utensils. Size - 2000 watts.

An air pressure water supply system furnishes water from a deep well and cistern for the house only. (See another sheet)

A pipe line milking machine operated by a 2 HP motor is used to milk an average of 13.3 cows.

A hammer type feed mill operated by a 5 HP electric motor grinds all the grain for the cattle and hogs.

AIR PRESSURE WATER SUPPLY SYSTEM RECORDS ON ELECTRO-TEST FARM OF GEO. TABBERT, RIPON EXPERIMENTAL LINE.

Date of Reading	Kw. Hrs.	Average Cost per Kw. Hr.	Cost of Pumping Water	Cu. ft. of water pumped		
				Well	Cistern	Total
Sept.18	6	8.83¢	$ .53	38	134	172
Oct. 18	5	7.20	.36	62	145	207
Nov. 16	5	5.76	.29	111	116	227
Dec. 18	4	5.26	.21	58	150	208
Jan. 18	5	5.16	.25	113	102	215
Feb. 18	4	5.11	.20	112	101	213
Mar. 20	5	5.10	.25	113	102	215
Apr. 19	4	5.14	.20	112	101	213
May 20	5	5.74	.29	113	102	215
June 18	5	7.35	.37	15	208	223
July 17	7	6.97	.49	47	207	254
Aug. 19	7	6.19	.43	117	173	290
TALS	62		$3.87	1011	1641	2652
E.PER MO.	5	5.82	.32	84	137	221

The air pressure water supply system furnishes hard and soft water to a mily of four living in a modern home. It required 3.12 kw. hrs. at a cost of cents to pump 1000 gallons. A 1/2 HP motor is used.

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ELECTRO-TEST FARM RECORDS

INDIVIDUAL ELECTRIC LIGHT PLANT

These records were taken for a three year period, July 1, 1926 to July 1, 1929, on the farm of Mr. Geo. Hull, Electro-Test Farm No. 12, Whitewater, Wis. This was on a 850 watt, 32 volt plant equipped with a 160 ampere hour battery. The plant had been in use about six years prior to this test. It had excellent care, but was adjusted and put in good condition for these observations. It was also equipped at that time with a new battery. Cost of plant - $585.00.

OPERATING COSTS

	Gallons Used			Price per Gallon							
	1927	1928	1929	1927	1928	1929	1927	1928	1929*	Total for 3 Years	Average Per Year
Overhead											
Interest on investment of $585.00							$17.56	$17.56	$17.56	$52.68	$17.56
Depreciation on $200.00 battery - 6 year life							33.33	33.33	33.33	99.99	33.33
Depreciation on plant - 12 year life							32.10	32.10	32.10	96.30	32.10
Maintenance Expenses:**											
Labor repairing plant							8.50	8.50	8.50	25.50	8.50
Engine generator and battery repairs							3.54	3.54	3.54	10.62	3.54
Fuel and Oil											
Kerosene	264	279	282	13.2¢	12.6¢	12.3¢	34.87	35.10	34.69	104.66	34.89
Gasoline	5	5	5	19.0	19.0	19.0	.95	.95	.95	2.85	.95
Oil	8	10	17	75.0	76.5	77.0	6.00	7.65	13.09	26.74	8.91
TOTALS AND AVERAGES							$136.85	$138.73	$143.76	$419.34	$139.78

*Actual records for only eleven months but corrected for one year.
** Taken from a survey of 46 Wisconsin farms in 1923.

ELECTRO-TEST FARM RECORDS

INDIVIDUAL ELECTRIC LIGHT PLANT

Kilowatt hours of electricity used, battery efficiency, cost per unit, etc., are generated by an individual electric light plant on Electro-Test Farm No. 12, Whitewater, Wisconsin.

	1927	1928	1929*	Totals for 3 Years	Average per Year
1. Kilowatt hours used per year	424.1	380.8	394.3	1199.2	399.7
2. Average used per month	35.3	32.5	32.9	33.3	33.3
3. Kilowatt hours put into battery	447.9	234.9**	337.1***	1019.9****	340.0
4. Kilowatt hours used from battery	346.1	171.1**	219.9***	737.1****	245.7
5. Kilowatt hours lost through battery	101.8	63.8**	117.2***	282.8****	94.3
6. Efficiency of battery (Lines 3 and 4)	77.2%	72.8%	65.2%	72.3%	72.3%
7. Kilowatt hours used direct from generator	78.0	209.7	174.4	462.1	154.0
8. Cost for fuel and oil (Page 1)	$41.82	$43.70	$48.73	$134.25	$44.75
9. Ave. cost per kw.hr. for fuel & oil (Lines 1 & 8)	9.86¢	11.47¢	12.36¢	11.19¢	11.19¢
10. Gallons of kerosene used per kilowatt hr.	.62 gal.	.73 gal.	.71 gal.	.69 gal.	.69 gal.
11. Total operating costs (Page 1)	$136.85	$138.73	$143.76	$419.34	$139.78
12. Average cost per kw. hr. (Lines 1 & 11)	32.27¢	36.43¢	36.46¢	34.97¢	34.97¢

*Actual records for only eleven months, but corrected for one year.

**Records for 8 months.

***Records for 10 months.

****Records for 30 months.

ELECTRO-TEST FARM RECORDS

INDIVIDUAL ELECTRIC LIGHT PLANT

Distribution of energy generated, work done, cost, etc. of an individual electric light plant on Electro-Test Farm No. 12, Whitewater, Wis., for 1927, 1928 and 1929.

	Total Kilowatt Hours	Total Cost	Average Cost per Kw.Hr.	Lights, iron & washing machine: Kw.Hrs.	Cost	Soft Water (cistern): Kw.Hrs.	Gallons	Cost	Hard Water (shallow well): Kw.Hrs.	Gallons	Cost
1927	424.1	$136.85	32.27¢	359.3	$115.95	11.7	11,310	$ 3.77	53.1	45,900	$ 17.13
1928	380.8	138.73	36.43	332.0	120.95	15.5	13,590	5.65	33.3*	29,145*	12.13
1929	394.3	143.76	36.46	346.9	126.48	13.1	14,632	4.78	34.3**	30,795**	12.50
TOTAL	1199.2	$419.34		1038.2	$363.38	40.3	39,532	$14.20	120.7***	105,840***	$ 41.76
AVE. PER MONTH	33.3	$11.65	34.71¢	28.8	$10.00	1.1	1,098	$ .38	4.5	3,994	$ 1.56

It required 1.02 kilowatt hours costing 35.4 cents, and 1.14 kilowatt hours at 39.6 cents to pump 1000 gallons of water from the cistern and well respectively. An automatic hydro-pneumatic shallow well water supply system is used in each case.

*Operated 7.5 months during 1928.
**Operated 7 months during 1929.
***Total for 26.5 months.

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ELECTRO-TEST FARM RECORDS

These records were taken during 1929 on the farm of Jos. N. Juckum, Electro-Test Farm No. 21, Chilton, Wis., in cooperation with the Wisconsin Public Service Corporation.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Cattle Clipping	Light Poultry House	7½ Horsepower Motor: Hammer Mill	Wood Sawing	Silo Filling
Feb. 22	96	$ 6.35	6.61¢	49				31	16	
Mar. 21	68	5.55	8.16	27		5	9	27		
Apr. 20	83	5.98	7.20	34			5	40	4	
May 21	99	6.43	6.49	26	19			54		
June 21	182	8.80	4.83	25	145			12		
July 26	429	15.84	3.69	51	370			8		
Aug. 28	221	9.91	4.48	32	163			26		
Sept. 27	328	12.96	3.95	50	87			23		168
Oct. 28	163	8.26	5.06	22	109			32		
Nov. 27	189	9.00	4.76	50	93		12	34		
Dec. 28	200	9.31	4.65	39	98		14	39	10	
Jan. 25	221	9.91	4.48	46	134		8	33		
TOTALS	2279	$108.30	4.75¢	451	1218	5	48	359	30	168
AVE. PER MO.	190	9.03	4.75¢	37.6	135.3		9.6	29.9		

The first month started Jan. 23, 1929

General Information:

Size of transformer - 7.5 kva. (Two customers are served from this transformer.)
Number in family - 8
House - furnace.
Stock - 45 cattle, 4 horses, 250 chickens and 10 sheep.

ELECTRO-TEST FARM RECORDS

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 21. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Cattle Clipping	Light Poultry House	7½ horsepower motor Hammer Mill	7½ horsepower motor Wood Sawing	7½ horsepower motor Silo Filling
Feb. 22	96	$6.35	6.61¢	$3.24				$2.05	$ 1.06	
Mar. 21	68	5.55	8.16	2.20		$ .41	$ .74	2.20		
Apr. 20	83	5.98	7.20	2.45			.36	2.88	.29	
May 21	99	6.43	6.43	1.69	$1.23			5.51		
June 21	182	8.80	4.83	1.22	7.00			.58		
July 26	429	15.84	3.69	1.88	15.66			.30		
Aug. 28	221	9.91	4.48	1.44	7.30			1.17		
Sept.27	328	12.96	3.95	1.97	3.44			.91		$6.64
Oct. 28	163	8.26	5.06	1.12	5.52			1.62		
Nov. 27	189	9.00	4.76	2.38	4.43		.57	1.62		
Dec. 28	200	9.31	4.65	1.81	4.57		.65	1.81	.47	
Jan. 25	221	9.91	4.48	2.06	6.01		.36	1.48		
TOTALS	2279	$108.30	4.75¢	$23.46	$53.16	$ .41	$2.68	$20.13	$ 1.82	$6.64
AVE.PER MO.	190	$9.03	4.75¢	$1.95	$5.91		$ .54	$1.68		

Miscellaneous under Lights includes a washing machine, iron and corn popper.

The combination range is used to cook for an average of 9 people. All of the baking is done in the electric range. The kitchen heater is used to heat water and considerable cooking.

The clipper was used on 46 head of cattle. It is of the portable pedestal type and is driven by a 1/4 horsepower motor.

The poultry house lights are operated by means of a time switch. The chickens were lighted for a period of four to five hours each day. 200 chickens were lighted during the spring and 250 during the fall months.

RECORDS OF THE 7½ HP MOTOR USED ON ELECTRO-TEST FARM NO. 2
1929

Date of Reading	Total Kw.Hrs.	Total Bill	Average Cost per Kw. Hr.	Hammer Mill: Kw. Hrs. Used	Hammer Mill: Cost	Hammer Mill: Pounds of Grain Ground: Oats	Barley	Total	Wood Sawing: Kw.Hrs. Used	Wood Sawing: Cost	Cords Sawed
Feb. 22	47	$ 3.11	6.61¢	31	$ 2.05	2656	1920	4576	16	$1.06	35
Mar. 21	27	2.20	8.16	27	2.20	2176	1584	3760			
Apr. 20	44	3.17	7.20	40	2.88	2784	2064	4848	4	.29	4
May 21	54	3.51	6.43	54	3.51	3136	2352	5488			
June 21	12	.58	4.83	12	.58	672	576	1248			
July 26	8	.30	3.69	8	.30	288	240	528			
Aug. 28	26	1.17	4.48	26	1.17	672	480	1152			
Sept.27	191*	7.55	3.95	23	.91	608	480	1088			
Oct. 28	32	1.62	5.06	32	1.62	1280	1008	2288			
Nov. 27	34	1.62	4.76	34	1.62	1024	1152	2176			
Dec. 28	49	2.28	4.65	39	1.81	2212	1344	3556	10	.47	22
Jan. 25	33	1.48	4.48	33	1.48	1984	1488	3472			
TOTALS	557	$28.59	4.75¢	359	$20.13	19,492	14,688	34,180	30	$1.82	61
AVE.PER MO.	46.4	$ 2.38	4.75¢	29.9	$ 1.68	1624	1224	2848			

*During the month of September the 7½ HP motor was also used to operate the ensilage cutter. 230 tons of ensilage were cut and elevated into the two silos. This required 168 kilowatt hours of electricity at a cost of $6.64. The average consumption per ton was .73 kilowatt hour costing 2.89 cents.

1.05 kilowatt hours of energy, at a cost of 5.9 cents, were used to grind 100 pounds of a mixture of barley and oats.

One-half kilowatt hour of energy, at a cost of three cents, was required to saw one cord of wood.

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ELECTRO-TEST FARM RECORDS

These records were taken during 1930 on the farm of Jos. N. Juckum, Electro-Test Farm No. 21, Chilton, Wis., in co-operation with the Wisconsin Public Service Corporation.

Table giving the monthly bill and kilowatt hour consumption as well as the consumption of various pieces of equipment. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw.Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Water Supply	Light Poultry House	7½ Horsepower Motor: Hammer Mill	Silo Filling	Wood Sawing
Feb. 26	200	$9.32	4.66¢	25	107		15	53		*
Mar. 26	201	9.34	4.65	44	111		5	41		
Apr. 26	269	11.28	4.19	28	185		4	52		
May 26	225	10.03	4.45	19	158	10		38		
June 26	209	9.57	4.58	16	171	18		4		
July 26	267	11.22	4.20	12	230	15		10		
Aug. 26	409	15.27	3.73	13	340	27		29		
Sept.26	338	13.25	3.92	20	134	23		9	152	
Oct. 26	214	9.71	4.53	48	118	18		30		
Nov. 26	193	9.12	4.73	51	75	25		21		21
Dec. 27	142	7.66	5.39	36	46	21	7	32		
Jan. 27	132	7.38	5.59	33	40	23	10	26		
TOTALS	2799	$123.15		345	1715	180	41	345	152	21
AVE. PER MO.	233	$10.26	4.40¢	29	143	20	8	29		

The first month started Jan. 25, 1930.

General Information:

Size of transformer - 7.5 kva. (Two customers are served from this transformer.)
Number in family - 9.
House - Modern.
Stock - 45 head of cattle, 4 horses, 250 chickens, and 16 sheep.

Table giving the monthly kilowatt hour consumption and bill as well as the cost of operating various pieces of equipment on Electro-Test Farm No. 21. It also includes the totals for the year and monthly averages.

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Lights and Misc.	Range	Water Supply	Light Poultry House	7½ Horsepower Motor: Hammer Mill	Silo Filling	Wood Sawing
Feb. 26	200	$9.32	4.66¢	$1.16	$4.99		$.70	$2.47		
Mar. 26	201	9.34	4.65¢	2.04	5.16		.23	1.91		
Apr. 26	269	11.28	4.19	1.17	7.76		.17	2.18		
May 26	225	10.03	4.45	.85	7.04	$.45		1.69		
June 26	209	9.57	4.58	.73	7.84	.82		.18		
July 26	267	11.22	4.20	.51	9.66	.63		.42		
Aug. 26	409	15.27	3.73	.49	12.69	1.01		1.08		
Sept.26	338	13.25	3.92	.78	5.26	.90		.35	$5.96	
Oct. 26	214	9.71	4.53	2.18	5.35	.82		1.36		
Nov. 26	193	9.12	4.73	2.41	3.55	1.18		.99		$.99
Dec. 27	142	7.66	5.39	1.94	2.48	1.13	.38	1.73		
Jan. 27	153	7.38	5.59	1.84	2.24	1.29	.56	1.45		
TOTALS	2799	$123.15	----	$16.10	$74.02	$8.23	$2.04	$15.81	$5.96	$.99
AVE. PER MO.	233	$10.26	4.40¢	$1.34	$6.17	$.91	$.41	$1.32		

Miscellaneous under Lights includes a washing machine, iron, corn popper, and radiant heater.

The combination range is used to cook for an average of 9.5 people. All of the baking is done in the electric range. The kitchen heater is used to heat water and for considerable cooking during the winter months.

The water system furnishes water for a modern home and 4 horses, 45 head of cattle, 16 sheep, and 250 chickens. This is a hydro-pneumatic system operated with a 3/4 horsepower motor. The lift is 48' with the cylinder 85' from the surface. The depth of the well is 131'. A 40 gallon pressure tank is installed.

The poultry house lights are operated by means of a time switch. The chickens were lighted for a period of 1.75 to 4.5 hours each day. 250 chickens were lighted during the spring and 200 during the fall months.

The 7½ horsepower motor is used for grinding feed, filling the silo, and sawing wood. (See another sheet for details.)

RECORDS OF THE 7½ HP MOTOR USED ON ELECTRO-TEST FARM NO. 21

1930

Date of Reading	Total Kw. Hrs.	Total Bill	Average Cost per Kw. Hr.	Kw. Hrs. Used	Cost	Hammer Mill Pounds of Grain Ground: Oats	Barley	Corn	Total
Feb. 26	53	$2.47	4.66¢	53	$2.47	2880	2160	112	5152
Mar. 26	41	1.91	4.65	41	1.91	2304	1728		4032
Apr. 26	52	2.18	4.19	52	2.18	2848	2064		4912
May 26	38	1.69	4.45	38	1.69	2048	1536		3584
June 26	4	.18	4.58	4	.18	198	196	56	450
July 26	10	.42	4.20	10	.42	448	336	336	1120
Aug. 26	29	1.08	3.73	29	1.08	1088	816		1904
Sept.26	161*	6.31	3.92	9	.35	576	432		1008
Oct. 26	30	1.36	4.53	30	1.36	1856	1248		3104
Nov. 28	42**	1.98	4.73	21	.99	1344	1008		2352
Dec. 27	32	1.73	5.39	32	1.73	1696	1248		2944
Jan. 27	26	1.45	5.59	26	1.45	1376	1008		2384
TOTALS	518	$22.76	----	345	$15.81	18662	13780	504	32946
AVE. PER MO.	46	$1.90	4.40¢	29	$1.32	1555	1148	42	2745

1.05 kilowatt hours of energy, at a cost of 6.9 cents, were used to grind 100 pounds of a mixture of barley, oats, and corn. A 3/16 inch size of screen was used.

*During the month of September the 7½ HP motor was also used to operate the ensilage cutter. 187 tons of ensilage were cut and elevated into the two silos. This required 152 kilowatt hours of electricity at a cost of $5.96. The average consumption per ton was .81 kilowatt hour costing 3.19 cents. The sizes of the silos are 12' x 37' and 14' x 46'. Ten feet of silage was left in the latter from 1929 at the time of filling.

**Twenty-one kilowatt hours of energy costing $.99 were used to saw 32 cords of stove length wood in December. Two-thirds of a kilowatt hour of energy, at a cost of 3.1 cents was required to saw one cord of wood.

File under Ensilage Cutting
8-29

UNIVERSITY OF WISCONSIN
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AGRICULTURAL ENGINEERING DEPARTMENT

TABLE I

RESULTS OF CUTTING ENSILAGE WITH 5 HORSEPOWER, SINGLE PHASE, 1800 RPM ELECTRIC MOTOR.

Specifications	Farm Number				
	1	2	3	4	5
Ensilage Cutter Type	Flywheel	Flywheel	Flywheel	Flywheel	Flywheel
Size of cutter	13"	13"	13"	13"	13"
Number of knives	2	3	3	3	3
Revolutions per minute	455	438	400	440	445
Length of cut	.44"	--	.52"	.52"	.52"
Height of silo	35'	37'	25'	46'	35'
Number of tons cut	170	85	104	21.6	55.6
Tons cut per hour	6.7	7.7	9.2	8.1	6.1
Total kw. hrs. used	115	55	62	16.3	42.3
Kw. hrs. per ton	.62	.65	.60	.76	.76
No. of men in crew	6	7	--	4	4
Teamsters	4	3	--	4	4
Spike pitchers	None	3	--	None	None
Feeders	1	1	--	None	None
Binder operator	1	None	--	None	1

NOTES: On Farm No. 1, forty-two loads, averaging 1-1/4 tons were cut in eight hours.

On each farm except No. 1, the tons per hour indicates the number of tons that would be cut in one hour of continuous operation with no time out.

CUTTING ENSILAGE WITH A 5 OR 7½ H. P. MOTOR

Recommended Specifications

Cutter

Type: Flywheel. Two or three knife.

Size: 12 or 13 inch throat width is preferred. No feeder is used at the machine, therefore, smaller sizes are not practical. Larger sizes are not recommended because of higher initial cost.

Fan design for good elevation: The fan wings must fit the housing very closely. (Clearance not over 1/8 inch) especially at the tips or ends. A reasonably close fit at the sides is also important.

Motor Specifications

Motor: 5 or 7½ horsepower. Single phase. 1800 or 1200 R.P.M. (1800 R.P.M. ball bearing, utility motor mounted on a truck is recommended)

Switch: Magnetic type with thermal overload relay. Never use a fused starting switch.

Transformer size:

5 H.P. motor - 3 or 5 K.V.A. transformer
7½ H.P. " - 5 K.V.A. or larger transformer

Transformer location: Hang the transformer as close to the center of the building group as possible, or close to the motor.

Primary line: Good voltage regulation.

Secondary line: The line from the transformer to the service switch, meter and on to the motor should be built according to the following specifications as to wire sizes.

Wire Sizes for 220 Volt, Single Phase, 60 Cycle Repulsion-Induction Motors

Size of Single Phase Motors	Distance from transformer to motor			
	Not over 100'	100' to 200'	200' to 300'	300' to 400'
2 HP	8	8	8	6
3 HP	8	8	8	6
5 HP	5	5	5	4
7½ HP	4	4	4	2

NOTE: Wire one size larger or smaller might be used, depending on the starting torque and R.P.M. of the motor. With motors of less than 700 R.P.M., the wire should be one size larger.

Power Transmission

Belt: 4" to 6" wide. Standard motor pulley is 6½" wide. A 4" belt will have to be in first class condition or kept very tight to transmit the full overload capacity as developed for short periods.

Avoid stiff belts on account of the small motor pulley. Use not over 4 ply stitched canvas or rubber, and single ply leather belts. A distance of 15 to 25 feet between pulleys is best. Somewhat longer or shorter belts can be used.

If the belt is not too short a crossed belt will have less tendency to flap and slip over the small motor pulley. A crossed belt is not satisfactory with an extremely small pulley.

Pulleys: Motor pulley. Fibre. 6½" face. Not smaller than 4½" diameter.

Cutter pulley. Cutter pulleys vary from 18" to 24" in diameter for this work. Refer to table for proper cutter speed, then calculate the exact diameter of cutter pulley as follows:

$$\text{Cutter pulley diameter} = \frac{\text{Motor pulley diameter} \times \text{Motor R.P.M.}}{\text{Cutter R.P.M.}}$$

Motor mounted on cutter: This arrangement with a roller chain or multiple "V" belt drive is especially satisfactory. It is simple, compact, efficient and troubleproof. The motor, switch and cable may be easily removed from a portable motor, and used for this job.

Operation, Care and Adjustment

Speed of the cutter: Practically the whole secret of cutting ensilage with a 5 HP electric motor depends upon operating the cutter at a very slow speed, and keeping it sharp and properly adjusted. (Refer to table of proper cutter speeds) Many of the older models of cutters will not elevate successfully at these slow speeds and a 5 horsepower motor will not pull the cutter at high speeds.

Rate of cutting: Four to ten tons per hour can be cut depending upon the following factors:

1. Speed of cutter. (Extremely important)
2. Sharpness and setting of knives. (Important)
3. Length of cut. (Not important)
4. Design of fan. (Important)
5. Good electric line and transformer. (Important)
6. Proper belt and pulleys. (Important)
7. Careful feeding. (Important)
8. Height of silo. (Not important)
9. Condition of corn. (Important)

Energy required: In general it required from 0.6 to 1.0 kilowatt hour (kw. hrs.) costing 2½ cents and up per ton depending upon the items listed under "Rate of Cutting."

Knives: Sharpen every half day, being careful to maintain the original bevel. Adjust knives as close as possible to the shear bar so as not to strike when running.

Ledger plate or shear bar: Replace or turn over to a new edge when badly worn.

Lubrication: Keep all working parts well lubricated.

Anchoring the cutter: A stake driven against the rear wheel next to the power is usually sufficient. An equally good anchor is to chain the cutter to a stake.

Anchoring the motor: The anchor should be fastened to the motor truck as near as possible directly behind the motor pulley. An iron or wooden anchor stake driven in the ground is satisfactory.

The following simple methods may be used for anchoring the motor and keeping the belt tight:

1. Self locking block and tackle with 3/8" or 1/2" rope is best.

2. Small wire stretcher.

3. Pass a loop of light log chain or rope around the anchor stake and through the motor truck frame, then twist it.

Pipe: The pipe should be reasonably straight, and in fairly close alignment with the cutter. Where a telescoping section of pipe is used to adjust the height, it must be set up with the inner section at the lower end, otherwise it will interfere with proper elevation of the silage.

Silage distribution: This can be accomplished by hanging two sections of distributor to the elbow, and fastening them in such a position that the silage will fall directly in the middle of the silo and will roll down toward the sides.

Tramping is unnecessary: If the silage is tramped it must be done thoroughly or it is apt to spoil. If it is desired to distribute the silage without tramping, it can be done by stationing a man at the top of the silo to handle a section or two of distributor.

Feeding: Feed steadily, lapping the bundles about 1/3. If the pitcher will take a little extra care in throwing the bundles on the feed table, a man will not be required at the cutter for feeding. This means quite a saving in labor.

Size of bundles: Average, medium sized bundles are satisfactory. It will not be necessary to split the bundles if they are not made too large.

Length of cut: Most silage is cut into 3/8 or 1/2 inch lengths. It is seldom cut longer than 1/2" and sometimes as short as 1/4". Short cuts will reduce the tonnage per hour, and increase the current consumption per ton.

Short cuts are a little harder to elevate.

Size of crew: The maximum size of crew which can be used to advantage depends upon the length of haul. The following crew is suggested:

1. One man on binder.
2. Two, three or four wagons unless the haul is extremely long.
3. One extra field pitcher, if desired.

TABLE II

MINIMUM SPEEDS FOR VARIOUS SIZED ENSILAGE CUTTER FANS TO ELEVATE INTO SILOS OF DIFFERENT HEIGHTS

Diameter of Cutter Fan in Inches	Height of Silo in Feet								
	25'	30'	35'	40'	45'	50'	55'	60'	75'
	Revolutions per minute of cutter fan								
30	500	530	575	610	650	690	720	750	835
32	465	495	540	575	610	645	675	705	780
34	440	465	510	540	570	610	635	660	735
36	415	440	480	510	540	575	600	625	695
38	390	415	450	480	510	545	570	595	660
40	370	395	430	460	485	515	540	565	625
42	355	380	410	435	465	490	515	535	595
44	340	360	390	415	440	470	490	510	570
46	325	345	375	400	425	450	470	490	545
48	310	330	360	380	405	430	450	470	520

NOTE: These speeds are based upon carefully conducted tests with a reasonable allowance to insure uninterrupted elevation. Good cutters will positively operate at these speeds.

The Annual Overhead Cost of Owning an Ensilage Cutter

Assume first cost	$320.00
Assume total life	16 years

Depreciation - 1/16 of $320.00	$20.00
Interest ($\frac{\$320.00 \text{ plus } \$20.00}{2}$) at 6%	10.20
Repairs - 1% of original investment annually	3.20
Total	$33.40

Under average conditions, the annual cost of owning the cutter will not vary greatly with the number of tons cut. Therefore, the cost per ton of using the cutter will decrease as the number of tons cut increases.

If 100 tons are cut annually, the cost per ton of using the cutter would be 33.4 cents. If 200 tons are cut annually, the cost would be reduced nearly one-half, or to about 16.7 cents per ton.

The Annual Overhead Cost of Owning a Utility Motor

	5 HP Motor	7½ HP Motor
Assume first cost	$250.00	$280.00
Assume total life	25 years	25 years
Depreciation - 1/25 of first cost	$9.20	$11.20
Interest - average investment at 6%	7.17	8.74
Repairs	3.00	3.25
Total	$19.37	$23.19

If the motor is used for several different jobs during the year, this cost should be divided among the various jobs. That is, if the motor was used for grinding feed, cutting ensilage, hoisting hay and elevating grain, the motor overhead cost would average $4.84 for the 5 HP motor and $5.77 for the 7½ HP motor.

The cost per ton for electric energy will be 2½ cents and up depending upon the electric rate and the factors mentioned under "the rate of feeding."

TABLE III

THE AVERAGE COST OF FILLING SILOS

(282 farms in Southeast Wisconsin)

Items	Cost per ton	Per cent of total costs
Silo, depreciation and repairs	$.22	10.6
Engine, depreciation and repairs	.17	8.2
Ensilage cutter, depreciation & repairs	.18	8.8
Corn binder	.10	4.9
Wagons	.01	.5
Man work, 1.83 hours	.58	28.1
Horse work, 2.57 hours	.35	17.0
Twine, 12¢ per pound	.07	3.4
Fuel*	.07	3.4
Interest on silo and equipment	.31	15.1
Total cost per ton	$2.06	100%

*Kerosene sold for about 11 cents per gallon and gasoline sold at approximately 15 cents per gallon.

NOTE: The above table is taken from Wisconsin Bulletin 386.

Under average conditions, and assuming that the motor is used for at least 2 jobs on the farm so that only about one-half of the motor overhead must be charged to silo filling; then, the machinery and power costs when using a 5 or 7½ horsepower motor and a 12 or 13 inch cutter will be approximately equal to the average costs given in the above table. As the number of tons cut annually increases, the total cost per ton of using the machinery will decrease.

File under Grinding Feed
10-29

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

GRINDING FEED AND ELEVATING GRAIN WITH ELECTRIC POWER

Mill Specifications

Type: Hammer type feed mill with fan elevator. The elevating fan is recommended as it simplifies removing the feed as ground at the mill, and the same fan may also be used for elevating grain into the bins at threshing time.

Size: Suitable for 2 to 7½ horsepower motor. (Size ratings are not standardized.)

Bearings: Ball or roller.

Motor Specifications

Motor: 2, 3, 5 or 7½ HP. Single phase. 1800 or 1200 R.P.M. (5 HP - 1800 R.P.M. Utility motor mounted on wheels is recommended.)

Switch: Magnetic type with thermal overload relay. Never use a fused starting switch.

Transformer Size:

2 HP motor	-	1½ K.V.A. transformer
3 HP "	-	3 K.V.A. "
5 HP "	-	3 or 5 K.V.A. "
7½ HP "	-	5 K.V.A. or larger transformer

Transformer Location: Hang the transformer as close to the center of the building group as possible, or close to the motor.

Primary Line: Good voltage regulation.

Secondary Line: The line from the transformer to the service switch, meter and on to the motor should be built according to the following specifications as to wire sizes.

Wire Sizes For 220 Volt, Single Phase, 60 Cycle Repulsion-Induction Motors.

Size of Single Phase Motors	Distance from the transformer to the motor			
	Not over 100'	100' to 200'	200' to 300'	300' to 400'
2 HP	8	8	8	6
3 HP	8	8	8	6
5 HP	5	5	5	4
7½ HP	4	4	4	2

NOTE: Wire one size larger or smaller might be used, depending on the starting torque and RPM of the motor. With motors of less than 700 RPM, the wire should be one size larger.

Power Transmission

Drive: (a) Belted direct from the motor to the mill is usually recommended. Do not drive through a line shaft.

(b) Direct connected to a 3500 R.P.M. motor where the motor is used for grinding only.

Belt: Four inches wide, thin, flexible, and preferably endless for a 5 HP motor. 3 ply endless rubber, or light single ply leather, either endless or laced with wire lacing. Avoid thick, stiff belts and stiff cumbersome lacings. A distance of 8 to 15 feet between pulleys is good.

Pulleys: The grinders are usually equipped with fibre or cast iron pulleys 4" in diameter with a 4½" or 5" face. High speed is essential for efficient operation of a hammer mill.

Two types of rotating cylinders are used. In one type the cylinder is straight, the hammers are all the same length and the diameter is about one foot. The recommended speed is 3500 to 4000 R.P.M. requiring an 8" or 9" pulley on an 1800 R.P.M. motor, or a 12" or 14" pulley on a 1200 R.P.M. motor.

In the other type, the cylinder is smaller on one end than the other and the grain is fed in at the small end. A speed of 3500 R.P.M. is recommended requiring an 8" pulley on an 1800 R.P.M. motor or a 12" pulley on a 1200 R.P.M. motor.

Installation

General Principles: The mill should be installed with an overhead bin so that it can be operated without an attendant. The ground feed can be dropped directly into an enclosed ground feed bin, or elevated to a convenient bin, or to the bagger by the fan elevator.

Hopper Bottom for Bins: Hopper bottoms are not necessary for ordinary elevated grain bins, that are emptied only once or twice a year.

Small grain hoppers over the mill should have sloping bottoms at an angle of 45°, that is, the vertical rise should be equal to the horizontal run. (See diagram)

Ground feed bins: Should be high and narrow rather than broad and low. The floor should have a slope of at least 60°, that is, the vertical rise should be 1¾ feet for each foot of horizontal run. (See diagrams) A simple agitator may be required for ground oats even with this steep slope.

Chutes: Grain chutes should be at least 6" inside, either square or round, and slope at an angle of at least 45°.

Ground feed chutes must be at least 1 ft. inside, either square or round, These chutes should be vertical or nearly so.

Mill foundation: The mill should be fastened to a reasonably solid foundation. It is not apt to vibrate appreciably but should not be placed on a flimsy framework.

Blower Pipe: If it is desired to blow the feed horizontally more than about 8 or 10 feet, the pipe should be arranged to go straight up somewhat higher than the ground feed bin or dust collector, then slope downward to the bin at an angle of 30° with the horizontal. (See diagram)

Elevating Grain

The fan of the mill can be used very satisfactorily for elevating grain at threshing time. The fans have a capacity of 200 or more bushels per hour, depending upon the size of the fan and the elevation.

Method of Elevating Grain: Feed the grain into the fan directly.

Speed of Fan for Elevating Grain: Run at a slower speed than when grinding to avoid cracking and hulling. Recommended speed - 1200 to 1600 R.P.M. for elevations up to 15 or 20 feet. For higher elevations, slightly higher speeds will probably be required. However, speeds much in excess of 1600 R.P.M. will be apt to hull or crack some of the grain. Exceedingly high speeds causing excessive cracking of the grain might cause the grain to mold.

Rate of Grinding and Energy Cost

The rate of grinding varies with:

(a) The fineness of grinding.
(b) The size of the motor.
(c) The material being ground.
(d) The condition of the grain, whether damp or dry.

In general,

One kilowatt hour of energy will grind from 35 to 300 pounds of material.
A 5 HP motor will grind from 200 to 1500 pounds per hour.
It requires 7 to 60 kilowatt hours to grind one ton.
Ordinary cow feed will require from 7 to 15 kilowatt hours per ton.
The cost will ordinarily vary from 25¢ to $1.50 per ton.
Where considerable current is used and energy for grinding is purchased at around 3¢ per kilowatt hour, ordinary cow feed will cost from 25¢ to 50¢ per ton for grinding.

The Annual Overhead Cost of Owning a Mill

Assume first cost -	$100.00	
Assume total life -	16 years	
Depreciation - 1/16 of $100.00	--	$6.25
Interest ($100.00 plus $6.25) / 2	@ 6%	3.19
Repairs ----------		2.00
		$11.44

In general, the mill is not recommended for hords of less than 12 to 15 cows.

The Annual Overhead Cost of Owning a 5 HP Utility Motor

Assume first cost plus freight - $235.00		
Assume total life - 25 years		
Depreciation - 1/25 of $235.00	--	$9.40
Interest ($235.00 plus $9.40) / 2	@ 6%	7.33
Repairs ----------		2.00
		$18.73

If the motor is used for several different jobs, this cost of $18.73 should be divided among the various jobs. That is, if the motor were used for grinding feed, cutting ensilage, hoisting hay and elevating grain, the motor overhead cost would average $4.68 for each job.

UNIVERSITY OF WISCONSIN
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AGRICULTURAL ENGINEERING DEPARTMENT

REPORT ON SMALL HAMMER TYPE FEED MILLS
1929-1930

TABLE 1 THE ALGOMA "OK" NO. 6

reen	R.P.M. Mill	Corn				Oats				Barley			
		Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#
/8	3350±	725	5.12	1.74	0.73	300	5.10	1.79	1.701	425	5.19	2.48	1.221
/16	3350±	1050	4.87	2.15	0.464	525	5.19	2.33	0.989	705	5.08	3.03	0.721
/4	3350±	1550	5.03	2.59	0.324	960	5.07	2.74	0.528	---	-----	-----	---
/16	3350±	1585	4.83	2.57	0.305	1095	5.38	2.95	0.492	1153	5.02	3.77	0.435

NOTE 1. The modulus for the 5/16 inch screen on corn is finer than on the 1/4" probably due to lighter feeding in proportion to the screen size. This was necessary due to the inability of the fan to handle more.

TABLE 2 THE GEHL NO. 713

reen	R.P.M. Mill	Corn				Oats				Barley			
		Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#
/8	3300±	510	5.07	2.14	0.994	250	5.14	2.02	2.055	330	5.07	2.44	1.535
/16	3300±	750	5.11	2.45	0.681	355	5.03	2.42	1.416	530	5.11	3.01	0.965
/4	3300±	1070	5.07	2.77	0.474	865	5.15	2.91	0.596	705	5.08	3.46	0.721
/16	3300±	1435	5.06	2.98	0.353	1140	4.94	3.28	0.433	1165	5.05	3.96	0.434

TABLE 3 THE PRATER 5—J

reen	R.P.M. Mill	Corn				Oats				Barley			
		Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#
/32	3350±	990	5.01	2.00	0.506	330	4.94	1.84	1.497	510	5.39	2.71	1.057
/8	3350±	1050	5.07	2.28	0.483	440	5.20	1.98	1.181	590	5.26	2.94	0.892
/16	3350±	1570	5.06	2.77	0.322	820	5.04	2.37	0.614	880	5.10	3.49	0.580
/4	3350±	1885	5.03	2.83	0.267	1095	5.03	2.88	0.459	1160	5.30	3.75	0.457
/8	3350±	2030	5.06	3.01	0.249								
/2	3350±	2120	5.11	3.10	0.241								

TABLE 4 THE ROWELL "WHIPIT" NO. 1

reen	R.P.M. Mill	Corn				Oats					Barley		
		Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#	Pounds per hour	Avg. HP	Fine-ness Modulus	HP Hrs. per 100#
/32	3950±	520	5.28	1.43	1.015	300	4.94	1.95	1.645	323	5.26	2.00	1.630
/8	3950±	550	5.13	1.58	0.933	420	4.98	2.19	1.185	350	5.15	2.16	1.472
/16	3950±	925	5.23	2.07	0.566	642	4.91	2.68	0.757	580	5.16	2.77	0.890
/4	3950±	1045	5.07	2.54	0.485	900	4.88	2.78	0.542	772	5.20	2.92	0.674
/16	3950±	1260	5.16	2.58	0.409	1090	5.09	2.95	0.467	950	5.12	3.24	0.539

NOTE 2. For all machines:

	Test Wt.	Moisture
Corn	51 lbs. per bu.	11.2%
Oats	34 lbs. per bu.	12.5%
Barley	46 lbs. per bu.	11.2%

Moisture determination by Brown-Duvel Method.

NOTE 3. These tables may be reproduced by securing permission from the Department of Agricultural Engineering, University of Wisconsin, Madison, Wisconsin. These tables may only be reproduced complete as given.

File under Grinding Feed
5-31

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

Report on Small Hammer Type Feed Mills.
1931
Table 5. The Stover No. 89 - Size 7 1/8" x 13¼".

CORN

Screen	R.P.M. Mill	Pounds per hour	Average H. P.	Fineness Modulus	H.P. hrs. per 100#	Kw. hrs. per 100#
3/32	3700±	630	5.11	1.91	0.812	0.713
1/8	3700±	955	5.07	2.18	0.531	0.605
3/16	3700±	1305	5.09	2.36	0.390	0.343
1/4	3700±	1480	5.12	2.60	0.346	0.304
5/16	3700±	1695	5.01	2.74	0.296	0.260
7/16	3700±	1975	5.10	3.13	0.258	0.227

OATS

Screen	R.P.M. Mill	Pounds per hour	Average H. P.	Fineness Modulus	H.P. hrs. per 100#	Kw. hrs. per 100#
3/32	3700	322	5.25	1.78	1.627	1.428
1/8	3700	560	5.16	2.07	0.921	0.809
3/16	3700	765	5.10	2.32	0.667	0.586
1/4	3700	1295	5.13	2.69	0.396	0.343
5/16	3700	1350	5.07	2.76	0.375	0.329

BARLEY

Screen	R.P.M. Mill	Pounds per hour	Average H. P.	Fineness Modulus	H.P. hrs. per 100#	Kw. hrs. per 100#
3/32	3700	360	4.92	2.13	1.365	1.198
1/8	3700	530	4.90	2.58	0.924	0.812
3/16	3700	835	5.33	2.85	0.638	0.560
1/4	3700	1120	5.09	3.23	0.454	0.398
5/16	3700	1258	4.98	3.33	0.396	0.348

Note 1.

	Test Wt.	Moisture
Corn	56.8 lbs. per bu.	16.2%
Oats	40.5 lbs. per bu.	10.0%
Barley	45.0 lbs. per bu.	12.4%

Moisture determination by Brown-Duvel Method.

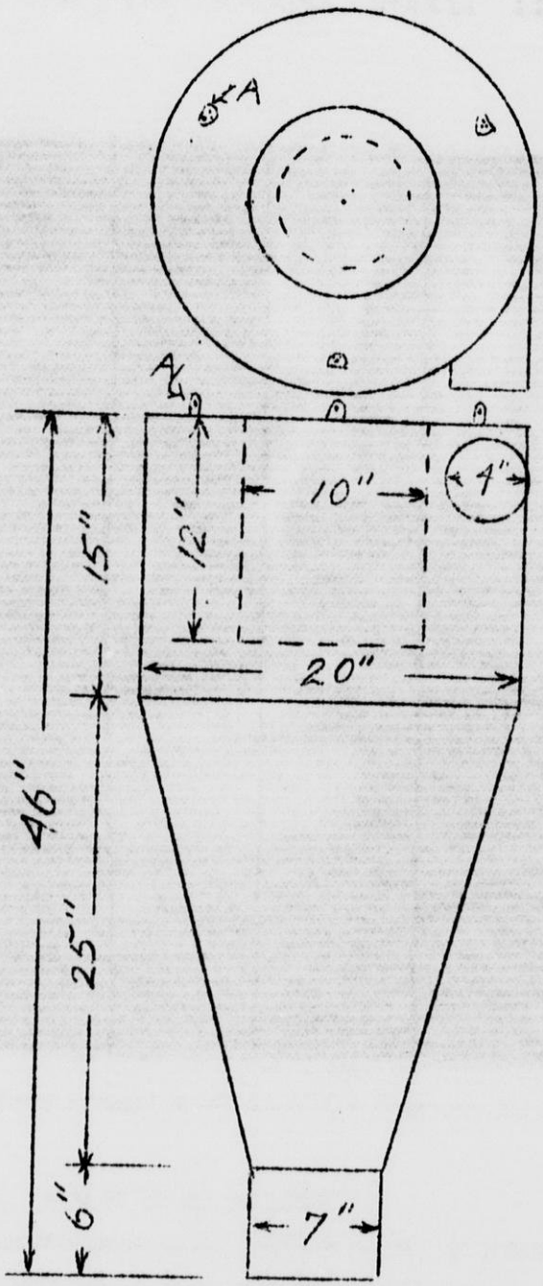
Note 2. Horsepower hours per 100 pounds refers to the net power or power output required, and kilowatt hours per 100 pounds refers to the power input based on 85% motor efficiency.

Note 3. This table is part of a series. It may be reproduced by securing permission from the Department of Agricultural Engineering, University of Wisconsin, Madison, Wisconsin. The table may only be reproduced, complete as given.

File under Grinding Feed
2-29

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

DUST COLLECTOR



The specifications of the dust collector are of a typical installation on the farm of Wm. Noyes, Beaver Dam, Wisconsin, and used with a hammer type feed grinder. It was made by a local tinsmith out of 26 gauge galvanized iron. Pail bails (A) are used to hang the dust collector from the ceiling or beams.

University of Wisconsin
COLLEGE OF AGRICULTURE
Agricultural Engineering Department

Hammer Type Feed Mill Installation

The above installation is located on the farm of H. S. Stauffacher, Monroe, Wisconsin

MILL: Hammer Type. 3500 R. P. M. 4″ pulley.

MOTOR: 5 H. P. portable utility motor. 1750 R. P. M. 8″ pulley.

BELT: 3 ply endless rubber belt, 4″ wide, 10 ft. between pulley centers.

Mr. Stauffacher mixes the grain in the small bin supplying the mill by alternately shovelling in small quantities of the various grains desired in the ration. By this method the grain is thoroughly mixed by the time it goes through the mill. This arrangement is extremely handy and saves hours of time.

(See Other Side)

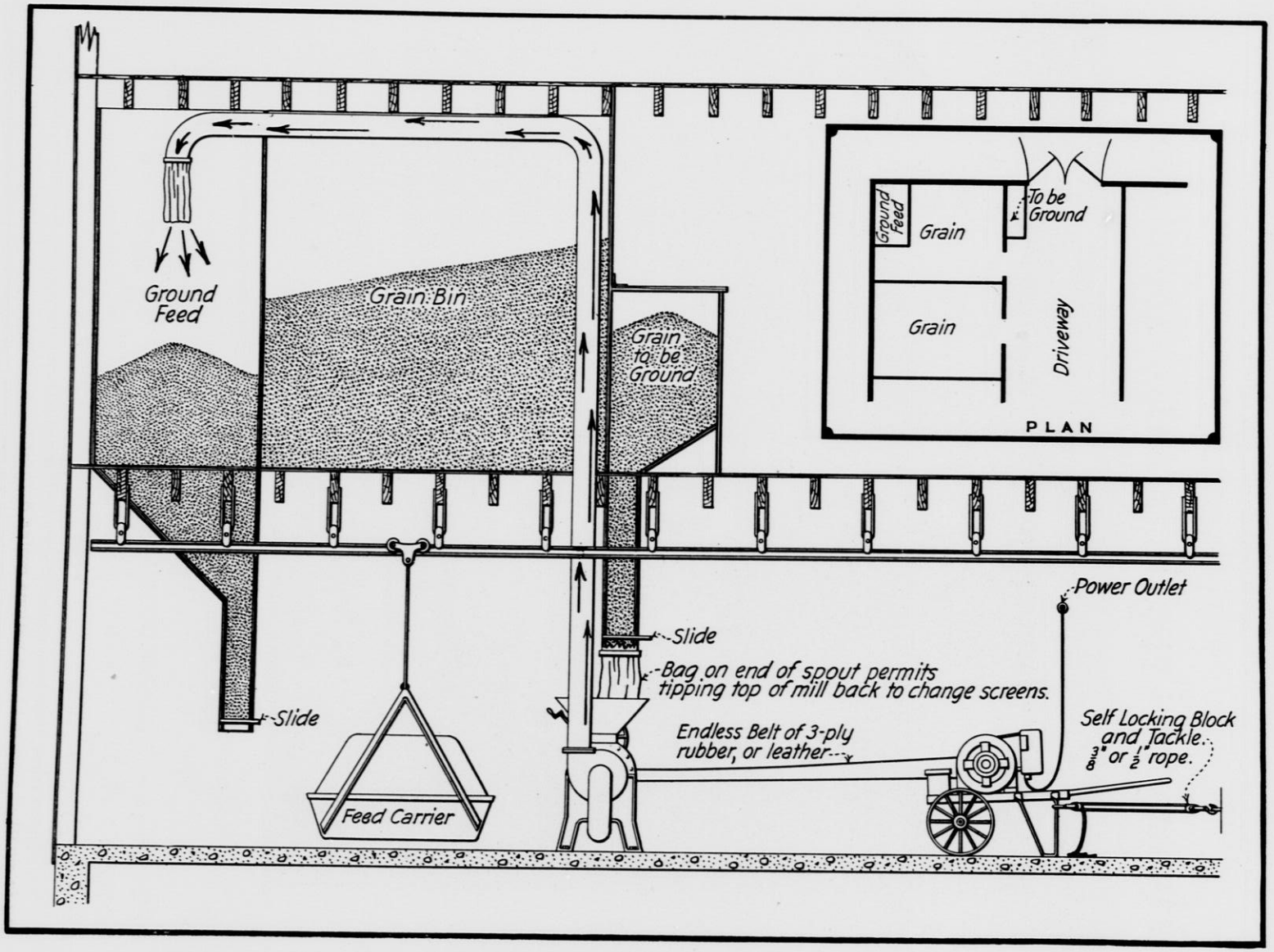
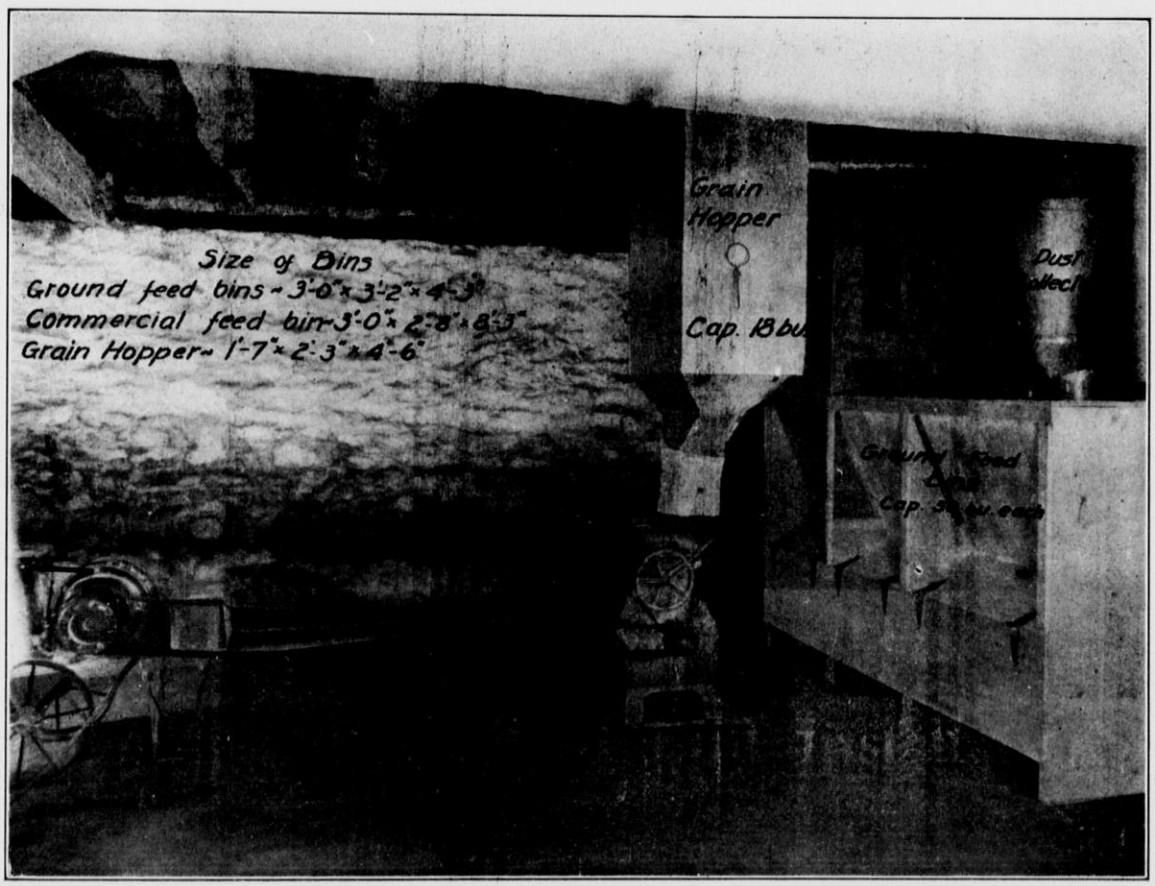


Diagram of Bin Arrangement

(See Other Side)

University of Wisconsin
College of Agriculture
Agricultural Engineering Department

Hammer Type Feed Mill Installation



The above installation is located on the farm of Carl Block, Wausau, Wisconsin.

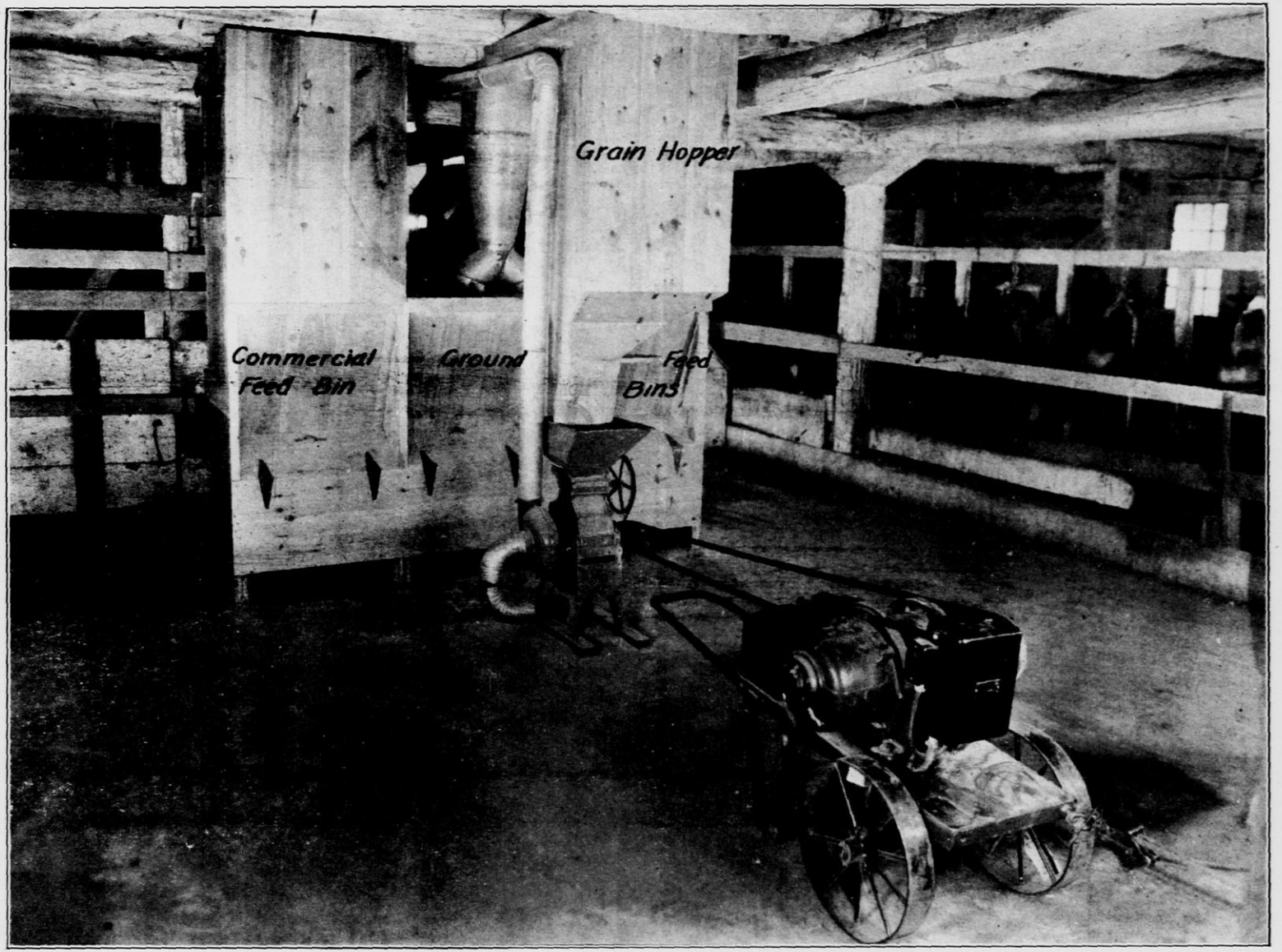
Mill: Hammer type. 3500 to 4000 R.P.M. 4 in. pulley.

Motor: 5 HP portable utility motor. 1750 R.P.M. 9 in. pulley.

Belt: 3 ply endless rubber belt. 4 in. wide. 10 ft. between pulleys.

The grain hopper and commercial feed bin have trap doors which open onto the threshing floor. The granary is located in one of the haymows so that the grain can be taken from this to the grain hopper either in sacks or a wheelbarrow. With two ground feed bins it enables him to keep the ground corn and oats separate. The commercial feed bin has a capacity of one ton and is used for bran, middlings, linseed meal, etc.

(See other side)

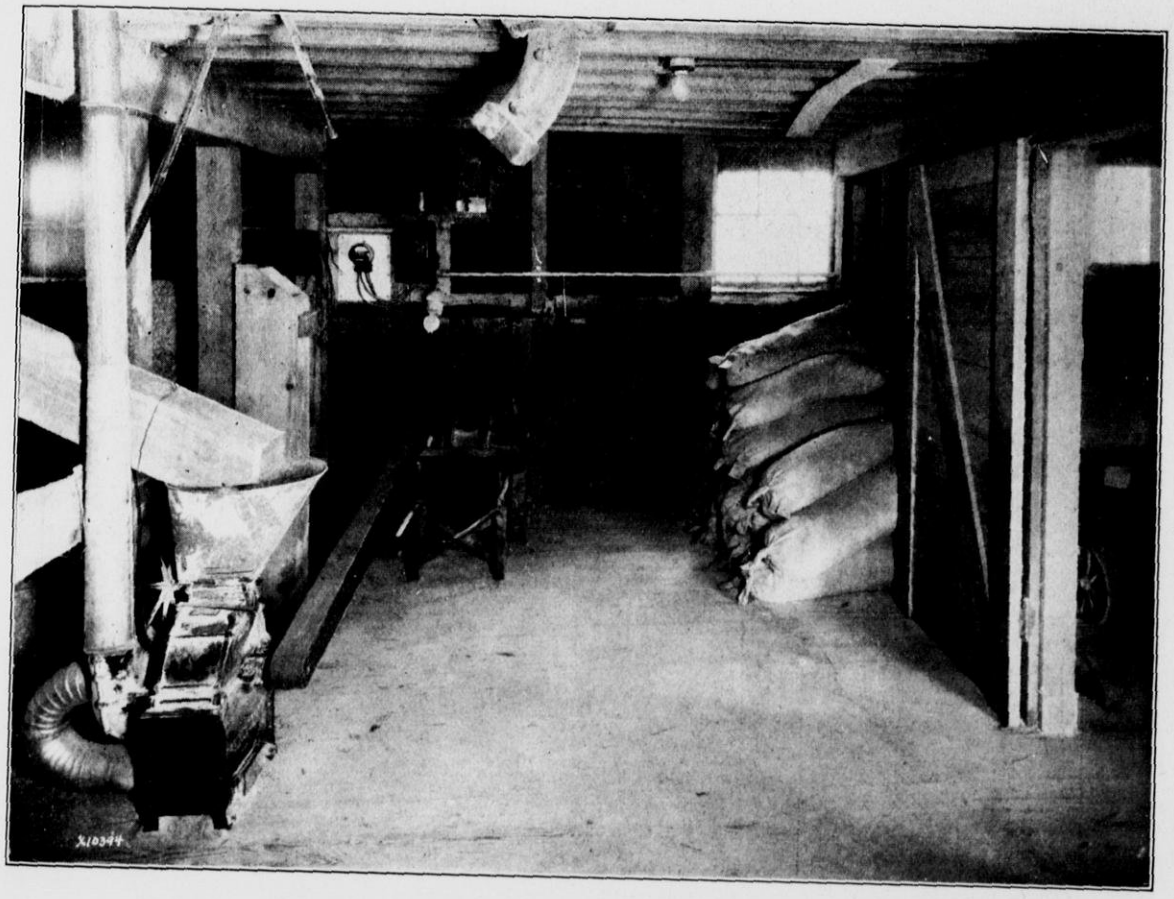


Hammer type feed mill installation

(See other side)

UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department

Hammer Type Feed Mill Installation



The above installation is located on one of the University of Wisconsin farms, Madison, Wisconsin.

Mill: Hammer type. 3500 to 4000 R.P.M. 4″ pulley.

Motor: 5 HP portable utility motor. 1750 R.P.M. 9″ pulley.

Belt: 3 ply endless rubber belt. 4″ wide. 10 ft. between pulleys.

Large overhead bins are used to store the grain. Chutes deliver the grain from these to the hammer feed mill where it is ground. The blower delivers the ground feed to overhead bins from which it is taken as needed for mixing the ration.

(See other side)

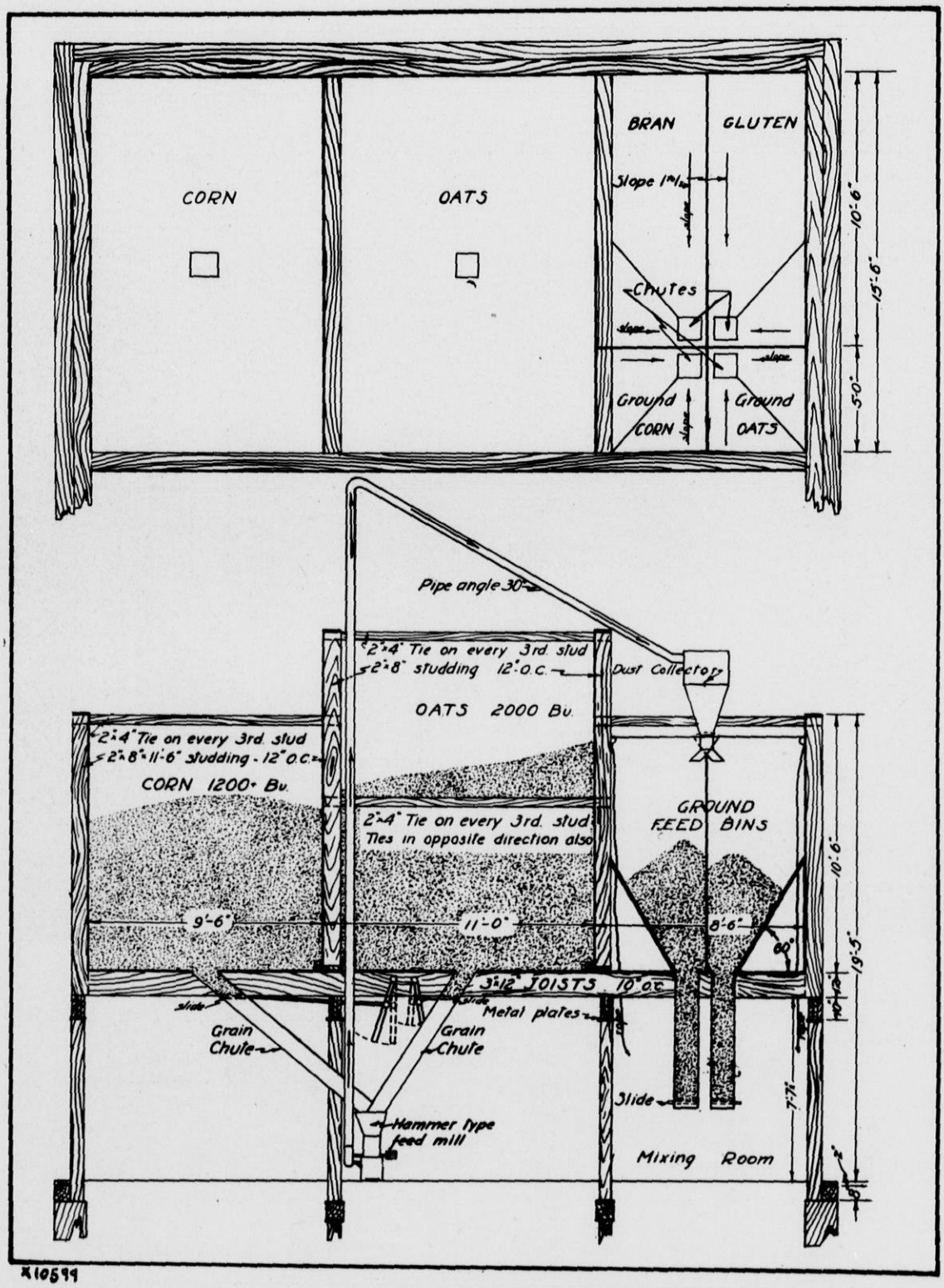
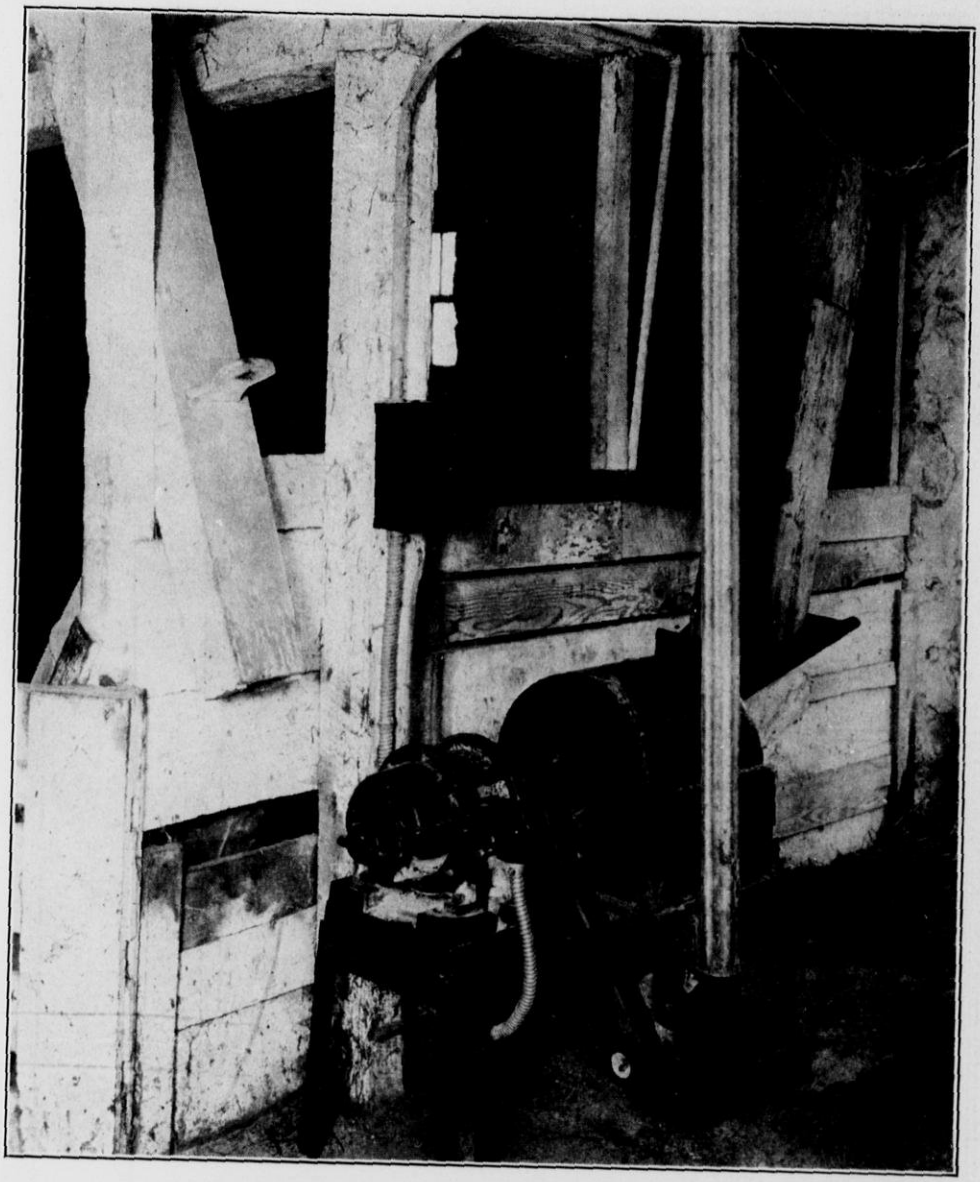


Diagram of Bin Arrangement

(See Other Side)

UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department

Hammer Type Feed Mill Installation



The above installation is located on the farm of H. G. Joeckel, Jackson, Wis.

Mill: Hammer type. Direct connected. 3500 R.P.M.
Motor: 2 H.P. 3500 R.P.M.

A supply hopper for the mill, holding about 20 bushels, was built in the alleyway of the granary. Alternate shovelfuls of the various grains to be ground are placed in the bin. A chute delivers the grain to the mill and thorough mixing takes place in the process of grinding. The attached blower delivers the ground and thoroughly mixed feed to a bin located at the end of the feed alley where it is handy for feeding the cattle.

(See other side)

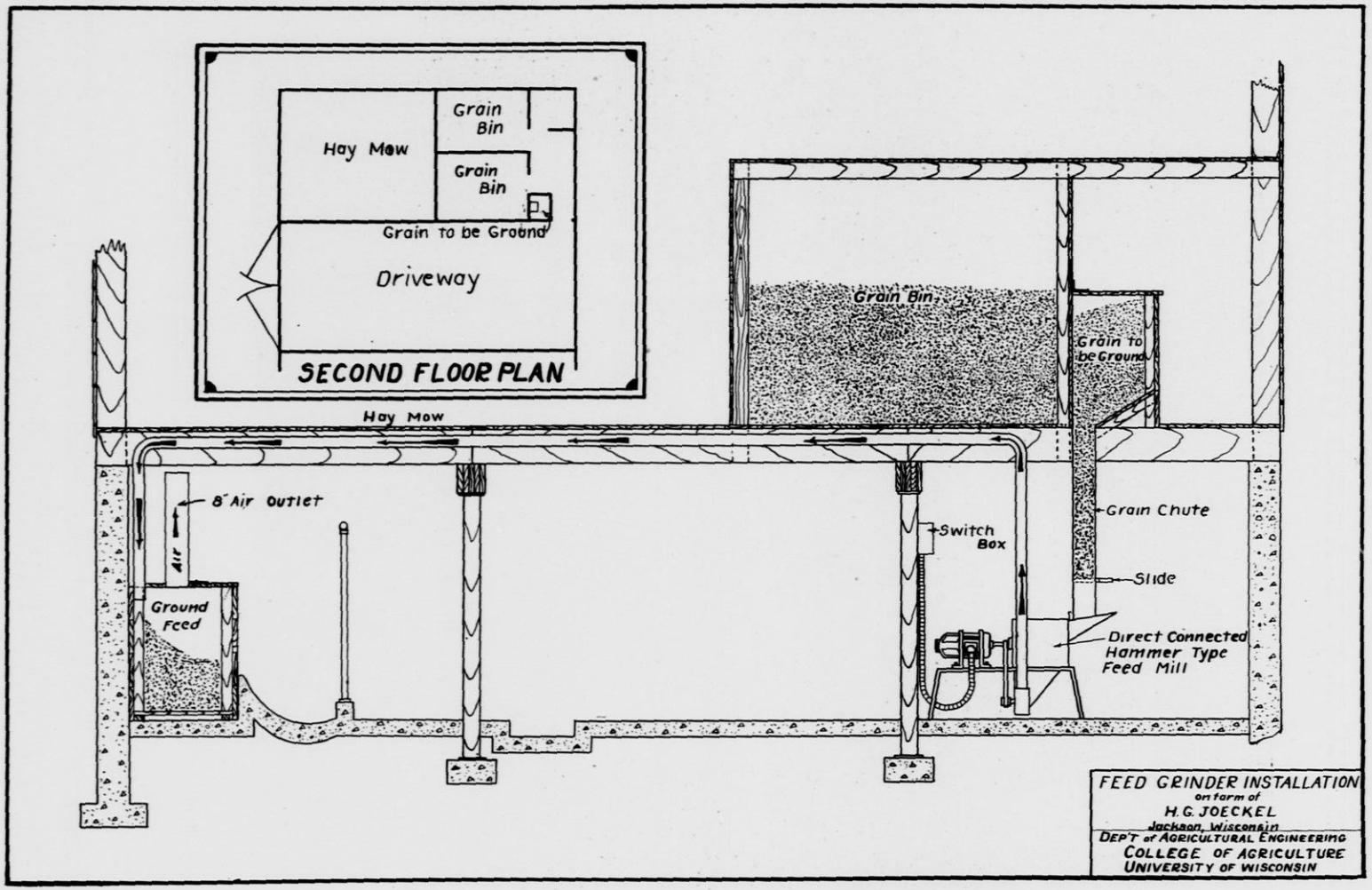
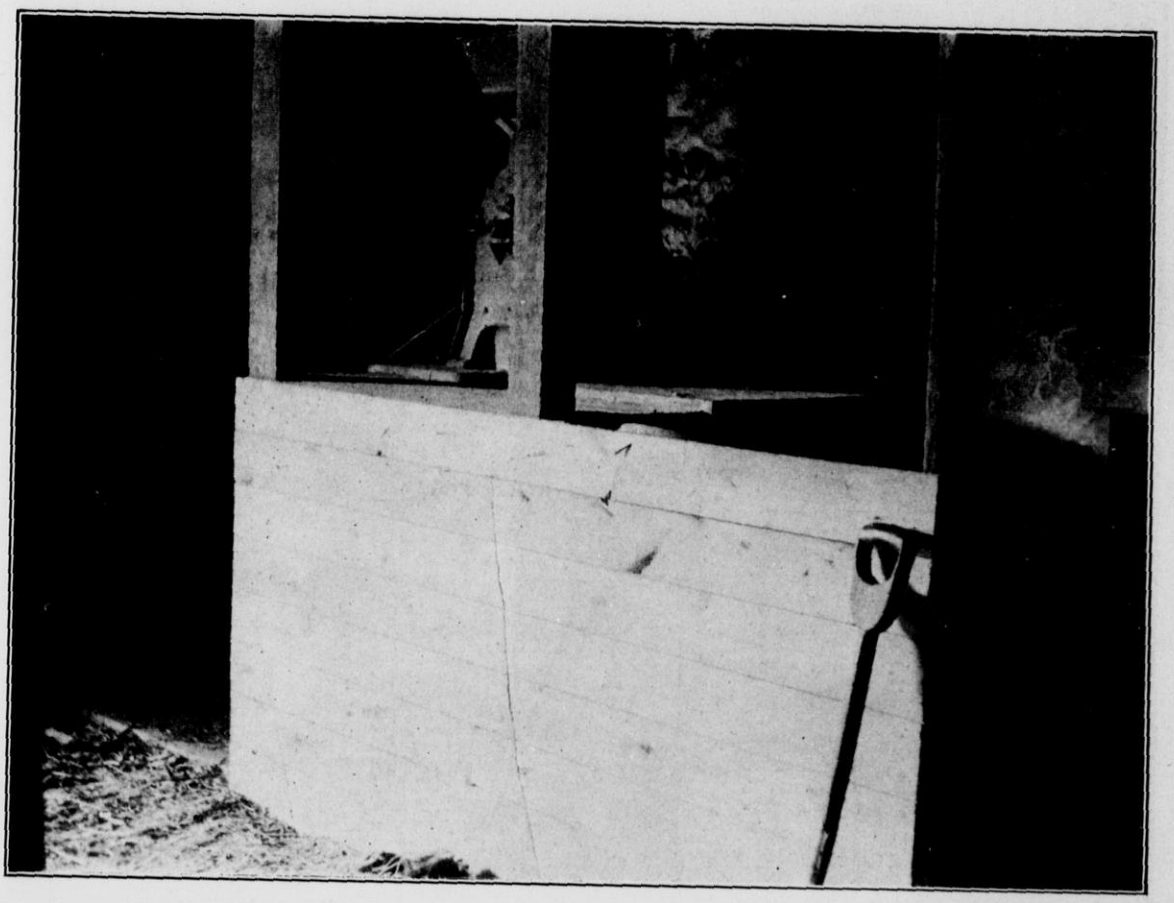


Diagram of Bin Arrangement

(See Other Side)

UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department

Hammer Type Feed Mill Installation



The above installation is located on the farm of Alvin Wilkes, Ripon, Wis.

Mill: Hammer type. 3500 to 4000 R.P.M. 4″ pulley.

Motor: 5 HP portable utility motor. 1750 R.P.M. 9″ pulley.

Belt: 3 ply endless rubber belt. 4″ wide. 10 feet between pulleys.

The grain is stored in two large overhead bins. Chutes deliver the grain from these to the hammer feed mill where it is ground. The mill is placed on top of the ground feed bin so that the ground feed falls directly into it. A burlap curtain is hung on the open side to help keep down the dust. A small mixing floor is provided in front of the bin.

(See other side)

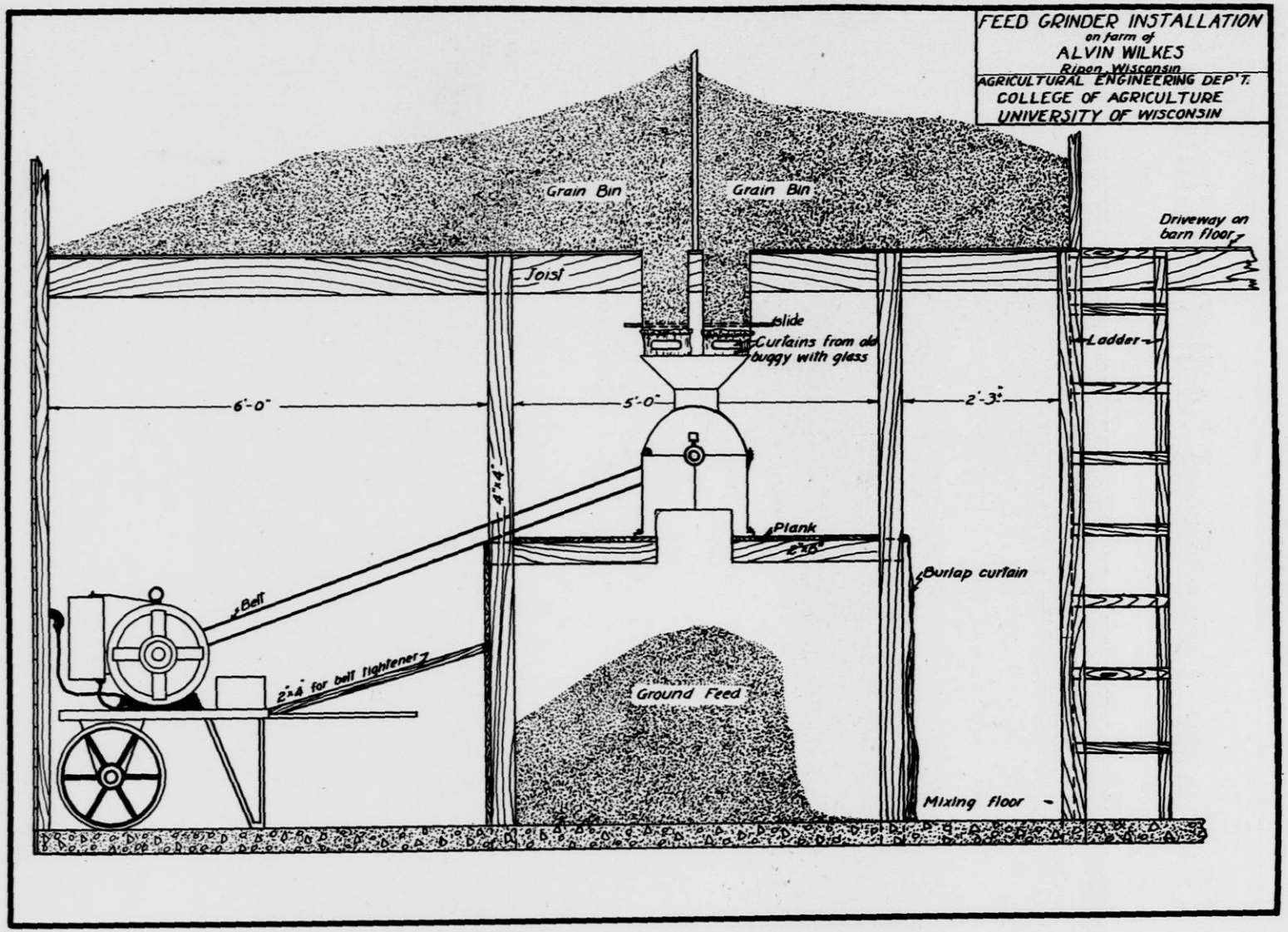


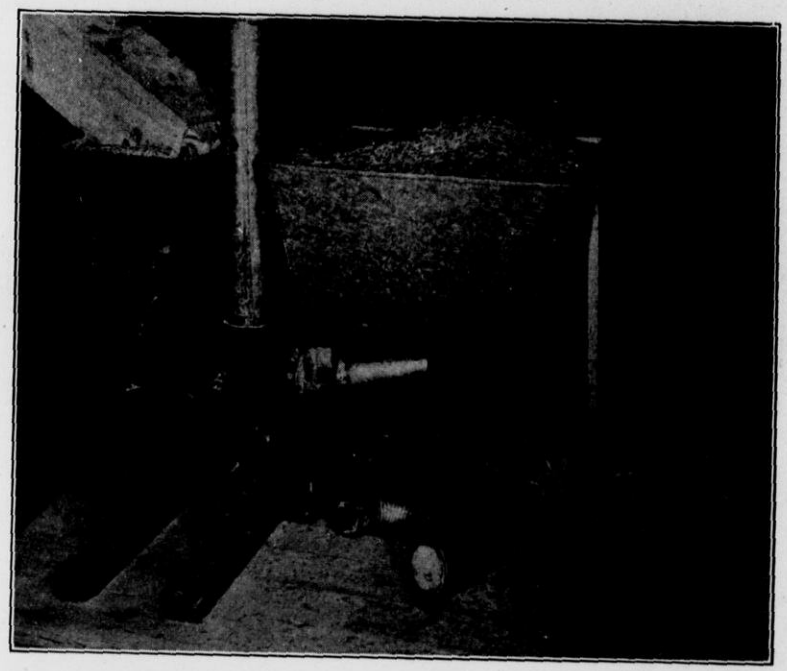
Diagram of Bin Arrangement

(See Other Side)

File under Grinding Feed
12-30

UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department

Grain Elevating



Elevating oats with a hammer type feed mill. The pipe carrying the ground feed from the lower part of the mill to the elevating fan has been removed. A hopper has been attached in its place and the grain is fed directly into the fan. A slide in the bottom of the hopper regulates the rate of elevating.

Capacity: The fans of these mills have capacities up to 250 or 300 bushels per hour, depending upon the size and design of the fan, height of bins, and kind of grain elevated.

Speed of fan: Speeds of 1200 to 1600 revolutions per minute are recommended for elevations up to twenty feet. For higher elevations and large capacities, slightly higher speeds will probably be required. Speeds much over 1800 revolutions per minute are apt to hull or crack the grain.

Motor and belt: Use the same motor and belt that are used for grinding feed.

Pulleys: The hammer mill is equipped with a fibre pulley 4″ in diameter. To secure the recommended speed it is necessary to use either the regular 3½″ or 4½″ diameter pulley on the motor.

Blower pipe: If it is necessary to blow grain horizontally more than about 8 or 10 feet, the vertical pipe should go up somewhat higher than the grain bin, and then slope downward to it at an angle of 30° with the horizontal.

File under Poultry
2-29

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

POULTRY HOUSE LIGHTING

Recommended Practices

Dates of Lighting: Lighting poultry from November 1 to March 1 will increase the egg production at a time when high prices prevail. It is practical to use lights on late maturing pullets even during October.

Size of Lamp: 40 watt.

Lamp Reflector: Cone shaped. 16" in diameter and 4" deep. Cover the reflecting surface with three coats of aluminum bronze paint. (If desired, reflectors for this purpose may be purchased.)

Number of Lamps: One lamp will light approximately 200 square feet of floor space. Divide the number of square feet of floor space by 200 to determine the number of lamps required. The nearest whole number should be used. Each pen must be figured separately. The 20' x 20' Wisconsin straw loft poultry house requires two 40 watt lamps. Fig. 1.

Arrangement of Lamps: The lamps should be placed in a row midway between the front of the house and the front of the dropping board. It is necessary that the roosts be lighted so that all the birds leave the roosts during the lighting period, and that there be no shaded areas under the roosts or dropping boards.

Height of Lamps: Six (6) feet from floor.

Distance Between Lamps: Ten (10) feet. The lamps at the ends of the row should be about five (5) feet from the ends of the pen.

Length of Lighting: The total length of the working day should be about twelve or thirteen hours. Longer hours may cause a high death rate.

Time of Lighting: There is no difference in the egg production between morning or evening lighting or a combination of both. Morning lighting is simplest as it requires fewer switches if it is to be automatic, thus being cheaper to install and also does not require dimming.

Switches: Automatic switches for turning bright or dim lights on or off are on the market. An alarm clock may be used for turning on the switch in the morning where only morning lighting is used. Figs. 2, 3 and 4.

Energy Consumption: From three to five kilowatt hours of electricity per 100 birds per month are required.

Increase in Egg Production: An increase of 10 to 30% in egg production may be expected.

Water: The hens ~~must be supplied~~ with water during the hours that they are lighted, for, every hour that they are without water is an hour lost.

Feed: Complete rations and proper management are necessary for success. Further information may be had by writing for Circular 141, "Feeding for Eggs", published by the College of Agriculture, Madison, Wisconsin

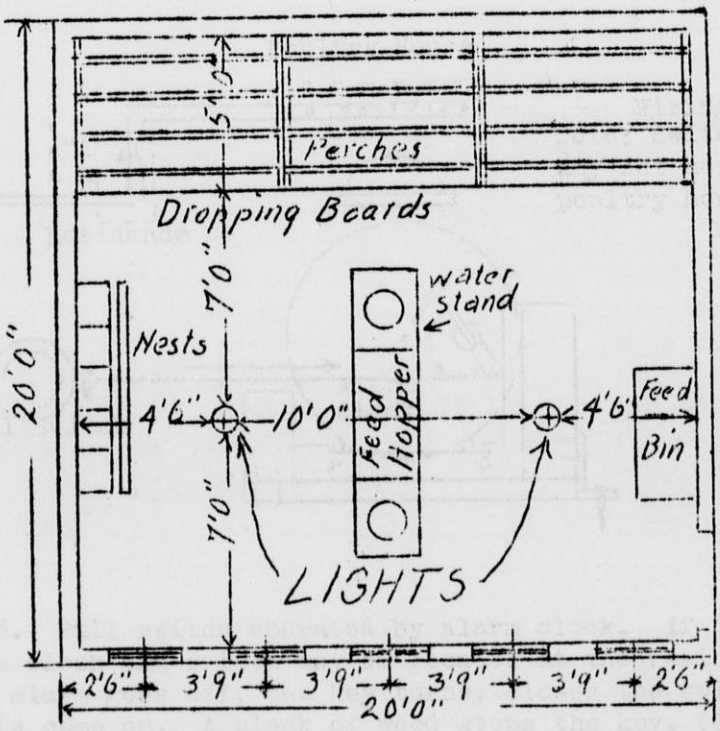


Fig. 1. Location of the lights in the 20' x 20' Wisconsin straw loft poultry house.

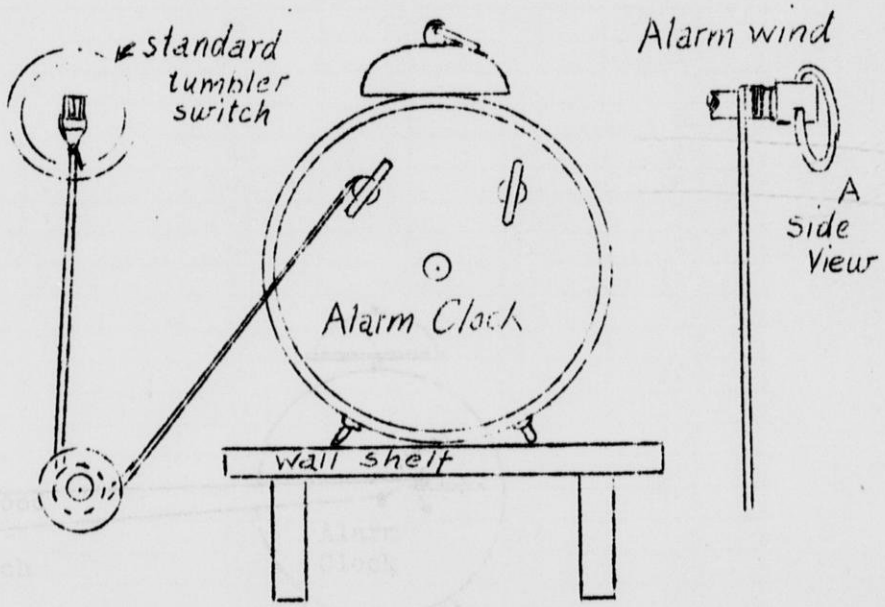
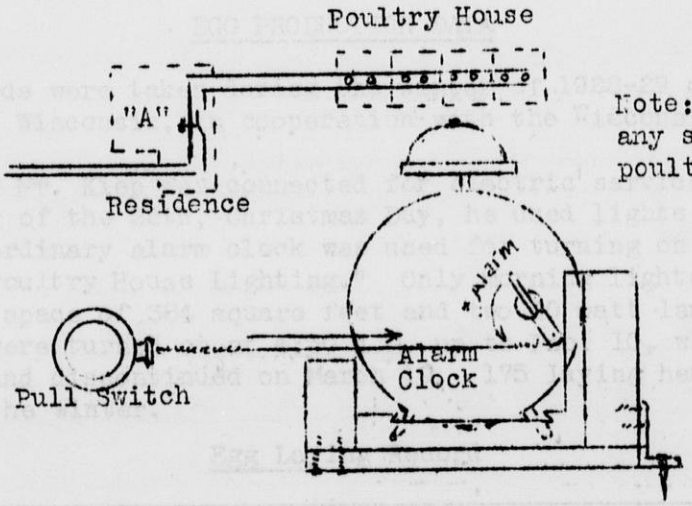


Fig. 2. Time clock and switch for poultry house lighting arranged by Gordon Hongstter, Sauk County, Wisconsin. Courtesy of "The Wisconsin Agriculturist."



Wiring Diagram
Note: Switch "A" closes at any set hour lighting poultry house.

Fig. 3. Pull switch operated by alarm clock. If desired, the alarm clock and switch may be located at the residence "A". When the alarm goes off, the key turns, closes the switch and the lights come on. A block of wood stops the key. (Courtesy of "Electricity on the Farm.")

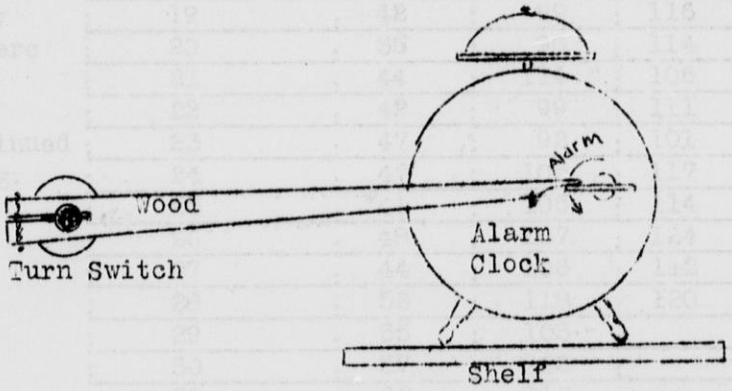


Fig. 4. Turn switch operated by alarm clock. A strip of wood about one foot long is clamped to a turn switch. One end rests on the winding key of the alarm clock. When the alarm rings, the key turns and the end of the stick drops off. As it swings down it turns the switch and the lights come on. (Courtesy of "Electricity on the Farm.")

File under Poultry
9-29

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT

EGG PRODUCTION DATA

These records were taken during the winter of 1928-29 on the farm of Mr. E. Kiep, Columbus, Wisconsin, in cooperation with the Wisconsin Power and Light Co.

The farm of Mr. Kiep was connected for electric service on Dec. 24, 1928, and on the morning of the 25th, Christmas Day, he used lights for the first time on his hens. An ordinary alarm clock was used for turning on the lights as shown in Fig. 2 under "Poultry House Lighting." Only morning lights were used. The house has a floor space of 384 square feet and two 40 watt lamps were installed. These two lights were turned on at 4:30 A.M. up to Feb. 10, when they were turned on at 5:00 A.M., and discontinued on March 10. 175 laying hens and 25 late pullets were kept during the winter.

Egg Laying Record

Day of Month	Month			
	Dec.	Jan.	Feb.	Mar.
	Number of eggs laid daily			
1		68	107	127
2		68	106	109
3		67	118	121
4		80	123	123
5		85	101	121
6	18	78	110	96
7	22	82	116	115
8	17	80	112	121
9	30	100	111	114
10	39	91	108	**104
11	39	83	107	114
12	35	101	109	97
13	35	101	109	89
14	40	87	109	118
15	44	93	122	105
16	34	84	111	94
17	40	117	110	91
18	48	85	119	110
19	42	99	116	99
20	36	90	114	113
21	44	114	106	106
22	42	99	111	105
23	47	92	101	109
24	47	105	117	101
25	*41	105	114	109
26	48	107	124	120
27	44	106	112	106
28	52	118	120	103
29	55	103		105
30	57	123		135
31	62	112		
Total for mo.	1058	2923	3143	3280
Ave. No. eggs per day	40.7	94.3	112.3	109.3

First day lights were used.

*Discontinued lighting.

Eggs Sold During January, February and March

January				February				March			
Date	Doz.	Price per doz.	Value	Date	Doz.	Price per doz.	Value	Date	Doz.	Price per doz.	Value
5	40	29¢	$11.60	1	21	32¢	$ 6.72	6	48	29¢	$13.92
17	80	29	23.20	6	47	31	14.58	7	12	28	3.36
23	47	29	13.63	9	24	32	7.68	14	60	24	14.40
29	50	34	17.00	16	45	34	15.30	23	30	24	7.20
				20	57	37	21.09	27	12	25	3.50
				27	54	35	19.04	30	51	25	12.75
Totals	217		$65.43		248		$84.41		213		$55.13

Value of Eggs for January, February and March

	Dozens	Value
Total Eggs Sold	678	$204.97
Total Eggs Used	100-5/6	30.48
Total Eggs Laid	778-5/6	235.45

It is estimated that the cost of lighting the hens for the entire period was approximately $1.00 at the rate of seven cents per kilowatt hour.

UNIVERSITY OF WISCONSIN
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AGRICULTURAL ENGINEERING DEPARTMENT

DAIRY REFRIGERATION TESTS

1927

These records were taken on four farms furnished central station service by the Southern Wisconsin Electric Company, Lake Geneva, Wisconsin.

Farm No.	Months used inclusive	No. of months used	Pounds milk cooled	Ave. pounds milk cooled per mo.	Type of installation	KILOWATT HOUR CONSUMPTION						
						Total used:	Ave. per mo.:	Ave. per 100#:	High mo.:	No. used:	Low mo.:	No. used:
1	Apr. to Nov.	8	143,752	17,969	Wet	1303:	163:	.906:	June:	205:	Nov.:	92
2	Apr. to Nov.	8	145,964	18,245	Wet	1430:	179:	.979:	July:	232:	Nov.:	78
3	July to Oct.	4	95,559	23,890	Wet	955:	239:	.999:	Aug.:	285:	Oct.:	190
4*	July to Oct.	4	83,222	20,805	Wet	787:	197:	.946:	Aug.:	231:	Oct.:	166
Totals and Averages:		24	468,497	19,520		4475:	186:	.955:				

*This is a two compartment tank. Due to the smaller compartment, the water for the evening's milk is left at a higher level which is more favorable for cooling the milk.

DATA ON BACTERIA COUNT

Table giving the data on the bacteria content of the refrigeration units of the table above. A premium of 40 cents per hundred pounds of fluid milk is paid if the bacteria content is below 10,000 and 25 cents if between 10,000 and 25,000.

Farm No.	Ave. bacteria count per week	No. of weeks: below 10,000	No. of weeks: 10,000 to 25,000	No. of weeks: over 25,000
1	38,140	10	9	13
2	3,537	31	1	0
3	10,515	8	8	0
4	12,435	9	5	2

DAIRY REFRIGERATION TESTS

1928

These records were taken on six farms furnished central station service by the Southern Wisconsin Electric Company, Lake Geneva, Wis.

Farm No.	Months used inclusive	No. of months used	Pounds milk cooled	Ave. pounds milk cooled per mo.	Type of installation	KILOWATT HOUR CONSUMPTION						
						Total used	Ave. per mo.	Ave. per 100#	High mo.	No. used	Low mo.	No. Used
1	Apr. to Nov.	8	128,041	16,005	Wet	1121	140	.875	Aug.	210	Nov.	51
2	Apr. to Nov.	8	144,504	18,075	Wet	1449	181	1.002	Aug.	265	Nov.	91
3	Apr. to Nov.	8	255,214	31,902	Wet	1742	218	.682	Aug.	347	Nov.	52
4	Jan. to Nov.	11	184,344	16,758	Wet	1570	143	.851	July	250	Feb.	69
5	May 16 - Nov.	5.5	146,859	27,065	Dry	1741	317	1.169	Aug.	442	Oct.	215
6	Aug. to Oct.	3	79,425	26,475	Wet	981	327	1.235	Aug.	435	Oct.	255
Totals and averages		43.5	940,487	21,620		8604	221	.915				

NOTE: The records of farms No. 1 to 4 inclusive are from the same farms as those given under these numbers for 1927.

An aerator is used on Farm No. 5. The energy used for pumping the water is not metered nor included in the record.

DATA ON BACTERIA COUNT

Table giving the data on the bacteria content of the refrigeration units of the table above. A premium of 40 cents per hundred pounds of fluid milk is paid if the bacteria content is below 10,000 and 25 cents if between 10,000 and 25,000.

Farm No.	Ave. bacteria count per week	No. of weeks below 10,000	No. of weeks 10,000 to 25,000	No. of weeks over 25,000
1	48,844	8	12	12
2	8,847	21	9	2
3	12,278	16	13	3
4	13,643	30	10	4
5	13,886	11	8	3
6	11,211	8	3	1

DAIRY REFRIGERATION TESTS

1930

These tests were taken on six farms furnished central station service by the Wisconsin Power and Light Company, Lake Geneva, Wisconsin.

Farm No.	Months used inclusive	No. of months used	Pounds milk cooled	Avg. pounds milk cooled per month	Type of installation	KILOWATT HOUR CONSUMPTION						
						Total used:	Avg. per mo.:	Avg. per 100#:	High mo.:	No. used:	Low mo.:	No. used:
3	May to Nov.	7	301,219	43,031	Wet	2490	356	.826	Aug.	518	May	177
7	July to Nov.	5	60,322	12,064	Wet	825	165	1.367	July	285	Nov.	20
8	Apr. to Nov.	8	194,509	24,314	Wet	2001	250	1.028	June	410	Nov.	100
9	June to Nov.	6	161,658	26,943	Wet	3156	526	1.952	July	640	Nov.	290
10	Oct. to Nov.	2	83,874	41,937	Wet	784	392	.935	Oct.	432	Nov.	352
11	Apr. to Nov.	8	127,631	15,954	Wet	1634	204	1.280	May	321	Nov.	93
TOTALS & AVERAGES		36	929,213	25,811		10,890	302	1.172				

NOTES: The records for Farm No. 3 are for the same farm as those given under that number in 1927 and 1928. Farms Nos. 7 to 11 inclusive are additional farms on which investivations were carried on in 1930.

The month in which the kilowatt hour consumption was the highest depends not only upon the temperature of the weather but also upon the quantity of milk cooled. See "Specifications of Installations," pages 4 and 5, for further details.

DATA ON BACTERIA COUNT

Table giving the data on the bacteria content of the refrigeration units of the table of the table above. A premium of 40 cents per 100# of fluid milk is paid if the bacteria content is below 10,000 and 25 cents if between 10,000 and 25,000.

Farm No.	Avg. bacteria count per week	No. of weeks below 10,000	No. of weeks 10,000 to 25,000	No. of weeks over 25,000
3	6,166	24	4	-----
7	11,082	15	3	2
8	10,036	22	9	1
9	14,165	13	7	4
10	25,181	----	5	3
11	16,287	22	9	1

DAIRY REFRIGERATION
SPECIFICATIONS OF INSTALLATIONS

These units are located on eleven farms furnished central station service by the Wisconsin Power and Light Co., Lake Geneva, Wisconsin. The numbers of these farms correspond with the numbers of the dairy refrigeration tests for 1927, 1928, and 1930.

Specifications	Farm Number 1	2	3	4	5	6
Make and model of system	Servel 51	Servel 51	Servel 51	Servel 51	Kelvinator	Kelvinator
Refrigerant	A	A	A	A	B	B
Ice capacity in tons per 24 hours	.5	.5	.5	.5	.5	.5
Type of installation	Wet	Wet	Wet	Wet	Dry	Wet
Size of tank (Inside)						
Length	7'6"	6'4"	10'0"	12'9"	5'0"	9'4"
Width	4'8"	3'4"	5'8"	3'9"	3'9"	3'9"
Depth	1'10"	1'10"	2'0"	1'10"	5'10"*	2'0"
Capacity in cans	15	12	20	20	12	16
Thickness of wall	8"	10"	7"	10"	6"	8"
Kind of insulation	Cork	Cork	None	Cork	Cork	Wallboard
Thickness of insulation:						
Sides	3"	2"	None	3"	3"	1.5"
Bottom	3"	1"	None	3"	None	1.5"
Cover or ceiling	None	None	None	None	3"	1.5"**
Motor size						
Compressor	.75	.75	.75	.75	1.5	1.5
Brine pump					1/6	
Method of control	Automatic	Automatic	Manual	Automatic	Automatic	Automatic
Method of cooling compressor	Water	Water	Water	Water	Air	Air
Type of cooling coils						
Basket type	✓	✓	✓	✓		
Annular tubes						✓
Aerator					✓	

NOTES: Under Refrigerant "A" stands for methyl chloride and "B" for sulfur dioxide.

Farm No. 4 has a twin tank. The lengths of these are 6'9" and 6'0". A 4" concrete wall separates the two.

Farm No. 5 uses an aerator to aid in the cooling of the milk. Cold water is available and used to reduce the load on the compressor. The energy for pumping the water is not metered.

* A brine tank occupies the upper part of the dry box, leaving a height of 0" for the milk cans. The door of this unit is about 36" high.

Farm No. 6 uses two 6" x 8' annular tubes for cooling the tank.

** Three pieces of wallboard and two of board, all .5" thick, were used in making the cover.

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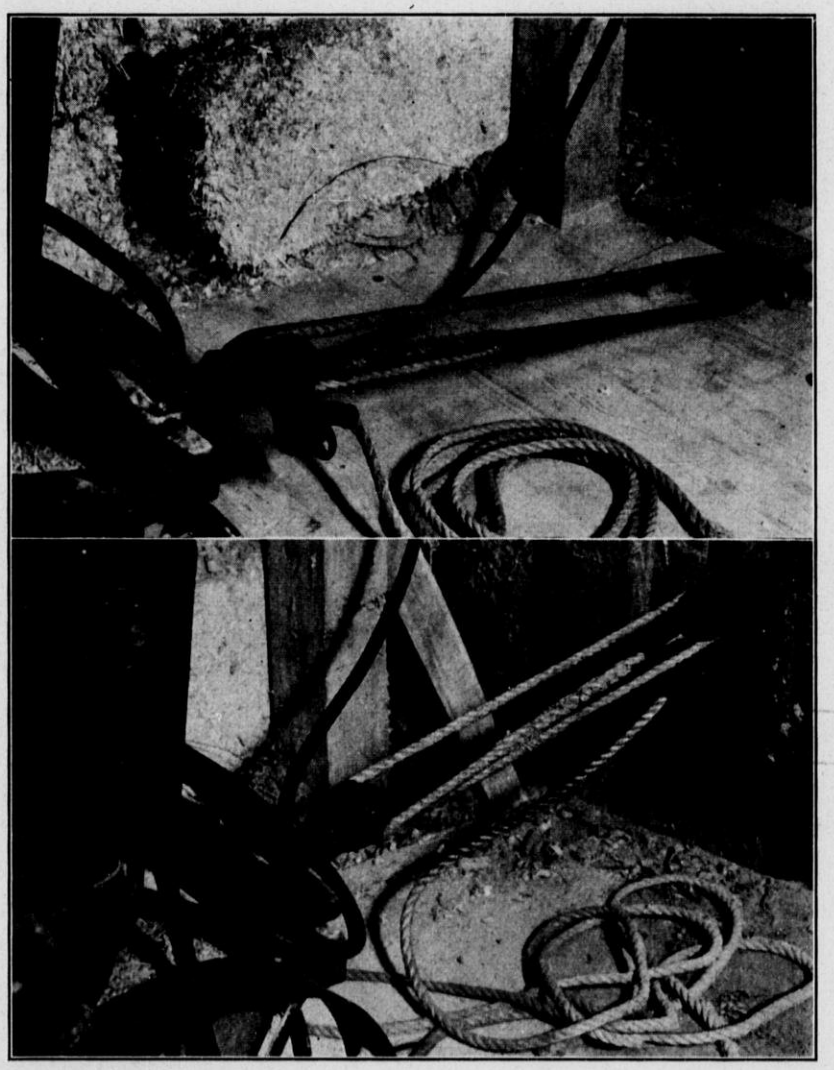
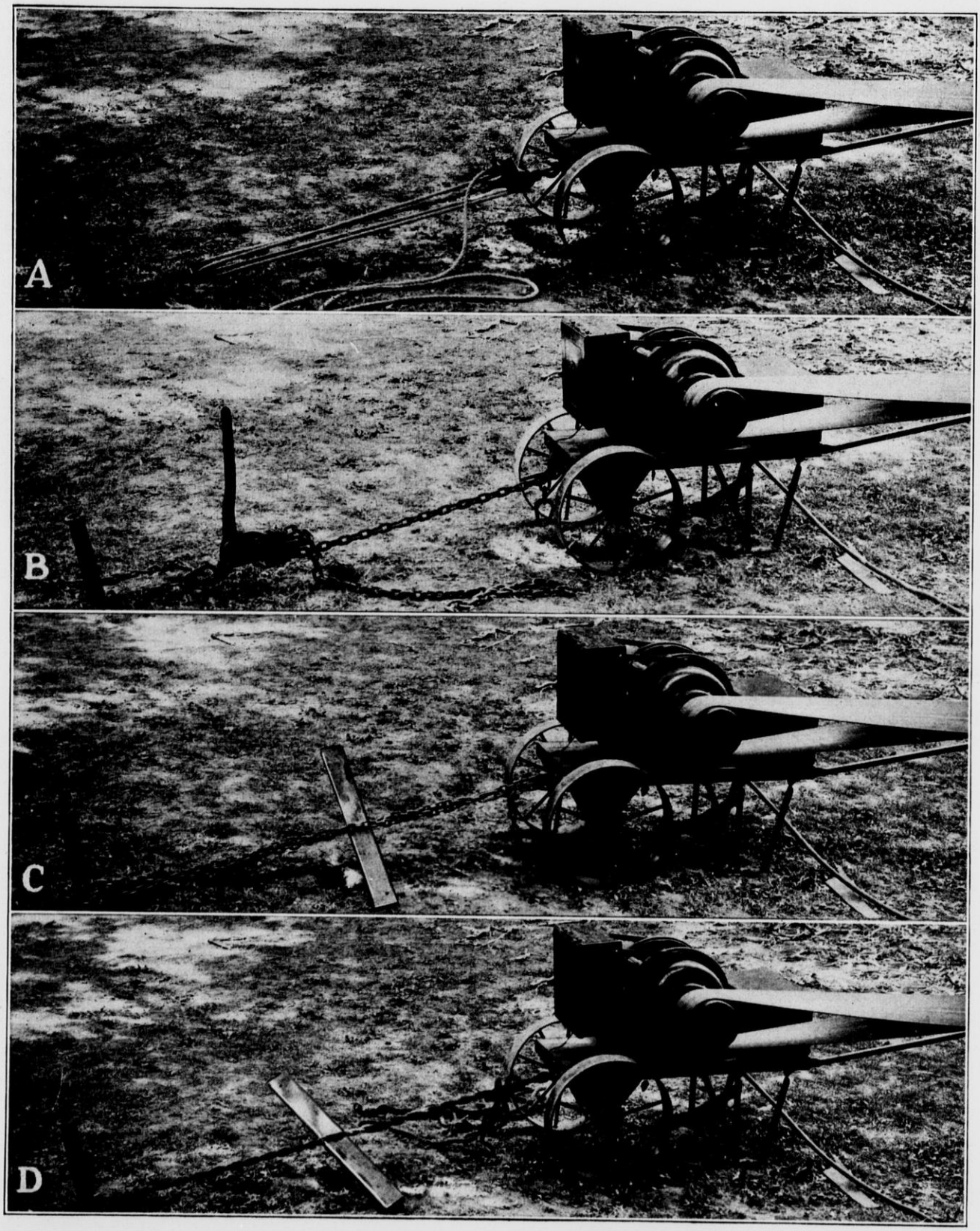
Anchoring the Utility Motor



Indoor Methods of Anchoring a Portable Electric Motor

The use of a self locking block and tackle for anchoring the portable motor and tightening the belt, as shown in the above illustrations, is very satisfactory. A fence stretcher or a twisted rope or chain may also be used and are shown on the opposite page.

(See other side)



Outdoor Methods of Anchoring a Portable Electric Motor

The self locking block and tackle (A) or fence stretcher (B) methods are especially satisfactory. They are easily adjusted and the motor can be moved readily to secure correct belt alignment. Keep the belt just tight enough to prevent slipping. Avoid excessive belt tension.

(See other side)

File under Water Supply

UNIVERSITY OF WISCONSIN
College of Agriculture
Agricultural Engineering Department.

FARM WATER REQUIREMENTS

Capacity: 200 to 400 gallons per hour will meet most farm conditions.

Pressure tank: 40 gallons and larger. A 120 gallon galvanized or iron tank tested to 125 pounds is recommended. Automatic switch is usually adjusted to start the motor at 20 pounds and stop it at 40 pounds.

Pump jack: Substantial, good sized bearings, gears covered and preferably running in oil. Connected directly to motor, which eliminates belt, is preferable.

Motor: One-quarter to one horsepower depending upon total lift, pressure and volume pumped. See table.

Cylinder: Diameter 2 to 3 inches with a 7 inch stroke is usually used.

Piping: One inch mains are usually satisfactory. 3/4" may be used if not much water is needed at one time. If the distance from the pump to the pressure tank is not over 10 feet and the capacity desired not over 250 gallons per hour, a one inch pipe is satisfactory. For greater distances and larger capacities a $1\frac{1}{4}$" pipe is desirable.

Water requirements per unit per day:

Person (bath room)	25 gallon
Person (no bath room)	12 "
Cow	10 "
Horse	10 "
Hog	2 "
Sheep	1 "

The above figures are averages and so a variation in the amounts of water consumed may be expected. Large cows and heavy milkers, for example, will require more water than small or dry cows.

CAPACITY OF PRESSURE TANKS

Size in inches	Capacity in gallons
16 x 48	42
18 x 48	53
18 x 60	66
20 x 60	82
22 x 60	100
24 x 60	120
30 x 60	160
30 x 72	220

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL ENGINEERING DEPARTMENT
POULTRY HUSBANDRY DEPARTMENT

ANALYSIS OF POULTRY BROODING TESTS 1931 AND 1932.

By
J. P. SCHAENZER
Project Director, Rural Electrification

* * * * *

During the springs of 1931 and 1932, fifty-five poultry brooding records were secured on farms scattered about the State of Wisconsin. Thirty-five records were secured in 1931 and twenty more during the 1932 brooding season. A detailed summary of these two groups was released after the work was completed each spring.

A brief summary of the two years of poultry brooding tests is given in Table I.

TABLE I. BRIEF SUMMARY OF POULTRY BROODING TESTS.

	Total	Electric	Coal
No. of flocks	55	52	3
No. of flocks started	17,967	16,833	1134
No. of chicks raised	15,955	14,902	1053
Per cent raised	88.8	88.5	92.9
Avg. no. of chicks started per flock.	327	324	378
Avg. no. of chicks raised per flock	290	287	351
Avg. no. of days brooded	34.1	32.4	31.3
Kilowatt hours per flock		184.5	
Pounds of hard coal per flock			790

It will be seen from Table I that 52 out of the 55 brooders were electrically heated and three used coal as a source of heat. Both groups did exceptionally well in number of chicks raised. The energy consumption for the electrically heated brooders averaged 184.5 kilowatt hours while an average of 790 pounds of hard coal was required per flock.

TABLE II. BROODING DATA OF 46 FLOCKS OF DAY-OLD CHICKS BY MONTHS, USING ELECTRIC BROODERS.

Month	No. of flocks brooded	Avg. chicks per flock: No. started	Raised: No.	Raised: %	Avg. No. of days brooded	Avg. kilowatt hours: Per flock	Per 100 chicks raised per day
Feb.	1	259	246	95	57	416	2.97
Mar.	7	305	281	92	40	251	2.22
Apr.	18	349	312	89	33	166	1.62
May	19	346	299	86	28	169	2.00
June	1	181	155	86	25	43	1.11

Table II shows that day-old baby chicks can be brooded electrically during the winter and early spring months and during extremely cold weather. A higher per cent of the chicks were raised during the earlier months of the year than during the warmer spring months. This ranges from 95 per cent in February to 86 per cent in May and June. As the weather got warmer, the length of brooding period in days increased. There was also a decrease in the energy consumption per flock and per 100 chicks raised per day as the brooding season progressed.

Two lots consisting of 400 chicks each were brooded at Edgar, Wisconsin, March 1 to April 6, a period of 36 days. When the chicks were only five days old, the temperature dropped to 5 degrees above zero inside of the brooder house (-15 degrees outside) without any ill effects to the baby chicks. At the end of the brooding period of these two lots, 387 and 366 chicks or 97 and 92 per cent respectively, were doing well. 301 and 303 kilowatt hours of energy were used by these two brooders respectively. A coal brooder was also started by this same poultryman on March 1, but only used to March 31, or a period of 30 days. 350 chicks were started and 302 raised, or 86 per cent. 775 pounds of hard coal at $18.00 per ton were required.

Another co-operator at Merrill, Wisconsin, ran comparative tests on a coal and electric brooder, April 10 to May 10, a period of 30 days. 364 chicks were started in each. Both did exceptionally well as 92 and 93 per cent of the chicks started were raised by the electrically and coal heated brooders respectively. The electric brooder consumed 113 kilowatt hours of energy and the coal brooder 650 pounds of hard coal.

TABLE III. BROODING DATA OF 46 FLOCKS OF DAY-OLD CHICKS WITH AND WITHOUT AUXILIARY HEAT, USING ELECTRIC BROODERS.

Auxiliary Heat	No. of flocks brooded	Avg. chicks per flock: No. started	Raised: No.	Raised: %	Avg. no. of days	Avg. kilowatt hours: Per flock	Per 100 chicks raised per day	Avg cost of extra fuel
Used	12	380	307	80.9	33	178	1.75	$1.49*
Not used	34	320	293	91.7	32	184	1.96	None

*Eight flocks only. Records of the other four not available.

TABLE IV. BROODING RECORD BY MONTHS OF 46 FLOCKS OF DAY-OLD CHICKS WITH AND WITHOUT AUXILIARY HEAT, USING ELECTRIC BROODERS.

Month	Auxiliary heat: No. of flocks	Auxiliary heat: % of total	No auxiliary heat: No. of flocks	No auxiliary heat: % of total
Feb.		0	1	3
Mar.	1	8	6	18
Apr.	4	33	12	35
May	7	59	14	41
June			1	3

Auxiliary heat, according to Table III, is not necessary for the successful electric brooding of baby chicks during the colder months of the brooding season. Nearly eleven per cent more chicks were raised when auxiliary heat was not used. Seven flocks were brooded during February and March without auxiliary heat while only one flock of the group using auxiliary heat was started on March 27. The energy consumption showed an average increase of six kilowatt hours for the flocks not using auxiliary heat, but the average additional cost for fuel for eight of the twelve flocks using auxiliary heat was $1.49. The energy consumption for the flocks using auxiliary heat was 1.75 kilowatt hours per 100 chicks

raised per day as compared with 1.96 kilowatt hours for those that did not use it. The poultrymen using auxiliary heat started with 19 per cent more chicks but raised only 5 per cent more than the other group.

TABLE V. BROODING DATA OF 46 FLOCKS OF DAY-OLD CHICKS WITH POORLY AND WELL INSULATED FLOORS, USING ELECTRIC BROODERS.

Floor insulation	No. of flocks brooded	Avg. chicks per flock started	Avg. chicks per flock Raised No.	Raised %	Avg. no. of days brooded	Avg. kilowatt hours Per flock	Avg. kilowatt hours Per 100 chicks raised per day
Good*	22	344	315	91.5	35.1	201.0	1.818
Poor**	24	328	280	85.5	30.0	165.8	1.971

*Well insulated floors: Double board and paper; and all using 1/2" insulating board.

**Poorly insulated floors: Single board; single board and paper; concrete; ground.

TABLE VI. NUMBER OF FLOCKS BROODED, BY MONTHS, OF THE ABOVE TWO GROUPS.

Month	Floor Insulation Good	Poor
Feb.	1	0
Mar.	5	2
Apr.	11	7
May	5	14
June	0	1
AVG. DATE	Apr. 9	Apr. 30

TABLE VII. AVERAGE AND MINIMUM TEMPERATURES BY MONTHS.*

Month	1931 Avg.	1931 Min.	1932 Avg.	1932 Min.
Feb.	---	---	27.1	2
Mar.	31.7	15	24.4	-4
Apr.	48.0	29	44.6	27
May	54.9	34	58.6	39
June	71.4	46	70.4	51

*The above records were taken from the "Monthly Meteorological Summary" for Madison, Wis. Published by the U. S. Weather Bureau, Madison, Wis.

Six per cent more chicks were raised when well insulated floors were used as compared with poorly insulated ones. Poultrymen using the better insulated floors started brooding their chicks considerably earlier in the season. The average starting date was April 9 as compared with April 30 for those using the poorly insulated floors. Table VII shows that the average and minimum temperatures by months increased for both 1931 and 1932 as the brooding season came to an end. As much of the brooding with the better insulated floors was carried on during the colder months, the brooding period was 5 days longer than with the other group. Although 35 more kilowatt hours were used per flock with the good floors, the energy consumption per 100 chicks raised per day was less.

TABLE VIII. BROODING DATA OF 46 FLOCKS OF DAY-OLD CHICKS BY SIZE OF FLOCK, USING ELECTRIC BROODERS.

Size of flock started	No. of flocks brooded	Avg. chicks per flock started	Avg. chicks per flock Raised No.	Raised %	Avg. no. of days brooded	Avg. kilowatt hours Per flock	Avg. kilowatt hours Per 100 chicks raised per day
Less than 225	11	179	144	80.2	32.2	133	2.30
225-399	18	307	285	92.7	33.3	166	1.75
400 and over	17	466	409	87.7	31.6	232	1.80

The highest per cent of chicks, 92.7, were raised when the size of flock started ranged between 225 and 399 chicks with an average of 307. Flocks less than 225 in number raised only 80.2 per cent, while those of 400 and over averaged 87.7 per cent. The average energy consumption of 1.75 kilowatt hours per 100 chicks raised per day was also lowest for the medium sized group.

TABLE IX. BROODING DATA OF 46 FLOCKS OF DAY-OLD CHICKS BY PER CENT OF CHICKS RAISED USING ELECTRIC BROODERS.

Per cent of flock raised	No. of flocks brooded	Avg. chicks per flock: No. started	Raised: No.	Raised: %	Avg. no. of days brooded	Avg. kilowatt hours: Per flock	Avg. kilowatt hours: Per 100 chicks raised per day
91-100	27	339	322	95	32.5	181	1.73
81- 90	12	332	289	87	32.3	151	1.62
71- 80	4	292	221	76	34.5	259	3.39
Less than 71	3	375	203	54	30.0	225	3.75

Twenty-seven out of forty-six electrically brooded flocks raised an average of 95 per cent of the chicks started. Another twelve averaged 87 per cent and only seven flocks raised less than 80 per cent. The energy consumption per 100 chicks raised per day was less for the higher percentages than for the lower ones.

TABLE X. BROODING DATA OF 46 FLOCKS OF DAY-OLD CHICKS BY KILOWATT HOURS USING ELECTRIC BROODERS.

Range in kw. hrs.	No. of flocks brooded	Avg. chicks per flock: No. started	Raised: No.	Raised: %	Avg. no. of days brooded	Avg. kilowatt hours: Per flock	Avg. kilowatt hours: Per 100 chicks raised per day
100 or less	10	279	257	92.0	31	76	0.95
101 -- 200	21	343	300	87.5	30	145	1.62
201 -- 300	7	326	290	89.0	35	232	2.28
More than 300	8	394	343	87.2	39	372	2.78

Of the 46 flocks brooded electrically, 21 used between 101 and 200 kilowatt hours of electricity or an average of 145. Ten others used less than 100 and 15 more than 200.

CONCLUSIONS.

1. The energy consumption of 52 electrically brooded flocks of chicks scattered about the state during the springs of 1931 and 1932 averaged 185 kilowatt hours and three coal brooded flocks required an average of 790 pounds of hard coal.

2. The per cent of chicks raised was satisfactory for both groups.

3. The death rate per 100 chicks started was less during the colder brooding period than toward the end of the season.

4. The brooding period in days per flock was longer for early season than for late brooding.

5. Six per cent more chicks were raised when no auxiliary heat was used. The energy consumption averaged six kilowatt hours more per flock but the average cost for the extra fuel was $1.49.

6. The poultrymen using auxiliary heat raised only 5 per cent more chicks but started with 19 per cent more than those who did not use it.

7. Baby chicks do not need a warm brooder house. Two flocks of 400 chicks each were brooded at Edgar, Wisconsin. When they were five days old, the temperature dropped to 5 degrees above zero inside of the brooder house (-15 degrees outside) and still raised 95 per cent of them.

8. Six per cent more chicks were raised on well insulated as compared with poorly insulated floors.

9. Although the average date of starting the flocks was April 9 for the well insulated floors and April 30 for the poor ones, the energy consumption was less per 100 chicks raised per day for the colder weather accompanying the earlier brooding.

10. Flocks ranging from 225 to 399 in size, with an average of 307 chicks, raised the highest per cent of chicks with the lowest energy consumption.

11. The energy consumption per 100 chicks raised per day decreases as the per cent of chicks raised increases.

ELECTRIC SERVICE AND FACILITIES FOR WISCONSIN FARMS BY COUNTIES TAKEN FROM THE CENSUS OF THE UNITED STATES. APRIL 1930.

Prepared by

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Project Leader, Wisconsin Committee
Application Electricity to Agriculture
Department of Agricultural Engineering
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Madison, Wisconsin

County	No. of farms	Farms having electric service: High line	Light plants	Total	Per cent	No. of electric motors	No. of telephones	No. having water piped into-- House	Bathroom
Adams	1239	20	29	49	4.0	21	650	58	27
Ashland	1087	54	34	88	8.1	47	212	119	70
Barron	4480	591	257	848	18.9	768	2939	755	299
Bayfield	1931	96	40	136	7.0	63	582	237	77
Brown	3076	638	319	957	31.1	557	1623	317	164
Buffalo	2042	79	379	458	22.4	385	1741	791	238
Burnett	1721	176	18	194	11.3	289	909	132	34
Calumet	2018	794	176	970	48.1	776	1316	308	263
Chippewa	3736	304	316	620	16.6	514	1758	593	250
Clark	5068	266	440	706	13.9	397	2017	599	227
Columbia	3042	539	274	813	26.7	673	2213	363	290
Crawford	1915	90	190	280	14.6	112	1381	218	76
Dane	5859	1663	778	2441	41.7	1658	4330	808	584
Dodge	4586	1535	359	1894	41.3	1427	3185	673	588
Door	2069	309	109	418	20.2	239	1022	192	141
Douglas	1922	61	67	128	6.7	36	469	147	56
Dunn	3515	287	308	595	16.9	526	2583	966	361
Eau Claire	2208	139	221	360	16.3	245	1508	457	187
Florence	356	96	18	114	32.0	50	45	50	24
Fond du Lac	4085	1150	301	1451	35.5	1243	2538	650	534
Forest	533	34	31	65	12.2	37	75	22	13
Grant	4087	383	679	1062	26.0	572	3632	833	385
Green	2386	439	565	1004	42.1	489	2075	651	390
Green Lake	1403	234	64	298	21.2	315	893	141	136
Iowa	2436	304	352	656	26.9	412	2078	334	217
Iron	585	32	19	51	8.7	4	14	121	11
Jackson	2284	103	259	362	15.8	277	1500	634	202
Jefferson	3209	916	352	1268	39.5	852	2106	392	293
Juneau	2221	138	204	342	15.4	321	1075	393	136
Kenosha	1220	488	105	593	48.6	433	860	370	253
Kewaunee	1972	258	147	405	20.5	256	1430	193	134
La Crosse	1733	220	346	566	32.7	511	1310	761	843
Lafayette	2254	139	382	521	23.1	297	1812	268	186
Langlade	1728	285	154	439	25.4	205	609	120	63
Lincoln	1755	150	190	340	19.4	177	518	186	70
Manitowoc	3767	1077	400	1477	39.2	954	2532	580	396
Marathon	6359	962	503	1465	23.0	877	2027	552	213
Marinette	2307	132	101	233	10.1	102	305	149	55

ELECTRIC SERVICE AND FACILITIES FOR WISCONSIN FARMS BY COUNTIES
TAKEN FROM THE CENSUS OF THE UNITED STATES. APRIL 1930.

County	No. of farms	Farms having electric service: High line	Light plants	Total	Per cent	No. of electric motors	No. of telephones	No. having water piped into-- House	Bathroom
Marquette	1302	65	64	129	9.9	127	1008	78	42
Milwaukee	1761	1166	171	1337	75.9	723	866	491	392
Monroe	3366	185	362	547	16.3	360	1845	1072	338
Oconto	2784	145	113	258	9.3	141	901	182	62
Oneida	768	71	44	115	15.0	41	166	62	35
Outagamie	3460	1091	229	1320	38.2	1059	2163	404	256
Ozaukee	1571	635	147	782	49.8	509	960	290	225
Pepin	939	162	49	211	22.5	329	782	281	81
Pierce	3013	148	281	429	14.2	243	1943	517	190
Polk	4143	791	129	920	22.2	1101	2831	781	300
Portage	3016	280	129	389	12.9	155	1068	223	112
Price	1997	62	59	121	6.1	40	645	85	33
Racine	1854	645	199	844	45.5	533	1329	502	309
Richland	2443	254	342	596	24.4	349	1669	591	251
Rock	3361	665	406	1071	31.9	746	2500	386	313
Rusk	2058	64	57	121	5.9	65	416	79	25
St. Croix	3221	344	192	536	16.6	527	2391	649	276
Sauk	3485	777	484	1261	36.2	1307	2668	813	495
Sawyer	1006	8	19	27	2.7	11	285	38	14
Shawano	3737	601	188	789	21.1	591	1993	204	124
Sheboygan	3513	1111	296	1407	40.1	922	2122	491	339
Taylor	2464	93	85	178	7.2	146	684	244	100
Trempealeau	3051	168	405	573	18.8	448	2437	1032	233
Vernon	4016	184	447	631	15.7	361	2745	1091	239
Vilas	451	101	39	140	31.0	72	93	54	35
Walworth	2502	798	321	1119	44.7	945	1912	422	330
Washburn	1341	39	26	65	4.8	42	518	112	53
Washington	2723	967	292	1259	46.2	912	1728	490	334
Waukesha	3164	1497	552	2049	64.8	1746	2210	626	518
Waupaca	3487	746	188	934	26.8	807	2521	268	162
Waushara	2186	217	80	297	13.6	295	1204	168	71
Winnebago	2573	682	231	913	35.5	724	1806	295	212
Wood	2819	310	220	530	18.8	311	1383	310	128
TOTALS	181,767	30,233	16,332	46,565	25.6	33,795	107,486	28,454	14,533